

WATERSHED MANAGEMENT ON A WATERSHED BASIS: IMPLEMENTING AN ECOSYSTEM APPROACH

June 1993



Water Management on a Watershed Basis: Implementing an Ecosystem Approach

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Un résumé de cette publication est disponible en français.



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ACKNOWLEDGMENTS

The development of the discussion in this document, and two other related documents in this series, resulted from the thoughts, efforts and collaboration of a range of people from a number of government ministries and the private sector. The work built upon the efforts of interagency groups and committees who were involved in various water management activities, and in developing this concept over several years. Contributors to this new direction for provincial water management included staff of the Ministries of Environment and Energy (MOEE), Natural Resources (MNR), Municipal Affairs (MMA), and Conservation Authorities (CAs). Representatives of a number of municipalities and engineering professionals from the consulting community and development industry in the private sector also contributed to this work.

The Provincial Urban Drainage Advisory Committee, an interagency group, has been a part of the evolution of watershed planning over the years. Also, the Waterloo Master Watershed Planning Committee, another interagency group, deserves mention as one of the first such groups to embark on watershed planning in the province.

At further stages, evolution of the concept of watershed planning also built on practical experience by some local agencies in watershed/subwatershed planning, and in the integration of this planning with municipal planning, notably in the Grand River and Credit River watersheds.

USING THIS DOCUMENT

The concepts and practical suggestions in this interim document are intended to assist those undertaking watershed planning in their communities, and to assist in the consistent application of provincial programs. This guidance is being provided to resource managers, planners and stakeholders for use over the next two years. During this time, provincial agencies will seek ways of effectively applying relevant programs and legislation to the development and implementation of watershed plans. Provincial participants in the watershed planning process will monitor how the ideas in these documents are used during the interim period, evaluating the processes used and the results achieved. Finally, on the basis of this experience, MOEE, MNR and MMA will develop optimum methods and processes for applying water management policies in the municipal land use planning process.

The suggestions here encourage municipalities to work together to address cross-boundary issues on a watershed basis. This approach is consistent with proposals found in other related documents on this matter, including: Draft Report on Planning and Development Reform in Ontario, Commission on Planning and Development Reform in Ontario; Streamlining Guidelines: The Development Review Process, Ministry of Municipal Affairs and Ministry of Housing; Growth and Settlement: Policy Guidelines, Ministry of Municipal Affairs; Cross-Boundary Issues in South Central Ontario: A Discussion Paper, Ministry of Municipal Affairs.

EXECUTIVE SUMMARY

Ontarians are fortunate to have a rich abundance of water resources, but are facing a growing range of water resource issues and challenges that affect our ability to fully enjoy the benefits of those resources. The province's steady economic and urban/industrial growth over the past several decades has brought with it a wide range of water management concerns, demands and conflicts, and these are more complex than ever before.

There are interconnections and relationships between human activities on land and what happens to water and subsequently to the organisms that use water. The boundaries of a watershed provide the natural limits for managing these interconnections and the subsequent state of the environment and of the resources within.

The environment and resources contained within a watershed are managed to preserve the natural values important to our society and to ensure that our continued use of them is sustainable. In the case of water, these include a healthy aquatic ecosystem, adequate supply, and water that is contaminant-free.

Municipalities have the legislative authority and political responsibility to undertake comprehensive land use planning which considers environmental issues. A consensus is emerging that currently, land use planning does not always satisfactorily protect the environment, particularly from the negative cumulative environmental effects of changing land uses. This is the case because adequate information is not always available for land use decision making.

When ecosystem considerations are integrated into the planning process, it is more likely that land use decisions will not jeopardize ecosystem and human health. An ecosystem approach can result in economic savings by avoiding the need for costly and difficult remedial actions.

An ecosystem approach to land use planning requires that boundaries for land use planning be based on biophysical boundaries as the context for examining the relationships between the natural environment and human activities. **The primary boundary for an ecosystem approach to land use planning should be the watershed.** This is based on using the hydrologic cycle as the pathway that integrates physical, chemical and biological processes of the ecosystem.

An appropriate vehicle for this integration is the watershed management plan. By providing a broad understanding of ecosystem function and status, and recommending actions for appropriate resource management in the watershed, the watershed plan can "capture" relevant ecosystem considerations that can be integrated into land use planning and decisions. The input of environmental considerations, goals and management recommendations into the land use planning process at early and appropriate stages should promote informed decision making; this, in turn, can lead to greater efficiency and effectiveness of both planning processes.

Proponents are encouraged to maximize the use of existing information as opposed to exhaustive new studies and inventories. Crucial gaps in information should be identified, however, and programs established to acquire this information.

This document discusses elements essential to successful watershed planning in terms of six main features.

- 1.0 DIRECTIONS** discusses the rationale for an ecosystem approach to both water management and land use planning in terms of a watershed plan. In this way, watershed management considerations outlined in the plan can be integrated with land use planning processes and decisions, as well as agricultural land stewardship considerations.
- 2.0 GROUNDWORK** provides general guidance on organizing and managing plan development, how to gather information that is needed, identifying biophysical conditions, and determining ecological issues of importance in the watershed.
- 3.0 THE PLAN** outlines ways to set goals, how to evaluate information and alternatives, and the features of recommended actions.
- 4.0 IMPLEMENTATION** notes general ways of putting actions in place.
- 5.0 AFTER THE PLAN** talks briefly about monitoring to measure progress, and the need to keep the plan up-to-date.
- 6.0 A WORD ON PUBLIC PARTICIPATION** discusses the importance of this component of the planning process, and the importance of making the watershed plan "everyone's plan," and not a plan of the province or a conservation authority.

1.0 DIRECTIONS

1.1 The Ecological Perspective

An ecosystem consists of air, land, water and living organisms, including humans, and the interactions among them. An "ecosystem" includes the community of living things and the complex of physical and chemical factors forming the environment. The scale of what is considered an ecosystem can be varied; there is a hierarchy of scales that are nested within each other and which overlap. A macro-ecosystem can be considered to be one with relationships among environment, society and economy. Ecosystem integrity is achieved when the environmental, social and economic relationships within ecosystems are balanced over the long term.

Water moving through the global hydrologic cycle (Figure 1) falls to earth and drains from the land transporting dissolved and solid materials from the land to the surface water and/or to ground water. This drainage water and these materials modify the physical, chemical and subsequent biological waterscapes of streams and lakes. A **water ecosystem**, therefore, includes all water, whether flowing or standing, the processes, factors and natural cycles which affect it and the organisms which live in the water. Three different scales of a water ecosystem, for example, include the bioregion, the watershed, and the watershed sub-basin or subwatershed.

A *watershed* is comprised of the land drained by a river and its tributaries. A *subwatershed* is comprised of the land drained by an individual tributary to the main watercourse. A watershed is a discrete ecosystem, the state of which is affected by the environmental condition of its component subwatersheds and by the condition of the mainstem river.

