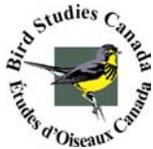


**Baynes Sound/
Lambert Channel-Hornby Island Waters
Important Bird Areas
Conservation Plan**

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April 2001**



Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

Foreword

The issue

The east coast of Vancouver Island and associated gulf islands represent extremely important habitat for a wide variety of birds both during the breeding and non-breeding seasons. The coastal waters stretching from Comox to Maple Guard Point on Vancouver Island, including the waters surrounding both Denman and Hornby Islands, represent one of the most significant areas for wintering waterbirds in BC. Recently, two Important Bird Areas were designated in this area: Baynes Sound and Lambert Channel-Hornby Island Waters.

Like many coastal regions of the world, the east coast of Vancouver Island in the vicinity of these two IBAs has undergone significant changes. Recent human settlement in this area has influenced the quality and quantity of both the marine and foreshore habitats. Numerous human activities have led to declines in water quality throughout the region, reductions in the amount of saltwater marshes and forested foreshore areas, and declines in the availability of waterbird foraging habitat

Summary

This conservation plan provides an overview of the birds present within these two IBAs, discusses the issues that may affect these birds and the habitats that they use, introduces and highlights some of the initiatives that are addressing some of these issues, and attempts to focus and direct future initiatives that could further address identified concerns. This plan was written in conjunction with a number of action-oriented non-government organizations active in the region, and is intended to facilitate work that they engage in, and to stimulate future work.

Availability of report:

This report is available in digital format from the Important Bird Areas Web Page: www.ibacanada.com.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Executive Summary

The **purpose** of this conservation plan is to elucidate the wildlife values in the Baynes Sound/Lambert Channel-Hornby Island Waters Important Bird Areas, discuss the issues that may affect these values, introduce and highlight the initiatives that are addressing some of these issues, and to focus and direct future initiatives that could further address identified concerns.

A) What is an Important Bird Area (IBA)?

An Important Bird Area (IBA) is a site providing essential habitat for one or more species of breeding or non-breeding birds. These sites may contain threatened species, endemic species, species representative of a biome, or highly exceptional concentrations of birds.

The goals of the Canadian IBA program are to: 1) identify a network of sites that conserve the natural diversity of Canadian bird species; 2) ensure the conservation of sites through partnerships of local stakeholders who develop and implement appropriate on-the-ground conservation plans

B) The Baynes Sound/Lambert Channel-Hornby Island Waters IBAs.

This complex of two IBAs is situated on the east coast of Vancouver Island. (Figure 1) The Baynes Sound IBA extends from the Courtenay River estuary at the head of Comox Harbour to Deep Bay and Mapleguard Point approximately 35 kilometres to the southeast. Included in this IBA is Chrome Island, which is situated off the southern point of Denman Island. The Lambert Channel-Hornby Island Waters IBA includes the body of water that separates Denman and Hornby Islands as well as the shores of

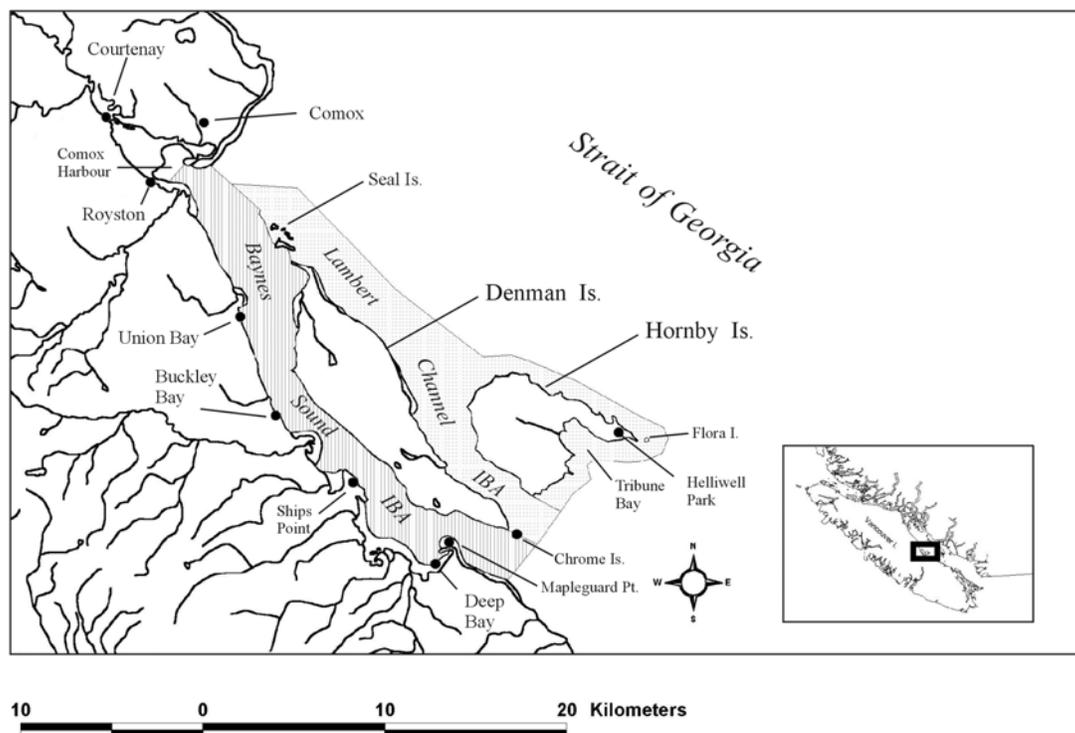


Figure 1. Location of the Baynes Sound and Lambert Channel-Hornby Island Waters IBAs

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

eastern and southern Hornby Island, especially the marine reserve associated with Helliwell Provincial Park and the marine portion of Tribune Bay Provincial Park. Included in this is a one-kilometre radius around Flora Islet.

The foreshore areas and marine waters that encompass these two IBAs represent one of the most significant areas for wintering and migratory waterbirds in BC. Within in the bounds of the two IBAs, a total of nine bird species have reached globally significant levels, three have reached continentally significant levels, and one species has reached nationally significant levels (Table 1). The predominance of this region as a significant area for several species of birds is due largely to the variety of different habitats and hence sources of food available to birds. The combination of sheltered and exposed waters together with the resultant varying intertidal substrates have given rise to a wide range of different habitat types such as inshore and foreshore marshes, low gradient deltas and tidal flats. This region is also one of the most productive Pacific herring spawning areas and shellfish growing areas in BC.

Table 1. Birds that reached global, continental, or national levels of significance in the Baynes Sound/Lambert Channel-Hornby Island Waters areas.

Bird Species	Level of significance*
Pacific Loons	Global
Western Grebe	Global
Brant	Global
Black Turnstone	Global
Surf and White-winged Scoter	Global
Harlequin Duck	Global
Mew Gull	Global
Glaucous-winged Gull	Global
Thayer's Gulls	Global
Great Blue Heron (coastal sub-species)	Continental
Trumpeter Swan	Continental
Pelagic Cormorant	Continental
Bald Eagle	National

* Bird Studies Canada, 2001, Canadian IBA database

C). Conservation issues in the Baynes Sound/Lambert Channel-Hornby Island Waters area

Like many coastal regions of the world, the east coast of Vancouver Island in the vicinity of these two IBAs has undergone significant changes. Recent population increases in the region have resulted in a number of issues that potentially impact the birds in these two IBAs. These include pressures on shoreline and associated habitats due to urban development; water pollution from non-point sources (e.g., failing rural septic systems, faulty storm drains, agricultural runoff, boater waste), and human disturbance (e.g., wildlife viewing). Other conservation concerns relate to the health of the Pacific herring stocks, and expansions to the shellfish industry in the area.

D). Current conservation actions and activities

The Baynes Sound/Lambert Channel-Hornby Island Waters area has long been recognized as an important area for waterbirds, salmon, herring and shellfish. In recent history, development in this area has resulted in significant impacts to the natural environment. In response to the challenges that development has brought, the area has seen the establishment of an numerous community-based conservation initiatives. The Baynes Sound Stewardship Action Group (BSSAG) is an aggregation of project orientated community, government and industry groups that meet on a monthly basis to address

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

local conservation concerns. This group includes Comox Valley Project Watershed Society, Comox Valley Citizens for Action on Recycling and the Environment, the BC Shellfish Growers Association, BC Ministry of Fish, Environment Canada, the local health unit, and others depending upon current project focus. BSSAG employs a collaborative problem-solving approach to the mitigation of local health and environmental issues.

Because of the tradition of action-based conservation activity in this region, the opportunities for effective conservation are numerous and are generally limited by access to project and core funding, rather than the capacity to design and implement the necessary projects. The IBA program will help focus conservation activities in this area. By doing so, waterbirds can be incorporated in to the various projects in the region. In addition, highlighting the birds within these IBAs can help galvanize support for conservation activities both inside and outside the community. The IBA program in this area is helping to connect agencies and programs together to support conservation related work in the region.

E). Conservation Goals and Objectives

The conservation goals and objectives for the Baynes Sound/Lambert Channel-Hornby Island Waters IBA encompass four main focal areas: program integration, water quality amelioration, education and outreach, and research and monitoring. In many cases these programs are ongoing but are always limited by available funding. In almost all instances the infrastructure and personnel are present within the community to accomplish most of the tasks required. The long-term capacity of these two IBAs to support the birds presently found here (resident and migratory) will be enhanced by the achievement of these conservation goals and objectives.

i) Program integration: the development of an information management system

Given the large geographic size of this area, and the number of different conservation initiatives that are ongoing it is critical to line diverse initiatives together. The *State of the Sound Program*, led by Comox Valley Project Watershed Society (Project Watershed) will create a system for the long-term management and reporting of water quality and conservation actions in the Baynes Sound region. This system will facilitate community access to information, improve awareness and understanding about stewardship issues, and increase public participation in decision-making and policy development related to water quality and conservation issues. This program is in its initial development stages and will require secure funding to fulfil its potential.

ii) Water quality amelioration: making the water cleaner throughout the region

Water quality is a key component in the conservation efforts in this area as problems associated with water quality can have far reaching affects on the entire ecosystem in the region. Deterioration of water quality can directly affect human health, result in economic losses for those industries that rely on clean water (e.g., the shellfish industry), and negatively impact spawning habitat for Pacific herring and the feeding habitat for various species of waterbirds. Water quality problems in the area result from several types of non-point source pollution, including failing septic systems, boater waste, and hazardous waste disposal.

