INSTITUTIONAL ASPECTS OF THE COASTAL ZONE:
THE CASE OF ESTUARINE MANAGEMENT ON VANCOUVER ISLAND

by

ALAN FERGUSON

B.A., Simon Fraser University, B.C.

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ABSTRACT

Environmental problems often stimulate a search for more appropriate laws, policies and administrative mechanisms. Within the coastal zone, the increased intensity of resource use demands and growing awareness of environmental deterioration has given rise to a reappraisal of traditional institutions and management practices. Many of the existing problems originate in the market failure to identify property rights and externalities. They reflect the need for an effective institutional structure for the expression of social preferences, formulation of resource use rules and provision of public goods and services.

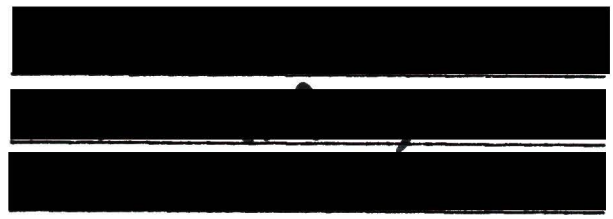
Coastal resource management has developed with a focus on the deterioration of resources, the complexity of jurisdictions and administrations and the nature of diverse resource use demands. It implies a broad basis for the formulation of resource management strategies and plans; one in which a wide range of problems, alternatives and participants are considered. Yet there can be constraints within the institutional structure which influence the process of decision making. This study examines some of these constraints in the management of estuaries.

Estuaries are amongst the most productive natural systems, providing nutrient-rich environments for the development of marine life. Conflict over the use of estuarine areas has resulted in criticism of existing laws, policies and administrative mechanisms. As a basis to analyzing this institutional structure, three criteria are employed: (1) the recognition and internalization of externalities, (2) the availability of information and technical resources, and (3) the opportunity to participate in the decision making process. These are evaluated in four estuarine areas associated with Cowichan River, Nanaimo River, Englishman River, and Courtenay River.

The results of the study indicate that estuarine management problems and their spatial dimensions vary significantly making it difficult to identify a distinct set of managers, problems and participants in the decision process. The problems often are not limited to local areas but encompass issues of regional development. Externalities were institutionally internalized through various coordinative measures, yet this process also displayed a lack of distinct estuarine objectives and decision making guidelines. Similarly, the evaluation of alternatives revealed difficulties in predicting the specific effects of estuarine modification and the lack of readily available environmental information relating to the estuarine areas. While significant coordination occurred within government, there was limited public access to the decision

process. These cases emphasize the ad hoc and piecemeal manner in which estuarine issues are dealt with and the lack of distinct decision making rules.

It is concluded that there is a need for greater commitment to estuarine protection and more explicit management objectives and guidelines. Better and more specific environmental research would assist the regional planning process in defining the requirements for estuarine protection. Furthermore, greater integration of resource management and community values could enhance the formulation of estuarine policies. A wide variety of management capabilities exist, the important task lies in improving their application.



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CHAPTER I

INTRODUCTION

Coastal environs pose special problems for resource management. The land-sea interface is an area of transition between marine, fresh water and terrestrial environments, possessing dynamic bio-physical processes. It is subject to a complex jurisdictional and administrative structure. It is also permeated by common property-private property conflict and confronted with increasing demands for industrial, residential, recreational and preservation uses. These competing uses generate a need for improved means of resolving conflict and protecting resource values in coastal areas. A critical factor in this task is the institutional structure: the laws, policies and administrative agencies and mechanisms employed to manage resources.

In British Columbia, the coast has long been a major focus of human activity. It extends some 4,463 miles of mainland and 11,622 miles of offshore islands. Conflict over resource use is particularly evident in the Strait of Georgia where controversy has centred on the impacts of estuary development, waste discharge, logging activities, transportation, recreation and residential development (English, 1972; Harris & Taylor, 1972; Ross, 1973; Barker, 1974). Many of

these problems are a product of rapid growth and development in the southwestern region of the province. They reflect increasing conflict between resource uses in a limited coastal area. Conflict in estuarine areas is particularly significant for it demonstrates the growing issue of urban and industrial infringement upon coastal resources. The need exists for an effective response to these threats.

Rationale

The development of special management programs for coastal areas is a relatively recent phenomenon in North America (Armstrong et al., 1974; Johnston et al., 1975). It emphasizes the increased intensity of resource use demands in coastal areas. The regional, national and international dimensions of coastal zone resource use call for new institutional frameworks and new standards for the use of coastal resources. As a consequence, the trend has been towards comprehensive management of the land-sea interface to control development and oversee the preparation of coastal zone plans. This has been the experience in the United States under the stimulus of federal legislation, and has given rise to a similar search for new or improved institutions in Canada.

Although the need exists for integrated resource planning in the coastal zone, the institutional structure in society is often slow to incorporate new philosophies and new values. The traditional legal and administrative framework may well result in resource administrators using limited

criteria for decision making in the face of complex environmental issues. As a basis for re-evaluating the institutional structure, there is a need to understand the way in which it constrains and influences the management of coastal resources. More specifically, the purpose of this study is to evaluate the extent to which the institutional structure associated with estuaries affects the ability to internalize externalities, employ information and expertise and provide opportunities to participate in decision making.

Estuaries, because of their importance for fish and wildlife habitat and their historical use for human activity, exemplify problems confronting the coastal zone. Commercial fisheries especially rely upon estuarine areas for feeding, rearing and resting, with an estimated 45 percent of all commercial catch being of estuarine dependent species (McHugh, 1966). Estuaries are also critical habitat for resident and migratory waterfowl. The increased pressures of land and water use in estuarine areas present new challenges to the institutional structure.

The lack of identifiable objectives and policies for estuaries of British Columbia is apparent in the increased scope of resource use conflict (Romaine et al., 1976; Dept. of Agriculture, 1975). Major criticisms suggest that such conflict originates in inadequate legislation, planning and regulation for estuarine management (Farrow, 1974; Croft, 1974; Hatter, 1973). Institutional reform, however, necessitates an appraisal of existing estuarine problems and government responses to them.

Methodology and Organization

An institution can have different definitions, referring to various established organizations, practices or customs in society. The institutional structure, as discussed here, includes not simply the administrative and organizational framework in resource management but also the legal, jurisdictional and political setting in which decisions are formulated. The institutions employed to manage resources must be viewed in perspective to the array of variables which affect decision making. Mitchell (1975) describes a diversity of research approaches in evaluating the institutional arrangements which reflect the complexity of this decision environment. The institutional structure is influenced by the role of actors, behaviour and context in decision making.

An analysis of decision making performance offers the opportunity to compare theoretical tenets to the actual manner in which decisions are made. It "attempts to fit a set of statements, either narrative or mathematical, to a real-world decision situation" (Burke & Heaney, 1975, p. 138). This approach avoids prescribing an optimum institutional structure or limiting the factors that are important to decision making. The evaluation of decision making provides an understanding of the link between knowledge and societal action. There can be, for example, many social, cultural and organizational characteristics which constrain the application of resource management strategies (White, 1969).

An array of general criteria is available to analyze performance in decision making. These criteria are based upon certain ideal characteristics of resource management institutions which contribute to an efficient and equitable expression of social goals and values. Kneese and Bower (1968) for example, suggest that regional water quality management agencies should have the ability to: (1) internalize externalities, (2) implement all relevant measures to improve water quality, (3) consider interrelationships between water quality and other aspects of water development and use, (4) consider water-land management interrelationships, (5) consider water quality management impacts on other aspects of environment, and (6) provide an opportunity for affected parties to have a voice in decisions. Craine (1969) similarly offers criteria: (1) ability to apply a total range of techniques for influencing water use and development, (2) ability to consider and adjust externalities, (3) flexibility to adapt management to different circumstances, (4) ability to express the range of values relevant to water management, (5) ability to efficiently finance water management, and (6) extent to which water management is recognized and institutionalized. Ranney (1972) presents three major requirements: (1) ability to carry out technical tasks of the systems approach, (2) capacity for innovation; and (3) capacity to generate alternatibe policies representing diverse values. Barr (1973) also employs similar criteria:

(1) economic efficiency, (2) social equity, (3) institutional flexibility, and (4) political acceptability.

Craine (1971) further presents an analytic framework for evaluating institutional aspects of lake and bay management. He emphasizes four factors in designing lake and bay management agencies. Firstly, the scope of an agency's powers is important, particularly in relation to the nature of the problems and the objectives for intervention in resource allocation. This includes the availability of a range of management mechanisms. "Ability to substitute one 'tool' for another, to use one 'tool' to reinforce another, or at least to avoid impairing the effectiveness of other intervention powers, is perhaps the essence of the idea of management" (Craine, 1971, p. 534). Secondly, geographic jurisdiction can be critical, for regional boundaries to the management shed can vary with natural, social and governmental systems. Thirdly, interagency linkages govern the operating relationships between resource administrators and define the constraints under which they act in the decision process. Finally, the form of organization influences the manner in which various interests gain access to decision making. A management agency must be responsive to the legitimate regional interests in lake-bay management.

A major problem with institutional evaluation is the lack of precise and operational criteria (Mitchell, 1975). The criteria discussed above offer some analytic standards

for evaluation, although many of these are not easily quantifiable. Many of the criteria are also oriented to describing ideal institutional characteristics without reference to their role in decision making. The important concern, however, is not simply the characteristics of the institutional structure but rather the effects they have on the decision process. By focussing upon the decision process it is possible to provide a more explicit view of how institutions behave.

The implications of much of the criteria for institutional design suggest the need for a system-wide approach to decision making which evaluates a range of alternatives and ensures socially appropriate decisions. For the purposes of examining institutional performance, a number of questions can be posed: Do resource management agencies display the capability to recognize the broad spatial dimensions of problems, especially where they spill over into other jurisdictions? Do they have the means to evaluate and employ a wide range of alternative management strategies? And do they adequately give expression to different regional and extra-regional interests both within and outside of government? These questions are associated with various aspects of the decision process.

Identification of problems: Resource management problems often transcend the functions of single agencies. Problems have to be recognized before they can be acted on. This includes an awareness of and response to externalities imposed

upon other interests. It is necessary for resource managers to take account of numerous water-land interrelationships. The relationships between such aspects as water quality, marine life and wildlife, land use, regional development and community objectives imply a need to identify the spillover effects or externalities created by particular courses of action. A major criterion then, is the institutional recognition and internalization of externalities.

Evaluation of alternatives: A major objective in resource management is to expand the range of choice in the application of management strategies (White, 1962). Once the dimensions of a problem are identified, resource managers require an ability or means to evaluate a wide range of bio-physical and social impacts related to alternative strategies of management. This necessitates adequate information and technical resources to fully analyze alternatives. It suggests the presence of personnel to undertake the necessary research or access to and use of individuals and organizations which offer such assistance. A critical factor, thus, is the availability of information and technical resources to evaluate alternatives.

Involvement of participants: The application of a selected course of action requires a degree of support and legitimization from a variety of interests. It is essential that resource use policies accurately reflect social goals, as generally expressed through a myriad of groups, organizations and political

processes. This implies coordination between government agencies and efforts to include public representation. Hence, an important criterion is the opportunity for all affected groups to participate in the decision process.

In order to evaluate the institutional structure in coastal areas, four estuaries on the east coast of Vancouver Island were selected for study. Each of the study areas have recently experienced conflict over resource use. Information was collected through government and consultant reports and newspaper articles related to the issues at the study areas. Interviews were undertaken with fourteen government officials involved in estuarine management. The interviews provided insights into the decision process which could not be easily reflected in more structured methods such as questionnaires.

Chapter II presents a review of the "coastal zone management" literature and identifies the critical role of institutional constraints upon resource managers. It suggests that there is a need not only for increased attention to biophysical values in the coastal zone but also to the framework in which decisions are formulated and resources allocated. The wide range of actors and intensity of resource use demands places new challenges upon the institutional structure. The implication is that the institutional structure constrains the range of problems, alternatives and participants considered in coastal resource management.

Chapter III describes the nature of the estuarine environment, the management problem and the institutional

areas and their related problems. Chapter V in turn, analyzes the decision processes in the study areas in terms of various criteria. Chapter VI presents conclusions of this analysis and implications for institutional change.

CHAPTER II

RESOURCE PLANNING AND MANAGEMENT IN THE COASTAL ZONE

Many of the problems of environmental deterioration and conflict at the coast are a result of failures in resource allocation. The function of both the private market and government are important to understanding these inadequacies. In the coastal resource management literature, a number of elements can be identified which assist in defining the challenges.

Inadequacies in Resource Allocation

Efficiency and Equity

Competitive markets guide private property into uses demanded by consumers. In a perfectly competitive market, maximum social welfare in the allocation of resources is based upon an efficient tradeoff between competing demands. Efficiency, or "pareto optimality," implies that resources will be distributed up to the point where the additional benefits obtained from one use equals the alternative benefits foregone from another use. In this situation, it is not possible to make any individual better off without making any other individual worse off. An efficient utilization of the shoreline

for industry and recreation, for example, would occur where the shore is fully utilized so as to maximize benefits from the combination of these activities. The exact tradeoff that society makes, however, between recreation and industry, is dependent upon the rate at which it is willing to substitute one use for the other. The tradeoff between these activities is a function of the values placed upon the shore for each of these activities. The major difficulty lies in determining these values to resource consumers.

Maximizing social welfare in the use of resources requires a consideration of the equitable distribution of benefits from resource use. There can be an infinite number of optimum social welfares corresponding to different perceptions of what makes up an equitable distribution of resources. The notion of social balance or equity, as Ducsik (1974, p. 60) notes, tends to make the analysis of optimality vague and imprecise since values are difficult to aggregate and fairness is a matter of subjective judgement. In addition, the ideal operation of the private market economy is distorted by the fact that not all goods, especially natural resources, are privately owned or possess identifiable owners; this contributes to the presence of "externalities" where the inputs and outputs of individuals or firms fail to exist independently.

Common Property Resources and Externalities

Property rights lie at the centre of many environmental problems. Ownership of property is in fact more accurately

described as a set of rights associated with an asset. It is rights, never objects, that are owned and these rights can be limited by law, particularly if the enactment of rights has harmful effects on others (Dales, 1968a, 1968b). Natural resource property rights are often held in common by everybody. Resources owned in common, however, are more prone to misuse and overuse since everybody's property is nobody's property. Difficulties arise from the market conception of common property as a free good. Problems such as overfishing (Gordon, 1954) and oil pollution (Ross, 1973), for example, originate in the resource user's economic relationship with a common property resource and result in the presence of "externalities."

Externalities are the effects of an action by one party upon an outside party, not directly involved in the action. When these effects result in diseconomies or costs to innocent parties, the market system fails to allocate resources with maximum efficiency (Seneca & Taussig, 1974). The efficiency of a competitive market depends on the identity of private costs and social costs. These two costs diverge when the market fails to convey the harmful effects created by one party and imposed upon others. To correct this misallocation of resources, it is necessary to internalize externalities within the user's decision making process, either by government regulation, economic inducement or political process.

Resource use conflict often originates in externalities. Harrison (1973) suggests conflict arises when an affected party is unwilling to appropriate the effect, and the generator of the externality is unwilling to alter the cause. Conflict then is essentially tied to property rights (Castle & Rettig, 1972). One approach for removing externalities is to provide an incentive to internalize externalities by establishing prices (such as pollution charges) which reflect the social value of resources. Harlow (1974) argues that through this process, conflicts can be diverted from the political process to the market. The formation of private property rights to environmental resources ensures each resource user will account for the impact of his decisions or actions. But there are considerable difficulties in placing a true value on many environmental resources. Coomber and Biswas (1973, p. 7) note, for example, that imputing the market price of "intangibles" ultimately involves the subjective deliberation of the questionnaire-answering public and simulated bidding techniques and requires that comparable goods and services be found in the commercial world. Moreover, it is questionable whether a price system could identify all resource consumers and reflect the total social costs of alternative values foregone (Ducsik, 1974, p. 66). Ross (1973), for example, recognizes a lack of institutional incentives to internalize costs of oil pollution. As Seneca and Taussig (1974, Ch. 4) state, the market solution is not

feasible when externalities are pervasive and diffuse throughout society and not limited to well-defined parties and when the costs of organizing a market become prohibitive.

Origins of Conflict at the Coast

The private market is responsible for many inadequacies in coastal resource allocation. Market failure relates principally to the presence of common property resources and externalities (Warren et al., 1972; Bish et al., 1975). Most apparent is an undervaluation of public resource uses:

> Basically, the market will allocate too little of the coastline to recreational and other public uses because it does not reflect real preferences concerning collective goods, because they are subject to decreasing costs and because positive spillovers are not considered. The market will allocate too many resources to those uses with negative spillovers because the social costs of these spillovers are not considered (Devanney et al., 1970, p. 32).

Knetsch (1971) argues that these problems stem from a lack of economic incentives to guide resources to their best uses, from the perspective of society. Land prices "simply do not reflect the important values associated with fish, wildlife, recreation and outdoor amenities that would be lost with the alteration of these important landscapes" (Knetsch, 1971, p. 86). Hanson (1976) and Pope and Gosselink (1973), for example, outline the need for assigning a dollar value to the ecological (or "life support") work that a tidal marsh performs. In similar fashion, Devanney et al. (1970) and Hite and Laurent (1972) suggest

the evaluation of "willingness to pay" for resource use or preservation within cost-benefit studies at the coast. The major objective has been to recognize the social values attached to resources that are often unrepresented in the private market.

