Review of Estuary Management Plans in British Columbia

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2002

Canadian Manuscript Report of Fisheries and Aquatic Sciences 2605

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Correct citation for this publication:

Williams, G.L, and O.E. Langer. 2002. Review of estuary management plans in British Columbia. Can. Manuscr. Rep. Fish Aquat. Sci. 2605: 57 p.

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ABSTRACT

Nine estuary management case studies in British Columbia were identified by Fisheries and Oceans Canada for review to document the planning process and plan components and to assess their effectiveness in protecting fish habitat. Six of the case studies were estuary management plans, with the Courtenay estuary plan accepted by DFO and in use by the Regional District but not the two local governments. Three of the studies, Prince Rupert, Port McNeill, and Tofino studies were actually habitat assessments of marine areas and were prepared to provide background information towards developing a plan. An estuary planning process for the Nanaimo River estuary has recently been initiated to develop a habitat classification and plan for the management and protection of fish habitat and other environmental values. The plan is targeted for completion in October 2002.

Of the five estuary management plans reviewed, the Fraser River Estuary Management Plan, prepared by the Fraser River Estuary Management Program (FREMP) provides the most comprehensive approach to estuary planning in British Columbia. The development of a habitat inventory and shoreline classification and coordinated project review using an Environmental Review Committee are two of the main achievements of the plan that have resulted in protection and creation of quality fish habitat (e.g. intertidal marshes). The classification system has been used in several smaller estuaries used as case studies for this assessment.

The Campbell River Estuary Management Plan, provides a unique example of efforts to manage the estuary almost solely for conservation and recreation with full broad stakeholder support. The formation of the Campbell River Estuary Management Commission and completion of an industrial relocation strategy have been effective in furthering the plan. The Plan has also benefited from substantial external grant funding to purchase land and conduct several habitat enhancement and restoration projects.

The Cowichan case study provided an example of a less effective management structure using the B.C. Order-in-Council approach. The weaknesses in the approach include difficulty in making changes to make the plan responsive to local needs and changing conditions. Subsequent attempts to revise the plan have been unsuccessful due to lack of local support.

Estuary management plans can be useful tools for implementing more sustainable development and protecting fish and wildlife habitat. However, it is important that the major stakeholders “buy in” to the plan from the onset. To develop more environmentally sound plans in the future, an ecological perspective is recommended for guiding the preparation of estuary management plans. Some recommendations for improving the planning process are offered and several candidate estuaries needing management plans are identified.

RÉSUMÉ

Pêches et Océans Canada a choisi d'examiner neuf études de cas de gestion des estuaires en Colombie-Britannique afin de documenter les diverses composantes du processus de planification et des plans de gestion, et d'en évaluer l'efficacité sur le plan de la protection de l'habitat du poisson. Six de ces études étaient des plans de gestion d'estuaire, dont notamment le plan de gestion de l'estuaire de la Couretenay, accepté par le MPO et utilisé par les autorités du district régional, mais non par les deux administrations locales. Trois études (Prince Rupert, Port McNeill et Tofino), qui consistaient en fait en des évaluations de l'habitat des zones marines, avaient été préparées pour recueillir les données de base pour l'élaboration d'un plan. On a par ailleurs amorcé récemment le processus de planification de l'estuaire de la Nanaimo, qui prévoit d'élaborer une classification de l'habitat et de dresser un plan de gestion en vue de protéger l'habitat du poisson et les autres attributs environnementaux de l'estuaire. Le plan devrait être prêt pour octobre 2002.

Sur les cinq plans de gestion des estuaires examinés, c'est celui de l'estuaire du Fraser, préparé par le Programme d'aménagement de l'estuaire du fleuve Fraser (PAEFF), qui propose l'approche la plus globale de la planification d'estuaire en Colombie-Britannique. Deux grands volets du plan, soit l'inventaire de l'habitat et la classification des rivages, d'une part, et l'examen coordonné des projets par un comité d'examen environnemental, d'autre part, ont permis de protéger efficacement les habitats du poisson et d'en créer de nouveaux de grande qualité (p. ex. des marais intertidaux). On s'est servi du système de classification dans plusieurs petits estuaires utilisés pour les études de cas dans le cadre de cette évaluation.

Le plan de gestion de l'estuaire de la rivière Campbell est un exemple unique des efforts qui peuvent être faits pour gérer l'estuaire presque uniquement en fonction de la conservation et des loisirs, avec l'appui large et entier des intervenants. La création de la Commission de gestion de l'estuaire de la rivière Campbell et l'élaboration d'une stratégie de relocalisation des industries ont permis de faire avancer le plan. Celui-ci a également bénéficié d'importantes subventions provenant de l'extérieur pour acquérir des terres et réaliser plusieurs projets de rétablissement et de mise en valeur de l'habitat.

L'étude de cas de la rivière Cowichan est un exemple d'une structure de gestion moins efficace, faisant appel à une approche axée sur les décrets de la Colombie-Britannique. La faiblesse de cette approche vient notamment de la difficulté d'apporter les changements nécessaires pour dresser des plans adaptés aux besoins locaux et aux conditions changeantes. Les tentatives subséquentes pour revoir le plan ont échoué à cause du manque d'appui à l'échelle locale.

Les plans de gestion des estuaires peuvent s'avérer de précieux outils pour favoriser le développement durable et protéger l'habitat du poisson et de la faune. Il importe toutefois que les principaux intervenants y « adhèrent » dès le départ. À l'avenir, pour que ces plans soient mieux étayés sur le plan environnemental, on recommande de les préparer dans une perspective écologique. On formule par ailleurs certaines recommandations pour améliorer le processus de planification, et on propose une liste de plusieurs estuaires ayant besoin de plans de gestion.

INTRODUCTION

Estuaries have long been recognized as being extremely productive habitats for fish and wildlife. Estuarine habitat utilization along the British Columbia coast by 49 economically important fisheries species was summarized by Williams (1989), and the importance of estuaries to migratory birds using the Pacific Flyway was reported in Butler and Campbell (1987) and Vermeer and Butler (1987). The relative value of estuaries along the Pacific Coast of North America is increased by the fact that estuaries and lagoons make up only 10-20% of the coastline, compared to 80-90 % for the Atlantic Coast (Macdonald 1977). For British Columbia, it is estimated that estuaries make up only 3 % of the provincial 27,000 km coastline (Anon. 1995).

In the 1970's, there were several efforts by the federal and provincial governments to implement estuary management plans to better manage economic development so as to protect the natural productivity of estuaries (Langer 2001). One of the first initiatives was the B.C. Ministry Environment initiative for the combined estuary of the Cowichan and Kosilah Rivers in 1974. Joint federal-provincial initiatives began in 1977 with the Fraser River Estuary Study (FRES) and in 1979 with the Squamish River Estuary Management Plan. More recent efforts have included the Campbell River Estuary Management Plan (1996), Port of Stewart Environmental Management Plan (1996), and more limited studies such as the Port McNeill shoreline habitat assessment (1996) and habitat and land-use assessment of the Tofino harbourfront (1998).

These plans or initiatives have had varying degrees of success. For example, the FRES led to the Fraser River Estuary Management Program (FREMP), which is now is a major component of environmental management in the Lower Mainland. Realizing the need to work cooperatively, the Department of Fisheries and Oceans (DFO) and the North Fraser Harbour Commission, developed the North Fraser Harbour Environmental Management Plan, which included a shoreline habitat inventory and classification and habitat compensation bank. The habitat inventory and classification component was later adopted by FREMP and applied to the entire Fraser River estuary. It has also been used as a model and applied to other estuarine areas (i.e. Tofino Harbour and Port of Stewart). The Campbell River Plan was endorsed by the general public, District council, and industry, in spite of a major objective to restore estuarine habitats and relocate industry out of the estuary. The Cowichan Estuary Plan does not have strong public or political support and recent efforts to revise the plan were unsuccessful.

With the initiation of the Courtenay Estuary Management Plan in 1998, Prince Rupert Harbour Environmental Management Plan in 1999, and Nanaimo Estuary Plan in 2000, it became apparent that there was a need to establish guidelines for preparing estuary management plans. In July 1998, Fisheries and Oceans Canada (DFO) retained G.L. Williams & Associates Ltd. to review existing estuary management plans and prepare a summary report that would include recommendations on preparing and implementing effective plans.

This report presents case studies describing the process and content of the individual estuary management plans, including a brief evaluation of each plan. From this information, recommendations are provided to guide future estuary management planning. A list of priority candidate estuaries that could benefit from estuary management plans is also provided.

METHODS

As part of its efforts to provide guidance and improve consistency in the preparation of future estuary management plans, DFO contracted a study to review existing estuary management plans in the B.C. The study was to review existing information and views, and was not designed to collect new information.

The main objective was to prepare case studies of several estuary management plans selected in advance. For each case study, existing estuary management plan documents were obtained and reviewed, the process used to prepare the plan was described, the main components of the individual plans were identified, and the main achievements in protecting fish habitat were summarized. The results were to be compiled in a matrix to assist comparison of the plans.

As well as reviewing the existing plans and related documents, personal or telephone interviews were held with several resource people to obtain further information on the process used in developing the plan, and problems or opportunities created during implementation. The draft report was reviewed by DFO staff and individual interviewees prior to finalization.

The following individuals were contacted to provide information on the estuary management plans or review comments on the draft case studies:

- Otto Langer, Habitat Enhancement Branch, DFO
- Rob Russell, South Coast Division, DFO
- Cimarron Corpé, DFO
- Bruce Shepherd, North Coast Division, DFO
- Tom Pendray, North Coast Division, DFO
- Mitch Drewes, North Coast Division, DFO
- Sharon Peters, Program Manager, FREMP
- Sharon Erickson, Environmental Assessment Officer, MOELP
- Brian Woodward, Administrator, District of Stewart
- Howard Paish, Howard Paish and Associates
- Ray Parfitt, Stanley Consultants Ltd.
- Margaret Page, Town of Port McNeill
- Bruce Cox, MOELP
- Margaret-Ann Thornton, District of Squamish
- Steve Macfarlane, Habitat Enhancement Branch, DFO
- Jim Cox, BCR Properties

- Jim Van Tine, Habitat and Enhancement Branch, DFO
- Ron Neufeld, District of Campbell River
- Shannon Anderson, Quinsam Hatchery, DFO
- Lee Luckhurst, Pat Martin, and Ian Legge, Raven Group
- Brian Naito, Habitat Enhancement Branch, DFO
- Scott Northrup, South Coast Division, DFO
- Bob Holden, Cowichan Estuary Preservation Society
- John Patterson, Habitat Enhancement Branch, DFO

CASE STUDIES

For each case study, a brief summary of the process used in the development of the plan, main estuary management plan components, and summary evaluation is provided. Special effort was made to highlight the unique features of each of the plans and document specific planning processes and components that could be of interest during the development and implementation of environmental management plans in other estuaries.

1. Cowichan Estuary Environmental Management Plan

Background

The Cowichan Estuary covers the estuaries of the Cowichan and Kosilah Rivers, which enter into Cowichan Bay, approximately 40 km north of Victoria. The intertidal area of the estuary covers about 277 hectares, making it one of the largest estuaries in British Columbia. Loss and degradation of estuarine habitat, which has occurred since European settlement of the area began in 1862, has resulted from dyking from agriculture, filling for industrial and commercial port development, log handling, and water pollution from waste discharges, sewage disposal and agricultural runoff.

In 1974, the B.C. Ministry of Environment (MOE) established an intergovernmental task force to establish land use options. Four options were prepared, ranging from total conservation to total industrial development. In 1975, Doman Industries purchased and re-established a mill on the old Slegg sawmill site, which included log storage areas in excess of the 8 ha agreed to in proposals to the government agencies. This increased public and governmental agency concerns about the commitment to environmental protection. In 1977, the provincial cabinet released the Order-In-Council 3339.

In 1978, the 20 member Cowichan Estuary Task Force was reconvened to examine the issues and recommend a land use plan. The Task Force's report was released in 1980 and contained several key recommendations relating to flood control, log management and overall land management. In 1981, MOE, recognizing that extensive negotiations would be required between the government agencies, forest companies, private land owners, and the general public, initiated the Cowichan Estuary Plan Implementation Program. A Coordinator was appointed to lead the negotiations and an office was opened in Duncan to provide a local contact point for public input. The implementation report was released in 1984 and described the proposed management plan. In 1986, Order-In-Council No. 1652 was issued to replace the outdated Order-In-Council 3339.

The Cowichan Estuary Management Plan was published in 1987 (Lambertsen 1987). Key components included area designations and environmental decision-making process. Company agreements were signed between the four main industrial landowners in the estuary, MOE, and the Canada Department of Fisheries and Oceans (DFO).

The area designations included:

- industrial/commercial
- agriculture
- habitat management
- possible mixed-use
- conservation/recreation
- log storage

Another "designation" was a defined area to be considered in the future for potential port expansion by Canadian National Railways. The area designations are shown in Figure 1.

An important step in determining consensus on the area designations, was the examination of log storage requirements and forestry operations in the Cowichan estuary. Of particular focus was the reduction of log storage, which had impacted approximately 135 ha or 49 % of the intertidal area of the estuary. Through consolidation of the log storage areas and improvements to log handling activities (e.g. dry land sorting), siting log storage in deeper water, and eliminating log storage areas surplus to company needs, the total area was reduced to 52.6 ha, or 19 % of the estuary.

Building consensus with forestry companies was also facilitated by pre-agreements with MOE and DFO. The pre-agreements included MOE supporting Crown Leases to use deeper water areas for log storage and providing approval-in-principle for a log haul road, subject to review of road and bridge design for the Kosilah River crossing (i.e. MacMillan Bloedel), tying mill expansion to limited log storage increases (i.e. Doman Industries), and facilitating future port expansion plans by CNR if and when they were proposed.

Another key feature of the Plan was the revised environmental review process (Figure 2). The new process was designed to facilitate approval of activities complying with the area designations, and more detailed review of projects with environmental impacts or those not consistent with the Plan. MOE would be Chair of the Environmental Assessment Committee, which would include key agencies such as DFO and the Cowichan Valley Regional District. The final decision would be prepared in writing by the Minister of Environment.

Management activities under the Plan included habitat enhancement and restoration. Improving water quality and flood control were other important issues that would be addressed during implementation of the plan.

Since a Cabinet Order had been issued to implement the Plan, amending the plan would require Cabinet approval. This would be coordinated by the MOE, and require consultation with the public, affected landowners, and government agencies. The revised amendment would then be taken to Cabinet for approval and a new Cabinet Order issued.

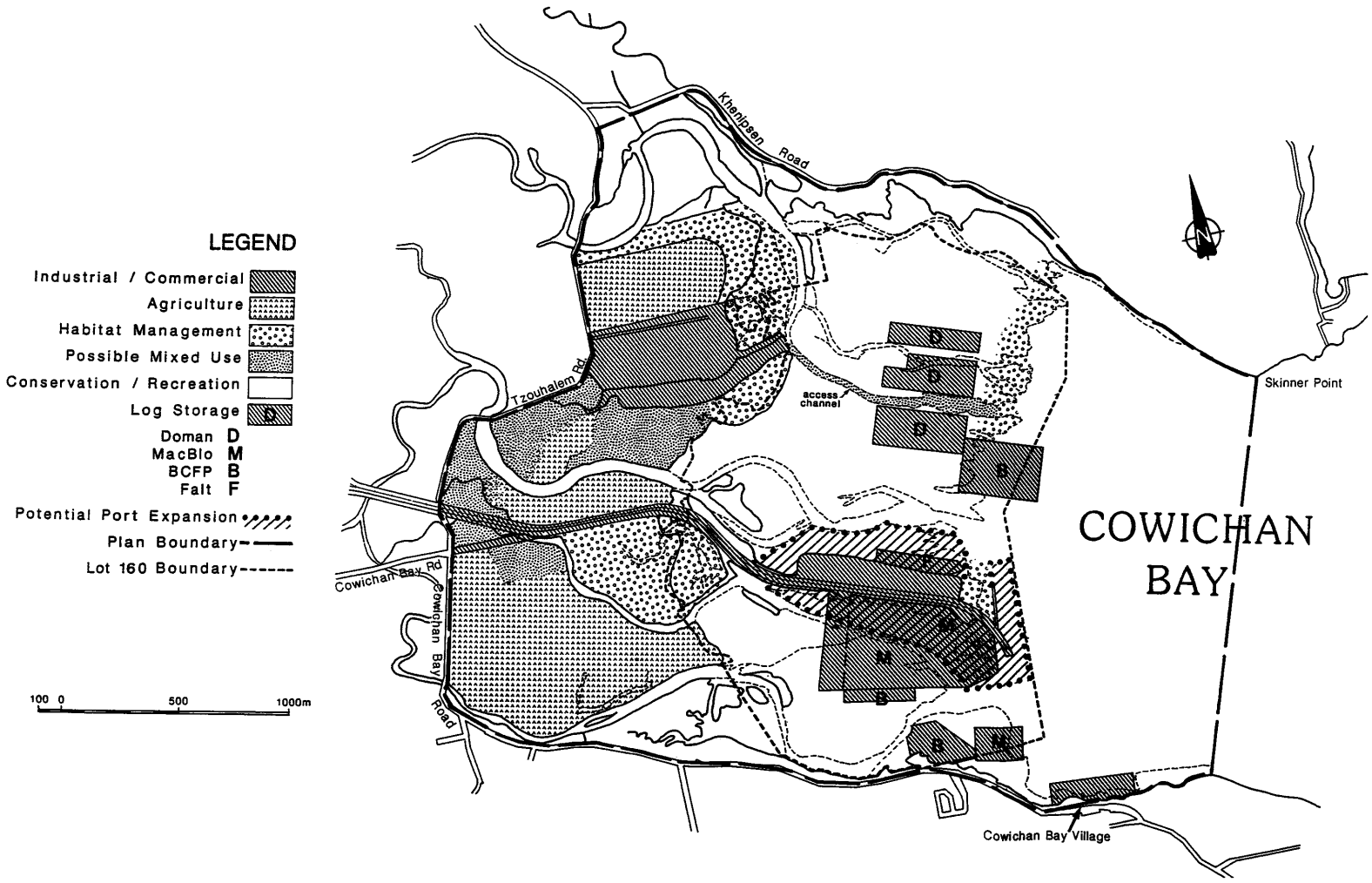


Figure 1. Area designation for Cowichan estuary.

