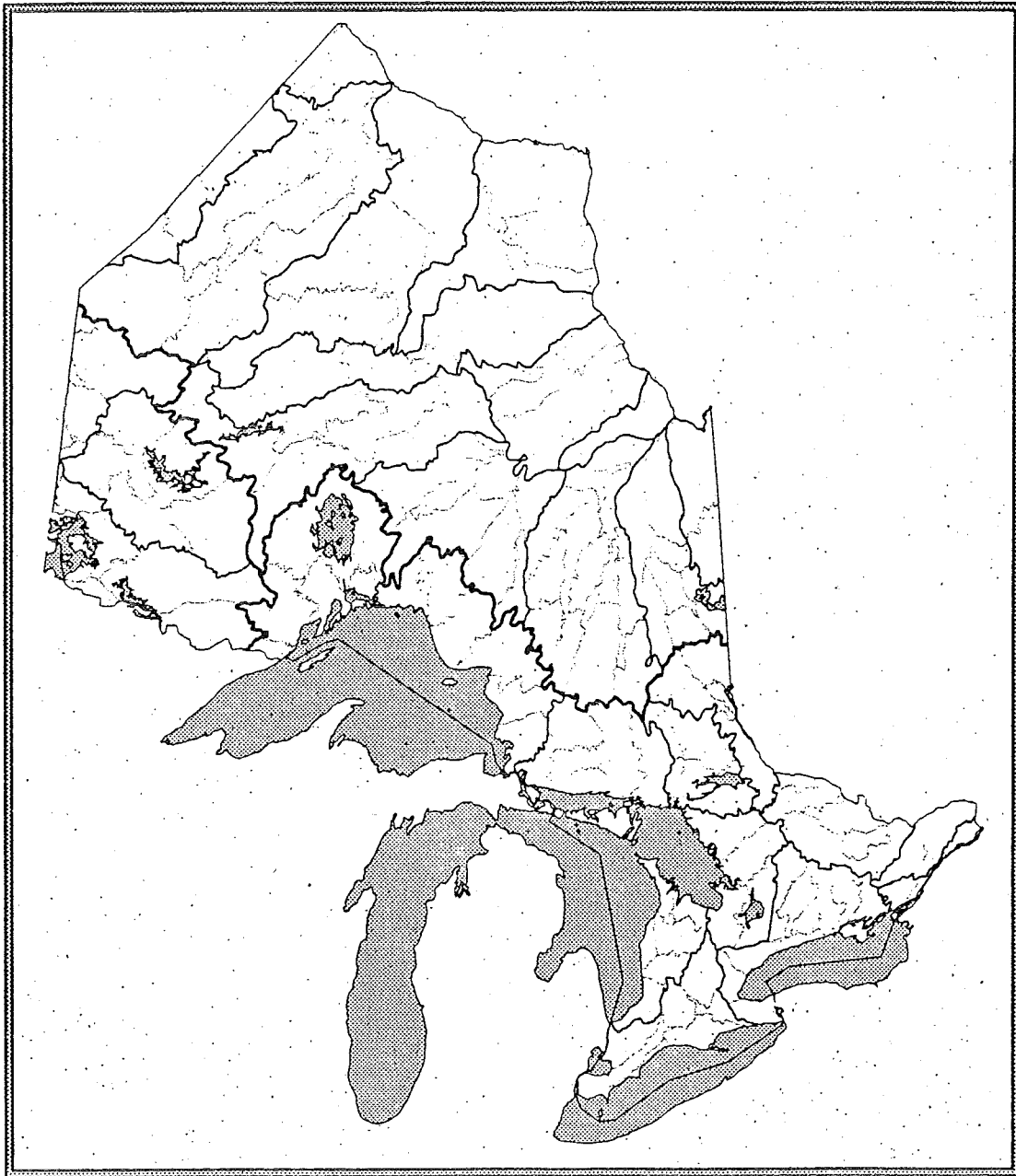


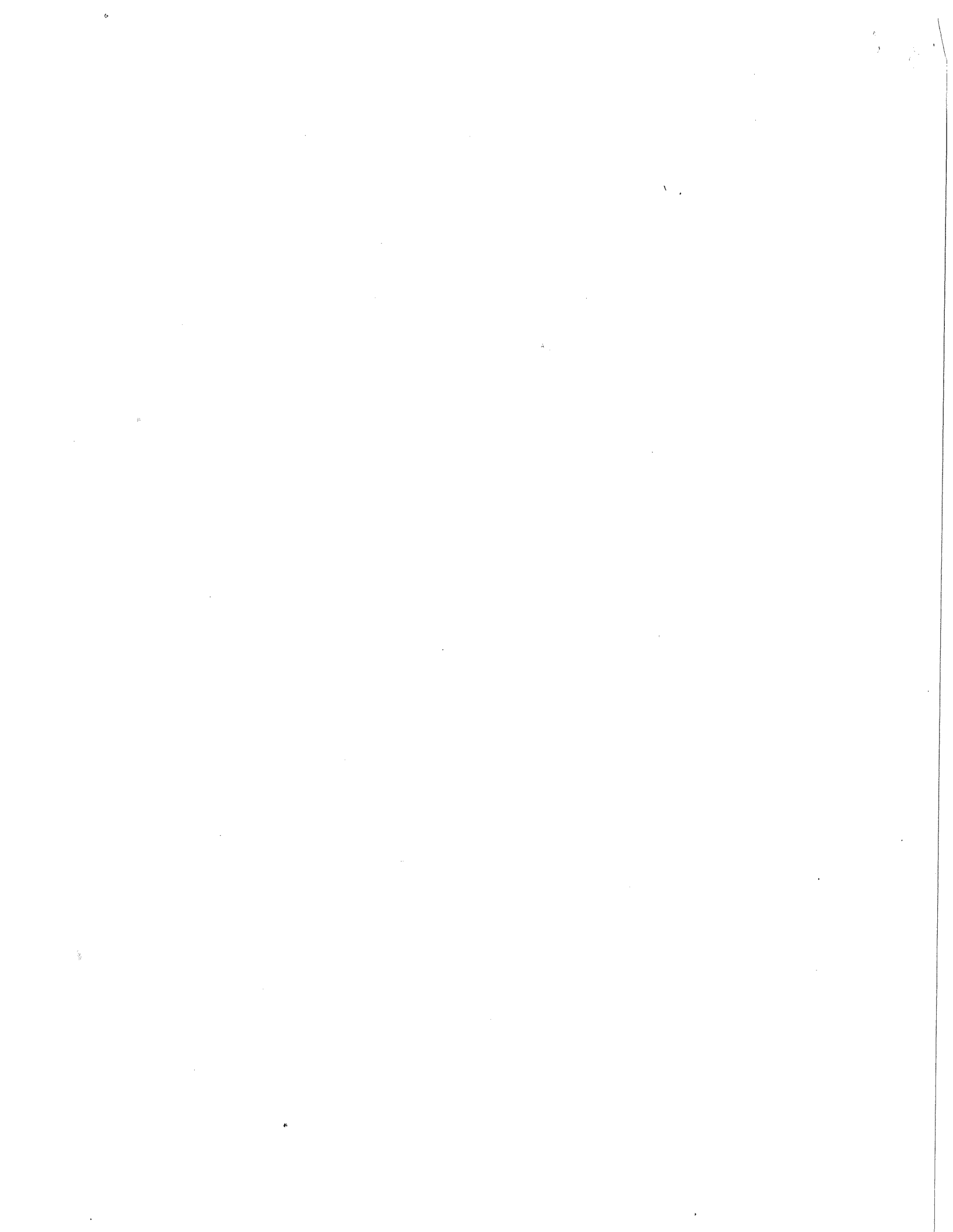
Water Management on a Watershed Basis: Implementing an Ecosystem Approach



Ministry of
Environment
and Energy

Ministry of
Natural
Resources

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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.

