IN SEARCH OF AN ENVIRONMENTAL PLANNING METHOD: A REVIEW OF GREAT LAKES INITIATIVES

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by

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ABSTRACT

During the past decade or so, many researchers, planners and managers the world over have propounded some version of "ecosystem approach" for problems and opportunities associated with the natural environment and renewable resources. Most of these approaches share the following features: a primary focus on ecological phenomena as opposed to engineering, economic or jurisdictional phenomena; a perception of some self-regulatory capacity on the part of an ecosystem; a recognition of the marked responsiveness of many ecological systems to natural and human activities; and a readiness to strike a pragmatic compromise between detailed reductionist understanding and a more holistic, comprehensive overview. Environmental workers in the Great Lakes Basin are now trying to operationalize, implement and institutionalize some form(s) of this approach.

This paper is an assessment of ten of the most recent of these "ecosystem approaches" developed for environmental problems in the Great Lakes Basin. Of the ten, one is the mapping method of environmental planning widely publicized by Ian McHarg which is the primary planning tool of most landscape architects. The comparison of these studies is intended to inform Great Lakes workers of the methods and information now available to them, and to explore the various interpretations of the meaning of "ecosystem approach". Through the latter, it was discovered that McHarg's method differs from other resource management techniques in its use of ecological information and concepts, and consequently its ability to interpret, predict and manage ecosystem behaviour. These and other differences between the ten studies are outlined and suggestions are given for their use in a state-of-the-art coordinated approach to Great Lakes environmental problems.

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PREFACE

As it is practiced by landscape architects today, environmental planning provides an excellent means of spatially sorting out land uses, but often a primitive information base for the subsequent development of management strategies. Since most planners have recently been required to accompany their spatial plans with such strategies, this is a good time for a critical self examination. What is the special understanding that a landscape architect can bring to an interdisciplinary resource problem? And how should that expertise best use and be used by other specialties: research data, legal and other regulatory guidelines, engineering and structural information, and etc.

The first real definition of a landscape architect's role in resource planning was developed by Ian McHarg. McHarg gave the field of landscape architecture a new relevance and a new vision by opening the way for integrative ecological planning, but made a serious mistake when he provided a very simple method for the purpose. For many (perhaps most) landscape architects without the scientific training to properly mold the method to each problem, McHarg provided a decree: to be used, information must be made spatial. Because spatial information must be highly simplified to be practical, landscape architects were given a planning tool that gave them what was often thought to be a good understanding, and what was often taken as a rather defensive central control. They were dealing with information translated into their language, often suppressing the importance of whatever was untranslateable.

Designers often seem to be comfortable with the coordinating role - certainly with simplification because these processes are essential to the integrative, creative act. With McHarg's planning tool, designers are able to capitalize on these strengths and, ironically, isolate themselves from the complexity of possible contributions from other fields. Their relationship

with research scientists is at best, remote; with resource managers, often purely cooincidental; with those developing regulations and guidelines, most often noninteractive. This disciplinary isolation is a product of at least 200 years of cultural specialization, to be sure, but the time has clearly come for bridging disciplinary worlds and landscape architects are not, as a profession, contributing much to the environmental management field.

My first reaction to the simplicity and what I see to be inadequacy of McHarg's overlay method was to attempt a unification. Several months were spent searching through recent ecological literature for concepts and techniques which could deal with the "process" information left over when all of McHarg's maps were complete: methods which could describe both the structure and function of ecological communities in such a way that reasonable predictions could be made about their responses to human activities. After a time, however, it became clear that ecologists had, by and large, not been anticipating the needs of planners: their concepts and techniques had not yet been refined for immediate, practical use. The story which preceeds a description of the current state of ecology and the concepts which are immediately useful follows.

The following are the views of one of ecology's earliest definers and promoters, Eugene P. Odum, on the state of the art in 1977:

> "Science and technology, during the past half century have been so preoccupied with reductionism that supra-individual systems have suffered benign neglect. We are abysmally ignorant of the ecosystems of which we are dependant parts." (Odum 1977, p. 1289)

Ecological research has primarily involved itself with the study of individuals, contrary to popular understanding. Until just fifteen years ago, a reductionist zeal for specific detail gave the study of individuals and their relations to those of the same species or interbreeding group, a cer-

tain validity which the more holistic and general search into diverse communities did not have. Rarely were plant and animal communities analyzed as interacting, evolving units.

A rather mechanistic, causal world view produced and was promoted by this linear analysis. This is the world described and bounded by physical and philosophical laws of the seventeenth century. Unidirectional cause and effect prescribed a predetermined and infinitely reducible universe. Each event had a single or set of causes which could invariably be traced; differences in findings indicated differences in physical conditions rather than possible differences in perception or interactions between the perceiver and the perceived. Logic was axiomatical and deductive; truth, singular (Maruyama 1974, in Regier 1978). Because organisms were studied one or two at a time, the true complexity of the "cause" of events was never revealed.

The tools used for this type of analysis are maps (primarily of geomorphology and species distribution); time series data of annual cycles; and simple statistical correlations between individual life cycle events (Regier and Rapport 1977). The primary means of ecosystem description are extensive species lists and, again, maps of various spatial analysis. If this sounds familiar, it is because these are still the primary tools used by planners and some managers to solve current ecological problems. According to Regier:

> "During the past decade, western nations have developed or strengthened a series of instruments to correct the worsening man-nature interaction. It need not surprise us that virtually all of these admittedly ad hoc initiatives have so far, fallen far short of full effectiveness. Part of the reason may be related to the fact that the ecological input has seldom escaped a slide into the reductionist method. Thus Leopold matrices, emission standards, agglomerated air or water quality indices, simple concepts of carrying capacity, maximum sustained yield, etc., singly and jointly, fail to address and safeguard the essence of ecological systems as perceived by holistic ecologists, or holists of any disciplinary persuasion." (Regier 1978,p. 95).

Ten to 15 years ago, the limitations of this reductionist view in furthering a study of whole ecosystems, combined with the urgent need for information to guide environmental management, stimulated many ecologists to search for different perspectives and different methods of analysis. A number of different schools of ecology developed. Some, such as compartment flow modelling, simply define further, the static, causal seventeenth centur world view, even while purporting to be holistic. Others have tended to adopt or create a very different world view. This view is defined by non-heirachical, interactive events, where the perceiver is admitted to define the perceived, and where the definition of that object or event is contextua Logic is complimentary rather than deductive, the universe is seen to be self-generating rather than predetermined, and the method for gaining information about that universe is relational and contextual, rather than classif-icational (Maruyama 1974, in Regier 1978).

The school of thought derived from this world view which seems to hold the most promise for planners is stress ecology. Rather than describing the structure of an ecosystem in detail, this school promotes the selection of certain key diagnostic variables which are then carefully monitored for chan The human activities which may cause environmental change are also monitored, and any small change or more drastic ecosystem transformation is then relate to the combination of human and natural stresses responsible for the change. school believes that it is usually impossible to tease apart the intricate web of interactions within an ecosystem, and that it is therefore necessary to begin to understand the system as a whole: its strengths, weaknesses and general ability to survive under stress.

One of the most important conclusions of this study is that environmenta planning, as defined by McHarg, is outdated. The method is not wrong; it is

simply incomplete. In the confusion and controversy of ecological ideas today, there are the beginnings of a better way to describe the dynamic behaviour of ecosystems to facilitate more creative management - from stress ecology, for example - which spatial planners, on the whole, have not adapted for their use.

CHAPTER ONE

Introduction

MAP 1. (IJC 1980).

In the Great Lakes Basin (Map 1), as in many parts of the world, a new focus has been developed for resource management over the past decade. That focus is environmental holism: a concern for whole-ecosystem health and an attempt to understand the man-environment interactions which enhance or degrade that condition. Initiatives in this field have come from researchers, managers, urban and resource planners, and have commonly been labeled the "Ecosystem Approach". Differing versions of this approach usually share at least the following: a primary ecological focus, a perception of the ecosystem as somewhat self-regulating and limited in recovery capability, and a willingness to adapt both reductionist and holistic techniques in a flexible approach to the problems.

Ecosystem approaches to resource management have been initiated independently for a range of environmental problems in the Great Lakes Basin: from terrestrial to aquatic; from urban to rural; from large to small scale. The institutional framework which exists to implement these management proposals is also extremely variable, and often inadequate to deal with the expanded management horizons. These traditionally narrow interests and mandates have been stretched to include and coordinate, or at least co-operate with many general planning functions: public involvement, regulation of land use, mechanisms for increasing program funding and more comprehensive administration organization.

This study is a response to the need to bring together these "Ecosystem Approaches" to Great Lakes Basin management problems, particularly since each calls for a more comprehensive and coordinated management strategy. The intent is to identify similarities, differences, and at times, insufficiencies in these approaches, and to use this understanding to begin to develop a comprehensive "ecosystem approach" for Great Lakes ecosystem issues.

MAP 1. (IJC 1980).

The comparison is intended to publicize the various applications of recent holistic ecological research so that professionals and environmental advocates: landscape architects, resource managers, urban planners etc., may judge the relationship of the form and scope of their methods to others currently in use. The comparison is not intended to select the best all-round method. The methodology for each of the ten studies selected for comparison was developed for different legislative and jurisdictional contexts. Some deal with different aspects of the same problem. The comparison, instead, is intended to describe each method and highlight both strengths and weaknesses within each context. Within this framework, however it is possible to make some judgements. Each study purports to make best use of the current state of the art of ecological understanding; they are therefore compared to criteria which, in the views of H.A. Regier and D.J. Rapport (1980, pers. comm.) best summerize the critical aspects of that understanding. Each study also forms a small part of a massive attempt to upgrade Great Lakes environmental quality; they are therefore compared with each other and against the suggested components of an optimum planning process to bring out similarities and complementarities in goals, methods and jurisdictions (or particular ecosystems addressed). Finally, they are used to define just what is meant today by an "ecosystem approach", and suggestions are given for ways in which this approach can be used to better integrate the studies presented here in a coordinated management effort.

The ten documents to be analyzed were selected by H.A. Regier, D.J. Rapport and the author as the most visible initiatives in each of the following fields: international Great Lakes water quality management, international Great Lakes fisheries management; Great Lakes Basin urban planning, Ontario provincial fisheries management, environmental planning and management in Ontario, 'ecological' planning in general, and environmental

information systems in Canada. The approaches are:

- International Joint Commission/Great Lakes Research Advisory Board (1978), The Ecosystem Approach;
- Leman and Leman (1976), The Great Lakes Megalopolis, GLM;
- Great Lakes Fishery Commission/ Francis, Magnuson, Regier and Talhelm (1979), Rehabilitating Great Lakes Ecosystems, GLER;
- Federal-Provincial Strategic Planning for Ontario Fisheries, SPOF;
- International Joint Commission/ Scientific Advisory Board/ Ryder (1979), An Ecosystem Objective for the Laurentian Great Lakes Based on the Fundamental Requirements of the Lake Trout, Lake Trout Indicator for Management, SAB/LT;
- Ian McHarg's Environmental Planning Method as demonstrated in the Toronto Central Waterfront Planning Study (1974 - present) CWPS;
- International Joint Commission/ International Reference Group on Great Lakes Pollution From Land Use Activities (1972-1978), PLUARG;
- Environmentally Sensitive Area Planning in Ontario, ESA Planning;
- Great Lakes Basin Eutrophication Models, GLEM;
- Rapport and Friend (1979), Rapport and Regier (1980), The Stress-Response Environmental Information System, S-RESS.

These approaches are compared and described according to criteria chosen, as well, by H.A. Regier, D.J. Rapport, and the author. As previously mentioned, the criteria were those ecological and planning features which were initially percieved to be important to ecosystem management in the Great Lakes basin, and were supplemented by other considerations which emerged as the analysis progressed.

The criteria are as follows:

- type of activity (planning or management; urban or resource related);
- scale of activity, or extent of area considered (ie urban neighbourhood, city, lake bay, whole lake, or great Lakes Basin);
- nature and ownership of ecosystems involved (ie terrestrial, lakeshore, inshore or deep water ecosystems; public or private ecosystem ownership);
- specific ecological and management characteristics of an optimal "ecosystem approach";
- philosophy and techniques used for public involvement; and
- recommendation of administrative strative strategies to implement management goals.

Chapter Two contains the comparisons of each approach according to the above criteria, preceeded by concise summaries of each approach. The summaries were formed from direct quotations whenever possible; the comparis were made on the basis of cited publications and extensive conversations wit key personnel and investigators.

Chapter Three is a very general synthesis of all relevant aspects of th ecosystem approaches so far discussed, into an integrated "optimum" planning framework. The ten approaches are then assessed for sufficiency and/or compatability with the requirements of this framework (whichever is appropriate the constraints of the approach). Chapters Two and Three were developed fro a paper by B.J. Lee, H.A. Regier and D.J. Rapport, of the Institute for Envi mental Studies, University of Toronto for the plenery session of the International Association for Great Lakes Research (IAGLR) annual meeting in King Ontario, May 1980. The text was written by B.J. Lee. The paper was funded The Great Lakes Fishery Commission.

Chapter Four contains a concise set of conclusions which address both methodology and the actual plans for action given by the ten ecosystem approaches. Suggestions are made about the strengths, weaknesses and compatabilities of the approaches as singular and collective means of solving Great Lakes environmental problems. They are aimed primarily at those interested in making specific improvements to environmental planning and management in the Great Lakes Basin.

Appended to this study are the questionaires used to gather information about public involvement, a detailed assessment of McHarg's overlay environmental planning method with specific reference to The Toronto Central Waterfront Planning Study, and a bibliography of selected publications on the theory of island biogeography for planning application. The assessment of McHarg's planning method is included as a separate discussion because it is of the most interest to landscape architects and because it alone, seems to require updating to include recently developed concepts of ecosystem dynamics and stress-related behaviour. This assessment is put forward with the sincere hope that designers and planners share a concern for improved ecosystem management and will therefore be open to suggestions for change.

CHAPTER TWO

A Comparison of ten recent Ecosystem Approaches to Planning and Management in the Great Lakes Basin

STUDIES UNDERTAKEN FOR COMPARISON

The following are the ten "ecosystem approaches" selected for study. An attempt was made to convey sufficient information about the substance of each to give meaning to the subsequent comparisons. In most cases, this information is restricted to context and statements of purpose, although methodology and conclusions are included for those studies which have been carried to an operational level and require the information for their understanding. Direct quotes from key references are used whenever possible, but when succinct quotations are not available, the substance of the text is summarized.

The Research Advisory Board's Ecosystem Approach, IJC/EA

Reference: IJC/Great Lakes Research Advisory Board (1978)

> "The Ecosystem Approach is a Special Report of the Great Lakes Research Advisory Board to the International Joint Commission in Response to the Commission's request for further advice on the scope and implications of the...approach" (p. vii) as well as
>
> (i) "any difficulties involved in melding the ecosystem and water quality objectives approaches,
>
> (ii) practical means of implementing the combined concept and,
>
> (iii) research needs and whether such needs relate to data, management techniques or other aspects." (p. 46)

The substance of the approach, which is described by qualitiative terms rather than by a comprehensive, systematic definition, is as follows:

> "This ecosystem approach is based on a man-in-system concept rather than a system-external-to man

> concept inherent in the 1972 Great Lakes Water Quality Agreement. Incorporation of this approach within the advisory and management functions of the Commission and Parties, respectively, necessitates political recognition of the Great Lakes Basin as an Ecosystem composed of the interacting elements of water, air, land and living organisms, including man, within the Basin. It further necessitates explicit recognition of exchange of materials such as atmospheric pollutants into and out of the Basin in biospheric perspective... It directs the efforts of the parties and commission toward treatment of the patient (the Ecosystem) rather than the symptoms or disease. It relates the biological and technical activities of man in the carring capacity of the Ecosystem, linking the human body to the biosphere." (p. vii).

The approach is defined in relation to the water quality approach by five criteria: consideration of man as an interacting part of nature; clarification of transboundary interactions with neighbouring areas; portrayal of system dynamics; consideration of public attitudes, perceptions and behaviour; and acceptance of limits of tolerance to human stresses.

Great Lakes Megalopolis, GLM

Reference: Leman and Leman (1979)

The 1975 Toronto Conference on the Great Lakes Megalopolis was called to gain general recognition for the dynamics of the vast urban conglomerate from Quebec in the east to Milwaukee in the west. An extremely diverse group was convened: philosophers, psychologists, anthropologists, geographers, planners, architects, ekisticians, engineers, futurists, resource managers, businessmen, economists, communications experts, administrators, public servants and lawyers. Views which were expressed on the nature of the issues and strategies needed to cope with them are therefore varied and often conflicting. The primary result of the conference was consequently an expansion of ideas and awareness rather than the development of planning strategies.

Harlan Hatcher stated its purpose:

> "What we have here is a dynamic maturation of one of the most important areas on the face of the earth that is already moving in a direction that we would prefer it not to go... Our purpose in the Megalopolis Research Project (and the usefulness of the concept of Megalopolis) is to give us a larger perspective of how to begin to think about a total region and how to begin to manage it with our present misunderstandings and the new ones developing, so that in another 50-100 years (perhaps 150), it will be able to support the extra 20 million people with some degree of graciousness and relaxation rather than the "wear and tear" that is destroying us at the present time". (p. 17)

This management will depend upon a new world view of anticipatory democracy, cooperation, symbiosis, and restraint (A.N. Christakas, p. 35); greatly improved communications to comprehend and share the meaning of the urban situation (R. Lourie and T. Langan, pp. 41-47); improved futures creative social and physical planning (A.N. Christakas, p. 35; C.A. Doxiadis, p. 105; J.G. Papaioannou, p. 60); inclusion of the users in this planning (M. Mead p. 40); management of the Great Lakes resources (G. Francis, p. 102) and perhaps, most importantly, consideration of each issue at the appropriate scale (M. Mead, p. 107).

In March 1979, a second workshop on planning issues in the Great Lakes Megalopolis was held in Windsor, Ontario. This workshop was sponsored by the Expert Committee on Societal Aspects, Science Advisory Board of the IJC

> "to determine how the IJC could be better informed about unmet current or emerging problems affecting the Great Lakes in order to increase its ability to advise the Governments of the United States and Canada." (IJC/SAB 1979, p.3)

Rehabilitating Great Lakes Ecosystems, GLER

Reference: Great Lakes Fishery Commission/Francis, Magnuson, Regier and Talhelm (1979)

> "In June, 1977, the Great Lakes Fishery Commission requested its Scientific Advisory Committee to review the state of the art for ecological rehabilitation of aquatic ecosystems and assess the feasibility of applying it to the Great Lakes. This study is the response to that request... (Its) main conclusion is that comprehensive ecosystem rehabilitation strategies for the Great Lakes are, in

The Committee outlined possible goals for rehabilitation and the technical, institutional and economic feasibility of rehabilitating ecosystems degraded by one or more of eighteen stresses identified as operating on Great Lakes ecosystems. They also reviewed the general socio-economic feasibility of such a program, and an institutional strategy which could be used to implement the technical strategies.