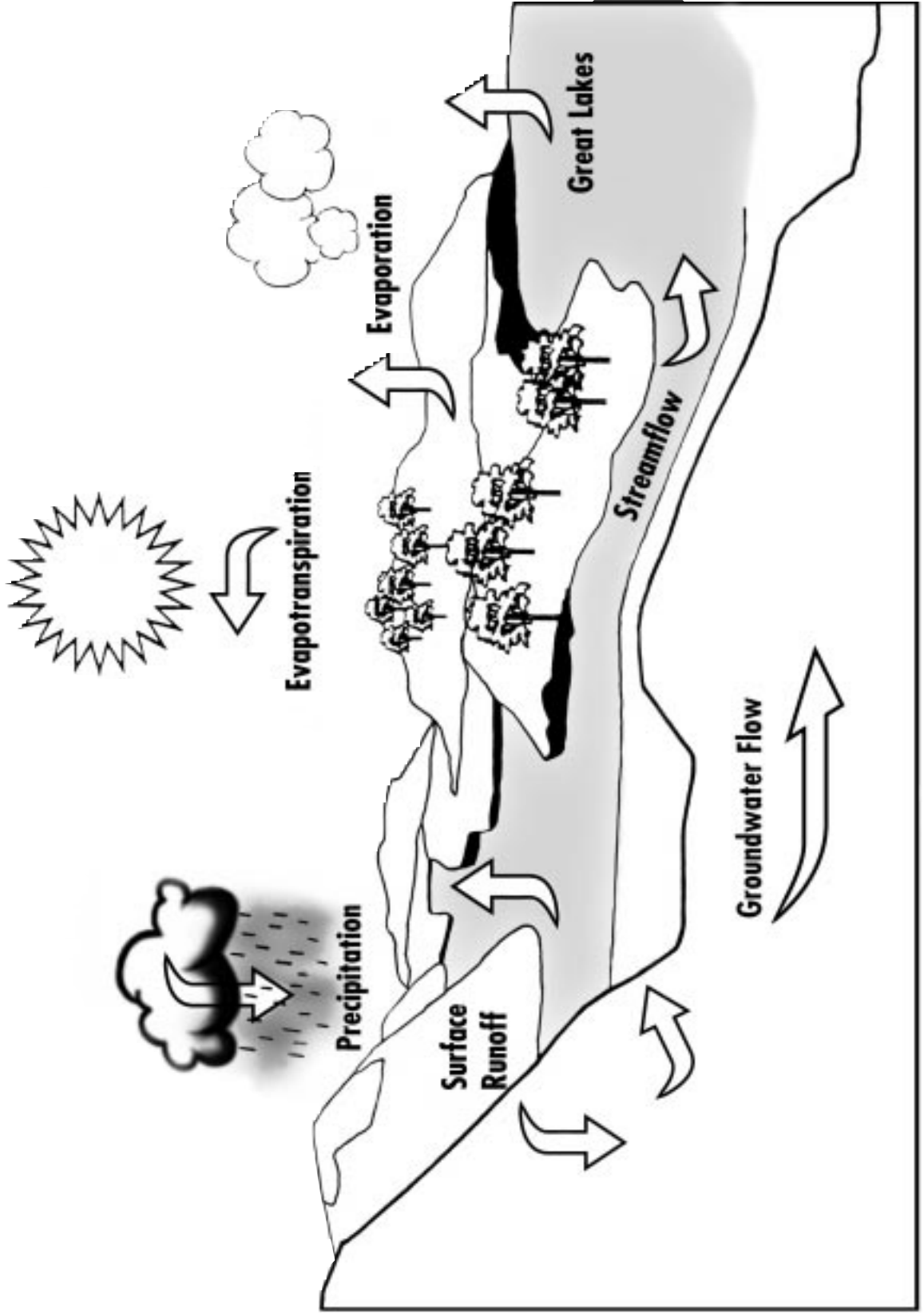
Flowing water, lakes and ground water are sensitive elements of the environment which are often the first component of natural environmental systems to suffer from poor management practices. In urbanizing areas, streams and rivers have frequently served as conduits for pollution and related environmental "problems," e.g., urban storm water. This use has proven to be shortsighted as it ignores the overall health of our aquatic resources, the uses made of them, the needs of downstream neighbours, and costs to society for remediation.

Despite numerous efforts to address these issues, there is evidence that many of Ontario's lakes and streams are deteriorating. Changes in water quality and quantity can unfavorably affect the life which our water resources sustain and limit the uses Ontarians make of these resources.

Ontarians are fortunate to have a rich abundance of water resources, but are facing a growing range of water resource issues and challenges. The province's steady economic, urban and industrial growth over the past several decades has brought with it a wide range of water quality and quantity concerns, demands and conflicts, and these are more complex than ever before.

It is generally accepted that the natural world is in a relatively comfortable state of dynamic equilibrium, maintained by constant flux, change, adjustment, rebalancing, growth and decay,

FIGURE 1
HYDROLOGIC CYCLE



and recycling. In the natural environment, most water (65 per cent) cycles back to the atmosphere through the transpiration of trees, and another 25 per cent infiltrates the soil, recharging the ground water below.

Human activities can greatly alter natural processes. It is apparent that the greatest proportion of water management problems and issues arise from human activities themselves. Urbanization and human activities are having cumulative impacts on water resources, activities like paving, storm runoff, channel diversions. The results of these impacts include degraded aquatic communities, the loss of well water supply, aquifer contamination, deteriorating water quality, and flooding and erosion. More demands -- and more diverse demands -- are being placed on water resources by competing users -- domestic, industrial, agricultural, recreational. The population, in general, is becoming more aware of and supportive of a need for environmental protection and wise management, and its close relationship to the province's economic health.

Water management in this context is a complex and challenging dilemma -- to use water wisely for beneficial uses, and to maintain the integrity of the ecosystem for its intrinsic value, for all life's sake. The Royal Commission on the Future of the Toronto Waterfront expresses the same view this way:

"Traditionally, human activities have been managed on a piecemeal basis, treating the economy separately from social issues or the environment. But the ecosystem concept holds that these are inter-related, that decisions made in one area affect all the others. To deal effectively with the environmental problems in any ecosystem requires a holistic or 'ecosystem' approach to managing human activities." Watershed, 1990

1.2 Water Management and Land Use Planning

There are interconnections and relationships between human activities on land and what happens to water and subsequently to the organisms that use water. The boundaries of a watershed provide the natural limits for managing these interconnections and the subsequent state of the environment and of the resources within.

The environment and resources contained within a watershed are managed to maintain and improve the natural values important to our society and to ensure that our continued use of them is sustainable. In the case of water, these include a healthy aquatic ecosystem and the interlinked terrestrial ecosystem, adequate supply, and water that is contaminant-free.

Traditionally, water management has been issue-driven, segmented among jurisdictions, and single resource based. This is difficult, costly, and not particularly effective. Proactive, cooperative management and early decision making is more appropriate, as is the perspective of ecosystem health. Much more can be accomplished through coordinated efforts and by respecting the complex nature of dynamic ecosystems.

Formerly, economic and environmental factors have been pitted against each other and "trade-offs" made. In the face of environmental management issues, the tendency has been to focus

on minimum requirements to reduce short-term impacts and to react to problems, to remediate or rehabilitate. Minimum standards generally result in minimum environmental quality. Increasingly, water managers and citizens alike are acknowledging the environmental importance and economic benefit of long-term sustainability, and anticipation and prevention of environmental problems or conflicts.

Municipalities have the legislative authority and political responsibility to undertake comprehensive land use planning which considers environmental issues. A consensus is emerging that currently, land use planning does not always satisfactorily protect the environment, particularly from the negative cumulative environmental effects of changing land uses. This is the case because adequate information is not always available for land use decision making, and natural resource boundaries often extend beyond the jurisdictional boundary of any one municipality. The call to adopt an **ecosystem approach** to planning has been outlined in reports by the Royal Commission on the Future of the Toronto Waterfront, the Commission on Planning and Development Reform in Ontario, the Ontario Round Table, the Premier's Council on Health, Well-Being and Social Justice, the Environmental Assessment Advisory Committee, and the Conservation Council of Ontario. An underlying principle of current thinking is that natural resources should be managed on a sustainable basis to provide for the environmental, social and economic well-being of Ontario.

When ecosystem considerations are integrated into the planning process, it is more likely that land use decisions will not jeopardize ecosystem and human health. An ecosystem approach can result in economic savings by avoiding the need for costly and difficult remedial actions. It places emphasis on early guidance and input into decisions on land use changes.

An ecosystem approach to land use planning provides early and systematic guidance on the interrelationships between existing and potential land uses and the health of ecosystems over time. This approach is based on the recognition that **ecosystems have limits to the stress which can be accommodated before the ecosystems are irreversibly degraded or destroyed.** Furthermore, this approach requires that ecological goals be treated equally with and be considered at the same time as economic and social goals. In some instances, a change in land use can have positive environmental effects, such as the revegetating of a valley corridor reach as part of the subdivision approvals process.

With an emphasis on the protection of the form and function of the natural environment, it is no longer acceptable, from an ecological as well as economic perspective, to impair water quality, degrade aquatic/terrestrial habitats, reduce baseflows, lower ground water tables, drain and sewer large areas, or line watercourses with concrete to the point where the integrity of the natural system is lost.

An ecosystem approach to land use planning requires that boundaries for land use planning be based on biophysical boundaries as the context for examining the relationships between the natural environment and human activities. **The primary boundary for an ecosystem approach to land use planning should be the watershed.** This is based on using the hydrologic cycle as the pathway that integrates physical, chemical and biological processes of the ecosystem.

The concept of using watersheds and subwatersheds for land use and resource management is appropriate for a number of reasons (see Figure 2). Water continuously moves through watersheds and influences numerous life cycles and physical processes throughout its cycle. An action or change in one location within a watershed has potential implications for many other natural features and processes that are linked by the interactive movement of surface and ground water. Also, of course, water movement does not stop at political boundaries, so that watersheds and subwatersheds may encompass all or part of several municipalities.