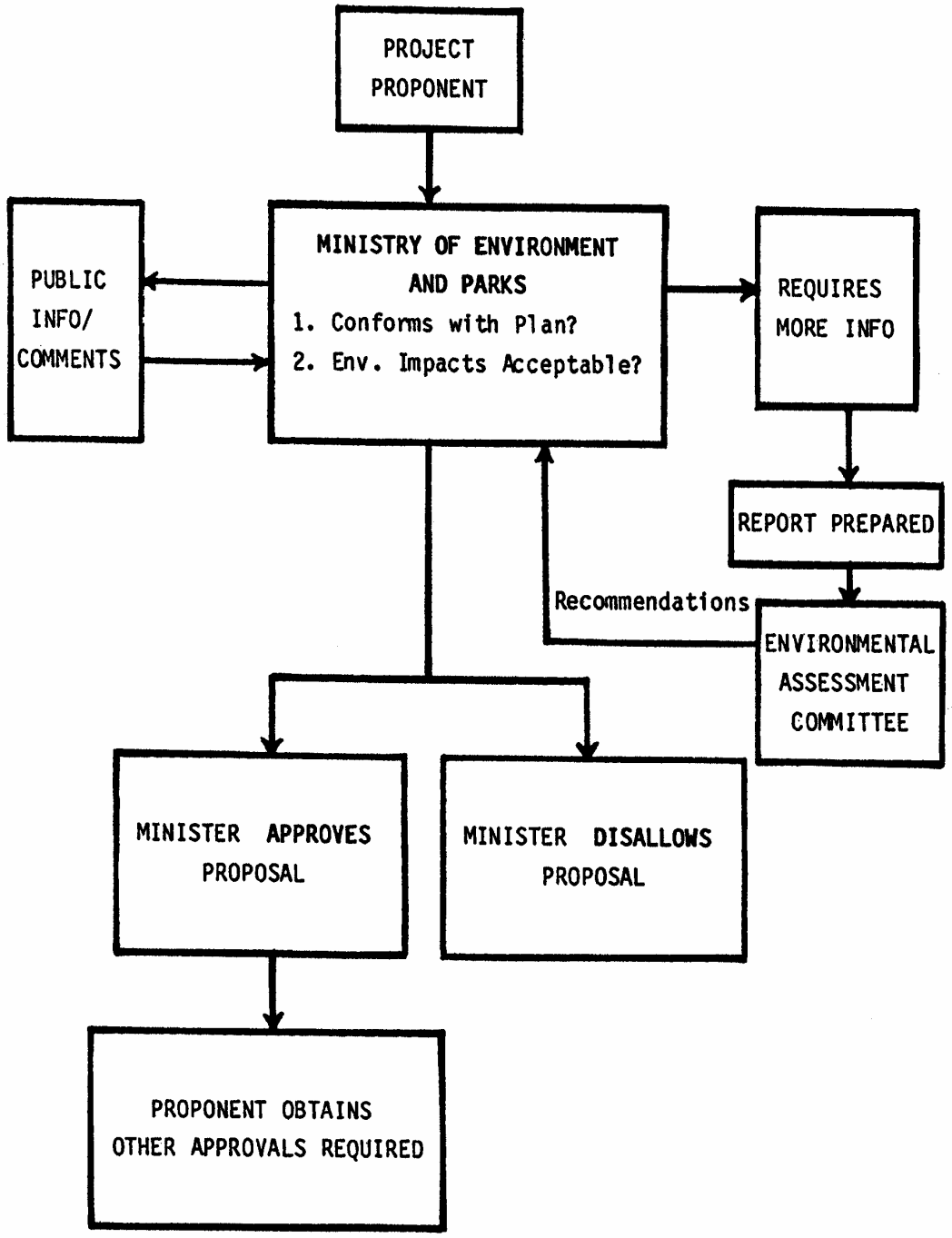


Figure 2. Cowichan Estuary Environmental Management Plan project review process (Lambertsen 1987).

In October 1991, MOE initiated a public review of the existing Plan, through the Vancouver Island Region Planning and Assessment Program. The review of the plan was conducted because the area had experienced rapid growth and associated development pressures with major changes in land ownership, and their was considerable public concern over management of the estuary. In March, 1992, a committee of five representatives from the DFO and the BC government was selected to review public input and draft a revised plan.

The main issue raised was public concern about the opportunity to participate in administration of the Plan, including the project review process. There was a general consensus that the review process was not clearly defined and did not include enough opportunity for public participation.

There was also concern over the focus of the plan on forestry activities and lack of consideration for other industrial development opportunities, particularly tourism. Issues included the extent of forest activities in the estuary and the impacts on estuarine habitats for fish, birds and wildlife, impacts of dredge material, and management of deadheads. Other major concerns included the effects of treated sewage discharge, agricultural runoff, fish hatchery effluent and water withdrawal from the Cowichan River. Although flood control management efforts had reduced flooding along the Cowichan River, little progress had been made along the Koksilah River. There were also concerns over recreation and access to estuarine lands.

Some residents felt that the land use designations were restrictive and were not successful in providing the highest net benefits to the community. However, **all** modifications of the land use designations required approval of cabinet according to the Order-In-Council. Even the Fisheries Act was made subservient to the Order. This complicated implementation of the Plan and made it more difficult for the local public and stakeholders to "buy into the Plan".

In February 1995, the revised Plan was released. However, the longshoreman union opposed the revised plan because of concerns over impacts on jobs and key landowners felt it was too restrictive. Further efforts by the Cowichan Regional District to facilitate improvement and acceptance of the plan were unsuccessful. The 1987 version of the plan, as mandated by Order-in-Council 1652, remains the official operational Plan.

Dredging has been a controversial issue and led to a review of dredging decisions in the Cowichan estuary conducted for the Cowichan Estuary Preservation Society (Braul 2000). The report documents public concerns over lack of input into committee review of dredging proposals. Changing conditions within the estuary have also led to modification of dredge management. For example, the practice of side casting dredge materials to provide log access for mill activities is no longer authorized by DFO, and previously side cast material was removed. Now dredging is handled under annual maintenance dredging approvals.

Summary Evaluation

The Cowichan Plan was successful in reducing forestry operations in the intertidal zone of the estuary, but has proven to be inflexible to meet changing conditions. The administration of the plan, including the area designations, are mandated by the 1986 Order-in-Council, which may not be still applicable.

The main shortcomings of the Plan appear to be:

- formal cabinet approval of even minor changes to the plan as required by the order-in-council, make modifications and improvements to the plan a lengthy and involved process;
- failure to obtain broad stakeholder support, as shown by public concerns with limited input into the process;
- inflexibility of Plan to deal with changing conditions in the estuary and implementation of more current, effective environmental management.
- making senior legislation (e.g. Fisheries Act) subservient to the provincial process.

2. Fraser River Estuary Management Program

Background

The most established and comprehensive estuary management plan in British Columbia, The Fraser River Estuary Management Plan, was produced by the Fraser River Estuary Management Program (FREMP). The plan was finalized in 1994, but FREMP had been in operation for several years prior to finalization of the plan.

FREMP evolved from several years of intensive, multi-agency, public, and stakeholder input. Prior to establishment of the program, there was an intensive phase of information collection, inventory of existing conditions and trends in the estuary, and public participation. This phase was the initial part of the Fraser River Estuary Study (FRES), and occurred from 1977 to 1979. Several working groups prepared background reports covering important topics such as recreation, habitat, industry, water quality, and review of management options. In 1980-1982, the second phase of FRES, a proposed management program was prepared and outlined in the report entitled "A Living River by the Door". In phase III, from 1982-1984, an implementation strategy was developed and described in the report entitled "An Implementation Strategy for the Fraser River Estuary Management Program". A linked-management system was proposed, rather than a new agency, reflecting the limited financial and administrative resources available at the time and the reluctance to establish more government bureaucracy.

In 1985 FREMP was established. FREMP is a cooperative agreement, not an agency, directed by representatives from Environment Canada, DFO, MOELP, North Fraser Harbour Commission and the Fraser River Harbour Commission. During phase I of FREMP, extending from 1985-1990, eight activity work groups study reports were

prepared and shoreline habitats were mapped and classified. From 1991-1994, Phase II policies and planning continued and a number of initiatives were implemented. In 1991 the Greater Vancouver Regional District (GVRD) joined as a partner of FREMP. Since 1994, the Program has continued as extensions to the Phase II agreement.

FRES and FREMP were established by the provincial and federal governments because of the rapid population growth in the Lower Mainland, and the associated 1970's public concerns about the impacts of continued growth on the biological productivity and natural features of the Fraser River estuary, and communication problems between government agencies.

FREMP's accomplishments have included coordinated procedures for project reviews, emergency response agreements, and borrow dredging and navigation channel maintenance approvals. Regional inventories and standardized databases have been established for habitat classification maps, recreation area mapping, environmental monitoring plan, and wet site archaeology. Management guidelines and region wide strategies have been prepared for Fraser River dredging, log storage, federal policies for the management of fish habitat, habitat classification and coding, area designation agreements with municipalities, and draft plans for nodal port and industrial development, and system of linked recreation units.

The Fraser River Estuary Management Plan includes identification of vision, goals and supporting principles, outline of six action programs, and integration and activation of the plan. The original vision of the Plan formulated in 1984 was to "improve the environmental quality in the Fraser River estuary while providing economic development opportunities and sustaining the quality of life in and around the estuary". The vision was revised in the Plan to more accurately describe the intention to work towards sustainability:

> "to provide the means for accommodating a growing population and economy while maintaining the quality and productivity of the Fraser estuary's natural environment".

The goals of the Plan are to:

- conserve and enhance the environmental quality of the river and estuary to sustain healthy fish, wildlife, plants, and people;
- respect and further the estuary's role as the social, cultural, recreational, and economic heart of the region;
- encourage human activities and economic development that protect and enhance the environmental quality of the estuary;

Guiding principles were established under three general themes listed below

1. Conserving and enhancing the estuary

    - keep the estuary healthy;
    - conserve and sustain natural habitat;

2. Integrating Management

    - encourage multiple uses within the estuary;
    - promote integrated decision making;
    - establish and maintain informed management processes;

3. Promoting Fairness, Equity and Accountability

    - promote and employ consensus-based decision making;
    - provide equitable access to the estuary;
    - establish and maintain accountable management processes;
    - develop active partnerships with the public in management activities.

Action Programs are directed towards environmental protection and human activities. Each action program provides an overview of issues and existing management activities, targets and actions, partnership and communication activities, related programs and relevant reports and studies. The action programs include:

Environmental Protection

- water quality management;
- fish and wildlife habitat

Human Activities

- navigation and dredging
- log management
- industrial and urban development
- recreation

Integrating the action programs will be accomplished by:

- implementing existing FREMP initiatives;
- developing new initiatives through FREMP;
- carrying out activities through member agencies
- undertaking capital projects
- establishing information systems
- developing communication and education materials and programs
- facilitating opportunities for consultation and involvement

Activating the Plan requires a commitment from the participating agencies and organizations. The commitments include endorsing the Plan and maintaining strong working linkages with other participants, providing support funding, promoting

consensus in decision making and conflict resolution, and conducting monitoring, evaluating and updating of the Plan as required.

Monitoring and evaluation will include reviewing vision, goals and guiding principles every five years and producing a state-of-the-estuary report. Strategy (e.g. targets and actions programs) and implementation (e.g. funding, management tools and public consultation) will be reviewed annually. The latest Plan updating began in 2002 and will be completed in 2003.

An example of the integration of the natural features of the estuary are shown in the shoreline habitat classification maps which provide the habitat inventory, shoreline habitat classification and area designations (Figure 3).

The shoreline classification definitions are provided below.

- red coded (highly productive) shoreline

  Development may occur in red coded areas provided that mitigation is applied through site location and/or design to **avoid** impacts on **habitat features** of the area. Habitat compensation is **not** an option as a rule. The only circumstances whereby exception to the above guideline can be considered are where the project is specifically undertaken in the interest of public health and safety. Even in these cases alternative siting and design mitigation will be pursued to the maximum extent possible.

- yellow coded (moderately productive) shoreline

  Development may occur in yellow coded areas provided that mitigation and/or compensation measures are incorporated into the project design to ensure that there is **no net loss** of productive capacity as a result of the project. Mitigation options should be pursued to the maximum extent possible prior to consideration of compensation for unavoidable impacts on habitat features.

- green coded (low productivity) shoreline

  Development may occur in green coded areas provided that reasonable efforts are made to mitigate environmental impacts through appropriate location and design. Habitat compensation will **not** be a condition of approval.

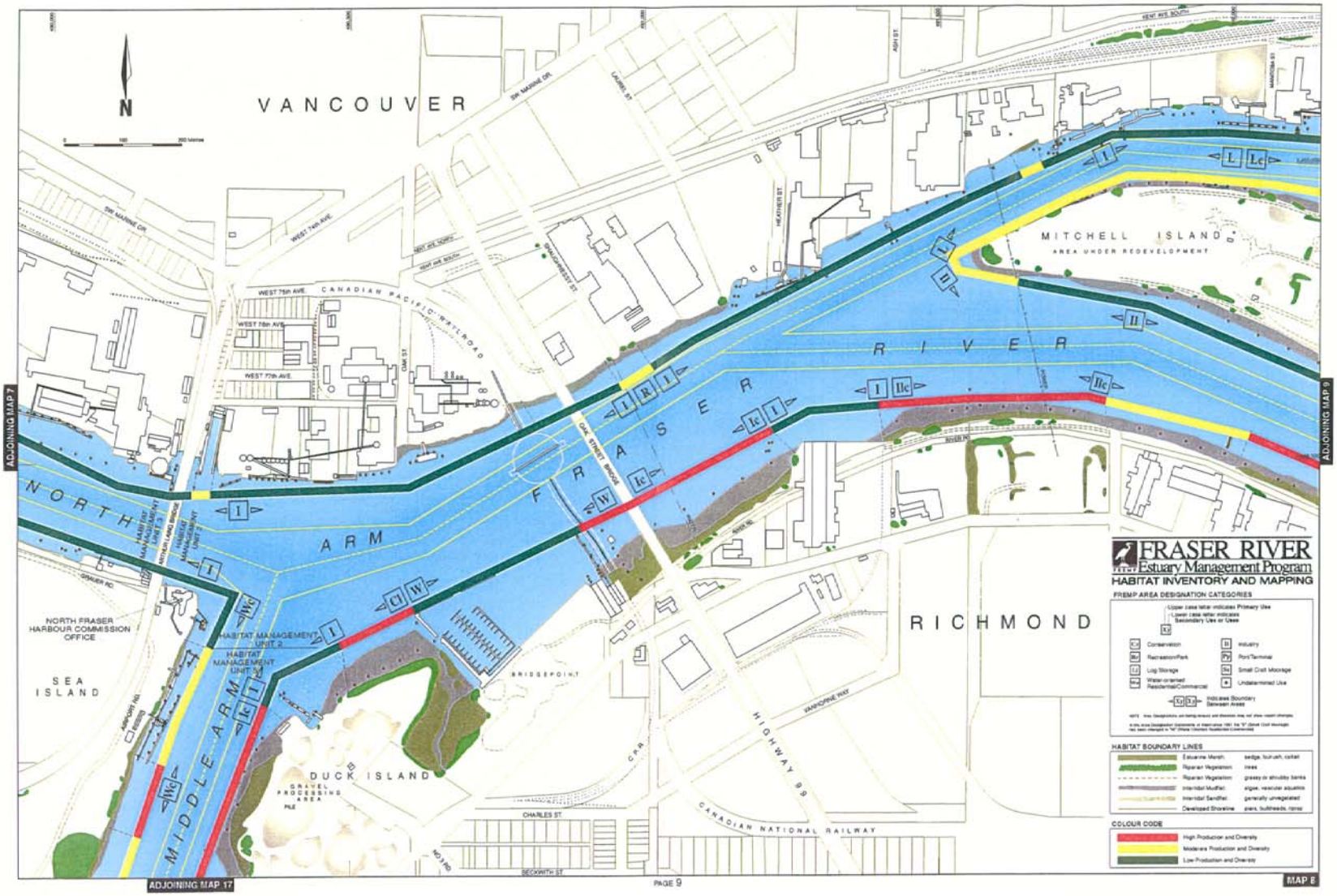


Figure 3. Fraser estuary shoreline habitat inventory and classification.