Federal-Provincial Strategic Planning for Ontario Fisheries, SPOF

Reference: Loftus, Johnson and Regier (1978)

> "A new management strategy for Ontario fisheries was addressed by a federal-provinical task force in 1974-76. It was initiated in an atmosphere of concern over the deteriorating status of fish stocks in Ontario, and indeed elsewhere in Canada. Speaking generally, it has become abundantly clear that our traditional approach to fisheries management--development-oriented, exploitive, open access--is no longer appropriate in the 1970's and 1980's... A new approach to fisheries management, characterized generally by maintenance in the north and by rehabilitation in the south is now essential. Much of the scientific and technical knowledge needed for the new approach is already available. To apply that knowlege, and to achieve the new knowledge and current data series necessary to its application, a major new initiative is necessary... The new initiative will require...funding,...(and) the evolution of different value systems, and of new and/or more explicit policies regarding
>
> - a new level of public participation;
> - a "user pays" policy:
> - more limited access and increased emphasis on protection;
> - ···"experimental management" to gain new knowledge necessary to manage;
> - environmental quality matters;
> ..

- explicit allocation of those parts of the resource base available for commercial and for recreational use; and
- new working arrangements between fisheries agencies and other institutions." (pp. 916-917)

An Ecosystem Objective for the Laurentian Great Lakes Based on the Fundamental Requirements of the Lake Trout (Lake Trout-Ecosystem Indicator for Management, SAB/LT

Reference: IJC/Scientific Advisory Board/Ryder (1979)

This paper was produced for the International Joint Commission in 1979 to illustrate the management of Ecosystem health through the monitoring of a single indicator organism.

> "For exemplary purposes, we have selected a single organism, the lake trout, as a system bellweather in order to demonstrate a non-sophisticated, simplistic example of the ecosystem approach methodology." (forward)

The objective for lake trout management is stated as:

> "the attainment and sustained maintenance of the appropriate oligotrophic environment in order to ensure the perpetuation of a cold water community of indigenous organisms." (p.5)

> "...system parameters to be measured should be both readily identifiable, and quantifiable, obtained with relatively little logistic difficulty and preferably be those properties that have been monitored traditionally over a substantial historical time frame" (p. 18) ...large sustained yields of palatable lake trout will be received as an indication of various system properties at several hierarchic levels, not excluding lake trout population dynamics, but including also coldwater community dynamics, and as a measure of community integrity and persistence, effective sea lamprey control measures, system stability, adequacy of the forage base, conditions of lake trout spawning grounds, degree eutrophication and effectiveness of toxic waste controls. A continually monitored lake trout harvest can demonstrate all of these <u>system</u> or <u>subsystem properties</u> as well as the management measures which need to be effected in order to maintain or improve the quality of the system." (p. 19)

Ian McHarg's Environmental Planning Method as Demonstrated in the Central Waterfront Planning Study, CWPS

Reference: McHarg (1969); CWPC (1974, 1976, 1978); CWPC/ Wallace, McHarg, Roberts and Todd (1976).

Ian McHarg, a landscape architect, educator and philospher, is generally recognized to be the first person to widely publicize the need to include "environmental" information in urban and regional planning (McHarg 1969). The method which he developed for this purpose is assessed here as it was used in the Toronto Central Waterfront Planning Study (CWPC/Wallace et al. 1976). Its stated goals were threefold:

> - "to integrate an understanding of the natural environment into an already complex urban planning process." (p. 81);
>
> - "to reconcile the conflicting demands for the accommodation of future uses and industry, housing and recreation on the one hand, protection of valuable natural and cultural resources on the other " (p. 1); and
>
> - to provide the City of Toronto with the tools to evaluate alternate courses of action in terms of their effect upon the natural environment of the Central Waterfront " (p. 2)..."and thus to weigh the alternatives judiciously " (p. 3)

McHarg's method of compiling and synthesizing environmental information is essentially an overlay mapping technique. In the CWPS, environmental components were identified and described by government agencies and interest groups in qualitative and quantitative terms (CWPC 1976). McHarg consolidated these into five major components and prepared five component maps. The social values and opportunities for human use of the waterfront resources had previously been established through numerous technical and planning studies, and an extensive public participation program (CWPC 1974, 1977). McHarg translated these uses and values into potential impacts (environmental constraints) and opportunities (environmental suitabilities) for each component, using as a general directive, the need to preserve as far as possible, the existing environmental state.

The final stage in the process was the compilation of performance requirements for each of the five components: Ministry of Environment air and water quality standards, plus management guidelines to "ensure that public health, safety and welfare maintained, valuable resources are preserved, that the waterfront environment is enhanced and that development is accommodated at minimal cost." CWPC/Wallace et al. 1976, p. 3).

International Reference Group on Great Lakes Pollution From Land Use Activities, PLUARG

Reference: IJC/PLUARG (1978)

> "The Canada-United States Agreement on Great Lakes Water Quality signed at Ottawa, April 15, 1972, by the President of the United States and the Prime Minister of Canada, requested the International Joint Commission to conduct a study of pollution of the boundary waters of the Great Lakes System from agricultural, forestry and other land use activities. As a result, an intensive inquiry was conducted by the International Reference Group on Great Lakes Pollution from land Use Activities (PLUARG), established by the International Joint Commission." (p.1)
>
> "The purpose of this study was:
>
> a) to determine and evaluate the causes, extent and locality of pollution from land use activities;
>
> b) to gain an understanding of the relative importance of various land uses in terms of their diffuse pollutant loads to the Great Lakes;
>
> c) to examine the effects of the diffuse pollutant loads on Great Lakes water quality; and
>
> d) to determine the most practicable remedial measures for decreasing the diffuse pollutant loads to an acceptable level and the estimated costs of these measures." (p. 9)

The major studies which were carried out for this project were:

- an assessment of the current state of the art of land use management, legislation, and its effects on Great Lakes water quality;
- a land use inventory within the Basin, including an assessment of trends and patterns and a projection of future economic and demographic conditions;
- detailed studies of 7 pilot watersheds, 11 small sgricultural sub-watersheds and 12 small forested watersheds, conducted to acquire detailed empirical data for the full range of land use activities in the Basin;
- stream bank erosion studies in representative areas throughout the Basin;
- determination of the levels of sedimentary, chemical, and biological loadings reaching the Great Lakes through tributaries, shoreline erosion and air transport;
- perceptions of the farming community about water quality issues; and
- integration of results into a whole-system framework.

Environmentally Sensitive Area Planning in Ontario, ESA Planning

Reference: Eagles (1979)

ESA Planning is a method of preserving and managing Ontario's "smaller scale but important natural areas" (p.1) within the institutional context of Official Regional Plans. The concept was developed and applied during the past five years by a large number of people from

universities, government agencies and private clubs in the vicinity of Waterloo, Ontario. Its principal instigators were Paul Eagles and George Francis (University of Waterloo), Wayne McEachern (Planner for Halton Region) and Mark Stagg (Director of Planning, Region of Waterloo) whose primary intent was to "protect parts of the range of genetic and landscape diversity that is found within Municipalities. (The) effort is now being recognized up to and including international levels (Argus, 1976; Ryan, 1977)" (p. 306) The approach, as outlined for Ontario, is part of a developing multi-insitutional strategy for conservation in the province..." ESA activities at the municipal level fit within the broad framework of federal and provincial programs that deal with natural areas " (p. 307) The philosophical basis and potential scope of the E.S.A. planning as a manifestation of the conservation movement is seen by Eagles as:

> "attempting to move human society towards the adoption of the model of the mature state of an ecosystem (introducing nutrient conservation; quality rather than quantity production; web-like rather than linear food chains; cyclic rather than linear resource chains; and feedback loops). In this context, natural area planning is an attempt to involve strategies to change the existing societal trend involved in reducing the maturity of natural ecosystems". (p. 125)

Within each Regional Municipality, then, the ESA Planning process is geared towards the general preservation of the natural environment. Its most important features are:

- formation of an Ecological and Environmental Advisory Committee from interested and knowledgeable citizens in the Municipality to oversee and advise the Regional Government and Planning Department on ecological planning and management matters;
- survey of the Municipal natural areas by an interdisciplinary team; identification, cataloging and mapping of their assets;

- selection of those areas which fulfill one or more of the criteria established for ESA's.
- designation of ESA's and incorporation into the Official Plan;
- detailed field assessment of all ESA's to adjust boundaries and develop management plans;
- ESA management "to ensure the long term maintenance of the features for which the site was designated" (P. 218); the preferred course being "to let nature run its course" (p. 218) and;
- possible restoration of derelict lands in the Municipality to ESA status.

Great Lakes Basin Eutrophication Models, GLEM

References: Di Toro and Matystik (1979); Heidtke (1979); Heidtke and Sonzogni (1979)

This comparison will deal only with the eutrophication models which have been designed for, or can be modified for Great Lakes water quality problems. They were chosen as a subset of the 135 Great Lakes models listed in a 1979 compendium by T.M. Heidtke, because they best represent integrated ecosystem processes. The purpose of these models, designed primarily for Lakes Ontario, Michigan and Huron (T.M. Heidtke, 1979) is, "to formulate, calibrate and verify quantitative methods for the analysis of eutrophication..." (DiToro and Matystik 1979, p. 233). They are "generally used to evaluate average whole-lake effects for individual basins or their major embayments" (Heidtke 1979, p. 2) although "several...have been used to evaluate the long term response of receiving waters to hypothetical management scenarios" (Heidtke 1979, p. 2).

Not all of these models have been used, however. Those which have been given the most attention in Great Lakes management are the five which were used to develop the 1978 IJC phosphorus target loads (Sonzogni and Heidke 1979):

- the Saginaw Bay model (SMILE 1), V.J. Bierman Jr.;
- the Revised Lake Ontario Phytoplankton model (LAKE 1-A), R.V. Thomann;
- the Chapra Total Phosphorus Model for Great Lakes, S.C. Chapra;
- the Eutrophication Model for Lake Erie (ERIE 01), D.M. Di Toro; and
- the Modified Vollenweider Nutrient Loading Model (1976), R.A. Vollenweider

The phosphorus target loads were developed from independent predictions from each of these models - all yeilding similar results. A re-investigation of these models and the target loads is currently underway by a joint Task Force of the Great Lakes Science Advisory Board and Water Quality Board on Phosphorus Management Strategies.

Stress-Response Environmental Information System, S-RESS

References: Rapport and Friend (1979); Rapport and Regier (1980)

Developed through a four year collaboration by D.J. Rapport, A.M. Friend and H.A. Regier for Statistics Canada, this information system "attempt(s) a fusion of two usually diametrically opposite "mind-sets", that of the ecologist and the economist" (Rapport and Friend 1979, p. 3). This fusion was achieved by a recognition that the state of the ecology and the state of the economy are interrelated; man's economic activities often introducing significant stresses to the natural environment. The system itself is comprised of 3 major types of data:

- a classification of "terrestrial and aquatic ecosystems according to ecological similarity - such as watersheds, ecosystems, communities and biomes (ecological transformations considered in terms of both plants and animals in the area concerned)" (Rapport and Regier 1980, p. 22)
- ..."a taxonomy, quantification and geocoding of those aspects of human activity which potentially alter the state of nature". (Rapport and Regier 1980, pp. 22-23); and

- an identification of " a series of indicators, some specific to particular types of ecosystems, which diagnose transformations in nature" (Rapport and Regier 1980, p. 23).

The framework of stresses and responses formed by these data is intended to be completed for as much of the recorded past as possible, to allow future management decisions to be made in light of known ecosystem responses to types and combinations of stress. These responses often follow a comprehensible transformation trajectory. The form of the information system is intended to be amenable to use by groups

> "concerned with environment impact assessment, conservation and preservation, resource management, environmental rehabilitation, land use, regional planning and environmental engineering" (Rapport and Friend 1979, p. 9). It should be useful in terms of designing future departures from natural situations or... engineering rehabilitation of natural systems which are deemed to have been transformed beyond the boundaries considered safe for mankind." (Rapport and Friend 1979, p. 29).

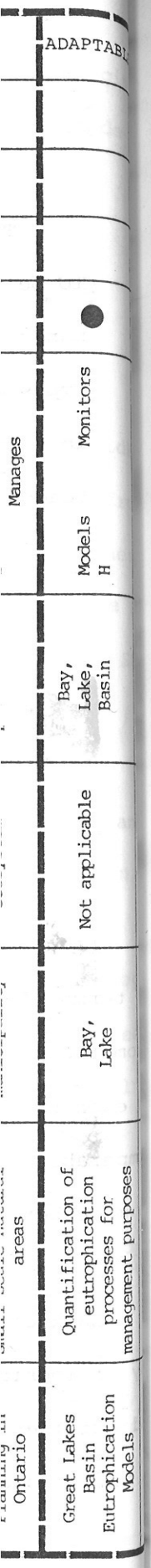
INITIAL OVERVIEW

Figure 1 gives an initial, general overview by describing each approach in terms of each selected criterion. The approaches vary in planning stage from the policy to the tactical or operational level. Interestingly, those at each stage (ie at similar levels of planning detail), are also the most comparable in field of specialization. The first comparison will therefore be made between those within each stage.

Policy Level Approaches

Each of the two approaches at the policy level (Fig. 1) promotes a new way of looking at natural and cultural processes within the Great Lakes Basin and outlines a new, more realistic and viable framework for problem solving in those domains.

PLANNING STAGE	APPROACH	OFFERS ADMIN STRATEGIES	CONSIDERS PUBLIC INVOLVEMENT[b]	CONSIDERS LAND USE EFFECTS	COMPARATIVE APPROACH TO MANAGEMENT	MANAGEMENT TOOLS[a]	SCALE OF ULTIMATE ASSESSMENT	MANAGEMENT UNIT	SCALE OF PROPOSED ACTIVITY	PRIMARY EMPHASIS
POLICY LEVEL	I.J.C.'s Ecosystem Approach	●	●	●		Models, Maps, Monitors	Great Lakes Basin	Undetermined	Great Lakes Basin	Environmental management to improve environmental quality
	Great Lakes Megalopolis	●	●	●	●	c	Megalopolis	Neighbourhood to Megalopolis	Great Lakes Megalopolis	Urban Planning
STRATEGY LEVEL	Rehabilitating Great Lakes Ecosystems	●	●	●	●	Models H/S, Manages, Monitors	Lake	Undetermined	Bay of Quinte Green Bay	Great Lakes ecosystem rehabilitation
	Federal-Provincial Strategic Planning for Ontario Fisheries	●	●		●	Models H/S, Manages, Monitors	Lake	Probably Ministry of Natural Resources Districts	Lake	Fisheries management to maintain northern lakes and rehabilitate southern lakes
	Lake Trout Indicator for Management				●	Models H/S, Monitors	Lake	Undetermined	Lake	System level monitoring for oligotrophic lake ecosystem rehabilitation
TACTICS LEVEL	Ian McHarg's Environmental Planning Method		●	●		d, Maps, f, e	Bay component	Bay component	Toronto Harbour (inner and outer)	Environmental land and water use planning
	Int. Ref. Group on Great Lakes Pollution from Land Use	●	●	●	●	Models H/S, Maps, Monitors	Watershed, Lake, Basin	Relevant jurisdictions at all government levels	Individual diffuse pollution source in the G.L.Basin	Generation of information on land based pollution to rehabilitate the Great Lakes
	Environmentally Sensitive area Planning in Ontario	●	●	●	●	Models S, Maps, Manages, Monitors	Regional municipality, province	Single terrestrial ecosystem	Regional municipality	Protection and management of Ontario's small scale natural areas
ADAPTAB	Great Lakes Basin Eutrophication Models				●	Models H, Monitors	Bay, Lake, Basin	Not applicable	Bay, Lake	Quantification of eutrophication processes for management purposes



Footnotes for FIG. 1. An Initial Overview

a. Four management tools are considered here: mapping elements of ecosystem structure; modelling ecosystem dynamics (H= "hard" or quantitative, S= "soft" or qualitative); monitoring indicators of ecosystem health or resource quality; use of experimental management techniques to achieve ecosystem understanding. This group of criteria represent the basic structural elements of an ecological approach to scientific information. Those which are recorded for each approach indicate the major emphasis or emphases as specified or implied in the key reference(s).

b. Consideration of public involvement includes philosophical consideration, program formulation and review of programs completed.

c. A monitoring program is recommended, but variables to be monitored are not specified.

d. Qualitative modelling has been carried out, but for ecosystem components which have not been assessed for their relative contributions to the well-being of the ecosystem as a whole.

e. An extensive monitoring program is recommended, but the proposed variables are components which have not been assessed in terms of their whole ecosystem contribution, synergistic effects or sufficiency.

f. Management recommendations are given for whole terrestrial ecosystems in the Central Waterfront area including the Toronto Island, but not for the Inner or Outer Toronto Harbour, as an aquatic ecosystem.

g. Any scale of ecologically sound unit for which information is available.

IJC's Ecosystem Approach recommends that the ILC redirect its monitoring emphasis from parameters of water quality to indicators of ecosystem quality and expand the boundaries and scope of its analysis to include the human activities which determine that quality. The Great Lakes Megalopolis conference was devoted to an assessment of those human activites. Conference participants discussed the types and spatial patterns of urban development in the vacinity of the Great Lakes. They were most concerned with the effect on the natural and human environment of the ever-increasing densities of human settlement, communication and transportation linkages, their international importance, and the implications of these phenomena for urban planning in the region.

There is disagreement between proponents of the two approaches about the most appropriate management unit (the Great Lakes Basin is recommended for environmental processes; the Great Lakes Megalopolis, for urban dynamics), but agreement does exist on the need for administrative strategies, improved land use management and public involvement (Fig. 1). There is also a shared resolve to educate the Great Lakes citizenry on the need to accept a lifestyle more responsive to intensifying cultural and ecological stress. Both approaches are currently under consideration by the IJC, which is "now faced with the need to become "anticipatory" and "forward looking" in dealing with problems in the Great Lakes Basin" (IJC/Science Advisory Board 1980a, p. 7).

Strategy Level Approaches

Each of the three strategy-level approaches (Fig. 1) is directed, at least in part, towards the rehabilitation of the Great Lakes aquatic ecosystems. The group conducting the Rehabilitating The Great Lakes Ecosystems (GLER) studies, are doing so as a politically detached scientific advisory group. Their consequent freedom from constraining institutional mandates is allowing them to work towards a "best possible" rehabilitation sollution. The studies have identified eighteen classes of culturally-related stresses impinging upon the lakes, and are considering the feasibility of financing, the necessity of

public education and involvement and the multi-level institutional strategies necessary to partially alleviate these stresses and rehabilitate the Great Lakes ecosystems. These general considerations were then taken to a local scale in workshops on single bays. The study is now refining recommendations on rehabilitation prodedures which will be mede available to relevant federal, provincial and state agencies.