Ducsik (1972, 1974) describes the misallocation of coastal resources, noting that ecology, public recreation, and aesthetics have been unable to compete since markets in general do not exist for these "products." Yet even where surrogates can be found for market prices, an efficient allocation of resources does not ensure that it is also socially optimal. Ducsik suggests new allocative mechanisms to ensure greater efficiency and social balance in public policy. While many coastal planning programs in the United States have been instituted to serve environmental protection and economic development, there is a particular need, as Dickert and Sorensen (1974) note, to incorporate the more arduous concept of social equity. In the case of San Francisco Bay, for example, Luken (1974) argues that income transfers must be accounted for when government interferes with the market. Parties adversely affected by individual actions or government regulatory powers must be compensated where benefits accrue to others.

Overcoming market failure depends upon an active government role in resource allocation. The public sector is best equipped to provide collective-consumption goods (such

as environmental quality) which are not readily packageable, divisible or generally provided by the market (Sproule-Jones, 1976). Where externalities exist among many individuals or groups, the decision making or bargaining costs of time, effort or money can prohibit an agreement to resolve conflict. Government representation is most needed where the individual lacks an effective incentive to enter into a cooperative agreement. The organizations employed to represent individuals and groups in society thus have an important role in providing public goods and reducing externalities.

The structure of government organization is an integral part of the process of political choice for it provides a means for the expression of social preferences, formulation of rules for resource use, and provision of public goods and services (Ostrom, 1975). Government agencies possess the capabilities and establish the decision making rules for the provision of public needs in response to different communities of interest. The nature of this institutional setting has an effect on the course of decision making. The decision process, for example, is influenced by the type and scope of problems, the function of resource agencies and their channels of communication to other agencies and the community at large. Formulating resource management policies and programs becomes even more complex in light of the diversity of social, economic and political processes in the coastal zone (Warren et al., 1972).

Resource use conflicts are associated with the behaviour of a multitude of organizations. In environments where problems are both complex and dynamic, the capacity of organizations to negotiate with others becomes strained, requiring new levels of coordination (Metcalfe, 1974). Many of the origins of conflict, therefore, lie in an understanding of the effects of the institutional setting on resource management decision making.

Some general conclusions arise from this review. First, many coastal problems originate because of unidentifiable property rights to resources. Second, externalities inhibit an efficient allocation of resources. Third, the process of resource allocation often avoids the important question of whether all individuals have an equitable opportunity to compete for society's resources. Fourth, the manner in which government agencies and the overall institutional structure influences resource allocation is important to resolving conflict in coastal areas. Some form of collective action is needed to cope with the interdependent nature of the resource problems. This implies a shift from single-use resource management to resource planning at a multiple-use scale (Devanney et al., 1970; Brahtz, 1972; Hite & Laurent, 1972). The political and institutional dimensions of this shift are critical to the improvement of coastal resource allocation.

Coastal Resource Management:
Concepts and Implications

The development of resource planning and management for the coastal zone reflects a need to resolve conflicting demands at the land-sea interface. In Britain, special planning for coastal areas is not a new phenomenon (Sheail, 1976). It focuses on such aspects as the impact of outdoor recreation (Heck, 1967; Tindall, 1967; Countryside Commission, 1970) and offshore oil production (Baldwin & Baldwin, 1975). In the United States, numerous coastal zone planning programs have been widely instituted to protect and preserve the coastal environment and to control development (Bradley & Armstrong, 1972; Zwicky & Clark, 1973). Increased awareness of the coastal environment in Canada has similarly encouraged a re-appraisal of coastal resource management (Johnston et al., 1975).

The concept of coastal resource management centres on the interrelationship between land and water uses and the need to approach them collectively. It recognizes the common property and multiple use characteristics of the coast. Although no compact body of theory exists, there are three principal elements which can provide a focus for analysis: resources, institutions and demands. These elements can be isolated to portray the challenges confronting coastal resource management.

Figure 1 identifies the role of each of these elements. It denotes interdependency among variables and the multiple levels of which resource management requires reform. Coastal resource management has developed from a recognition of the nature, significance and misuse of coastal resources (RESOURCES). This awareness has inspired the use of bio-physical principles in resource planning and management to mitigate the impact of human activities. Concurrently, observation of the institutional structure reveals numerous piecemeal jurisdictions and administrations, implying a need for more comprehensive resource planning (INSTITUTIONS). The objective is to internalize externalities within a single decision making system. But it is also recognized that there are tradeoffs to be made among multiple competing demands which reflect differences among and between local, regional and extra-regional interests (DEMANDS). These elements pose a significant challenge to the traditional resource management framework.

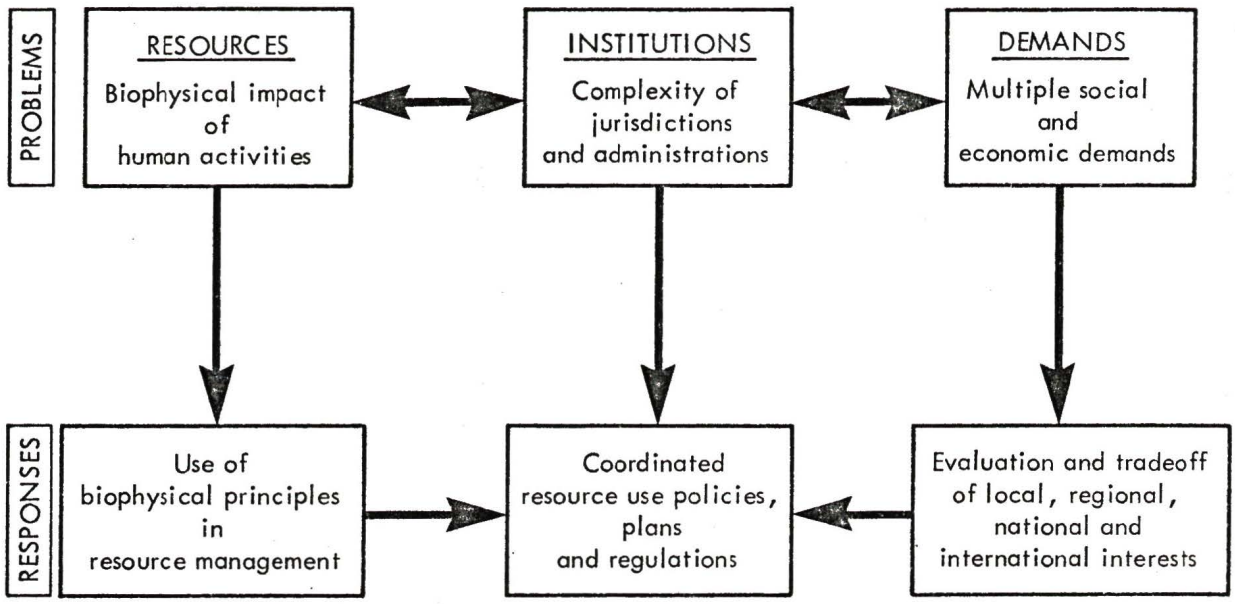
Resources

Much of the coastal resource management literature is concerned with the condition of coastal resources. Knowledge of bio-physical processes and their intrinsic value has provided a basis for resource use plans.

The coastal zone, as an interface of high biological productivity between oceanic and terrestrial environments,

FIGURE 1

COASTAL RESOURCE MANAGEMENT: SOME CONCEPTUAL ELEMENTS



provides a critical setting for human activities. The very nature of this interface environment or ecotone creates a variety and density of flora and fauna which is highly susceptible to alteration (Dolan et al., 1975). But the coast is also a particular focus of settlement. In British Columbia some 75% of the population lives in the Strait of Georgia basin (Barker, 1974).

There is considerable awareness of the changes resulting from human activities, although this relationship is often only crudely understood (Steers, 1966; COMSER, 1969; Niering, 1970; Ketchum, 1971, 1972; Pestrang, 1974).

Federal government studies in the United States have highlighted the condition of coastal areas. In 1962, the Outdoor Recreation Resources Review Commission reported that a mere 5-7% of recreational shoreline in the U.S. was in public ownership. Years later, the National Estuarine Pollution Study (1969) and the National Estuary Study (1970) brought attention to the destruction of estuarine areas. The reports of the Commission on Marine Science, Engineering and Resources (COMSER, 1969) identified the major coastal zone problems as (1) water pollution, (2) shoreline erosion, (3) shoreline damage from storms, (4) loss of wildlife and nutrient areas, (5) silting and shoaling, (6) eutrophication, and (7) proliferation of pests and unwanted species. This concern has stimulated a search for improved techniques to monitor and manage wastes in the coastal zone (National

Academy of Sciences, 1970). United States coastal legislation is also largely motivated by a new awareness of environmental degradation amidst increasing use conflict and development pressures (Bradley & Armstrong, 1972). The United Nations programme on Man and the Biosphere (UNESCO, 1974) has similarly recognized the critical nature of coastal zones, and has sought to investigate the ecological effects of human activities and conflicts in rexource utilization.

Concern over the management of coastal areas in Canada has generally been related to problems of water pollution, offshore oil and mineral exploration, estuary degradation, industrial and transport development, public access and non-resident ownership (Stewart & Dickie, 1971; Environment Canada, 1972 a & b; Brack, 1973; Romaine et al., 1976). Stewart & Dickie (1971), for example, suggest a need for integrative studies of such areas as the Strait of Georgia to better understand the relationship between human activities and biophysical processes. Similarly, the Special Estuary Series studies undertaken by Environment Canada provide ample evidence of resource deterioration and use conflict (Hoos & Packman, 1974; Bell & Kallman, 1976 a & b).

One of the principal conclusions of coastal resource literature is that proper management is dependent upon an understanding of biophysical processes. The approach advocated recognizes the integrative nature of coastal environments and the need to "translate appropriate physical and

biological laws and theories into managerial principles of general applicability" (Dolan et al., 1975, p. 1). It suggests a re-adjustment of institutions to facilitate these principles. Bio-physical characteristics therefore are offered as constraints to the formation of resource use policies and plans (Cooper, 1971; Spencer, 1972; Mann, 1972; Clark, 1974; Onuf & Murdoch, 1974).

McHarg (1969) has popularized this approach in an overlay methodology which classifies areas according to general levels of tolerance to human use. The Canada Land Inventory offers a similar tool to identify the "natural capability" of land to support various uses, although it tends to lack detail (Romaine & McCormack, 1972). Christensen (1973) describes a comparable methodology for evaluating a hydro-system and identifying critical areas for preservation. A more direct attempt to relate biophysical principles to coastal resource use is presented by Clark (1974). His book, Coastal Ecosystems, describes critical ecological processes and outlines general constraints to various uses with the goal of maintaining coastal ecosystems in their highest and best conditions. Bauer (1970) has also developed a procedure for identifying important geo-hydraulic and ecological processes in the marine environment as a basis to resource planning.

More intensive analysis of such processes can be sought through modelling of specific ecosystems. Environmental models, which describe the effect of inputs such as waste

residuals, can provide an important information base to management models, which rank alternative strategies according to given economic and social criteria (Russell, 1975). Some proposals have also attempted an integration of biophysical characteristics with user requirements and social objectives, although these tend to demand detailed knowledge of specific effects of various uses or to assume a given set of objectives (Spencer, 1972; Twiss & Sorenson, 1972; Nehman et al., 1975). They do, nevertheless, offer an indication of resource values and resource use constraints. Mackenzie (1974) and Peterman (1975) in particular, recognize a need to incorporate a wide range of biological, economic and social factors in fisheries management systems and to synthesize these so that managers can identify and choose among many alternatives.

Alongside research into resource characteristics and values, there has been reappraisal of the institutional framework necessary for coastal planning and management. This has occurred in direct response to a new awareness of coastal resource problems.

Institutions

The myriad of jurisdictions and administrations in coastal areas has generated much of the demand for coastal zone planning. The boundaries of local government are often considered too small to take account of the spillover effects

of their actions. Moreover, the spillover effects of one activity on another are engendered by the presence of common property resources. Eliminating these externalities, or internalizing them within the decision making process, requires coordination between decision makers. Individual decision makers and particularly local governments are often found to make parochial decisions (Devanney et al., 1970). In the United States, for example, the Stratton Commission (COMSER, 1969) stated that a state agency is required for coastal planning because the problems have outrun the capabilities of local government to plan their orderly development and to resolve conflicts:

> . . . the States must be the focus for responsibility and action in the coastal zone. The State is the central link joining the many participants, but in most cases, the States now lack adequate machinery for that task. An agency of the state is needed with sufficient planning and regulatory authority to manage coastal areas effectively and to resolve problems of competing uses (COMSER, 1969, p. 56).

The work of the Commission culminated in passage of the Coastal Zone Management Act (1972). The Act is a federal grant-in-aid measure which provides States with up to two-thirds of the cost of developing and administering coastal planning programs. The Act did not originate from any single concern but was motivated by a variety of interests related to recreation, estuary protection, ocean development and land use policy (Zile, 1974). This legislation was stimulated principally by the lack of adequate planning at the local

level and appears to have served as a forerunner to national land use policy. It is noteworthy, then, that coastal areas in the United States are also those areas where some of the most critical urban problems exist; the coastal setting simply accentuates the conflict between development and preservation.

In Canada, the coast is also managed by a complex jurisdictional structure. Federal and provincial legislation often overlap, creating an interdependence prominent in the coastal zone. With the federal government largely responsible for marine areas and the provincial governments largely responsible for land areas, the integration of resource management policies is essential (Thompson & Eddy, 1973). Thus, on both the Atlantic and Pacific coasts of Canada, there have been proposals for special institutional structures to transect jurisdictional and administrative boundaries (Albert & Harrison, 1974; Johnston et al., 1975; Farrow, 1975). These proposals reflect the growing demand for a comprehensive and integrated response to environmental deterioration at the coast.

Johnston et al. (1975) have analyzed the management framework in Atlantic Canada and propose a four-tiered approach to coastal planning in the region. They reject the concept of single-agency management but recognize the need for coordination among existing agencies. The first level of management involves the preservation of specific "critical" sites through the use of ecological reserves. The second

approach establishes a system of designating areas vulnerable with special protection where such protection cannot be provided under any one existing agency. Thirdly, a broad sub-regional management regime might be established composed of federal, provincial and municipal agencies which are responsible for a particular area. Finally, coastal problems which permeate the entire region could be handled through a Commission to provide a measure of comprehensive planning among governments.

In British Columbia, the particular problems of the Strait of Georgia apparently warrant comprehensive goals, policies and management programs (Stewart & Dickie, 1971; Nelson, 1973; Barker, 1974). Effective planning, Barker (1974) suggests, is hindered by the division of powers and limited coordination.

In essence, this coastal planning movement is based on the need for a comprehensive and more centralized approach to overcome uncoordinated management. Hite and Stepp (1971, p. vi) state:

> The tie that binds these diverse coastal areas together is the need to resolve the conflicts over the use of uniquely coastal resources through systems of rational, scientific management . . . the basic concern is with the creation of new, and the modification of existing, institutions within a political context.

Brahtz (1971, p. 3) argues that coastal planning " . . . implies a broadly conceived systems approach at all levels in the government hierarchy;" Gilbert & Robie (1971) see the

need for comprehensive estuary planning; the United Nations Economic and Social Council endorse integrated coastal area development (Baum, 1974); similarly, the Woods Hole Coastal Zone Workshop recommended national coastal zone policies.

There is considerable debate, however, as to the appropriate institutional structure for coastal planning and management. The planning challenge, it is argued, lies not so much in a lack of tools as in a lack of institutions necessary to adopt the comprehensive viewpoint (Sewell, 1975). There can be certain advantages to institutional complexity in reflecting a spectrum of alternative views and permitting greater channels to the decision making process (Warren et al., 1972; Harris, 1972, Moss, 1972). Sproule-Jones (1976) for example, argues that the federalist approach facilitates the signalling of citizen-consumer preferences, provides institutional means for internalizing negative interdependencies and distributing the costs of collective-consumption goods, and assists continual adaptation of government provision systems to competition. Russell and Kneese (1973) similarly offer political and technical justifications for doubting the desirability of centralized resource allocation. They suggest, however, mechanisms to facilitate the transfer of information to decision makers.

Principally, institutional reform must resolve inefficiencies in resource use and inequities in benefit

distribution that arise from existing institutional arrangements (Craine, 1971). The presence of multiple and conflicting demands provide a formidable setting for improving these institutional arrangements.

Demands

Within the coastal planning literature, relatively little attention has been given to the kinds of economic and social demands which exist at the coast and their associated processes of resource allocation. These demands are important to the design of institutional arrangements and planning programs for they establish the choices that must be made amongst resource values; the decision making and plan implementation context is influenced by the types of demands (activities) competing for resource use and the perceived values of these demands to community well-being. Differences in these demands amongst coastal communities must be reflected in the planning process.

In evaluating socio-economic aspects of coastal pollution, Yuen (1972) alludes to the need for information related to location needs of coastal activities and costs of pollution control. Questions of resource use are inherently tied to dynamic spatial processes. In coastal British Columbia, for instance, the demand for port facilities in the forest industry is related to changes in levels and techniques of production and technologies of transportation (Transport

Canada, 1973). Changing strategies of log handling (bundle booming, land storage) similarly affect the demand for estuary foreshore log booming.

