STORMWATER MANAGEMENT:

Emerging Planning Approaches and Control Technologies

CHAPTER 2

" WATER MANAGEMENT ON A WATERSHED BASIS "

CHAPTER 2

2.1 INTRODUCTION

Much of the material presented in this module was obtained from the MOEE/MNR document entitled "Water Management on a Watershed Basis:Implementing an Ecosystem Approach", June 1993.

2.1.1 Training Objectives

The goal of Chapter 2 is to provide an overview of the development and implementation of a "Watershed Management Plan". To put watershed planning in perspective, watershed issues, goals and objectives are discussed and an overview of the land use planning process is provided.

The specific training objectives are to develop an understanding of the following:

1. The ecosystem approach to water management.

2. The relationship between, and importance of, Watershed Plans, Subwatershed Plans, and Site Management Plans.

3. The need to integrate watershed management into the Official Plan through the land use planning process.

4. The essential components of watershed plan development and implementation.

2.1.2 Background

The term "ecosystem" refers to the physical environment such as air, land, water, and the biological elements such as living organisms, and the interactions among them.

Water moving through the global hydrologic cycle 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, as illustrated in Figure 2-1. This drainage water and these materials modify the physical, chemical and biological characteristics 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 and depend on it. 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. The boundary of a watershed provide the natural limits for managing the interconnections between human activities and a water ecosystem.

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.

With an emphasis on the protection of the form and function of the natural environment, it is no longer acceptable, from an environmental 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.

Municipalities have the legislative authority and political responsibility to undertake comprehensive land use planning which considers environmental issues. A consensus is emerging that land use planning does not always satisfactorily protect the environment, particularly from the negative cumulative environmental effects of changing land uses.

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 environmental goals be treated equally with and be considered at the same time as economic and social goals.

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

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.

2.1.3 Overview

This Chapter is organized into 3 sections which are summarized below:

1. Watershed Plans

   This section provides a general discussion of watershed goals and objectives. Included in this discussion is a presentation of relevant planning documents such as the Watershed Management Plan, Subwatershed Management Plan, and the Site Management Plan.

2. Land Use Planning Overview

   This section provides a brief overview of land use planning in the municipal context.

3. Watershed Plan Development and Implementation

The final section provides a discussion of watershed planning which includes:

- the planning framework
- the plan development
- roles and responsibilities
- plan funding
- performance monitoring of the plan