Federal-Provincial Strategic Planning for Ontario Fisheries (SPOF), on the other hand, must produce recommendations which are more directly implementable and appropriate to the existing federal and provincial institutional structures. Thus, while its stated goals for the Great Lakes are very similar to those of GLER, the scope for their implementation is somewhat more limited. Financing and public education and involvement are considered to a similar extent, but the number of stressful activities over which the Ministry of Natural Resources has control is less than the total identified by GLER. This is primarily due to the fact that the agencies involved in SPOF are only two of the three identified by G.R. Francis (GLER working group) as having some control over ecosystem quality in the Great Lakes.

The remaining strategy level approach, Lake Trout Indicator for Management cannot be considered in a planning context. This approach simply offers an alternative to the present IJC water quality monitoring program, established in 1972 under the Great Lakes Water Quality Agreement and revised in 1978. Proposed is a substitution of many of the parameters now monitored for a few which indicate whole-system properties - initially the lake trout. In its current form, the proposal gives no consideration to planning implications: funding, public involvement, institutional implementation and land use considerations (Fig. 1). These are presumed to be under the control of the IJC.

All three strategy-level approaches use similar ecological concepts fo process of rehabilitation: program coordination in terms of lake-wide processes, qualitative and quantitative modelling for appropriate portions of the system, extensive monitoring to provide program feedback and experim tal management techniques (lake trout proposal excluded) using experience from comparable ecosystems to guide their selection (Fig. 1). Ecosystem mapping is done incidentally, but not emphasized in SPOF and GLER. The sect defining "ecosystem approach" elaborates these fundamental considerations.

Tactical Level Approaches

The three studies which have been completed at the tactics level (Fig. are again similar in focus; each deals in some way with terrestrial ecolog Together the studies provide data and recommendations which could allow la use planning and management in the Basin to become much more responsive to problems and opportunities of both its terrestrial and its aquatic ecosyst Ian McHarg's Environmental Planning Method, as demonstrated in the Central Waterfront Planning Study (CWPS) is essentially a method of allocating lan in harmony with an area's current ecology, and developing management strate which maintain that ecology. The approach is most often used at the regio and municipal government levels. Environmentally Sensitive Area Planning provides a more strategic and specialized approach to ecological ervation at the regional level by ensuring that specially designated areas protected from development or encroachment. The International Reference G on Great Lakes Pollution From Land Use Activities (PLUARG) differs somewha the former planning approaches; it forms a massive international data ba land use effects on Great Lakes aquatic ecosystems coordinated only by ver general Basin-wide management recommendations. It does not rest within an

institutional structure; rather its recommendations are generally available to the large number of agencies at every government level in Canada and the U.S. which have the mandate and financing to put them into effect.

Unlike the 'aquatic' approaches at the strategy level, the 'terrestrial' approaches show some variation in their use of ecological information and concepts. Figure 1 illustrates that McHarg's CWPS method is the only one of the ten which fails to assess the behaviour of monitored parameters (i.e. air and water quality factors) and analytic subsystems (land, water, life, etc.) in terms of the whole system (terrestrial, bay or lake ecosystem). McHarg's is also the only approach taken to a strategic or tactical level of resolution which is not comparative; that is, it does not draw on data from similar ecosystems to help develop management guidelines. Because existing environmental standards and guidelines are used without question, there are also no suggestions for the re-evaluation of agency philosophies, priorities, jurisdictions or relationships. Of the other approaches which are sufficiently comprehensive to make institutional recommendations appropriate, (IJC's Ecosystem Approach, G.L.Megalopolis, GLER, SPOF, PLUARG, ESA Planning) none fails to do so.

PLUARG and ESA Planning have a much more similar ecological basis. Both acknowledge the need for a systems overview, although for PLUARG the "systems" in focus are aquatic and the overview is in terms of the Great Lakes boundaries while for ESA Planning the "systems" are terrestrial and the overview is in terms of Ontario regional or provincial boundaries. Both approaches are comparative and both suggest administrative strategies. All three draw heavily on public participation for direction and public support (Fig. 1).

Adaptable Tools

The final two approaches are adaptable tools which can, but do not necessarily, form or determine the nature of the planning or management process. Each is, in fact, a primary means of putting into effect a particular para-

digm of ecosystem perception and analysis. All considered, it seems more appropriate to restrict their assessment to one of use of ecological concepts and compatability with a generalized "ecosystem approach" in the last section of this chapter.

PRIMARY MOTIVATION IN ECOSYSTEM MANAGEMENT

An interesting relationship between the approaches can be seen when they are compared according to their primary motivation, or the type of ecosystem intervention which they facilitate (Fig. 2). The first type can be called protective intervention: safe guarding selected ecosystems (in whole or in part) from development and management of those systems along with the surrounding land used to maintain their valued features. The second is corrective intervention: management of the ecosystem and all impinging stresses to upgrade its quality to a selected state. The third is exploitive intervention: design of specific types of development or activities to make use of ecosystem resources, features and processes (non-degradation being explicit in the "ecological" version of this interaction).

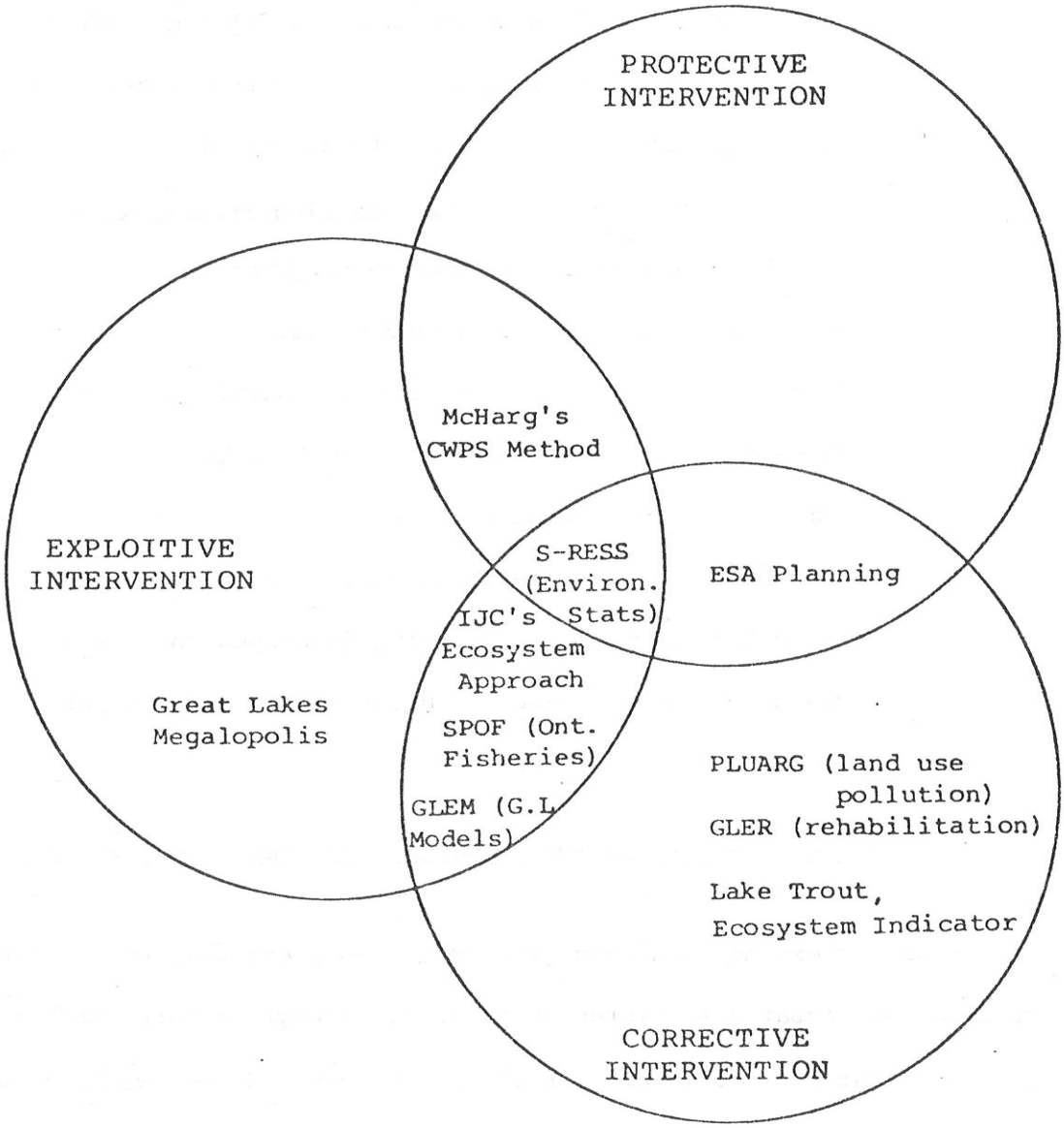


FIG. 2 Primary motivation in ecosystem management

The pattern which emerges from this comparison is probably not unpredictable given the interests of the people who selected the studies: eight of the ten make general recommendations for corrective ecosystem intervention, or rehabilitation.

Other observations are:

- the inconsistancy in ecological thinking between urban land use and resource planners illustrated in Figure 1 is demonstrated again in Figure 2. The only two studies which do not develop methods of ecosystem rehabilitation are the Great Lakes Megalopolis and McHarg's CWPS method. Megalopolis is not intended to provide a whole planning framework, but McHarg does purport to provide the best possible ecological planning recommendations.
- Simple protective intervention (or maintenance of the existing situation) appears not to be a meaningful management option for the Great Lakes at this time, except for some isolated bays of Lake Superior.
- An information system is being developed which has the potential to meet the needs of all three types of activity (S-RESS).

TYPE OF ECOSYSTEM MANAGED VS. HISTORIC OWNERSHIP OF ITS RESOURCES

Figure 3 expands a distinction which was previously made between terrestrial and aquatic ecosystem approaches. Ecosystems are further divided into four categories: land, shoreline, lake bay and open water or whole

lake, with the approaches placed horizontally along this continuum. Vertically, they are distributed according to historic ownership (public or private) and consequent treatment of ecosystem resources.

Agencies which deal with public resources have historically been characterized by the following features:

- they have a significant amount of control over large territories;
- they deal with resources which are common property and hence heavily exploited by a public with very little responsibility for, or control over, its collective actions; and
- as a result, the resources are "used to the point where their marginal utility is equal to their price - zero", since common property rights "lead to careless use and often to a greedy, frenetic sort of behavior " (Dales 1976, p. 492).

Figure 3 identifies the approaches which deal primarily with public resources and are now responding to this situation: IJC's Ecosystem approach, Great Lakes Eutrophication Models and Lake Trout Indicator for Management, under the direction of the IJC; and SPOF, under the direction of Environment Canada and the Ontario Ministry of Natural Resources.

Private ownership of land has, on the other hand, historically conveyed the right to its control and the responsibility for its' "wise" use explicitly to the owner. Agencies which attempt to exert some control over private land are often in a difficult mediational position between the variety of individual special interests promoted by landholders and some common "public good".

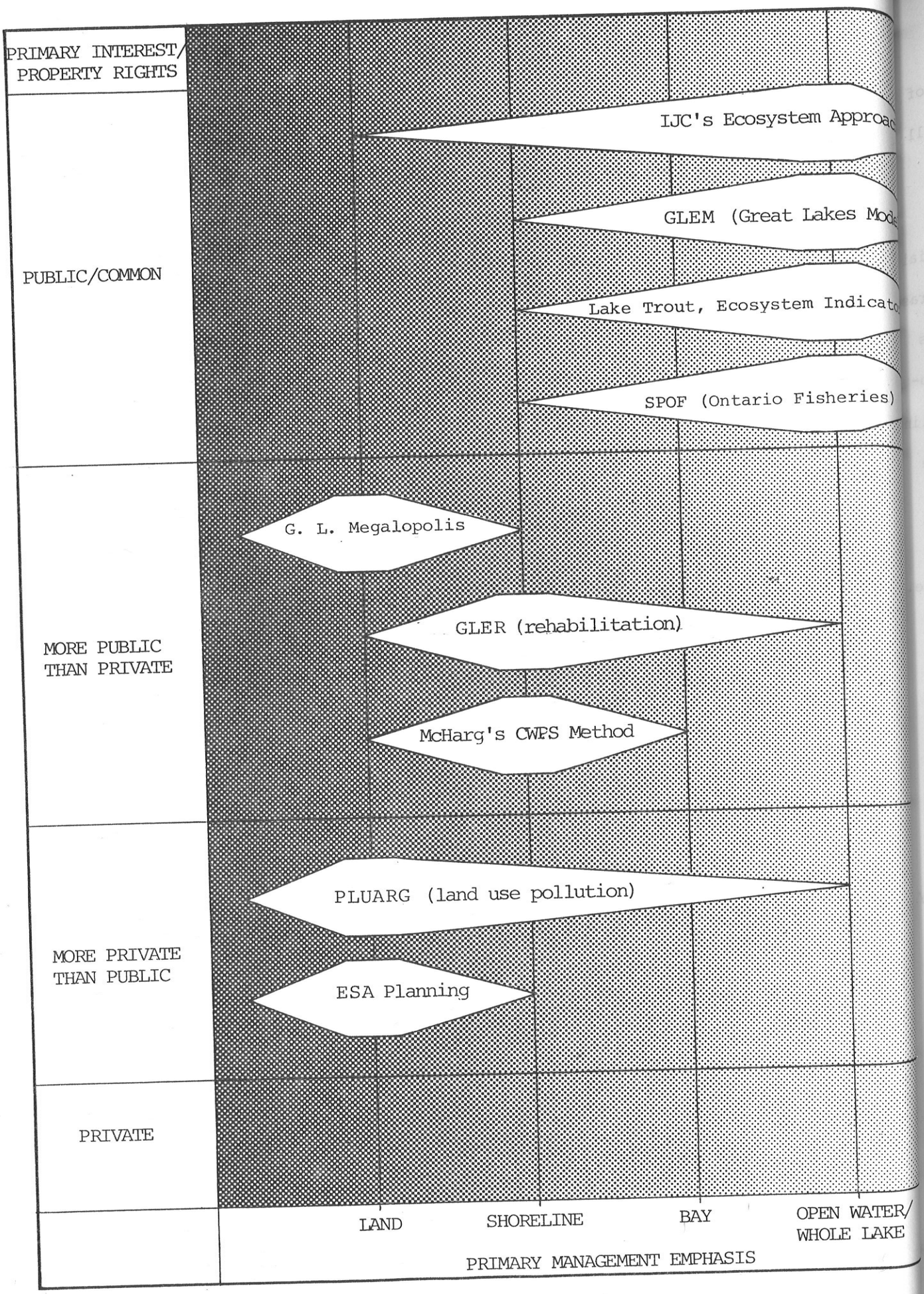


FIG. 3. Type of ecosystem vs historic ownership of its resources.

The control necessary to implement this "public good" must usually be wrested from the private land owners with great difficulty and much negotiation. There are no approaches designed to deal only with privately owned land, but the private component in ESA Planning and PLUARG land studies is far greater than the public (Fig. 3). As a result, both approaches place an emphasis on negotiations with land owners to gather information and secure management agreements. There is a private component to GLER studies but common property rights in the bay resources play a greater role in the design of its approach.

Urban areas, again, have a different history of land use control. The private/public land mix tends to be more public, due to the high ratio of service and park land. A far tighter system of public control has also been used and accepted for urban areas than has ever been applied to rural land, with a longer history of intensive public negotiation. Urban planning processes, placed in Fig. 3 in the "more public than private" category, are McHarg's CWPS Method and the Great Lakes Megalopolis study.

PHILOSOPHY AND USE OF PUBLIC INVOLVEMENT

A fourth comparison between approaches is made on the basis of their use of, and response to, public input. All of the approaches which involved comprehensive planning activities addressed the need for some kind of public input into agency planning. Public participation programs are an integral part of each of the three completed studies (McHarg, in CWPS, ESA Planning and PLUARG); are in the development stage for two of the three strategy-level processes (SPOF and GLER); and are recommended in both policy level approaches (IJC's Ecosystem Approach and the Great Lakes Megalopolis).

Public participation has become a catch-all phrase for a wide range o agency-public interactions varying from placation of public concern to ful citizen control of the decision making process. The "public" involved in these interactions is also a matter of agency choice: any number of committed and uncommitted groups and individuals may be recognized as potenti contributors to the process. "Public participation" then is clearly a phr which cannot be used without definition, and it is this emphasis which has been placed on its analysis here. Each of the programs or program philoso phies has been assessed on the basis of a 10 part questionnaire which outl intent, structure, management and legal framework. All questionnaires are included in full in Appendix 1 . Although evaluation of these programs is beyond the scope of this paper, published evaluations do exist for one of the programs - that of the PLUARG study, and references are given for thes

IJC's Ecosystem Approach

"The Ecosystem Approach" was prepared for the IJC specifically to elaborate its improvements over the existing Water Quality objectives as a framework for environmental management in the Great Lakes Basin.

Development of a program for public participation, or even objectives for public involvement was not considered germane to the documents' primar purpose. Specific emphasis is given, however, to the need for recognitio of man and his activities in any environmental management strategy. This emphasis takes three forms:

- a view of man as a component of the Great Lakes Basin system, the actions, reactions and lifestyle of which must be considered by planners and managers within the Basin.

- a further definition of the human component as one whose activities within the Basin (a) have a determining effect upon its environmental quality and (b) may be changed through a re-direction of perception, attitude and ultimately, behaviour; and
- a brief consideration of the potential desire of people within the Basin, to play a part in the effective management of its ecosystem(s).

The Great Lakes Megalopolis

The diverse and often conflicting statements of philosophy and intent for public involvement in future Great Lakes Megalopolis planning fall roughly into four categories:

- a call for public involvement as an essential component in any current planning study;
- an emphasis on the special need for public participation programs as planning evolves from plan production to a continuing creative process;
- misgivings about the task of inviting the unsophisticated "general public" to influence the enormously complex arbitration process which planning has become, and assessments of a planner's role in such a situation; and
- expressions of the need to understand the requirements of the individual in a megalopolitan environment, - requirements which the individual himself may not be able to articulate, but which the planner and urban designer must understand and translate into built form.

Rehabilitating Great Lakes Ecosystems

The GLER Study Group is a research body with no official planning role. Public involvement is not officially or mandatorily part of the research effort. "However, both in the Green Bay II and Long Point workshops, a wide range of public agencies and interests were invited and made contributions to the process of information diffusion and generating interest"(A.P.Grima 1980, pers. comm).

Federal-Provincial Strategic Planning for Ontario Fisheries

The most important initial stage in the provision of more public input to the Ministry of Natural Resources fisheries management programs is one of education, both for the agency and for the public. The extensive public education program now being prepared is designed primarily to improve public understanding of the existing ecological situation of Ontario lakes, proposed management goals and the need for public cooperation with future management tactics. "The public" in this case refers to "fishermen, the public at large and fisheries agencies"(Ontario Ministry of Natural Resources and Environment Canada 1978, p. 3). The type of participation planned for the Ministry's decision-making process is "a combination of informing, consulting and negotiating" (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 1) with emphasis on a large number of small District Workshops. A more responsible, controlling role may evolve (K.H.Loftus 1980, pers. comm).