One attempt to relate the physical environment to the socio-economic system of the coastal zone is presented by Hite and Laurent (1972), using an input-output framework developed by Isard (1968) and others (Emmett, 1975). By analyzing ecologic-economic linkages they describe the interdependence between economic activities and the physical environment, and thus provide an indication of the marginal effects of regional economic growth on environmental quality. In addition, they seek a measure of "willingness to pay" for environmental "goods" (quality) as a basis for valuing trade-offs between growth and environmental damage. The technique provides a systematic tool for ecologic-economic evaluation, although the authors recognize problems in considering equity and technological change and in obtaining specific and detailed information. In itself, however, the technique is simplistic because it assumes linear relationships between parameters such as industrial production and environmental damage, which do not realistically describe ecological processes (Emmett, 1975). Furthermore, it fails to reflect both the non-material effects of economic activity and the complex process of determining environmental quality objectives and translating them into resource use decisions. There is a need, therefore, to relate ecologic-economic models

to the larger resource management-decision making framework.

Warren et al. (1972) recognize the importance of dynamic social, economic and political processes in allocating coastal resources. They note:

> The formation of a comprehensive federal or even state-level coastal zone policy will not be a matter of simply deciding on rules to preserve marine ecosystems, since there must be choices made among environmental, social, and economic values. There will also be a need to ration or choose among the possible alternative uses of the resources and determine who will be able to use them (p. 213).

The problem of formulating policy for the coastal zone is, as Kissin (1971) and Rettig (1974) note, tied to complex bio-physical and socio-economic systems and requires considerable flexibility to account for changes in knowledge, technology, social values, population density and the physical environment. There may also be spatial diversity in these factors since coastal development is also associated with processes of regional economic growth and structural change (Harrison, 1973; UNESCO, 1974) and with various regional social characteristics. These regional factors are significant for they set the context in which choices are made amongst multiple resource uses.

Harrison (1973) has analyzed conflicts amongst urban coastal activities and found a relative shift from commercial to non-commercial activities and the conflicts generated by them. This increasing importance of non-commercial activities at the shoreline, which reflects economic growth and

transition, is also accompanied by an increase in the number and type of bargaining groups representing these activities and thus suggests a greater need for responsive policy making structures. Bish and colleagues (1975) also identify, in the case of Puget Sound, a trend from individual to collective decision making. They find that, although there is no consensus over the balance between development and preservation or the appropriate level of management, the scale of environmental politics has grown so that local communities are subject to outside intervention from government and public interest groups. Much of the conflict, then, is between local and regional or extra-regional demands over resource allocation. Different interests can reside at different spatial scales, and therefore, require that decision making incorporates a broad perspective.

In the case of Atlantic Canada, Dale (Johnston et al., 1975) argues that the economic and social problems of this region partially invalidate restrictions on industrial development. The policies to stimulate development in an underdeveloped region, on the one hand, can clash with policies to preserve environmental quality. Spatial variations in social and economic demands call into question the application of broad standards or policies for environmental protection. The political process therefore, establishes the choices open to resource managers.

Implications for Resource Planning

Theories of planning are rooted in the belief that comprehensive plans can provide an optimum resource allocation, with the assistance of some technical expertise. The application of normative concepts often implies a capability to design optimum plans. Social and political realities, however, have forced a recognition of planning as a process of conflict resolution amongst groups in society (Batty, 1974; Kitchen, 1974, Trist, 1974). In the coastal zone, the nature and intensity of resource use demands necessitates a broad yet flexible approach to the formulation of plans and management strategies. The diversity of local, regional, national and international interests hinders the ease at which biophysical principles might be applied (although conflict among demands also stimulates an awareness of such principles). Planning programs, therefore, must account for this complexity of demands if they are to be effective.

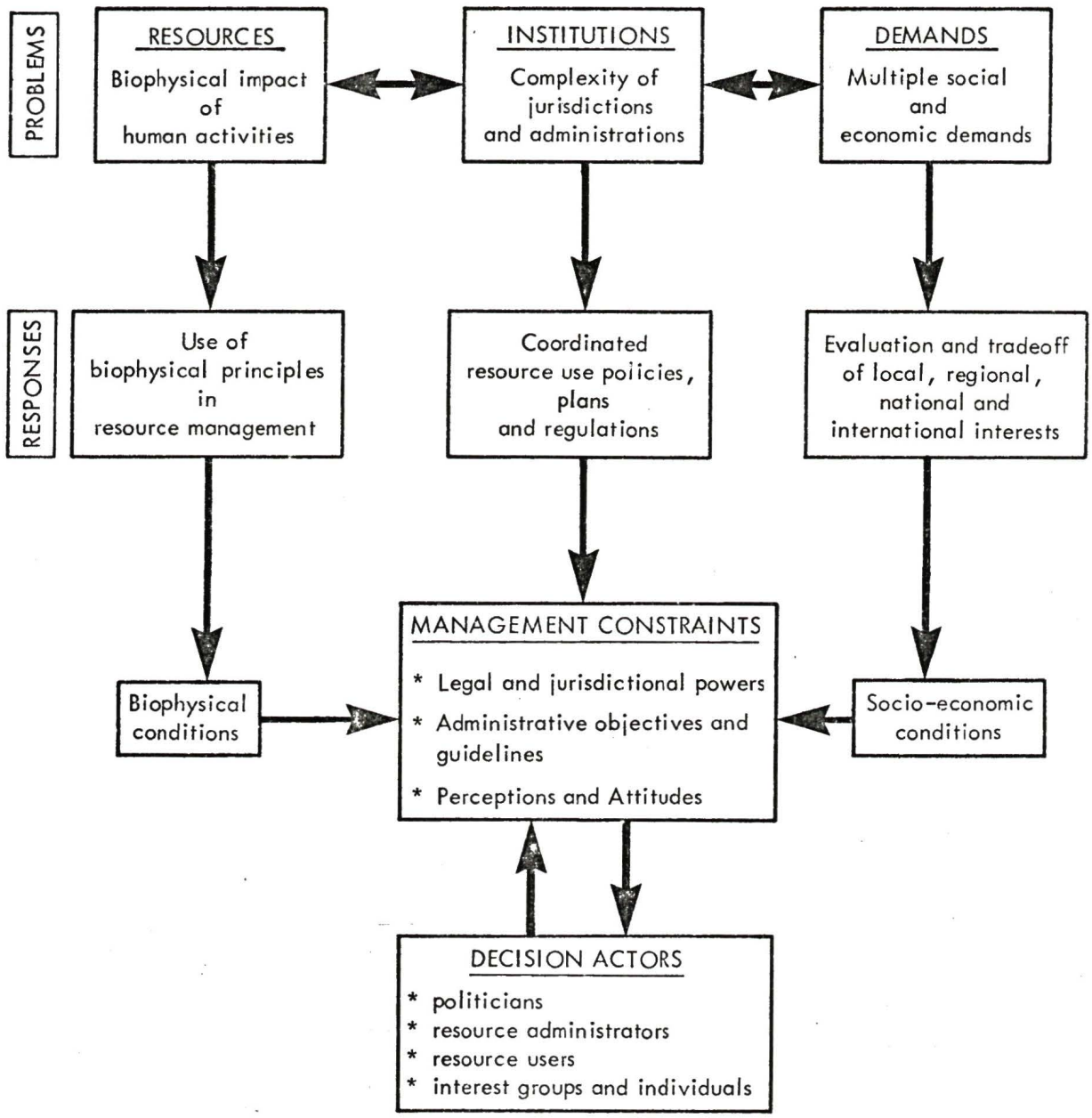
With a myriad of decision actors in the coastal zone, environmental quality as a problem of social choice is plagued with conflicting objectives and unidentifiable consumers which require representation in both a technical and political manner (Haefele, 1972). The result is often a form of "bargaining" among decision actors, where decisions are co-produced in a milieu which is subject to numerous influences. It implies a broad basis from which

resource management decisions and plans are formulated. Yet, as White (1969) has described, resource managers are often limited in the choice of decisions by a complexity of personal, social and organizational constraints. Such limitations can establish barriers to a wider decision making process. The institutional structure provides a critical framework for improving resource allocation.

Figure 2 suggests that the process of coping with biophysical and socio-economic inputs will be influenced by a number of broad management constraints. Where demands are intense and resources highly vulnerable to human modification, considerable stress can be imposed upon the institutional structure as the conflicts become more critical and traditional decision making processes increasingly obsolete. The need for multiple use and integrated resource management stimulates new ventures in broadening the scope of decision making. The particular way in which resource managers respond to problems, however, can be influenced by certain legal, political, organizational and personal constraints within the decision making units. Decisions, recommendations or proposals are acted upon by a larger decision making environment where they may be fed back, inducing a re-appraisal of resources, demands and management processes, until a negotiated decision is arrived at. The result can be a very dynamic setting, one in which the appropriate scale and tact of management is dependent upon the particular nature and behaviour of biophysical processes, affected individuals and

FIGURE 2

COASTAL RESOURCE MANAGEMENT CONCEPTUAL IMPLICATIONS



groups in society and agencies of government. Here it is possible to identify some factors which affect the capability to manage this setting.

Legal and jurisdictional powers define, albeit subject to interpretation and overlap, the responsibilities and duties of resource managers. MacNeill (1971) for example, recognizes that the jurisdictional setting can condition the selection of environmental management strategies. Environmental problems tend to be dominated by spillovers within a complex jurisdictional setting. Responsibility for the effects of these spillovers or the development of new problems is often never incorporated into the decision making process. In addition, punitive forms of legislation such as those used to protect water quality and fisheries habitat are largely based on threat of penalty and may well inhibit more long term planning.

Secondly, within the legislative and jurisdictional setting, administrative processes establish objectives, set guidelines and implement policies (which are often unwritten and based upon past experiences). Administrators are often given considerable scope to interpret and respond to legislation. The processes of decision making are also continually evolving as resource administrators respond to new problems and changing social values (Ingram, 1972). The need for environmental impact assessment and public participation, for example, has given rise to new decision making guidelines within government agencies in keeping with the political

culture (Sewell & O'Riordan, 1976). Similarly, the need for comprehensive management stimulates new referral systems. Bureaucratic change nevertheless, is often slow, disjointed and incremental (Barr, 1973). One may well question the extent to which government agencies have responded to new concepts of coastal resource management by establishing objectives and guidelines for decision making.

Thirdly, resource managers often have narrow perceptions of and attitudes towards problems and strategies of management in relation to their profession and function (Sewell, 1971). This may be especially significant where particular problems are new to an agency or where there is uncertainty about the appropriate management strategy.

In summary, it is stated that coastal resource management presents a number of particular challenges in protecting biophysical processes, coordinating institutions and accounting for increased demands of conflicting users. There are legal, administrative and personal characteristics critical to the management process. Figure 2 particularly reflects the need for information in the application of biophysical knowledge, for an institutional ability to manage externalities within one system, and for the means to represent a diversity of demands.

It is possible to evaluate aspects of this institutional structure through an analysis of performance in decision making. Some criteria have previously been suggested (Chapter

1) relating to problem identification, alternatives evaluation and participant involvement. These can be used to assess institutional problems in estuarine management for they reflect some of the challenges confronting resource managers in the coastal zone. It can be hypothesized that the institutional structure constrains the ability to internalize externalities, employ adequate information and technical resources and provide opportunities to participate in decision making. In testing this hypothesis, the analysis seeks to indicate the presence or absence of (a) institutional incentives for resource administrators to consider interdependencies, (b) information and expertise useful to evaluating alternatives and (c) channels of communication to the decision process for all groups in society.

Chapter III describes the nature of the estuarine environment, the management problem and the scope of the institutional setting.

CHAPTER III

ESTUARIES AND THE INSTITUTIONAL CONTEXT IN BRITISH COLUMBIA

> Who is responsible by legislation for wetlands? I think you will find this a wooly area indeed. . . . At present there are no wetland management or development policies in any department of government. Yet there are a wealth of wetland management techniques which we can apply.[1]

There are an estimated 170 estuaries in British Columbia (Harris & Taylor, 1972). These areas provide a nutrient-rich environment for the development of marine life. They are particularly significant for the feeding, rearing and resting of salmon as they move between river and sea. In addition, they serve as important habitat for wildlife. Estuaries on Vancouver Island, for example, provide winter habitat for some 25% of the world population of trumpeter swans (Harris & Taylor, 1972). These estuarine bays, however, have also historically served as prime areas of human settlement. Conflict between human activities and the need to preserve important bio-physical conditions emphasizes the integrated nature of these areas and a particular

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[1] W.A. Benson, 1975, in Dept. of Agriculture, British Columbia, Interior and Coastal Wetlands of British Columbia, Victoria.

need for estuarine management.

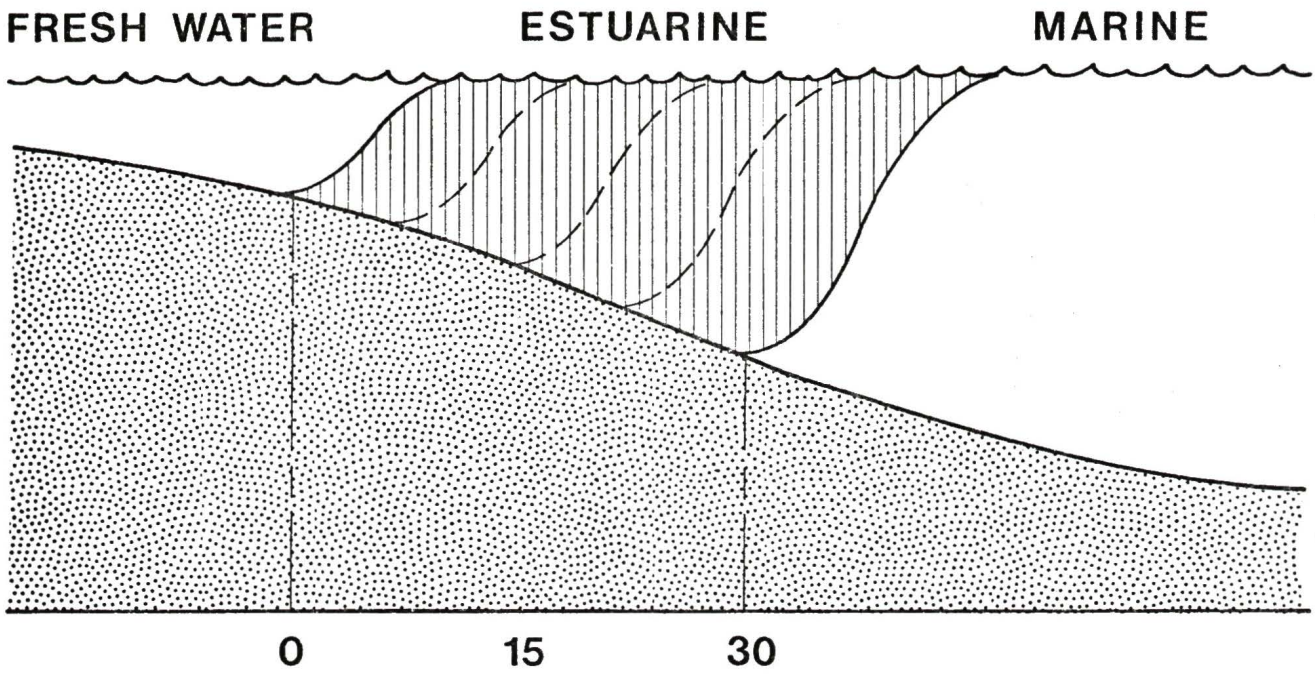
The Estuarine Environment

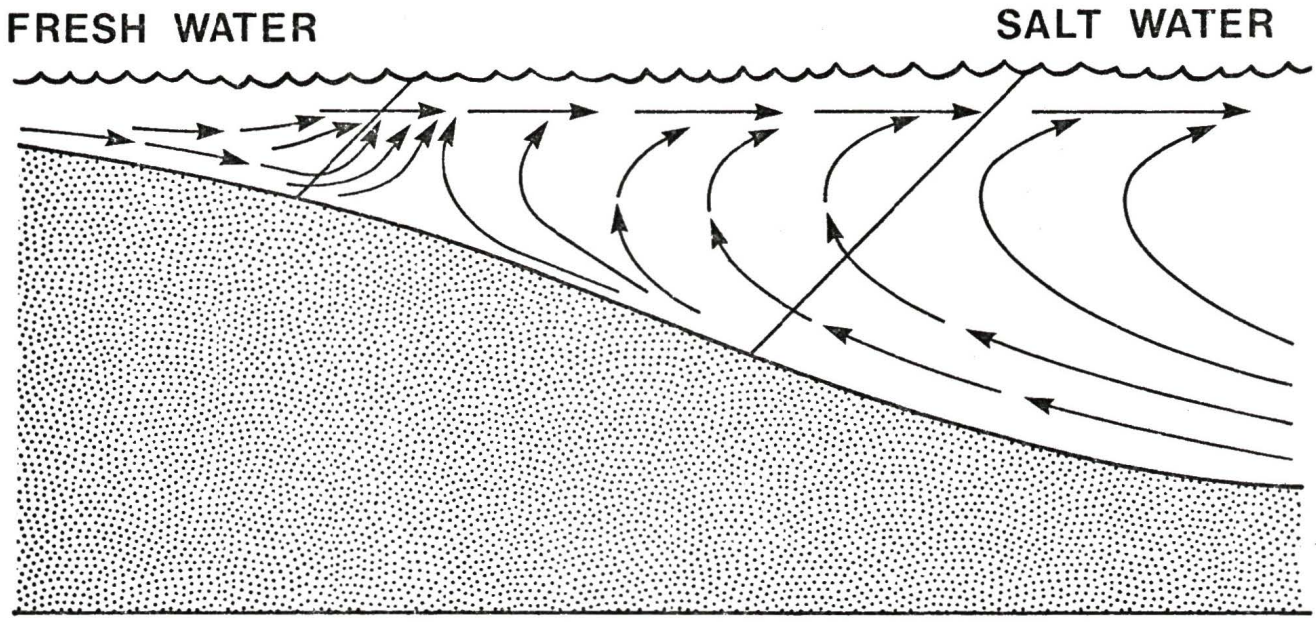
> An estuary is a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage (Pritchard, 1967).