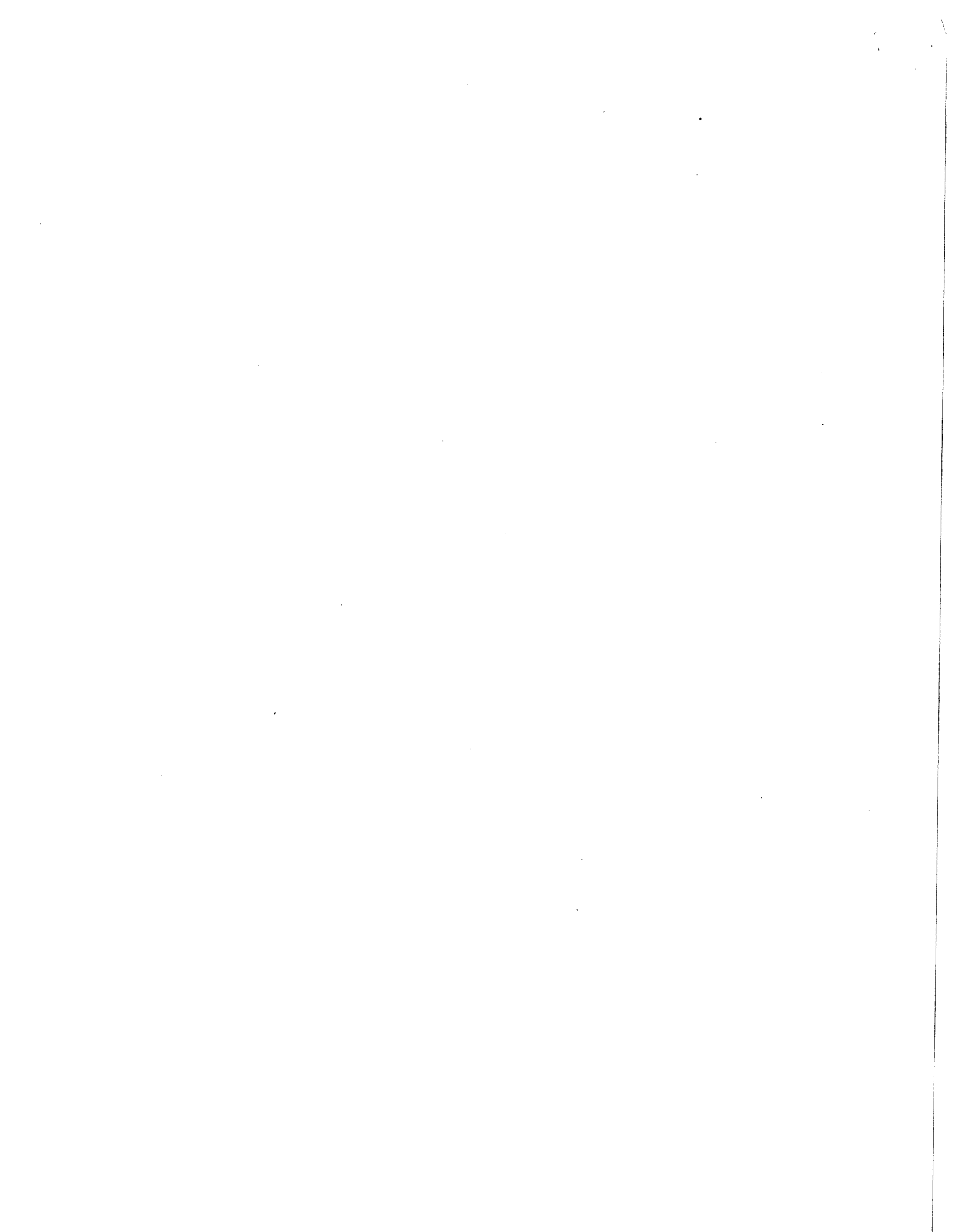
The environment and resources contained within a watershed are managed to preserve the natural values important to our society and to ensure that our continued use of them is sustainable. In the case of water, these include a healthy aquatic ecosystem, adequate supply, and water that is contaminant-free.

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 hydrological cycle as the pathway that integrates physical, chemical, and biological processes of the ecosystem.

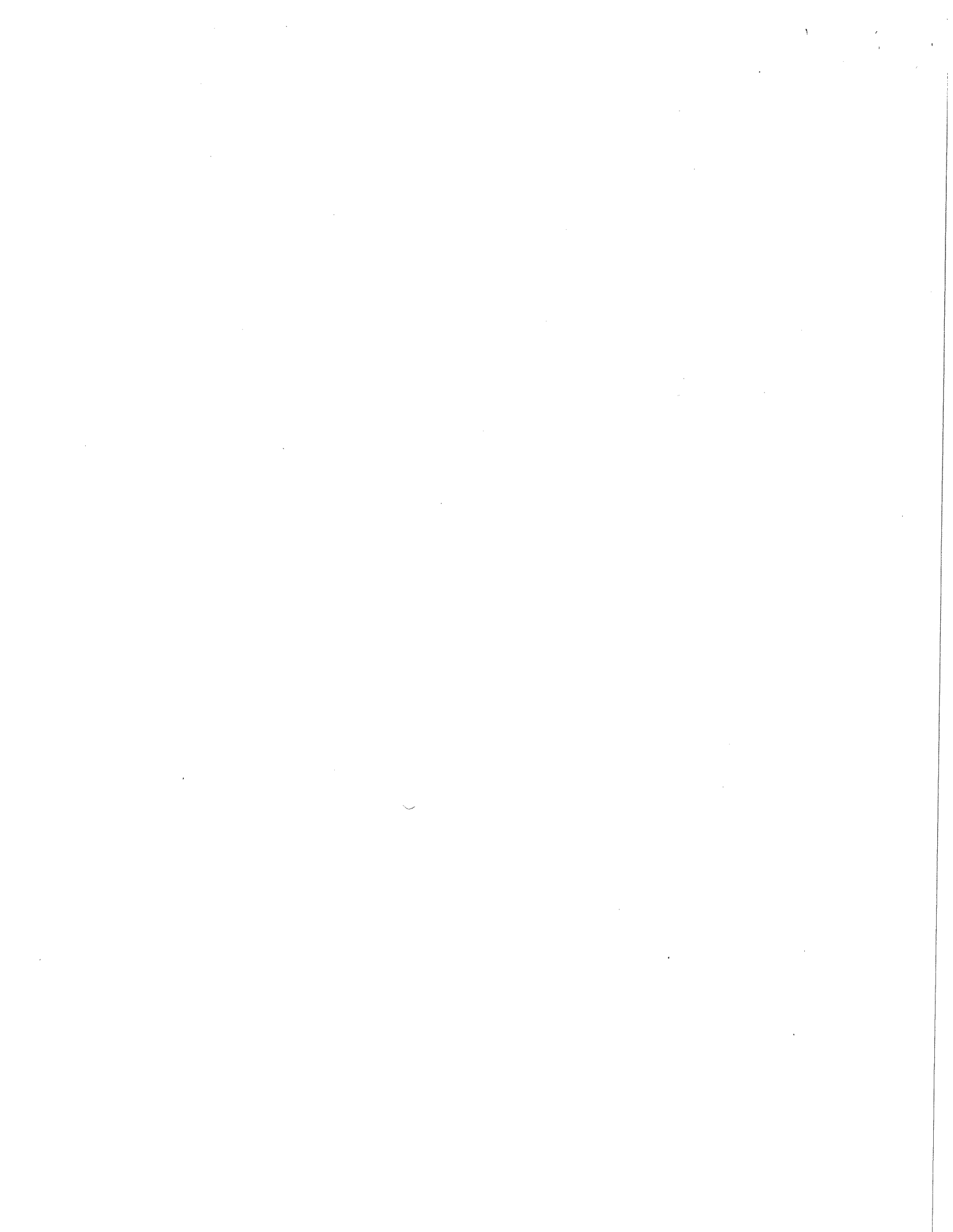
An appropriate vehicle for this integration is the watershed management plan. By providing a broad understanding of ecosystem function and status, and recommending actions for appropriate resource management in the watershed, the watershed plan can "capture" relevant ecosystem considerations that can 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.

- I. **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.
- II. **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.
- III. **THE PLAN** outlines ways to set goals, how to evaluate information and alternatives, and the features of recommended actions.
- IV. **IMPLEMENTATION** notes general ways of putting actions in place.
- V. **AFTER THE PLAN** talks briefly about monitoring to measure progress, and the need to keep the plan up to date.
- VI. **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.