Failing septic systems

Water quality problems associated with failing septic systems have been chronic in the region. Presently, there are several initiatives that are actively addressing this issue. These initiatives include:

Septic seminars/socials: a community out reach program implemented by Comox Valley Citizens for Action on Recycling and the Environment (CVCARE) demonstrates the proper care and maintenance of a septic system. This program has been extremely successful in selected locations in the area, but requires additional funding to be implemented over a larger area.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Union Bay Waste to Wealth Project: a project that will research innovative approaches to the treatment of wastewater at a community level. It will include constructed wetlands, solar greenhouses and vermi-composting. This project will represent a significant contribution to water quality amelioration in the region. Should this program prove successful, it could be used as a model for similar sized communities in the region and throughout BC.

Hornby Island constructed wetland and grey water treatment system: a project implemented by CVCARE examines the feasibility of using a small constructed wetland and grey water treatment system to treat waste from individual residences. The program is well suited for this region, as well as many coastal communities in BC.

Biofiltration Wetlands: these small constructed wetlands built by Project Watershed in conjunction with the Department of Highways improve the water quality of stormwater runoff and wastewater effluent, while creating valuable wildlife habitat. Within the region there are numerous areas that could benefit from these projects.

Boater waste

Construction of boater pump out facilities is planned at each end of Baynes Sound (Comox Harbour and Deep Bay). These facilities will provide an alternative to dumping raw sewage into the marine waters of Baynes Sound.

Hazardous Waste disposal

Spring Clean-up was a pilot project developed and implemented in the spring of 2000 by CVCARE that focused on raising awareness of the misuse of hazardous chemicals, and offered information on using safer alternatives. The campaign culminated in a hazardous waste drop-off day for all citizens of the Comox Valley. This project may be repeated in following years, pending long-term funding.

iii) Outreach/Stewardship: increasing the awareness of conservation issues and providing useful information and practical tools

Business Partners for Clean Water

This program initiated by Project Watershed will involve local businesses in the automotive, marine, landscaping, building maintenance, construction, and other business sectors whose activities contribute to water quality problems in Baynes Sound. At least 200 businesses will be invited to participate as “Business Partners”, and will receive best management information that will prevent and/or reduce levels of toxic substances entering wastewater disposal systems as a result of their business activities.

Clean Boating handbook

The Baynes Sound Boaters Guide produced by Project Watershed, outlines responsible boating operation including such activities as sewage and engine waste disposal, and boat maintenance. Future editions may include a wildlife viewing component either as an addition to the original document, or as an insert (e.g., BC Parks Living with Wildlife).

Sound management of marinas

A program initiated by Project Watershed that is in the early stages of development will focus on how marina operators can carry out business in an ecologically sensitive manner. If feasible this program will be extended to boaters, both recreational and commercial. The initiation of this project is pending the acquisition of sufficient funding.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

Disturbance to wildlife

Ecotourism and use of natural areas such as Provincial Parks have increased throughout coastal BC. One of the consequences of these activities is the disturbance to wildlife. The disturbance to wildlife in this region is an issue that will undoubtedly escalate as the popularity of wildlife viewing increases, and as the population in the area increases. It is therefore important that the public be made aware of how disturbance affects wildlife, and how to share the waters with wildlife without causing undue disturbance. The production of information material on how to utilize natural areas with due care and attention will help reduce the detrimental consequences for wintering birds that uninformed use of these areas can cause. Signage at local boat launching areas and marinas, and within high use areas (e.g., Provincial Parks) can also reduce these impacts.

Foreshore stewardship

One of the most important activities that could be implemented in this region is a foreshore stewardship program. One component of this program, proposed by Project Watershed, is the mapping and inventory of foreshore wetlands, and wildlife habitat for government and private landowners. In addition, the marine section of the Living by Water Program initiated by the Federation of BC Naturalists could be modified and expanded in order to more thoroughly address marine issues such as the alteration of marine wetlands, the role of large trees as potential heron and raptor nest sites, and disturbance of sensitive wildlife habitat areas such as herring spawning areas and heron colonies.

Stewardship of another sort: connections between birds and shellfish growers who are outside the BC Shellfish Growers Association

Presently the BC Shellfish Growers Association, the BC IBA Program and the CWS are developing a waterbird supplement for the shellfish industry's best management practices. This supplement integrates waterbird natural history with shellfish growing operations in order to minimize the conflict between growing operations and waterbirds. It will be important that this material be extended to the numerous businesses that do not belong to the BCSGA in order to include as many growing operations as possible.

Increased awareness of birds in winter

The development of signage in appropriate locations that highlights the area as a globally important wintering area for waterbirds may increase the connection of local inhabitants to the area, and thereby potentially influencing day-to-day interactions with the natural environment. Content material for these signs would include how development, resource use, and day-to-day living affect major limiting factors such as water quality, disturbance to birds, and foreshore and herring spawning habitat, and how to responsibly interact with this resource.

F. Research and Monitoring: ensuring the availability of meaningful data

i). Waterbird monitoring

Presently, the Coastal Waterbird Survey, conducted by local natural history organizations in conjunction with Bird Studies Canada, is a vehicle that can track potential changes in bird distribution within this area. It is therefore critical that this program continues as it is currently providing valuable data on which changes in abundance and distribution of birds can be based upon.

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

ii) Exploration of the relationship between shellfish growing activities and waterbird biology

Concerns raised by numerous individuals (both government and non-government) regarding the potential impact of shellfish industry on waterbird foraging habitat suggest that a long-term, carefully thought out and well-planned research project will be necessary to address these concerns.

iii) Great Blue Herons

Declines in the numbers of Great Blue Herons in coastal BC indicate that an examination of heron foraging habitat is warranted.

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**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

Table of Contents

Foreword.....	ii
The issue.....	ii
Availability of report:.....	ii
Executive Summary.....	iii
Table of Contents.....	ix
List of Figures.....	xi
List of Tables.....	xi
List of Appendices.....	xi
1. Introduction.....	1
2. The IBA program.....	3
3. IBA Site Information.....	4
3.1 Baynes Sound.....	4
3.2 Lambert Channel-Hornby Island Waters.....	4
4. IBA Species Information.....	4
4.1 Bird species found within the bounds of the IBA.....	4
4.1.1 Baynes Sound.....	4
4.1.2 Lambert Channel-Hornby Island Waters.....	5
4.2 Species accounts.....	6
4.2.1 Pacific Loon.....	6
4.2.2 Western Grebe.....	6
4.2.3 Pelagic Cormorant.....	7
4.2.4 Surf Scoter and White-winged Scoter.....	7
4.2.5 Harlequin Duck.....	7
4.2.6 Great Blue Heron.....	8
4.2.7 Trumpeter Swan.....	8
4.2.8 Bald Eagle.....	9
4.2.9 Black Turnstone.....	9
4.2.10 Brant.....	9
4.2.11 Mew Gull.....	10
4.2.12 Thayer's Gull.....	10
4.2.13 Glaucous-winged Gull.....	10
4.3 Areas of conservation value outside the IBA.....	10
5. Other elements of high conservation value.....	10
6. Land ownership and use.....	11
6.1 Historical.....	11
6.2 Present.....	11
7. Conservation concerns: factors that may influence bird abundance and distribution.....	11
7.1 Shoreline development.....	12
7.2 Water pollution.....	12
7.3 Herring fishery.....	12

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

7.4 Shellfish Farming	13
7.5 Human disturbance.....	14
7.5.1 Disturbance from boaters.....	14
7.5.2 Disturbance from shoreline areas	15
8. Conservation management achieved at the IBA site.....	15
9. Groups active in the areas that encompass the IBA(s).....	15
10. Opportunities.....	17
11. Conservation Goals and Objectives	17
11.1 Program integration.....	17
11.1.1 The development of an information management system	17
11.1.2 Ensure that birds are incorporated into stewardship activities.....	17
11.1.3 Ensure that birds are incorporated into BC Parks initiatives	18
11.2 Water quality amelioration.....	18
11.2.1 Failing septic systems	18
11.2.2 Hazardous Waste disposal	19
11.3 Outreach/Stewardship	19
11.3.1 Clean Boating handbook.....	19
11.3.2 Sound management of marinas.....	19
11.3.3 Disturbance to wildlife	19
11.3.4 Foreshore stewardship	19
11.3.5 Increased awareness of birds in winter	20
11.3.6 Connection of birds with shellfish growing operations: within and outside the BCSGA	20
11.3.7 Business Partners for Clean Water	20
11.4 Research and Monitoring	20
11.4.1 Exploration of the relationship between shellfish growing activities and waterbird biology	20
11.4.2 Other research and monitoring opportunities	22
12. Evaluating success	27
13. Acknowledgements.....	27
14. Bibliography	28
14.1 Personal communications (pers. comm.)	28
14.2 Literature Cited	28
Appendix 1: Common and latin names used in this text.....	31
Appendix 2: IBA Canada Partners.....	32

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**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

List of Figures

Figure 1. Location of the Baynes Sound and Lambert Channel-Hornby Island Waters IBA	1
Figure 2. Total bird abundance in Lambert Channel just prior to and during the herring spawn in 1989 and 1990	2
Figure 3. Habitat sensitivity map for the Baynes Sound area	14

List of Tables

Table 1: IBA species, the time at which they are present in the area, the approximate percentage of the population, the significance at the global (G), continental (C) or national (N) level, and the provincial status for the Baynes Sound IBA.	5
Table 2: IBA species, the time at which they are present in the area, the approximate percentage of the population, the significance at the global (G), continental (C) or national (N) level, and the provincial status for the Lambert Channel-Hornby Island Waters IBA.	6
Table 3. Conservation goals and objectives.....	23

List of Appendices

Appendix 1: Common and Latin names used in this text	33
Appendix 2: IBA Canada Partners.....	34

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

1. Introduction

The east coast of Vancouver Island and associated gulf islands represent extremely important habitat for a wide variety of birds both during the breeding and non-breeding seasons. The coastal waters stretching from Comox, to Maple Guard Point on Vancouver Island, including the waters surrounding both Denman and Hornby Islands, represent one of the most significant areas for wintering waterbirds in BC.