The concept is not a new one. The Ganaraska Region Conservation Authority was the first agency established on a natural resource boundary basis. This occurred almost 50 years ago, in 1946. The *Conservation Authorities Act* of 1946 established "conservation authorities" with jurisdiction over natural areas based on watersheds. Conservation authorities are the only agencies in Ontario with administrative borders based on surface water drainage boundaries. This makes them particularly well suited for coordinating watershed management activities. There are 38 conservation authorities (CAs) in Ontario; five of these are in Northern Ontario.

Watershed studies have been conducted in Ontario since the 1940s, but these were largely inventories of existing conditions in the watershed. Over time, the complexity of these studies increased and evolved from simple assessments to multidisciplinary studies that are moving toward consideration of the carrying capacity and integrity of the ecosystem. Clearly, there has been a shift from remediating problems to proactively protecting and enhancing the environment.

Watershed planning and land use planning consider the same environmental issues but from differing viewpoints and at different levels of detail. Currently, the components of resource management and land use planning are not undertaken in a truly integrated manner. More detail on this integration is provided in a companion document, *Integrating Water Resource Management Objectives into Municipal Planning Documents*.

An appropriate vehicle for this integration is the watershed management plan. By providing a broad understanding of ecosystem function and status, and recommending actions for appropriate resource management in the watershed, the watershed plan can "capture" relevant ecosystem considerations that can be integrated into land use planning and decisions. The input of environmental considerations, goals and management recommendations into the land use planning process at early and appropriate stages should promote informed decision making; this, in turn, can lead to greater efficiency and effectiveness of both planning processes.

1.3 The Watershed Plan

A *Watershed Management Plan* is a document developed cooperatively by government agencies and other stakeholders to manage the water, land/water interactions, aquatic life and aquatic resources within a particular watershed, in order to protect the health of the ecosystem as land uses change. It recommends how water resources are to be protected and enhanced in relation to changing land uses. In so doing, it also "sets the stage" for the undertaking of smaller scale subwatershed management plans (Figure 3). A *Subwatershed Management Plan* should reflect

FIGURE 2
CREDIT RIVER SUBWATERSHEDS

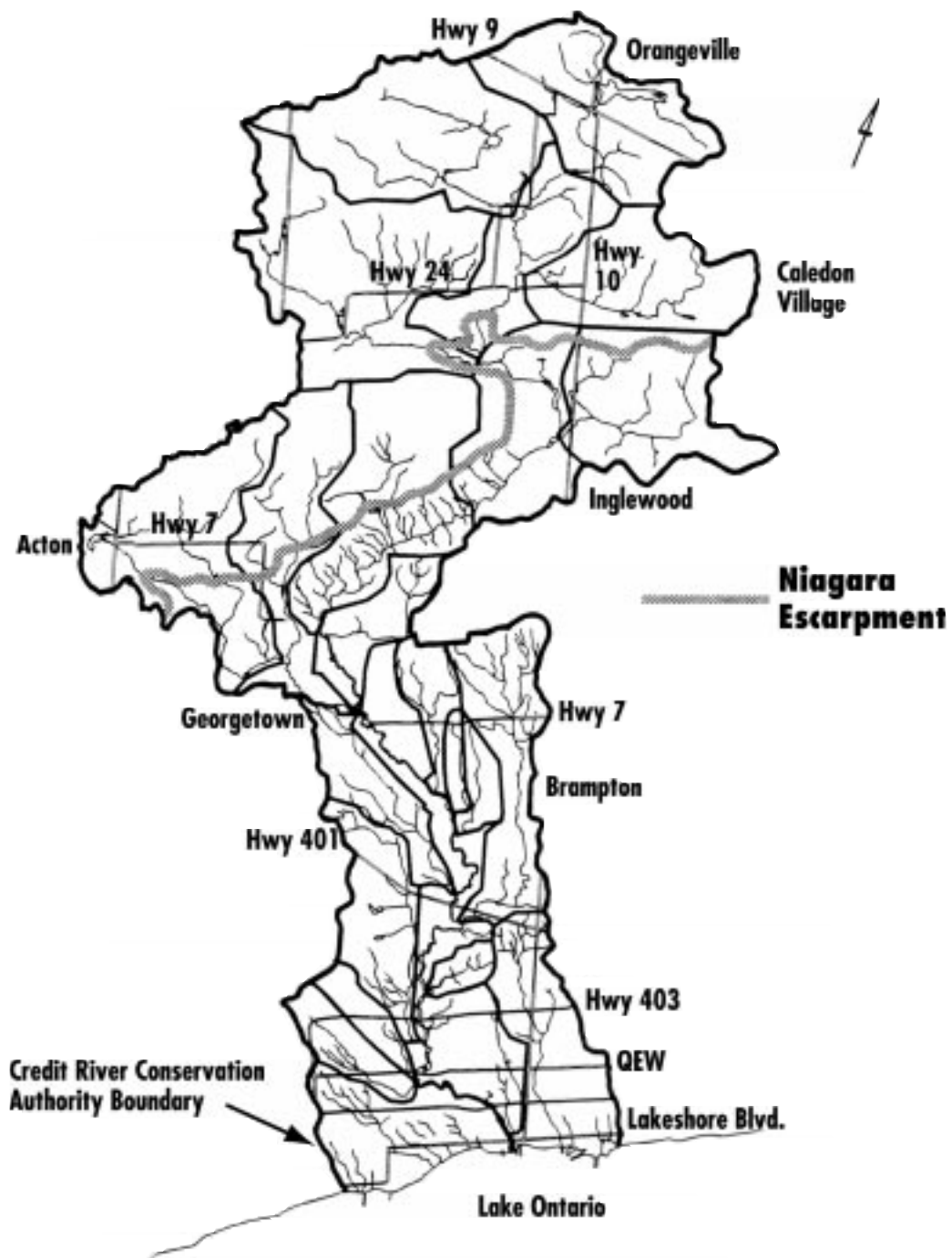


FIGURE 3
WATERSHED PLANS



- will take a broad ecosystem approach to water, water related natural features, terrestrial resources, fisheries, water dependencies/linkages and valley/open space systems
- will provide watershed-wide policy and direction for:
 - ecological integrity and carrying capacity
 - the protection of valley systems and green space planning
 - the management of water quantity and quality
 - aquifer and ground water management
 - fisheries management
 - rehabilitation/enhancement programs
 - a framework for implementation of watershed policies and programs
 - regional opportunities/constraints
 - document servicing needs/availability of water/sewerage
- will delineate subwatershed planning areas
- present targets, goals and objectives for subwatershed

PLAN RECOMMENDATIONS TO BE INPUT TO OFFICIAL PLANS

FIGURE 4 SUBWATERSHED PLANS



- enhance detail to address local environment issues
- will detail and implement specific subwatershed targets, goals objectives to establish:
 - natural system linkages and functions
 - surface and ground water quantity and quality management
 - the enhancement, rehabilitation of natural features
 - areas suitable for development
 - best management practices for incorporation into subdivision designs
 - specific implementation schemes and responsibilities for all recommendations
 - management practices for open space areas and green space corridors
 - an implementation strategy
- will outline directives for stormwater management plans and other studies/designs for specific areas within the subwatershed
- future monitoring requirements will be outlined