I. DIRECTIONS

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 unfavourably 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, and recycling. In the natural environment, most water (65%) cycles back to the atmosphere



through the transpiration of trees, and another 25% infiltrates the soil, recharging the groundwater 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

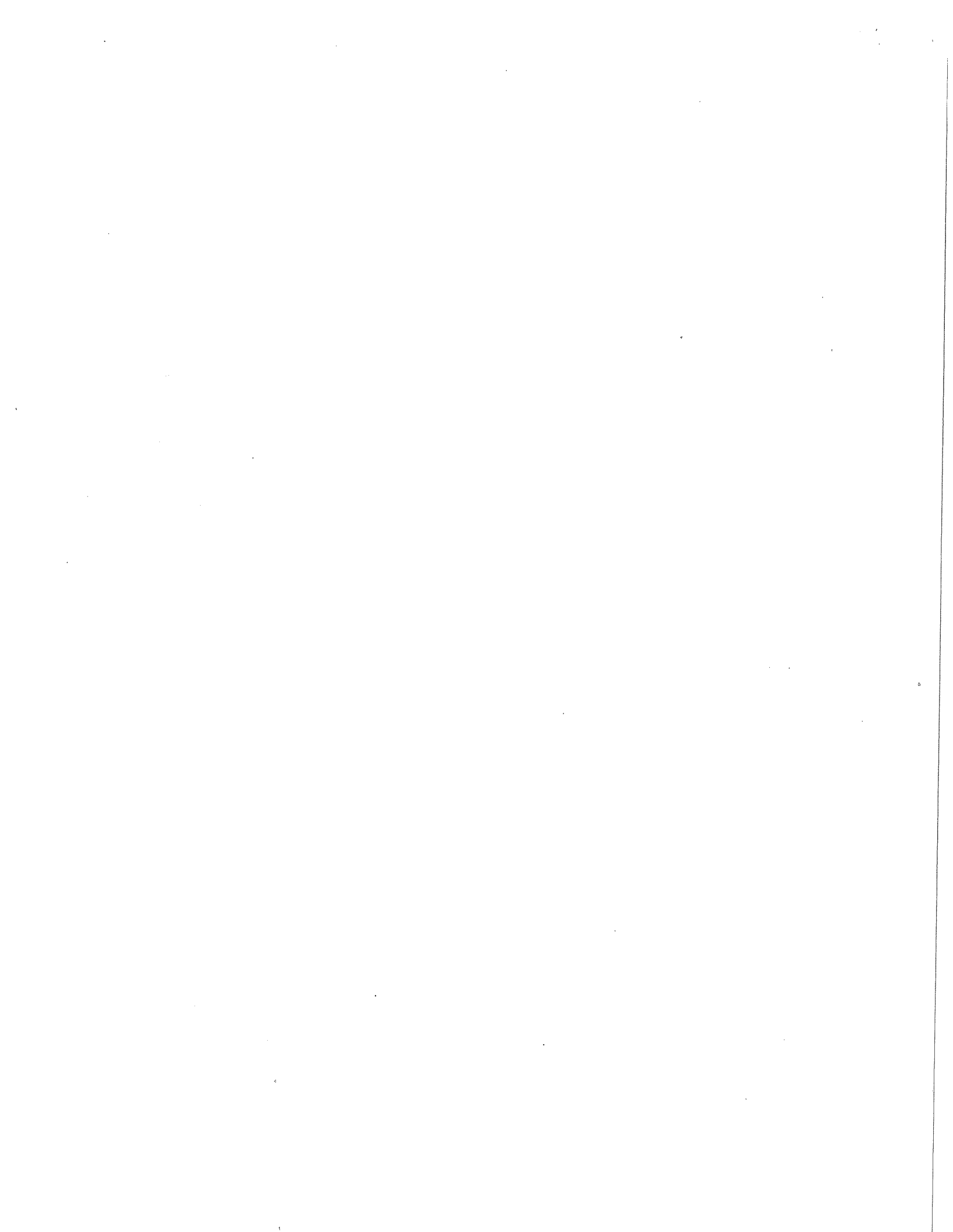
2. Water Management and Land Use Planning

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.

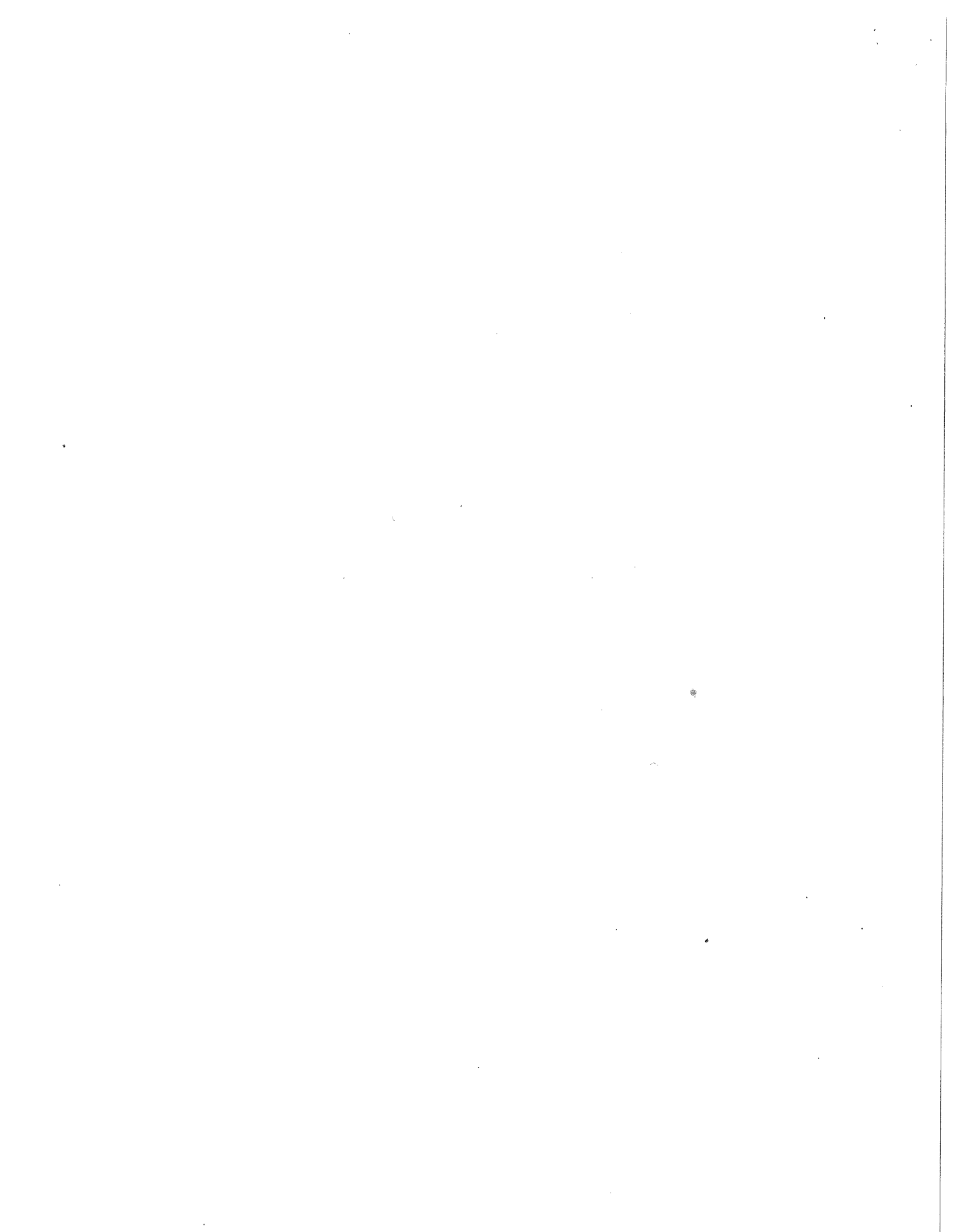
Municipalities have the legislative authority and political responsibility to undertake comprehensive land use planning which considers environmental issues. A consensus is emerging that currently, land use planning does not always satisfactorily protect the environment, particularly from the negative 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 groundwater 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 hydrological 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 thirty-eight conservation authorities (CAs) in Ontario; five of these are in Northern Ontario.