Presently this area encompasses two IBAs. The Baynes Sound IBA includes the marine and foreshore areas between Vancouver Island and Denman Island. The Lambert Channel-Hornby Island Waters IBA includes the body of water that separates Denman and Hornby Island as well as the shores of eastern and southern Hornby Island, especially the marine reserve associated with Helliwell Provincial Park and the marine portion of Tribune Bay Provincial Park. Included in this is a one-kilometre radius around Flora Islet (Figure 1).

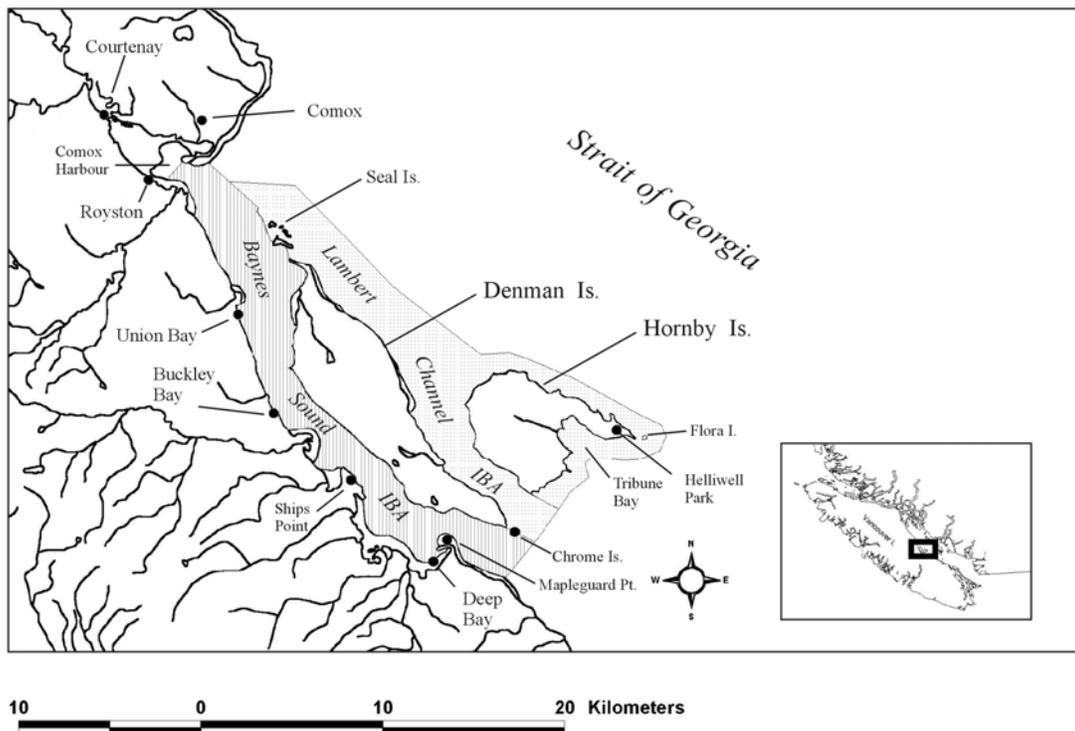


Figure 1. Location of the Baynes Sound and Lambert Channel-Hornby Island Waters IBAs

The predominance of this region as a globally significant area for several species of birds is due largely to the variety of different habitats present in this area. The combinations of sheltered and exposed waters together with the resultant varying intertidal substrates have given rise to a wide range of different habitat types including inshore and foreshore marshes, low gradient deltas and tidal flats that receive input from nutrient rich river systems, and rocky intertidal beaches. These numerous different habitats support a complex food web that supports a wide range of birds species including fish eating species such as herons, loons and cormorants; diving ducks such as buffleheads and scoters that prey on gastropods and

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

bivalves; shore birds that feed in the exposed intertidal areas such as Turnstones and Dunlin; and dabbling ducks, geese and swans that feed upon the emergent vegetation of estuarine and foreshore habitats. One of the most important sources of food for birds in this area is the prolific herring spawn that occurs throughout the region. During the peak of the herring spawn upwards of 60,000 birds descend upon the foreshore areas of the region to feed upon adult herring and their eggs (Figure 2, Haegele 1993).

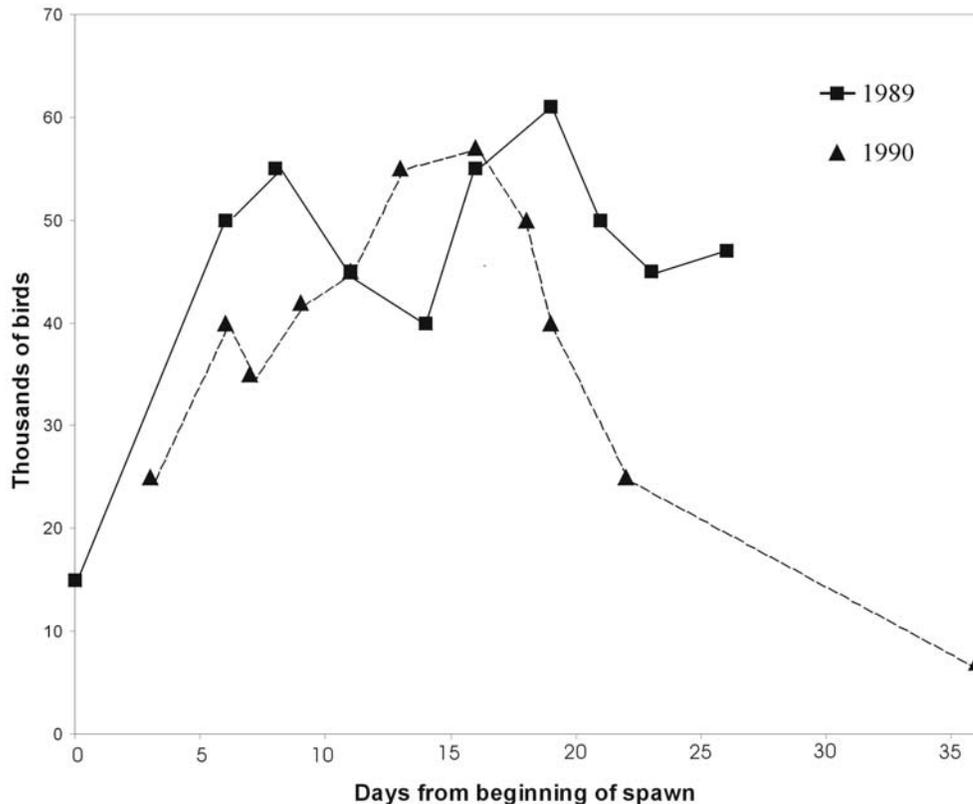


Figure 2. Total bird abundance in Lambert Channel just prior to and during the herring spawn in 1989 and 1990 (adapted from Haegele 1993)

Like many coastal regions of the world, the east coast of Vancouver Island in the vicinity of these two IBAs has undergone significant changes. The east coast of Vancouver Island is one of the fastest growing areas in Canada. The area is presently experiencing an annual growth rate of 7% (MABF 1999). Furthermore, the long history of European settlement in the region has resulted in a wide array of land uses, many of which can have a negative impact on natural ecological processes. The present land uses include urban and suburban regions, agriculture, commercial forestry and log storage, recreational boating and associated infrastructure (marinas), commercial fisheries, and aquaculture. This increased human presence in the area has influenced the quality and quantity of both the marine and foreshore habitats. Urbanization, agriculture, commercial fishing and recreational boating in the area have led to declines in water quality throughout the region (Vermeer and Ydenberg 1989). The deterioration of water quality has had widespread impacts, especially for the commercial aquaculture industry in the area. Similarly increased settlement has seen the reduction of saltwater marshes (Campbell-Prentice and Boyd 1988, Dawe et al. 1998) as well as the forested foreshore areas. The intensive shellfish industry has also raised concerns about affect on the availability of waterbird foraging habitat (Savard 1989, Axys 2000).

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Furthermore, disturbance to nesting, roosting, moulting and feeding birds from water-based activities such as ecotourism and recreational boating has also increased in the area.

Human induced changes in this region have not gone unnoticed by local residents, and all three layers of traditional government. Within the region there is a strong and vibrant community of local organizations who have designed, developed, and implemented a wide variety of measures and programs that have addressed some of the major environmental concerns in the region. These range from small scale programs that involve individual land owners (septic seminars), to projects that will influence entire communities (Union Bay Waste to Wealth) to initiatives that will track environmental activities over a large geographic area (State of the Sound; please see section 11.2 for a description of these initiatives).

These IBAs have been grouped together in to one conservation plan because, with minor exceptions, similar bird species are found in both IBAs. In addition, conservation concerns are similar in both IBAs. The purpose of this conservation plan is to elucidate the wildlife values in the area, discuss the issues that may affect these values, introduce and highlight the initiatives that are addressing some of these issues, and to focus and direct future initiatives that could further address identified concerns.

2. The IBA program

The IBA program is an international initiative co-ordinated by BirdLife International, a partnership of member-based organizations in over 100 countries seeking to identify and conserve sites important to all bird species worldwide. Through the protection of birds and habitats, they also promote the conservation of the world's biodiversity. There are currently IBA programs in Europe, Africa, the Middle East, Asia, and the Americas.

The Canadian BirdLife co-partners are the Canadian Nature Federation (CNF) and Bird Studies Canada (BSC). The Canadian IBA program is part of the Americas IBA program which includes the United States, Mexico, and 17 countries in Central and South America.