**PLAN RECOMMENDATIONS TO BE INCORPORATED
WITH OFFICIAL AMENDMENTS**

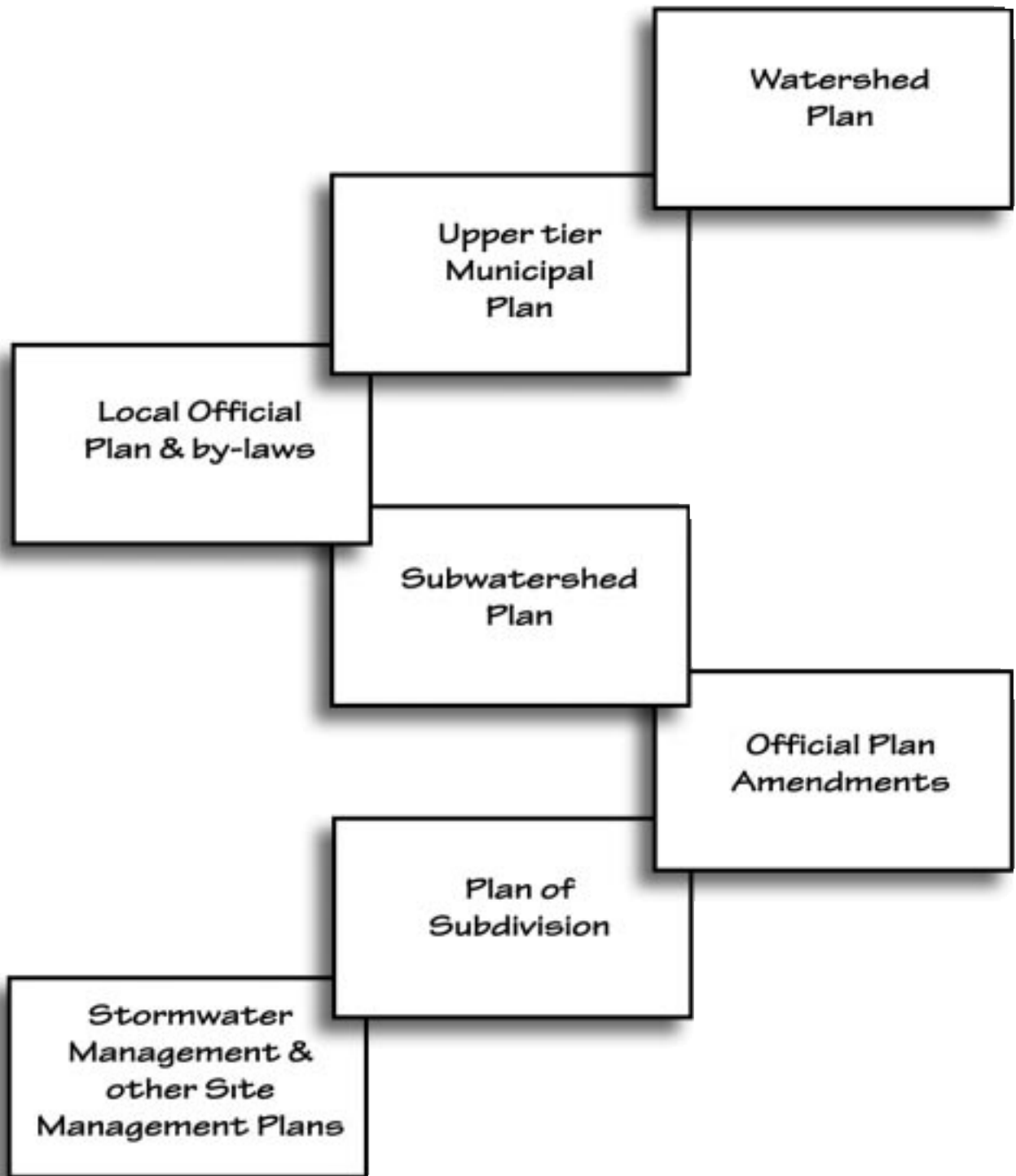
FIGURE 5
SITE MANAGEMENT PLANS



- will present the designs of specific best management practices, subdivision drainage designs, details of enhancement or rehabilitation programs
- will demonstrate compatibility of designs with subwatershed plan recommendations
- may include permits and applications for construction approvals
- may include requests for clearance of draft plan conditions
- may identify need for specific environmental assessments
- may detail design, operation and maintenance of Stormwater Best Management Practices

**PLAN RECOMMENDATIONS TO ASSIST WITH THE PREPARATION OF
PLANS OF SUBDIVISION AND LAND/RESOURCE DEVELOPMENT PROPOSALS**

FIGURE 6
WATERSHED AND
MUNICIPAL PLANNING



the goals of the watershed management plan but is tailored to tributary needs and local issues (Figure 4). Subwatershed plans can provide more detailed guidance for site-specific water resource planning issues. Further detail on subwatershed planning can be found in a companion document, *Subwatershed Planning*. Finally, localized, site-specific planning is provided for in *Site Management Plans* (Figure 5).

On the basis of ecological mapping of a watershed, a watershed management plan ascribes sensitivity ratings to natural values, and prioritizes them, and then identifies selected areas for preservation, protection, enhancement or rehabilitation.

The plan should provide an "image" of how the watershed should look and function, and what areas are appropriate for preservation, protection, enhancement or rehabilitation of desired values. This "picture" can be portrayed in terms of ecological areas, e.g., headwaters, middle reach, mouth/delta/estuary, etc. The plan is a "blueprint" for responsible water management and water-based resource management, and a guideline for the execution of civic responsibilities and provincial mandates. Table 1 suggests kinds of information that could be useful in a watershed management plan.

A watershed plan covers a broad area in size and a wide range of environmental topics. *Its focus, however, is water and water resource-related issues.* The plan purposely lacks the detail and specific information needed to describe local conditions or address local issues. Rather, a watershed plan provides a comprehensive understanding of ecological form and function in the watershed, an understanding of water and water-related functions across time and space. The plan can explain, for example, why a resource feature is present, its importance, the factors that sustain it, and the factors that need to be managed in order to sustain it, as well as indicator species to monitor the long-term health of the resource.

At the same time, a watershed plan indicates how these functions are largely adjusted to or a product of physical patterns and processes, e.g., land uses. It provides a "big picture" understanding of how land use changes can take place without being in conflict with watershed water resources. Figure 6 illustrates the relationship between watershed planning and the land use planning process, using existing mechanisms.

In contrast, the conservation authority watershed plans of the late 1970s and early 1980s were largely inventories of environmental attributes pertinent to the jurisdictions of conservation authorities only, activities such as acquisition of conservation lands or implementation of flood and erosion controls.

Plans are also drafted for co-ownership, for partnerships. Water management and land use planning issues in an entire watershed necessarily affect a range of jurisdictions and stakeholders: municipalities, conservation authorities, the Ministries of Environment and Energy, Natural Resources, Municipal Affairs, and Agriculture and Food and other local stakeholder agencies. Plan recommendations address "big picture" issues and the needs of the entire watershed, and provide a mechanism for auditing their success across the geographical extent of the watershed

TABLE 1
COMPONENTS OF A
WATERSHED PLAN

A Watershed Plan clearly presents the following information:

- **WATERSHED MANAGEMENT STRATEGY**, which is practical, comprehensive and environmentally sound.
- **IDENTIFICATION OF FORM AND FUNCTION OF NATURAL SYSTEMS** including land uses, natural features, linkages and surface and ground water systems. Identification of existing systems should include aquatic and terrestrial features/habitats, and the quantity and quality of surface and ground water resources, relationships and water-related dependencies, and factors influencing the viability of the resources.
- **RELATIONSHIP OF WATERSHED PLAN** to subwatershed plans, objectives for each and direction for other drainage, environmental, land use and planning studies and programs.
- **PLAN RECOMMENDATIONS:**
 - specify areas for protection, rehabilitation, and/or enhancement. It should be clearly noted where changes within the watershed should not occur along with appropriate setbacks from natural areas, and recommended management strategies for these areas;
 - establish areas that can be developed in a manner compatible with watershed goals.
- **IMPLEMENTATION PLAN** outlining:
 - information/input in land use planning and decision making;
 - recommendations and responsibilities for future studies;
 - monitoring program and responsibilities for information updating and corrective actions;
 - time frame for review/update of plan;
 - agency endorsement.

as well as the range of agencies involved. These agencies should work together in developing watershed plans.

At the same time, the watershed plan can provide very specific directives for subwatershed studies, including identification of the subwatersheds, priority ranking of subwatersheds, and subwatershed issues and goals.

A watershed plan provides a view of the landscape as a nested hierarchy of drainage basins. As such, it can narrow the set of variables or directives needed for effective decision-making at lower levels. This can assist decision-makers as to the appropriate level of resolution required, or to identify comparable situations elsewhere in the watershed. For example, a plan can indicate how small systems develop and operate within the large-scale systems of which they are a part. Wetlands, or deep/shallow aquifers can have different significance if they are considered on a watershed or subwatershed basis.

A watershed plan can provide a range of practical, environmentally acceptable and economically sound recommendations at a time when they can be effectively incorporated into land use planning documents and decisions.

1.4 Benefits

The very nature of watershed plans carries some inherent benefits, as noted: an understanding of ecological form and function, and their relation to land uses; involvement of a range of stakeholders; directives for further local study/planning; assisting decision-makers in determining level of resolution required.

Watershed planning can be a win-win proposition. It can enable decision-makers to accommodate both land use and ecosystem needs. It also allows water managers to keep a firm focus on water issues and water-based resources in the context of other ecosystem issues, and in the larger context of land use-ecosystem considerations. By the same token, it allows land use planners to make better decisions about appropriate land uses.