Watershed studies have been conducted in Ontario since the 1940's, 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 multi-disciplinary 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 Provincial 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.

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

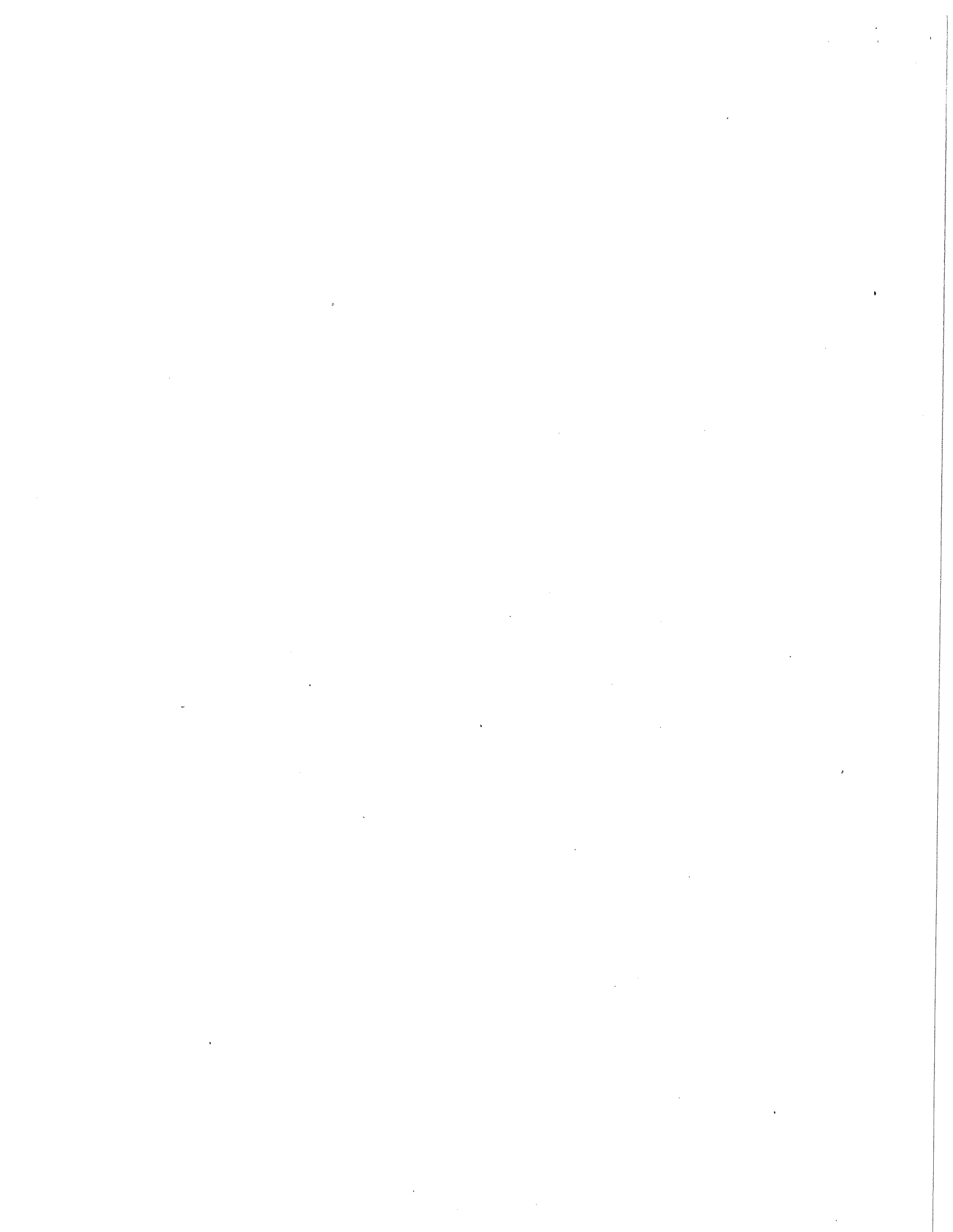


Figure 3
WATERSHED PLANS



- 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 groundwater 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

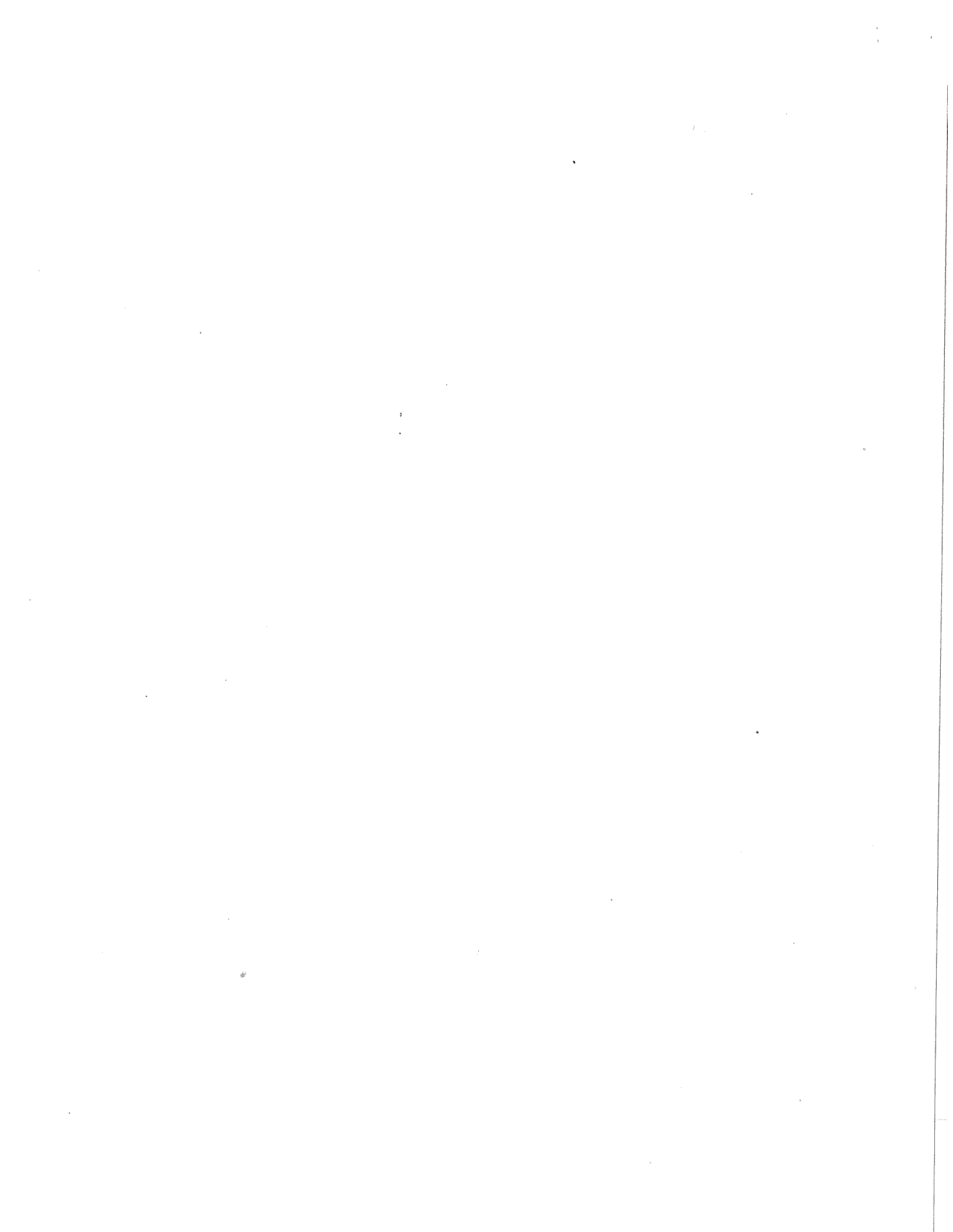
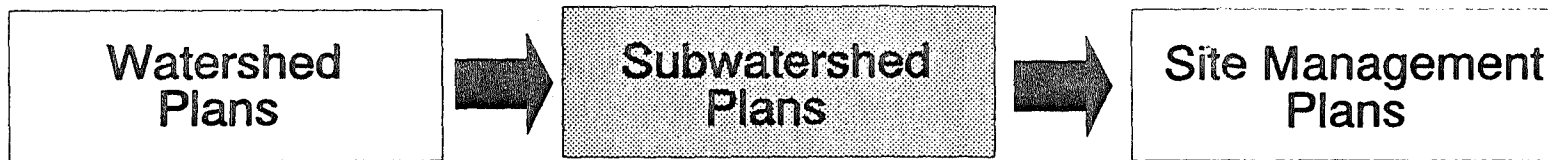