In the mid-1990's, the FREMP shoreline habitat inventory and classification was incorporated into a computerized geographical information system (GIS), using a 1995 orthophoto base layer. Recent work to improve the system and make it more ecologically based has been completed (Williams 2001; 2002) and is being reviewed for updating the inventory and classification. An Ecological Features and Functions Approach (EFFA) was developed to provide more integrated management of human and natural functions. The approach includes GIS inventory and classification mapping unto a 2002 orthophoto base and Access database.

Another feature of the plan is the project review process. The Coordinated Review Process includes identification of a Lead Agency, typically one of the Port Authorities (formerly harbour commission) or BC Lands, and establishment of the Environmental Review Committee (ERC) that reviews project proposals. The ERC consists of representatives from Environment Canada, DFO, and BC MOELP, as well as the Port Authorities. ERC agencies are requested to provide a response within 30 days, which are summarized in a coordinated agency response and issued as a FREMP project approval. Recently, the project review process was modified to include a 3–phase, 4-track review process (Figure 4). The modifications were made to allow the Port Authorities to conduct Track 1 reviews and improve the efficiency and accountability of the project review process. Reviews of decisions may be queried in writing by the proponent and in special cases, may be referred to the Executive Management Committee for alternative review.

Summary Evaluation

FREMP is the largest and most complex of the estuary management plans implemented in British Columbia. Coordination of multiple agency jurisdictions in the Fraser River estuary has been one of the main purposes of the program. Reviews of development projects have been enhanced by the coordinated project review and the "one-window" approach is more effective than numerous separate reviews.

Four important areas require mention. The first is the continuing need to obtain sufficient professional expertise and financial support from partner agencies to operate effectively. Government cutbacks have led to recent transitional phases as the supporting agencies adjust to reduced revenues and changing agendas. In late 2002 the Management Committee began a critical evaluation of the program to determine ways to reduce the costs to address reduced funding from federal agencies and port authorities.

The second is the need to refine the habitat shoreline classification to make it more consistent but retain flexibility based on site-specific conditions. There are public concerns that the classification is not being applied in ways that conserve habitats, while industry is concerned that the classification is punitive or inflexible. Part of the concern lies with the inconsistent interpretation of the classification by agency managers over the years. As well, in some cases the classification has not been adequately explained to stakeholders, or the classification has not been determined in strict accordance with pre-determined criteria.

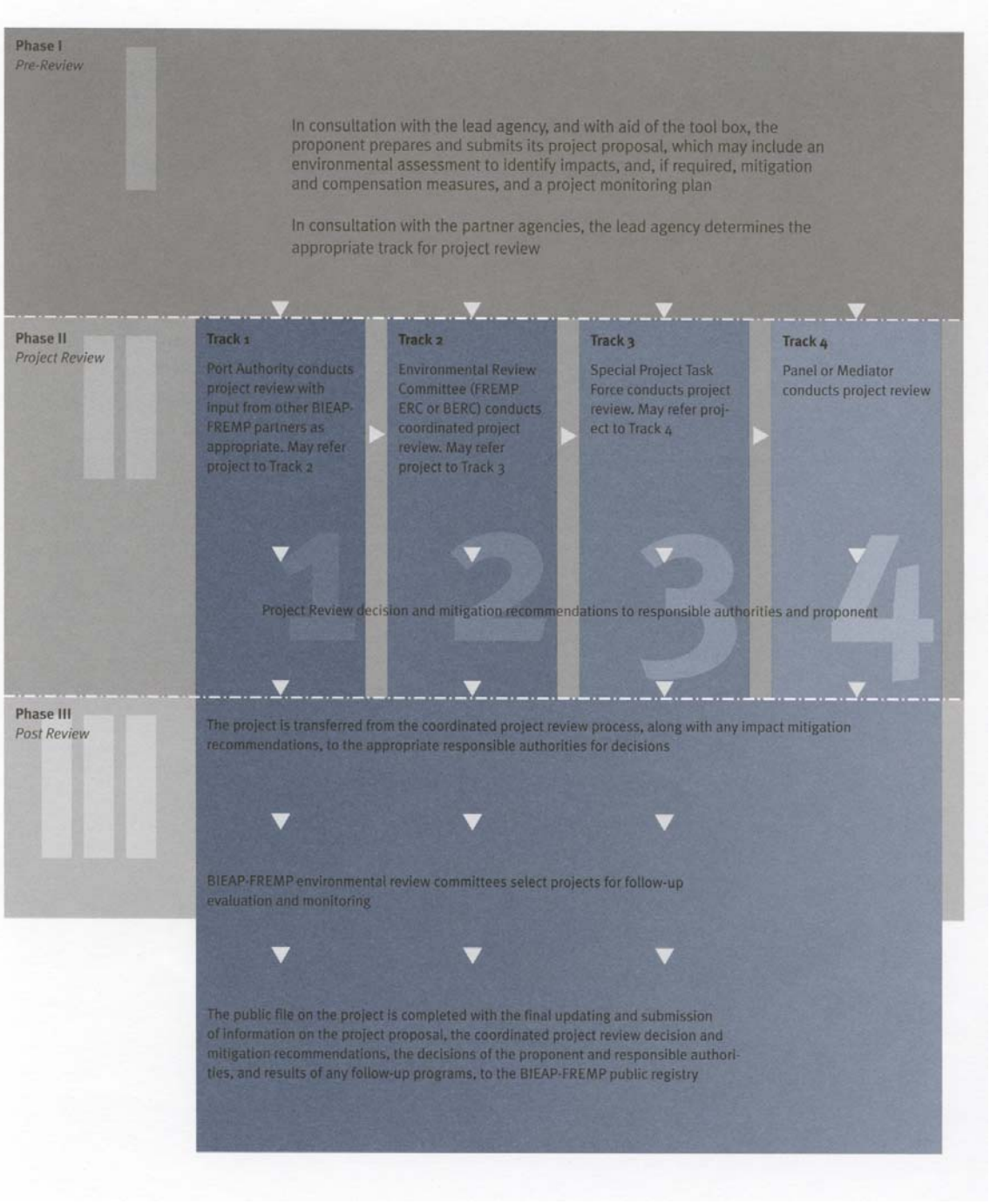


Figure 4. Revised FREMP Coordinated Project Review Process (2002).

With the adoption of work of the EFFA conducted by the Habitat Classification Improvement Task Group, habitat inventory and classification will be based on more ecologically based criteria that integrates habitat features and fish and wildlife functions, existing human uses, municipal zoning and OCP designations, and FREMP area designations. Included in the new approach are specific use guidelines that will provide more consistent guidance on permitted development activities.

The third difficulty is ensuring public confidence in the FREMP process. To some special interest groups, there still is a misunderstanding concerning the authority of FREMP, and the fact that it is strictly a forum for regulatory agencies to provide coordinated management. The strength of FREMP is the ability to build consensus and promote balanced management. Public support and participation in FREMP has been an important stimulus to keep the various agency and political commitment to fund FREMP and provide staff and administrative assistance.

The fourth factor is the need to complete the area designations with the municipalities within the FREMP area, with the aim of making the area designations and municipal zoning and Official Community Plan designations complementary in terms of supporting sustainable development. The FREMP boundary is the high water level and upland areas, which are usually under municipal control, are not directly covered. Without consensus with municipalities, effective estuarine management can be difficult or ineffective. Concluding area designations agreements have been slow caused by conflicts between the various jurisdictions within the Fraser River estuary. However, the requirement of Port Authorities under the Canada Marine Act to prepare of Land Use Plans and the incorporation of municipal OCP and zoning designations into the Ecological Features and Functions Approach, may reduce the need for Area Designation in the future.

3. Squamish Estuary Management Plan

Background

The Squamish Estuary Management Plan was initiated in May 1979 jointly by MOE and DFO. The agencies were concerned about recent conflicts between development (e.g. BC Rail filling of parts of the estuary for port development and construction of the training wall) and conservation of estuarine habitat. The goal of the plan was to provide a decision-making framework, which could be used to guide land and water use in the Squamish estuary, but remain flexible to allow refinement in later years. The Plan was designed to be a voluntary process.

The proposed Squamish Estuary Management Plan was published in September 1982, consisting of Volume 1, The Plan, and Volume II, Appendices. However, the plan was not ratified and there were several revised versions in 1992/1993 and 1999, before it was finally signed in October 1999. Full implementation of the plan is anticipated as soon as the required land transfers are completed.

To prepare the Squamish Estuary Management Plan, a Planning Committee (PC) was formed in 1979 comprised of representatives from the following agencies:

- Fisheries and Oceans Canada
- Environment Canada
- B.C. Ministry of Environment
- B.C. Ministry of Industry and Small Business Development
- District of Squamish
- British Columbia Railway

The PC was chaired by the MOE with the vice-chair from the DFO. Terms of reference for the PC included specific guidance on its responsibilities and operation, including definition of the study area boundaries to extend from the 5 fathom (9 m) depth up to highest high tide level, with possible inclusion of up to a 500 m wide perimeter zone; target completion dates for draft (May 30th, 1980) and final (November 15th, 1981) plan reports, and requirement to form a series of work groups to provide technical reports on planning, land use, habitat, water quality and recreation. A public involvement process was to be prepared and approved by the PC.

The terms of reference for the PC specified determination of five area use designations:

- preservation
- conservancy use
- industrial or commercial
- mixed-use
- unclassified

Criteria to be used in determining area designations were:

- present use
- potential uses
- biophysical factors
- social and cultural factors
- aesthetic factors
- economic factors

Use designations for each area were to include a management objective and management guidelines. A process for resolving conflicts and making adjustments, refinements or updating the use designations was to be provided.

To assist the PC prepare the plan, four preliminary management exercises were conducted. The first included a review of other estuary management planning exercises in B.C. and Washington State to provide guidance for developing the Squamish Estuary Management Plan.

The second involved two exercises to prepare draft management designations and preliminary identification of issues, concerns and conflicts. Each exercise involved government and public organizations knowledgeable of the Squamish River estuary applying proposed area designations to an aerial photo mosaic of the Squamish River estuary. The results of these exercises helped to refine the area use designations and provided an indication of the level of consensus for the designations and issues.

The third exercise was the Public Involvement Work Group (PIWG), comprised of a broad range of local interest groups, non-government organizations (NGO's), and local community members. The role of the PIWG was to provide a liaison between public, PC, and work groups. Funding and technical support was available upon request to the PC.

The fourth exercise was the staging of two workshops attended by the Planning Work Group, technical work group representatives, and MOE resource staff. The purpose of the workshops was to review and integrate the information into the draft plan.

Based on the 1982 plan, implementation of the plan was to coordinated by the Coordinating Committee (CC) and the Implementation coordinator (IC). The CC would operate under approved terms of reference covering its responsibilities and administrative procedures. Its responsibilities included determining the type of environmental review each project required based on information provided by the project proponents, reviewing the results of environmental assessment and making recommendations to regulatory agencies, suggesting amendments to the management plan, and identifying funding and manpower requirements to implement the plan.

The IC would serve as secretary to the CC, based on terms of reference approved by the CC. The IC was be responsible for implementing the technical and administrative day-to-day activities of the plan and would be the main contact with advisory levels of government, private sector and public.

Another important component of the administrative structure of the plan was the establishment of an information bank, to be located at the Squamish Public library. The information bank was to be a public repository for information associated with the Plan, including all related project reports, correspondence and CC minutes.

One of the most important items in the Plan was the determination of appropriate area designations to balance urban development with protection of natural fish and wildlife habitat. The original five area use designations were simplified to three by the Planning Committee in 1992. The three area designations included conservation, industrial/commercial and planning assessment (termed unclassified in the original PC terms of reference). Preservation and mixed-use designations were dropped from consideration following the preliminary area designation exercises conducted by the Planning Committee. The management objective and policies for each designation are provided below. The area designations are primarily a recognition of existing resource and industrial values within the estuary.

Conservation:

Objective:

Areas containing estuarine habitats that are integral to the continued existence of the estuary as a productive biophysical entity will be managed for conservation. These portions of the estuary will be managed to maintain, restore or enhance productivity. Educational and recreational opportunities may be compatible.

Policies

1. only those activities which will not hinder the achievement of the conservation objectives should be allowed;
2. activities involving modification to the estuary will be subject to an environmental impact assessment;
3. activities adjacent to conservation areas will be reviewed to ensure that the integrity of the conservation area is not compromised;.
4. public appreciation and understanding should be promoted through the information bank and other means.

Industrial/Commercial Areas

Objective

Provide long-term security for industrial and commercial activities on sites with supporting land or water-based transportation connections. Encouragement is given to maximizing utilization of existing sites to avoid development of new areas.

Policies:

1. Increasing utilization and efficiency of land in the industry/commercial designation should be encouraged as an alternative to development of other sites within the estuary. Increasing the period of tenure may be an incentive to promote long-term efficient use.
2. Water dependent uses will be preferred and non-water dependent activities discouraged.

Planning Assessment Areas

Objective:

Lack of information prevented designation as either conservation or industrial/commercial, so the planning assessment area designation was applied until further economic and/or environmental information could be compiled and assessed. The environmental controls will be the same as conservation and an environmental impact assessment will be required to obtain approval for development.
Policies

1. The existing character of the areas in this designation will be retained.
2. The CC will require all proposals conduct an environmental impact assessment, as well as an economic feasibility and benefit/cost analysis in some cases.
3. Studies for these areas will focus on better use of the area.

Implementation of the 1982 plan indicated that amendments were needed to make the plan more workable. For example, there was too much uncertainty about what and where development could occur and the project review process needed improvement. SECC did not include some specific public interest groups and the implementation of some of the 1982 plan recommendations were complicated by lack of designated funds.

The 1992 draft was prepared to address the shortcomings of the 1982 plan, with one of the main objectives to re-evaluate the area designations and reduce the uncertainty of the large Planning Assessment area. The two stated aims of the 1992 Plan and retained in the 1999 Plan were to ensure that:

- ecological diversity and environmental quality were sustained in an intact ecological unit comprising physical and biological features representative of the original Squamish River estuary;
- sufficient land and water area is allocated to enable industrial, commercial, recreational, transportation-related and other development to proceed in order to strengthen the economic base of the community.

In 1993 the 1992 Plan was revised to include the following changes:

- socio-economic impact studies to be completed as necessary for project proposed in the Plan area;
- Ministry of Forests representative be added to the SEMC;
- an environmental assessment of Site A be conducted by BCR properties.

The area designation was refined to reduce the uncertainty caused by the large Planning and Assessment area. The 1999 area designations, shown in Figure 5, included:

- conservation, totalling 579 ha (1432 acres) compared to 394 ha (974 acres in 1982;
- industrial/commercial, totalling 330 ha (816 acres) compared to 271 ha (670 acres);
- transportation corridor, totalling 20 ha (50 acres), not considered in 1982;
- planning and assessment, totalling 8 ha (20 acres) compared to 258 ha (638 acres) in 1982.

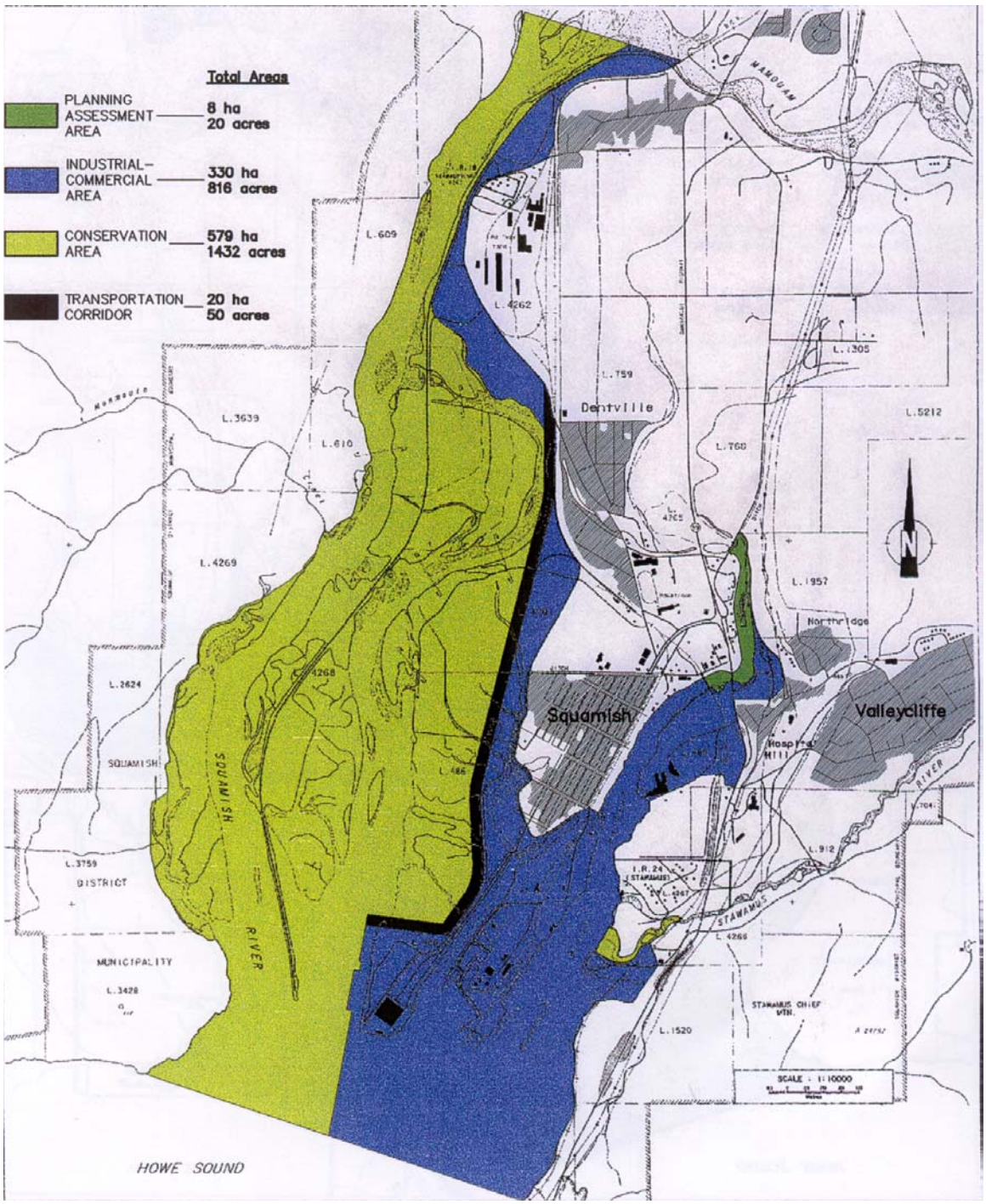


Figure 5. 1999 area designations for the Squamish Estuary.