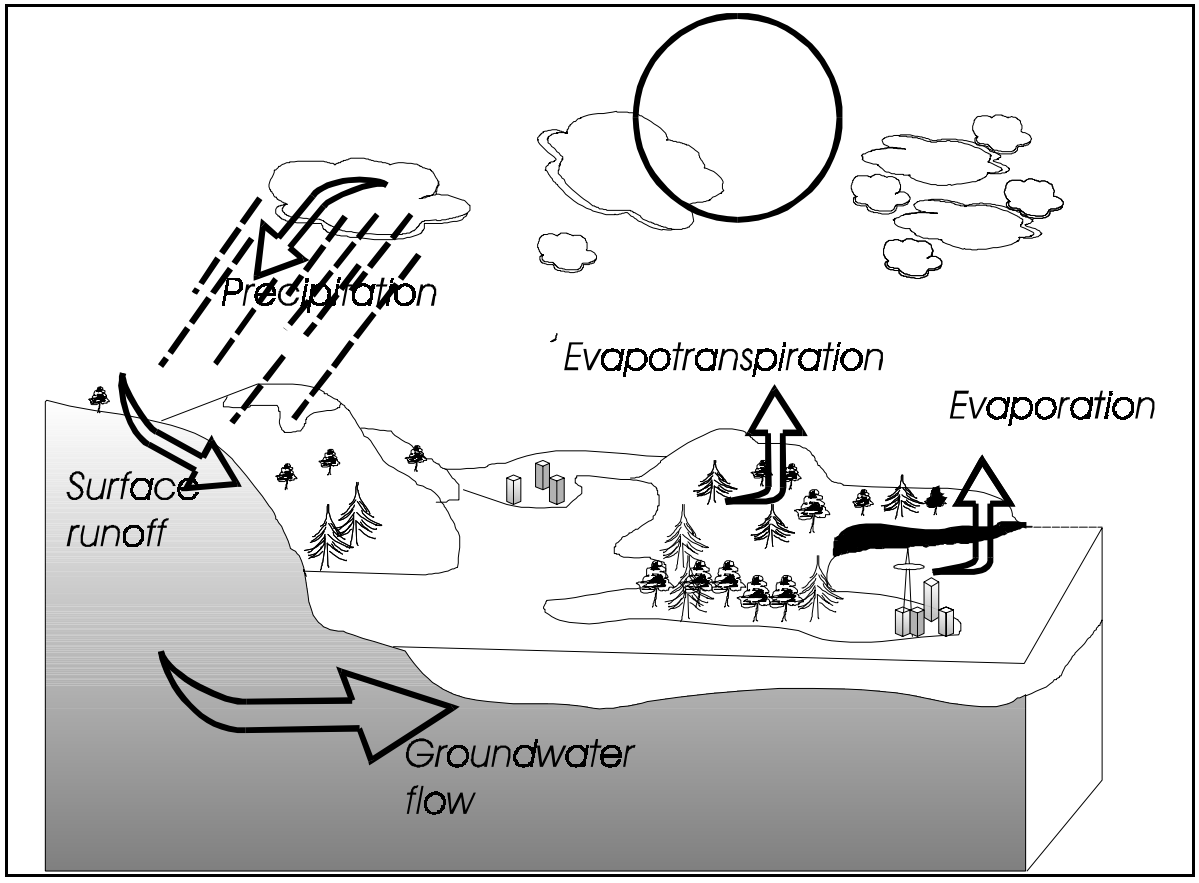

Figure 2-1 The Water Cycle

- keeping the plan up-to-date
- public participation.

2.2 WATERSHED PLANS

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. 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 2-2). A *Subwatershed Management Plan* should reflect the goals of the watershed management plan but is tailored to tributary needs and local issues (Figure 2-3). 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 module, *Subwatershed Planning*. Finally, localized, site-specific planning is provided for in *Site Management Plans* (Figure 2-4).

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 also 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. 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.

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.

The watershed plan can also 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, 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. Watershed planning can enable decision-makers to accommodate both land use and ecosystem needs. It also allows water managers to focus on water issues and water-based resources in the context of other ecosystem issues. 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.

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. Since public inputs are considered in the development of plan, the community will be receptive to the decisions that are made regarding the development and management of the resources in the watershed. In a well conceived plan there are economic and ecological benefits which are of value to the community and to society as a whole. These include:

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

Public involvement has significant benefits. For example, 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.