A comprehensive public participation program is currently being formulated within the Ministry. Its characteristics, as of April 1980 are outlined in Figures 4 and 5, and further detailed in Appendix 1.

McHarg's Environmental Planning Method in the Toronto Central Waterfront Planning Study

The public participation program which provided McHarg with his information on preferred uses of the Toronto waterfront was initiated by the City of Toronto Planning Board and Council in 1978, and conducted by the Central Waterfront Planning Committee (CWPC), to the present date. The CWPC is composed of representatives of almost every government agency (federal, provinical, regional and municipal) and every private organization with an interest in planning the waterfront area. The incorporation of interested members of the public into the planning committee itself constituted the most important means of public involvement in the Central Waterfront Planning Study. The Committee planning process was accompanied by various means of public education and attempts to solicit a wider public involvement, listed in Figure 5.

The stated intent of involving the public in central waterfront planning was to have "goals set up by all the participants...(with) plan preparation···done by the planners and brought back for public evaluation in terms of established goals" (CWPC 1974, p. 101). Like the SPOF approach, "the public" was defined to include both special interest groups and the public at large, although attempts to involve the general public were primarily educative (through media advertising) rather than interactive (through questionnaires or special workshops).

The structure of the public participation program is summarized in Figure 4 and detailed in Appendix 1.

International Reference Group on Great Lakes Pollution From Land Use Activities

In 1977, the IJC expanded its usually mode of public participation - that of public hearings to review fully formed management decisions - by

consenting to a full participation program during the last year of the PLUARG studies. The intent of this participation program was:

- to enhance the public's input into the public hearings held by the I.J.C. on the PLUARG final report;
- to improve the I.J.C.'s credibility with the public;
- to inform the public; and
- to provide interested persons and parties to play a role in the development of final recommendations." (IJC/PLUARG 1976, p. 14)

The primary mode of participation within this program was a series of 17 public consultation panels, - advisory bodies whose aim was to "identify public concerns and practicable management strategies" for the pollution-generating land uses in the Great Lakes Basin. Panelists were chosen from 600 of the 1000 people who attended PLUARG-sponsored open houses in Canada and the U.S. and volunteered for panel membership. The panels were provided with technical information from the PLUARG Study as it was generated. They met three times and submitted a report to PLUARG in early 1978, and once again to review a draft of PLUARG's final report, "Environmental Management Strategy for the Great Lakes System" (1978). Panel chairmen met once alone and once with PLUARG members. Extensive media coverage then preceeded a series of public meetings in the fall of 1978 to advertise both the study and the subsequent hearings on the final report held in late 1978.

The scale of the PLUARG public participation program is by far the largest of all programs considered here. The program was also subject to the most critical review (Grima 1980, 1978; Mason 1979a, Mason 1979b). Details of the program are summarized in Figures 4 and 5 and expanded in Appendix

Environmentally Sensitive Area Planning

ESA Planning has been conducted as a part of Regional Plan development in a number of municipalities in southern Ontario, each with a slightly different public participation process (Eagles 1980, pers. comm.) These processes are centered around the activities of an Ecological and Environmental Advisory Committee (EEAC), a group of informed members of the Regional public which advise the municipal councils and planning staff on environmental matters on a continuing basis. The participation processes, in general, are the result of opportunities embedded within the Ontario municipal planning process. The legal entrenchment of public rights to participate in municipal planning is one of the primary reasons for the success of ESA Planning at that government level (Eagles 1980, pers. comm.).

The most successful participation process being conducted is in Halton Region. The success is due partly to amount of public exposure which the ESA draft plans received and partly to the particular structure of the Region's EEAC. Halton's EEAC is composed of members of the public who represent only themselves. This is a contrast to Waterloo Region's EEAC, the members of which represent agencies and institutions in the Region, and tend, therefore, to be vocally constrained by the responsibility to put forward and "official" position.

The structure of the ESA Planning process and the role of the EEAC are summarized in Figures 4 and 5 and detailed in Appendix 1.

Discussion

For each of these approaches, the type of public involvement recommended or carried out depends upon its planning stage (policy, strategy or tactical, Fig. 1) and, more importantly, its historical attitude towards decision- making; scale of planning; and ownership of resources (public or

APPROACHES	GENERAL PUBLIC SURVEYS: General Public Canvassed — During issue formulation	GENERAL PUBLIC SURVEYS: General Public Canvassed — During conflict resolution	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: General Public Represented — In agency information collection body	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: General Public Represented — In agency planning body	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: General Public Represented — In an advisory body	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: Interest Groups Represented — In agency information collection body	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: Interest Groups Represented — In agency planning body	PUBLIC REPRESENTATION IN THE AGENCY PLANNING STRUCTURE: Interest Groups Represented — In an advisory body	MODES OF PUBLIC-AGENCY INTERACTION: Open Plan. Office — Planning office/process open to public briefs/discussion	MODES OF PUBLIC-AGENCY INTERACTION: Informal Interactive Meetings — During issue formulation	MODES OF PUBLIC-AGENCY INTERACTION: Informal Interactive Meetings — During conflict resolution	MODES OF PUBLIC-AGENCY INTERACTION: Formal Hearings — During issue formulation	MODES OF PUBLIC-AGENCY INTERACTION: Formal Hearings — During conflict resolution	PUBLIC APPEALS OF AGENCY PLANNING DECISIONS: Judicial Recourse — Which bodies will hear public appeals of agency Final planning decisions?	STRUCTURE OF PUBLIC PARTICIPATION PROGRAM: Program Management, Publicity and Evaluation — Was the program managed by persons outside the agency planning process?	STRUCTURE OF PUBLIC PARTICIPATION PROGRAM: Program Management, Publicity and Evaluation — Is the influence of the program made clear in the final report?	STRUCTURE OF PUBLIC PARTICIPATION PROGRAM: Program Management, Publicity and Evaluation — Does the agency planning process include a mechanism for evaluating the program?
SPOF (Ontario Fisheries)	○	●	○	○	✶	○	○	✶	○	●	●	○	○	Provincial Ombudsman, Environmental Assessment Act	✶	✶	●
McHarg's CWPS[a] Method	○	○	○	○	○	●	●	●	●	●	●	○	●	City Council Committee, Planning Board, Ont. Municipal Bd	○	●	○
PLUARG (Land Use Pollution)	○	○	○	○	●	○	○	●	○	●	●	○	●	No judicial recourse, but this was not a planning study.	●	○	●
ESA Planning	●	●	○	○	○	○	○	●	●	●	●	○	○	Ontario Municipal Board, Provincial Cabinet	○	●	●

● Mode of public participation was (will be) used.

○ Mode of public participation was not (will not be) used.

✶ Mode of public participation may be used; see Appendix 2 for a full explanation.

[a] Public participation for the McHarg Approach was carried out by the Central Waterfront Planning Committee.

FIG. 4. Structure of public participaiton programs

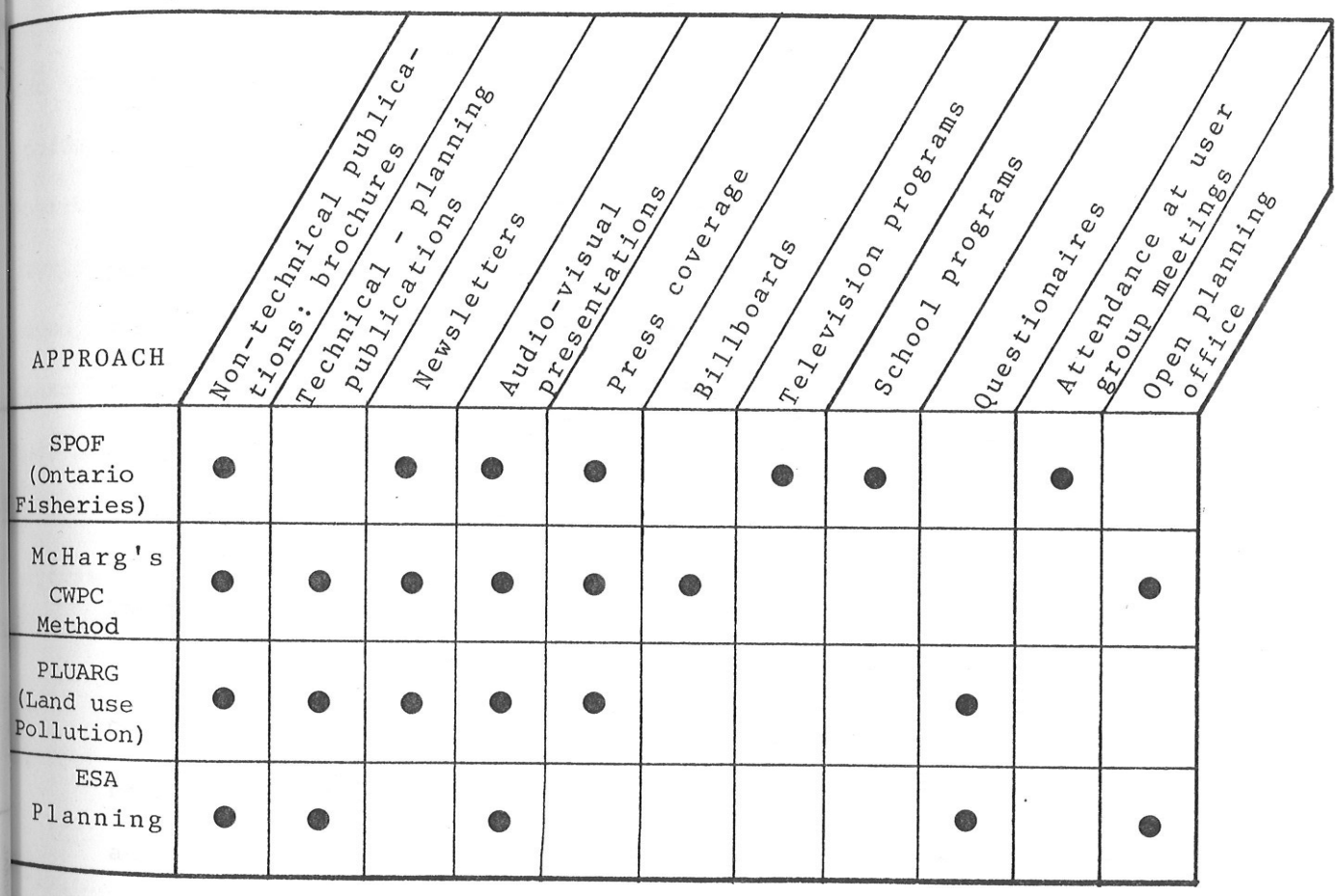


FIG. 5. *Means of public education used in public participation programs*

private, Fig. 3). All of these factors have influenced the legislative framework which now exists for each, to facilitate public participation.

Generally speaking, public education designed to expand public awareness of, and support for agency activities, is the highest initial priority for policy level approaches (IJC's Ecosystem Approach and Great Lakes Megalopolis), and those dealing with large areas of common property (GLER and SPOF). The scale of these initiatives is large: international or provincial.

On the other hand, involvement in actual agency decision-making and emphasis on the public-to-agency information flow, seems to be most important to those approaches dealing with small tracts of private land (ESA Planning), and those within an urban planning context (McHarg's Approach), where active public participation has a legal and historical context. These processes have occurred at the municipal scale.

Means of Public Involvement

The means of involving the public in agency planning has differed between agencies which have actually carried out participation activities. The Ontario Ministry of Natural Resources (SPOF agency), has traditionally held informal meetings between Ministry personnel and interested citizens, and will continue to rely primarily on this means of agency-public interaction as the SPOF program progresses. Citizens wishing a review of agency decisions may appeal to the Provincial Ombudsman or invoke the Environmental Assessment Act. Neither has many precedents in this context.

The Central Waterfront Planning Study (that using McHarg's environmental planning method), used the most direct and intensive means of public involvement - inclusion of representatives of public interest groups within the actual planning committee. This method facilitated the greatest measure of citizen control in the planning process, but tended to be

expensive and time consuming (E.Greenwood 1980, pers. comm.). More well deve
means of public appeals of agency planning decisions also exist within the ur
planning framework than within the provincial resource planning context (SPO
Citizens may be heard personally by a City Council Committee or the City Pla
ning Board, or judicially, by the Ontario Municipal Board.

The principal method of participation used the PLUARG studies was a series of citizen advisory panels. These panels prepared a report containin recommendations for land use planning, management and further study in the Great Lakes Basin, which was incorporated into the general study findings on in the final PLUARG reports. The late inclusion of the public participation component in the PLUARG studies was a constraint over which personnel direc the component had no oontrol, and a general need for earlier public involve was expressed by S. Leppard (1980, pers. comm.), A.P.Grima (1980, pers. comm and R.J.Mason (1979b). Advantages and disadvantages of citizen advisory pane as a means of public participation and as related directly to the PLUARG stu in light of this constraint, are discussed by A.P.Grima (1978, 1980) and R.J Mason (1979a, 1979b). Because no planning decisions were made in the study, no recognized avenues exist for citizen appeal of study recommendations.

Finally, one of the methods of public involvement in ESA Planning, like that in the CWPS, is regular and intensive, and like that in PLUARG, involv citizen advisory bodies. Unlike both, however, the bodies are (relatively) permanent additions to the ongoing planning process in each Regional Munici pality. Another differing aspect of the ESA citizen advisory bodies (EEAC's is that their primary purpose is to provide environmental planning expertis rather than to represent the feelings of the general public or a cross-sect of interest groups. Other means of involving the affected publics such as informal meetings, questionaires and newsletters, have been successfully us to keep citizens aware of, interested in, and supportive to regional planni goals.

It is unfortunately impossible to speculate on the "best" methods of

participation for each planning scale - a good question for further study.

THE USE OF ECOLOGICAL CONCEPTS

Until now, the ten "ecosystem approaches" have been described and compared, but not defined in terms of their ecological content. Six basic features are put forward here to help to distinguish an "ecosystem approach" from other approaches in planning and management. The approaches are compared according to the first five of these features in Figure 6.

1. Their focus is primarily on ecological phenomena, rather than on the conventional and historically powerful political, engineering, economic or accounting perceptions.
2. The boundaries within which management plans are formulated should reflect some aspect of ecological integrity.
3. A balanced, integrated combination of mapping, monitoring and modelling should be used to convey, analyze and update ecosystem information.
4. The cohesive, self-regulatory systems structure and function of ecosystems should be considered. Stable phases or states of equilibrium and thresholds or limits of stress tolerance of those states should identified whenever possible.
5. The fact that ecosystems respond to (ie, are changed by) mans' activities should be recognized during formulation of their management plans. Those plans should, then, draw connections between the current state of an ecosystem and (1) its capability for self-regulation and (2) the amount and kinds of stresses placed upon it by the variety of human activities to which it is exposed. Any plans for change in the ecosystem should consider the potential necessity of first changing those stressful activities.

6. The entire range of current ecosystem paradigms - including both reductionistic and holistic, theoretical and practical, disciplinary and interdisciplinary - should be considered in the choice of an appropriate method of ecosystem analysis. The state of mind which the analyst should bring to this decision should be one which is well-informed and free from entrenched biases, so that the most appropriate and flexible choices can be made.

Discussion

According to our criteria, all approaches except the Great Lakes Megalopolis and McHarg's CWPS method show relatively similar ecological strength. All but these exceptions are, in fact, the product of teams which include active research ecologists who are putting forth new holistic methods in an attempt to upgrade formerly piecemeal resource management practices. In effect, each approach is an attempt to bridge the gap between ecological research and its practical application. Since the Great Lakes Megalopolis did not deal primarily with ecological concepts, the only approach to which criticism is due for application of ecological understanding is McHarg's CWPS method. An assessment of McHarg's method which specifically states the reasons for its inadequacy in light of current scientific understanding and resource initiatives is out of place in a study which attempts to provide a balanced comparison of all ten approaches. Since it is important that these criticisms be aired in the context of a comparison with a range of recent initiatives, however, they are included in the study in Appendix Two.

CRITERIA	APPROACH									
	I.J.C.'s Ecosystem Approach	Great Lakes Megalopolis	GLER (Rehabilitation)	SPOF (Ontario Fisheries)	Lake Trout, Ecosystem Indicator	McHarg's CWPS Method	PLUARG (Land Use Pollution)	ESA Planning	GLEM (G. Lakes Models	S-RESS (Environ. Statistics)
Primary emphasis is on ecological phenomena.	●	○	●	●	●	●	●	●	●	●
Boundaries reflect ecological integrity.	●	◖	●	●	●	◖	●	●	●	●
Mapping, monitoring and modelling are used to assess ecological state and processes.	◖	○	●	●	●	◖	●	●	◖	●
Ecological self-regulation is considered.	●	○	●	●	●	○	●	●	●	●
Ecological responsiveness is considered.	●	●	●	●	●	●	●	●	●	●

● Criterion is used.
◖ Criterion is partially or inconsistantly used.
○ Criterion is not considered.

FIG. 6. Ecological criteria for an "ecosystem approach"

CHAPTER THREE

A Proposed Planning Framework

INTRODUCTION

A wide range of ideas has so far been presented about the types of ecological and general planning considerations which seem best suited to deal with current, complex environmental problems in a manner which preserves (or creates) some "social justice". To provide a sense of the ways in which these considerations fit together and reinforce each other, a complete planning process will now be put forward. This is a synthesis of ideas from a number of sources, the most influential being, H.A. Regier, D.J. Rapport, C.S. Holling, L.K. Caldwell, P.F.J. Eagles, D.A. Bella, E. Jansch and E.P. Odum. The framework for this process is simply the systems approach, as outlined by C.S. Churchman (1968). Any planning process, to be effective, should be organized to accomplish a specific set of goals, and this is, in fact, Churchman's generic definition of a system. His five characteristics of a systems approach are listed below and form the structure of the planning process outlined in Figure 7 at the conclusion of this section.

- system goals, or "more specifically, the performance measures of the whole system" (p.29);
- the context of the system, or its environment: "the fixed constraints" (p. 29);
- system resources, or "the things a system can change and use to its own advantage (p.37), which are "the general reservoir out of which the specific actions of a system can be shaped" (p.39);
- system components; "their activities, goals and measures of performance" (p.30); and
- system management, which "has to deal with the generation of plans for the system. The management sets the com-

ponent goals, allocates the resources and controls the systems performance" (p.44).

SUGGESTED PLANNING PROCESS

System Goals

The system described here is the human/natural environment within a certain geographic area. The Great Lakes Basin, for some purposes can be treated as a system, for instance, but more often an area chosen for management is smaller, politically homogeneous and ideally ecologically integral. Logically, the best units for environmental management are often watersheds, which, in southern Ontario, are under the control of the Regional Conservation Authorities. Four goals are proposed here for the management of these systems:

1. Maintenance of a minimum level of environmental quality below which degredation is considered unacceptable. Appropriate indicators of this quality should be selected and monitored so that change is detected sufficiently early to correct.
2. Maintenance of the natural level of environmental variablilty (the diversity of species and their natural patterns of fluctuation) (Holling 1978). Persistance of these organisms rather than stability in their numbers should be the management goal (Whittaker 1975).
3. Optimization of the natural diversity within each ecosystem. Ecosystems have characteristic numbers of species, according to their type and stage of succession. Management should attempt to prevent the usual simplification which occurrs when a single use is maximized or when the ecosystem is heavily stressed.