In 1999 the Plan was further revised following input from the Squamish Nation and the community concerns with Site A. The conservation area included transfer of land title to

the Crown, with a 561 ha (1386 acres) parcel to manage as a Wildlife Management Area an additional area of 30 ha (74 acres) being transferred to the Squamish Nation under a restrictive "Wildlife Management" covenant. To facilitate this land transfers, land will be transferred from the Crown to BCR.

An area-wide Habitat Compensation Agreement will be prepared by DFO, replacing the need to undertake project specific habitat compensation in the industrial/commercial designated areas. Included in the agreement will be several habitat restoration projects including culvert installations, remedial work to clear wood debris restricting fish access, construction of a new re-watering channel and habitat, removal of dredged sand along the Squamish Training wall, and phasing out log sort operation at the West Barr site in the conservation area.

The Planning and Assessment area was substantially reduced and a 60 m wide transportation corridor added. There were also some refinements along the borders of the industrial/commercial boundaries to promote the use of vegetated buffers, storm water detention and pedestrian links.

Administration of the 1999 Plan includes changes to the management structure and process of implementation. The Squamish Estuary Management Committee will replace SECC. The SEMC will include existing member agencies as well as the PC and Squamish Environmental Review Committee (SERC). The Plan Coordinator and the SERC will assist SEMC.

The project review process was modified and consists of three review paths based on the degree of environmental impacts and level of review required (Figure 6). Path 1 is for projects with low environmental impacts and will be reviewed by the PC. Path 2 will review projects with moderate environmental impact and will reviewed by the SERC. Projects with high environmental impact will be referred by SERC to the appropriate agencies for more intensive review and evaluation. Within 30 days of submitting an application to SERC, the PC will notify the proponent of the path selected for review and request for more information, if required.

There was identification of the need for a mechanism for conflict resolution, to be determined by the SEMC. Options could include public meetings or mediation.

Summary Evaluation

The Squamish Estuary Management Plan had been "in process" for 20 years and represents a "worst case" study showing the difficulties that can occur in establishing a plan. The plan has experienced several changes of council at the municipal political level and corresponding changes in support for the plan, a hard-nosed approach at varying

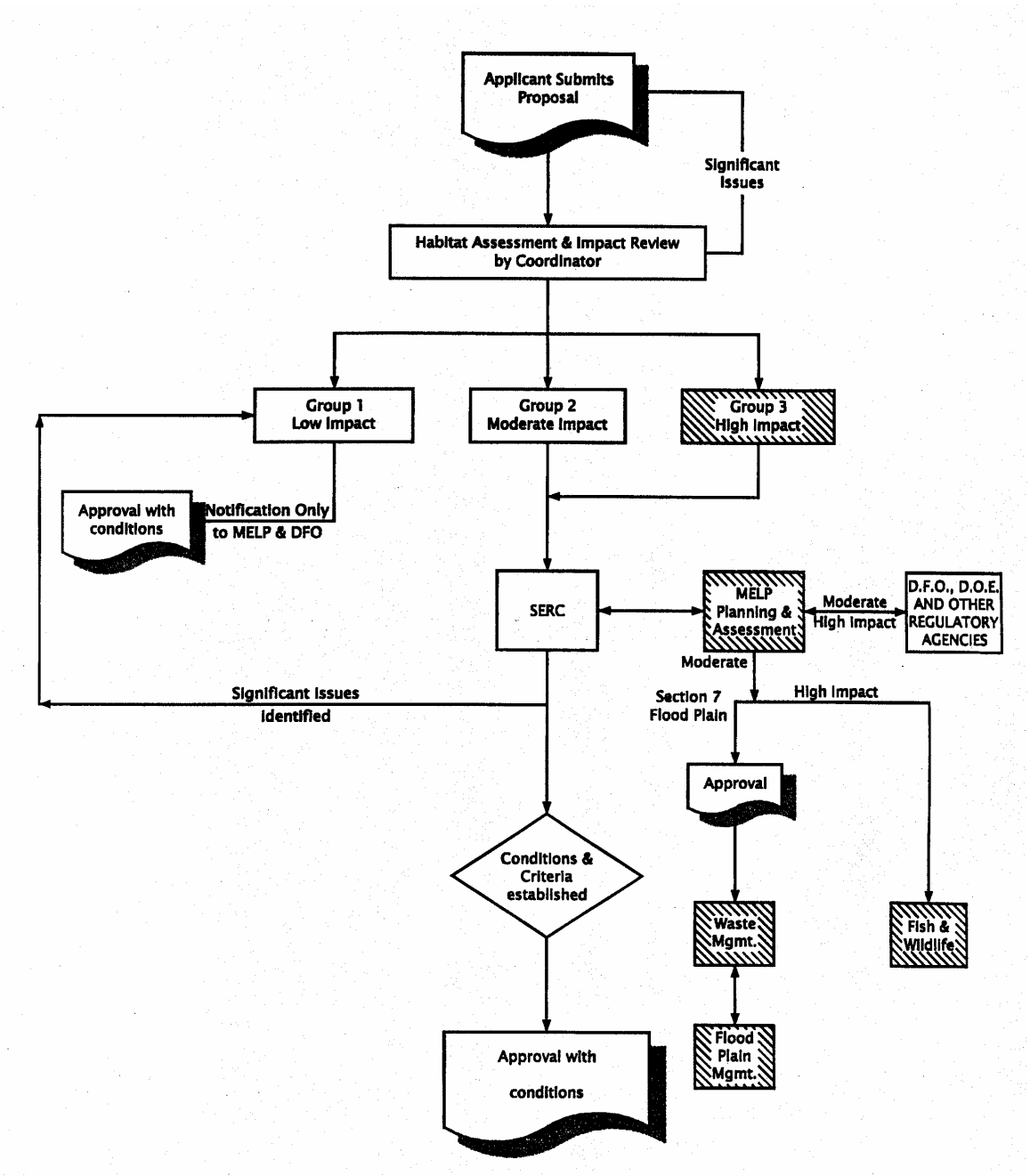


Figure 6. The Squamish Estuary Management Plan Review Process.

times from either the development interests or environmental agencies, and a more and more sceptical public sector. The whole process has been quite adversarial at times and

several agencies interviewed were doubtful that the plan would ever be signed. The costs of producing the plan to-date have largely been borne by BC Rail, as there is a shortage of available funding for the extended process.

While the Squamish Plan took an excessive amount of time to complete, there were several habitat restoration improvements undertaken during negotiations to finalize the agreement. These included:

- installation of two culverts in the Squamish River training wall providing fish access directly to the central basin of the estuary;
- removal of sand that had accumulated along the training wall to intertidal elevations suitable for marsh establishment. The sand removal began in 1990's and will be completed by 2005;
- identification of several specific habitat enhancement and restoration options to be completed once the Plan is implemented.

4. Port of Stewart Environmental Management Plan

Background

In December 1994, the District of Stewart approved preparation of The Port of Stewart Environmental Management Plan (PSEMP). The purpose of the Plan was to develop a more efficient system to deal with proposed port development in the estuary and gravel removal in the Bear River. DFO and the District of Stewart actively supported the plan. The draft plan was to be prepared by G.L. Williams & Associates Ltd. and funding was provided by the District of Stewart and DFO.

The PSEMP was based on the North Fraser Harbour Environmental Management Plan model and modified to meet the specific needs of the District of Stewart. The plan components included an estuarine inventory and habitat classification, project environmental design guidelines, establishment of the District of Stewart Project Registry and project review process, and identification of cooperative habitat enhancement and restoration options for the Bear River estuary. There was also the provision for the establishment of a habitat compensation bank to provide a proactive tool for improving port development and habitat management in the estuary.

The work was guided by a Steering Committee composed of federal and provincial agencies, as well as the District of Stewart. The plan was completed in December 1995, with official signing by the District and DFO in February, 1996 (Williams 1995).

The Bear River estuary habitat inventory and classification involved review of existing information and a joint DFO habitat survey in June 1995 (Williams 1995). Habitats inventoried included mudflat, estuarine marsh and backshore/riparian vegetation. Once the inventory was completed, the shoreline was classified according to a simple three-colour coding, based on the relative value rating: red for highly productive, yellow for moderately productive and green for low productivity. The shoreline habitat inventory

and classification is shown in Figure 7.

An important component of the plan was the establishment of the Stewart Project Registry, which provided a project review process modelled on the Fraser Estuary Management Program (FREMP). This was a significant improvement over the previous local project review process, because it identified the District as the Lead Agency for project proposals and established guidelines for proposal preparation. By serving as the Lead Agency, it provided a local management contact that could more effectively implement the PSEMP and promote more environmentally sustainable development. A flow chart showing the integration of the project review process and habitat classification is shown in Figure 8.

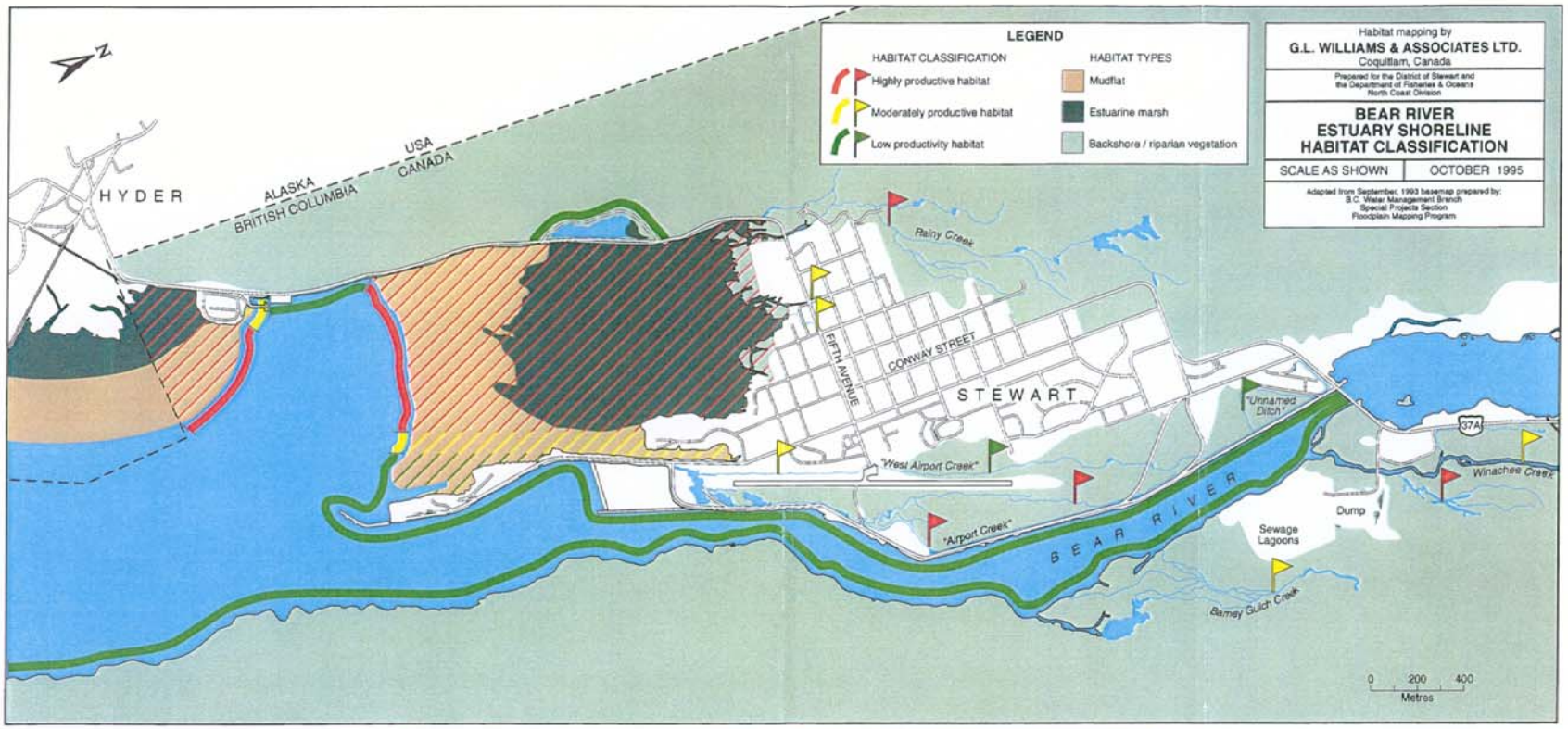
As part of the plan, a cooperative management program was proposed for habitat enhancement and restoration, water quality, applied research and improving communications between the District, regulatory agencies, and proponents.

Summary Evaluation

The PSEMP was the first estuary management plan to be established in the North Coast. It includes a modified application of the FREMP shoreline habitat classification and coordinated project review process. The Plan was incorporated into the Official Community Plan and the Stewart Project Registry process is being actively used for environmental management for projects within the estuary (B. Woodward, District of Stewart, pers. comm.).

Although the shoreline habitat colour coded classification was designed to provide developers with an indication of the level of importance of the estuarine habitats and suitability for development, an application was made to fill part of the adjacent Salmon River estuary soon after the plan was implemented. This application did not comply with the intent of the plan. This was done in spite of DFO's efforts to work with the developer in suggesting alternative sites or mitigation.

The plan was further tested in 1999 when DFO requested to the District of Stewart that Airport Creek be reclassified to a higher rating since salmon were spawning in the watercourse. This was the first habitat classification modification since the plan was implemented.



HABITAT ECOLOGY OF THE BEAR RIVER ESTUARY

The Bear River estuary provides productive habitats for fish, waterfowl and wildlife. Fish stocks include chum and coho salmon from the Bear River and Rainey Creek, as well as the Salmon River in Alaska. Pacific herring, eulachon and Dungeness crabs are other fisheries species that use the estuary during part of their life cycle. Wildlife which may use the estuary include small mammals such as raccoon, mink, otter, and larger animals such as black and grizzly bears. Important waterfowl include ducks (e.g. mallards and red-breasted mergansers), Canada geese, and trumpeter swans. The following summaries provide a brief description of the habitats in the Bear River estuary and their ecological importance.

MARSH

The intertidal marshes found in the Bear River estuary above mean sea level are dominated by sedge (*Carex lyngbyei*), specialized grasses that are able to withstand daily submergence during high tides. These intertidal marshes are one of the most productive natural habitats in North America. They produce large amounts of plant material which provide the basis for a complex food chain that includes numerous species of invertebrates that colonize the marsh or sediments. Peak production in the marsh occurs in late summer and the plants spend the cold winter months as over-wintering shoots which remain dormant until warmer temperatures arrive in the spring.

Typical species which depend on the marsh or the nutrients it provides as the organic matter is decomposed include several species of worms that live in the soil, insect larvae, snails, clams, and numerous small crustaceans (e.g. harpacticoid copepods). The latter are important food for juvenile chum salmon. Larger animals include crabs, clams and numerous species of fish other than salmon (e.g. starry flounder, sculpins and threespine stickleback). Of particular importance to fish are the tidal channels which retain water during low tides. The tidal channels also serve as arteries to the marsh, channelling fresh, oxygenated water into the marsh and concentrating fish food organisms and nutrients during falling tides.

MUDFLAT

The large expanses of unvegetated mud in the Bear River estuary located below mean sea level to the low water line are termed mudflats. The fine mud sediments and frequent inputs of nutrients from the marsh during falling tides and marine waters during flood tides make mudflats very productive habitats as well. Important animal residents include many burrowing invertebrates such as numerous worms, clams, insect larvae and other animals that provide food for fish and waterfowl. The surface of the mudflat also supports a film of algae and diatoms which in turn provides food for other animals such as harpacticoid copepods and insects. As with marshes, these animals are preyed upon by fish and waterfowl. Generally the mudflats are located at too low an elevation to support marsh plants, although patches of ditch grass (*Ruppia*) do colonize the mudflat.