Estuaries are highly dynamic and highly productive biological environments. The estuary is in fact part of a larger "estuarine zone" which is influenced by water from an estuary, including salt marshes, coastal and intertidal wetlands, bays, harbours, lagoons and inshore waters (Dzurik, 1973; Harries, 1973). The actual form of an estuarine zone is a compromise between land topography, run-off of water from land drainage, sediments deposited by rivers or by the sea, and sea level (McLusky, 1971, p. 6). Relationships between bio-physical processes throughout this environment are intensely symbiotic.

Salt and fresh water mixing takes place in the estuarine zone. The flow of fresh water and the greater density of salt water causes lower salinity close to the surface (Figure 3). This circulation pattern results in the outward transport of surface organisms and the inward transport of bottom organisms. An upwelling of nutrient-rich deep water replaces the outflowing fresh water. It is particularly conditioned by tides, fresh water run-off and winds, resulting in varying degrees of stratification of fresh and salt water. Continual flushing from sea water and fresh water

FIGURE 3 The Estuarine Zone of Transition





Source: Dzurik, 1973.

assists in transporting nutrients and providing biotic growth. As Brack (1973, p. 5) describes this function:

> Estuaries trap, recycle, and produce abundant nutrients. Subject to a complex interplay between river and marine waters, winds and currents, they play a crucial role in the production of organisms entering the food chains of the ocean and the neighbouring littoral.

Estuaries are amongst the most productive natural systems in terms of tonnage of organic matter. The biotic system is based on a food chain which transfers energy from "producers" (plants and phytoplankton) to "consumers" (zooplankton and benthos) to "foragers" (larger fish) to "predators" (birds and man) which feed on consumers and finally to "decomposers" (bacteria) which return dead matter (organic detritus) to nutrients (Clark, 1974). The nutrients produced by estuary grasses, for example, provide a food source for fish further out to sea and ultimately for man. These ecosystem linkages can extend throughout coastal water basins and their adjacent lands.

Many species of fish are resident in estuaries. This nutrient-rich environment serves as a critical rearing ground for young fish, particularly salmon. McHugh (1966) estimates that some 45% of the commercial fish catch in the North Pacific is of estuarine-dependent species. Many bird species also rely on estuarine areas for resident and migratory habitat.

The complex biological, chemical and physical

characteristics of estuarine areas results in a particularly productive environment, one which provides considerable social and economic value to society (Sweet, 1971). Many problems exist, however, in their protection and management.

The Estuarine Problem

Some of the greatest threats to estuaries in British Columbia arise from development proposals for dredging and filling, waste discharge, stream-bank logging and water transportation and storage of logs (Harris & Taylor, 1972; Barker, 1974). Many of the effects of these activities are described in the Special Estuary Series published by Environment Canada (Hoos & Packman, 1974; Bell & Kallman, 1976 a & b). The criteria which influence decisions affecting such activities in estuarine areas tend to be distributed among a broad range of institutions and resource managers.

It is often argued that effective planning and management in estuarine areas is inhibited by a complex institutional framework where responsibilities are held by a myriad of government agencies at the federal, provincial, regional and local levels. This complex decision-making environment creates significant problems for management. In the case of estuarine fisheries, McHugh (1966, p. 152) notes:

> Even when the necessary scientific knowledge exists, it is often impossible to apply this knowledge effectively because local traditions and laws prevent it. This is why none of our estuarine fishery resources is under successful management in the sense that North Pacific halibut and Bering Sea fur seals are under management.

Institutional constraints, as Karr and Wilfert (1971) suggest, in the form of laws, statutes, regulations, customs and political jurisdictions can inhibit the development of resource planning in estuarine areas. The challenge centres upon the extent to which the traditional management practices can evolve toward integrated concepts of resource management. In a study of water management in England and Wales, Barr (1973, pp. 10-11) describes these institutional problems:

> Although legislation provides some guidance as to which levels of government are responsible for particular aspects of water management, there always remains some uncertainty about responsibility for problems that are not specifically identified. In Britain, for example, it is not immediately clear what responsibilities the central government has for dealing with floods, droughts or estuarial and coastal pollution. This may well account for the fact that action on these matters in the past has been typically crisis-oriented rather than a matter of continuous planning and policy.

Barske et al. (1974, p. 176) describe similar institutional inadequacies:

> The coastal wetland zone is a gray zone as far as effective government control is concerned. Often there is no authority existing to set the ground rules, or the authority is too narrow and limited.

The concept of an integrated and comprehensive management framework for estuarine areas is often held to be necessary for the control of estuarine destruction and pollution (Gilbert & Robie, 1971; U.S. National Water Commission, 1973). A 1964 estuarine fisheries symposium, for example, called for new policies and new comprehensive planning programs for estuaries (Caulfield, 1966; Schmidt, 1966).

Planning methodologies have since developed seeking to integrate 'coastal zone science' with regional planning (Koppelman, 1974) and to coordinate different planning-management organizations as a 'strategic' and 'tactical' level (Klingeman, 1973). The latter, developed in Oregon, recommends adopting existing institutions to (1) a regional strategic planning level; (2) an intermediate tactical level of advance planning for individual estuaries; and (3) a local tactical level for specific planning and projects in individual estuaries. This multi-level approach is similar to that proposed for Atlantic Canada (Johnson et al., 1975).

In British Columbia, insitutional problems relate to the lack of comprehensive goals, policies and management programs in coastal and estuarine areas (Barker, 1974; Stewart & Dickie, 1971). It is implied that there are limitations in the ability of the institutional structure to provide for protection of estuarine resources, largely because of the traditional and divided responsibilities of government resource management agencies. As a consequence, special administrative bodies are often suggested to deal with resource use in estuarine areas (Steves, 1975; Farrow, 1974; Croft, 1974). Other criticisms include inadequate controls, the lack of any coastal "plan" and the need for legislation and whatever other measures are necessary for coordinated planning and preservation of estuaries (Hatter,

1973).[1]

A recent provincial conference on wetlands similarly recognized the need for inter-agency and inter-disciplinary management (B.C. Dept of Agriculture, 1975). It attempted to identify administrative conflict and recommended an inter-agency Provincial Wetlands Co-ordinating Committee to serve Regional Resource Management Committees and the Land Management Branch. Further challenges to the institutional structure are evident in the case of the Fraser River estuary. The Ecological Subcommittee for the Vancouver International Airport Planning Committee (Romaine et al., 1976) recommended a moratorium on further development until a comprehensive estuary/delta policy can be prepared through a joint federal-provincial-municipal planning program. Dorcey et al. (1976) also highlight the need to strengthen Regional District and other agency capabilities in managing water quality on the Lower Fraser River. Such is the task which confronts other estuarine areas as well.

The search for a planning and management framework in estuarine areas requires an understanding of how the institutional structure affects response to problems. It has been suggested in this and the previous chapter (Figure 2) that a

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[1] "Biologists Request Estuary Controls," Victoria Times, Dec. 7, 1972, p. 25; "Must Guard Estuaries," Victoria Times, Sept. 14, 1973, p. 7; "Moratorium Urged on Estuary Development," Vancouver Sun, Sept. 24, 1973, p. 12; "Save Estuaries & You Save People From Starving," Vancouver Sun, Jan. 4, 1975, p. 6; "Estuary Preservation Need Stressed," Victoria Times, Nov. 26, 1976, p. 21.

number of constraints will influence the management process. These constraints are likely to place limitations upon resource administrators in decision-making. The concern for resources, institutions and demands in the coastal zone implies a need to consider a broad range of problems, management strategies and participants.

As a basis for evaluating the effects of institutional constraints upon estuarine management, it is first necessary to define the scope of the institutional structure.

Estuarine Institutional Context

A cursory overview is presented here of the jurisdictional and administrative framework. It does not purport to explain the full range of institutional 'actors' but rather is intended to reflect the nature of the estuarine institutional environment in which the study is applied.

The Jurisdictional Setting

Estuarine areas, primarily because of their importance to fisheries, have significance to the international community. The recent declaration of a 200 mile coastal zone jurisdiction recognizes an interrelationship between fisheries and habitat and establishes a broad spatial level of management. Salmonid enhancement in the Puget Sound-Strait of Georgia basin for example, involves the issue of sharing of fishery stocks (Moos, 1976). Thus, organizations such as the International Pacific Salmon Commission and the Canada-United

States International Joint Commission are relied upon to represent international interests in fisheries and water resource management. Major jurisdiction nevertheless is at the national and provincial level.

The British North America Act (1867) and subsequent judicial interpretations establish the jurisdictional responsibilities of federal and provincial governments. The federal government has major control over marine areas with provincial governments largely responsible for land areas. In general, the federal government has jurisdiction over navigation, fisheries, international trade and commerce, federal harbours, seabed resources, offshore waters, Indian affairs, national parks, defence, federally-owned land, and inter-provincial, national and international concerns. The provinces have major ownership of public lands, forest, wildlife, inland water resources and generally all matters of a local or private nature in the province. Both levels of government have responsibility for agriculture and boundary and coastal waters as well as the power to legislate. Further, the provinces have delegated municipalities and Regional Districts with power over local matters.

Property rights are particularly intricate in coastal areas. The courts have declared the seabed of all harbours, bays, estuaries and inland waters, with the exception of federal public harbours and Crown Grants, to be under title to the province. All matters concerning navigation and

shipping in these waters, however, are in federal jurisdiction. The fisheries in such waters create added intricacy:

> . . . the provincial legislatures have jurisdiction over all proprietary and marketing aspects of fishing (granting of private rights to fish, determining the law of private fishing rights, processing and selling fish once caught, etc.), but that Parliament controls the regulatory aspects of fishing (determining fishing seasons, methods of fishing, conservation regulations, pollution measures, public fishing rights, etc.)(Gibson, 1970, p. 114).

The federal government has delegated some administrative functions to the Province. These relate mostly to the non-tidal sport fisheries. The Province has assumed jurisdictional responsibilities in some fisheries, those closely associated with "property" (e.g. oysters, clams and aquatic plants). Both governments have jurisdiction in the fish processing and fish inspection fields.

There are numerous areas of overlapping and conflicting jurisdiction. The provincial control over lands, waters and forests, for example, is influenced by the federal role in such aspects as regional development, fisheries, ports and airports. Conflict of interpretation can especially exist in federal responsibility for research and aspects of "national interest" and provincial responsibility for "matters of a merely local or private nature." The BNA Act also provides the federal government with residual powers to make laws for the "peace, order and good government of Canada" where clear jurisdiction does not already exist. Beyond proprietary rights, both governments have legislative

powers to make laws relating to property and civil rights (federal powers relate to providing national uniformity of these rights). Provincial responsibility for these rights, for example, permits them to enact fisheries legislation related to private property rights which exist in non-tidal waters. Thus, the valid law-making powers of each government are independent of ownership rights and permit them to affect resources owned by the other government.

Legislative powers themselves are subject to conflicting interpretations and application (Gibson, 1970). There are circumstances, for example, where the laws of one government are not applicable to activities carried on by or under the legislative control of another government. Further, the federal government has spending powers to make grants available for schemes falling under federal as well as provincial jurisdiction.

From the high water mark, the shoreline is often held in private ownership. An individual owning land adjacent to a body of water has common law riparian rights of reasonable access to and use of the water. These rights of (1) access to navigable waters, (2) ownership of natural accretions, and (3) to construction of dykes and protective embankments largely remain intact. Other riparian rights to (4) the flow of water undiminished in quality and quantity, (5) ownership to part of the bed of a stream or river, and (6) to the erection of floats, wharves and landings have reverted by

statute to the Province of British Columbia.

Complicating the jurisdictional and ownership setting in estuarine areas of British Columbia are a number of Crown Grants of land and water. The Esquimalt and Nanaimo Railway Grant on eastern Vancouver Island, for example, involved a series of grants (to the E & N Railway Company), the first being made in 1884. Much of the granted land included ownership to the beds of bodies of water and streams, navigable or otherwise, and rights to certain foreshore and coal underlying the sea (Taylor, 1975).

This complexity of rights and jurisdictions creates a serious problem of ensuring coordinated resource uses. At the federal level alone, some 67 statutes have been identified as being actually or potentially relevant to the coastal zone (Johnston et al., 1975). To fully define the jurisdictional structure it would be necessary to identify the scope of each relevant statute as well as the decisions of the courts and administrative tribunals. Of more direct concern, however, is the way in which this legal framework is manifested in the administration of government. The scope of administrators involved in estuarine management can include a full range of government agencies and coordinating institutions depending upon the nature of the site and the problem. In the controversy surrounding Nanaimo harbour port development, for example, 13 federal and provincial agencies became involved, reflecting the complex decision making environment.

It is possible, nevertheless, to identify some of the principal agencies responsible for estuarine management.

The Administrative Framework

A range of government agencies and their associated management functions can be identified as indicative of the institutional structure in estuaries (Table 1). The scope of agencies involved varies with estuaries; in many estuaries, for example, Indian Councils and the federal Department of Indian Affairs may play a major role even though they are not principally responsible for estuarine resources. Similarly, in situations such as marine research activities or serious threat to fishery stocks, the international community might become involved. This set therefore does not include all possible resource administrators but is believed to reflect some of the administrative complexity of estuarine management.

Federal

Department of Environment. Three Environment Canada agencies are primarily responsible for coastal resource management: Fisheries & Marine, Environmental Protection, and Environmental Management Services. Fisheries and Marine Service is composed of Fisheries Management and Ocean and Aquatic Affairs. While the latter has research, investigatory and data collection functions, Fisheries Management duties include "the management of the fishery, an assignment

TABLE 1: ADMINISTRATION OF ESTUARINE MANAGEMENT IN BRITISH COLUMBIA

Major Agencies	Enabling Statutes	Principal Functions
FEDERAL		
Dept. of Environment		
Fisheries & Marine Service	Fisheries Act, 1970	Protection of fisheries and aquatic habitat
		Fisheries enhancement expenditures
		Regulation of fishing in tidal waters
Environmental Protection Service	Ocean Dumping Control Act, 1975	Discharge permit
Lands Directorate		
Canadian Wildlife Service	Canada Wildlife Act, 1973	Purchase of reserves; research
	Migratory Birds Convention Act, 1948	Regulatory protection of migratory waterfowl
Inland Waters Branch	Candad Water Act, 1970	Federal-provincial water management agreement
		Regulatory protection of "water quality manage. area"
Ministry of Transport		
Marine Services	Navigable Waters Protection Act, 1969	Regulatory protection of navigation
	Canada Shipping Act, 1971	Regulation of cargo or fuel discharge from ships
National Harbours Board	National Harbours Board Act, 1963	Establishment and powers of Harbour Commissions
Dept. of Public Works	Public Works Act, 1960	Construction of works and maintenance of navigable waterways
PROVINCIAL		
Ministry of Environment		
Land Management Branch	Land Act, 1970	Crown land and foreshore lease, grant and reserve
	Ecological Reserves Act, 1971	Establishment of ecological reserves
Water Rights Branch	Water Act, 1960	Water use license
	Drainage, Dyking & Development Act, 1948	Construction and management of water works
Pollution Control Branch	Pollution Control Act, 1967	Waste discharge permit
Water Investigations Branch	Land Registry Act, 1971	Floodplain development regulations
Ministry of Recreation & Conservation		
Marine Resources Branch	Fisheries Act, 1961	Fisheries enhancement expenditures
	Fish Inspection Act, 1969	Licensing of fish and aquatic plant processors
Fish & Wildlife Branch	Wildlife Act, 1966	Regulation of hunting, trapping and guiding
	Fisheries Act, 1960	Regulation of non-tidal sport fishing
		Enforcement of fish protective devices
Parks Branch	Park Act, 1965	Provincial parks and recreation areas
Ministry of Agriculture		
Land Commission	Land Commission Act, 1973	Agricultural land reserves
	Greenbelt Protection Fund Act, 1972	Purchase of greenbelt reserves
Ministry of Highways	Riverbank Protection Act, 1960	Construction of protection works
Environment & Land Use Committee	Environment & Land Use Act, 1971	Coordination and conflict resolution
B.C. Harbours Board	B.C. Harbours Board Act, 1967	Assistance in harbour development
Regional Districts	Municipal Act, 1960	Regional plans
		Zoning bylaws and land use contract
	Regional Parks Act, 1965	Regional parks
Municipalities (incorporated areas)	Municipal Act, 1960	Community plans
		Zoning bylaws and land use contract

that entails not only the development and enforcement of quota systems, but also the creation of policies that determine the structure of the industry itself" (Johnston et al., 1975, p. 62). The major enabling legislation is the Fisheries Act which permits prosecution where actions are deleterious to fisheries, as well as a variety of other fisheries management tasks. The Environmental Protection Service is generally concerned with water and air pollution problems and particularly the control of effluent, ecological protection investigation, shellfish sanitation control and contingency planning for pollution emergencies. Environmental Management includes Canadian Forestry Service, Lands Directorate, Canadian Wildlife Service and Inland Waters Directorate.