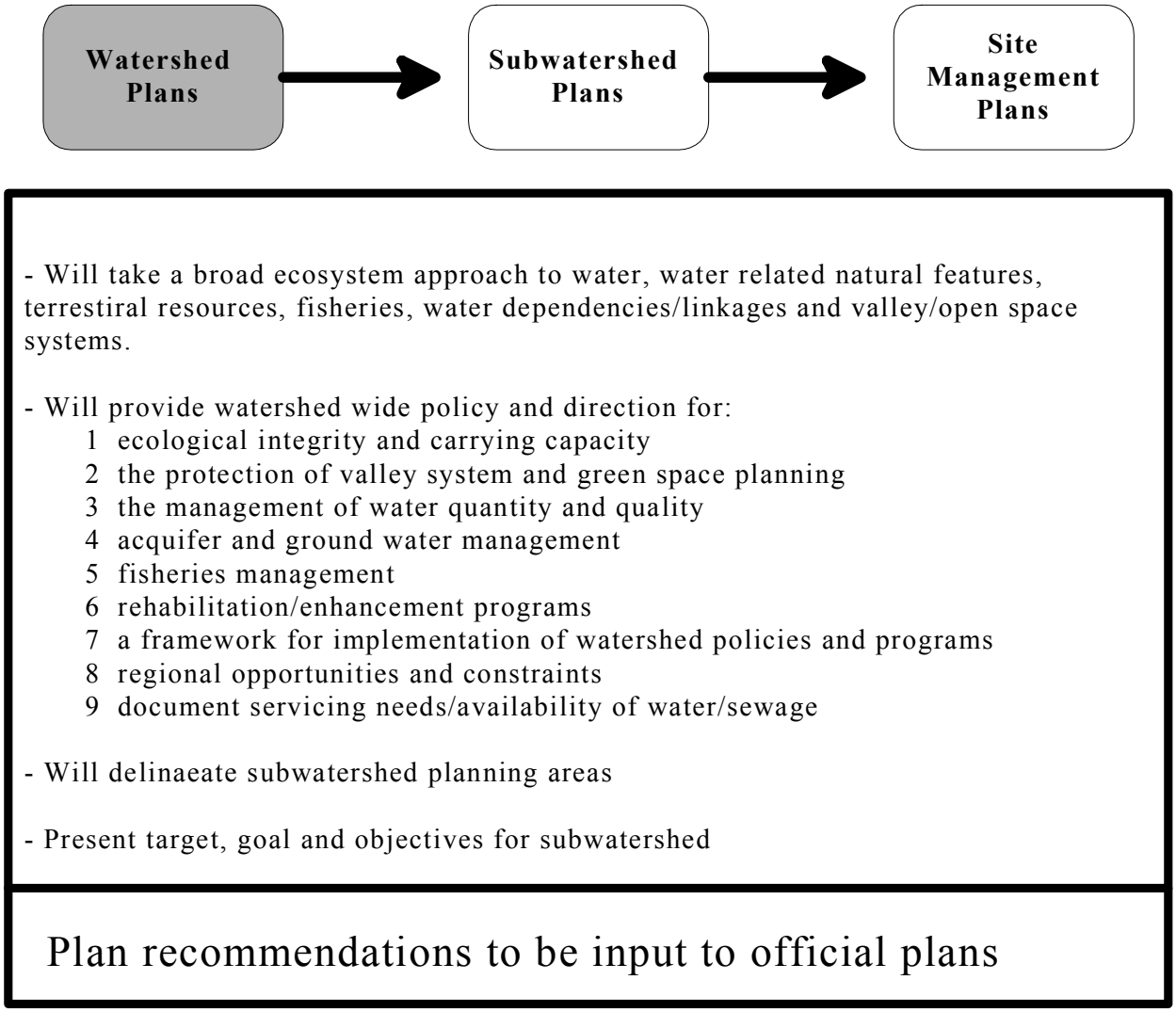

FIGURE 2-2. (Fig. 3 "Watershed Plans" from WTRSHD.JUN)