RIPARIAN AND BACKSHORE VEGETATION

The trees and shrubs growing along the banks of streams are termed riparian vegetation. When growing along the beach or adjacent marine waters, they are referred to as backshore vegetation. The dominant tree and shrubs along the lower Bear River within the estuary are cottonwood, red alder, willow, sweet and Sitka spruce. Within the Bear River estuary, backshore vegetation includes shrubs such as sweet gale and red-osier dogwood, and several species of grass and large herbs such as cow parsnip.

Upland vegetation is important because it provides shelter and cover for juvenile fish, especially juvenile coho and chum salmon. Trees and shrubs provide an effective buffer between human upland activities and natural wildlife habitats. The leaves from trees and shrubs provide organic inputs to the water, as well as insects. These inputs provide nutrients and food for fish and fish food invertebrates living along the shoreline.

Upland vegetation also provides cover for animals (e.g. beaver, otters and racoons) and birds. Small birds such as songbirds may nest along stream-side shrubs and trees, while larger trees may provide nesting sites for birds of prey such as eagles, as well as other birds such as wood peckers and great blue herons.

Figure 7. Bear River estuary habitat classification.

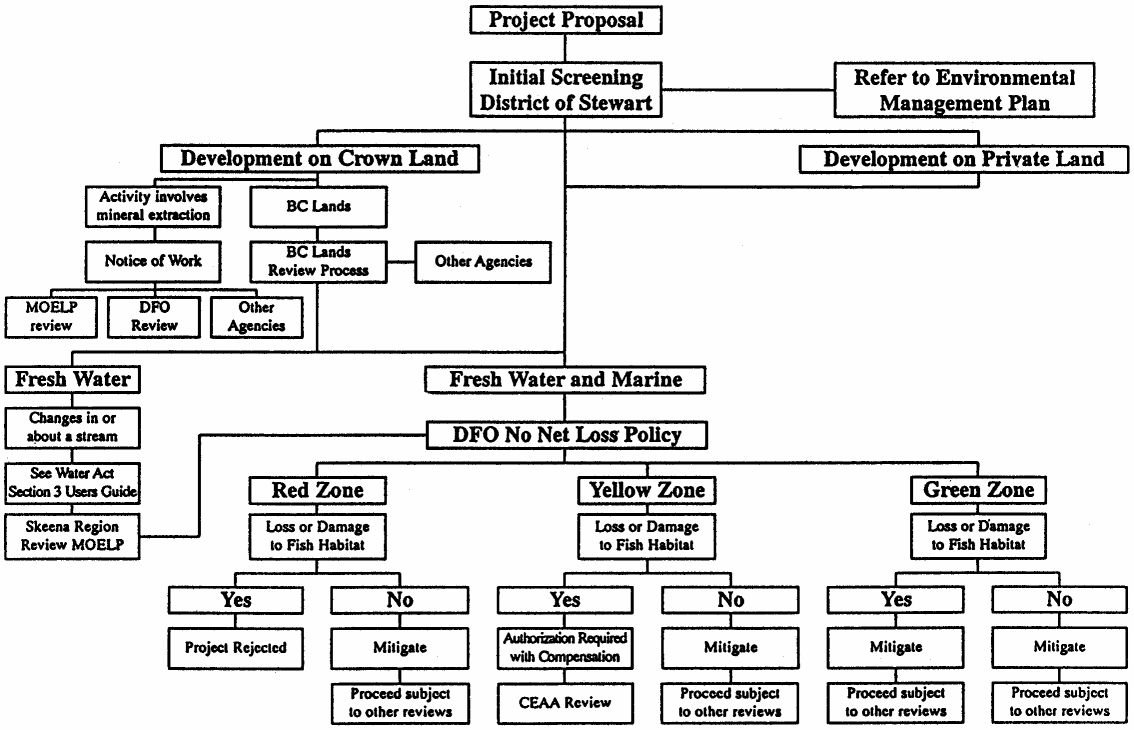


Figure 8. Project review process in the Port of Stewart Environmental Management Plan.

5. Campbell River Estuary Management Plan

Background

In 1994, in response to a proposal by Coast Guard Canada to dredge the estuary and other ongoing development issues, the Council of the District of Campbell River established a committee to oversee the preparation of a comprehensive management plan for the Campbell River estuary. In 1996 the Campbell River Estuary Management Plan was completed and adopted by Council. The Campbell River Estuary Management Commission (CREMC) was formed in 1997 as mandated by Council (Bylaw 2551, 1996; Bylaw 2726, 1998) to advise Council on implementation of the Plan. The purpose of the plan was identified by a specific terms of reference:

- produce a long range strategy to guide development decisions concerning the use of land and water in and around the estuary to accomplish the restoration of the estuary as stated in the Community Plan;
- identify opportunities and programs for restorative/rehabilitative activities throughout the estuary;
- establish an environmental baseline measure, e.g. water quality, fish habitat, and wildlife, from which monitoring can be undertaken;

- define the role and responsibilities of all parties (i.e. users, government, and public) involved with the estuary;
- produce an up-to-date consolidation of information on the estuary.

The area to be covered by the Plan extended from Orange Point to the Westmin dock up to the Highway Bridge and lands generally within the designated Campbell River floodplain. The study was divided into two sub-areas: the immediate estuary and lands and waters beyond the estuary.

Planning principles were also identified in the terms of reference:

- promote long term benefits to the natural environment over short term gains in any particular agency or user group;
- improve and increase the effectiveness and efficiency of long and short term decision making by regulatory agencies with regard to the management, development, and allocation of land and water resources in the estuary;
- shall be dynamic rather than defining an end state;
- incorporate sustainability principles.

The Committee also modified one of the principles to:

- be founded on inherent biophysical capabilities of the estuary;
- recognize the long-term socio-economic needs of the community as it relates to land use decisions in the estuary.

The Management Committee was composed of a diverse representation including DFO, Quinsam River Salmon Hatchery, District of Campbell River, Canadian Coast Guard, Ministry of Environment, Lands and Parks (one representative from Lands and one from Environment), B.C. Hydro, industry and sport fish user representative and public interest group representative. The Committee met monthly or more often depending on need.

Development of the Plan was guided by four key determinants:

1. active Management Committee involvement;
2. public/interest group consultation
3. assessment of habitat and land use considerations
4. existing policies and programmes.

The Management Committee actively participated in the identification and approval of opportunities, constraints and issues; approved the focus upon two alternatives; developed and adopted the Vision Statement for the estuary; and prepared two alternative intervention scenarios and subsequently approved one; completed an issue/policy session and adopted the Plan.

Public Involvement occurred on two occasions. An open house was held at Tyee Spit

over two days. Participants listed their likes and dislikes related to the estuary and identified areas of interest/concern on an aerial photograph overlay. An optional guided tour and completing a questionnaire was also conducted. The questionnaire was also made available to the general public. The second public meeting was held with interest groups (industrial users, Tyee Spit users, and the Estuary Society). Three meetings were also held with the Campbell River Indian Band.

Assessment of habitat and land use considerations were conducted by a consultant team including an wetlands biologist, that met with staff, conducted field visits and reviewed pertinent information. Key wildlife and aquatic habitat areas were identified and appropriate monitoring programs were specified. Habitat mapping in 1995 was provided by DFO.

Existing policies and programs were reviewed by the planning team to determine their effectiveness on land uses, zoning and development initiatives. A thorough review of scientific and policy and planning studies of the Campbell River estuary was also conducted.

The Plan includes several recommendations guided by a set of general and specific management area policies. The recommendations cover:

- one time dredging to complement industrial relocation strategy
- systematic habitat restoration
    - bank erosion
    - freshwater fish habitat
    - estuarine fish habitat rearing
    - wildlife habitat
- industrial relocation
- modification of existing industrial operations
- park and interpretation development
- tourism development
- upland re-development
- Tyee Spit

The study area was divided into 20 management areas, corresponding to water lot leases, land ownership, and natural features. For each management area, specific issues requiring resolution were identified and policy statements and actions needed to ensure policy implementation were identified. Management areas 1 and 2 were broader study areas. Management Area 1 covers the District of Campbell River and Management 2 refers to the entire study area. Estuary policies for area 1 must be compatible with Official Community Plan. In Area 2, land uses and future development must recognize the values and policies established for the estuary.

Due to the achievements of the Management Committee it was decided that the existing

structure would be continued until a more appropriate model was identified in the future. To assist the committee, a Secretariat was appointed from the District of Campbell River to work on a part time secondment basis. In 1996 the Campbell River Estuary Management Commission was established by the District of Campbell River and formally created in March 1997. The bylaw, revised in 1998, created an 11voting member commission to advice Council on the implementation of the estuary management plan. The Commission members were appointed by Council and include two representatives from the federal and provincial governments, one member from the Campbell River Indian Band, two members from industrial and business, two members from recreational users, and four citizens at large. In addition there are two ex-officio members of Council and one staff person who provides administrative support to the Commission only.

It was identified in the Plan that a clearing house be established to provide a contact for the general public. Ecological monitoring was identified as an important activity for the long term (e.g. 10-120 year period), with review and evaluation every 3-5 years. This called for establishing a adequate baseline to determine changes. The Estuary Commission will produce an annual report card on the estuary.

A sub-committee was recommended to deal with industrial concerns and implement the proposed industrial relocation strategy. In 1997, the Commission in conjunction with the Property and Economic Development Department, secured Forest Renewal BC (FRBC) funding to hire a consultant to begin a three month comprehensive Industrial Relocation Strategy Study to provide a review of existing industrial operations in the estuary, strategy for relocating industry, public consultation process, and an implementation plan.

Zoning was to be completed after comprehensive development plans have been prepared and there is a legal agreement on development and servicing costs and public open space requirements. Of particular importance was the review of waterlot lease tenures to ensure that they were compatible with the estuary management plan policies, and ensuring meaningful dialogue with the Campbell River Band.

The Plan will be reviewed every five years, but specific annual reviews will be undertaken by the Estuary Commission to check the progress of the plan implementation, issues and coordination activities with government. Amendments will be brought to Council by the Estuary Commission, and dealt with similar to amendments to the OCP.

Habitat restoration projects will be implemented on a priority basis once the source of habitat degradation is removed. Priorities were established for implementing restoration work, ranging from reducing risk of property damage from erosion, flood or contamination, to restoring natural hydrology and flushing of areas with degraded water quality, to creating new aquatic habitats.

The Estuary Commission has been very successful in obtaining funding to undertake habitat restoration and rehabilitation, building a comprehensive trail network plan for the estuary, developing a Geographic Information System (GIS) for monitoring and assessing

the estuary issues.

The Plan established a preferred concept for land uses and development in the Campbell River estuary. This was based on a public review of several options, with the moderate intervention alternative being further refined and adopted by the Estuary Commission as the preferred concept plan (Figure 9).

The main objectives of the Estuary Commission of during implementation of the Plan were to:

- facilitate and implement the industrial relocation plan;
- continue a vigorous habitat restoration program and complete a trail network;
- encourage consistent enforcement and monitor use of the estuary;
- facilitate local management plans to ensure more effective management of the estuary;
- continue to provide Council with recommendations on development proposals and issues using the Estuary Management Plan, OCP and other relevant documents for guidance.

Updating the Plan is currently underway and identified as a District Operational Priority in 2003. A final draft of a Memorandum of Understanding between the District and senior agencies was being reviewed for signatures in 2002.

Summary Evaluation

The Campbell River estuary management plan has been very successful. The fact that a community has reached a consensus to virtually eliminate industry from its estuary is quite unique. This has been achieved by a combination of circumstance, community and political support and cooperation, generous program funding, and focused work on behalf of the implementing committee. This is a positive example for small community estuary management.

Habitat restoration projects for juvenile salmon rearing and adult spawning have included construction of several intertidal beaches and marshes, tidal channel and training wall breaches, bank stabilization with integrated riparian and boulder habitat features. The funding obtained from various sources is around one million dollars. Estimates of the habitat created include over 1.7 ha of intertidal (rearing) habitat and about 0.7 ha of spawning habitat. As well, there are several other projects in the planning or construction stages to improve and restore other areas within the Campbell River estuary.

Another factor was the cooperation from industry, such as Raven Forest, a major landowner in the estuary. This cooperation was partly a result of the mill closing down due to the severe downturn in the forestry sector. The proactive initiative to obtain funding for a relocation study to assess existing forestry operations and determine alternate business strategies and areas for development was also a factor.

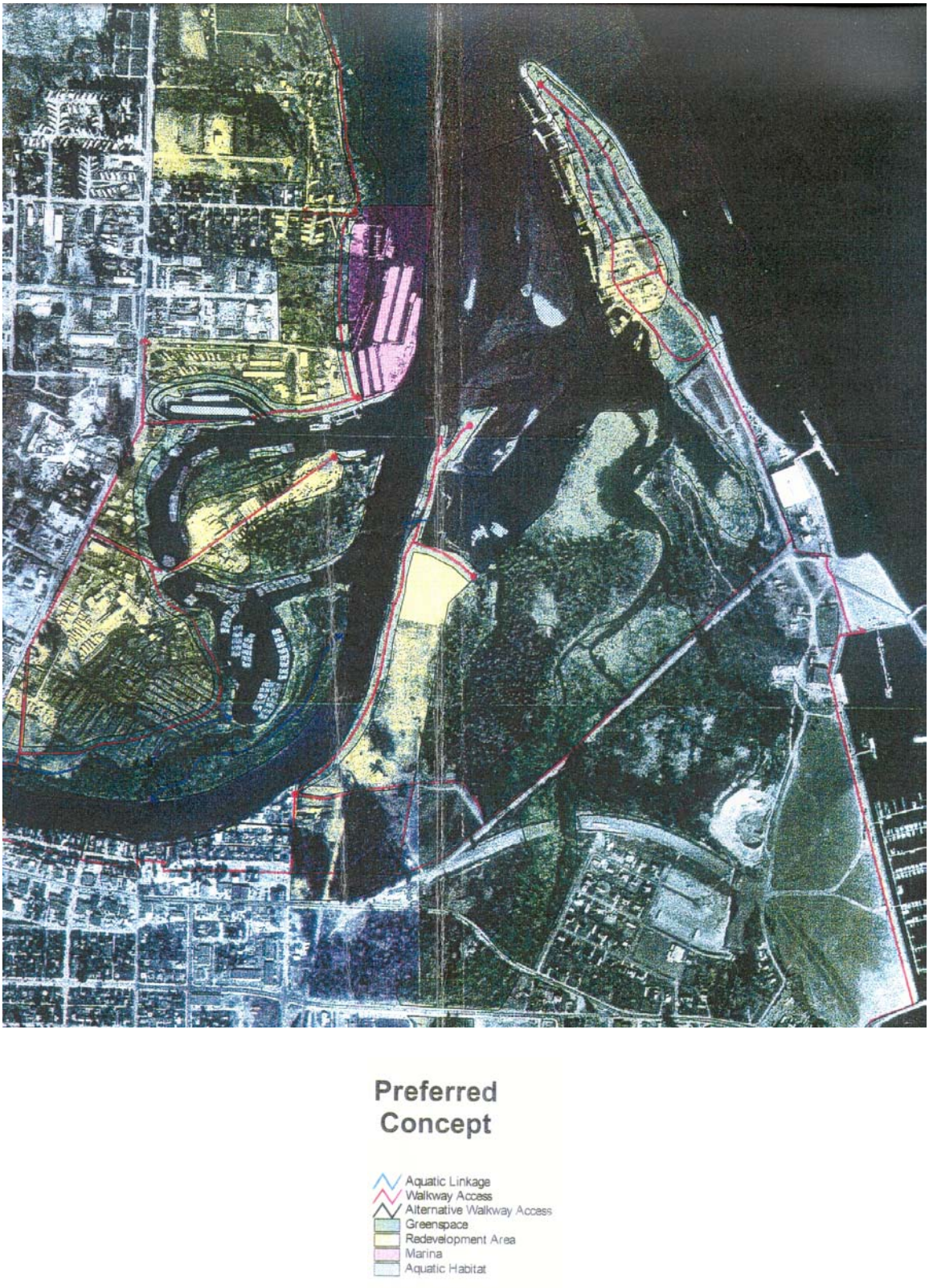


Figure 9. Preferred concept for Campbell River estuary land uses.

6. Port McNeill Waterfront Study

Background

In 1996, as part of an update of the Port McNeill Official Community Plan, a shoreline habitat assessment was made of the marine shoreline within the jurisdiction of the Town of Port McNeill. No harbour management authority exists and all waterfront uses fall under the jurisdiction of the Town of Port McNeill. The objectives were to identify the critical habitat areas and issues, and provide recommendations for waterfront planning and development based on the natural site features and discussions with local contacts, including DFO and MOELP staff.

The shoreline habitat assessment consisted of habitat inventory and description of six shoreline units including photographic record. For each shoreline unit, the biophysical features were described and available information (e.g. fisheries, eagle nesting and waterfowl utilization, salmonid enhancement projects, etc.) was summarized. Development potential, based on ideas suggested by local contacts, was briefly reviewed.

A summary of environmental considerations for waterfront and development was provided to guide future projects. Most of the information was concerned with obtaining approvals from DFO, and provided an overview of habitat compensation and monitoring requirements.