By inviting, and requiring for its success, the participation of a wide range of stakeholders and jurisdictions, watershed planning encourages co-operation, information sharing and coordinated efforts. This alone can boost the efficiency of planning (less duplication, overlaps, delays, information gaps), and therefore, reduce the cost of planning for these stakeholders. Watershed planning can reduce the costs of ongoing water management and land use implementation, not just by saving the costs of remediating unacceptably degraded conditions. It can also provide a planning "umbrella" for the integration of a myriad of considerations, municipal needs, approval mechanisms, provincial guideline considerations, and general planning procedures and the interests of different planning bodies.

The early involvement of everyone in watershed planning, moreover, can go a long way to minimizing conflicts, not just between land use and ecosystem needs, but also among agency mandates or responsibilities, or between long-term and short-term goals. Or, conflicting values

can be weighed to seek mechanisms to define priorities. In this sense, no one "owns" the plan, but everyone is a collective owner of the plan.

This leads to further benefits. Successful watershed planning increases the likelihood of:

- progress of plan development
- practical plan implementation
- plan success through support

Ongoing consultation among all participants is the key to a good plan and the progressive development of that plan. First, all participants have different interests and different expertise. By sharing information and putting their points of view across at key stages in the plan development process, they increase the likelihood that the plan will a) continue to evolve, b) get better, and c) get done with everyone still in the game and the plan on track.

In practical terms, if all participants have been continually fully involved in the evolution of the plan, there is greater likelihood that, when it is completed, everyone will be relatively satisfied and therefore committed to it, and will know what their responsibilities are for implementing it within their own jurisdictions and mandates.

Public awareness of and participation in the plan is a key determinant of its success. Ultimately, in its recommendations for ecosystem protection and enhancement, which in turn provide a basis for decisions on acceptable, appropriate land uses, the plan provides something important for the public in that watershed: **publicly valued deliverables**. These are benefits for everyone and they are both economic and ecological. All are things that are of value to the society as a whole, things like:

- significant sensitive natural resources and environments
- recreational opportunities
- new development that respects ecosystem integrity
- water taking/water use assessment
- hazard land designation
- efficient servicing

Opportunities can be created by the participating agencies for public input into the watershed plan, to ensure that their interests, as the public at large, can be part of plan development, and according to the procedures of the coordinating agency/agencies, integrated into the plan.

This has significant benefits. The first is to proponents of the plan. Public involvement in plan development increases the likelihood of public understanding of and support for the plan. This support translates directly into stakeholder willingness to advance the plan, fund plan implementation, and to carry out their mandates/responsibilities in accordance with the plan.

A major benefit is to the public who supports the plan. In their own local region, they have a chance to realize the publicly valued products which they endorse and support, resulting in a better living environment for them and for the community as a whole.

2.0 GROUNDWORK

2.1 Planning Framework

Before embarking on development of a watershed plan, participants are advised to follow some important steps for organizing and managing that process. The process itself can be divided into three main stages (see Figure 7):

- set the stage
- prepare the plan
- adopt the plan

This framework is intended to assist coordinating agencies by providing key considerations in how the plan gets done.

Set the Stage

A number of events or actions by this point have made it apparent to agencies such as conservation authorities, provincial agencies and local governments that there is a need for a watershed plan. These events could be such things as land use conflicts, degraded environments, unusual or unnecessary expenditures, lengthy delays, etc. The challenge is to transform requests for a watershed plan into commitments for participation, support, adoption and implementation of the plan. One of the most significant jobs in these early days is to prioritize issues needing attention, that is, those issues to which resources need to be directed.

A need having been established, the next step is to identify the main issues and concerns in the watershed which have brought the parties together to try to formulate a watershed plan. In almost all cases, there should be sufficient information to draft a brief overview document outlining the presence and status of water and water-related features as well as aquifer resources. At this point, the planners need not be concerned about overlooking issues or concerns that may prove important at a later stage; these issues will be more firmly established as plan development progresses and as more information becomes available.

While conservation authorities are an obvious choice for coordinating the preparation of a watershed plan, other agencies may also be considered for this role, e.g., local municipality, MOEE and MNR. The latter will certainly be necessary for areas of the province outside conservation authority and/or municipal jurisdiction.

FIGURE 7 PLANNING FRAMEWORK

SET THE STAGE

- recognize the need
- establish the issues
- establish the coordinating agency
- develop and seek support for funding proposal

.....
This stage will answer the following questions:

- Why is a study needed?
- Where in general will the study occur?
- Who will be coordinating agency?
- What issues need to be studied?
- What funding is required?

PREPARE THE PLAN

- select/appoint study coordinator
- formalize agency commitments
- define study area
- complete data base overview and tour subwatershed to define/refine issues
- develop preliminary goal statements for subwatershed
- prepare terms of reference
- establish steering committee and their function
- develop public involvement program
- collect/synthesize data base for study team
- monitor budget and schedule
- establish means of resolving disputes

.....
This stage will answer the following questions:

- Who will initiate the study?
- What are the studies terms of reference?
- What committees should be established and who should be involved?
- What are study boundaries?
- What role does the coordinator play in directing the study ?
- What are the issues and how are they addressed?
- How will the public be involved?

ADOPT THE PLAN

- review/modification of plan modifications
- obtain agency endorsements and acceptance of implementation schedule

.....
This stage will answer the following questions:

- How can agency commitment be obtained to ensure that plan is implemented?
- How will individual agencies accept the plan?
- Will the public support the plans?

Determining funding requirements and responsibilities is an important and challenging task in this early part of the planning process. The parties need to know the extent of funding that will likely be required, possible sources of funding, the extent to which each party can contribute, and possibilities for phasing the undertaking. All these factors influence the framework for initiating the watershed planning exercise.

Prepare the Plan

Representatives from the core provincial agencies, along with First Nations within the watershed, members of public interest groups, agricultural communities, and local municipalities may be appropriate representatives on a Steering Committee to coordinate plan development activities. Membership could also be extended to other parties later at certain key decision points.

While it might seem obvious, the Steering Committee should confirm or redefine the watershed boundaries for the planning exercise. This may include consideration of important ground water recharge and aquifer areas.

A tour of the watershed would be useful for participants. At this point, broad goals for watershed management can be formulated, to be refined later on as more information becomes available. These goals need to be agreed upon by all participants. Discussions should begin on ways of securing early and continued involvement of the public in plan development.

As part of plan preparation, it is important at this point to prepare a Terms of Reference for the watershed plan development exercise, which will clearly identify the work program, project schedule, and expected products. A key consideration in drafting the Terms of Reference is that only the information essential for plan development be collected.

The Province of Ontario is in the process of negotiating agreements outlining practical arrangement whereby First Nations and Ontario co-plan and co-manage natural resources in areas of Treaty Rights. When a watershed (or subwatershed) plan is being prepared that includes areas of Treaty Rights, First Nations representatives should be approached to provide input on a "government-to-government" or province-to-local government agency basis. This action should occur at the initiation of the plan as a process separate from general stakeholder involvement.

Adopt the Plan

In large measure, the ease with which the final plan is adopted by the participating agencies will depend on the effectiveness of the preceding stages in the process of developing it. The questions of goals, affordability, benefits, suitability of proposed actions, and responsibilities will have been worked out and agreed to by this point.

When all participants agree on a final direction, the real work of watershed management can begin. Conversely, little will be achieved if there is no such agreement. Because after this

point, the responsibilities for implementation and provision of operating costs now fall to participating agencies. At this point, commitment to implement the plan is secured from all participants.

2.2 Information Gathering

A great deal of information about the target watershed is required for the watershed management planning process. At the outset, the planners need to know what conditions exist in the watershed, and what issues are of significance, in order to determine appropriate goals for the watershed. The primary purpose of information gathering is to secure an understanding of ecological form and function in the watershed.

A successful and acceptable watershed plan need not collect extraordinary amounts of information on the watershed ecosystem. The planners, in conjunction with the technical resource experts, need to determine what information is needed to meet the planning and management needs of that watershed. This means what kind of information and at what level of detail.

Before this can be done, the planning team needs to know, in broad terms, what they are looking for. They can limit information gathering on the basis of a realistic assessment of the biophysical information on the watershed required to formulate realistic goals. This is not really a tall order. The planning team by this point knows what the "desired values" are in the watershed. This identification of values can be developed by the participants already familiar with watershed conditions to formulate broad-based "goals" for watershed management. This is in advance of the intensive information-gathering exercise on the biophysical conditions in the watershed.

Next, an important exercise for the planning team is to determine a) what information is already available, and b) what must still be collected. Much valuable information exists in previous watershed studies and as a result of provincial agency activities; it is recommended that these sources be consulted.