4. Optimization of the natural diversity among or between ecosystems in each region of biome. The remnant island ecosystems which currently exist within each heavily populated area (such as southern Ontario) should be assessed according to ecological regions and managed to maximize the number of different species, associations, ecosystems and successional stages within each region (G. Francis, University of Waterloo, pers comm. 1980).

Fixed Constraints or Systems Environment

The fixed constraints to the planning and management of each system are often severe (political agency mandate, wide political acceptability, economics, etc.) and often prevent the acheivement of the preferred goals listed above. There is no denying the impeding powers of these constraints, but they should not simply be taken for granted. Any opportunity to circumvent, narrow or even eliminate the difficulties should be taken.

System Resources

In order that the apparent constraints don't unnecessarily prevent the achievement of environmental goals, all factors necessary to reach these goals should be included as manipulable resources or system components, rather than having some dismissed as fixed constraints. At the least, these resources should include: the best current scientific information, the finances necessary to carry out management programs and public understanding and support.

System Components

System components, or those 'parts' which actually make up the system, should be both natural (ecological) and cultural (social). The natural components should include all factors necessary to construct a qualitative

management-oriented model of those ecosystem portions which best represent its general health; cultural components should include all activities within and without the ecosystem which contribute to its stress load. This human-initiated stress vs ecosystem response structure forms the basis of the stress-response environmental information system developed by Statistics Canada (Rapport and Friend 1979; Rapport and Regier 1980).

Systems Management

The following are comments about the process of management itself, which, to recapitulate, directs the components towards the chosen whole-system goals. The management sets component goals, allocates the resources and controls the system's performance. This process must rely heavily on feedback from previous tactics in the production of new strategies. That feedback must be available through an appropriate monitoring program (Holling 1978). Thus, although the process is goal-oriented, it must be creative,evolving and experimental, constantly using incoming information to reassess the present means of achieving system goals.

Management alternatives should be effectively communicated to resource managers and politicians, with the values underlying each made as explicit as possible (Holling 1978). The management process should therefore separate the ecologically feasible options from subjective values and subjective weighting schemes. The information generated from these options should be easily translateable into administrative regulations (Caldwell 1970,1975). These will be in the form of broad policies for the federal-provincial level and standards or guidelines at the local level.

Actual management decisions should be directed by the need to avoid large scale irreversible ecosystem changes and the concommitant loss of present and future options (Bella 1974, Bella and Overton 1972, Odum 1969, Holt and Talbot 1978). This can best be achieved through spatial and tempora

restriction of any single activity which changes the natural environment; a process designed to produce a regional mosaic of land uses. Within this mosaic, as outlined in "system goals", the diversity of ecosystem types and stages of succession should be maximized. The shape and spatial pattern of these 'remnant islands' should optimally facilitate maximum diversity in each ecosystem and maximum colonization of species from ecosystem to ecosystem. Again, in order to avoid these large scale changes and because many ecosystems are inherantly unpredictable, all management decisions should include a safety factor (Holt and Talbot 1978). This would also take into consideration the fact that knowledge is perennially limited and institutions, imperfect.

Because the management process should attempt to use as much of current research as is applicable to each problem, it should be a stimulous to the 'reserves' of scientific knowledge, encouraging specific, applied, cost-effective, interdisciplinary research (Regier 1978).

Other Planning Considerations

Four additional planning considerations also seem to be important to the effective implementation of an ecosystem approach to current environmental problems:

- The systems approach itself must be evolutionary; it must contain a mechanism for revising system goals in light of continuing futures-creative activity (Caldwell 1970; Jantsch 1972, 1975).
- A just resource allocation system must be designed so that distribution of resources to the public is not entirely dictated by their geographic location and economic means (Loftus et al. 1980).

- Policies must be formulated to resolve conflicts over multiple uses of an ecosystem, so that consumptive and non-consumptive uses are regulated to maintain or restore the designated base level of ecosystem quality, and so that resource wastage is eliminated (Bulkley and Gross 1977, Holt and Talbot 1978).
- The process of conflict resolution and resource allocation should be carried out so that within a region, those benefiting from environmental resources pay for their maintenance (Bulkley and Gross 1977).

All of these planning considerations are listed in Figure 7 against each of the ten ecosystem approaches. The distinction has been made, in the assessment, between (a) agreement with or use of a planning concept or method, (b) partial or incomplete use of the concept/method, (c) use of a different concept/method in the same context, and (d) failure to address the issue.

Discussion

The framework provided for analysis of planning context in Figure 7 appears to be a relatively appropriate initial checklist; very little disagreement was found in the use of planning concepts or methods (triangular symbols). In fact, the greatest disagreement was found in the need to separate ecological options from value judgements - simply because most of the approaches clearly support the concept and value of rehabilitation over other management options (ie ecosystem maintenance, amelioration, etc.).

Other observations are:

- The failure of IJC's Ecosystem Approach, the Great Lakes Megalopolis, Lake Trout, Ecosystem Indicator and the Great Lakes Basin Models, to consider many of the planning criteria is simply a reflection of their conceptual nature and the fact that they presuppose a planning struc-

provided by the IJC.

- The Great Lakes Basin Models are capable of attaining only one of the four goals listed for environemntal management: 'maintenance of a minimum level of environmental quality'. Attainment of the remaining goals in a more comprehensive rehabilitation program requires the wide range of strategies now under development in the GLER and SPOF studies.
- The PLUARG study is outstanding in its comprehensiveness, with one exception. Two of the goals important in the application of PLUARG findings to land use planning and management were not considered: 'optimization of diversity between ecosystems in each region', and maintenance of the ecosystem's natural variability'. These should be kept in mind by agencies now developing guidelines on the basis of the PLUARG study.

Footnotes for FIG. 7. Planning Criteria for an "ecosystem approach"

● Criterion is used.

◖ Criterion is partially or inconsistantly used.

▲ A different method or concept is used instead of the criterion.

○ Criterion is not considered.

a. McHarg's Approach is part of the Central Waterfront Planning Study; the entire study is considered here.

b. All planning measures listed are recommended by the PLUARG study, to the Canadian and American governments, to be implemented at the appropriate levels.

	PLANNING CRITERIA	APPROACH									
		I.J.C.'s Ecosystem Approach	Great Lakes Megalopolis	GLER (Rehabilitation)	SPOF (Ontario Fisheries)	Lake Trout, Ecosystem Indicator	McHarg's CWPS Method[a]	PLUARG (Land Use Pollution)[b]	ESA Planning	GLEM (G. Lakes Models	S-RESS (Environ. Statistics)
SYSTEM GOALS	Maintenance of a minimum level of ecosystem quality	●	●	●	●	●	●	●	●	●	●
	Optimization of diversity within ecosystems	○	○	●	●	▲	●	●	●	○	●
	Optimization of diversity between ecosystems	○	○	●	●	○	●	○	●	○	●
	Maintains the ecosystem's natural variability	○	○	●	●	●	○	○	●	○	●
SYSTEM RESOURCES	Best current scientific information	●	●	●	●	●	◗	●	●	●	●
	Financing for management programs	○	○	●	●	○	●	●	●	○	○
	Public understanding and support	●	●	●	●	○	●	●	●	○	○
SYSTEM COMPONENTS	Important ecosystem resources and indicators of health	●	○	●	●	●	◗	●	●	●	●
	Cultural activities which stress the ecosystem	●	●	●	●	●	●	●	●	●	●
SYSTEM MANAGEMENT	Adaptive, experimental management	○	○	●	●	●	▲	◗	●	○	●
	Monitors human activities and ecosystem indicators	○	●	●	◗	●	◗	●	●	●	●
	Attempts to communicate management alternatives	●	○	●	●	○	●	●	○	●	●
	Separates ecological options from value judgements	○	○	▲	▲	▲	●	▲	▲	●	●
	Considers translation into administrative regulations	●	●	●	●	○	●	●	●	●	○
	Avoids or attempts to prevent large scale ecosystem change	●	○	●	●	●	●	●	●	◗	●
	Uses a safety factor	●	○	●	●	○	◗	○	●	◗	○
	Outlines specific direction for research	●	○	●	●	●	●	●	●	●	●
OTHER CONSIDERATIONS	Has or recommends a self-reviewing evolutionary structure	○	●	○	○	○	◗	●		▲	○
	Designs a just resource allocation system	○	○	○	●	○	○	○	○	○	○
	Attempts to resolve multi-use conflicts	○	○	○	●	○	●	●	○	○	○
	Addresses regional distribution of costs and benefits.	○	○	○	○	○	○	●		○	○

FIG. 7. Planning criteria for an "ecosystem approach"

CHAPTER FOUR

Conclusions

It is possible to draw two sets of conclusions at this point: one which summerizes the contributions of each of the ten studies to the understanding of an "ecosystem approach", highlighting the strengths and weaknesses of the methods used by each study; and the other which draws from the findings of each study and suggests ways in which they can be better co-ordinated to acheive Great Lakes environmental goals.

1. With regard to the first set of conclusions: the "ecosystem approach", as a composite optimum method for dealing with todays environmental problems,is essentially the development of management goals for ecosystems within a comprehensive planning framework. The development of those goals has an ecological, a social,an economic, and an administrative/political component, all of which must be integrated in the planning process. The essence of the "ecosystem approach" is as much the integration as it is the use of sound ecological principles. Figure 6 lists those principles which should form the basis of the ecological component and Figure 7 outlines the integrating planning framework.

- Of the nine studies which have an explicit ecological focus (omitting the Great Lakes Megalopolis), only McHarg's CWPS method fails to acknowledge the necessity for ecologically significant boundaries and to apply the concept of ecosystem self-regulation (Fig. 6). In other words, only McHarg's method can be sited for inadequacies in the ecological component. It is undoubtedly McHarg's intent to develop and publicize a method which uses ecological information to the fullest extent and facilitates

accurate ecological planning recommendations. However, the primarily spatial techniques used in the method fail to capture the dynamic integrative aspects of ecosystem behaviour, and unless these aspects are addressed in an ad hoc fashion by those chosen to work on each project, the failure leaves each study vulnerable to important oversights. A more detailed account of the oversights within the CWPS, as an example, is given in Appendix Two.

It may not be possible to capsualize a method for representing ecosystem dynamics which could be added to McHarg's spatial overlays to complete the analysis. The form of this representation (a stress-response ledger of information, a qualitative model, a quantitative computer model, a series of best expert judgements, etc.) must depend upon the nature of the ecosystem and the planning process (time, information, personnel and finances available). In some instances, it may be more useful for one of these methods of information integration to replace the traditional McHarg map overlay technique; in others, for one to be added to the spatial analysis.

Those who follow McHarg's overlay synthesis are led to believe that the synthesis or integrative process is the role of the planner; this often precludes any kind of synthesis other than the standard overlay. This is primarily because the kind of ecological insight which is necessary to choose the most appropriate means of expressing and synthesizing the dynamic information about a particular ecosystem is not found within a planners' training. In this situation, planners have no choice but to rely on the familiar techniques, appropriate or not. If ecologists were brought into the synthesis stage with the express purpose of developing techniques appropriate to the type of

ecosystem and the information available, then the chances of fitting method to problem (instead of visa versa) would greatly increase. Ecosystem management in urbanized areas tends to be a process whereby a series of informed judgements or guesses are made about the steps necessary to upgrade or maintain a level of quality in the face of intensive and often changing human use. The more creative and perhaps intuitive a management program must be, the more insight is necessary for its development. This insight, not only into the type of information necessary , but also into the type of management necessary must come from those specialists who are most familiar with the ecosystem. McHarg's method, as detailed in Appendix Two, facilitates the former, but not the latter.

- On the other hand, McHarg's method, as an explicit integration of ecological concerns into the urban and regional land use planning structure,has many planning strengths. The method is often used with a heavy public participation role; it allows mapping of land use so that this important consideration can be related to the strictly environmental goals (this is not done in SPOF,for example; a study which seeks to find ways of managing the quality of Ontario's water bodies); and, perhaps most significantly, it brings the ecology of a landscape into consideration in the initial stages of the planning process.

- Other than the methodological frameworks provided in Figures 6 and 7, perhaps the most important comments about methodology which can be made at this time are about the dangers of rigidity. A synthesis of the methodogical strengths of all ten studies would not solve the complex and ever-changing environmental problems faced

today by the residents of the Great Lakes Basin or anywhere else. Both the methods and the resulting management guidelines must be flexible, and conditional upon their success in achieving the desired ecosystem quality goals.

2. With regard to the second set of conslusions - those which suggest ways of coordinating the various activities in the Great Lakes Basin to overcome jurisdictional problems and better facilitate comprehensive planning within ecological boundaries - two observations are made.

- An enormous potential exists for coordination and comprehensive planning by the IJC. Concepts and data from the following studies are now held within different communities of the Commission:

  "The Ecosystem Approach"
  "Great Lakes Megalopolis"
  Lake Trout, Ecosystem Indicator
  PLUARG
  Great Lakes Basin Eutrophication in Models

  These deal with every facet of Great Lakes Basin management for Great Lakes rehabilitation: urban to rural and terrestrial to aquatic environments as well as general philosophy to detailed management recommendations. They contain a wealth of hard data which appears to cover every ecological and most planning criteria addressed in this analysis. Some members of the IJC (The Expert Committee on Societal Aspects and their supporters) in fact, recognize this potential, and sponsored a workshop on Anticipatory Planning in March 1979 to discuss related issues. The IJC is in the singular position of having a long history of international recognition and respect; potential and existing liaison with bodies from every government level; strong non-governmental advisors (ie Great Lakes

Tomorrow); an enormous bank of data on aquatic parameters, water quality parameters, land use and its effect on the aquatic ecosystem and urban planning parametes; and a recently established holistic framework for comprehensive, whole-ecosystem planning and management. If the role of the IJC expands as suggested, to include surveillance of "human settlements, demographics, economic development, transportation and related matters" (IJC 1980b, p. 23), then the Commission will be in the best possible position to coordinate economic and social activity within the Basin with its concurrent environmental quality. The framework for this coordination is available in S-RESS.

The need for some form of coordination between the multitude of government agencies with jurisdiction over the Great Lakes to active rehabilitation goals is particularly stressed in GLER. The 1979 Workshop on Anticipatory Planning recommended that the IJC act to initiate broad, informal and regular contact between federal, state/provincial, local and non-governmental bodies, and fill the role of information coordinator.

The fact that the IJC has no real designating power over the agencies responsible for implementing IJC recommendations may prevent their full effect within the Basin. Good working relationships with these agencies however, will probably increase the chances that IJC advice will be regarded as valuable aid rather than interference.

- Implementation of any rehabilitation scheme requires the cooperation of land use planners. An unfortunate division seems to persist between land use planners and aquatic resource managers - bridged only theoretically by concept (IJC's "Ecosystem Approach") and PLUARG data. Although the information exists to develop a comprehensive

generalized Great Lakes Basin plan, there have been no attempts on the Canadian side to begin. The strongest rehabilitation studies (GLER and SPOF) have not yet incorporated land use planning concerns or land use planners. Urban and regional land use planning processes (CWPS and ESA Planning) have not addressed rehabilitation issues. The need for more comprehensive and anticipatory planning direction seems to be felt on many fronts. For example,

1. Transportation:

> "Transportation planning in the Great Lakes Basin suffers from the lack of identifiable goals and objectives and the absence of a comprehensive planning framework to constrain and guide individual development programs." (IJC 1980b, p. 93).

2. Energy:

> "There is increasing uncertainty as to future fuel and electricity requirements in the Great Lakes Basin and the continuing deterioration of long term oil supply availability through a combination of resource depletion, cartel pricing and political and military insecurity. Thus, anticipatory planning with regard to fuel and electricity supplies for the Great Lakes Basin becomes a critical requirement." (IJC 1980b, p. 119); and

3. General rehabilitative planning in the Great Lakes Basin:

> "No comprehensive plan or model exists for the entire Great Lakes Basin that can provide any form of guidance for any type of development or conservation policy." (IJC 1980b, p. 50).

The 1979 Anticipatory Planning Workshop recommends the following steps to complete a comprehensive Great Lakes Basin plan:

1. The Canadian federal government should transfer or partially delegate the powers, and technical and financial means to develop the Canadian half of the Great Lakes Basin Plan, to the Ontario government;
2. The IJC should attempt to presuade the Ontario government to prepare such a plan;

3. "A comprehensive Great Lakes Basin Plan be prepared that would ultimately be adopted by the Canadian and U.S. federal governments; Ontario and State governments, and through institutional arrangements, and the powers of the U.S. Federal government and Ontario provincial government, be transmitted to local plans."

To be effective, all plans must be prepared with implementation strategies which recommend alternative pollution control measures which are feasible technically, environmentally, economically, politically and socially. We can't afford to keep planning for land use and Great Lakes rehabilitation separately; they are connected through all of these aspects. Specifically, rehabilitation concerns must be passed on to urban and regional planners from those provincial agencies most involved, ie OMNR and MOE.

- In summary, the main problem which seems to be holding back Great Lakes rehabilitation is not lack of data, lack of articulated direction or lack of articulated methods. It lack of their formal acceptance and of the communication, cooperation and organization necessary for their implementation. This is demonstrated, in part, by the convergence of thought in almost all approaches about what needs to be done and the methods which are best suited to do it.

The major obstacle seems to be jurisdictional; hundreds of agencies have jurisdiction over some portion of the Great Lakes Basin or some aspect of its operations. There is a real need to develop administrative strategies which involve groups of agencies in major issues, facilitating much more extensive inter-agency cooperation. To be effective, however, the management plans which these agency groups formulate must pertain to ecologically meaningful areas, such as watersheds. The organization of agencies into groups which manage ecologically integral areas should be one of the highest priorities of the IJC.

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APPENDIX ONE

Public Participation Questionnaire

PUBLIC PARTICIPATION QUESTIONAIRE

IJC'S "THE ECOSYSTEM APPROACH"

1. INSTITUTIONAL FRAMEWORK

The management of environmental resources within the system defined by the Great Lakes Basin Watershed boundaries. The system must be managed as a unit with the coordinated efforts of U.S. and Canadian government agencies.

2. DURATION OF THE PLANNING PROCESS

Unspecified, but presumed to be a continuing process.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

The document which outlines the ecosystem approach was prepared for the International Joint Commission specifically to elaborate its improvements over the existing Water Quality objectives as a framework for environmental management in the Great Lakes Basin. Development of a program for public participation or even objectives for public involvement was not considered germaine to the document's primary purpose. Specific emphasis is given, however, to the need for recognition of man and his activities in any environmental management strategy. This emphasis considers the public in 3 ways.

i As a component of the Great Lakes Basin system, the actions, eactions and lifestyle of which must be considered by planners and managers within the Basin.