The Lands Directorate has focussed on land capability and other land use studies, often related to shoreland. The Canadian Wildlife Service, under powers of the Canada Wildlife Act and Migratory Birds Convention Act, is responsible for the protection of wildlife and their habitat. They have been particularly involved in assessment of waterfowl population and habitat conditions in estuarine areas. Inland Waters is involved in estuarine management through administration of the Canada Water Act and the collection and dissemination of data on the quality of inland, estuarine and coastal waters. All Environment Canada agencies partake in the environmental impact assessment process.

Ministry of Transport. The Ministry of Transport has direct control over navigation and pilotage regulations, lighthouses, buoys and beacons, the declaration and regulation of public harbours and the control of shipborne pollution. The Marine Administration of Transport Canada includes Marine Services, which is responsible for pilotage, navigation and safety, and the National Harbours Board which oversees management of designated public harbours. Federal harbors in British Columbia include Vancouver, New Westminster, Victoria, Esquimalt, Port Alberni, Nanaimo and Prince Rupert, four of which are located on major estuaries. The National Harbours Board and the local commissions are responsible for the development and operation of port facilities in these harbours.

A new port management structure and Canada Port Act is proposed to provide greater port planning and improved liaison between federal and local port managers (Transport Canada, 1976).

Provincial

Ministry of Environment: Lands Service. The Lands Service, under the Land Act, is responsible for the administration of Crown Lands. Their responsibility actually encompasses only 30-40% of Crown Lands, the remainder being administered by other provincial agencies (Crook, 1975). The Lands Service jurisdiction includes the administration of foreshore water lots. The Land Management Branch within

the Serviceis authorized to lease, sell and grant Crown Lands, to issue utility and railway right-of-way easements and to reserve Crown Lands for a variety of purposes. The Lands Service also has responsibility for the Ecological Reserves Act, which permits the preservation of areas of significant natural features.

Water Resources Service. The management of water resources under this service is divided among three branches: Water Rights, Water Investigations and Pollution Control. The Water Rights Branch administers the control and use of surface water under the authority of the Water Act. It is responsible for issuing water licenses, supervising improvement districts for irrigation, waterworks, drainage, dyking and administering water utilities under the provisions of the Drainage, Dyking and Development Act, Water Utilities Act and Energy Act. The Pollution Control Branch principally administers the Pollution Control Act, which requires permit approval of all major discharges of liquid, solid and gaseous wastes. The Branch is also charged with establishing environmental quality standards for the discharge of wastes and assisting the Pollution Control Board in setting objectives and processing appeals. The Water Investigations Branch serves the evaluation, control, planning and management of water resources where these do not directly come under the administration of the Water Act or the Pollution Control Act. It is largely involved in hydrologic studies, floodplain and flood-hazard surveys and mapping, environmental studies

and processing and supervision of water projects. In particular, floodplain management is pursued through the application of flood-proofing regulations. The Land Registry Act requires all subdivisions in floodplain areas to obtain Water Resource Service approval.

Ministry of Recreation and Conservation: Fish and Wildlife Branch. The Fish and Wildlife Branch is charged with protecting and enhancing all fish and wildlife and their habitat within provincial jurisdiction. The Wildlife Act and Fisheries Act provide the major enabling legislation. Through a system of licenses and regulations, the Branch manages sport fishing and hunting. It also controls the activities of trappers, big game guides and commercial breeders of game birds and fish. Alongside this managerial capacity, the Fish and Wildlife Branch is active in providing advice to other government agencies with regard to the impact of development upon habitat.

Marine Resources Branch. The Marine Resources Branch operates in close liaison with Federal Fisheries and other government agencies to manage marine resources under provincial jurisdiction. The provincial Fisheries Act provides enabling legislation. Major responsibilities include inspection and licensing of fish processing plants and canneries, oyster growing areas, data collection and technical advice to commercial interests and government agencies.

Parks Branch. Estuarine areas can also be important for recreation and outdoor education. The Parks Branch is primarily responsible for recreation features of a provincial nature and assisting the development of Regional Parks.

Ministry of Municipal Affairs. The Ministry of Municipal Affairs provides advisory assistance to the Municipalities and Regional Districts in their planning and administrative functions. The Ministry also insures that local authorities comply with the requirements of the Municipal Act, providing guidelines for the preparation and implementation of by-laws, provision of services and the borrowing of funds. City, town, village and district municipalities have major responsibilities for land use planning (including surfaces of water). Zoning by-laws provide the principal tool for land use regulation, although Councils may designate development areas in which land use contracts can be entered into with land owners. In addition, these local governments partake in regional land use planning. There are 28 Regional Districts in the province which "coordinate the administration of services and undertake land use planning in the unorganized rural areas of the province" (Rees & Karlsen, 1972, p. 5). They are governed by Regional Boards composed of representatives from member municipalities and rural electoral areas. These Boards are authorized to prepare regional land use plans by which local representatives are required to abide. In unorganized areas of

the Regional Districts, Boards have the right, subject to approval from the Department of Municipal Affairs, to establish by-laws and enter into land use contracts.

Environment and Land Use Committee Secretariat. The Environment and Land Use Committee comprises the ministers responsible for resource departments (Environment, Forests, Mines and Petroleum Resources, Recreation and Conservation, Agriculture, Economic Development, Health, Highways, and Municipal Affairs). Under the Environment and Land Use Act, the committee has ultimate control over all provincial resource use. These powers, however, are used to coordinate departments and agencies and to provide a means of resolving critical conflicts and supervising large-scale problems and development programs affecting environment and land use. The Environment and Land Use Committee Secretariat provides technical expertise and coordination of inter-agency task forces. The Secretariat assists the conflict resolution process through both formal and informal channels of communication (Crook, 1975).

Other Government Agencies. There are numerous other government agencies which administer resource use in estuarine areas. The British Columbia Harbours Board, for example, was initially established (in 1967) to oversee development of Roberts Bank Superport at the mouth of the Fraser River. Although port management is under federal control, the Board exercises control over the 23.3 mile (37.5 km.)

to the port as well as considerable area of backshore adjacent to Roberts Bank. It has an important role in developing port facilities at Roberts Bank and other harbour areas of the province.

The Ministry of Agriculture also recognizes a role in managing estuarine areas. According to the Department, wetlands, including coastal estuarine areas, are important contributions to the production of agricultural products (Dept. of Agriculture, 1975). The development of agricultural lands through dyking or drainage schemes can significantly affect the conditions of these estuarine areas. The Land Commission also has significance through the preservation of prime agricultural lands and greenbelt lands around urban areas.

Similarly, the Ministry of Forests, can affect estuaries through their regulation of timber harvesting practices in watershed areas of British Columbia. Thus, the list of government participants in estuarine issues can extend throughout government service.

The setting for estuarine management thus encompasses a complexity of resource administrators. While it is often difficult to identify distinct estuarine boundaries, it is equally difficult to isolate an exact set of managers. This complex physical and human environment, the multiple levels of management and uncertainties over their interrelationships suggests major problems for the formulation of estuarine management strategies. The role of this setting will be explored through a number of cases.

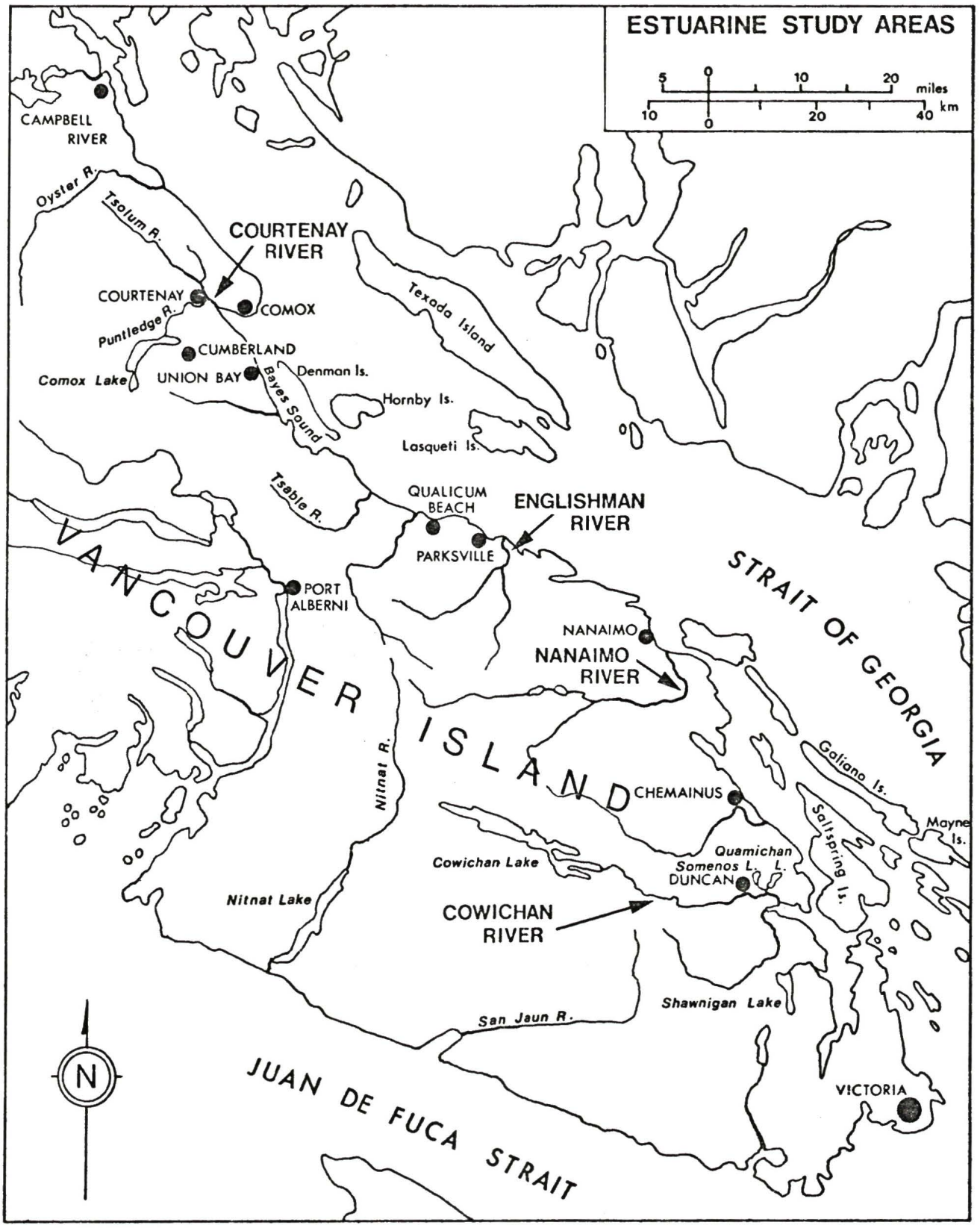
CHAPTER IV

ESTUARINE STUDY AREAS

Vancouver Island has a history of settlement based upon the exploitation of coal, forests and agricultural lands (Forrester, 1966). The topography of the Island and limited means of transport influenced the settlement of the south and mid-eastern coastline during the early years. The sheltered bays and estuaries provided areas for ship berthage and easily developable backshore. In more recent years, the estuarine areas have become important sites for forest processing and particularly for the sorting and storage of logs. The demand for shoreline residence and recreation has also placed significant pressures on these estuarine areas.

The estuarine areas associated with Cowichan River, Nanaimo River, Englishman River, and Courtenay River reflect some of the increased development pressures and threats being experienced on the east coast of Vancouver Island. These study areas (Figure 4) were selected for study because they have all recently been subject to resource use problems or conflicts. They reveal a growing public concern over the deterioration of estuarine areas. They also exemplify various local settings, with differences in rural and urban

FIGURE 4


ESTUARINE STUDY AREAS
5 0 10 20 miles
10 0 20 40 km
CAMPBELL RIVER
Oyster R.
Tsolum R.
COURTENAY RIVER
COURTENAY
COMOX
Puntledge R.
CUMBERLAND
Comox Lake
UNION BAY
Bayes Sound
Denman Is.
Hornby Is.
Texada Island
Lasqueti Is.
Tsable R.
QUALICUM BEACH
ENGLISHMAN RIVER
PARKSVILLE
PORT ALBERNI
VANCOUVER ISLAND
STRAIT OF GEORGIA
NANAIMO
NANAIMO RIVER
Nitnat R.
CHEMAINUS
Galiano Is.
Saltspring Is.
Mayne Is.
Quamichan L.
Somenos L.
DUNCAN
Cowichan Lake
Nitnat Lake
COWICHAN RIVER
Shawnigan Lake
San Jaun R.
N
JUAN DE FUCA STRAIT
VICTORIA

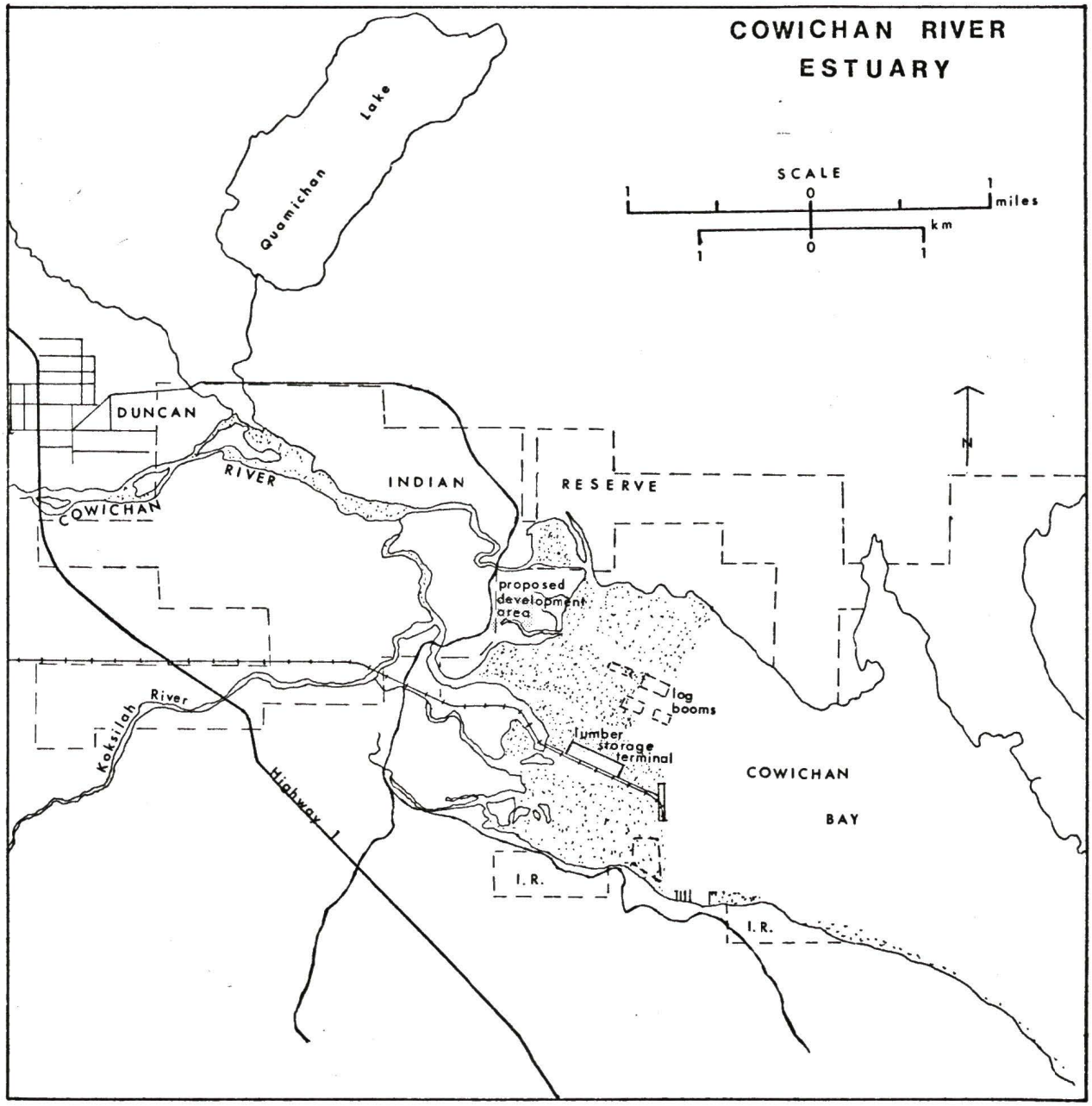
location and the nature of problems that arise. The issues at each of the four estuaries are outlined.

Cowichan River Estuary

The Cowichan River estuary is situated at the outlet of the Cowichan and Koksilah Rivers (Figure 5). These rivers are highly important on Vancouver Island because of the variety and abundance of salmonid species and their significance to commercial, recreational and Indian fisheries. The value of fish stocks for commercial and recreational uses has been estimated at $2.2 million and $2.4 million respectively (1973 prices) (Bell & Kallman, 1976, p. xxii). The estuary is also an important migrant waterfowl resting and overwintering area and supports intensive waterfowl hunting as well as other recreational activities. The intertidal portion of the estuary occupies about 480 hectares (1200 acres) and ranks as the seventh largest estuarine area in the province (Tretheway, 1974).