The goals of the Canadian IBA program are to:

1. identify a network of sites that conserve the natural diversity of Canadian bird species and are critical to the long-term viability of naturally occurring bird populations;
2. determine the type of protection or stewardship required for each site, and ensure the conservation of sites through partnerships of local stakeholders who develop and implement appropriate on-the-ground conservation plans; and
3. establish and support ongoing local involvement in site protection and monitoring.

IBAs are identified by the presence of birds falling under one or more of the following internationally agreed-upon categories:

1. Sites regularly holding significant numbers of an endangered, threatened, or vulnerable species.
2. Sites regularly holding an endemic species, or species with restricted ranges.
3. Sites regularly holding an assemblage of species largely restricted to a biome.
4. Sites where birds concentrate in significant numbers when breeding, in winter, or during migration.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

3. IBA Site Information

3.1 Baynes Sound

The Baynes Sound IBA (CABC057G; 49°33' N, 124°51' W) is situated between the east coast of Vancouver Island and Denman Island in the Strait of Georgia in southwestern British Columbia (Figure 1). This IBA extends from the Courtenay River estuary at the head of Comox Harbour to Deep Bay and Mapleguard Point approximately 35 kilometres to the southeast. Included in the IBA is Chrome Island, a Pelagic Cormorant breeding colony, situated off the southern point of Denman Island.

Baynes Sound is a shallow coastal channel fringed by protected bays, open foreshore, tidal estuaries, inshore marshes and adjacent forests. Comox Harbour, which bounds Baynes Sound on the north, is a large low gradient deltaic deposit. Together these protected waters and their many freshwater streams function as a single estuary. The shoreline, much of which is in a relatively natural condition, ranges from wide expanses of mud and sand flats to rocky shorelines overlooking deep water. The key habitats are a series of low gradient deltas, sand and gravel beaches, tidal flats, estuaries and foreshore. The Sound has several small bays that support one of the most productive shellfish growing areas in BC. The surrounding land is a mixture of second growth forest, areas of commercial pasture and cropland, small farms, urban and suburban development and light industry. (Dawe et al. 1998)

3.2 Lambert Channel-Hornby Island Waters

The Lambert Channel-Hornby Island Waters IBA (CABC061G, 49° 32' N, 124° 45' W) includes the body of water that separates Denman and Hornby Islands (Lambert Channel) and the marine areas that encompass Hornby Island. Lambert Channel is a predominantly shallow, tidal body of water that separates Denman and Hornby Islands. The shores of the two islands are a mixture of gravel and rock, the latter being predominantly shallowly shelving sandstone. Some bays have extensive sand beaches.

Waterbirds are concentrated in Lambert Channel in a roughly 1.5 km wide band along the entire northern shore of Denman Island (including the Seal Islets), and the shores of Hornby Island, including the marine reserve associated with Helliwell Provincial Park, the marine portion of Tribune Bay Provincial Park, and Flora Islet, a small island that is separated by a narrow 400-metre channel lying to the east of the southern tip of Hornby Island (a.k.a. St. John Point). The cliff face along the south side of the point in Tribune Bay provides nesting habitat for Pelagic Cormorants on the narrow ledges and within holes in the conglomerate rock of the cliffs. The upland habitats adjacent to the channel are part of the dry Garry oak / Douglas fir forests that are restricted in British Columbia to the Strait of Georgia (Butler and Lemon 1998, Lemon 2000, CDC 2000).

4. IBA Species Information

4.1 Bird species found within the bounds of the IBA

4.1.1 Baynes Sound

The Baynes Sound IBA is a site of global significance for 7 species of birds (Table 1). Maximum single day counts during 1980 -1981 surveys recorded globally significant populations of Pacific Loons, Western Grebes, Brant, Black Turnstones, Mew Gull, Thayer's Gull, and Glaucous-winged (Dawe et al. 1998). Three other species are present in nationally significant numbers: Pelagic Cormorant, Trumpeter Swans, and Great Blue Heron. Pelagic Cormorants breeding on Chrome Island represent 3.3% of the national population (Vermeer et al. 1989).

Portions of Comox Harbour and the Trent River represent the largest concentrations of Great Blue Herons, Trumpeter Swans, Brant, dabbling and diving ducks, Coots, Sanderling and Glaucous-winged Gulls in the Baynes Sound IBA (Dawe et al. 1998). In winter, Common Murre and Marbled Murrelet (also in summer) concentrate off Goose Spit on the northeastern entrance to the harbour (Savard and Lemon 1992). Wintering and migrating Black Turnstones, Black-bellied Plovers and Surfbirds are

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

most abundant in the central region around Union Point and Hart Creek on Vancouver Island and at Henry Bay on Denman Island. The largest concentrations of loons, grebes, cormorants, gulls, and eagles occur in the southern portion of the IBA from Ship Point on Vancouver Island and Metcalf Bay on Denman Island, to Deep Bay and Mapleguard Point. This area also sees concentrations of Trumpeter Swans, Brant, Surf Scoters, and, in spring and summer, Common Murres and Marbled Murrelets (Dawe et al. 1998).

Table 1: IBA species, the time at which they are present in the area, the approximate percentage of the population, the significance at the global (G), continental (C) or national (N) level, and the provincial status for the Baynes Sound IBA.

Species/Groups Meeting IBA Criteria	Season ¹	Number ² (1 day peak)	Approximate % of population ³	Sig.	Provincial ranking ⁴	National Ranking
Pacific Loon	W	1,005	2 (NA)	G		
Western Grebe	W	10,356	8.6 (W)	G	Red	
Great Blue Heron (spp. <i>fannini</i>)	S	136	1.4 (NA)	C	Blue	SC
Pelagic Cormorant	B/W	141 pairs, 263	2 (CDN)	N		
Brant	SM	5,291	4.0 (NA)	G		
Trumpeter Swan (Pacific population)	W	179	1.1 (NA)	C	Blue	
Mew Gull	W/SM	1,256	2.5 (NA)	G		
Glaucous-winged Gull	W	6,250	3.5 (NA)	G		
Thayer's Gull	W	257	2.6 (NA)	G		
Black Turnstone	W	3,093	4.0 (W)	G		

¹ W=winter, S=summer, B=breeding, SM=spring migration

² Numbers: Bird numbers from BSC (2001).

³ Importance: Percentages from the BSC (2001); W – % of world population, NA – % of North American population (of species if G, or of subspecies/flyway etc. if C), CDN – % of Canadian population

⁴ Red = threatened or endangered, Blue = vulnerable

⁵ SC =species of special concern

4.1.2 Lambert Channel-Hornby Island Waters

In the Lambert Channel-Hornby Island Waters IBA in 1989 and 1990, at least three species were recorded in globally significant numbers: Surf/White-winged Scoters, Glaucous-winged Gull (Haegele 1993) and Harlequin Ducks (Wright et al. 1988; Table 2). During the same study, nationally significant numbers of Pelagic Cormorants and Bald Eagles are also present, with a one-day peak of 692 in 1990. In addition to these species, relatively large one-day peak numbers of Oldsquaw (8,500), Bufflehead (600), Barrow's / Common Goldeneye (1,400), and Common Merganser (440) were also recorded (Haegele 1993). The southeast portion of this IBA is also a site of national significance for the north pacific population of Pelagic Cormorants. A survey in 1987 recorded 101 pairs nesting along the bluffs on the south side of the point (Vermeer et al. 1989). Glaucous-winged Gulls and Pigeon Guillemots also nest at the site (Rodway 1991). Furthermore, the surrounding waters of both Hornby Island and Denman Island are important feeding areas, and molting areas for migratory Harlequin Ducks. These ducks congregate in huge numbers to feed on herring in the spring and also use the shores of Hornby Island as a molting site during summer and early fall (M. Rodway, pers. comm.). Numbers vary through the season, but a recent count of 2500 birds was made on March 20, 1998 (P. Clarkson, field notes as cited in Lemon 2000).

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Table 2: IBA species, the time at which they are present in the area, the approximate percentage of the population, the significance at the global (G), continental (C) or national (N) level, and the provincial status for the Lambert Channel-Hornby Island Waters IBA.

Species/Groups Meeting IBA Criteria	Season ¹	Number ² (1 day peak)	Approximate % of population ³	Sig.	Provincial rank ⁴
Pelagic Cormorant	SM	2,080	2 (NA)	C	
Pelagic Cormorant	B	101 pairs	1.6 (CDN)	N	
Surf and White-winged Scoter	SM	28,000	?	G	Blue (SUSC)
Harlequin Duck	SM	4,000	2.6 (NA)	G	
Glaucous-winged Gull	SM	40,000	23 (NA)	G	
Bald Eagle	SM	692	1.3 (CDN)	N	

¹ W=winter, S=summer, B=breeding, SM=spring migration

² Numbers: Bird numbers from BSC (2001).

³ Importance: Percentages from the BSC (2001); W – % of world population, NA – % of North American population (of species if G, or of subspecies/flyway etc. if C), CDN – % of Canadian population

⁴ Red = threatened or endangered, Blue = vulnerable

4.2 Species accounts

4.2.1 Pacific Loon

Pacific Loons breed on fresh water lakes and ponds in eastern Siberia and in North America from the Arctic coast of Alaska and the northern part of Canada east to Baffin Island and Hudson's Bay (Campbell et al. 1990a). Autumn migration begins in late August and carries through November with the main southward movement taking place in late September and October. In wintering areas it is not uncommon to find flocks of several thousand Pacific Loons in up-welling regions. This species of loons tend to frequent deeper waters than other loons, but can also be found in coastal habitats such as bays, estuaries, surge narrows, channels and coves (Campbell et al. 1990a). In the spring, migration occurs as early as February and March in southerly areas. This northerly movement also coincides with the Pacific herring spawning season where large flocks congregate to feed on spawning herring (Campbell et al. 1990a, Haegele 1993).