Figure 4
SUBWATERSHED PLANS



- enhanced detail to address local environmental issues
- will detail and implement specific subwatershed targets, goals, objectives to establish:
 - natural system linkages and functions
 - surface and groundwater 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 PLAN AMENDMENTS

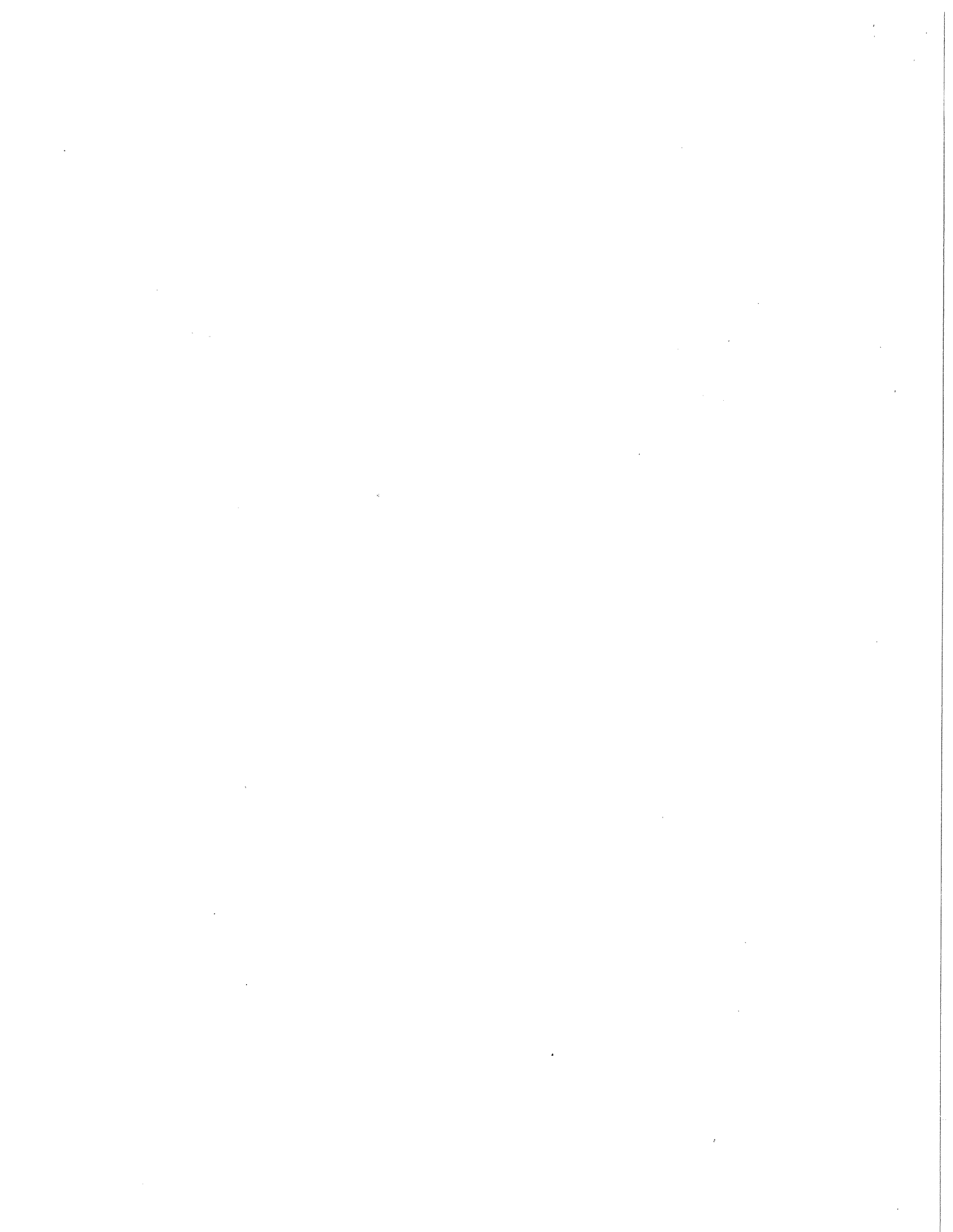


Figure 5
SITE MANAGEMENT PLANS



- 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 Management BMPs

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



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 - An Interim Guide"*. 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.

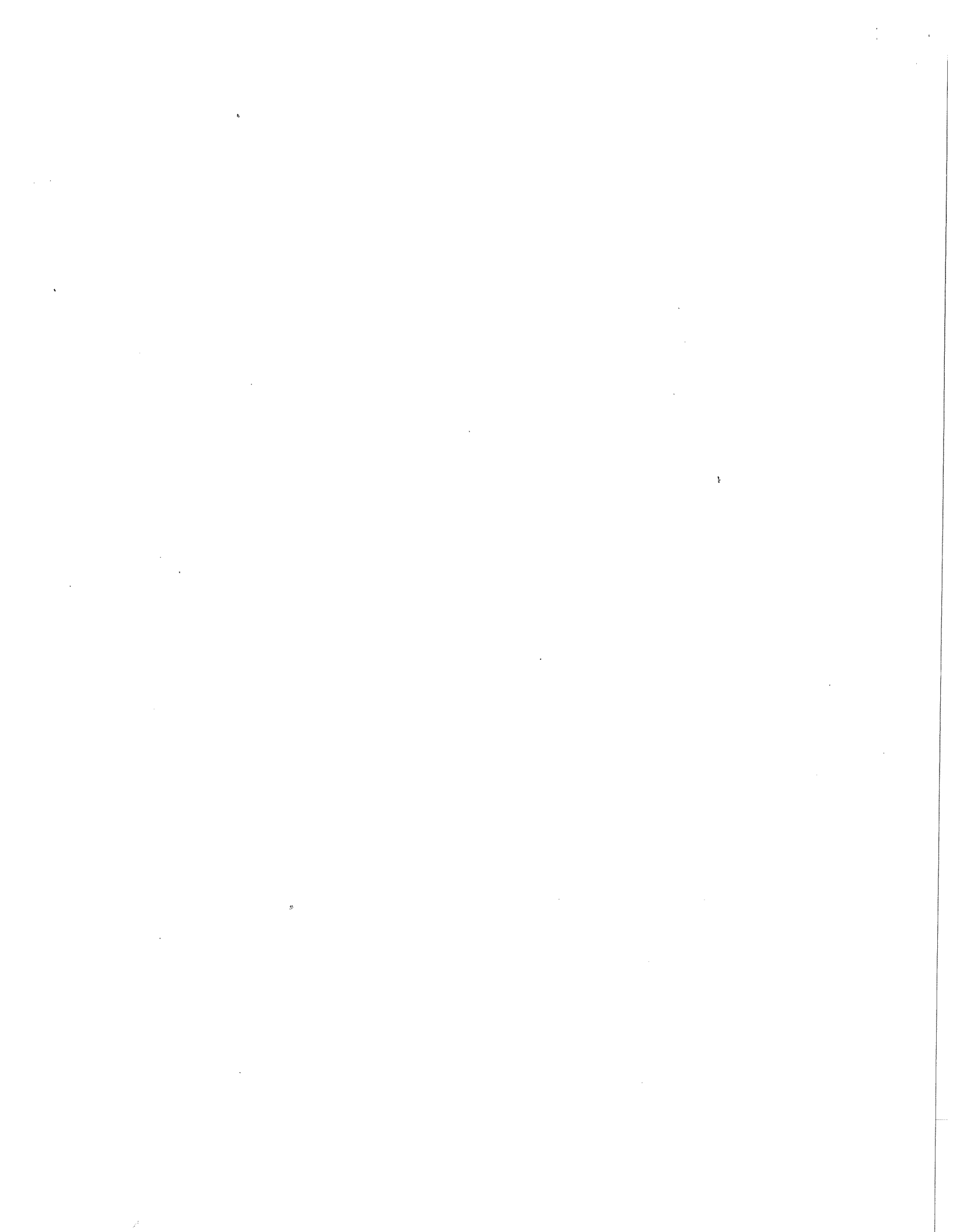
The plan should provide an "image" of how the watershed should look and function, and what areas are appropriate for preservation, protection, enhancement or rehabilitation of desired values. This "picture" can be portrayed in terms of ecological areas, e.g., headwaters, middle reach, mouth/delta/estuary, 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, 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



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.