If it is determined that further information is required for a proper picture of the watershed, the following questions may provide useful criteria for limiting the scope of information gathering:

- ! What information is really needed to:
 - further refine the watershed management goals?
 - improve knowledge of the watershed ecosystem?
 - ascertain management practices that will be effective?
 - define and prioritize subwatersheds?

- ! To what extent could decisions be made better by what improvements in the information available?

- ! How might information be improved through different types of monitoring and studies? What are the costs and time required for such studies?

This is an important exercise. Scoping or focusing the information-gathering required can significantly reduce the costs of plan development. It can lead to a better plan because all the information is relevant to the formulation of goals for the watershed. All this can result in more efficient management and thus less cost later.

Participants should bear in mind that it is not necessary to gather as much information as possible, but rather to determine the knowledge that is required **to get the job done**.

Some sources of watershed information include:

- watershed municipalities
- the watershed conservation authority
- provincial/federal government agencies
- Crown agencies, e.g., Ontario Hydro
- Ontario universities and colleges
- private interest groups
- private companies

Typical kinds of information include:

- provincial and federal mapping
- technical reports
- municipal official plans
- pollution control reports
- impact studies
- remote sensing information
- physiography texts
- wildlife/fisheries inventories and information
- other resource inventory reports

2.3 Biophysical Conditions

Initially, information is needed on the structural and functional relationships among air, land and water and associated biota of the watershed ecosystem over time. This consists of a summary of environmental features such as natural features, aquatic communities, water resources including water quality and ground water, recreational areas, flooding, erosion and aesthetics.

Data quality standards should be agreed upon by participants and these criteria should be used to screen information which is to be analyzed.

The most practical and useful way to obtain this information is to carry out "ecological mapping." The technical information and the level of detail required to ecologically map a watershed, and

to evaluate sensitivities will reflect the management goals for that watershed and the sorts of land use change impacts anticipated.

Mapping information should be based on Ontario Base Maps (OBM) where available. For parts of the province not covered by OBM mapping, information should be placed on mapping which can be digitized for eventual use with a Geographic Information System (GIS).

Topics, and the level of detail, depend on the particular issues in the watershed. For this reason, a generic terms of reference for studies to be undertaken is not provided here. Subjects which may be of relevance to the watershed, however, are suggested below.

In terms of physical environment and resources, topics could include:

- geology, physiography
- topography
- soil types and relative permeability
- climate data (especially for large watersheds with large regional variations in precipitation)
- hydrology, hydraulics, flood risk
- drainage system
- geomorphology

Information on water resources, e.g., location, quality, quantity, could include:

- maps showing the watershed location and watershed boundaries (surface water and ground water)
- maps showing subwatershed locations and boundaries
- water quality assessments for the mainstem river and tributaries
- land use patterns
- hydrogeology
 - ground water/aquifer
 - location maps
 - direction of ground water movement/relative transmissivity
 - recharge zones/susceptibility to contamination
 - ground water spring locations

Information on biota could include:

- ecological surveys and biological inventories
 - fish habitat, e.g., spawning and rearing areas, migratory routes, etc.
 - Ministry of Natural Resources District Fisheries Management Plans
 - vegetation, e.g., MNR forest inventory maps
 - migratory water bird habitat information/wetlands
 - earlier river basin and watershed studies of the area

- wetlands, Areas of Natural or Scientific Interests (ANSIs), Environmentally Sensitive Areas (ESAs)

Information on water uses, e.g., recreational impoundments, aquaculture, hydroelectric, etc., could include:

- present and potential sources of point and non-point contaminants, such as:
 - land use, e.g., urban areas, agricultural, forestry, etc.
 - areas where human consumption of a fish is restricted
 - areas where fish stress has been detected
 - location of watercourse structures and activities
 - altered watercourses

Ecological boundaries should be depicted as encompassing areas which possess similarities and/or areas which are interdependent. Ecological boundaries of importance for management should be derived from:

- the watershed management goals
- watershed issues
- knowledge of aquatic ecological relationships

Where ecological boundaries extend beyond the watershed, information should be collected in cooperation with adjacent conservation authorities and municipalities.

A variety of criteria should be used to ascribe ecological bounds. These boundaries should stress ecological land/water linkages for both ground water and surface water. These are areas important to watershed water quantity, quality and aquatic habitat, and include, but are not limited to, wetlands, floodplains and riparian vegetation belts including headwaters areas. Another example is this: the boundaries of locations where significant infiltration of surface water occurs to ground water which then becomes the source of springs needed to maintain fish spawning areas that sustain reproducing brook trout populations in the watershed.

2.4 Watershed Issues

Watershed issues or potential threats and opportunities can be identified on the basis of their ecological significance. These issues can be categorized in terms of (the need for):

- ! preservation (Areas of Natural or Scientific Interest or rare, threatened or endangered species)
- ! protection (measure to prevent intrusion of land use)
- ! enhancement (optimization of use or sustainable yield)
- ! rehabilitation (restoration required)

Preliminary goals of the watershed management plan should determine what areas or resources are to be preserved, protected, enhanced, or rehabilitated. A balance is needed between

ecosystem health and human needs, as well as an accepted mechanism for determining this balance.

During and after land use changes, some measures can be used to reduce, limit or otherwise modify adverse effects of human activities on the aquatic environment and on aquatic resources. Our reliance on these measures must be prudent, however. There are limits to what changes the ecosystem can withstand; these limits should be considered first, before any thought is given to "mitigation" measures to accommodate further changes.

It is wrong to assume that the adverse effects of human activity can always be eliminated or rendered ecologically insignificant through mitigation, regardless of how costly the measure or how good the intention. Such measures cannot replace good planning -- better and earlier environmental considerations in land use decisions.

There are a variety of measures, however, that can be applied for alleviating impacts. These range from non-structural ones, such as modifying the timing of a particular development action, to structural measures, like the use of engineered controls. But again, these must be applied prudently, and not as a means of extending land use changes to the point of burdening the ecosystem.

Best Management Practices (BMPs) can serve as performance standards to ensure that excessive or unusual burdens are not placed on the ecosystem, e.g., fish kills as a result of massive siltation from erosion. However, they do not eliminate impacts. BMPs alone do not necessarily afford the protection identified by the plan as needed for particular environmental resources. These practices may overlook site-specific sensitivities, or at best, not meet particular goals of the watershed plan.

Finally, measures considered for alleviating impacts need to be properly applied, if they are to have any value. Many publications provide useful information on the application and efficacy of such measures.

3.0 THE PLAN

3.1 Goals, Objectives and Principles

The watershed planning process begins with a description of the end in mind. Goals of the watershed plan provide a statement of how the watershed should be in the future-- a target condition, involving numerous ecosystem components. They address local watershed management issues and needs.

Initially, broad "goals" will have been formulated to guide and limit the gathering of information on biophysical conditions in the watershed. On the basis of the information collected, and the issues identified in the watershed, goals for watershed management can now be formulated with greater understanding and certainty.

Goals are developed for features of the watershed that are desired values, or threats to desired values, e.g., water quality, ground water, recreation, aquatic communities, flood protection, erosion control, natural features, aesthetics. Within each area of the watershed, management goals should be stated for each management category: preservation/protection, rehabilitation, enhancement. This provides focus for subsequent management actions.

Because the cost and effectiveness of the watershed plan and subsequent land use decisions are entirely dependent on the quality of the goals themselves, management goals should be very carefully thought out and expressed. They must be clear and precise. They should, of course, have the support and endorsement of all participants.

Goals should be defensible, that is, supported by sound ecological and economic reasoning:

- the goal should be attainable
- the goal must have public/agency/stakeholder endorsement
- it should be economically responsible
- the ecosystem must have the capacity for the goal to be achieved

Goals should be sufficiently flexible to accommodate natural fluctuations in watershed conditions, and those for rehabilitation should be progressive and allow for future adjustments. Goals can be long term or short term; the time frame should be established in the implementation plan. Most importantly, goals are iterative, continually refined by new information, more experience, and progressive changes.

Briefly, management goals should be:

- ! practical to ensure achievability
- ! explicit, verifiable
- ! result focused to ensure accountability of those implementing the plan

Also, goals for the watershed provide the focus for the formulation of subwatershed goals. It is also appropriate for the watershed plan to identify its component subwatersheds, key issues in those, and some general suggested management strategies and priorities for action. Following are some samples and suggestions for formulating goals and objectives, and suggested principles on which to base these.

Each watershed and ground water aquifer system in the province exhibits unique conditions and is subject to particular pressures. It is important, therefore, to establish goals and objectives that address the water and related resource management issues *that are particular to that individual watershed and ground water aquifer system*. Nevertheless, there are some fundamental or generic goals, objectives and principles that can apply to all water and related resource management activities.