4.2.2 Western Grebe

Western Grebes breed on emergent vegetation along the margin of medium to large freshwater lakes and ponds in western North America from southern BC and the Canadian Prairie provinces south to Mexico. They winter in both interior and coastal areas. In the interior, Western Grebes winter on larger lakes, larger sloughs and back channels of rivers. Large numbers also winter on the coast in estuaries, bays, inlets, channels, harbours and lagoons (Campbell et al. 1990a). The autumn movement can begin as early as late August, but is generally observed to occur from mid-September to mid-October. Numbers tend to build through November and December during which time flocks of up to 10,000 have been recorded (Campbell et al. 1990a). In coastal areas they feed on Pacific herring and herring eggs as well as other small fishes (Vermeer and Ydenberg 1989). Spring migration occurs from late April to mid-May across the southern parts of the province. Western Grebes are red-listed in BC primarily because of the breeding population is restricted to three regular sites and each are vulnerable to human disturbance (Fraser et al. 1999).

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

4.2.3 Pelagic Cormorant

There are two subspecies of Pelagic Cormorants breeding in BC. The northern subspecies, *Phalacrocorax pelagicus pelagicus*, is a resident from Japan north to eastern Siberia, the Bering Sea, the Aleutian Islands and south and east to the Queen Charlotte Islands (Cannings 1998). The southern subspecies, *P. p. resplendens*, breed from northern Vancouver Island and the mainland coast south to central Baja California. Pelagic Cormorants breed in colonies throughout inner and outer coastal areas on cliffs of forested and grassy rocky islands and headlands. They also nest in caves and on artificial structures such as navigation beacons and bridge pylons (Campbell et al. 1990a). In the Baynes Sound area, this species nests on the rocky ledges of Chrome Island off of the south tip of Denman Island and off of the south tip of Hornby Island. Autumn movement from nesting areas begins in September and continues through October while spring migration occurs primarily in late March and early April. There are also major shifts in the distribution of Pelagic Cormorants throughout their range. These shifts coincide with seasonal changes in the availability of fish. During winter Pelagic Cormorants are found in rocky coasts and feed in bays, harbours, lagoons, surge narrows and coves. During both summer and winter, this species feeds primarily on bottom-dwelling fishes (Fraser et al. 1999) but also congregate around herring spawning areas where they feed on adult herring (Haegele 1993, Vermeer et al. 1997).

The numbers of nesting Pelagic Cormorant numbers have declined along the southeast coast of Vancouver Island (Moul 1999). The decline in breeding pairs has been attributed to predation by Bald Eagles, and to disturbance that is caused by both Bald Eagles and boaters (Moul 1999).

4.2.4 Surf Scoter and White-winged Scoter

Surf Scoters breed on forested, freshwater lakes across northern North America including west central Alaska, northern BC, central Alberta, northern Saskatchewan, northern Ontario, eastern Quebec and Labrador (Campbell et al. 1990a). In winter, Surf scoters tend to frequent relatively open shallow waters of straits in proximity to beaches, spits and points, as well as protected areas such as bays, harbours and lagoons (Campbell et al. 1990a). Female Surf Scoters begin their spring migration in late May, but the main movement of birds from the coast occurs from mid-April to mid-May. In the fall, large number of Surf Scoters begin to arrive in coastal waters in late September and build in numbers through October and November. The spring migration of Surf Scoters generally occurs in April and May, and autumn migration runs from late September through early November (Campbell et al. 1990a). They are blue-listed in BC because they are known to breed in only a few locations in northeastern BC (Fraser et al. 1999).

White-winged scoters breed on fresh water lakes and ponds in relatively open country to forested landscapes in northern reaches from Alaska to northern Ontario and in central BC, north central Washington State and northern North Dakota. The presence of large number of birds on the coast in all seasons makes the time of migration difficult to determine. Spring migration generally occurs in April and May, and autumn migration runs from late September through early November. Many sub-adult birds migrate, but first-year birds remain on salt water (Campbell et al. 1990a). During the non-breeding season, White-winged Scoters tend to utilize deeper waters than Surf Scoters including bays, inlets, channels, and estuaries (Campbell et al. 1990a).

While in the Baynes Sound area, Surf and White-winged Scoters dive in search of bivalves such as mussels and clams as well as a variety of snails (Vermeer and Ydenberg 1989). Most notably, these two species, especially Surf Scoters, congregate in large numbers in this area during the herring spawning season during which time they feed primarily on herring eggs (Haegele 1993).

4.2.5 Harlequin Duck

Harlequin Ducks have been recorded nesting in western Alaska, and the northern Yukon, south to California and Wyoming, and from Southern Baffin Island to central Quebec and Labrador. This species also breeds in Greenland, Iceland and eastern Asia. They nest in both marine and freshwater habitats from near sea level to 2100 m in elevation along coastal and interior rivers, creeks and glacial streams. This

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

species is relatively common in coastal waters, especially the Strait of Georgia in all seasons. In coastal BC, wintering birds are often found in turbulent waters along rocky shorelines and bays (Campbell et al. 1990a). Numbers drop in coastal areas in May and early June when pairs fly to their breeding sites along inland and coastal rivers (Savard 1989). Male Harlequin Ducks leave incubating females on their breeding grounds and move to spring molting areas on the coast as early as late May. Females and juveniles join the males on wintering areas on the coast in August and September (Campbell et al. 1990a). While on the coast, Harlequin Ducks feed on a variety of organisms including snails, limpets, fish and fish eggs, crabs, chitons and bivalves (Vermeer 1983). Like many of the other bird species in this area, Harlequins also feed extensively on herring eggs during the herring spawn (Dawe 1976 as cited in Savard 1989, Haegele 1993). Of particular interest in the Baynes Sound/Lambert Channel-Hornby Island Waters area is the large concentration of molting Harlequin Ducks in the vicinity of St. Johns Point on Hornby Island. During this time these birds are unable to fly and are vulnerable to disturbance from both land and water-based traffic (Campbell et al. 1990a, M. Rodway, pers. comm.).

4.2.6 Great Blue Heron

The coastal sub-species of Great Blue Heron breeds and winters along the Pacific coast from south east Alaska south to Washington State (Cannings 1998). Great Blue Herons nest singly or in colonies usually in the upper part of mature trees. Colony sizes ranges from 1 to 169 nests, but most colonies consist of 1-10 nests (Forbes et al. 1985). In coastal BC, nesting colonies are generally within 8 km of foraging habitat (Butler 1997). Most colonies are used year after year, however some colonies are ephemeral and if abandoned, may or may not be used in future years (Fraser et al. 1999). Great Blue Herons feed along tidal mudflats with large eelgrass meadows, estuaries, slow-moving rivers, sloughs and marshy lakes. Recent changes in the status of colonies throughout coastal BC suggest that heron numbers are declining (R. Butler, pers. comm.). These declines have been linked with human disturbance at colony sites and the effects of predation by Bald Eagles (R. Butler, pers. comm.). This subspecies has been blue-listed in BC due to its declining numbers and the threats to nesting and foraging habitat from human development of coastal areas.

4.2.7 Trumpeter Swan

Trumpeter Swans breed in three distinct areas of North America. The Pacific coast population breeds in interior and coastal south-central Alaska and winters along the coast from Alaska south to Oregon. The Rocky Mountain population consists of two sub-populations. The interior sub-population breeds in Alberta, north-eastern BC, southern Yukon, southwestern Northwest Territories and south-west Saskatchewan. This sub-population winters in the Tri-State Area (Wyoming, Idaho, Montana). The Tri-State sub-population remains in the Tri-State area year-round (Campbell et al. 1990a). In all areas this species breeds on freshwater ponds, lakes, marshes and occasionally or rivers (Campbell et al. 1990a, Fraser et al. 1999). In winter, the Pacific population seeks out estuaries, sloughs, bays and agricultural fields along the Pacific coast where it feeds on emergent vegetation, pasture grasses, grains and tuberous crops (Fraser et al. 1999). The interior populations winter on lakes and rivers that remain ice free during which time they subsist on aquatic vegetation. There are wintering populations scattered throughout the interior of BC including Fraser Lake, the Tachie and Stuart Rivers near Ft. St. James, and the Thompson River, near Kamloops.

The autumn movement from breeding locations occurs in mid-late October or November depending upon freeze-up in Alaska. Generally, most birds arrive on wintering grounds in mid-to late November and peak in December (Campbell et al. 1990a). Trumpeter Swans leave coastal areas to return to breeding grounds in late February and early March with the biggest movement of birds occurring in late March and early April. Historically Trumpeter Swans were more widely distributed than they are at present. Over-harvest, especially due to a commercial market for swan skins as well as habitat alteration led to dramatic declines across the species range such that this species was, at one time, considered a vanishing species (Campbell et al. 1990a). Breeding surveys in the last 30 years suggest that populations

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

have dramatically increased (Fraser et al. 1999). The trend of increasing population numbers on the breeding grounds is also reflected in swans wintering in BC. Mid-winter aerial surveys along the east coast of Vancouver Island and the Lower Fraser River conducted by the Canadian Wildlife Service recorded a 600% increase in Trumpeter Swans between 1970 and 1998 (or 23.2% per year). The wintering population has also increased from 947 swans in 1970 to 7,111 adult and juvenile swans in 1998 (CWS 2000). Despite these increases Trumpeter Swans are blue-listed in BC primarily because of the small breeding population in BC, and because wintering habitat, especially in coastal areas, is threatened by potential development.