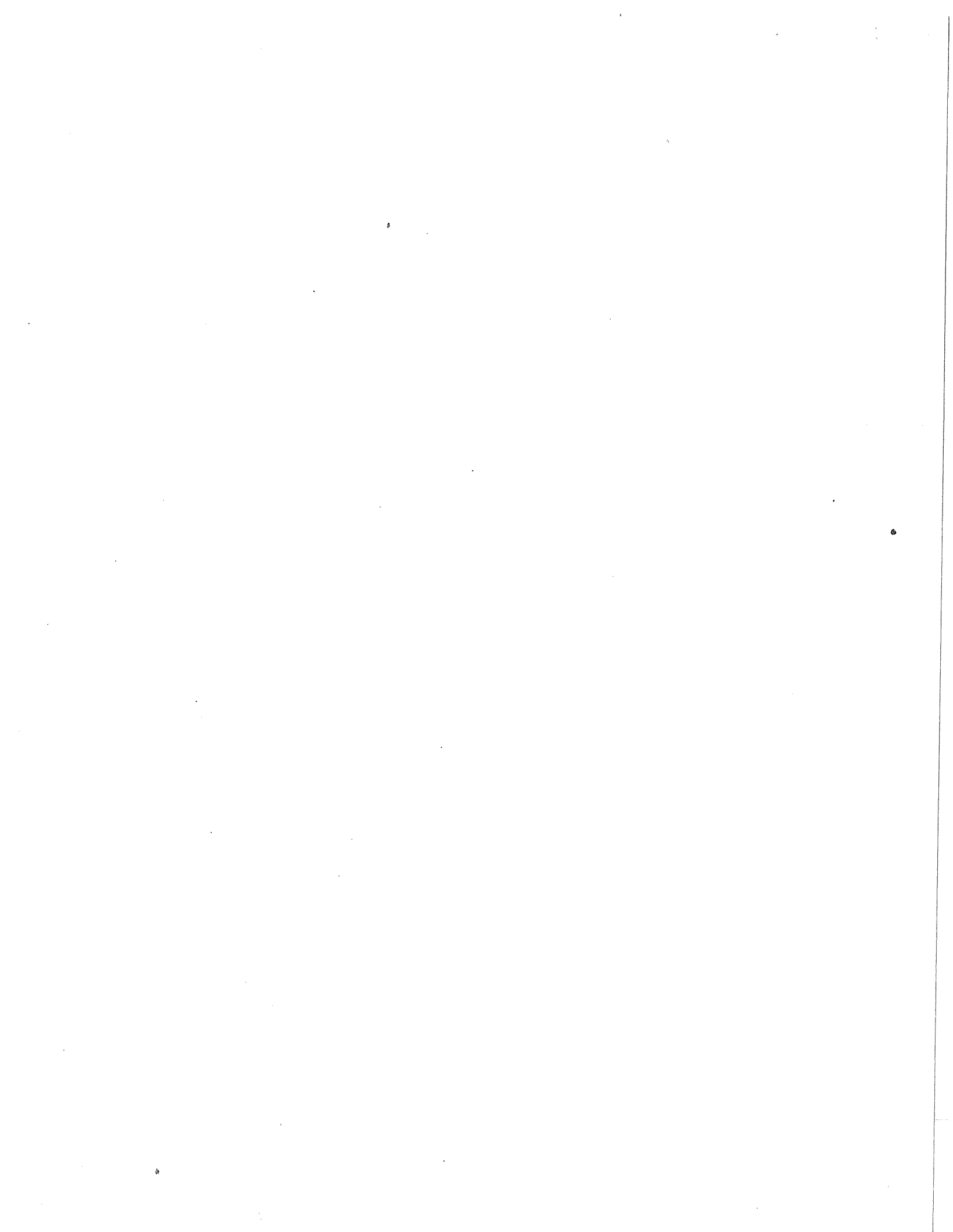
4. Benefits

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.

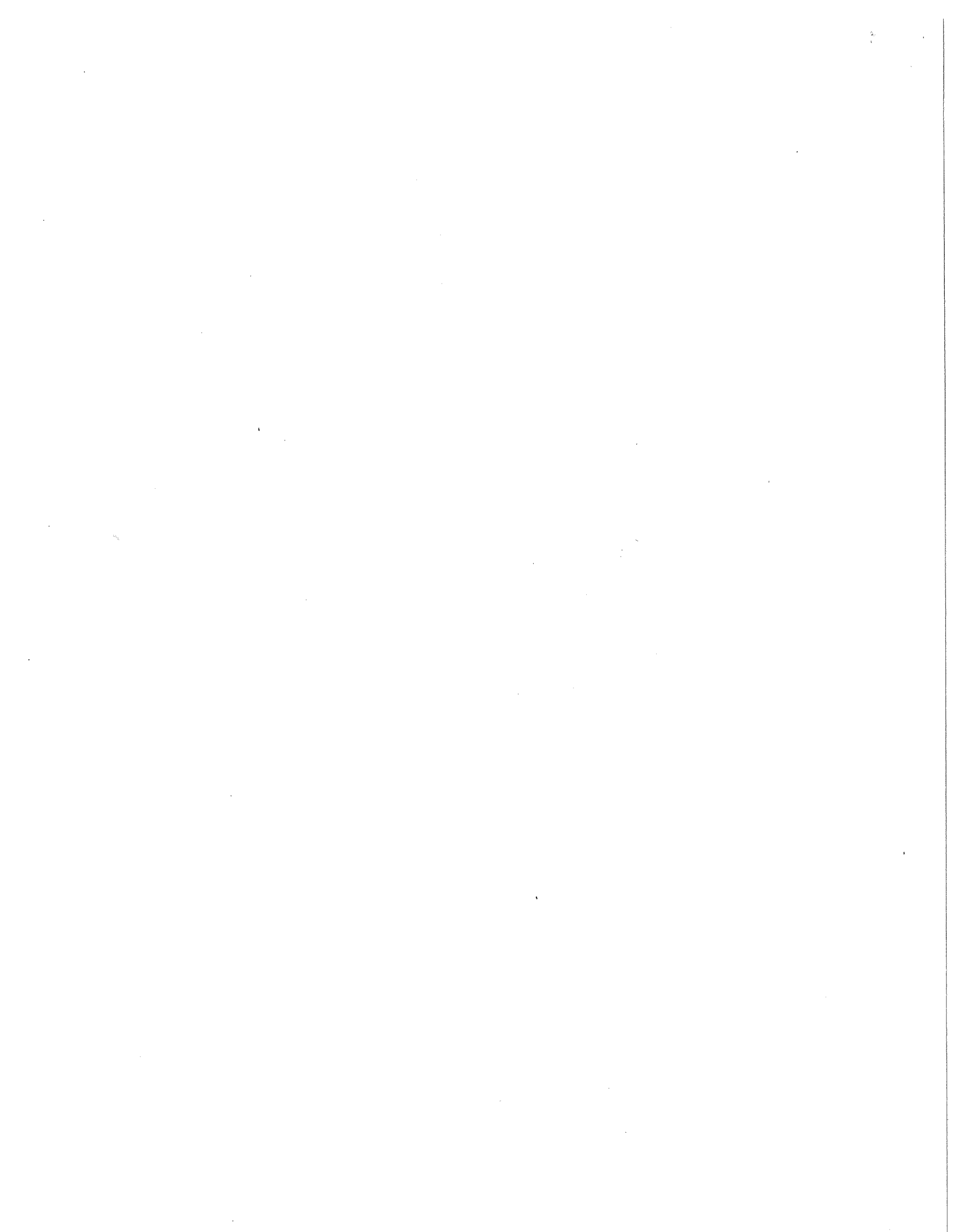
In practical terms, if all participants have been continually fully involved in the evolution of the plan, there is greater likelihood that, when it is completed, everyone will be relatively satisfied and therefore committed to it, and will know what their responsibilities are for implementing it within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