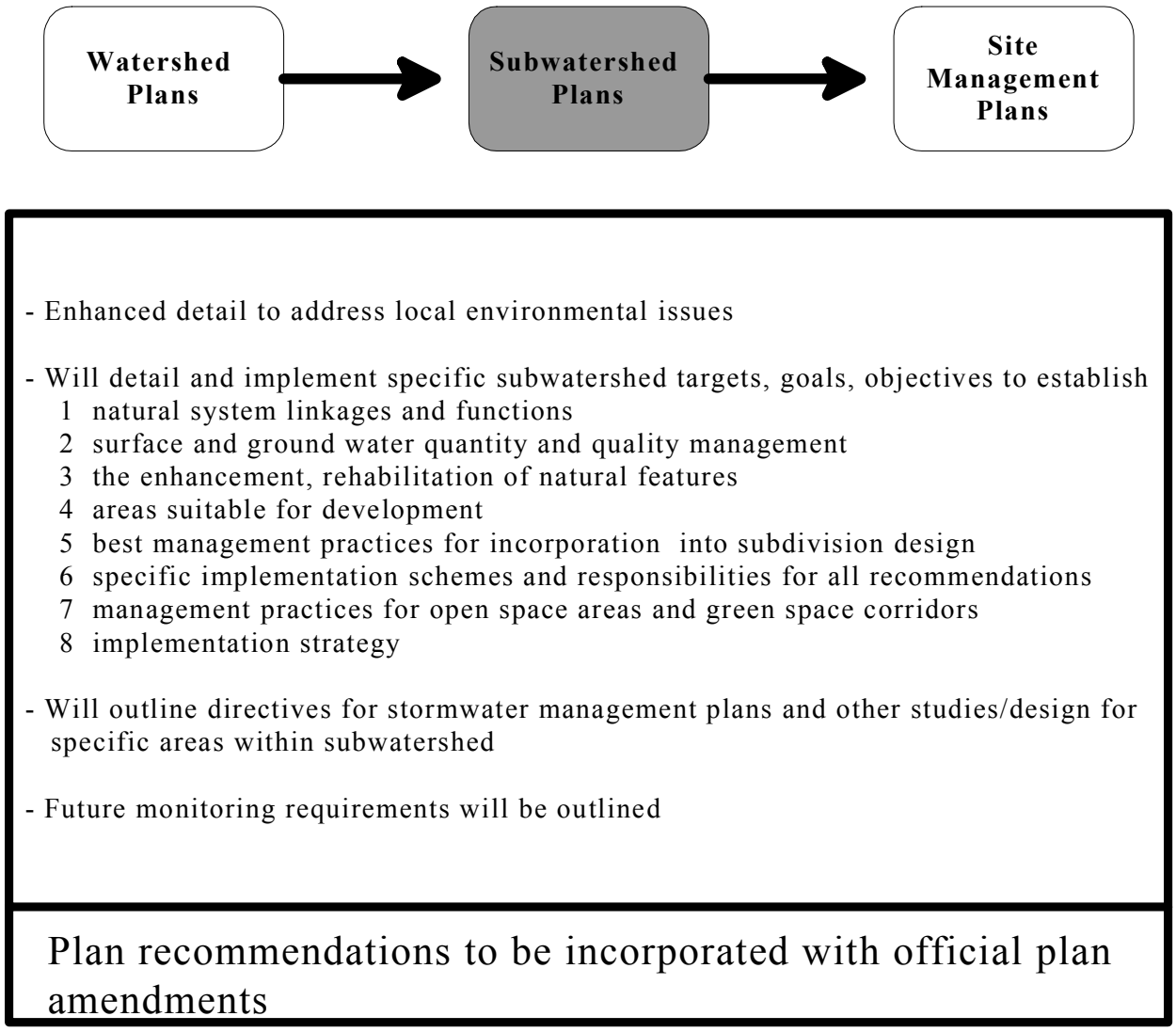

FIGURE 2-3. (Fig. 4 "Subwatershed Plans" from WTRSHD.JUN)