The development of the forest industry in the Cowichan Valley was assisted by the construction of the Esquimalt and Nanaimo Railway during the 1880s. In the 1920s, logging activities developed with Cowichan Bay as a major log booming ground. Expansion of the forest industry since 1960 has been responsible for the reclamation of 91 hectares (225 acres) of estuarine wetland (Bell & Kallman, 1976, p. 5). Only recently, however, have the effects of such activities

FIGURE 5


COWICHAN RIVER
ESTUARY
SCALE
1 0 1 miles
1 0 1 km
Quamichan Lake
DUNCAN
COWICHAN RIVER
INDIAN RESERVE
N
proposed development area
log booms
lumber storage terminal
Koksilah River
Highway 1
COWICHAN BAY
I.R.
I.R.

on marine life become recognized. Bark debris from log handling accumulates on the estuary bottom, smothering benthic life and creating a high biochemical oxygen demand (BOD). Such high BOD levels can limit biological populations due to oxygen depletion. Water-stored logs also release leachates, or soluble organic compounds which deplete the amount of dissolved oxygen.

The estuary and lower floodplain of Cowichan River have also been subject to periodic flooding. This has been partly a consequence of rapid development of the watershed and urban areas (Arnell, 1967). The City of Duncan, located 10 kilometres (6.2 miles) west of Cowichan Bay, has a population of about 4500, in addition to about half as many native Indians situated between the City and the Bay.

In early 1974, the B.C. Development Corporation proposed the assembly of 429 hectares (1060 acres) of land in Cowichan Bay for the development of industrial-port facilities. The Corporation, a provincial government agency, asked the Environment and Land Use Committee Secretariat (E.L.U.C.S.) to study the implications of the proposal.

Cowichan Bay has for a number of years been used for log storage, processing and transportation. In 1964, 2.9 hectares (7.1 acres) of the estuary intertidal zone was filled to provide an area for log and lumber handling. This was extended in 1967, adding 4.2 hectares (10.3 acres) of land fill. Most recently, 16.8 hectares (41.5 acres) was

filled for the construction of a sawmill and planer mill (Bell & Kallman, 1976, p. 138). With some 24 hectares (59 acres) already filled, and a previous proposal to develop a shake and shingle mill rejected in 1972,[1] further development faced considerable objection. The recognized importance of the Bay in terms of fishery, wildlife, recreation and residential values has thus affected the choices open to decision makers (Arnell, 1967)

In May 1974, the E.L.U.C. agreed that the Secretariat should coordinate a Task Force to consider the appropriate development of the Cowichan River estuary. The Task Force eventually included representatives from 13 government agencies. Four broad development alternatives were considered: recreation and agricultural dedication, status quo, limited industrial expansion and industrial-commerical dedication (Cowichan Estuary Task Force, 1974). The Task Force study found that the estuarine area possesses particularly high values of fisheries and wildlife resources. Industrial development would result in the serious loss of irreplaceable habitat for fisheries and wildlife and would damage the recreational and aesthetic environment. A companion study by the Canadian Wildlife Service noted relatively large populations of waterfowl using the area for wintering or migratory habitat and considerable potential for waterfowl and upland

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[1] Victoria Times, October 28, 1972, p. 18.

[2] Vancouver Sun, August 12, 1972,

game bird production (Tretheway, 1974). The report ranked recreation and agricultural dedication as most desirable.

The submission of the Cowichan Estuary Task Force report resulted in a decision by the E.L.U.C. to reject the proposal and maintain the status quo.[1]

Subsequent to the Task Force report, the Regional District of Cowichan Valley completed a community land use plan for Cowichan Bay (Urban Programme Planners, 1975). With objectives "to preserve the rural and marine setting" and "to protect the estuary of the Koksilah and Cowichan Rivers from damage," the plan proposed an agricultural and recreational designation. The wetlands, it noted, should be encompassed in a "wildland" designation; "present industrial uses on the estuary are not suitable, and every avenue towards phasing them out should be pursued" (Urban Programme Planners, 1975, p. 40).

In addition, questions of floodplain protection were found to have an important bearing on the estuarine area. The Water Investigations Branch in 1967 had proposed a system of dykes set back from each of the two rivers that would protect existing developments and agricultural lands. Although there is general agreement of the scheme in principle, the Federal Fisheries Service, Canadian Wildlife Service, and the Provincial Fish and Wildlife Branch prefer a much broader

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[1] Vancouver Sun, November 27, 1974.

floodplain to preserve the natural estuarine conditions.

The original industrial proposal was eventually withdrawn by the B.C. Development Corporation. An existing industrial site changed ownership during the preparation of the Task Force report and the report provided a basis for defining the conditions under which the site was to be used.

The problems at Cowichan Bay reflect the need to re-evaluate the historical location of industries, in the face of changing values associated with estuarine use. It also implies a need to employ a regional perspective in determining the optimum location for industry in coastal areas.

Nanaimo River Estuary

The Nanaimo River estuary is the largest estuary on Vancouver Island, with an intertidal area of about 820 hectares (2,000 acres). It provides major habitat for Pacific salmon, migratory trout, herring, shellfish, crab and a variety of other marine life. Much of the local commercial and sport fishing is dependent upon the estuary and its river tributaries. The estuary is also a critical feeding, resting and marshalling area for resident and migratory birds (Bell & Kallman, 1975b).

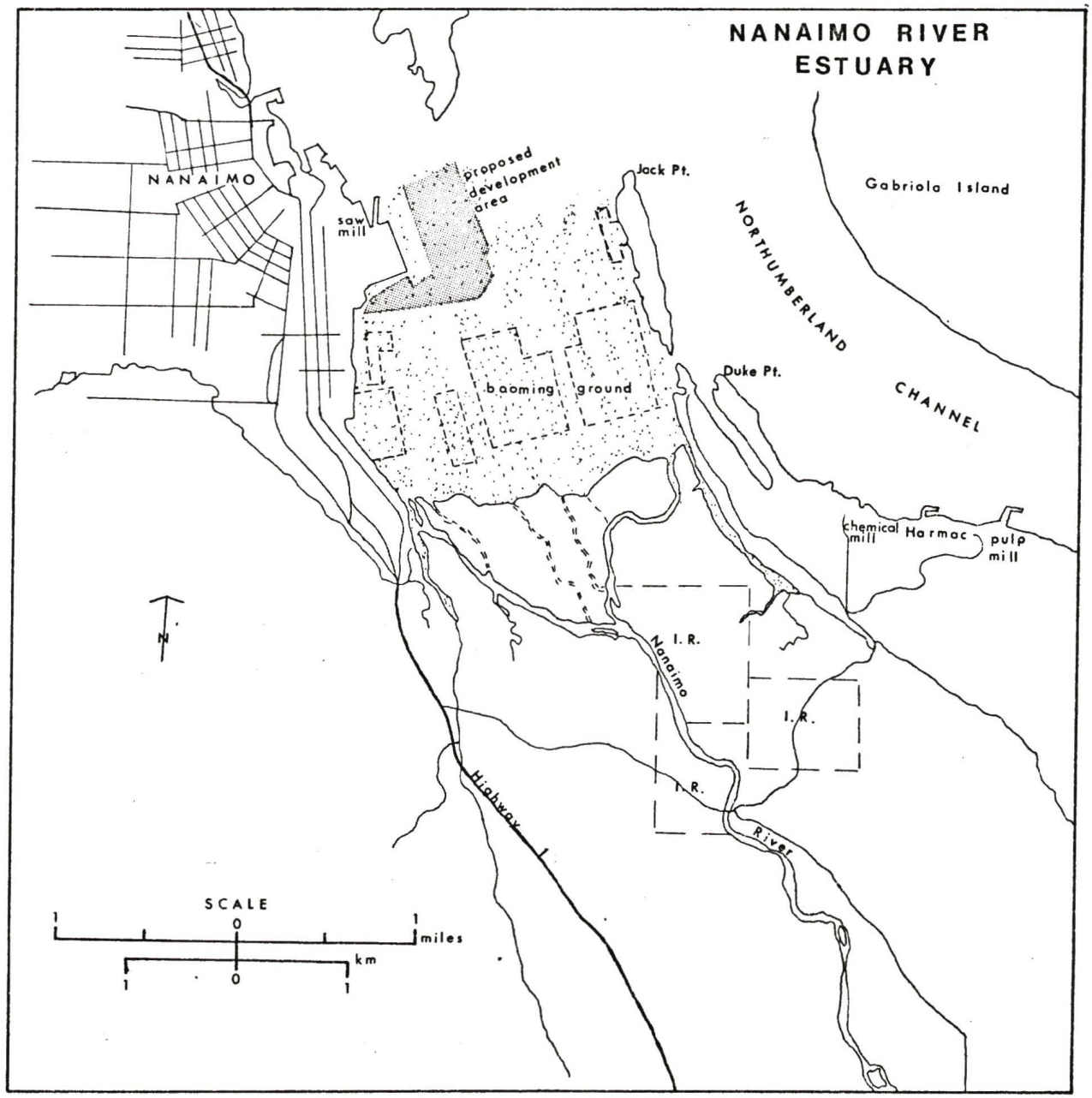
Nanaimo is a community of some 42,000 people situated at the mouth of the Nanaimo and Chase Rivers. It is also a major port on the east coast of Vancouver Island, loading over one million tons of forest products annually. The city

has had a long history of industrial development, beginning with coal mining and evolving to forest products processing. Waterfront use is dominated by port facilities managed by the Nanaimo Harbour Commission (Figure 6). The foreshore is used extensively for log storage, leases for which are administered by the same authority.

In February 1972, the Nanaimo Harbour Commission announced from Ottawa that federal loans had been granted for a major expansion of port facilities. The Commission proposed to construct an $8.7 million expansion of facilities including ship berths and industrial area on 67 hectares (165 acres) of reclaimed land. The forest industry agreed to construct processing plants to employ 425 persons. The proposal was immediately followed by criticism from public interest groups that the development was planned in secrecy.

Along with public interest groups the Advisory Planning Commission, which assists Council on planning matters, also complained of not being involved in the plans. In response, the Harbour Commission appointed an oceanographic consultant to study the effects of the proposed development upon the Nanaimo estuary. The environmental assessment undertaken for the Commission recommended reducing fill from 67 hectares (165 acres) to 60 hectares (148 acres) but stated that there would be no effect on fish if provision was made to divert existing channels. The proposed development was to cover 43% of the estuary but two deep channels would permit tidal exchange. The assessment report drew considerable public and

FIGURE 6


NANAIMO RIVER ESTUARY
NANAIMO
saw mill
proposed development area
Jack Pt.
Gabriola Island
NORTHUMBERLAND CHANNEL
Duke Pt.
booming ground
chemical mill
Harmac pulp mill
N
I. R.
Nanaimo
I. R.
I. R.
River
Highway 1
SCALE
1 0 1 miles
1 0 1 km

professional criticisms and led to subsequent reports from the consultant in defence of the proposed project.

Public interest groups were particularly effective in attracting public attention to the project and in criticizing the manner in which decision making was taking place. In particular, these groups gained credibility by soliciting the advice of biologists and other scientists on the environmental impact of the proposed project. The most significant effect was to create an awareness of the need to better predict the ecological, economic and social implications of the proposal.

The federal Department of Environment studied the potential effects of the project upon fisheries. A public meeting held by the Canadian Port and Harbour Planning Committee (the first such public meeting in Canada) received about 60 briefs from interested parties. They subsequently recommended engineering, ecological, urban and socio-economic impact studies prior to a decision. These studies were undertaken by various government agencies. They eventually recommended rejection of the Inner Harbour site for the port porposal, and Duke Point on nearby Northumberland Channel came to be accepted as the most favourable site.

In 1974, the Nanaimo Harbour Commission abandoned the Inner Harbour port proposal and submitted a plan to construct the facilities at Duke Point. The original $8 million proposal had inflated to $26 million. Since then, economic

conditions have delayed construction of the project.

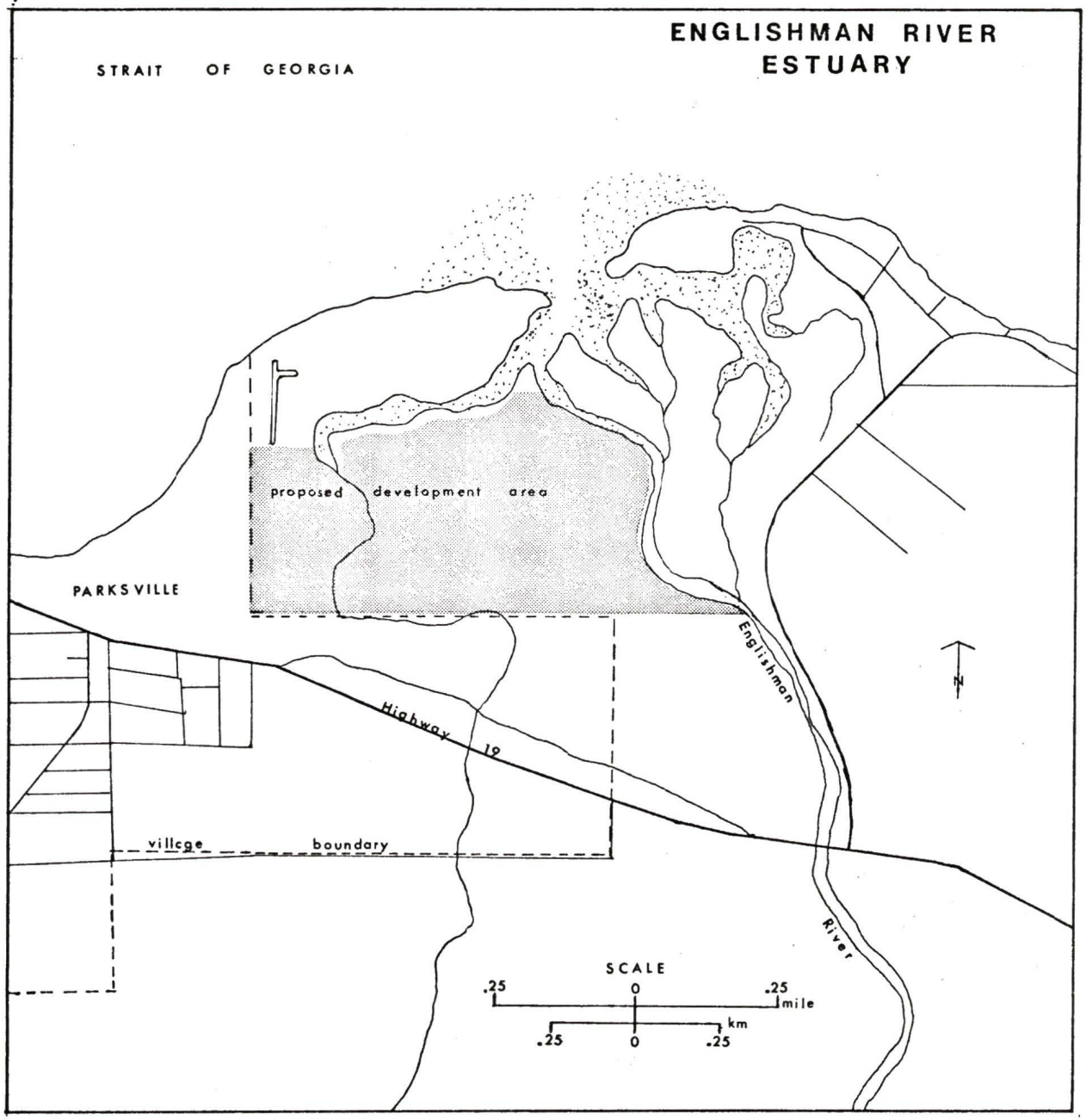
The conflict at Nanaimo estuary illustrates the extent to which local community interests and concerns are an integral aspect of port development and can play a critical role in environmental decision making. It also reveals a need to require adequate environmental assessment in conjunction with development proposals in estuarine areas.

Englishman River Estuary

The Englishman River enters the Strait of Georgia in a lowland marsh area adjacent to, but not included within the Village of Parksville (Figure 7). With a village population of 2200, the area has experienced significant pressures of residential development. The estuary itself is relatively small, encompassing about 40 hectares (100 acres) of intertidal and related zone.

The river and estuary are a popular recreational area, with runs of Pacific salmon and Steelhead trout. The size of these runs, however, has declined significantly in past years. Chum salmon for example, declined from a high of 35,000 in 1947 to about 500 in 1967 (TERA, 1975). Dyking and landfill has reduced the original intertidal area to about half its original size but the area is still of significance to a wide variety of wildlife species, especially waterfowl. Some 107 species of birds occur in the general area, including trumpeter swans (TERA, 1975).

FIGURE 7


ENGLISHMAN RIVER
ESTUARY
STRAIT OF GEORGIA
proposed development area
PARKSVILLE
Highway 19
village boundary
Englishman
River
N
SCALE
.25 0 .25 mile
.25 0 .25 km

A 87.5 hectare (216 acres) parcel of private property known as Parksville Flats is situated on the north-east side of the river estuary, bounded also by a municipal park and residential subdivision. The land is low and flat with most of it less than 1.5 metres (5 feet) above high water mark. A dyked slough drains through the largely open grassland property.

The property surrounding the Englishman River estuary has been destined for residential subdivision similar to adjacent properties. In January 1974, the Village of Parksville, supported by the Parksville-Qualicum Advisory Planning Commission, the Nanaimo Regional District and local conservation groups, requested provincial government purchase of the property as a greenbelt for wildlife sanctuary and recreation.[1] At the same time, owners of the property proposed to develop a residential-commercial complex on the southern part of the property, while preserving the ecologically sensitive and recreationally valuable areas. The strata-title development was proposed to include a hotel, convention centre, senior citizens accomodation, commercial centre and residential condominium. The owners engaged environmental consultants to ensure that the planned development would protect the natural features of the estuary (TERA, 1975).