> "The ecosystem approach provides the philosophic basis for a view of man as part of nature. It directs the efforts of the Parties and the Commission toward the treatment of the patient (the Ecosystem), rather than the symptioms or disease. It relates the biological and technological activities of man to the carrying capacity of the Ecosystem, linking the human body to the biosphere". (IJC/G.D.R.A.B. 1978, p. vii).

ii In particular, as one component whose activities within the Basin: (a) have a determining effect upon its environmental quality, and (b) may be changed through a redirection of perception, attitude and ultimately, behaviour.

> "The Board is not under the illusion that improved attitudes, perceptions and behaviour will automatically result from adoption of an ecosystem approach in the Basin. On the contrary, we believe that the first and immediate need in implementing such an approach would be for international coordination of existing environmental information/education programs at community, regional state and provincial levels to permeate all levels of society from primary schools to high level executives in buiness, industry and government with the concepts of "ecosystem" and "biosphere." The amount of money spent on advertising soft drinks in the United States and Canada (to cite but one example) is of the order of $200 million per year (12). In view of the benefits to citizens arising from the exposure of "hidden" biospheric costs, any of which are associated with water, it would be reasonable to invest some appreciable fraction of this sum in improving public knowledge of the concepts of "ecosystem" and "biosphere"." (IJC/G.L.R.A.B. 1978, p. 15).

iii And very briefly, as a set of individuals who may want to play a part in the effective management of the Great Lakes Basin ecosystem.

> "attitudes, Perceptions, Behabiour - does the approach allow persons in the Basin to relate to the biosphere in a manner consistant with the aims of the Parties, the Boundary Waters Treaty and the Water Quality Agreement? Does it allow and encourage public intersts". (Criteria Used in Evaluating the Ecosystem Approach) (IJC/G.L.R.A.B. 1978, p. 29).

In summary, the participation of the public in planning and management decisions within the Great Lakes Basin is considered in "The Ecosystem Approach" only in so far as public or human activities affect the quality of the Basin ecosystem. The degree to which managment decisions affect the quality of the individual lives of those citizens' and the ability of each to influence management decisions in some way, is not considered.

PUBLIC PARTICIPATION QUESTIONNAIRE

GREAT LAKES MEGALOPOLIS

1. INSTITUTIONAL FRAMEWORK

The institutional framework for planning of urban development within the Great Lakes Megalopolis, will require coordination between each government agency operating within the Great Lakes Basin, from the neighbourhood to the international level. Each level will deal with issues pertinent to that scale.

2. DURATION OF THE PLANNING PROCESS

The length of the planning process will depend upon the scale and the nature of the issue considered.

3. STATED PHILOSOPHY OR OBJECTIVE OF PUBLIC PARTICIPATION

The 1975 conference which focused attention on the Great Lakes Megalopolis, did so to elaborate the need for a comprehensive planning strategy (or series of strategies), not to facilitate their development. Opinions on all issues are therefore representative only of individual points of view. Because the group which convened was so diverse, these often conflict or contradict with each other.

Public involvement in planning was considered throughout the discussion, however, and statements of its philosophy and intent can be foughly placed into four categories:

i A call for participation as an essential planning component in any current context:

> "To return our great agregations of people to any kind of a human livable position, somehow we have to include the users in the planning..." (M. Mead p. 40 in Leman and Leman 1976).

ii Statements of the special need for participation as planning evolves from plann production to a continuing, creative process:

> "The contemporary attitude is towards future-creative planning, i.e. adaptive, participatory, and anticipatory modelling of a particular cultural situation. The paostion is based on the premise that the value of planning to citizens, decision-makers and policy-makers lies primarily in their participation in the process, and not in the production of a document representing a regional development plan". (A.N. Christakis, p. 36, in Leman and Leman 1976).

iii Misgivings about the task of inviting the unsophisticated "general public" to influence the enormously complex arbitration process which planning has become, and assessments of the planners' role in such a situation:

> "I see that a real problem in remaining democratic in our idealism, is to allow a wider influx among people - and not insitutions - in defining our future perceptual realities of where we are going; not the buildings we are going to be in so much, and not environmental steps, although they are certainly important, but in trying to plan out what we are going to perceive as the future". (R. Reed, p. 89, in Leman and Leman 1976).

> "The Great Lakes Megalopolis may provide some chance for region-wide citizen involvement but the obstacles will prove difficult to surmount. There are commonly shared resources like water, air, some minerals, various networks of communication and transportation. I expect that whatever progress is made will be made in those categories.
>
> The GLM, as any megalopolis, lacks an effective incentive system for public involvement and participation in the planning process... In fact, there is an increasing number of disincentives for citizen participation at the megalopolitan level of government. Some of these are:
>
> (a) the development of useful public policies at a megalopolitant scale depends upon the

understanding of an educated and informed public. The complexity of environmental quality management on a regional scale challenges the most sophisticated pollution control agencies no matter how superb their software and hardware in cybernetics and analysis might be.

(b) Distance and available time provide increasing obstacles for direct citizen participation in a megalopolitan or national decision process. Even though the megalopolitan or national decision process may have greater individual impacts, citizens tend to spend more effort and time on issues involved with dwelling groups, small neighbourhoods, neighbourhoods, small towns, towns, and large cities. With improved networks, videophones, and other technological devices to ease the time-space problem, the lower and modest income individuals could be prived out of the citizen participation process as is so often the case with national and international public decision making". (S.W. Harlick, p. 88, in Leman and Leman 1976).

"As planners, we do have to plan, "to tell people today - and the future generations - how they may live"..."what we are now concerned with, is whether planning is going to be a kind of manipulation and if so, are we fully aware of what that is doing to our liberties? What are the methods that we can use to retain some of the important values, while we plan for change"? (S.B. McLaughlin, p. 90, in Leman and Leman 1976).

iv Expressions of the need to understand the requirements of the individual in a megalopolitan environment; requirements which the individual himself may not be able to articulate, but which the planner and urban designer must understand and translate into built form:

"Over the centuries, we have learned quite a bit about how a nuclear family can live in a single dwelling. We have had centuries to work on that, but we have not had much time to learn how communities can live in highrise buildings". (B. King, p. 48, in Leman and Leman 1976).

"It doesn't matter what gets built next, most people in Toronto 10 years from now will be living in buildings that exist right now; and so maybe what we should be looking at is...how to make existing buildings livable". (B. King, p. 48, in Leman and Leman 1976).

"I think that it is worth emphasizing that many things have been taken for granted here, by those of us who are used to speaking to each other and who have participated in the activities of the 10 years of Delos Symposia. We have not said, as we should have, that the reason we are thinking about human settlements is because we care about people and how they live; that under modern conditions, we can no longer leave the course of such settlements to the slow adjustment of chance and time". (M. Mead, p. 107, in Leman and Leman 1976).

PUBLIC PARTICIPATION QUESTIONNAIRE

REHABILITATING GREAT LAKES ECOSYSTEMS

1. INSTITUTIONAL FRAMEWORK

Rehabilitation of the Great Lakes, to be brought about by the regionally and/or locally coordinated efforts of Canadian and American federal, provincial/state; and municipal government agencies.

2. DURATION OF THE PLANNING PROCESS

No time scale has been set for the development of technical and institutional strategies for individual bays and harbours within the Great Lakes.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

The GLER study group is a research tem organized to advise government agencies; it has no official planning status of it own. The mechanics of Great Lakes rehabilitation are seen, by the group, to operate within local rehabilitation working groups, formed from initial workshops set up "to explore ecosystem rehabilitation strategies for other selected areas in the Great Lakes (than Green Bay and the Bay of Quinte)" (Great Lakes Fisheries Commission/Francis , et al. 1979, p.).

Workshops which were staged as pilot projects for Green Bay and the Bay of Quinte, were composed of "some people who were directly involved with research relating to the bay in question, others who were knowledgeable about the local economy and land use issues, and some members of (GLER) study group". (Great Lakes Fisheries Commission/ Francis et al. 1979, p. 75). Subsequent workshop participants are advised by the GLER study group to be "individuals from various organizations which could contribute to rehabilitation strategies for these

areas." (Great Lakes Fisheries Commission/Francis et al. 1979, p. 85). Although the preferred composition of the local rehabilitation groups which are to carry on the work initiated by these workshops, is not mentioned, there is no indication that these groups should include members of the public. The only reference to the general public made by GLER - the only recommended avenue for direct public contact associated with the rehabilitation program(s) - is one of public education:

> (Chapter 7, Recommendations) "#2. Prepare a more popularized, illustrated version (of the GLER report) to help foster wider public understang and interest in ecosystem rehabilitation, and arrange for its publication and sale". (Great Lakes Fisheries Commission/Francis et al. 1979, p. 85).

The philosophy of public participation held by the GLER study group, then in one primarily of mutual information exchange. The nature of public involvement in the GLER study may be re-examined, however, especially in light of experiences from the Green Bay, Long Point and Bay of Quinte workshops (L. Grima 1980, pers. comm.).

PUBLIC PARTICIPATION QUESTIONNAIRE

FEDERAL-PROVINCIAL STRATEGIC PLANNING FOR ONTARIO FISHERIES

1. INSTITUTIONAL FRAMEWORK

Development of a new approach to planning and management of fisheries by, and for the Province of Ontario.

2. DURATION OF THE PLANNING PROCESS

Long term-continuing.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

Public participation in Ontario fisheries management is a very recent change from a situation where "decisions about resource management in Ontario (were) made by government". (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 4.) Because the concept is new, and must be brought about by a large agency with a strong traditional mandate for in-house decision making, the most important initial stage is one of education, both for the agency and for the public. The specific terms of reference for the participation strategy, in fact promote the process of mutual education to the position of highest importance: "To create and institutionalize new communication channels among fishermen, the public at large, and fisheries agencies". (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 3).

It is hoped that an extensive public education program will foster a more comprehensive public understanding of the existing ecological situation of Ontario Lakes, proposed management goals and the need for public cooperation with future management tactics including some reallocation of fishery resources and restrictions of previous fishing freedoms. If this program is successful, it will allow vested interest

groups who traditionally persue a single purpose to mediate their view with an understanding of all factors involved in the pursuance of present and future goals. It will include the unorganized, non-vested interest sement of the public. Finally, it will allow the press better access to information and encourage objective evaluation of MNR programs.

The participation program also includes a limited form of public involvement in agency decision-making:

> "Of the various levels of participation possible, a combination of informing, consulting and negotiating appears most appropriate; full partnership decision-making or citizen control, is not recommended". (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 1) (···at this time. K. Loftus 1980, pers. comm.).

> "Citizen advisory groups should be considered only if the information dissemination and feedback mechanisms described above (workshops, seminars, meetings) are inadequate. If (they) are used, they should relate only to the Great Lakes or provincially significant waters. A Provincial Fisheries Advisory Committee is not recommended". (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 19.)

> "The public" which is to be involved in the SPOF public participation programs, refers to all Ontario residents: "...fishermen, the public at large, and fisheries agencies". (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 3.)

4. PUBLIC EDUCATION

An intensive, broad, multi-media education campaign is currently being planned for Ontario residents. It will include the following:

A. Non-technical publication (brochures)

Brochures on aspects of fisheries management will be published in non-technical language and distributed to the general public from displays in community buildings, and to the various user groups.

B. Press/media coverage

A large advertising campaign will be staged to promote fisheries management, including news releases, press meetings, radio, TV, and bus advertisements.

C. T.V. programs

A series of 13 half-hour shows, called Sport-Fish Ontario will premier in January 1981. These shows will give fishing instruction and management information for lakes and rivers in norther, central, and southern Ontario - including the Great Lakes.

D. Displays, films and slide presentations

Display panels and information services will be set up in shopping malls and at user-group functions.

E. School programs

Education packages will be supplied to Ontario schools to promote early interest in and knowledge of fisheries management.

5. PUBLIC INVOLVEMENT IN THE PLANNING PROCESS

A. Will the views of the general 'uncommitted' public be canvassed:

- during issue formulation? No
- during conflict resolution (the planning stage)? Yes

B. Will the general public be represented within:

- the agency information collection body(ies)? No
- the agency planning body(ies): No
- an advisory body? Yes, only if every other means of communicating with the public is inadequate and only in relation to the Great Lakes or other provincially significant waters.

C. Will vested interest groups be represented within:

- information collection body(ies)?
- planning body(ies):
- an advisory body? Yes. 4 specific groups are suggested for representation on all committees and 7 others are suggested for inclusion, depending on local circumstances. (Ontario Ministry of Natural Resources and Environment Canada 1978, p. 23.)

D. Will interaction between 'the public' and the planning agency occur during informal, interactive meetings such as workshops, open houses and seminars, during the:

- issue formulation stage? Yes, the public is included in informal meetings with MNR now in some northern regions, but participants are usually restricted to interest group members. This type of interaction will be expanded to all regions, and an attempt will be made to involve representatives of the general public.

- planning stage? Yes, this type of interaction and communication will ultimately take precedence over formal hearings in the planning process.

How will the public be informed of these meetings?

- general public: They will be informed but the actual mode has not been chosen.
- interest groups in particular: Same as for "gener public".

time of meetings: daytime____ evening____.

Location of meetings: A series of small meetings will be held in each of MNR's 48 Districts. The emphasis in public contact will be at the District, rather than the Regional or Provincial levels, but it will be coordinated at the Regional level.

E. Will interaction take place between 'the public' and the M.N.R. during formal hearings where briefs are presented, during the:

- issue formulation stage? Probably not.
- planning stage? If formal hearings are held in the near future, they will probably be called by user groups to obtain an explanation for MNR policy or actions. Formal hearings are not anticipated to form a part of the normal planning process.

F. Will agency (and advisory body) meetings be open to public attendance and public briefs?

As a general rule, it is not anticipated that MNR-sponsored planning meetings will be open to public attendance and briefs. During special meetings, however, there will be representatives by by elected members of interst groups and Key Actors' from unorganized public interests. Occasionally MNR staff and Public representatives could meet with the broader constituency at large public meetings.

6. JUDICIAL RECOURSE

Will the public have recourse to a judicial process if the final planning statements are found to be unsatisfactory?

The 1975 Ombudsman's Act allows citizens to bring such complaints before the ombudsman. He reviews ezch case, and if he feels the complaint is justified, makes a recommendation to the Ministry. The Ombudsman does not have any leagl power but his actions are often highly publicized, and my therefore exert enough pressure to influence Ministry decisions. Other Appeals may also be brought forward in conjunction with the Environmental Assessment Act, but these investigations are usually prior to Ministry decision-making.

7. LEGAL MANDATE

Will public participation be a manditory part of agency planning? There is a general committment within the MNR to involve the public in fisheries planning and management, but no legal mandate exists for the solicitation of public opinion on each issue.

8. PROGRAM PERSONNEL

Will the program be managed by persons not normally a part of the process? The advertising portion of the education program will be handle by an advertising agency. Also, all current large scale programs will be managed by consultant firms. Future programs may be managed by the Ministry if the internal resources are available and if Ministry management is appropriate to the issue.

9. PROGRAM JUSTIFICATION

Will the influence of the public participation program upon final planning decisions be made clear in the final reports? The final planning documents will be published as approved management plans and will

only be published in a form for general public distribution if the particular issue or section is particularly relevant to a current problem. The influence of the participation program on MNR decisions will be made explicit in these documents but no mandate or policy yet exists on the issue.

10. PROGRAM EVALUATION

Will mechanisms for evaluating the public participation program be included in the planning process. Yes, the program will be evaluated, but the results of this evaluation will not necessarioy be made public. The information will be used internally to improve future projects.

PUBLIC PARTICIPATION QUESTIONNAIRE

CENTRAL WATERFRONT PLANNING STUDY

1. INSTITUTIONAL FRAMEWORK

Urban community planning process within the City of Toronto, involving approximately 3000 acres of water-related land and 2560 acres of protected wa within Toronto Harbour.

2. DURATION OF THE PLANNING PROCESS

September 1974 - present date.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

A. General level or type of participation:

"Broad participation should occur in defining needs, setting goals, and evaluating plans in terms of these goals. Presenting plans that have been worked out without participation in setting the terms of reference is not participatory planning - all the public can do is to criticize the plans, regardless of merit. However, if the goals are set up by all the participants, then plan preparation can be done by the planners and brought back for public evaluation in terms of the established goals. Everyone then does the job for which they are best equipped (in terms of skill, time, inclination) and there is some chance of success on two scores - a good plan and an accepted one. The public cannot arbitrarily change the plan, but they can change the goals from which new plans will stem, and they can insist that the plans do stem from their goals." (.W.P.S. 1974, p. 101)

B. Definition of the public:

"A first general principle of this programme of participation is that the special interest groups represented on the central waterfront planning committee must expand their roles from participation by individual representation to: (i) the active involvement of their full memberships through publicizing the issues, methods, and work programme: (ii) involvement of the public at large through publicizing their group's interests so that people can identify with and participate through the interest group which most closely represents their concerns." (C.W.P.S. 1974, p. 105)

4. PUBLIC EDUCATION

What were the primary methods of informing the public of agency views, before and during the process:

A. Non-technical publications:

Various brochures published to make the public more aware of the waterfront, the planning process and various issues involved. For example, the City of Toronto's Information Bulletin, "Explore the Central Waterfront" and summaries of the Island airport, Island Neighbourhood Park and Harbourfront issues.

B. Technical/Planning publications:

Technical reports on the program for planning, waterfront precedents, climate, physical geography, vegetation, wildlife, air quality, noise, water, housing, industry, recreation and Port of Toronto were published separately for sale. Reports were also published on alternative uses for various sites around the waterfront.

C. Newsletters:

Many of the organizations represented on the Central Waterfront Planning Committee used their newletters to inform members of Committee issues and progress. Some of these organizations are very large (The Ontario Sailing Association has a regional membership of 10,000). The Planning Department quarterly magazine, "City Planning", also published several related articles.

D. Press coverage:

"There has also been fairly good coverage in the press, with major articles on the process that has been set up for Central Waterfront planning, the Island Airport, Harbour Square, problems of access to the Islands at the Ferry Terminal and Aquatic Park." (C.W.P.S. 1974, p. 102)

E. Displays and slide presentations:

Poster and slide displays have been set up at City Hall and Harbourfront for student and general public review

F. Open planning office:

The Central Waterfront planning office was located within the waterfront area to encourage public contact with planning personnel and the library.

G. Billboards:

Publicly advertised the waterfront planning study.

5. PUBLIC INVOLVEMENT IN THE PLANNING PROCESS

A. Were the views of the general uncommitted public canvassed:

- during the issue formulation stage? No.
- during the conflict resolution stage? No. no general public opinion poll or survey was taken but interested Ward organizations were encouraged to participate.

B. Was the general public represented within:

- the agency information collecting body(ies)? No.
- the agency planning body(ies)? No.
- an advisory body? No.