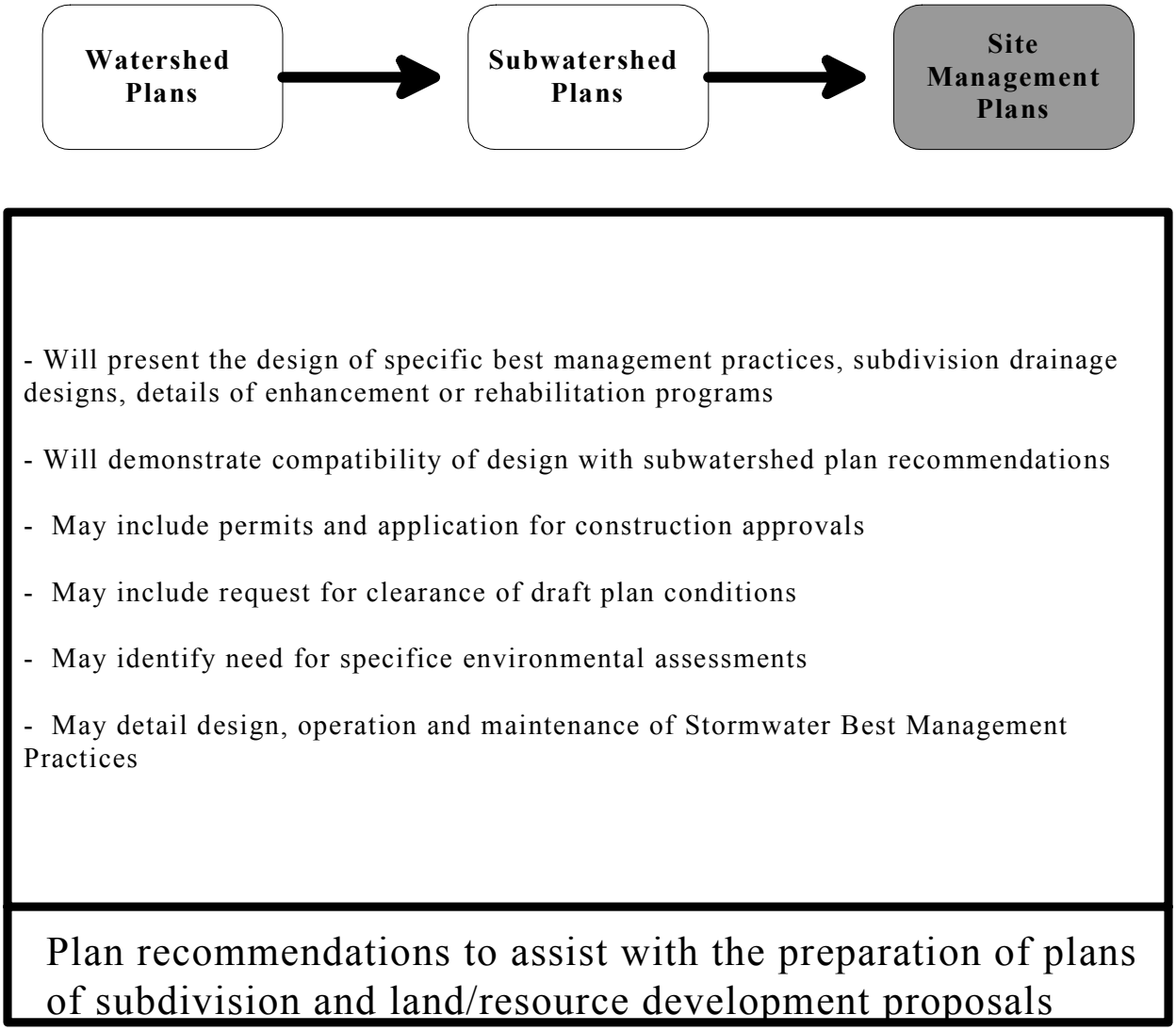

FIGURE 2-4. (Fig. 5 "Site Management Plans" from WTRSHD.JUN)

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 developed and managed. 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 and 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 carefully thought out, clear, and precise.

Goals should be defensible, that is, supported by sound ecological and economic reasoning. They should also be sufficiently flexible to accommodate natural fluctuations in watershed conditions, and those for rehabilitation should be progressive and allow for future adjustments. Briefly, management goals should:

- be easily refined as new information becomes available
- be practical to ensure achievability;
- be explicit, verifiable;
- be result focused to ensure accountability of those implementing the plan;
- have public/agency/stakeholder endorsement; and
- be economically responsible.

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.

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*. These goals and objectives are formulated on the basis of the following accepted watershed planning and management principles.