A general goal, for example, could be expressed as follows:

To ensure all water and related resource management systems are maintained at, or restored to a clean, naturally sustainable condition.

Some commonly held objectives are as follows:

Water within the watershed, subwatershed and ground water aquifers is available in sufficient quantity and of such quality as to provide optimal and continuous environmental, social and economic benefits to existing and future residents of Ontario on a sustainable basis.

The integrity of aquatic and riparian ecosystems and the biota they support are maintained or enhanced.

Human life and property are not threatened by water or water-related hazards.

These kinds of goals and objectives can be formulated on the basis of the following well-accepted watershed planning and management principles.

The Watershed and the Hydrologic Cycle as the Basis for Planning and Management

The watershed and subwatershed basins and the hydrologic cycle are the basis on which watershed systems are planned and managed to meet water management objectives. Where possible, the impact of land use changes or proposed developments will be evaluated on the basis of their impacts on the watershed, subwatershed, and aquifer system, including upstream/downstream and cumulative effects of these changes.

Stream and Lake Conditions

Man-made changes to natural vegetation and natural processes in watersheds and subwatersheds have resulted in detrimental changes to stream and lake conditions. These changes are to runoff, temperature, habitat, chemical and baseflow characteristics which adversely affect the hydrologic cycle and natural aquatic communities.

Principles associated with water management on a watershed basis are consistent with principles of the hydrologic cycle and those identified in the Strategic Plan for Ontario Fisheries (SPOF II), particularly the following:

Sustainable development requires that adverse impacts on natural systems such as air, land and water be prevented or minimized to ensure the aquatic ecosystem's overall integrity.

Naturally reproducing fish communities, based on native fish populations, provide predictable and sustainable benefits with minimum long-term costs to society.

Maintaining Natural Watercourses

Streams and lakes and their adjacent riparian systems, e.g., floodplains, wetlands and valley slopes, provide essential natural functions and values to society. They are not just lands "left over" from other land use activities. Also, they all possess a form and function directly linked to the adjacent land surface and other components of the environment, e.g., land use, climate, bedrock, wildlife. In particular, they serve an essential role in maintaining water quality and quantity in streams and lakes.

All land use and natural resource management activities should maintain watershed systems such as headwater streams, watercourses, lakes and related riparian systems in a naturally functional and as undisturbed a state as possible. Attempts should also be made to restore the functional character of water systems that have been degraded by previous land use activity.

Valuing the Resource

In making decisions about the treatment or removal of water from a site, the proponent should consider this water to be a valuable natural resource to be properly managed, rather than a by-product of land use changes. This involves managing the water as soon as it falls to the ground as opposed to trying to manage its quality and quantity as it leaves the site.

Best Management Practice

Best Management Practice (BMP) involves an attitude to the resource, a willingness to consider aspects of its welfare, as well as the best technology to accomplish this, where available. The best available technology economically achievable should be used to manage water resources in a way that maintains, and where possible enhances, the health of watershed systems. This includes improving stream, lake and aquifer conditions, and avoiding detrimental effects. Merely ensuring "no net decrease" in water quantity or quality is not an acceptable target, especially if conditions are already degraded, and if technology exists and can be applied to improve these conditions. However, **it is wrong to assume that technology alone constitutes BMP.**

Innovative Approaches

Planning agencies and proponents of development should be encouraged to explore innovative approaches to better address water management needs on an ecosystem basis.

3.2 Alternatives and Evaluation

This phase of plan development considers alternative measures that may be used to protect, enhance or rehabilitate the environmental features identified in the watershed issues and goals.

A watershed plan is not like a jig-saw puzzle that has only one solution. It represents, instead, a strategic planning exercise whose intent is to maximize benefits (to the watershed as a whole), and to minimize the efforts and costs needed to formulate planning decisions and put directives in place.

A key part of this strategic planning exercise is to consider alternatives -- alternative approaches, alternative scenarios, alternative measures. It needs to explore what is needed to achieve the goals. These considerations include costs, affordability, public acceptance, timing, legitimacy, feasibility, likely effectiveness, and the degree of ease or difficulty of implementing certain measures.

Before alternative scenarios are considered for various resource features, for example, different general approaches to resource management can be identified as possible courses of action, including: pollution prevention, pollution control, regulatory control, land use policy/planning, water conservation, and habitat enhancement.

3.3 Recommended Actions

Recommended actions are the result of the evaluation of watershed conditions and issues relative to goals by means of management scenarios with alternative actions. At this point, there should be a fairly clear notion of what actions are needed to meet management goals and objectives in each part of the watershed.

The watershed management plan should set out recommended actions for each ecological area in the watershed in terms of management categories: prevention/protection, enhancement, rehabilitation. The ecologic areas include headwaters, aquifer recharge/discharge areas, fish habitat, and confluence of rural and urban areas and valleys or lakes.

To promote ecosystem **protection**, appropriate initiatives should be developed and stated for key water and water-based elements that are necessary for protecting ecosystem health. For example, actions to promote water quality for the watershed should be devised in order to ensure the healthy functioning of the system. Natural systems, ravines and floodplains can be identified as critical areas for ecosystem health, as well as adjacent associated landscape features that will ensure their function.

The plan should specify opportunities for **enhancement** of ecological components and particular uses that will serve to improve the function and health of the ecosystem, e.g., infiltration, vegetative linkages, buffers, fish habitat, sanctuaries, public access points, treed parks, creation of rural beaches/water contact sport areas, riparian vegetation, etc.

The plan can provide technical guidance for **rehabilitation**. Criteria for prioritizing site rehabilitation should be established, and time and fiscal and human resources required for each site should be estimated. Corrective actions for existing problems should be described, including technical descriptions of how the change should occur. The plan can outline preferred measures or strategies for improved land management and for the abatement of all point and non-point sources, e.g., stormwater management facilities, water pollution control plant facilities.

Natural resource managers can take advantage of overlaps and interrelationships among categories of management goals to maximize the use of available fiscal and human resources. For example, a **preserve/protect** action might be aimed at maintaining ground water discharge characteristics and habitat quality for an existing brook trout population; an **enhancement** initiative might be aimed at constructing five brook trout spawning areas; a **rehabilitation** action could be aimed at restoring 10 kilometres of lost brook trout habitat.

Finally, the plan should provide a description of how environmental monitoring should be used to measure the success of watershed management decisions or actions.

It is important to encourage municipalities in the watershed to incorporate information on potential effects on or responses by (positive, neutral and negative) the watershed environment into decisions on land use planning as guided by their Official Plans. The intent is to find creative solutions which ensure that future land use changes make a positive contribution to the ecosystem as a whole, rather than achieve the narrow ends of certain interests.

4.0 IMPLEMENTATION

4.1 Roles and Responsibilities

The scheduled events and responsibilities for implementing the recommended actions are a delivery mechanism that should provide answers to the questions:

- ! **what** doable tasks are needed to accomplish each recommended action?
- ! **who** is accountable for each task?
- ! by **when** is each task to be accomplished?
- ! **how** will monitoring results be used to modify implementation?

Implementation of recommended actions is likely to take place largely through land use planning decisions, but others will be the responsibility of participating agencies, through such things as approval processes, regulations and permits. If there has been consistent interaction among participating agencies throughout the plan development process, it is likely that by the implementation stage, all participants will know what they are required to do.

The issues and recommended actions in watershed plans involve the jurisdictions and mandates of a range of agencies, including municipalities, conservation authorities, provincial ministries, First Nations and private interests. All participants can effectively use existing mechanisms and tools, such as legislation, policies, procedures and approval processes, to implement the watershed plan. Provincial agencies such as MOEE, MNR, MMA, and OMAF have a number of key pieces of legislation that can be used to carry out recommended actions. These include MNR's *Lakes and Rivers Improvement Act*, *Fisheries Act*, *Endangered Species Act*, *Trees Act*, and *Provincial Parks Act*. Also useful are MOEE's *Environmental Protection Act*, *Environmental Assessment Act*, and *Ontario Water Resources Act*, as well as OMAF's *Topsoil Preservation Act*. A listing of provincial legislation is available in Ministerial Responsibility for Acts, Ministry of Government Services, Queen's Printer for Ontario, 1991.

Conservation authorities are encouraged to administer the provisions of the *Conservation Authorities Act*, and Fill, Construction and Alteration to Waterways regulations pursuant to Section 28 of the Act. Municipalities are encouraged to administer the provisions of the *Municipal Act* and the *Planning Act* and plans and by-laws adopted according to these acts.