In response to the proposed development on Parksville Flats, and to another larger proposed residential subdivision

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[1] Vancouver Sun, January 19, 1974.

five miles upstream, the Provincial Land Management Branch employed consultants to prepare an environmental and social assessment of the proposed developments. The consultants recommended that the most environmentally and socially desirable alternative was that the area be reserved for public recreation and/or conservation (Blood, 1976; Le Baron, 1976).

The Parksville Flats area lies within District 69 of the Nanaimo Regional District. As such, the proposed development is compatible with the community plan which seeks to concentrate development in the Parksville area. The site, however, is situated adjacent to the Village of Parksville and considerable effects would be expected from the development. Although the Village Council was on record as favouring preservation of the Flats, they did not provide a clear indication of the desirability of the proposed development. Council declined input to the social impact assessment on the grounds that the property is outside the Village boundaries.

Due to the opposition to the proposal, a land use contract has not yet been agreed upon by the Regional District and the developer. It is expected that a modified proposal will be presented.

Major issues arose from the Parksville Flats controversy. Both citizen and government personnel commented that legislation to protect waterways could have avoided such conflicts. The Nanaimo Regional District, for example, noted

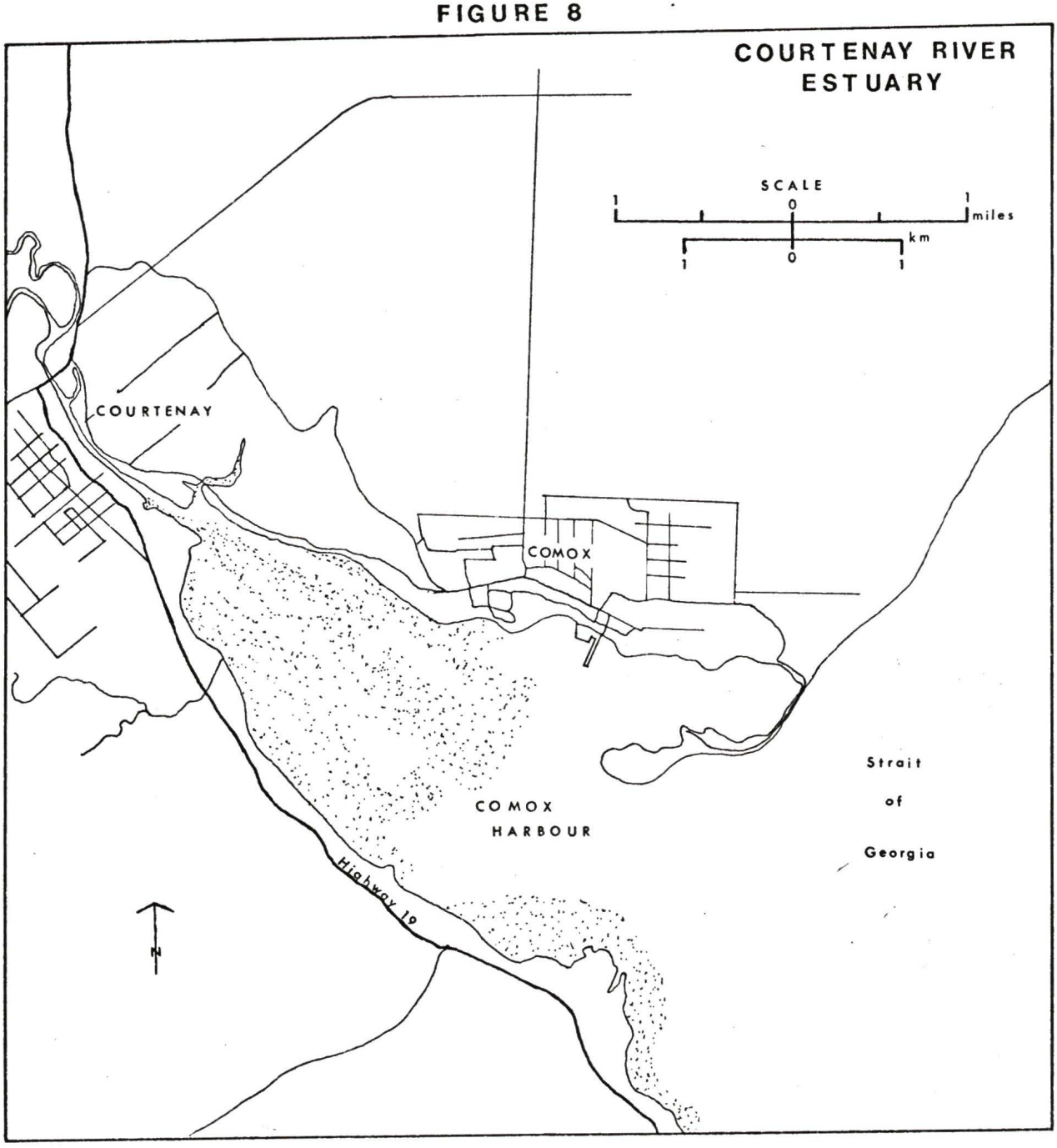
the inadequacy of subdivision regulation and land use contract in controlling floodplain development (LeBaron, 1976). The Regional District in 1974 requested an amendment to the Land Registry Act, requiring a greenbelt strip of one chain (20 metres) where a subdivision is proposed along any river or stream capable of supporting fish. Some assistance was provided when the Act was amended requiring all subdivisions in floodplain areas to obtain Provincial Water Resources Service approval. Estuarine areas in themselves, however, remain only indirectly protected from development.

The dispute over Englishman River estuary portrays the vulnerability of local areas to development pressures and the ease by which local by-laws can be challenged. It emphasizes a need to employ stronger forms of designation and to more fully recognize the role of an estuarine area in community plans.

Courtenay River Estuary

Comox harbour possesses a large estuarine zone at the mouth of the Courtenay River. It is bounded by the Town of Comox and City of Courtenay with a collective population of about 14,000 (Figure 8). Water pollution and destruction of fisheries habitat in the area have been related to these surrounding industrial and urban uses. Recent protective measures include acquisition of a 10 hectare (25 acres) Greenbelt site which provides habitat for various waterfowl

FIGURE 8


COURTENAY RIVER
ESTUARY
SCALE
1
0
1
miles
km
1
0
1
COURTENAY
COMOX
COMOX
HARBOUR
Strait
of
Georgia
Highway 19
N

(Comox-Strathcona Regional District, 1975).

The estuarine area has historically been utilized by the forest industry. In recent years, some 24 hectares (60 acres) have been used for log dumping and storage purposes (Task Force Committee, 1974). Upstream modifications to the Puntledge River which leads into Courtenay River estuary, have been associated with logging and hydro-power activities (B.C. Fish & Game Branch, 1962). The rivers nevertheless maintain a significant commercial and sport fishery, including salmon and steelhead.

During 1972, the local Health Officer requested the Federal Department of Environment to investigate bacteriological levels in harbour waters to determine whether they were acceptable for shellfish harvesting. The Department eventually discovered that the waters were unacceptable at some sites and during some periods. Subsequently, water quality management in Comox Bay came under criticism.

In June 1972, the Environment and Land Use Committee requested its Technical Committee of Deputy Ministers to undertake an environmental study of waters within and associated with Comox harbour. An inter-agency task force committee was organized, coordinated by the Water Resources Service. The committee sought to collect information related to (a) existing waste disposal practices and base line water quality, and (b) aspects of health, recreation, fish and wildlife, land use, forestry practices, agricultural operations

and use of chemicals (Task Force Committee, 1974). The final objective was to determine the nature and magnitude of existing environmental water quality problems and to relate these to acceptable future criteria for harbour water quality.

The report concluded that major effluent discharges were of a municipal and domestic nature and that waste disposal practices should be based on environmental effects. Although no indications of excessive algae growth or nutrient buildup were found, some coliform samples showed levels greater than those regarded as acceptable for shellfish harvesting. The report drew attention to the need for better sewage treatment but provided little leadership in initiating new programs.

These problems reflect a lack of integration of land and water management and the historical origins of estuarine pollution. They also emphasize the need to include social goals and community land use issues into the on-going estuarine management process. The institutional characteristics which influence decision making in these study areas will be analyzed in Chapter V.

CHAPTER V

EVALUATION OF INSTITUTIONAL PROBLEMS

The laws, policies and administrative agencies and procedures associated with estuarine areas establish the framework in which decisions are made. An analysis of decision making in the four study areas seeks to identify the role of this institutional structure. Three aspects of the decision process are analyzed: (1) problem identification and the ability to internalize externalities, (2) alternatives evaluation and the use of information and technical expertise, and (3) participant involvement and the opportunity to participate in decision making.

Problem Identification

Problems have to be perceived to be acted upon. The identification of estuarine problems and externalities generated will vary with the personal and institutional constructs of resource administrators and the course of decision making. This institutional setting can establish requirements or processes by which externalities are internalized by decision makers.

At Cowichan River estuary, the Environment and Land Use Act and Committee ensured that a wide range of problems were considered by way of inter-agency task force. These

included technical studies of fisheries, flood control, Indian affairs, industry, recreation, residential, transportation and wildlife. The Act and its discretionary powers over all land use in the province permitted negotiation of shore and foreshore development. The legislation simply provided a legal basis on which to require developers to agree to certain negotiated conditions. As such, it assisted in the ad hoc response to conflicts which arose, but did not however, function to provide designation of critical estuarine values.

Legislation does not specifically focus upon estuaries but rather regulates related problems and land use planning generally. The Land Commission Act, for instance, reserves prime agricultural land from development, similarly, subdivision of land on floodplains is subject to the Land Registry Act which requires consent of the provincial Water Resources Service. All development is required to be "floodproof" (without dyking) in any area which could reasonably be expected to be subject to flooding. The Regional Districts are assisted by the Water Resources Service in identifying the 200-year floodplain and in implementing floodplain zoning. There is, therefore, a piecemeal approach to the internalization of externalities.

The port proposal at Nanaimo River estuary was initiated by the Nanaimo Harbour Commission, who according to the Harbour Commissions Act was not answerable to the local advisory planning commission. The Harbour Commission thus

avoided any major consideration of the social impact of the development by assuming expanded port facilities in the Inner Harbour to be in the best interests of the community. An oceanographic consultant was employed to study the bio-physical effects of the proposal. A one and one-half page report was submitted, stating that the development would not seriously affect the total productivity of the tidal flats if provision were made to accommodate the salmon and trout runs to the Nanaimo and Chase Rivers during the period of hydraulic dredging. The effect of identifying these problems was to reduce the size of the project from 165 to 148 acres and to require that existing river channels be diverted within the estuary. The consultant also reported that changes brought about by the proposed development would improve conditions for shellfish production in the estuary. Considerable objections however, gave rise to subsequent more detailed studies. There existed little institutional incentive for the Harbour Commission to recognize potential problems imposed upon other jurisdictions.

Jurisdictional limitations constrained the consideration of problems generated by the proposal. The federal Harbour Commission Act empowers commissions with "jurisdiction to regulate and control the use and development of all land, buildings and other property within the limits of the harbour." At Nanaimo, the Commission comprised three members, two appointed by the Governor-General in Council, and the

other appointed by the City of Nanaimo. The Commission formulated plans with little regard for surrounding jurisdictions. It soon became apparent that serious conflict existed between harbour plans and community land use policies. The need to make harbour commissions responsive to local concerns was recognized during the controversy, resulting in the addition of two members to the commission. In addition, the pressures of competition for harbour land has in part inspired a proposed reorganization of port management. A new Canada Ports Act is to replace the National Harbours Board and Harbours Commission Acts and provide a single system of port management. The proposal is based upon the need for greater planning at the national level and at the local level, more responsive port management (Transport Canada, 1976).

The private developer of the property at Englishman River estuary employed a consultant to undertake an environmental assessment of the site which was used to guide design of the proposal. Objections to development of the property previous to the proposal appeared in a request by the local government and advisory planning commission for the provincial government to purchase the property. It reflected a local concern to preserve the area and emphasized the extent to which land use controls are subject to change. The importance of this area to the Parksville community was not incorporated within the district community plan, leading to a search for other forms of control such as the

provincial Greenbelt Fund.[1] Major problems were identified in a social assessment undertaken for the province by the Land Management Branch which determined that preservation of the estuary and backshore was strongly supported by area residents. The bio-physical impact was evaluated in a companion assessment report. Significantly, development of the estuarine area could not be adequately prevented due to flexibility in existing land use by-laws and policies. Internalizing the externalities generated remained a process of negotiation.

There are no requirements under the Municipal Act to protect estuarine areas. The Act dictates that incorporated areas prepare community plans, with the Regional Districts being responsible for preparing regional plans and community plans in unincorporated areas. Both the Regional Districts and municipal councils have the same powers with respect to zoning, subdivision and building regulations. Under Section 702, these powers relate to the use of land and the surface of water. In many cases, however, there is superseding legislation regulating such aspects as foreshore leases, navigable waters, port facilities and fisheries habitat. Provincial and federal controls over water use therefore can contradict local by-laws. In addition, variances to by-laws can be permitted, giving planning regulations considerable flexibility and making them subject to local development pressures.

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[1]The Green Belt Protection Fund Act (1972) provides funds to purchase green belt areas.

Water quality problems at Courtenay River estuary-Comox harbour were initially recognized in 1972 through closure of shellfish harvesting by the Federal Fisheries and Marine Service of Environment Canada. One of the major problems stemmed from a lack of information on the source of pollutants in the estuary. The inter-agency task force undertook evaluation of (1) wastewater and solid waste disposal, (2) land use patterns, (3) pesticides and herbicides, (4) logging practices, (5) river water quality, (6) marine water quality and beach biota, (7) recreation and conservation, and (8) health. The task force report thus analyzed a broad number of largely technical issues related to water quality.

Water quality management is enforced primarily through the Water Act and Pollution Control Act, which require respectively, a water license for consumptive use of water and a permit for waste discharge. Crook (1975) notes that these pieces of legislation contain no management or planning terms of reference. Licenses and permits are issued on an ad hoc, piecemeal basis, although other agencies are given the opportunity to object to the granting of a license or permit. While the legislation permits coordination between land and water managers, there is no requirement to consider the cumulative effects of watershed land use, water consumption and waste discharge. This limitation exemplifies a major problem in estuarine areas: there is no clear delineation of where water management responsibilities end and where

land management responsibilities begin. The indistinct boundaries, however, may be as much a function of the nature of the particular problems as it is of legislative inadequacies. The effects of and spillovers between land and water activities are not easily defined. There is little requirement, however, to ensure that identification of these externalities is incorporated within a planning process.

One of the major observations from the study areas is that problems are not easily internalized within any common set of resource agencies. Problems varied with such factors as the nature of biophysical processes, the historical use of estuarine areas, the perceived impact of development proposals and the presence and tactics of public interest groups. Table 2 portrays the major problems and issues which arose in the study areas, based upon a review of events. Response to these estuarine problems was generally to resolve specific issues such as fill and dredge, waste discharge, shoreline development and not one of incorporating the issues into the long term process of defining and implementing objectives for estuarine areas. The recognition and internalization of externalities created by resource users proved dependent upon coordinative efforts with few previous guidelines as to those estuarine values which require protection.

TABLE 2: PROBLEMS INVOLVED IN ESTUARINE STUDY AREAS

	Cowichan	Nanaimo	Englishman	Courtenay
Urban Land Use		X	X	X
Rural Land Use	X		X	
Port Facilities	X	X		
Recreation	X		X	X
Wildlife	X	X	X	X
Fisheries	X	X	X	X
Agriculture	X			X
Forestry	X	X		X
Floodplain Development	X		X	
Foreshore Leases	X	X		X
Dyke Construction	X		X	
Dredge and Fill	X	X		
Waste Discharge	X			X
Upstream Development	X		X	
Flooding	X		X	X
Erosion			X	
Water Quality	X			X
Shellfish Production		X		X
Economic Development	X	X	X	
Community Growth		X	X	
Indian Affairs	X	X		

Alternatives Evaluation

The development of planning in coastal areas suggests a broad model for evaluating alternatives. The ability to evaluate a wide range of resource management strategies is greatly dependent upon the availability and applicability of adequate information and technical expertise. The search for alternatives is an important phase of the decision process.

At Cowichan, four alternatives were chosen for study: (1) recreation and agricultural dedication, (2) status quo, (3) limited industrial expansion, and (4) industrial and commercial dedication. The study concentrated on the estuary and floodplain as an integral unit offering a diversity of values. The task force pointed out the need to consider the appropriate location for industry in the region as a whole. Little attention, however, was given to this need. The question of whether adequate sites existed outside of Cowichan Bay was outside of the terms of reference of the task force, although non-development alternatives had regional implications regarding the requirements for industry.

Research limitations were also apparent. The effects of alternatives were evaluated in general terms, predicting a "considerable" reduction in fisheries and wildlife habitat and "serious" loss of recreational opportunity. Impact on size of fishery stocks and numbers of wildlife and waterfowl proved difficult to estimate quantitatively. The marginal effects of estuarine modification were thus evaluated

by way of broad principles. It suggests a lack of specific research on the cause-effect relationships between human activities and biological values.

The port proposal for Nanaimo harbour was developed without adequate consideration of biophysical and social aspects. In the initial proposal information and specialist assistance was not sought from other government agencies, nor was the consultant employed to evaluate alternative locations for the development. Detailed impact evaluation of alternative sites was undertaken only after considerable public objection. These objections led to an eventual decision by the Canadian Ports and Harbours Planning Committee to request evaluation by an interdisciplinary task force.