4.2.8 Bald Eagle

Bald Eagles breed from north-west Alaska, central Canada and south to the southern United States and Baja California. During breeding season eagles feed opportunistically utilizing a wide variety of prey including fish, various birds such as gulls, pigeons, waterfowl and herons, carrion, and refuse (Stalmaster 1987). A large portion of the North American bald eagle population leave their summer habitat and move to wintering grounds in October and November (Stalmaster 1987). On wintering grounds eagles congregate, often in large numbers, in areas associated with open water and a readily available source of food (Keister *et al.* 1987, McClelland *et al.* 1981, Stalmaster 1987). On the Pacific coast, spawned-out salmon, schooling fish such as Pacific herring and sandlance, waterfowl, rodents, refuse, and to a lesser extent mammalian carrion, represent food sources for wintering eagles (Stalmaster 1987, Booth and Merkens 1998, Campbell et al. 1990b). Eagles suffered great declines in southern and eastern part of range earlier this century. However as of early 1990s populations in many areas had rebounded from the low levels that occurred before DDT use was banned in the U.S. Populations have been increasing in the contiguous 48 states: the number of nesting territories nearly tripled between 1980 and 1990 (Kjos 1992 as cited from ABI 2000). In the lower 48 states, breeding population has doubled every 6-7 years since the late 1970s (USFWS, Federal Register as cited from ABI 2000). The increase in eagle numbers has been associated with the decrease in abundance of numerous species of nesting birds along the BC coast including Great Blue Herons, Pelagic and Double Crested Cormorants (T. Chatwind, R. Butler, pers. comm.).

4.2.9 Black Turnstone

Black Turnstones are a small (24 cm) shorebird that nests colonially on the coastal salt grass tundra of western and southern Alaska (Erlich et al. 1988, Campbell et al. 1990b). This species winters only on the Pacific coast from south-east Alaska to central Mexico. They leave their breeding grounds and begin to arrive along coastal BC in late June. Numbers remain relatively low until September when the late departing juveniles arrive. Wintering birds remain in coastal areas until late April to mid-May. During winter they feed on reefs, rocky beaches, jetties and gravel bars at the mouths of rivers where they consume barnacles, snails, molluscs and crustaceans (Erlich et al. 1988). They may also forage on adjacent mudflats, wet sandy beaches, floating kelp beds and piles of washed-up seaweed. The Baynes Sound area represents the largest wintering numbers in the province (Campbell et al. 1990b).

4.2.10 Brant

Brant are a species of goose that breeds in the arctic regions of North America and Eurasia. This species winters along the Pacific coast from southeastern Alaska and the Queen Charlottes to Baja California, and along the Atlantic Coast from Massachusetts to North Carolina. In BC, Brant are considered a spring migrant (February-March) during which time thousands can be found spread out along coastal areas. The distribution of Brant in coastal areas is closely associated with the distribution of eel grass, which is a common food source in winter (Campbell et al. 1990a). Brant have also been known to congregate during herring spawn where they feed on herring eggs (Haegele 1993). While Brant are abundant visitors to the coast of BC, this species has declined dramatically over the last 100 years due primarily to past over-harvesting activities (Campbell et al. 1990a).

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

4.2.11 Mew Gull

Mew gulls are a small (40 cm) gull that breed on small freshwater lakes, marshes, ponds or other wetlands either singly or in small colonies from central and south-east Alaska to north-western North America and in northern and coastal BC. During winter this gull is widely distributed along coastal BC in a variety of habitats including bays, estuaries, surge narrows, beaches, mudflats, and harbours. It also follows rivers and inlets up to 150 km inland (Campbell et al. 1990b). On the coast, Mew Gulls arrive in wintering areas in August. Their numbers increase until they reach peak levels in December. Spring migration occurs from early March through mid-May (Campbell et al. 1990b). In winter, this species feeds primarily on euphasid shrimp that are common at up-welling sites such as Active Pass. Away from up-welling sites this Mew Gulls are also known to feed on fish such as Pacific herring and sandlance and are commonly observed in large numbers at both Pacific herring and eulachon spawning sites (Vermeer and Ydenberg 1989).

4.2.12 Thayer's Gull

Thayer's Gull breed on the Arctic islands of Canada. This species winters mainly along the Pacific Coast from BC to Mexico. During the winter they frequent estuaries, bays, lagoons, harbours as well as garbage dumps. They arrive in coastal areas in late July and August; however, the main movement begins in September. Numbers gradually increasing through November and peak in December and January. The return to breeding grounds occurs from late March through April (Campbell et al. 1990b). Large aggregations can be found at easily available sources of food such as herring spawning areas during the spring and dumps during the winter (Campbell et al. 1990b).

4.2.13 Glaucous-winged Gull

Glaucous-winged Gulls are one of the most common gulls in BC. They breed from the southern Bering Sea and southern Alaska south along the Pacific coast to northwestern Washington (Campbell et al. 1990b). Despite the fact that this species is present along the coast throughout the year there is a discernible seasonal movement of individuals. In spring, gulls move from wintering areas between late March and early May. In the autumn, movement occurs between late September and late October. These seasonal movements coincide with the herring spawning season (spring) and this salmon spawning season (fall). During winter, this species is widely distributed along the entire BC coast in various habitats including bays, harbours, estuaries, and areas where spawning salmon, eulachon and Pacific herring are found. They are also often found in large numbers over schools of sandlance and Pacific herring (Vermeer and Ydenberg 1989, Campbell et al. 1990b). Over the past 50 years, the population of this species has increased up to 3.5 times in size. The total breeding population in BC was estimated to be approximately 25,000 pairs in 1987 (Campbell et al. 1990b). Declines of Glaucous-winged Gulls in the southern Strait of Georgia have been noted in recent studies (Sullivan et al. *In press-b*). These declines have been linked with the increased frequency of disturbance by Bald Eagles.

4.3 Areas of conservation value outside the IBA.

At present, there is a Great Blue Heron Colony on the north east coast of Hornby Island that meets the continental threshold for coastal Great Blue Herons. In 1999 a total of 55 nests were identified in this colony (M. Elkins pers. comm.). The large heron nesting colonies on Denman Island have, for the most part, been deserted. The status of these colonies is presently under investigation. Similar events have occurred on Vancouver Island. One of the large colonies near Royston was deserted in 1999 as a result of residential construction adjacent to the nest trees (M. Page, pers. comm.). There are presently three small colonies on Vancouver Island in the Baynes Sound area. All three are presently on either provincial crown land, or in regional parks (K Morrison, pers. comm.).

5. Other elements of high conservation value

Marbled Murrelets, a provincially red-listed species and nationally threatened species occur in various locations within the two IBAs and may be nesting in the forested slopes on Mt. Geoffrey, Hornby

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Island. Seven species of salmon (Coho, Chum, pink, Chinook, and Sockeye) Cutthroat trout and Steelhead are known to spawn in the area (Dawe et al. 1998). In addition, one of the most prolific areas of Pacific herring spawning sites occurs along the shores of Vancouver, Denman and Hornby Islands (DFO 2000). Six-gill sharks are known to occur in the marine waters off the southeastern shores of Hornby Island (A. Heath, pers. comm., CDC 2000).

6. Land ownership and use

6.1 Historical

The Baynes Sound/Lambert Channel area has a long history of resource extraction and development by the European settlers. The discovery of coal deposits in the region in the mid 1860's led to influx of thousands of miners to the area resulting in a high demand for lumber for construction materials and for agricultural products (Fry 1994). The E&N Railway Land Grant in 1884 resulted in 20 million acres of land being sold to private interests, including most of the lowland areas of Baynes Sound. From that time onward, resource extraction (logging and coal mining) occurred throughout the area by the various different landowners. Foreshore areas were heavily impacted during this time through road and dyke construction and log sorting activities. Despite the development of the foreshore area during this time, the intertidal mudflats in the region were well known for their bountiful clam beds. Denman and Hornby Islands were not part of the E&N Land Grant, as a result they had a mixed history small logging operations, ranches and a small whaling industry (Fry 1994).

6.2 Present

The east coast of Vancouver Island has undergone a dramatic increase in population in the recent past. Between 1991 and 1996, the City of Courtenay grew 48% to a current population of 20,000 residents, while the rural community of Royston grew a staggering 74%. The populations of both Denman and Hornby Islands, however, have remained relatively stable in recent times. Despite the increases in population, this area represents a significant area of relatively undeveloped lowland on the east coast of Vancouver Island (Fry 1994). As such, it provides important recreation and tourism opportunities to Comox Valley and BC residents alike.

The Baynes Sound/Lambert Channel has a long history of shellfish farming in BC. Presently, the area produces 45 percent of the total oyster and clam stock cultured in British Columbia (Axys 2000). The industry in this area currently provides full-time sustained employment for over two hundred persons. Four hundred and eighty-five hectares of crown land in Baynes Sound area is leased for shellfish aquaculture, of which 380 ha support intertidal culture of oysters and clams. The remaining 105 ha are deep water leases that cultivate oysters and scallops (Axys2000). Shellfish farming occurs on Crown lands that area leased by the Provincial Government. The Baynes Sound/Lambert Channel area is also one of the most prolific Pacific herring fisheries in BC. The herring roe catch from the Baynes Sound/Lambert Channel area during the last 5 years (1994-1999) represented between 40-60% of the total herring roe fishery in BC. Estimated landed values for the fishery from the Baynes Sound/Lambert Channel areas ranged from \$10-43 million/season (DFO 2000).

7. Conservation concerns: factors that may influence bird abundance and distribution

Given the geographic size of this area, in addition to the long tenure of human settlement (particularly European settlement) in the area, the factors that can affect wildlife species in this area are numerous and complicated. For the purposes of this document, the factors that can affect the abundance and distribution of birds in this area have been grouped into the following categories: shoreline development, water pollution, shellfish farming, declines in the herring stocks, and human disturbance.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

7.1 Shoreline development

The increase in population growth that has occurred throughout the area has led to numerous issues that pertain to bird and bird habitat in the Baynes Sound and Lambert Channel-Hornby Island Waters IBAs. This growth has led to the degradation of sensitive bird and wildlife habitat, particularly coastal wetlands. In excess of 32% of the former salt water marshes on Vancouver Island have been impounded by dikes (Campbell-Prentice and Boyd 1988). Certain kinds of shoreline development can have significant implications for herring spawning habitat (see Section 7.3). In addition, overstory tree removal from shoreline areas is also a large concern on Vancouver, Denman and Hornby Islands. This has implications for both Bald Eagle and Great Blue Heron nesting habitat. In sum, one of the greatest threats to bird habitat in this area is the destruction or degradation of habitat by urban development (Dawe et al. 1998). Industrial activity also represents a potential threat to bird habitat in the area. One local sawmill along the Courtenay River has slowly expanded into some sensitive estuarine habitat.