Conservation authorities, where they exist, are encouraged to coordinate watershed management, and can play a key role in plan implementation in the following ways:

- ! Assist municipalities and planning boards to incorporate the intent and recommendations of the watershed plan into the land use planning process and appropriate planning documents.
- ! Review and comment on proposed planning that may have implications for the watershed plan or water management.
- ! Make representation or provide technical expertise to the Ontario Municipal Board or other appeal bodies, where a matter related to the watershed plan and water management may be an issue.
- ! Consult with ministries, public agencies, boards, authorities and municipalities on matters pertaining to the watershed plan and water management, as appropriate.
- ! Inform the general public about the principles and practices of watershed management, and provide information on the characteristics and consequences of various land use and development activities.

Where conservation authorities do not exist, the Ministry of Natural Resources and the Ministry of Environment and Energy are responsible for coordinating a program to address watershed planning and management.

4.2 Funding for the Task

Watershed plans vary widely in scope and kinds of activities required, and many jurisdictions and agencies are likely to be involved in this work. Thus, there cannot be a simple, generic funding formula in place. Those participating in plan development and implementation need to be innovative in securing new and various funding sources. Watershed studies to date have demonstrated innovative approaches to funding through the establishment of cost-sharing partnerships among agencies involved, and for funding some activities in phases. By phasing plan development or implementation, costs can be borne more realistically, on the basis of more precise information as the work progresses, and thus better cost estimates. Also, broad scope of watershed planning -- developers, local governments, provincial agencies, reviewers, landowners -- enhances opportunities for partnership funding.

It is possible for each of the participants to take part in funding the watershed plan by building their share of costs into their budgets for certain years, perhaps phased over several years with other partners. Participants may also find that some of their ongoing work can be "reprofiled" to contribute to the needs of the watershed plan. Participants are encouraged to make study costs "affordable" by a realistic scoping of study needs, and by innovative practices, such as phasing of study development, cooperative information sharing, assessment of previous work and trends to determine generic components or aspects of an acceptable watershed plan.

In any case, expensive long-term studies are not required to produce an acceptable watershed plan, nor major new outlays of funds for implementation of the plan to be successfully carried out.

5.0 AFTER THE PLAN

5.1 Monitoring - Auditing the success of watershed management

The relative success of watershed management decisions or actions should be audited using monitoring. Implementation of the plan should be a flexible and iterative process which both directs and responds to status changes in the adherence to recommendations and the achievement of the plan's goals. A monitoring program can identify the environmental conditions that indicate progress. There are two major components to monitoring: monitoring the success of the plan, achievement of its goals and objectives (response of the system to the implemented plan); and monitoring the performance and success of the tools used to achieve the objectives developed by the plan.

Implementing the watershed management plan will require monitoring data for a variety of uses. It is important to remember that **monitoring programs need not all be sophisticated or highly technical.** Sometimes, observation will suffice. Local citizens can be enlisted to watch for and report the status of or changes in environmental conditions. This will provide the public with a tangible opportunity to participate in achieving the watershed plan's ecosystem objectives, and thereby, the integrity of their own surrounding environment. It will also probably reinforce and

maintain interest in the plan's success in achieving its management goals. Another method is to identify appropriate "indicator species" for ecologic integrity, and establish "water budgets" for aquifers.

As well, it is important to note that **monitoring need only be applied to issues or conditions in the watershed that the plan has identified.** Furthermore, the plan can even identify some aspects to be monitored by federal or provincial agencies, as aspects to be incorporated into their ongoing state of the environment monitoring programs.

If monitoring reveals successful initiatives, these should be documented and shared with agencies that might benefit from this knowledge.

5.2 Currency - Keeping the watershed management plan up-to-date

Effective watershed management is an iterative process, taking full advantage of both the successes and mistakes of implementation. Lessons learned from performance monitoring during implementation should be used to make appropriate revisions in watershed management programs.

As a general rule, it is appropriate to re-evaluate a watershed plan when land use changes are identified in an official plan of a municipality in the watershed.

Milestones for the progress of implementation are useful to keep implementation on track. Such milestones should also have some flexibility to allow for unusual or unforeseen circumstances, more efficient means of implementation, fiscal constraints, or fluctuations in natural environmental conditions. For the most part, however, adherence to such milestones as much as possible signifies commitment on the part of participants to act on recommendations in the plan.

6.0 A WORD ON PUBLIC PARTICIPATION

The purpose of public participation in any planning or decision-making process is to allow for an exchange of ideas between the planning team and the stakeholders so that controversy can be minimized or avoided, and knowledge upon which good decisions are made can be improved. Public education and participation in decision making are often viewed as luxuries that can only be undertaken if staff time and budgets permit. Increasingly, provincial and municipal agencies are recognizing that public participation in the development of plans or projects affecting the public is a key determinant of the success of these undertakings.

The real value of having the public play a part in planning something like watershed management is often overlooked. Interest groups and the public at large can provide valuable insights and information to any planning team, often bringing new ideas and a sound understanding of local conditions and aspirations. Drawing people into the planning process at

an early stage can identify their concerns and interests throughout the process, and can provide "checks and balances" to the planning professionals.

An effective public participation program needs to identify and target a number of different audiences. Among those to consider are:

- ! **"Friends"** - people who are supportive of the planning effort and who are already "on board." These include local interest groups, environmentalists, groups that stand to benefit, e.g., growers.
- ! **Affected parties** - individuals or groups who may be contributing to watershed degradation, but who also have a potentially important role in solutions. Examples include farmers, developers, boaters and foresters. They usually need to be convinced that there is a problem before they can play a part in solutions.
- ! **Local elected officials** - key decision-makers and opinion leaders who have an influential role in allowing a watershed planning effort to be accepted and implemented. They are usually interested in the political and financial implications of the planning process.
- ! **Government agencies** - officials and technical staff from a wide range of local, provincial and federal agencies, who can provide technical and political support to the planning effort. Other agencies include regional, township and city government agencies like public works, health, planning; special purpose agencies (interagency drainage boards, harbour commissions); federal agencies (Health and Welfare, Environment); and international agencies (International Joint Commission).
- ! **The "general public"** - this group is typically the target of any public participation effort. They are both environmentally aware and concerned, and keenly representative of their own interests and worries.

There is no single formula for designing an effective public education and participation program, but several key elements of any successful public participation strategy should be considered. If a rule exists, it is this: **a public education and participation strategy should be developed early as an integral part of the watershed planning process.**

There are many simple ways to reach the public and gather their concerns and insights.

- ! **Printed materials**, such as brochures, flyers, fact sheets and newsletters are effective ways of informing people about the subwatershed planning process.
- ! **Special events**, such as an open house or information fair, displays at malls or halls, are excellent methods of educating the public and generating "feedback" on a one-to-one basis.

- ! **Field trips** can be very effective in illustrating subwatershed issues to an interested public.
- ! **Public meetings** are important ways of generating public discussion and even debate about key watershed issues; adequate advance notice is required as well as a broad enough scope of stakeholders.
- ! **Media** - Radio, newspaper and television can all be used to help educate the public about watershed issues, garner public support and publicize meetings and events.
- ! **Public opinion polling** is a fairly successful method used in the U.S. for gathering public attitudes about water management issues.

There are other benefits to both the public and to planning agencies from having the general public take part in developing watershed management plans. Local support is generated for the project, and political endorsement of the project is likely to be easier if the public is in agreement with the project and its goals. Also, a supportive public can assist in making the project a reality and a success by monitoring the implementation of the project, its effects on local conditions, and its success in achieving the stated goals.

Without public support, many of the best-planned and engineered projects can founder in limbo, face stringent criticism and opposition, be implemented poorly, or never be implemented at all. Countless examples over recent years demonstrate the importance of support from the public. The Great Lakes Remedial Action Plan process has public involvement as an integral part of every stage of its development. Local stakeholders participated in identifying the problems, developing feasible solutions, and determining who has appropriate responsibility for actions and funding. The recently completed Credit River Water Management Strategy, and MNR's Strategic Plan for Ontario Fisheries (SPOF II) have also relied heavily on public consultation for their successful development.

Moreover, the public in general has become much more knowledgeable and concerned about the environment, especially over the last five years or so, and with this awareness is a need for the public to feel that they are part of the solutions to environmental problems, as well as that they have a say in preventing new ones. Finally, since ecosystem integrity in the watershed is the basis for not only sound water management but also many other ecological and economic conditions of value to society as a whole, the watershed plan can become a kind of "community plan," and the public take part in planning their own local future.