Summary Evaluation

The Port McNeill Waterfront Study is an example of a lower level approach to protect natural values where a formal, higher level plan is probably not warranted. The study provides an example of the usefulness of providing site specific, ecologically based information to complement normal zoning and baseline administrative components in the Official Community Plan. Detailed information provided at the OCP stage is useful since it is available to planners and developers working at the municipal (i.e. local) level.

7. Tofino Harbourfront Habitat and Zoning Assessment

Background

Ongoing conflicts between waterfront development and conservation interests led to the Tofino Business Association requesting funding from DFO to conduct the Tofino Harbourfront study. No harbour management authority exists and all waterfront uses fall under municipal jurisdiction. The original objective was to assess the potential for establishing a habitat compensation bank within the 1800 m shoreline of the Tofino Harbour as a means for resolving the competing needs for land development and protection of marine habitat. Work on the project was initiated in the summer of 1996 and the final report produced in June 1998. The study team involved Howard Paish & Associates, and Archipelago Marine Research and G.L. Williams & Associates.

Once the preliminary fieldwork was completed, it was apparent that there was very limited opportunity for habitat banking, and that a broader environmental management plan was required to manage habitat and human development. To provide a framework for developing the plan, the following components were recommended:

- habitat inventory and classification;
- assessment of habitat compensation bank opportunities;
- foreshore development guidelines;
- cooperative planning and management.

In developing the framework and preparing the assessment, it was agreed that an ecological functions approach should be used. For this study, the environmental considerations were different in that the Tofino harbour is a concentration of development in a larger, virtually pristine coastal area. Therefore, the focus was on preserving sufficient habitat along the southern shore of Duffin passage for migrating juvenile salmon, and maintaining the abundance and diversity of intertidal and shallow marine species and habitats. It was recognized that the existing and future harbour development should be water-dependent and support the economic activities of the Tofino area.

The habitat classification was developed recognizing the need to satisfy two main objectives:

1. maintaining the functional capability of the waterfront habitat;
2. facilitating the project review and approval process.

The functionality objective was based on the conservation of valued habitats and maintenance of habitat diversity. The approach was to provide sufficient area for maintaining existing habitat functions, and targeting areas for habitat restoration and compensation banking. The habitat classification involved a relative rating for segments of the shoreline and specific development guidelines. The aim was to provide proponents with consistent and straightforward guidance for addressing foreshore habitat issues.

The habitat inventory was conducted in August and September 1996. The results of the inventory, along with the classification were mapped unto a photo-mosaic of the Tofino waterfront area (Figure 10).

The classification/development guidelines consisted of a three colour-coded rating. The rating and guidelines are summarized below:

red (Highly valued habitat)	• no development is the preferred option, but small scale piled structures may be permitted; • retain a significant portion of natural features • no foreshore fill • dredging must ensure “no net loss” on intertidal flats, eelgrass beds, and brackish marsh, preferably without

compensation measures;

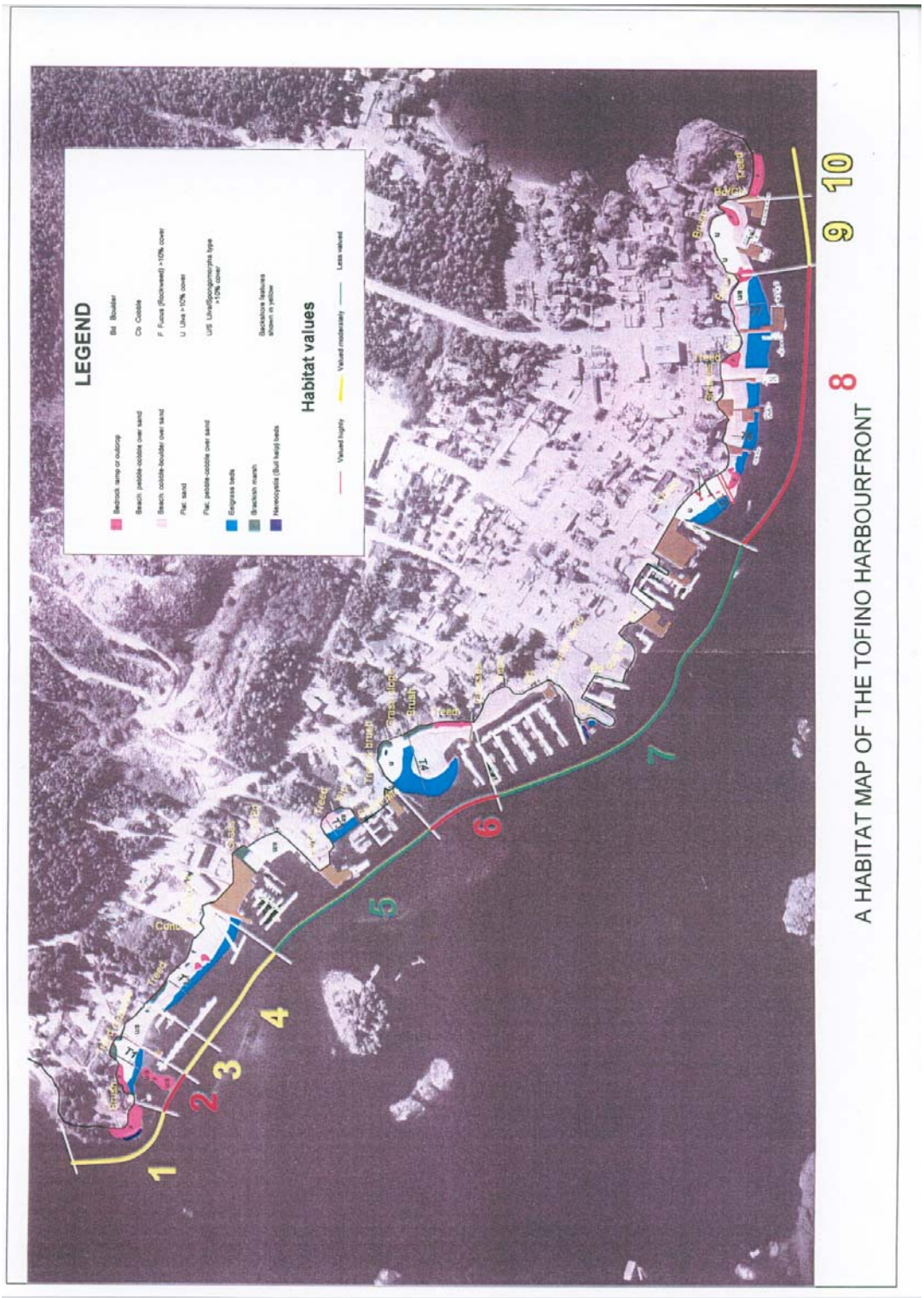


Figure 10. Tofino harbourfront classification.

yellow (Moderately valued habitat)	• no foreshore fill except in the extreme high tide areas of rocky shoreline; • retain a significant portion of riparian features; • retain brackish marsh (using compensation if necessary); • conserve 70 % of on-site intertidal sand flat (using compensation if necessary); • dredging must maintain habitat diversity, including intertidal flats and suitable habitat for eelgrass colonization/transplants;
green (Less valued; or developed for human use)	• conserve all remaining sandflat, eelgrass, and brackish marsh • focus restoration and compensation in these areas, with the goal of enhancing spatial habitat diversity;

Three habitat banking sites were identified, totalling over 0.4 ha. Most of the banking areas were modified or developed areas.

The second focus of the assessment was a review of upland zoning, controlled by the District of Tofino. Of particular relevance to the waterfront assignment was the designation of the Tofino Harbour as the "Harbourfront Special Policy Area", under section 5 of the draft OCP. The objectives for this special policy area include ensuring maintenance of a working harbour, supporting mixed use (e.g. transportation, commerce, residential, and recreation) and the need for redevelopment to complement the diversity and stability of the area.. The main activities in the Tofino Harbour (e.g. commercial fishing, aquaculture, tourism and moorage, boat launching and recreation) were briefly reviewed and used to illustrate the need to include water dependant considerations in the foreshore planning, inclusive of whether the land is privately, publicly, industrially or commercially held.

Summary Evaluation

The assessment report has been finalized but there is no decision yet on adoption of the recommendations. The critical parties in furthering the work include DFO, District of Tofino and TBA.

The main shortcomings of the exercise were that the initial terms of reference were to evaluate the potential for implementing habitat banking for the Tofino Harbour Waterfront and did not have enough input from the District of Tofino. It was basically a project between DFO and the TBA to facilitate the project approval process. Once the habitat assessment was made, it was obvious that habitat banking opportunities were limited and a broader terms of reference were required.

The habitat assessment provides a comprehensive foundation for continuing the

formation of a plan and has the conditional acceptance of DFO. However, without municipal support, there will be little chance to integrate the work into municipal planning and management and improve the project review process. The municipal support will require that the work be submitted to the general public for review and comment. This public participation should include consideration of the future land use changes and the potential role the harbour will play in it.

8. Courtenay River Estuary Management Plan.

Background

In the spring of 1997, the Seal Predation Committee of the Comox Valley Watershed Assembly released its final recommendations to DFO on measures to protect endangered salmon stocks of the Courtenay/Puntledge watersheds. One of the recommendations was for FOC to work with local governments to develop an estuary management plan for the Courtenay River estuary (Adams and Asp 2000).

In response to this recommendation, an interim Steering Committee was formed in September 1997 to prepare terms of reference for establishment of a management plan for the Courtenay River estuary. The Committee consisted of representatives from the Comox Indian Band, Town of Comox, City of Courtenay, Regional District of Comox-Strathcona, Ministry of Fisheries (formerly the Ministry of Agriculture, Fisheries and Food), Ministry of Environment, Lands and Parks, and Fisheries and Oceans Canada.

In April 1998, a consultant firm, ECL Envirowest Consultants Limited was hired to develop the estuary management plan. The Interim Steering Committee was restructured in July 1998 as an Advisory Committee and membership was expanded to include the Agricultural Land Commission, Ministry of Agriculture and Food, and Islands Trust. One of the legislated mandates for developing the estuary management plans for activities affecting coastlines and estuaries exists with DFO under the Oceans Act.

The Courtenay River Estuary Management Plan produced at the end of the study in the spring of 2000, consists of three volumes: integrated management plan working draft, summary of consultation process and background summary of resource values. The work was a product of an extensive consultation process involving government agencies, local businesses, Crown Corporations, and environmental and community organizations. The consultation process included a government Advisory Committee, referral list/mail-out, two open houses and a workshop and numerous one-on-one meetings.

The final product produced was a working draft and will require additional effort on the part of the agencies and stakeholders to finalize and implement the plan. The purposes of the management plan were to:

1. provide goals and objectives to guide human development while maintaining and/or enhancing the estuary's environmental values;
2. establish a framework or strategy for ongoing coordinated management of

activities in the estuary;
3. define steps for implementation of the estuary management plan, including program targets and activities, management tools (e.g. Area Designation Agreements) and opportunities for public involvement;
4. incorporate mechanisms or processes to monitor, evaluate, and improve successful aspects of the management plan, and identify areas requiring change.

The Courtenay River Estuary Management Plan is modeled on the Fraser River Estuary Management Program. The plan provides a vision statement, goals and objectives, an administrative program, coordinated project review, and action programs. These are summarized below.

1. Vision — The Courtenay River estuary is a natural and productive estuary for plants, fish, wildlife, and people.

2. Goals

a. conserve and enhance the quality of estuarine environments to the benefit of plants, fish, wildlife and people. This goal is of primary importance in the implementation of the Estuary Management Program;

b. acknowledge the estuary's role, as a natural and productive ecosystem, in the long-term environmental, social, economic, and recreational well-being of the Comox Valley.

c. encourage human activities that protect and enhance the estuary's natural environment and discourage human activities harmful to this environment;

d. accommodate the long-term socio-economic needs of the community as they relate to land and water use decisions provided that they are compatible with the foal of conserving and enhancing the estuary's natural environment.

e. recognize the importance of agricultural land within the management plan area both for its role in providing wildlife habitat, and for its role in producing food for the community at large;

f. recognize the importance of existing industrial and commercial activities in the management plan area for their role in the economic well-being of the community at large.

3. Objectives

1. Conserving and Enhancing the Estuary
   - conserve and enhance the health of the estuary
   - conserve and enhance habitat

2. Integrated Management
    - encourage multiple uses within the estuary
    - promote integrated decision making
    - establish and maintain informed management processes
3. Fairness, Equity and Accountability
    - promote and employ consensus-based decision making
    - provide equitable access to the estuary
    - establish and maintain accountable management processes
    - develop active partnerships with the public in management activities

A summary of the legislated jurisdictions and mandates for the Courtenay River estuary was provided. Included were the main federal, provincial, municipal, regional, and First Nations mandates.

A preferred administrative model was proposed after consideration of four alternatives. The administrative model is similar to the FREMP program, consisting of Management Committee composed of agencies with legislative authority to implement environmental management decisions, Environmental Review Committee for ensuring consistent environmental assessments, and addition of a Public Advisory Committee, to provide more opportunity for public involvement. Project referrals are submitted to MC, ERC and PAC simultaneously. The PAC response is to be provided within 30 days, with all agencies responding within 15 days of the PAC review.

Also included in the proposed plan are 7 action programs, with each action program having defined objectives and several actions the 7 action programs are:

- industrial and urban development;
- log storage and handling management;
- navigation and dredging;
- recreation;
- water quality management;
- plant, fish and wildlife habitat.

An interesting feature of the plan is the use of a three-tiered colour-coded system. The Habitat and development classification is shown in Figure 11. Habitat ratings are based on habitat value, determined by the relative biological productivity, biophysical environment and habitat functions sustained at the site or as part of a broader continuum. The shoreline covered include riparian, intertidal and subtidal (i.e. low water to the -10 m depth contour). Specific criteria for determining relative value is not provided in the documentation. The proposed classification of the Courtenay River estuary is based on site observations made during the study and existing documented information.

It is recommended that the plan be reviewed every five years.

CLASSIFICATION	HABITAT VALUE	ENVIRONMENTAL CRITERIA FOR DEVELOPMENT
Red	High; high biological productivity associated with a relatively complex biophysical environment; critical habitat functions are sustained onsite or as part of a broader continuum	Development must demonstrate impact mitigation sufficient to ensure that existing habitats are not harmfully impacted
Yellow	Intermediate; intermediate biological productivity associated with a relatively simple biophysical environment; important habitat functions are sustained onsite	Development must demonstrate impact mitigation to the greatest extent practical; residual harmful impacts to existing habitats to be compensated for through creation of replacement habitats
Green	Low; low productivity is associated with a modified biophysical environment to such an extent that biological productivity is not significant from a habitat resource perspective	Development must demonstrate impact mitigation and sound environmental design, construction and operation

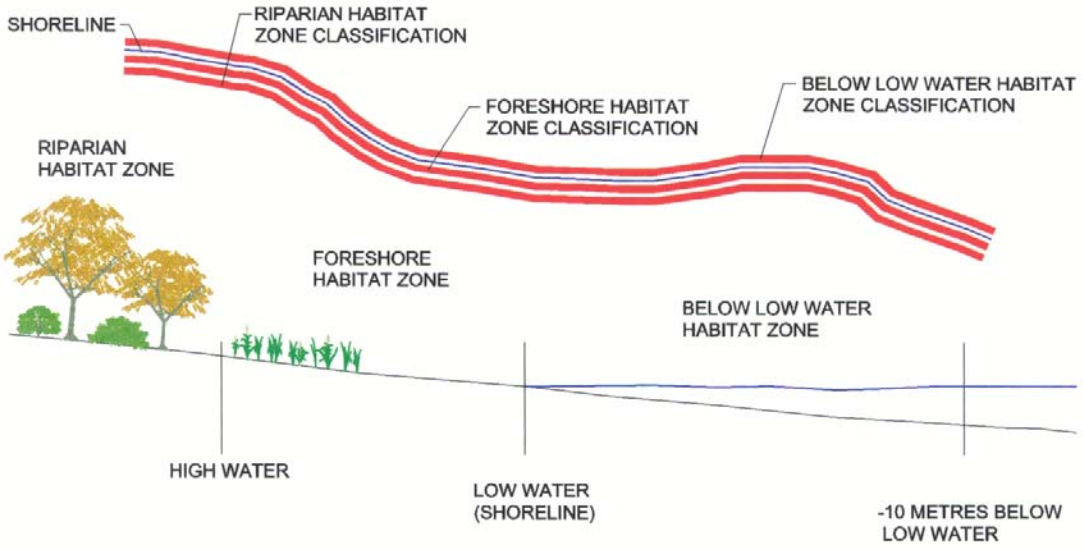


Figure 11. Courtenay River estuary management plan habitat classification.

Summary Evaluation

The Courtenay estuary plan is currently under review by DFO and other stakeholders and no decision has been made on the proposed components or implementation. There has been some concern from DFO that the proposed administrative structure may be difficult to implement with existing funding and resources. The separate habitat colour coding for riparian, intertidal and subtidal provides an alternative approach to determining habitat sensitivity.

9. Prince Rupert Harbour Foreshore Habitat Classification and Proposed Development Criteria

Background

In Prince Rupert and Port Edward areas, waterfront development is touted as critical to the revival of a staggering economy. Proponents of development proposals were highly vocal in expressing their frustration over the uncertainty of DFO requirements, and in their criticism of constraints placed on their projects as a consequence of the application of DFO fish habitat policy and regulations. DFO Habitat staff were frustrated by the lack of scientific data and criteria for making decisions on nearshore development proposals.