II. GROUNDWORK

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

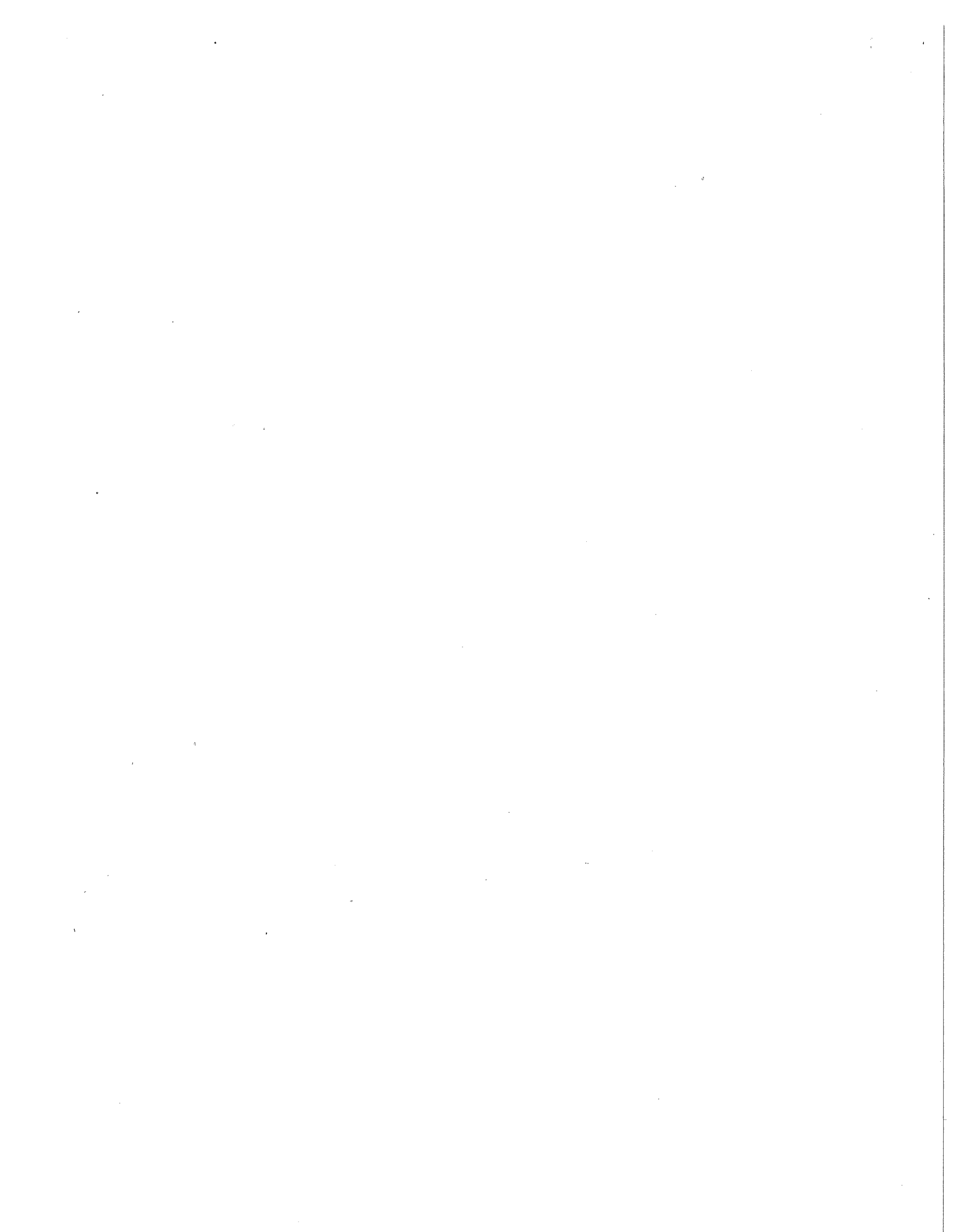
This framework is intended to assist coordinating agencies by providing key considerations in how the plan gets done.

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.



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.

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.

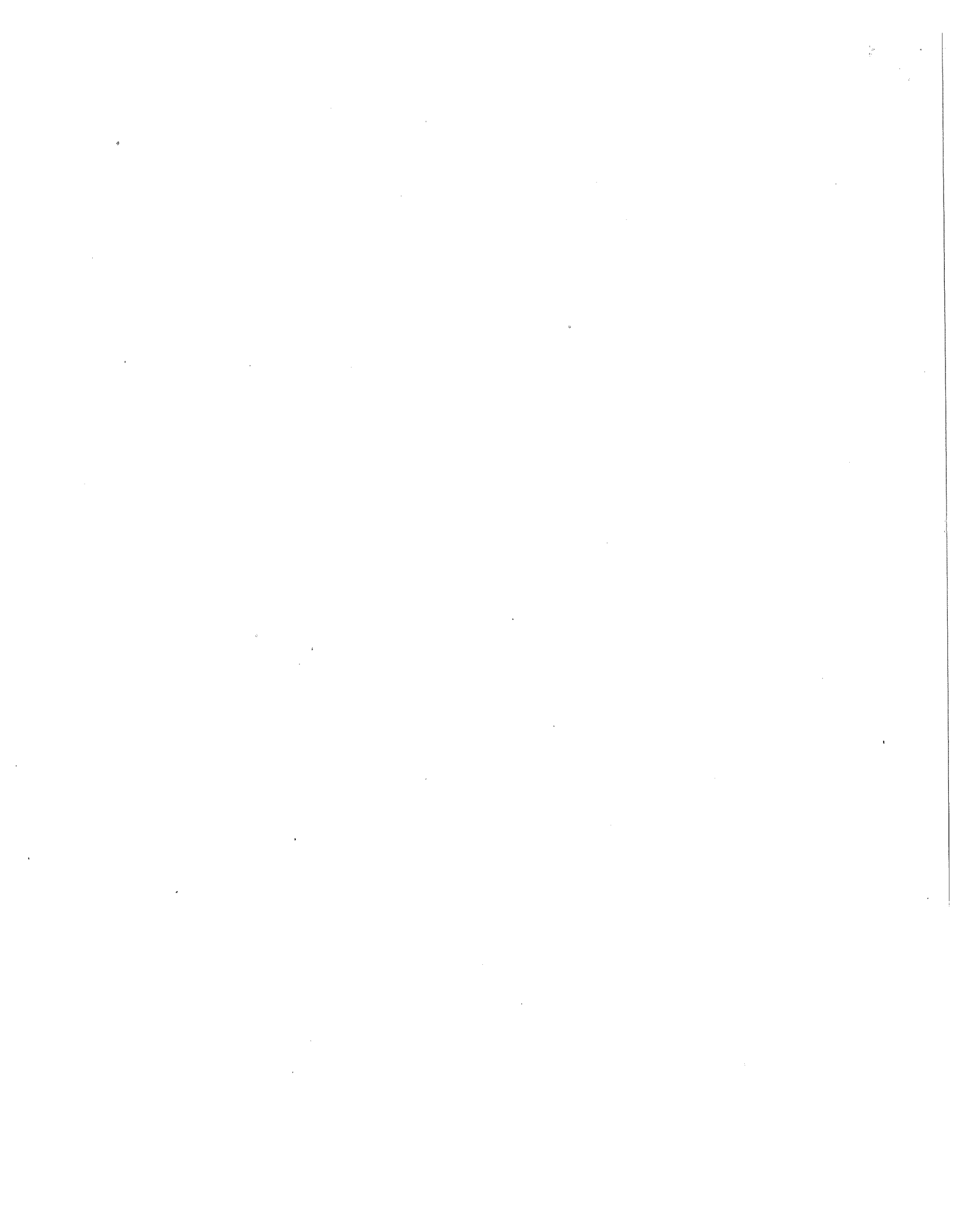
Before alternative scenarios are considered for various resource features, for example, different general approaches to resource management can be identified as possible courses of action, including: pollution prevention, pollution control, regulatory control, land use policy/planning, water conservation,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

3. 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.