PRINCIPLE #1. 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.

PRINCIPLE #2. Stream and Lake Conditions

Changes to natural vegetation and natural processes in watersheds and subwatersheds have resulted in detrimental changes to stream and lake conditions. These changes have impacts on runoff, temperature, habitat, chemical and baseflow characteristics which adversely affect natural aquatic communities.

PRINCIPLE #3. Maintaining Natural Watercourses

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.

PRINCIPLE #4. 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.

PRINCIPLE #5. 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.

PRINCIPLE #6. 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.

2.3 LAND USE PLANNING OVERVIEW

In the municipal land use planning process, the key planning document is the official plan. The official plan sets the municipality's goals and objectives for land uses within its jurisdiction. The official plan also provides specific policy direction which guides land development in accordance with provincial policies and guidelines as provided for under the *Planning Act*. *It is an important mechanism, therefore, that can be used to promote and implement the objectives of water and related resource planning. If this is done, the process can be considered to be integrated land use/ water resource municipal planning*.

The policies of the official plan should clearly recognize the importance of the quality of surface water and related resources to the environmental, social and economic well being of the municipality.

Under the *Planning Act*, the municipal land use planning process sets out a distinct framework for the development of environmental, social and economic goals and objectives for the municipality. However, the planning process alone cannot be expected to incorporate and implement all aspects of an effective watershed planning and management process. Therefore, linkages between the two processes are very important.

Watershed planning is recognized by federal and provincial governments as being the most effective means of evaluating and developing water-related resource management strategies and practices. Most decisions that are made on privately owned lands, however, are made in the context of the municipal land use planning process on the basis of municipal boundaries or property ownership. It is very important, therefore, that there be adequate linkages established to incorporate water and related resource management directions into the municipal land use planning process.

Because land use planning can be influenced by environmental issues beyond the boundaries of particular upper or lower tier municipality, it is important that these municipalities incorporate the input of agencies mandated to manage broader water and related resource management areas. Upper tier plans (e.g. Official Plans of Regions, Counties, etc.), can provide for implementation of provincial policy and resource and growth management by means of a strategic, coordinated approach to physical (land use), social and economic development.

Each municipal level, both upper and lower tier, need to integrate water management components into the municipal planning process. This integration provides policies and directions for the protection of aquatic resources, as well as providing a better information base for traditional planning decisions.

Upper tier official plans provide for the coordination and management of resources at a regional level. Because of wide geographical context, the plans should:

- establish the broad land use strategy for the region or county,
- outline provincial interests and programs in municipal terms, and
- provide a basis for allocating the area's resources among member municipalities and among various population concentrations in accordance with the goals and objectives it sets out.

Lower tier plans address community needs in conformity with the broad strategic framework of the upper tier plan, but at a local, detailed level. In this way, both upper and lower tier plans can have a long-term horizon, but at different levels of detail, and different geographic perspectives. The coordination of upper and lower tier plans provides a unique opportunity for the development of a strategic and multidisciplinary approach to land use planning.

2.4 WATERSHED PLAN DEVELOPMENT AND IMPLEMENTATION

The ultimate goal of watershed plan development and implementation is to see that the appropriate components developed through the watershed planning and management process are incorporated and/or linked into the municipal planning process, as highlighted in Figure 2-5.

The official plan should identify implementation schedules and mechanisms, that is, how and when the policies in the official plan will be implemented. This includes, for example, identifying when specific water and related resource planning and management tools, like subwatershed plans and stormwater management plans, will be needed. This is to ensure that linkages between watershed and land use planning are established at the outset. These policies should be implemented through zoning by-laws.

Where a watershed plan has been prepared, all land use planning decisions should be carried out in accordance with the recommendations of the watershed management plan. An official plan can reflect the broad directions, goals and targets established in the watershed management plan.