C. Were vested interested groups represented within:

- the agency information collecting body(ies)? Yes groups with an interest in the waterfront area were invited to sit on the Central Waterfront Planning Committee (C.W.P.C.) or various task forces, by the City Planning Board and by the C.W.P.C. itself, after its formation, subject to approval by the Board and City Council.

VC

- the agency planning body(ies)? Yes. The C.W.P.C., composed of representatives from all levels of government and vested interest groups, carried the planning study through to the development of the Central Waterfront land use plan.

D. Did the interaction between the public and the planning agency occur during informal, interactive meetings such as workshops, open houses and seminars, during:

- the issue formulation stage. Yes. All meetings of the C.W.P.C. were open to the public.
- the planning stage? Yes. All meetings continued to be public. As well, further individuals were recommended to sit on Task Group dealing with specific area issues.

How was the public informed of these issues?

- general public: weekly announcements of the public planning meetings in the Globe and Mail, as well as through the City of Toronto Planning Board's Information Bulletin and community newspapers.

- interest groups in particular: C.W.P.C. member organization newsletters. In the planning stage, meetings were set up by each C.W.P.C. member organization for members, agency staff and other interested C.W.P.C. members, to inform all member organizations of the planning process.

When did they take place? daytime _____ evening X

Where did they take place? City Hall committee and board rooms.

E. Did interaction between the public and the planning agency occur during formal hearings where briefs are presented, during:

- the issue formulation stage? No

- the planning stage? Yes, hearings took place for a number of separate issues (STOL service at the Island Airport; Harbourfront; the Island Park Neighbourhood), as a regular prerequisite to Council's approval of planning recommendations.

How was the public informed of these meetings?

- general public: newspaper advertisements

- interest groups in particular: those directly involved were sent notices of each hearing.

F. Were the planning bodies and planning office open to public briefs, suggestions, etc. during::

- the issue formulation stage? Yes

- the planning stage? Yes

6. JUDICIAL RECOURSE

Does the public have recourse to a judicial process if the final planning statements are found to be unsatisfactory?

Yes. Appeals for change of the final land use plan may be brought before the Ontario Municipal Board (a quasi-jucicial body). Prior to this stage, members of the public may appear as deputants before the Planning Board and before City Council Committee.

7. LEGAL MANDATE

Is a public participation program manditory in agency planning? Public advertisement and the right to deputize are required for any Official Plan changes, but a full scale participation program is not required. With whom does the decision to implement the process lie? City of Toronto Planning Board and Council. 1.

8. PROGRAM PERSONNEL

Is the program managed by persons not normally a part of the planning process? No.

9. PROGRAM JUSTIFICATION

Is the influence of the program upon final planning decisions made clear in the final report? It will be. 2.

10. PROGRAM EVALUATION

Are mechanisms for evaluating the public participation program included in the planning process? No. 3.

COMMENTS :

Since the interest groups in the planning process tended to promote their individual interests only, they tended not to represent "the public at large" The process, in general, was very open, but at a tremendous cost of money and planners' time. A significant portion of the planners' time, was in fact, spent interfacing with individual members of the public, rather than on planning tasks; a difficulty which delayed production of the planning document. Also, the Task Groups became very cumbersome.

PUBLIC PARTICIPATION QUESTIONNAIRE

ENVIRONMENTALLY SENSITIVE AREA PLANNING

1. INSTITUTIONAL FRAMEWORK

Eagles outlines a process of designating and institutionally protecting Environmentally Sensitive Areas (E.S.A.'s) which occurs primarily at the Regional government level (a level which originated in 1970 from a reorganization of county governments), within the context of the Regional Official Plans. Some progress is also being made at the County government level.

2. DURATION OF THE PLANNING PROCESS

The duration varies with each Regional Municipality, but the process of ESA designation and Official Plan preparation usually takes about three years.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

A. General level or type of participation:

"The ability of the public to make their views impact upon governmental policies and programs" (Eagles 1979, p. 111); and the ability of citizens to influence environmental management deisions" (Eagles 1979, p. 305)

The philosophy of providing citizens with the legal right to influence rather than make planning decisions is that which is officially stated in the Ontario Planning Act (5.21):

"Council should be free to seek advice and assistance from council committees and citizen advisory bodies, but the actural decisions on official plans and zoning by-laws must rest with council itself" (Eagles 1979, p. 283)

3. B. Legal rights to participation:

"Effective participation in decision-making can be enhanced by the establishment of a legal right to participate in the relevant legislation. This legal right is not just a privilege that may be granted as a matter of discretion or policy" (Eagles 1979, p. 108).

4. PUBLIC EDUCATION

The most important (successful) means of educating the public about agency views have been:

A. Non-technicial publications/Questionnaires

Regional newspapers containing:drafts of the Regional Official Plan, questions or questionaires about planning issues and the planners to contact about questions and responses, were distributed to every household in the Region.

B. Technical Planning Publications:

All planning documents involved with ESA designation were made accessible: they were distributed to anyone who requested a copy, and to all local libraries.

C. Displays and/or slide presentations:

A series of advertised graphic displays and open houses were held in community buildings around the Region.

D. Promotion of the planning process by advisory committees.

The E.E.A.C.'s played a major role in disseminating information and generally publicizing the planning process, primarily to the groups they work for or are connected with, as well as to the general public.

5. PUBLIC INVOLVEMENT IN THE PLANNING PROCESS

A. Were the views of the general "uncommitted" public canvassed:

- during issue formulation? Yes. Regional newspapers containing drafts of the Regional Official plan and questions or questionaires

about planning issues were distributed to every household in the Region. Questionaires outlined 25 planning issues perceived by the planning staff and requested householders to rank the issues in order of importance to them.(Halton County approach).

- during conflict resolution (the planning stage)? Yes, members of the public who were directly affected by or had some knowledge of the proposed E.S.A.'s were extensively consulted during the planning phase. In Waterloo, every land owner was contacted by letter.

B. Were members of the general public selected to sit on:

- the agency information collection body(ies)?
- the agency planning body(ies)? No.
- an advisory body? No.

C. Were vested interest groups represented within:

- the agency information collection body(ies)? No.
- the agency planning body(ies)? No.
- an advisory body? Yes. In two Regional Municipalities, an E.E.A.C. was formed to provide advice and direction to the planning staff and council on environmental planning matters, including E.S.A designation.

  In Halton, the E.E.A.C. was originally selected from people who responded to advertisements in Regional newspapers. These ads requested people with a high level of knowledge in specified fields to volunteer for committee membership. Vacancies in the committee are advertised by knowledge specialty each year, with new members being chosen by the EEAC.

D. Did interaction between the public and the planning agency occur during informal, interactive meetings such as workshops, open houses and seminars, during:

- the issue formulation stage? Yes, a Halton newspaper asked for advice on which issues were important.
- the planning stage? Yes, but only after a draft Official Plan has been formulated.

How was the public informed of these meetings?

- The public at large: Regular newspapers ads as well as within the special Regional Newspaper prepared for the planning process.
- vested interest groups: no special means of advertisement.

Time of meetings: daytime _____ evening X

Location of meetings: Library or council chambers of every local municipality in the Region.

E. Did interaction take place between the public and the planning agency during formal hearings where briefs were presented, during:

- the issue formulation stage? No.
- the planning stage? No.

F. Were council meetings (and advisory body meetings where applicable) open to public attendance and public briefs? Yes.

6. JUDICAL RECOURSE

Does the public have recourse to a judicial process if the final planning statements are found to be unsatisfactory?

Yes. Environmental policies and all other policies contained in Official Plans can be appealed by any person, to the Ontario Municipal Board. The Board then holds a hearing and makes a decision with regard to the policy objection. If the O.M.B. decision is also not favorable, any person may appeal to the Provincial Cabi

7. LEGAL MANDATE

Is a public participation program manditory in agency planning?

Yes. The Planning Act stipulates several manditory routes for public access to municipal decision-making. These include: public notification of pending decisions right to be heard in front of council, right to appeal council decisions to the O.M.B. and right to appeal O.M.B. decisions to the Provincial Cabinet. Almost none of these rights are present in provincial or federal resource management decision-making structures. (One of the reasons for success with E.S.A. planning at the municipal level is this series of rights to access the decision-making process. Eagles 1980, pers. comm.)

8. PROGRAM PERSONNEL

Is the program managed by persons not normally associated with agency planning?

No.

9. PROGRAM JUSTIFICATION

Is the influence of the program upon final planning decisions made clear in the final report?

Yes, about 80% of the final decisions are made clear in the final report (Eagles 1980, pers. comm.).

10. PROGRAM EVALUATION

Are mechanisms for evaluating the public particpation program included in the planning process? There is constant feedback to members of the Regional Council.

COMMENTS

"I am convinced that one of the reasons for the success of the E.S.A. program has been due to the public participation opportunities which are legally embedded in the municipal planning process in Ontario"(Eagles 1980, pers. comm.).

PUBLIC PARTICIPATION QUESTIONNAIRE

INTERNATIONAL REFERENCE GROUP ON GREAT LAKES POLLUTION FROM LAND USE ACTIVITIES

1. INSTITUTIONAL FRAMEWORK

The International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG) was set up by the International Joint Commission from members of the Federal, State and Provincial, U.S. and Canadian governments to study diffuse land-based sources of water pollution in the Great Lakes Basin.

2. DURATION OF THE PROCESS

The planning process was 6 years; the participation process, one year.

3. STATED PHILOSOPHY OR OBJECTIVES OF PUBLIC PARTICIPATION

"(i) to enhance the public's input into the public hearings held by the I.J.C. on the PLUARG final report; (ii) to improve the I.J.C.'s credibility with the public; (iii) to inform the public and (iv) to provide interested persons and parties to play a role in the development of final recommendations" (IJC/PLUARG 1976, p. 14)

4. PUBLIC EDUCATION

What were the primary methods of informing the public of agency views before and during the process?

A. Technical or Planning Reports

Technical reports were given to the public consultation panels on various aspects of the PLUARG studies as they became available. A draft of the final publication, "Environmental Management Strategies for the Great Lakes Basin" was also given to the panels for review.

B. Non-technical publications

Leaflets on the work and organization of PLUARG, plus lists of issues in the Basin were distributed to the public during a series of

fourteen open houses held in small centres throughout Ontario.

C. Newsletters

Two newsletters, the IJC "Great Lakes Focus" and the Great Lakes Basin Commission "Great Lakes Communicator" were used to publicize PLUARG information. These were distributed by mail according to the PLUARG mailing list of interested people and organizations.

D. Press Coverage

The PLUARG public participation program generally recieved very good press coverage (Grima, April 1980, pers. comm.). The open houses, consultation meetings and important meetings of chairpersons were given radio, T.V. and newspaper publicity.

E. Slide Shows and Poster Demonstrations

Slide shows and poster demonstrations were available at the open houses.

F. Questionaires

Questionaires on farming practices and pollution issues were mailed to a random sample of Canadian farmers in the Great Lakes Basin (Statistics Canada supplied the basic statistics from which the sample was taken).

5. PUBLIC INVOLVEMENT IN THE PLANNING PROCESS

A. Were the views of the general uncommitted public canvassed:

- during the issue formulation stage? No[1].
- during the planning stage? No (Mason 1979b,p. 13).

B. Was the general public represented within:

- the agency information collection body(ies)? No.
- the agency planning body(ies)? No.
- an advisory body? Yes. The open houses which were held to seek volunteers for the citizen panels were open to everyone.

C. Were vested interest groups represented within:

- the agency information collection body(ies)? No.
- the agency planning body(ies)? No.
- an advisory body? Yes. The committee which selected panelists from the 600 volunteers was "broadly representative of the various interests involved (educationists, conservationists, cottagers, farmers, manufacturing interests, sportsmen and fishermen's association)" (Grima 1980, p. 14). Eight panels were set up in Ontario; 9 in the U.S. "to assist in 'identifying public concerns and practicable management strategies' relating to pollution from land use activities" (Grima 1980, p. 14).

D. Did interaction between the public and the agency occur during informal, interactive meetings such as workshops, open houses and seminars suring:

- the issue formulation stage? Yes. In the summer of 1977, 15 open houses were held in Ontario to solicit volunteers for citizen advisory panels.

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[1] "no additional surveys of the general population were conducted" (other than an "Agricultural Practices Survey"). (Mason 1979b,p. 13)

- the planning stage? Yes. In the fall of 1978, more public meetings were held to inform the public about the report and to generate interest in the (subsequent) hearings (Grima 1980).

How was the public informed of these meetings?

- public at large: Radio and newspaper public service announcements, posters, volunteers.
- vested interest groups: The PLUARG mailing list, which was available at the time, was used to locate interest groups.

Time of meetings: daytime _____ evening X

Location of meetings: The major portion of Ontario, with the exception of some of the northern regions, was divided into 14 areas, each with a 50 mile radius. A small town within each of these areas was chosen for the location of an open house.

E. Did interaction between the public and the agency take place during formal hearings where briefs were presented during the:

- issue formulation stage? No
- planning stage? Yes. Public hearings on the PLUARG reports were sponsored by IJC and held in late 1978.

How was the public informed of these meetings?

Legal notices were placed in newspapers; newletters and flyers were mailed to those on the PLUARG mailing list.

Time of meetings: daytime X evening X

Location of meetings: In Canada these hearings were held in Thunder Bay, Toronto and Chattam. They were also held in three major cities in the U.S.

F. Were agency meetings (and advisory body meetings) open to public attendance and public briefs?

PLUARG meetings were not open to the public, but the advisory body (public consultation panels), meetings were open to anyone who chose to attend.

6. JUDICIAL REVIEW

Does the public have recourse to a judical process if the final planning statements are found to be unsatisfactory? No

7. LEGAL MANDATE

Is the public participation program a manditory part of agency (IJC) planning? Public hearings are manditory, but the participation process is not.

If not, with whom does the decision lie to implement such a program? For the PLUARG study, the decision was made by the PLUARG members, themselves.

8. PROGRAM PERSONNEL

Was the program managed by persons not normally a part of the planning process? Yes, a consultant, Sally Leppard, was hired to coordinate the public participation program.

9. PROGRAM JUSTIFICATION

Was the influence of the program upon final planning recommendations made clear in the final report(s)? PLUARG members each had to attend Panel meetings. At these, they reported on why recommendations had not been accepted. A summary of 10 major issues was submitted by panels to PLUARG; 5 were accepted (S. Leppard 1980 pers. comm.). The following comments, however, were made on the results of this process by R. Mason (1979b). "The panels brought forth and emphasized a large number of issues

which were either downplayed or ignored by PLUARG in its report to the IJC" (p. 23). "...PLUARG did not make any attempt in its report in any other way to explain how it had dealt with the input from the panels. There is generally no accounting for those recommendations which were accepted, or found to be useful, and those which were not". (p. 23).

10. PROGRAM EVALUATION

Are mechanisms for evaluating the public participation program included in the agency planning process?

Evaluation of the program is in part of the contract under which the consultant was hired.

11. COMMENTS

References for critical assessments of PLUARG's public participation program are: Grima 1980, Grima 1978, Mason 1979a, and Mason 1979b.

APPENDIX TWO

Specific Criticisms of McHarg's Environmental Planning Method with reference to the Toronto Central Waterfront Planning Study

adequacies. Further complicating the synthesis, some of the reports were delivered to the firm just a few months before the final presentation was given. To be fair, then, the conditions under which the synthesis report was produced made that production more difficult, but to be realistic, the situation described here imposed constraints which are common to many planning studies.

The environmental planning method used by McHarg's firm, however, does not have the capacity to overcome these difficulties. The method is limited in scope and outdated in its use of ecological concepts, and the resultant lack of in-depth ecological understanding often leads to the acceptance of ecologically inadequate study parameters. Specific criticisms of the CWPS are outlined in the following sections.

Boundaries - The boundaries of the study area must include all important influences on the ecosystem under study. This is much more difficult with an aquatic, than a terrestrial ecosystem, of course. To set appropriate boundaries you must know the major processes operating within the ecosystem and the activities, or stresses, both man-made and natural, which influence or direct those processes. McHarg's method seems to deal well with the terrestrial ecosystems on Toronto Island, identifying and responding to the forces of wind and wave erosion, human use, succession (etc.). But consideration of the aquatic ecosystem, is limited to the water body itself, and therefore to only a few of the forces which determine its character and quality. The most notable omissions are upstream land use and point source pollution, and whole-lake connections. Two examples of the problems which result from this limitation of study scope are those of dredging and of relating

to plans for Lake Ontario rehabilitation.

Dredging is an activity which has been carried out by the Toronto Harbour Commission ever since its inception to ensure that navigation channels remain navigable. Dredgeate used to be considered useful fill for on-land construction or shoreline restructuring - until the pollutant levels contaminated the benthic silt to a point where the material is now known to be extremely dangerous. The Harbour Commission is now faced with the expense of storing contaminated material in heavily dyked areas to prevent open-lake or on-land contamination. The dyked areas are toxic, relatively unsightly and extremely expensive - the expense being born by the Harbour Commission. The causes of pollution lie upstream, with both point and non-point sources. The only means of controlling the output of these sources, in relation to the seriousness of the pollution problem is to invoke very general provincial water quality standards. The use of a watershed, rather than a waterfront boundary would have made it possible to include the causes of pollution in the study area and adjust pollution controls more specifically to the particular and changing situation.

The second example is consideration of the relationship between the Toronto Harbour and Lake Ontario. Toronto Harbour was originally one of the three most important wildlife nest and fish spawning areas in Lake Ontario (Whillans 1977). Its complete urbanization has resulted in its status as one of the most significant sources of phosphorous and other contaminants (O.M.O.E. 1980). Plans to rehabilitate aquatic habitat and water quality in Lake Ontario must include Toronto Harbour, perhaps not as a potential fish spawning area, but certainly as a contributor of pollutants and provider of important recreational opportunities. These

plans could influence the pollution standards, recreational use, restructuring of shoreline and lake bottom, preservation, creation or destruction of certain types of habitat, etc. within the Harbour - but these factors were not considered.

Biogeography - Not only is the size of an ecosystem important to consider; its shape and relations to other ecosystems also has ecological implications. The theory of island biogeography deals with the viability and behaviour of plant and animal populations in areas cut off by some physical barrier such as water or mountains. Small natural ecosystems surrounded by a "sea" of urban, agricultural or otherwise altered environment act much like islands in a sea of water. Thirteen different terrestrial vegetation communities, from beach, dune and rocky areas to dense woodlands were identified on Toronto Island and the waterfront area (CWPC/Wallace, McHarg, Roberts and Todd 1976). Each may be thought of as a small island ecosystem, as may Toronto Island itself. The theory of island biogeography has developed in the last fifteen years to encompass the following observations (a selected bibliography of these studies is given in Appendix 3):

- The number of species that an island will support depends upon its size, shape and proximity to sources of colonizing species. The larger the island or the closer its proximity to land or other islands, the more species will be maintained.
- Each island has an equilibrium number of species, above which no further species can be supported.