These ongoing conflicts concerning waterfront development and fish habitat protection led to DFO initiating a foreshore habitat classification study, in partnership with the Prince Rupert Port Corporation, City of Prince Rupert, and other interested parties. This study was seen as a first step towards the development of a foreshore management plan for the Prince Rupert and Port Edward Harbours. The foreshore habitat classification study was envisioned to help DFO Habitat staff manage local fish habitat, and to provide development agencies and proponents with a better understanding of DFO's concerns and guidelines with respect to foreshore development.

The project was led by a multi-agency Steering Committee consisting of:

- DFO
- City of Prince Rupert
- Prince Rupert Port Corporation
- Port Edward Port Corporation
- BC Ministry of Environment, Lands and Parks
- Skeena-Queen Charlotte Regional District
- Prince Rupert Chamber of Commerce
- Metlakatla First Nation
- CN Rail

Fairly early in the deliberations of the Steering Committee, it became evident that the development of a foreshore plan was too ambitious and the work was limited to conducting a habitat inventory, foreshore classification and habitat mitigation criteria for

proposed developments. The Prince Rupert Harbour Foreshore Habitat Classification and Proposed Development Criteria report, produced in March 1999 was the final product of that initiative (Anon. 1999a). The study consisted of a three-step process: habitat inventory, foreshore classification, and preparation of development criteria and considerations.

The habitat inventory used compact airborne spectral imagery (CASI) obtained in September 1997, colour aerial photos from 1995 and 1996, ground truthing from 1996, and oblique aerial video imagery and ground-truthing conducted in September and October of 1998. The Prince Rupert Harbour includes 225 km of shoreline and includes a diverse assemblage of marine and estuarine habitat (e.g. Flora Bank). To make the inventory more manageable, priority shoreline areas were determined by the Steering Committee, corresponding to those areas considered to be most likely to be subject to some form of development in the foreseeable future, and 126 shore units encompassing 95 km of the harbour were classified. The aerial video and photo imagery were used to identify shore units and dominant physical and biological characteristics. Shore unit data were used to group shorelines into five categories (i.e. rock, rock and sediment, sediment, estuary and man-made). Wave exposure was also determined for shorelines within the study area. Biological characteristics included intertidal marshes, eelgrass beds, and algal vegetation.

The high diversity of biophysical features within the study area led to the further identification of valued habitat features. Examples of the valued intertidal habitat features are shown below.

- eelgrass beds;
- intertidal clam beds;
- canopy kelps (i.e. *Nereocystis luetkeana* and *Macrocystis integrifolia*)
- intertidal brackish marshes;
- physically complex habitats (crenulated shorelines, mixed substrates, tides or algae communities);
- estuaries;
- "remnant" natural habitats

The foreshore classification was based on relative "ecological" criteria consisting of habitat sensitivity, presence of rare or uncommon habitats, habitat complexity, and fisheries resource value. Other criteria used included degree of modification, presence of existing habitat compensation, and restoration potential. Foreshore classification of the Prince Rupert Harbour was simplified into a three colour coded system similar to that used for the Fraser River estuary. The criteria used for determining the colour coded habitat value are summarized in Table 1and the resulting foreshore classification for Prince Rupert Harbour is shown in Figure 12.

Table 1. Criteria used to determine colour-coded habitat value in the Prince Rupert study.

Relative Habitat Value	Colour Code	Criteria
High	Red	• sensitive or rare/uncommon habitat • high habitat complexity &/or fisheries resource value • existing compensation site • high priority restoration site
Moderate	yellow	• no sensitive or rare/uncommon habitat/species • moderate complexity or fisheries resource value • lower priority restoration site
Low	green	• low complexity and low fisheries resource value

The final component of the study was consideration of foreshore management in support of the habitat classification scheme. Topics included development criteria, habitat mitigation, habitat restoration, habitat banking, and identification of data gaps. The development criteria were based on the FREMP 1997 criteria for red, yellow and green colour-coded areas, with slight modifications for the marine habitats in Prince Rupert Harbour. Mitigation included discussion of construction timing windows and options for structures and techniques designed to minimize impacts in different habitat types. Specific habitat restoration opportunities were identified. Habitat banking potential was considered to be limited because of the variable success in creation of marine habitats compared to estuarine habitats. For example, estuarine-*Carex* marshes created in the North Fraser Harbour Habitat Bank have been more successful than the brackish or salt marshes attempted along the coast of British Columbia. However, it was felt to be possible to construct "excess" habitat as part of development projects that could be held as credits for use as habitat compensation in the future.

The study also provided suggestions for using the foreshore habitat classification in developing a foreshore management plan, including a revised project review process. The Steering Committee had planned to determine the next steps towards the development of a foreshore management plan, but continued economic downturn and an overall lack of funding has stalled these efforts.

The project also included three public meetings/open houses during the process. The first occurred at the beginning of the process and included a DFO speaker recommending use of the FREMP three colour coding system. A second meeting, scheduled in the middle of the project, was designed to inform citizens of the progress made up to that point. At open house was held at the completion of the process to present the mapping and other components of the work.

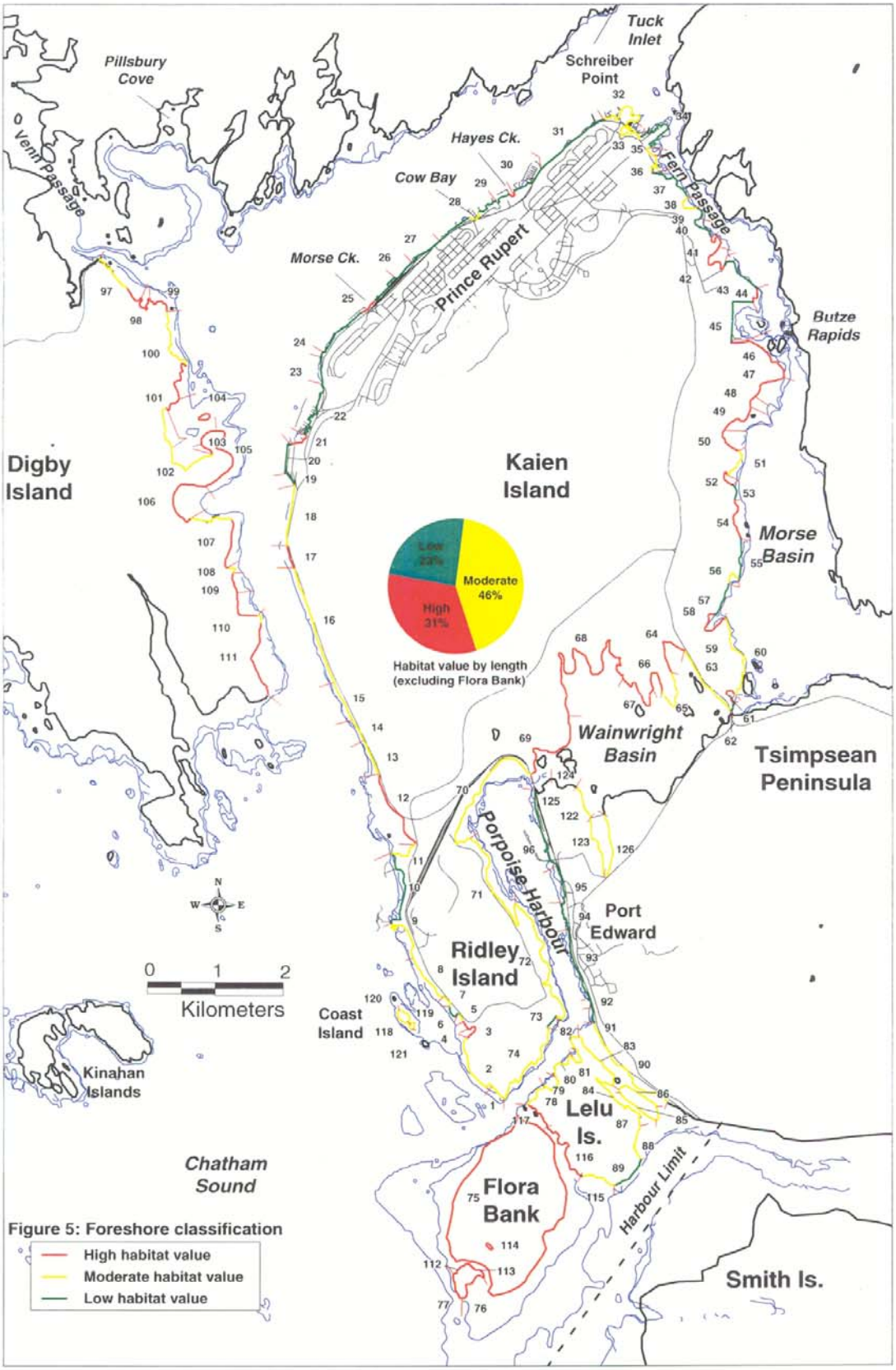


Figure 12. Prince Rupert harbour habitat classification.

Summary Evaluation:

The large geographical area presented technical challenges for DFO and the study team. Data collection was based on a rather experimental process initiated by the Port of Prince Rupert. Due to time constraints on the funding and commitments to other funding partners, the classification methodology and ranking system was essentially a "pilot" effort and required further scientific scrutiny, including review/input from habitat specialists in DFO. To obtain habitat information useful for implementing DFO's policies, orthophoto interpretation (e.g. 1:6000 scale and georeferenced) combined with ground truthing would have been a better approach. The habitat classification map has limitations in scale, with some stakeholders (e.g. City of Prince Rupert) hoping for finer resolution of to match property boundaries and development areas. The mitigation section, geared to habitat types provides useful information that should assist development proponents.

One major obstacle in the process was definite objective of some of the pro-development stakeholders to obtain unrestricted rights to develop within the study area. For example, the colour coding, specifically the red or highly productive habitat classification was considered to be restrictive and shows that the intent of the classification was not really fully understood. Many developers consider the DFO habitat policies and regulations as being overly protective and partly responsible for limiting economic development.

To overcome this resistance from development interests, the process required a more focused commitment from stakeholders, including being more open to economically and environmentally sustainable development and stronger promotion of the final product. More adequate support in terms of partner funding, longer time period to collect and assess habitat information, and prepare an integrated habitat classification may have led to a more broadly supported plan.

More habitat utilization data for foreshore areas within Prince Rupert Harbour is required to assist DFO staff. A two-year study of the area by DFO will be completed in 2002, and will supplement existing foreshore classification information. This additional information will supplement efforts by DFO staff to educate developers and other stakeholders on the importance of shoreline habitats. Hopefully, it can also be used to more accurately identify important areas and provide greater resolution for the habitat classification.

DISCUSSION

Of then nine case studies reviewed, six produced estuary management plans. The Prince Rupert, Port McNeill and Tofino case studies cover marine shorelines and are habitat inventory or classification studies intended to provide guidance for developing a complete plan. A summary of the planning process, plan highlights, and achievements for each of the nine plans or assessments reviewed is shown in Table 2. It should be noted that the Courtenay and Prince Rupert plans have not been fully implemented.

Estuary management planning began in the mid-1970's with the Cowichan Estuary, followed by the Fraser and Squamish Estuaries. The planning process at that time was a lengthy and complex undertaking, ranging from 12-20 years for the Cowichan and Squamish plans, respectively. The three plans initiated in the 1970's usually required several drafts to allow stakeholder review, with multiple year intervals between each draft. Estuary management planning for smaller estuaries continued in the mid-1990's and the process was typically more reasonable, averaging approximately two years to complete the plan.

Except for the Cowichan estuary plan, which utilized the B.C. Order-in-Council process, all the estuary management plans have been established by stakeholder consensus and direct ratification by the main management agencies. Usually, either the B.C. Ministry of Environment or federal DFO have been the initiating party for establishing a plan, with the main the exceptions being the Port McNeill waterfront assessment and Campbell River estuary management plan. For the Campbell estuary, the District of Campbell River Council appointed a committee to develop the plan, which was later formally established as the Campbell River Estuary Management Commission. For the three marine planning assessments (i.e. Port McNeill, Tofino, and Prince Rupert), municipal governments or development interests have been initiating parties, usually in partnership with DFO.

The actual motivation or trigger to begin an estuary management planning process was often a single proposed development project that had the potential for major impacts on the estuary: e.g. BC Rail filling for port development in the Squamish estuary, Coast Guard dredging in the Campbell estuary, or port development and gravel extraction in the Bear estuary (Port of Stewart). However, in all cases, there was a historical struggle between development proponents and environmental protection agencies. Estuary management plans can be an effective administrative tool to balance development and conservation interests and build multi-stakeholder consensus on issues.

Estuary management plans consist two main components: shoreline inventory and classification to identify development and conservation areas and a procedure for project review. Area designations were incorporated into some of the earlier plans. Several of the plans used existing data or information to develop a classification system in place of a detailed habitat inventory. This reduces the effort, funding, and time required to prepare

Table 2. Summary of estuary planning process, plan highlights and achievements for the nine case studies reviewed.

Management Plan	Initiation Date	Approval	Initiating Parties	Motivation	Plan Highlights		Achievements				
					Planning Components	Project Review	Improving Process	Habitat Gains	Water Quality	Restoration	Recreation
Cowichan Estuary Environmental	1974	BC Order in Council # 1652 in Sep 1986	MOE	- proposed port & industrial development in 70's for forestry operations - BC Environmental Management Act	- 4 legal agreements with main industrial users - area designation - flood proofing	MOE led process has not been perceived to be protecting environment	No; process considered inflexible and lack of public input of project review	enhancement of Fishgut Alley as part of flood proofing project		-breaching of sea dyke near Blackley Farm by Ducks Unlimited -CNR land transfer to Pacific Estuary Conservation Program	
Fraser River Estuary	1977	1994, but FREMP in-effect since 1985	DFO, DOE & MOE, NFPA and FRPA; GVRD in 1991	- population growth & industrial development	- shoreline habitat inventory and classification - action programs - area designation	Coordinated Project Review (Environmental Review Committee)	- improved project reviews - ERC review used by municipalities to protect areas	- increased high value habitat (marshes) - habitat banks	- formed monitoring program	-restored Ladner Lagoon - habitat cleanups	- recreation plan by GVRD
Squamish Estuary	May 1979	proposals issued in September 1982; revised in 1992/93 & signed in Oct. 1999; not yet approved	MOE & DFO	- proposed port & industrial development by BC Rail, preceded by training wall and fill projects in early 1970's	- area designations & proposed WMA - coordinated project review	PC or SERC coordinated project review	- 3 path project review established	- improved fish access with culverts, sand removal for marsh growth	- improved flushing with new culverts	- proposed culvert removal - compensation plan to be developed by BCR and DFO	- identified need for public access, education & passive use
Port of Stewart Environmental	December 1994	Feb. 1996	District of Stewart & DFO	- port development and Bear River gravel extraction	- habitat inventory and classification following FREMP model	District of Stewart administered review process	- provided review process format and guidelines for developers			- identified restoration options	
Campbell River Estuary	1995	1996	Campbell River Estuary Management Committee appointed by Council	Coast Guard dredging proposal in 1994	- identifies preferred uses - industry relocation plan - lease extension of Ocean Blue Cedar mill	CREMC project review improves process - estuary habitat compensation for project impacts elsewhere (form of habitat banking)	CREMC project review Improves process - estuarine compensation for project impacts in community	- numerous habitat creation projects with funding grants - NCC land purchase for recreation & conservation	- relocation of industrial facilities and property cleanup	Nature of Canada Conservancy purchase of former Raven property	- estuary conservation and recreation plan in process - acquisition of Tyee Spit & preparation Tyee Spit Park Plan
Port McNeill Waterfront Assessment	1996	1996	Town of Port McNeill	update of Port McNeill Official Community Plan	- shoreline habitat assessment		- included in OCP				
Tofino Habitat & Zoning Assessment	1996	report completed June 1998	Tofino Business Association & DFO	proposed Tofino Business Association projects & feasibility of habitat banking	-habitat inventory and classification based on FREMP approach	Not specifically covered in port plan	Not specifically covered in port plan				
Courtenay River Estuary	September 1997	report submitted April 2000; under review	DFO as part of Steering Committee	Seal Predation Committee of the Comox Valley Watershed Assembly recommendations	- uses FREMP classification, but separates riparian, intertidal & subtidal	- FREMP model but includes Public advisory Committee	Under review				
Prince Rupert Harbour Foreshore Habitat Classification and Development Plan	1996	report submitted March 1999	Prince Rupert Port Corporation, DFO, City of Prince Rupert	- development pressures and for transparent decision-making process - need for port inventory & classification	- marine habitat classification based on FREMP model	- general (and specific) development guidelines	Not specifically covered in port plan (classification maps have not improved day-to-day management	Not specifically covered in port plan	Not specifically covered in port plan	Not specifically covered in port plan (restoration opportunities identified but no work done)	Not specifically covered in port plan

the plan, but a comprehensive habitat inventory provides a better foundation for creating a more thorough management tool.