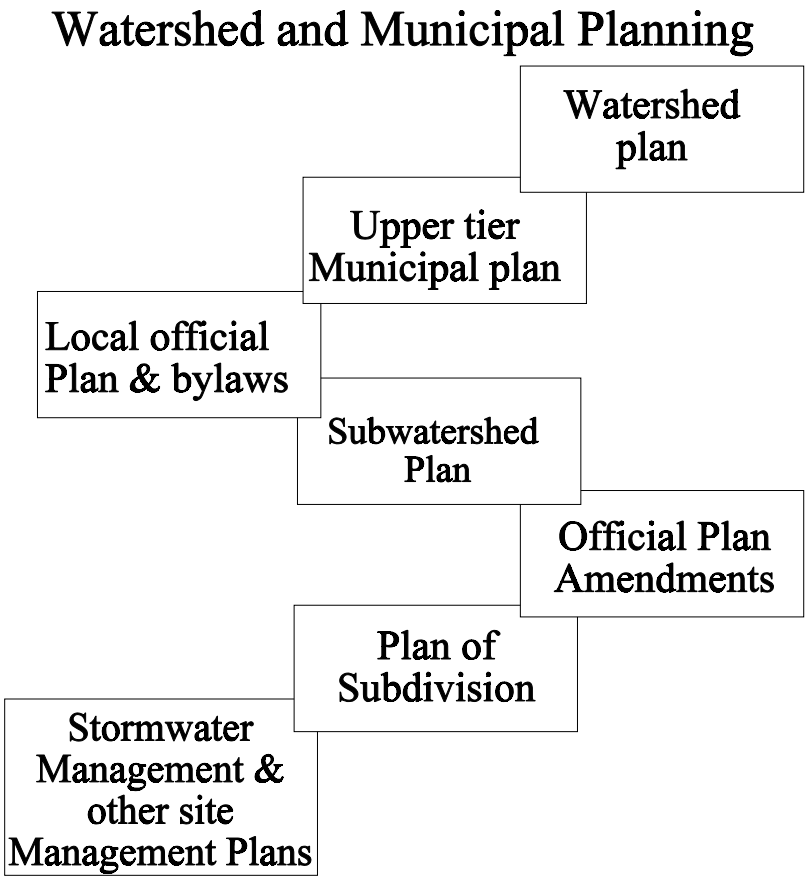

FIGURE 2-5. Watershed & Municipal Planning Process.

2.4.1 Planning Framework

Before embarking on the 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: (1) set the stage, (2) prepare the plan, and (3) adopt the plan.

Stage 1. Set the Stage

Initially a number of events or actions 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 and degraded environments. 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 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 (e.g. regional groundwater systems).

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.

Stage 2. 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.

At this point, broad goals for watershed management can be formulated, to be refined 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.

Stage 3. 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. These stages are:

- work out and agree upon the questions of goals, affordability, benefits, suitability of proposed actions, and responsibilities;
- establish evaluation criteria and the assessment protocol;
- collect all relevant background information and supplementary field data;
- screen all possible BMP measures for a set of feasible and practical BMP techniques;
- combine these measures together in various combinations to form alternate SWM strategies;
- apply the assessment protocol to the long list of strategies to select a recommended strategy(ies); and,
- verify the utility of the recommended strategy against the evaluation criteria.

When all participants agree on a final direction, the recommended strategy can be adopted as the SWM Plan and 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.

2.4.2 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 should be able 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 what information is already available, and 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:

    - improve knowledge of the watershed ecosystem?
    - further refine the watershed management goals?
    - 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.

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

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.

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.

Information on water resources, 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
- well location maps
- direction of ground water movement/relative transmissivity
- recharge zones/susceptibility to contamination
- ground water spring locations

- floodline maps

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, and hydroelectric, could include present and potential sources of point and non-point contaminants such as:

- storm sewer outlets
- sanitary sewer overflows and cross-connections
- industrial effluent outlets
- areas of direct livestock access
- septic tank systems
- milk house wastes

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.