Land around the Englishman River estuary has been developed for residential use for a number of years. Alternatives for the area have been significantly narrowed by increased private ownership, demand for shoreline housing and the lack of distinct objectives. Assessment of the proposed development included technical comment by the federal Fisheries Service and provincial Fish and Wildlife Branch. To assist in considering applications for subdivision along the Englishman River, the Land Management Branch also sought ecological and social impact assessment. Significantly, such assessments take place at the discretion of government or resource administrators and there is no assurance that findings or recommendations will affect eventual decisions.

Water quality problems at Comox harbour also reveal the need for greater recognition of water related values in resource allocation. The purpose of the provincial task force was to provide an inter-departmental collection of information. It provided observations and some recommendations on a number of water quality aspects but avoided any detailed analysis of alternative means of reducing water pollution or their social implications. Little guidance was provided for ongoing planning and the application of "acceptable future criteria for harbour water quality." The emphasis had been placed upon providing baseline information while the critical task remains in translating the information to a set of alternative management strategies.

In summary, the evaluation of alternatives, although generally including a range of environmental considerations, was often limited to specific sites and occurred outside of the regional planning process. The marginal effects of estuarine modification proved difficult to predict other than by way of broad principles. Few direct measures of impact were provided. The implication is a lack of information and research on the nature of these estuarine areas and the cause-effect relationship between human activities and biophysical processes. In particular, major problems appear to exist in evaluating the suitability of mitigating measures.

The ability to apply information and technical expertise to estuarine problems is inhibited by the gap between

day-to-day management by resource agencies and the overall regional planning process. Most of the specialist information and expertise is applied only after significant conflict arises and a need for better information is recognized. Resource administrators note, for instance, that objectives and decision making guidelines are formulated on an ad hoc basis. They are at best woven through previous actions, statements and responses. Particularly at the regional government level, there is a lack of personnel to evaluate estuaries, and management is largely a process of reacting to proposals or events. Administrators rely on past experiences and referral systems to formulate decisions.

Participant Involvement

It is important that estuarine management is responsive to many groups in society. In evaluating the institutional structure it is necessary to examine the extent to which various groups and individuals have an opportunity to make their views known.

Within government, a number of levels of coordination have been institutionalized. The first level of coordination between government agencies is a referral system which permits agencies to comment and object to applications for land or water use. This occurs as a matter of regular practice in such cases as the administration of water licenses, pollution control permits, Crown leases, designation of reserves, dredging and construction. Informal contact also exists bet-

ween administrators when the interest of another agency is perceived in a particular manner.

Major coordination also occurs through environmental impact assessment. Environment Canada has an Environmental Assessment and Review Process which (1) identifies proposals likely to have a significant impact, (2) undertakes an initial environmental evaluation with the developer and other branches of government and where necessary, (3) prepares a full scale environmental impact statement. Similarly, at the provincial administrative level, general environmental impact assessment guidelines for Crown lands have been established to deal with (1) project justification, (2) evaluation of alternatives and (3) determination of project development criteria.

The most evident coordinative measure in the study areas was the use of inter-agency task forces. The Environment and Land Use Committee and its Technical Committee (Deputy Ministers) and Secretariat (technical staff) provide the organizing mechanism for establishing these task forces where conflict cannot be resolved at the departmental working level. This process is supplemented by the Regional Resource Management Committees, comprises representatives from the major provincial resource departments.

In addition, Regional Districts are required (Municipal Acts s. 798[b]) to establish technical planning

committees. These committees comprise the Regional District Planning Director, local Medical Health Officer, municipal and school board officials, and provincial resource department representatives. Major concerns of the Technical Planning Committee include regional plans, by-laws, and land use contracts.

Other efforts in coordination are also apparent in estuarine areas. An Estuary Working Group has been established by Environment Canada to collect and publish environmental information on estuaries in the province. A salmonid enhancement program has also been developed to further the preservation and restoration of salmonid rearing grounds. The objective is to encourage government and public groups to develop projects for restoring salmonid habitat. The program, however, has yet to set out the minimum requirements or criteria for salmonid enhancement and there is no obligation for provincial and local authorities to recognize such standards, implied or otherwise.

In the estuarine study areas, the involvement of participants varied significantly. At Cowichan, the Environment and Land Use Committee provided the mechanism for organizing the inter-departmental study of the development proposal. The Cowichan Estuary Task Force involved representatives from fourteen government agencies--federal, provincial, and regional. The amalgamation of technical information provided a basis for the selection of the four

development alternatives. This task force provided background technical information largely independent of the land use planning process and without public participation. It recommended that further studies explore the economic and social aspects of land use in the Cowichan estuary.

In the controversy at Nanaimo estuary, the initial proposal was formulated within the confines of the Nanaimo Harbour Commission. Opposition to the proposed development resulted in a wider consideration of issues. It forced federal politicians to have further environmental studies undertaken. The environmental impact assessments became a key basis for resolving conflict over the proposed port development. The reports were undertaken by an Environment Canada Task Force, the Department of Public Works, the Nanaimo Regional District and consultants. These environmental assessments provided a formal means of coordination among government agencies. In addition, some 16 public interest groups played a critical role in the eventual rejection of the inner harbour site for port development. These groups effectively presented their veiws through various forms of media and public presentation and gained credibility by enlisting the advice and support of scientists and other specialists. Their effect was to stall the project until adequate environmental studies could be undertaken, which subsequently recommended an alternative site.

The first public meeting ever held by the Canadian Ports and Harbours Planning Committee provided a means for articulating the concerns of the public. The need for such public input was not recognized in the original proposal, some 11 months previously. The failure of the Harbour Commission to consider public response to the proposal in the early stages of formulation contributed to a long and difficult process of developing port facilities.

Environmental and social assessments of the residential commercial proposal for Englishman River estuary provided a means of incorporating bio-physical and social aspects. The assessments were undertaken for the Land Management Branch and Department of Highways in their concern for subdivision in rural areas and development on floodplains. The referral system among federal, provincial and regional authorities served to coordinate government agencies. Public response was evaluated in the social assessment through public meetings and informal discussions. This included submissions from 10 public interest groups and a number of individual residents.

At the Courtenay River estuary, however, the public had little role. The Comox Harbour Task Force was formulated through request from the Environment and Land Use Committee. Participants were limited to the technical nature of the study. Social issues were not evaluated during the course of study.

Table 3 portrays the actors which became involved in the case studies. It reflects the need to provide extensive opportunity to participate in estuarine management decision making. It is apparent that inter-agency task forces and the established referral system among government agencies have been extensively employed to resolve conflict in the study areas. Where public interest groups become involved, as shown in the Nanaimo estuary case, they can have a significant role in opening resource management decision making to public view. The social aspects in estuarine management have, however, received only limited commitment in the decision process.

Summary

The experiences of these four study areas suggests that estuarine management involves a considerable range of problems beyond the estuary, including larger spatial issues of watershed and community land use development. Problems were generally identified after significant conflict among users had occurred. The recognition and internalization of externalities by decision makers depended upon coordination and negotiation among a variety of actors. This process was particularly important since few direct guidelines were available to outline estuarine values that require protection. The lack of distinct objectives for estuarine areas for example, contributed to the piecemeal consideration of

TABLE 3: ACTORS INVOLVED IN ESTUARINE STUDY AREAS

	Cowichan	Nanaimo	Englishman	Courtenay
FEDERAL				
Fisheries and Marine Service	X	X	X	X
Can. Wildlife Service	X	X	X	
Ministry of Transport		X		
Dept. of Public Works		X		
Dept. of Reg. Ec. Expansion	X			
PROVINCIAL				
E.L.U.C.S.	X	X		X
Dept. of Agriculture	X			X
Dept. of Ed. Dev.	X			
Dept. of Highways	X		X	
Dept. of Municipal Affairs	X			
Dept. of Health				X
Fish & Wildlife Branch	X	X	X	X
Forest Service	X			X
Land Management Branch	X	X	X	X
Water Resources Service	X	X	X	X
B.C. Dev. Corporation	X			
B.C. Harbours Board		X		
OTHER				
Regional District	X	X	X	
Munic., Town, Village		X	X	
Advisory Planning Comm.		X	X	
Harbour Commission		X		
Indian Band	X	X		
Public Interest Groups	X	X	X	

individual problems. The ability to internalize externalities is not so much based upon legislative requirement as upon interaction among government and public interest groups.

Inter-agency task forces, the administrative referral system and environmental impact assessment procedures ensured a relatively wide range of alternatives and interests were considered. In at least the case of the Nanaimo estuary, this did not occur without assistance from public interest groups which succeeded in having the initial proposal for port development reconsidered and evaluation expanded. Evaluations, however, suffered from research inadequacies in predicting estuarine modification and its effects. Much of the environmental baseline information lacks specific detail. The exchange of information and technical expertise relied on coordinative measures and the formation of special groups to study estuarine issues. In addition, studies were undertaken to resolve largely specific conflicts, independent of the ongoing planning process. This perhaps reflects the most significant shortcoming: many of the problems could have been avoided through previous identification, study and protection of estuarine values.

While many groups became involved in each of the case studies, there existed few opportunities for the public to participate in decision making, and these occurred only after public objection to development proposals. The mechanisms exist for the expression of public response but are used with caution. The conflict in these estuarine areas

highlights a failure of traditional land and water use policies. Bio-physical and social values inherent in estuarine areas have not been adequately reflected in resource management policies.

CHAPTER VI

CONCLUSIONS

Estuarine areas in recent years have received recognition as one of the critical components of the coastal zone. Their significance to fisheries and marine life in general is especially important in the face of increased resource use pressures in the coastal zone.

The modification and destruction of estuarine areas often originates in the existence of common property resources and the inability to identify property rights. There is, therefore, a need for government intervention to ensure that estuarine values are protected. The development of coastal resource management has focussed upon (a) employing biophysical principles, (b) ensuring coordinated policies and planning, and (c) resolving conflict among various demands. It implies a broad basis for decision making, including a wide range of organizations and groups. The decision process however, can be constrained by the nature of the institutional structure.

In British Columbia, estuarine management problems have been attributed to the lack of comprehensive goals, policies and management programs. As a consequence, new administrative bodies, legislation and regulations have been suggested for coastal and estuarine areas. These imply

that the existing framework provides for only a limited range of considerations in decision making. The increased conflict in estuarine areas and changing environmental values reflect a need for continual reappraisal of management institutions and practices.

Problems and Responses

Estuarine areas associated with the Cowichan, Nanaimo, Englishman and Courtenay Rivers have experienced different conflicts in recent years. Particular issues related to industrial and residential development proposals and water pollution. The problems that arose touched upon a wide spectrum of resource uses and included larger regional aspects of community growth and watershed development.

Much of the estuarine conflict originated in the presence or threat of externalities. There were few prior incentives in the form of requirements for resource users to internalize externalities. The lack of distinct estuarine objectives or decision making rules limited the ability to internalize externalities and added to uncertainty as to the appropriate use of estuarine areas. Nevertheless, legislation such as the Fisheries Act, Pollution Control Act and Environment and Land Use Act permitted a basis on which to assist consideration of externalities by decision makers. Externalities were thus handled through coordination and negotiation between resource agencies.

These coordinative measures also served to provide information and technical expertise. Evaluation of the estuarine areas was primarily limited to resolving specific issues such as fill and dredge; waste discharge and shoreline development. Although numerous aspects of these issues were considered in all four cases, there was little framework for long-term planning of these estuaries. Information and expertise was provided in response to specific problems, although this occurred in isolation from the established regional and community planning process. In addition, the evaluation of alternatives reflected difficulties in predicting the effects of estuarine modification other than by way of broad principles.

The established referral systems between government agencies and informal contacts were important coordinative measures. Task force groups were formed at three of the study areas while at the fourth, environmental assessment consultants were employed. Public interest groups in at least two of the study areas were also critical in broadening the decision making process and motivating social assessment of the proposals. Public participation, however, only became acknowledged after significant public outcry. Although various means of undertaking social assessment are available under existing legislation, there is no legal requirement to do so. Social and biophysical assessment relied upon active public response to threats of environmental deterioration.

In Chapter II it was hypothesized that the institutional structure constrains the ability to internalize externalities, employ adequate information and technical resources to evaluate alternatives and provide opportunities to participate in decision making. This can be largely confirmed. While coordinated response to the study area conflicts ensured a significant range of considerations, there were major constraints in the decision process. The ability to internalize externalities was inhibited by a lack of identifiable objectives and guidelines to assist decision making. The application of information and technical expertise reflected a lack of readily available and detailed environmental information and little committment to ongoing research with practical application to the study areas. Limited opportunity for the public to gain access to the decision process was also apparent, although the legal basis often exists to undertake public participation. There are two particular characteristics of estuarine management which can be observed.

Firstly, these case studies reflect the piecemeal and ad hoc manner in which estuarine use issues are dealt with. The institutional structure is oriented to respond to conflicts which attain a critical level. There is only very minimal resource planning, and this is limited to specific concerns such as prevention of flood losses or land use zoning. The major planning function for instance occurs

through the Municipal Act, yet plans and by-laws under this Act are easily changed or superseded by federal and provincial legislation.

Secondly, there is no legislative requirement that resource administrators undertake adequate environmental impact assessment. Resource administrators are forced to interpret the appropriate decision making requirements in context with other administrators and public groups. Objectives and resource use guidelines are vague, based upon past experiences and evolving through referral among government agencies on individual cases. As a result, estuarine management policies and procedures are not clearly articulated but must be determined through inter-action and negotiation in decision making.

Implications

The estuarine study areas exemplify the need for flexibility in designing coastal zone institutions. Estuarine management problems and their spatial dimensions can vary considerably, making it difficult to identify a distinct set of managers and problems. The boundaries of an estuarine area are themselves often indistinct and fluctuate with season. There is similarly no standard framework of participants in estuarine management. The problems are often not limited to local areas but encompass issues of regional development and preservation that include representation from non-local groups and participants.

This broad and changing context within which estuaries are managed inhibits the concept of a single coastal resource management agency. It reflects, however, an institutional structure which permits a variety of levels of resource management and channels of input to the decision making process. Given the complexity of interests and variability of issues (spatial and otherwise) in coastal areas, multiple agencies and multiple levels of management offer functional advantages. Significantly, the important factor is not the array of institutions but rather the processes by which they formulate decisions. Improving coastal resource management therefore will depend more upon reforming decision processes than on rearranging institutions. These case studies suggest a number of implications.

Firstly, estuarine values are generally recognized only under threat of deterioration and there are few explicit rules for the management of estuaries. The need exists therefore for more distinct management objectives and guidelines. It is apparent for example, that committment to estuarine management focusses upon regulative measures such as pollution control permits, land use bylaws, floodplain regulations and prosecution, with very little use of more direct measures such as ecological reserves, wildlife sanctuaries, parks and habitat improvement projects. Opportunities also exist for implementation of special resource use guidelines similar to the approach established in the Fraser River estuary where mandatory environmental impact assessment is

required.[1] Resource administrators have indicated that objectives and guidelines are formulated on an ad hoc basis. A clear expression of estuarine values and decision making procedures would therefore assist in defining standards of estuarine use.

Secondly, environmental information is not effectively applied in estuarine management. There is a lack of specific information on resource use-biophysical interrelationships and a lack of personnel at the regional government level to undertake research into estuarine values. Specialist expertise exists at the federal and provincial level, yet this expertise is only employed where specific problems arise and provides little baseline information for the long-term regional planning process. The study area conflicts served to highlight a paucity of existing information and in themselves stimulated a search for data useful to estuarine management. The implication is for increased investment in research which could provide a basis to estuarine management policies and assistance in regional planning. The federal-provincial Estuary Working Group and Salmonid Enhancement Program offers an opportunity to expand research and to identify the land and water use requirements for estuarine protection.

Thirdly, the social and political elements of estuarine management have received inadequate attention. The

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[1] "Environmental Studies Required for Shoreline Development," Vancouver Sun, March 19, 1977, p. 18.

development of estuarine management policies requires not simply better technical information and expertise but also a means of identifying and expressing social goals related to estuarine areas. Federal and provincial agencies administer individual aspects of estuarine use and provide indirect and discretionary means of public access to the regulatory process. The regional and community planning function, however, exists at the regional and local level of government. It is this gap between federal-provincial and regional-local functions which acts as a significant barrier to improved estuarine management. The need exists therefore to ensure that federal and provincial estuarine management practices are responsive to community values through greater use of public participation, social impact assessment and Regional District planning.

The shift away from crisis-response toward increased planning will require considerable change in traditional estuarine management. With greater pressures of resource use the importance of improving estuarine management decision making is likely to become increasingly apparent. The growing incidence of estuarine use conflict provides evidence of obsolete policies and practices, and testament to the need for better recognition of and committment to estuarine values.

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VITA

Surname: FERGUSON Given Names: Alan John

Place of Birth: VANCOUVER, B.C. Date of Birth: Sept. 18, 1949

Educational Institutions Attended,
with Dates of Entering and Leaving:

SIMON FRASER UNIVERSITY	1967 to 1971
UNIVERSITY OF AUCKLAND	1972 to 1972
UNIVERSITY OF VICTORIA, B.C. Canada.	1974 to 1977
	____ to ____
	____ to ____

Degrees, Diplomas, Etc., Awarded,
with Dates and Names of Institutions:

B.A.	1972	Simon Fraser University
Dip. Town Planning	1974	University of Auckland
	____	
	____	

Honors and Awards:

Regional and Resource Development Fellowship, British Columbia Institute for Economic Policy Analysis, 1975/76

Publications:

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Author [redacted]

Signature

Alan J. Ferguson
Name

28th April, 1977
Date