7.2 Water pollution

Water quality issues have been at the heart of some of the most problematic issues in the Baynes Sound area. Failing septic systems from communities along the east coast of Vancouver Island as well as on both Denman and Hornby Islands have long been recognized as one of the major sources of fecal coliform contamination (B. Joughin, pers. comm.). Estimates for systems that were either failing or were in pre-failing conditions were as high as 50% in some areas (CVCARE 1999). Untreated sewage from recreational boaters as well as from the commercial herring fleet has also contributed to the water quality problems in this area. In addition, water quality in the entire region has also been adversely affected due to faulty storm drains (sanitary sewer/storm drain cross connections) and agricultural runoff. This issue peaked in 1994 when approximately 25% of the Sound was closed to shellfish harvesting due to widespread fecal coliform contamination (R. Drake pers. comm.).

High levels of fecal coliform contamination in freshwater and marine systems create complex and diverse health concerns for the species inhabiting and using these systems. In addition, eutrophication from runoff can threaten existing herring spawning habitat (D. Hay, pers. comm.). There are also isolated, site specific threats to water quality that exist in the Baynes Sound area. For example, a derelict fishing boat moored in Baynes Sound, known as the “blue boat”, represents a potential source of oil and fuel that would lead to an isolated contamination event that could have a significant, isolated impact on shoreline habitat.

7.3 Herring fishery

Pacific herring spawning sites within the Baynes Sound/Lambert Channel-Hornby Island Waters IBAs attract thousands of birds to these areas. During the spawn herring and their eggs provide food by numerous bird species (Haegele 1993, Vermeer et al. 1997). In the area around Baynes Sound/Lambert Channel, Pacific herring are probably the single most important prey species for water birds (Hay et al. 1987). Bird numbers can increase by as much as 135 fold during the peak spawning period along the east coast of Vancouver Island, particularly Lambert Channel (Sullivan et al. *In press-a*) and have reached in excess of 60,000 individuals during this time (Haegele 1993; Figure 2).

The correlation between herring spawn and waterbird numbers is relatively clear—herring play a major role in the distribution of birds in this area. Consequently any activity that negatively affects the distribution and abundance of herring can have a significant impact on birds. However, it is difficult to determine what these factors are because the locations of herring spawn can change between years probably as a result of changes in ocean climate. This can lead to minor changes in location between years, or to major shifts in distribution over a longer time scale (e.g. tens of years). Therefore, observed changes in the distribution of herring spawning areas can occur independent of any local human induced activities (G. Thomas, pers. comm.).

Prior to the 1960s, the regulation of the herring fishery resulted in significant decreases in abundance of herring throughout Georgia Strait. Since that time the changes that were implemented have

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

resulted in the rebounding of stocks to near, or in excess of historic levels (D. Hay, pers. comm.). Apart from the direct overexploitation of the herring fishery it is difficult to say with certainty that any one specific activity can have a significant impact on the distribution and abundance of herring. Rather, gradual changes over long periods of time can result in local depletions of specific spawning sites. Factors that can contribute to reductions in the herring spawning activity in any area are those activities that either directly negatively impact spawning habitat via alteration of bottom conditions (e.g. booming areas and log dry-sorts; Hay and McCarter 2000), excessive shoreline development such as marinas (J. Schweigert, pers. comm.), or alterations to water quality (e.g., eutrophication from sewage systems, or discharge from major industry; D. Hay, pers. comm.). Several kilometres of shoreline on Denman, Hornby and Vancouver Islands represent the some of the most prolific spawning habitat in BC. Several sections of coastline are ranked among the top 5% of all shoreline areas in BC in terms of the frequency and magnitude of recorded spawn (cumulative spawn; Hay and McCarter 2000, Figure 3). It is essential that these areas be candidate sites for conservation activities, as are areas immediately adjacent to these spawning areas. This is of concern because if herring-spawning habitat is lost, it cannot be assumed that the affected stocks will spawn elsewhere, nor can it be assumed that new spawning can be created (Hay and McCarter 2000).

7.4 Shellfish Farming

Concerns have been raised regarding numerous different aspects of the shellfish growing operations in the Baynes Sound/Lambert Channel areas. These concerns have escalated largely due to the proposed expansion of shellfish growing operations in the areas bounded by the two IBAs in question (BC Assets and Land Corporation, press release, April 14, 2000). These concerns can be grouped in two general areas: the reduction of potential foraging habitat for foraging shorebirds and diving ducks, and the potential disturbance to birds by shellfish workers.

In clam culture operations, farmers actively exclude diving ducks from planted Manila clam beds with the use predator netting. Panels of various kinds of netting are laid over seeded clam areas to protect them from diving ducks, certain species of fish, and crabs (Axys2000). The primary concern regarding the use of this netting is the immediate loss, or potential loss of foraging habitat for shorebirds and diving ducks. There is also a concern regarding the gradual and cumulative reduction in the total area available to foraging birds as new leases are approved. At present, shellfish leases occupy 376 hectares or 33% of the Baynes Sound intertidal area. These primarily occupy delta; rock platform with beach veneer; and mixed beach substrates. If all of the proposed lease expansions become operational the intertidal leased area will increase by almost 80 hectares to a total of 40% of the Baynes Sound intertidal area (Axys 2000). The expressed concern is that these expansions are being approved without knowledge of the potential impacts of said expansion on the waterbirds that inhabit these areas. There are also concerns that the improper use of netting for prevention of predation may lead to the entanglement and subsequent drowning of diving ducks (Rueggeberg and Booth 1989, Axys 2000). Presently, there are no data to indicate whether shorebirds, such as Black Turnstones, will be able to forage through, or on the material used for predator exclusion (Axys 2000).

The disturbance of shorebirds by shellfish workers is also a potential concern. Since both peak shorebird foraging activities and peak activity of work on intertidal shellfish growing operations coincide with the low tides, there is a potential conflict between these two activities. Disturbance to the feeding of shorebirds by shellfish workers is of concern because of the reduced energy intake by birds, either by reduced foraging time in specific areas, or because birds are excluded from particular areas due to the presence of workers (Axys 2000). Potential disturbance may also become an issue should shellfish farmers in the area feel the need to obtain permits from Environment Canada for the purposes of either scaring foraging birds from shellfish growing operations (as have been made for mussel growing operations on Salt Spring Island), or for the culling of birds that are feeding on growing operations (as is a common place occurrence in eastern Canada; S. Chiasson, pers. comm.).

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

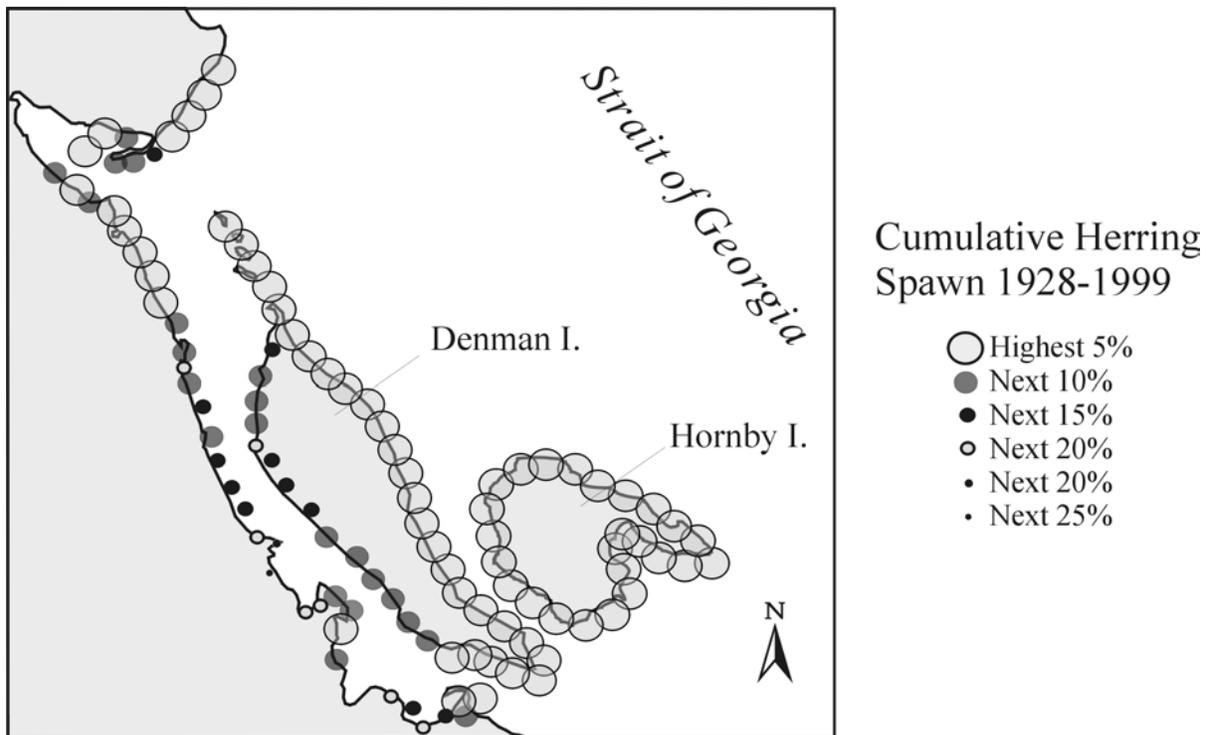


Figure 3. Habitat sensitivity map for the Baynes Sound area. The cumulative spawn (since 1928) is depicted at each km position of shoreline by the proportional size of each circle. The cumulative spawn takes into account both the frequency and magnitude of recorded spawn. Different sizes of circles represent six classifications of cumulative spawn. The largest circles represent the top 5% of all kilometres measured in BC (i.e., the km sections with the highest cumulative spawn) followed by the next 10%, 15%, 20%, 25% and 25% of the remaining km in BC (Adapted from Hay and McCarter 2000).