2.4.3 Development of Plan

The alternatives and evaluation 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 represents 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.

Recommended actions are the result of the multi-objective 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, and rehabilitation.

- Protection: The ecologic areas include headwaters, aquifer recharge/discharge areas, wetlands, and fish habitat. To promote ecosystem protection, appropriate initiatives should be developed for key water and water-based elements that are necessary for protecting ecosystem health.

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

- Rehabilitation: Criteria for prioritizing site rehabilitation should be established, and time and fiscal and human resources required for each site should be estimated. The plan can

outline preferred measures or strategies for improved land management and for the abatement of all point and non-point sources.

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.

2.4.4 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, 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 *Drainage Act*. A listing of provincial legislation is

available in Ministerial Responsibility for Acts, Ministry of Government Services, Queen's Printer for Ontario, 1991. The federal *Fisheries Act* is also applicable.

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 by:

- Assisting municipalities and planning boards to incorporate the intent and recommendations of the watershed plan into the land use planning process and appropriate planning documents.

- Reviewing proposed planning that may have implications for the watershed plan or water management.

- Assisting the Ontario Municipal Board or other appeal bodies, where a matter related to the watershed plan and water management may be an issue.

- Consulting with ministries, public agencies, boards, authorities and municipalities on matters pertaining to the watershed plan and water management, as appropriate.

- Informing the general public about the principles and practices of watershed management.

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.

2.4.5 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.**

2.4.6 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.

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.

2.4.7 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.

2.4.8 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. 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 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.

- **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.

- **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. Typical methods of reaching the public include: printed materials, special events, field trips, public meetings, media and public opinion polling.

Public involvement encourages local support 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.

2.5 SUMMARY

A summary of the major topics covered by this training module is provided below:

1. Ecosystem Approach to Watershed Planning

   A watershed is a discrete ecosystem, the state of which is affected by the environmental condition of its component subwatersheds. The primary boundary for an ecosystem approach to land use planning is the watershed.

2. Watershed Planning Documents

   The goals of watershed management planning address areas or resources which are to be preserved, protected, or rehabilitated. These goals are incorporated into watershed planning documents such as the Watershed Management Plan, the Subwatershed Management Plan and the Site Management Plan. Each plan represents an increasing level of detail, however, watershed-wide goals and objectives are integrated into watershed planning at every stage.

3. Watershed Planning versus Land Use Planning

   At the municipal level, the key planning document is the Official Plan. The Official Plan represents an important mechanism to promote and implement the objectives of water and

related resource planning.

4. Watershed Plan Development and Implementation

Important elements of watershed plan development and implementation are summarized below:

(i) Planning Framework: The framework of a watershed plan encompasses: (1) setting the stage, or establishing the need, (2) plan preparation, and (3) plan adoption or implementation.

(ii) Information Gathering: Careful assessment of existing information and efficient collection of additional information represent key elements of a successful Watershed Plan.

(iii) Development of Plan: The development of a watershed plan represents a strategic planning exercise designed to maximize benefits to the watershed as a whole. The plan sets out recommended actions for each ecological area in the watershed with regard to prevention/protection, enhancement, and rehabilitation.

(iv) Roles and Responsibilities: The issues and recommended actions defined in watershed plans involve a range of agencies, including municipalities, conservation authorities, provincial ministries, First Nations and private interests.

(v) Funding: Watershed planning is typically funded through cost-sharing partnerships among the agencies involved.

(vi) Monitoring: Straightforward monitoring programs are necessary to track the performance of a watershed management plan.

(vii) Currency: Lessons learned in performance monitoring are applied to make appropriate revisions to the watershed management plan.

(viii) Public Participation: Public involvement in the watershed management planning process is a key element to a successful water management plan.

Watershed management represents an effective means of preserving, or improving, the general health of a watershed ecosystem. Numerous benefits are realized by all parties concerned.