An important objective in any plan is the establishment of an effective project review process to address the issues that arise between proposed development projects and environmental protection. The most common and effective approach includes a coordinated project review, which provides development proponents the advantage of a single window for project environmental approvals. The FREMP Environmental Review Committee (ERC) is the most established system and is arguably the most successful component of FREMP. All waterfront development projects in the estuary require a FREMP review and municipalities commonly require ERC approval as part of the municipal development or rezoning approval. The FREMP Coordinated Project Review has been modified to include a 3-phase, four tracked review process. The modification was required to meet new Port Authority review responsibilities under the Canada Marine Act. Ports may now take on responsibility for Track 1 or low impacting projects (e.g. routine maintenance) under the project review process.

Assessing the success of the individual plans is reflected in the five categories under the achievement column. A critical objective is to improve project reviews. In most of the operational plans, a tiered approach based on the level of project impacts has improved review efficiency and decreased the time for proponents to obtain approvals. It also permits expanding the scope and participation of the agency reviews for projects with substantial impacts. Public review and input is incorporated into most of the plans reviewed.

The one model that does not appear to be functioning as well as intended is the Cowichan estuary plan, which is the only B.C. Order-in-Council formulated plan. There have been public and agency criticisms of the inflexibility of the planning process. Attempts to modify the plan have been unsuccessful due to stakeholder lobbies (e.g. union concern of job loss or landowner concerns over loss of use) and poor public support of the changes. Any attempt to change the plan would require Cabinet approval, which requires a major effort and expense.

The most successful operational plans in B.C. appear to be for the Fraser and Campbell River estuaries. FREMP has received substantial funding over the years and provides a broad range of coordination. The FREMP one-window Coordinated Project Review provides advantages (quicker approvals, reductions in agency review effort and expense, etc.) over the former system of individual multi-agency reviews. There have been substantial improvements in the creation of high quality habitat (e.g. intertidal marsh, channels, and riparian). Most of the more recent estuary plans have adopted the FREMP classification system and/or coordinated project review process.

The Campbell estuary plan has been very successful and should be considered when establishing plans for smaller estuaries. However, it is unusual because the major focus was to restore fish and wildlife habitat, with industrial concerns being secondary. This was made possible by citizen support for conservation, the downturn in the forestry

sector and willingness of industrial landowners to sell property, and establishing an industry relocation strategy. The initial establishment of an estuary planning committee funded by the District of Campbell River, provided an efficient structure and led to the formation of the Campbell River Estuary Management Commission: an 11-member committee comprised of agency, development, recreational, First Nation, and public representation.

Another factor has been the large amount of funding received to restore wetland habitat. Hundreds of thousands of dollars have been spent on habitat creation and enhancement. The Nature of Conservancy of Canada purchase of the former Raven Forest lands, with support funding from the District of Campbell River, government agencies, and private contributors, was another positive activity.

Other accomplishments by the District of Campbell River under the Plan include the acquisition of the Tyee Spit and subsequent establishment of the Tyee Spit Parks Plan, involvement of the Job Protection Commission regarding lease extension of Ocean Blue Cedar Mill, and habitat creation being done within the estuary as compensation for habitat impacts elsewhere in the community (a form of habitat banking).

Most of the plans have resulted in some habitat gains, because they have included environmental protection or conservations as one of the main objectives of the plan. For example, dyke breaching (Cowichan estuary) or installation of culverts (Squamish estuary) have improved fish access and the amount of available habitat for fish and wildlife. Other plans have provided administrative benefits: e.g. Port McNeill and Port of Stewart, where the assessment or estuary management plan, respectively, were incorporated into the Official Community Plan. For the plans that are not yet operational, the estuary planning initiatives have provided agencies and municipal planners with a compilation of resource information, management guidelines, and/or proposed project review procedures that should, either directly or with modification, improve the implementation of more sustainable development.

SUMMARY

Of the nine case studies reviewed, five plans have been signed and are being implemented, although the full implementation of the Squamish Estuary Management Plan requires completion of land transfers between B.C. Lands and B.C. Rail. The Courtenay estuary management plan was submitted, reviewed by DFO, and a final plan completed, but "buy in" and integration into zoning is a local government decision. The Port McNeill shoreline assessment has been incorporated into the Town of Port McNeill OCP, but no active development has been undertaken since preparation of the study. The economic downturn has postponed port and shoreline redevelopment.

The Fraser River estuary is the most comprehensive of the active management plans and provides a useful history of habitat inventory, shoreline classification and coordinated project review through use of a multi-agency committee. The Fraser estuary habitat

classification approach has been adapted for use in most of the plans conducted in B.C. The Fraser Estuary Management Plan is currently being updated to focus on more effective ways to coordinate more environmentally and economically sustainable development. As well as updating the plan to meet changing conditions within the estuary, it also must address reduced funding support from several partner agencies.

The most successful plan in terms of habitat enhancement and restoration outside the Fraser, has been the Campbell River Estuary Management Plan. The administrative and financial support of the Council of the District of Campbell River, combined with substantial funding from federal, provincial and company sources for numerous habitat creation, enhancement and restoration projects since approval of the plan in 1996, are two important factors. The decision to conduct an industrial re-location strategy and economic downturn in the forestry industry also contributed to the success of conservation and habitat projects within the estuary.

Of the operational plans reviewed, the Cowichan River estuary plan appears to be the least effective in providing balanced management. It is hampered by an awkward administrative process under a B.C. Order-In-Council process, and has limited local support. To be effective, estuary management must be flexible to adapt to changing conditions, but based on sound ecological principles to ensure that estuarine natural processes and major habitats are protected.

Recommendations for future estuary management plans are summarized below.

1. Importance of Applying Ecosystem Based Management:

In virtually all the estuary management plans prepared to-date, concerns over habitat loss either through continual urban or industrial development or specific large-scale development was a major motivation for establishing a plan. To maintain estuarine functions that provide a wide range of benefits, it is important that an ecological approach be used in the development of the management plan.

Ecosystem based management (EBM) – also know as ecosystem management - is the preferred approach for effective integrated resource management (e.g. see Grumbine 1994; Christensen 1996) and is recommended for use in developing and implementing estuary management plans. A useful working definition for EBM is provided by the Ecological Society of America Christensen (1996):

" Ecosystem management is management driven by explicit goals, executed by policies, protocols, and practice, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure and function."

To guide the development and implementation of EBM in several of the estuary management plan reviewed in this report (e.g. North Fraser Harbour, EFFA for

the updated FREMP shoreline classification and EMP, and Port of Stewart) the use of an ecological perspective has been found to be quite useful (Figure 13).

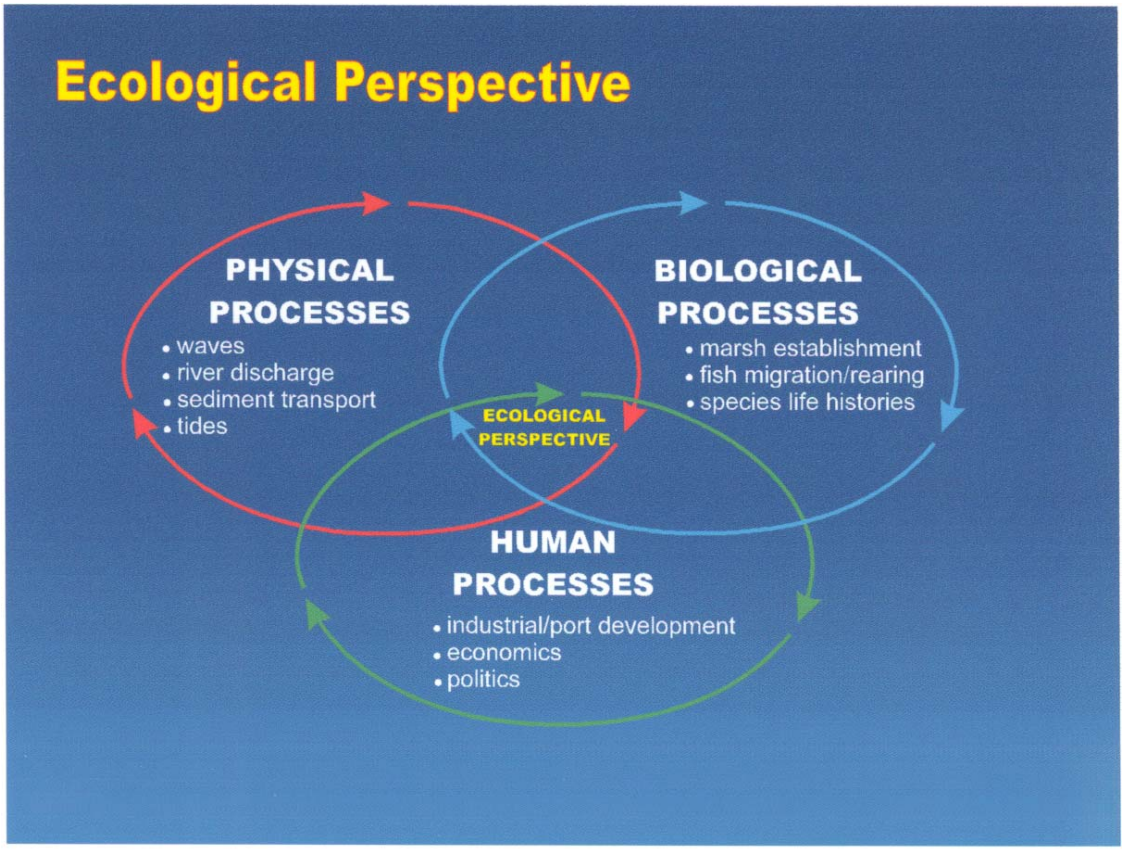


Figure 13. Ecological perspective used for estuary management planning.

An ecological perspective involves a thorough understanding of the physical, biological, and human processes, recognizing that there may be specific spatial and temporal influences. For example, it is not sufficient to simply identify the resources within the estuary (i.e. what is there). Estuaries are dynamic systems and one must be aware of the numerous interacting processes (i.e. what is happening at the site). These processes have temporal factors (e.g. daily, seasonal, or longer term) and local or regional spatial connections. An appreciation of the natural processes and functions provides a better foundation for sustainable planning.

Using an ecological perspective helps to promote the balance of environment and economic development, and the end result of sustainable development. By understanding the natural features and functions that occur in an estuary, proper management initiatives can be implemented to ensure industrial or port development does not reduce estuarine productivity. Human development is necessary to maintain economic activity, but ensuring it respects the natural

features and functions in the estuary will result in more successful management.

2. Need for Stakeholder Commitment and "Buy-In"

Committed and cooperative effort on the part of major stakeholders, regulatory agencies, and the public is required to prepare and implement an estuary management plan. Unless the stakeholders, including the general public, feel that they are all participants and can accept the plan, it will not become an effective management tool. The stakeholders must also be willing to listen to each other and willing to modify their initial positions, if necessary, in order to reach consensus during formulation and implementation of the plan. Failure to build a consensus approach can result in a key agency putting a plan in place to meet their mandated requirements.

Public input is important early in the planning process to determine a vision and goals for the plan. Usually, there is considerable local knowledge and expertise about the estuary that can provide useful information to the plan. As well, public input at the start of the plan will help to make the community aware of the exercise and build trust in the process. Regular feedback will also keep the community informed of the progress and provide an opportunity to raise concerns that can be dealt with before they become major issues.

3. Establish Vision, Goals and Guiding Principles

In order to provide a framework or strategy for implementing the plan, it is useful to establish an overall vision, goals, and guiding principles. The Fraser River Estuary Management Plan defines goals and guiding principles. Goals are end points or ideals to be continually and progressively pursued during the plan. Principles are broad statements that set forth rules to guide decisions on the use of the estuary and management of human activities. To successfully guide the Plan, it is important to provide clear goals and formulate specific guiding principles to focus action items under the plan. This will help to ensure that participants understand the intent of the plan and enable them to monitor and sustain progress.

A useful component of a plan is the establishment of specific action programs that define key targets and actions. Targets are tangible points to aim for which are reached by an action or series of actions carried out over a specified time frame. Actions are defined as accomplishments, usually completed over a defined time frame, in stages, or with the possibility of repetition, to achieve prescribed targets. Action programs are usually directed at one component of a plan and supported by a number of activities to reach the target.

4. Establish A Steering Committee and Sub-Committees

To assist in preparing the estuary management plan, it is useful to form a Steering

Committee comprised of estuary stakeholders. The Steering Committee should be small to improve decision making, but not exclude important stakeholders. The Steering Committee members oversee development of the plan and provide local knowledge, expertise in several areas (e.g. political, professional, regulatory, etc.) and commitment to complete the work. The Steering Committee should determine if the Plan can be implemented using existing personnel or through the use of consultants or other specialists. The Committee will also be required to obtain funding to undertake the plan, through either stakeholder support or external sources.

It may also be useful to form sub-committees, to provide more focused guidance or complete specific tasks to further the plan. Sub-committees should have representation from the Steering Committee, but members may also be drawn from other stakeholder groups, especially if specialized expertise is required. In most of the estuary management plans reviewed, there were individuals who served as champions in the promotion, preparation or implementation of the plan. Some originated from the public sector and were active in special interest groups. Others were consultants with specialized expertise and skills for implementation, agency or private-sector managers that were committed to seeing the plan established, professional staff that were knowledgeable of funding opportunities, and stakeholders that had a vested interest in establishing the plan.

Political champions are also important. Without political support from federal, provincial and municipal government, industry, and local citizens, establishing and implementing estuary management plans are more difficult.

5. Obtain Funding and Administrative Support

Preparing an estuary management plan requires funding and administrative support. Depending on the scope of the activities under the plan, funding needs could be met with local resources and the support of stake holders or may require substantial external funding. Funds are required to undertake basic inventory and field surveys, compile information, prepare presentations and materials for public open houses, prepare the plan document, and implement specialized projects to implement the plan. Particularly in small communities, there are limited financial and administrative resources to dedicate to an estuary management planning process. Senior government agencies, including DFO and port authorities should provide support funds for estuary planning.

The provision of personnel to work on the plan also is important. In several plans, personnel from individual stakeholder groups, agencies or companies have provided administrative support as part of their job responsibilities. This may work if the work load does not interfere with their main responsibilities. However, usually the work associated with managing a plan warrants a person largely dedicated to it.

Another option is to have a consultant or consultant team, under direction of the Steering Committee, prepare the estuary management plan (e.g. Campbell estuary, Port of Stewart, and recently, the Courtenay and Nanaimo estuaries). This option can be an effective alternative, especially in the case of smaller communities where expertise in completing plans is limited and agency staff are busy with existing workloads.

6. Components of the Plan

Although each plan will have specific needs, the following components are recommended as being particularly necessary for effective estuary management.

- inventory of natural habitats and resources and well as human activities, including ownership and zoning and OCP designations;
- classification or ranking of the sensitivity of areas within the estuary to guide development and/or protection of estuarine resources and identify permitted uses;
- regular updating of the classification based on current conditions to ensure that changes in the estuary are reflected in the classification and other adjustments are made as required;
- establishment of a project review process, including appeal or conflict resolution to deal with project reviews;
- provision for public input and review;
- identification of estuary improvement opportunities, including habitat restoration and enhancement, industry relocation, etc.
- updating mechanism to ensure the plan remains current and pertinent to the stakeholders needs.

One of the most useful components of a plan is the compilation of information for the estuary under study. More informed decisions will result from a plan based on a comprehensive habitat inventory, identification of species utilization, and listing of human activities and land ownership in the estuary. Shoreline habitat classifications are included in several estuary management plans and assist agency staff and development proponents in promoting sustainable development. A relative value system classification using a three colour coded system is the common approach, but other systems may be more appropriate depending on site conditions. However, continuity and consistency of approach from one estuary to another is important in any one geographical area.

With proper integration with municipal zoning and area or land use designations, it may be possible to prepare specific use guidelines to protect habitat features and functions, as was attempted in the North Fraser Harbour plan. This approach is being incorporated in the updating of the FREMP habitat inventory and classification, using GIS mapping over an orthophoto base and supplementary Access database. Regardless, a site specific inventory and classification system is

recommended as a foundation in estuary planning and as a proactive tool for indicating development suitability or status of habitat sensitivity.

7. Candidate Estuaries for Management Plans

An estuary management planning exercise was completed for the Courtenay estuary and work is currently underway for the Nanaimo estuary. The following estuaries were identified by DFO biologists as priority candidates for estuary management plans, either due to local support, need or changing conditions that presented opportunities for improving management.

1. Somass River (Port Alberni)
2. Quatse River (Port Hardy)
3. Salmon River (Sayward)
4. Kitimat River (Kitimat)

It would also be useful to develop a shoreline management plan for a marine foreshore area, to address some of the difficulties identified in the Prince Rupert foreshore habitat inventory and classification project. The complexity of coastal processes and high diversity of organisms utilizing marine habitats make marine inventory and classification more difficult, and may require different management approaches than those used in estuaries. DFO should conduct an ecological study of a marine foreshore area to provide the scientific background for developing a marine inventory and classification system. For example, the study should include aerial photo interpretation, ground truthing and working with DFO habitat managers and other agencies and stakeholders (e.g. Port Authority staff) to develop a template or model for plans in other marine areas along the B.C. coast.

ACKNOWLEDGEMENTS

This study was funded by the Fraser River Action Plan under the federal government's Green Plan. Otto Langer and John Patterson, DFO, provided project administration.

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