- Each species population requires a minimum number of breeding members in order to maintain itself; this minimum population requires a minimum area of suitable habitat. More mobile species that have the ability to cross physical barriers may find this habitat in a number of different areas but less mobile species are more dependent on a single source. More mobile species are also able to colonize more distant islands.

Based on biogeographical studies, Diamond (1976) has developed a number of spatial principles for the design of nature reserves (areas to be preserved in a natural state (Figure 8)).

The implications of the size of each vegetation community on the potential diversity of species and the amount of habitat required by viable populations of species; and the effects of future human use on these needs was not considered in the McHarg CWP study. It may be in this case, that these considerations would not make a noticeable difference to management recommendations but it is difficult to judge without the proper information. In general, the effect of the size and shape of ecosystems upon their diversity and viability is not included in McHarg's studies.

A very positive feature of McHarg's approach is the maintenance of diversity within and between different ecosystems. Although the effect of size and shape is rarely included, the benefit of diverse mosaics of different types of ecosystems in different stages of succession is usually promoted. According to Bella (1974), Bella and Overton (1972), Holling (1978), Holt and Talbot (1978) and Odum (1979) the risk of irreversible change to the environment and the resultant loss of present and future options is minimized if

1. Larger reserves are better than smaller reserves.

2. One larger reserve is better than several smaller reserves.

3. Reserves closer together are better than those farther apart.

4. Reserves in a cluster are often better than those in a line.

5. Connected reserves are better than unconnected reserves.

6. Circular reserves are often better than linear reserves.

FIG. 8 Geometric principles for the design of nature reserves (Diamond 1976, in Eagles 1979, p. 129)

a regional mosaic of land uses and ecosystem types is created. Maintaining this mosaic necessitates the spatial restriction of actions which destroy or alter natural environments, and ensures diversity of landscape types for reasons practical, (ie. erosion control), aesthetic, (ie. ensures variety characteristic of the region), and ecological (ie. maintains species gene pools for recolonization and rehabilitation).

Ecosystem Structure - It is an often used truism that the plants and animals comprising an ecosystem depend upon each other in a number of ways (ie. "Everything is connected to everything else.") But these connections are not ubiquitous.

"Each species has a limited number of connections with others that give a distinct organization to the ecological system. This organization results in a unique capacity to absorb and funnel impacts" (Holling 1978, p. 27).

"Analysis of studies ... suggest that ecosystems exhibit patterns of connections resulting in subassemblies that are highly connected with themselves, but loosely connected to others" (Holling 1978 p. 28).

The method of assessing "what is there" used in most planning and impact studies is a species list, which bears as much relation to what is really there as a pile of wooden parts does to a finished house. Judgements of a community's requirements for survival and reactions to stress can be made much more easily if the architecture of the community is described. Again, it is not possible to assess the difference which this insight would have made to the

planning and management recommendations for the terrestrial environment in CWPS. It is possible, however, to point out that the spawning grounds recommended for protection in the study are those of a species of fish that was introduced to the Lake Ontario ecosystem in the late nineteenth century and which now comprises almost 80% of its biomass (Samples and Bishop 1980). It may be that attempts to create an ecosystem in the Lake which more closely approximate the original structure and composition will be frustrated by the dominance of that single introduced species, and that recommendations for Lake Ontario rehabilitation will be to reduce rather than maintain their numbers. If the community structure and significance of the species found in the Toronto Harbour ecosystem were assessed, especially in relation to plans for that of the whole Lake, these aspects would have been considered.

Ecosystem Function - One of the basic flaws of McHarg's method is that, although the intention exists to treat the ecosystem as a dynamic, somewhat integral, functioning system, the concepts used to describe and predict the operations of this system are often too simplistic. It is true that most of the ecological concepts used in recent research to explain ecosystem behaviour have little applicability in planning situations where time, money and data are extremely limited. But one way to begin to understand and predict ecosystem behaviour in response to certain human uses (or stresses) without an in-depth study is to observe that of similar ecosystems in a variety of circumstances. This can often

yield valuable information about the ability of an ecosystem to withstand different forms of stress. McHarg's method does not compare and it is interesting that of all ten approaches considered in this paper, no other which is operative fails to do this (Figure 1).

Further, in order to recognize stressed states, it is necessary to understand the unstressed or baseline condition, the definition of which is primarily a matter of choice. For ecosystems intended to be kept in a (more or less) natural state, the baseline for comparison would be a similar native ecosystem, if this could be found. For those which are natural (ie. not built form) but heavily used or changed, the native baseline may still provide a useful measure of the ecosystems' potential for upgrading and may also provide a model for the process. This is not to say that the native state would be the rehabilitation goal. This is not practical or even possible, in most cases. The native state would simply define a direction for change, should that change be compatible with existing and anticipated use. In many (though not all) ecosystems, the natural state is more diverse and productive than is the heavily impacted; it is also often safer and more pleasurable for human use - particularly in aquatic systems.

It is even possible to assess the ecological potential of urban ecosystems. Dorney (1979) has shown that different environments within the city have different characteristic bird diversities. A knowledge of the potential of an area for ecosystem quality and habitat diversity helps to promote more rehabilitation than simply maintenance-oriented management.

The original native state of the Great Lakes is the baseline that is being used to develop current rehabilitative management goals (GLER, SPOF, Lake Trout, Ecosystem Indicator). The goals themselves represent conditions closer to the original state than those that exist now. But the knowledge of the Lakes' original ecosystem, as well as the changes that have taken place since European settlement allows assessments of the extent of change and the potential for rehabilitation. For example, Lake Ontario originally supported three types of fish communities: the river spawners, the warm water shoreline bottom-feeders and the cold water free roaming open-lake species. The last category which included all prized commercial and recreational species (sturgeon, trout, etc.), has virtually been eliminated from the Lake and replaced with schools of smaller, less commercially valued fish (ie. alewives).

Resource managers are now attempting to formulate strategies to bring back some of the open-lake commercial species. They are also intending to introduce non-native open-lake species that are more similar to the original lake inhabitants than those that live there now - and also, more commercially valuable. The process of reorganizing (or rehabilitating) an ecosystem is one which is largely a game of chance. Methods must therefore be experimental and adaptive to continually monitored results.

This concept of a goal for ecosystem management <u>other</u> than that of the existing state or some successional variation, is foreign to McHarg's method. This may be because McHarg's concept of ecosystem 'state' is not one which incorporates 'health' based on certain characteristic, baseline conditions, and is therefore

not one which, as a matter of course, recognizes those which are non-characteristic or unhealthy.

McHarg's criteria for preservation and type of management strategy is, instead, social value:

> "Performance requirements specify those human actions necessary to maintain the resource at the 'norm' at which its value to society is undiminished. A 'norm' may be a very specific legal standard, ... an accepted guideline, or an official recommendation. If there is no legal precedent or if insufficient data exists to specify a quantifiable 'norm' a general statement must suffice" (CWPC/Wallace, McHarg, Roberts and Todd 1976, p. 81).

Ecosystem Self-regulation - One of the most important functions of an ecosystem is its "homeostatic" ability to recover from a stressed condition to some more healthy or representative condition. The branch of ecology which deals with "healthy"/"normal" and "dangerous"/"abnormal" deviations from an ecosystems' steady state, and the mechanisms which determine and direct its recovery, or transformation to another state is stress ecology.

The ability to predict ecosystem stability from certain observable or measurable characteristics is an important consideration in stress ecology, and one which is of unquestionable value to the planner or manager. One of its most important characteristics discussed to date in ecological literature is the complexity of an ecosystem, and its related "functional redundancy"; that is, the number of species fulfilling very similar roles in the organization of the ecosystem. Current theory suggests that in stable (dominantly favourable) physical environments, complex, competitive ecosystems develop which are stable in the sense that component populations tend to fluctuate very little.

The classic example of a complex, stable ecosystem is a tropical forest. Because there is a high functional redundancy in such a system, certain changes within the system may have little effect on its overall functioning. For example, the destruction of one vegetative layer, all the vegetation in a limited area, or of selected insect species (ie. the tse tse fly) may have no perceptible effect on the forest as a whole. Because these systems tend to be adapted to a narrow range of physical envionmental fluctuations, however, they are particularly sensitive to disturbances beyond this range, and may take a relatively long time to recover their original complexity once degraded or destroyed. According to May (1975), they are "less able to withstand our battering".

In physical environments which are unstable or intermittently stable, such as estuaries, intertidal zones, or fire-adapted forest or grassland ecosystems, organisms tend to reproduce quickly and exploit newly found or created favourable circumstances. Ecosystems tend to be less complex than those in stable envionments and composed of species with much larger population fluctuations. In the sense of continuity of population numbers, then, these species may be thought of as unstable; but by virtue of their unstable, exploitive nature, they tend to be resistent to a much wider range of stresses. It could be said of all species that they are "preadapted" to a certain range of stresses, but species from unstable physical environments tend, by definition, to be pre-adapted to a wider range of stresses. Inter-tidal communities for example are pre-adapted to physical displacement, wind, wave abuse and substantial changes in salinity and moisture. Some of these stresses (physical displacement, for example), actually aid in the development of a diverse community (Paine 1966), although diversity, in general tends to be higher under stable conditions (Whittaker 1975).

The least diverse communities tend to be those developed in constantly harsh physical environments where relatively favourable conditions produce intermittent periods of growth for a narrow range of especially hardy species. The classic example of this type of environment is the Arctic. Ability to withstand and recover from stress in these communities is more related to the relatively short periods when growth (and hence recovery) is possible, than to the resilience of the species involved.

Each of these examples demonstrates that the ability of an ecosystem to (1) withstand or (2) recover from stress (environmental or cultural) is related to the "usual" type and intensity of environmental stress to which they are exposed (and hence adapted) and to the structure and strength of the homeostatic processes within the system itself. As just discussed, these factors are related, although perhaps not as preciselyas the examples would indicate . The system's ability to withstand stress can be measured by the size of disturbance necessary to cause (1) noticeable change and (2) irreversible change. Cairns and Dickson (1977) have labelled the first property, the system's "inertia", and the second, its "vulnerability". Each is measured by the size of disturbance necessary to cause the respective changes (irreversible being defined as having a recovery time greater than a human life span). The rate of ecosystem recovery after a disturbance has been referred to by Cairns, Dickson (1977) and Orions (1975) as the system's "elasticity". Presumably the greater the system's elasticity, the less is the recovery period. The number of times a system is able to recover from a similar disturbance is its "resiliency" to that disturbance (Cairns and Dickson (1977).

Studies by Cairns and Dickson (1978) indicate that an ecosystem's ability to recover from a disturbance may itself be degraded by successive stresses. The salt marsh ecosystem which they studied was shown to be able to recover from four to five oil spills in quick succession. When the number was increased to 16 or 17, with the same frequency, however, the ability of the marsh to recover was either considerably reduced or destroyed altogether. Resiliency was therefore shown to be related to the type, intensity, number and frequency of stresses applied to the ecosystem - and is an extremely important concept to develop for environmental management.

Orions (1975) describes a number of other properties of ecosystems (see Figures 9,10 & 11) including persistence, which he defines as the survival time of the system. If the stresses to which the system is forced to respond are too severe, the system may be destroyed (as in the case of severe persistent SO_2 poisoning in the Sudbury region of Ontario (ie Friedman a Hutchinson 1980). More often, however, the system will reorganize itself at a different point of equilibrium (Holling 1978) almost always to produce resource of lower unit and aggregate value (Regier 1973). Documented cases of the transformation of the Great Lakes fish communities during the nineteenth century, for example, are frequent (Loftus, K.H. and H.A. Regier (eds)1972). W (1977, 1979) provides detailed evidence of fish community transformation in three small bays within the Great Lakes: Toronto Bay (now known as Toronto Harbour), Burlington Bay on Lake Ontario, and Inner Bay on Lake Erie.

The

The detail in this discussion of stress ecology is provided simply because it seems to be, along with the theory of biogeography just discussed, the most applicable contribution to planning and management from recent ecological research. If those stresses to which an ecosystem is pre-adapted can be identified, then so may the classes of human stress to which the system can best adapt. If the mechanisms by which ecosystems recover from stress can be discovered, then management guidelines can be formulated which aid, rather than inhibit the process.

FIG

Constancy: the lack of change in some parameter of the system.

Persistence: the survival time of the system.

Inertia: the ability to resist external perturbations.

Elasticity: the rate at which the system returns to its former state following a perturbation.

Amplitude: the area over which the system is stable (the same as Hollings's resilience).

Cyclical Stability:

the property of a system to cycle about some central point or zone.

Trajectory Stability:

the property of a system to move toward some final end point or zone despite differences in the starting points (equifinality).

The factors which increase each of these properties are listed in Figures 9 and 10.

FIG. 9 Orians' terminology (Kay 1979).
Seven properties of ecosystems which are related to their stability.

A. Persistence

1. Environmental heterogeneity in space and time
2. Large patch sizes
3. Constant physical environment
4. High resource utilization thresholds of predators

B. Inertia

1. Environmental heterogeneity in space and time
2. Greater phenotypic diversity of prey
3. Multiplicity of energy pathways
4. Intraspecific variability of prey
5. High mean longevity of individuals of component species (Frank, 1968)

C. Elasticity

1. High density-dependence in birth rates
2. Short life cycles of component species
3. Capacity for high dispersal
4. Strong migratory tendencies
5. Generalized foraging patterns

D. Amplitude

1. Weak density-dependence in birth rates
2. Intraspecific variability of component species
3. Capacity for long-distance dispersal
4. Broad physical tolerances
5. Generalized harvesting capabilities
6. Defense against predators not dependent on a narrow range of hiding places

E. Cyclic Stability

1. High resource-utilization thresholds
2. Long lag times in response of species to changes in resource availabil
3. Heterogeneity of environment in space and time

F. Trajectory Stability

1. Strong organism-induced modifications of the physical environment
2. All factors increasing elasticity.

FIG. 10. Orians' terminology (Kay 1979).

Environmental factors and phenotypic characteristics of species that increase different kinds of stability.

A. Temperate forests

1. Low species richness in most taxa
2. Proportionally fewer rare species
3. High reproductive rates
4. Extensive seed dormancy

5. High average dispersal rates
6. Many migratory species, short barriers ineffective

7. More habitat generalists
8. More dietary generalists?

B. Tropical forests

1. High species richness in most taxa
2. Proportionally more rare species
3. Low reproductive rates
4. Little or no seed dormancy (Gomez-Pompa et al., 1972)
5. Low average dispersal rates
6. Few migratory species, short barriers effective (Diamond, 1973a, b, MacArthur, Diamond & Karr, 1972)
7. Fewer habitat generalists
8. More dietary specialists?

FIG. 11. Orians' terminology (Kay 1979).

General adaptive characteristics of species in temperate and tropical forests.

The ability to predict ecosystem thresholds of tolerance to stresses has been developed only as a concept. It is possible, however, to obtain estimates of tolerance levels through practical experience. Observations of changes in an ecosystem through time may be correlated with human influences or stresses to show those stresses from which the ecosystem could recover, and those from which it could not. This dual accounting system of human stresses and ecosystem responses is the basis for S-RESS. According to Rapport and Regier (1980), "Ideally, if the relationship between stress and the ecosystem responses were fully specified, one set of data (eg. stress) might be inferred from the other (eg. response) and visa versa. The current state of knowledge is sufficient for this in some special cases."

This correlation of stress and response is possible in the Toronto Harbour aquatic ecosystem, for example, where Whillans (1977, 1979) has traced transformations in the ecosystem to fairly specific human and storm activities. The human activities are related to increased urbanization of the waterfront and Don River watershed discharging into the harbour (industrial and sewage wastes, dredging and disposal of dredgeate, shoreline restructuring, removal of lake-bottom stones for building purposes, etc.). Once the stress is identified, it is possible to pinpoint the controlling forces; in this case waterfront and watershed planning and the establishment of pollution control standards. While a knowledge or at least a speculation about the tolerance limits of the Toronto Harbour ecosystem would have been a useful tool to those involved in these processes during its urbanization,if any value had been placed on good water quality and a healthy ecosystem, it is still possible to use this hindsigh in the rehabilitation of the ecosystem of management of similar ecosystems.

Management within ecosystem tolerance levels is a practice which is most applicable to those ecosystems for which a natural character is intended, in the face of rather intensive human use. The concept is therefore highly applicable to both Toronto Island and Toronto Harbour. McHarg's method addresses ecosystem tolerance by limiting use according to its inherent fragility. For smaller, terrestrial ecosystems requiring no quantitative wildlife management practices, this method can be very effective (ie. for Toronto Island). But, in aquatic ecosystems, where all stresses are highly integrated, and in larger terrestrial ecosystems where the variety of resource demands may impose stresses which are not possible to intuitively integrate and assess, McHarg's method is clearly inadequate.

Monitoring: Indicators of Ecosystem Health - The advantages of monitoring changes in an ecosystem through time leads to the problem of the choice of variables to monitor. Rapport and Friend (1979) and Rapport and Regier (1980) suggest that the variables to be monitored should be those which represent important aspects of the health or proper functioning of the ecosystem. Rapport and Regier liken these systemic variables to the vital signs in human medicine. Disruption to any of these vital signs signifies that something is wrong, although it may not be possible without a good deal of previous experience to diagnose the malady and isolate the proper causes. The type of indicators most appropriate to each ecosystem depends upon its type and use.

> "An ecosystem which retains many of its natural properties and is used in a 'near-natural' state requires an early warning monitoring approach in which response variables sensitive

> to gradual degradative changes are key elements in the information system. At the other end of the spectrum are devastated ecosystems in which gross changes are of interest. In between the two extremes (ie. in areas like Toronto Island) there is a need for a more complex, concentrated ... [network of indicators, some sensitive to initial changes, and others resilient enough to demonstrate cumulative, long-term effects] . (Rapport and Regier 1980 , p. 26).

This process of selecting only indicative variables for monitoring produces a system which is both more sensitive to the important vital parameters within an ecosystem and more economic.

The parameters suggested for monitoring by the CWPS are those outlined by the Ontario Ministry of Environment (MOE). These parameters are extensive, are assessed individually rather than synergistically and many bear little known relation to the "health" of an ecosystem. They are also limited strictly to water and air quality; ignoring other ecosystem parameters which are vital to its survival (ie. amount of toxin accumulated in the food chain, or availability of important habitat). It is unreasonable to expect that the firm of Wallace, McHarg, Roberts and Todd should help MOE to reorganize its monitoring system. It is reasonable, however, to expect that they would understand its limitations and help the CWPC to overcome them. This, they did not do.

In summary, some developments in ecological understanding which are not reflected in McHarg's methodology are discussed above. The implication for planners is <u>not</u> to rush to incorporate these ideas into a "revised" methodology but to have some appreciation for the developing and highly complex field. Planners should be aware of these developments in order to better utilize the ecologists with whom they work, rather than to hope to apply them independantly.

APPENDIX THREE

The Theory of Island Biogeography: Selected References for Planning

THE THEORY OF ISLAND BIOGEOGRAPHY

SELECTED REFERENCES FOR PLANNING APPLICATION

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