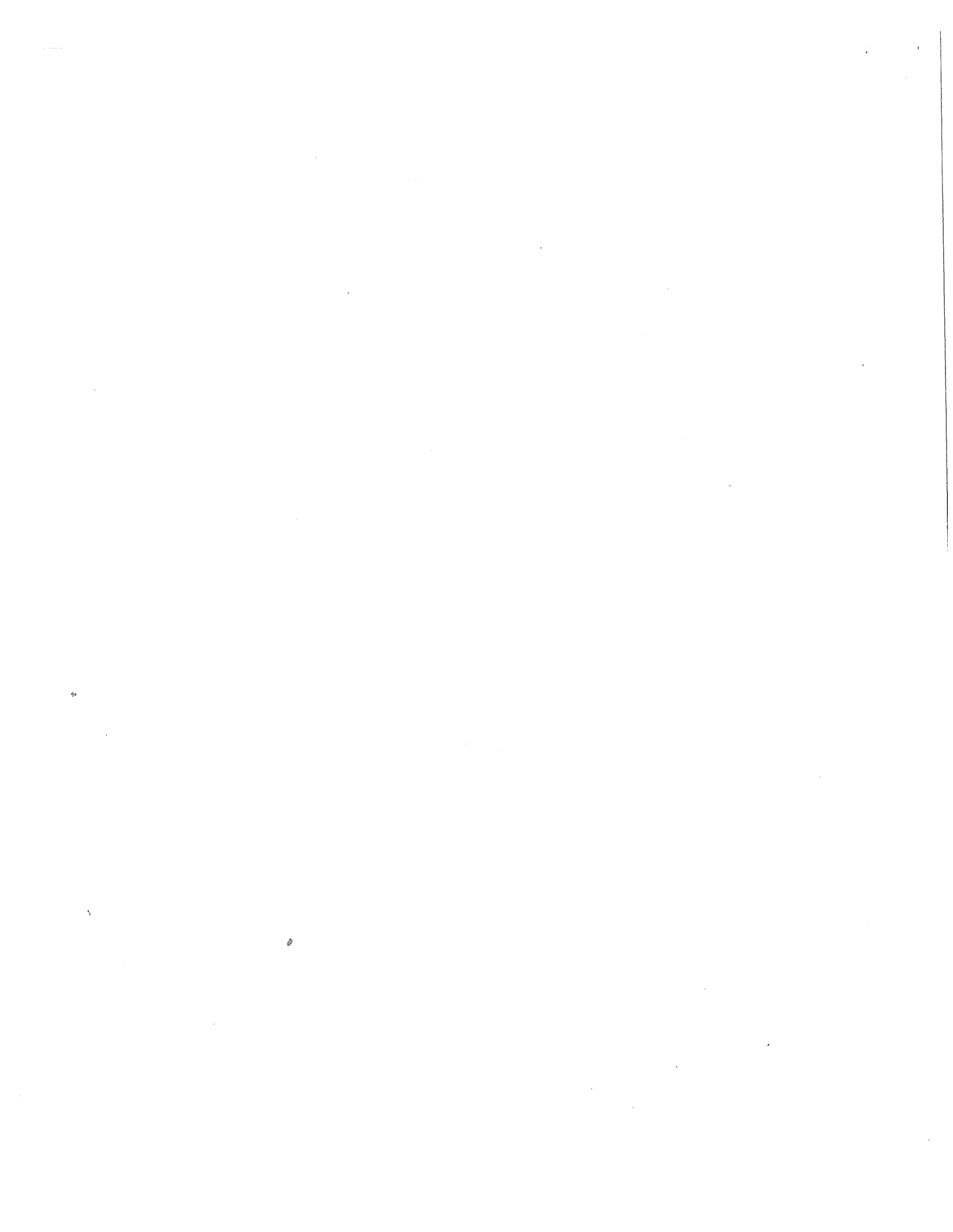
It is important to encourage municipalities in the watershed to incorporate information on potential effects on or responses by (positive, neutral and negative) the watershed environment into decisions on land use planning as guided by their Official Plans. The intent is to find creative solutions which 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.

IV. IMPLEMENTATION

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?



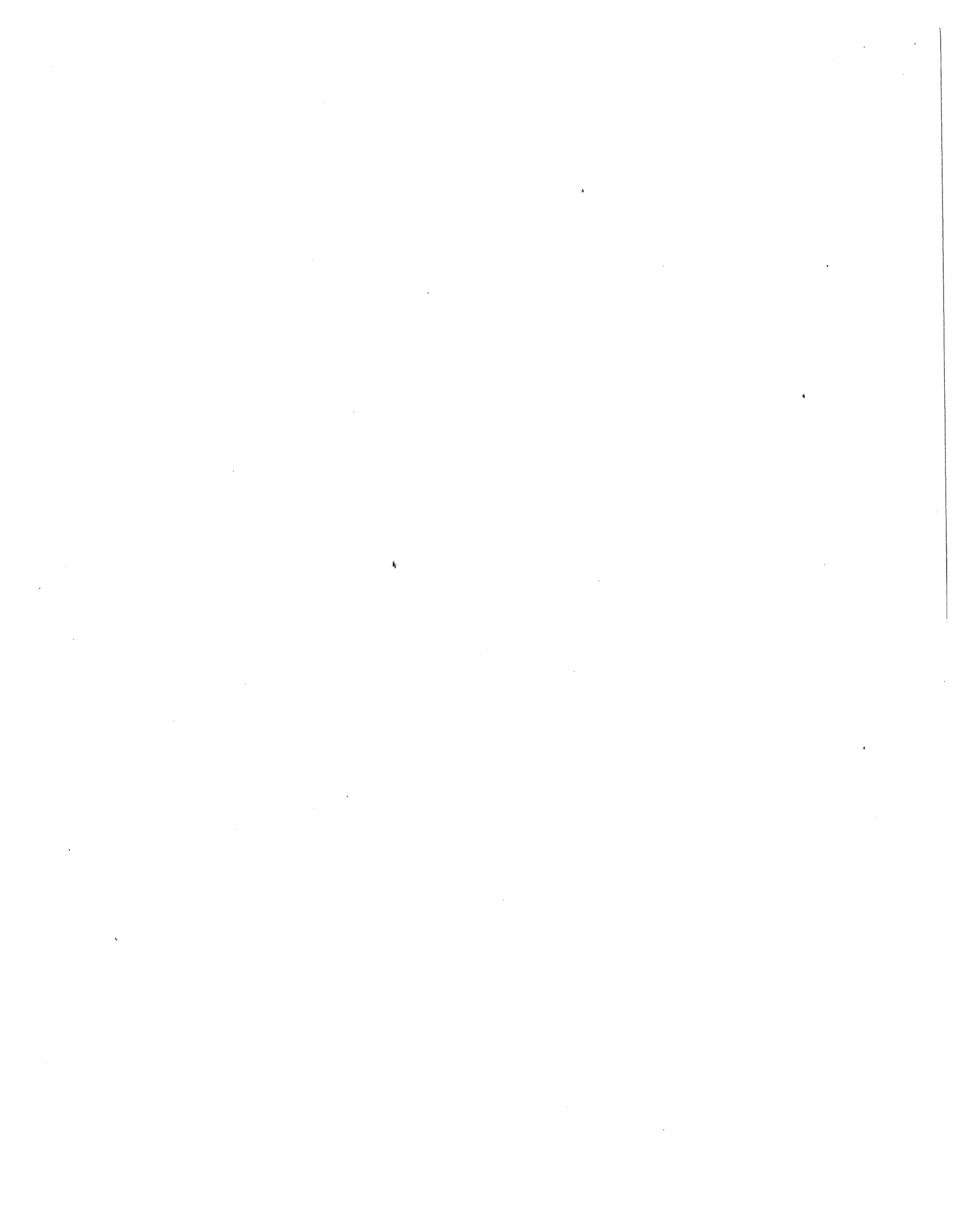
Implementation of recommended actions is likely to take place largely through land use planning decisions, but others will be the responsibility of participating agencies, through such things as approval processes, regulations and permits. If there has been consistent interaction among participating 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, like 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.

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, co-operative 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.

V. AFTER THE PLAN

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.