While clam farming may negatively impact certain species of birds by potentially reducing foraging habitat, other types of growing operations can benefit the same and other species. Floating structures in deep water growing operations may provide habitat and cover for prey fish, which can in turn provide food for fish-eating birds such as loons, grebes and mergansers (Axys 2000). Furthermore, rafts, trays and tubes that hold juvenile oysters and clams, and ropes that anchor these facilities can also provide prey, especially mussels for diving birds such as scoters (Booth and Ruggeberg 1989, Axys 2000).

7.5 Human disturbance

7.5.1 Disturbance from boaters

Ecotourism is a fast growing industry in BC. There are a large number of companies that provide commercially guided tours (powerboat and kayak based tours), primarily for the purposes of whale watching in the Strait of Georgia. In addition, there is a growing community of individuals that are seeking outdoor experiences separate from commercially guided tours. As a result, there is a general increase in the number of water-based interactions between people and wildlife along the coastal waters of BC in general. These impacts are being felt in numerous places in the Baynes Sound/Lambert Channel areas. Of particular concern is the potential conflict between boaters and the congregation of Harlequin

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Ducks and nesting Pelagic Cormorants in the vicinity of St. Johns Point. Harlequin Ducks return to the Hornby Island area during the mid-summer months (males in July, and females in August) during which time they molt their flight feathers, and consequently are unable to fly (M. Rodway, pers. comm.). This time coincides with a peak time of water-based disturbance, primarily from kayakers. This water-based disturbance also affects the nesting cormorants near St. Johns point and Flora Island (A. Zilenski, D. Baker, pers. comm.). Water-based disturbance is also present throughout the season, albeit at lower intensity with the exception of an influx of traffic during the Easter long weekend. In addition, disturbance from recreational personal watercraft has also been documented in the vicinity of St. Johns Point. While it is unclear how this disturbance affects survival and productivity of Harlequin Ducks, it is of concern and deserves ameliorative measures (M. Rodway, pers. comm.).

7.5.2 Disturbance from shoreline areas

The Provincial Parks on both Denman and Hornby Islands receive a substantial number of visitors each year. For example, Helliwell Park on Hornby Island receives up to 60,000 visitors per year (T. Quinn, pers. comm.). This amount of traffic undoubtedly affects bird distribution within the bounds of these parks. In addition, people with dogs have been identified as a disturbance factor for wintering Harlequin Ducks at St. Johns point. However, it is believed that disturbance from dogs is secondary to disturbance from watercraft (kayaks, personal watercraft, power boats). It has also been documented that human disturbance is having a significant affect on the nesting success of Great Blue Heron colonies in areas throughout coastal BC (R. Butler, pers. comm.).

8. Conservation management achieved at the IBA site

The Federal and Provincial Governments as well as the Pacific Coast Joint Venture (PCJV) via the Pacific Estuary Conservation Plan (PECP), have purchased or have jurisdiction over a number of parcels of land in the Baynes Sound/Lambert Channel area. In addition there are two Provincial Parks on Hornby Island, and one on Denman Island. Fillongley Provincial Park is a small park (23 hectares) located on the North side of Denman Island that includes the Seal Islets. The southeastern region of Lambert Channel is protected from development by Tribune Bay Provincial Marine Park and Helliwell Provincial Park. These parks limit foreshore development but do not necessarily protect wildlife and wildlife habitat from either disturbance or degradation due to overuse.

There is also a proposal that has been put forth by the BC Ministry of Environment, Lands and Parks to designate portions of Baynes Sound as Provincial Wildlife Management Areas (WMAs). Presently there are four small reserves in the Baynes Sound area: Fanny Bay (40 ha), Mud Bay, Deep Bay (26 ha) and two in the Courtenay River Estuary (30 ha). There are applications being tendered for additional reserves in intertidal foreshore/estuary habitat at Coal Creek, Little Bay, Rosewall Creek, and Trent River to Millard Creek. If these applications are successful these reserves will protect 1000 ha and would all be recommended for WMA status (T. Clermont, pers. comm.).

9. Groups active in the areas that encompass the IBA(s)

There are numerous groups active in the Baynes Sound/Lambert Channel-Hornby Island Waters IBAs. They include:

- **BC Fisheries** is responsible for the management of the shellfish industry in the area. They along with **Environment Canada** in North Vancouver also monitor shellfish health and water quality in the area.
- **BC Parks** has three provincial parks in the area. Of major importance is Helliwell Provincial Park on Hornby Island.
- **Community Futures Development Corporation of Strathcona** employs a full time stewardship coordinator that will help guide stewardship initiatives in the Courtenay/Comox area.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

- **Comox Valley Citizens for Action on Recycling and the Environment (CVCARE)** works on recycling, composting, and wastewater management and education issues in Baynes Sound area.
- **Comox Valley Project Watershed Society (Project Watershed)** is a community watershed stewardship organization, has delivered remediation and monitoring initiatives to help improve water quality and raise awareness about water quality issues in Baynes Sound
- **Ducks Unlimited** has been involved in numerous projects in the Baynes Sound area. DU also plays a major role in the PCJV
- The **Baynes Sound Stewardship Action Group (BSSAG)** is an aggregation of project orientated community, government and industry groups that meets on a monthly basis. This group includes Comox Valley Project Watershed, Comox Valley CARE, the BC Shellfish Growers association, BC Fish, Environment Canada, the local health unit, and others depending upon current project focus. BSSAG employs a collaborative problem solving approach to the mitigation of local health and environmental issues.
- The **BC Shellfish Growers Association (BCSGA)** represents the interests of shellfish growers in BC. They actively support local water quality improvement initiatives in the Baynes Sound area.
- The **Canadian Wildlife Service** is federal agency that is responsible for the management of migratory waterbirds that inhabit this area. CWS also plays a major role in the Pacific Coast Joint Venture.
- **The Comox Valley Land Trust** has the ability to hold Conservation Covenants in the area.
- The **Comox Valley Naturalists Society** has contributed significantly to conservation work within the region, particularly in the Millard/Piercy Creek Watershed project. Members of the society are also participants in the coastal waterbird survey.
- The **Denman Island Conservation Society** has a history of stewardship projects. Members of the society are also participants in the coastal waterbird survey.
- The **Fisheries and Oceans Canada (FOC)** has responsibility for the management and regulation of the herring fishery in the region. In addition, FOC also plays a role in stewardship initiatives in the area.
- The **Hornby Island Conservation Society** has a stewardship agreement with BC Parks regarding the management of the Helliwell Park on Hornby Island. Members of the society are also participants in the coastal waterbird survey.
- The **Millard/Piercy Creek Watershed Stewards** is an organization that helped shape a community development strategy for a major watershed in the Courtenay area. This could act as a model for watershed management in numerous places on the east coast of Vancouver Island
- The **Ministry of Environment, Lands and Park (MELP)** is the provincial agency responsible for the management of wildlife. In addition to MELP, **British Columbia Crown Assets and Lands (BCAL)** is responsible for the issuance of shellfish farming licenses in coastal areas of BC.
- The **Nature Trust of BC** is a landowner and land manager in the area. They have responsibility for the management of small patches of estuarine and wetland habitats
- The **Pacific Coast Joint Venture (PCJV)** under the auspices of the Pacific Coast Estuary Conservation Plan (PECP) is a major player in land acquisition along the coastal areas of BC.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

10. Opportunities

Baynes Sound has long been recognized as an important area for waterbirds, salmon, herring and shellfish. It has also had a long history of development that has resulted in significant threats to the natural surroundings. At the same time there is also a long history of remediation work that has taken place in this area. Numerous organizations have long histories of designing and implementing creative solutions to long-term environmental problems. Many of these organizations are actively pursuing work that specifically addresses threats to the birds that inhabit this area. Numerous other projects are in the early conceptual stages of development.

Throughout the region there is a significant commitment to volunteerism. Natural history groups, conservation groups, land trusts and other organizations have spent a considerable amount of time addressing conservation issues. In numerous places the volunteer base is active and vibrant. Recent initiatives by FOC through the Oceans Directorate and the Community Futures Development Corporation of Strathcona, as well as the on-going work facilitated by BSSAG suggest that the potential for long-term change in this region is good. In all, the opportunities for effective conservation activities in this region of BC are numerous and are generally limited only by sufficient funding, rather than that capacity to design and implement the necessary projects.

11. Conservation Goals and Objectives

The conservation goals and objectives for the Baynes Sound/Lambert Channel-Hornby Island Waters IBAs are multi-faceted and address numerous different objectives. These both directly and indirectly address birds and bird habitats. They can be grouped into four broad categories: program integration, water quality amelioration, education and outreach, research and monitoring. In many cases these programs are on-going but are always limited by available funding. In almost all instances the infrastructure and personnel are present within the community to accomplish most of the tasks required. Summaries of these goals and objectives can be found in Table 3.

11.1 Program integration

11.1.1 The development of an information management system

Given the large geographic size of this area, and the number of different initiatives that are on-going there can be missed opportunities. These are often associated with Provincial and Federal Government projects that do not have a direct link with locally-based, action-orientated organizations, but can also include initiatives developed and implemented by non-government organizations (e.g., the coastal waterbird survey that is being conducted by local natural history organizations in conjunction with Bird Studies Canada, and the bird surveys being conducted by CWS). It is therefore important that there is a system that will help link these diverse initiatives together. The *State of the Sound Program* delivered by the Project Watershed on behalf of the Baynes Sound Round Table will create a system for the long-term management and reporting of water quality and conservation actions in the Baynes Sound region. This system will facilitate community access to information, improve awareness and understanding about stewardship issues, and increase public participation in decision-making and policy development related to water quality and conservation issues. This program is in its initial development stages and will require secure funding to be successful.

11.1.2 Ensure that birds are incorporated into stewardship activities

It is extremely important that initiatives such as septic seminars and hazardous waste clean up days (see Section 11.2.1) be associated or linked not only with clean water for the benefits of humans, but also for the benefit of wildlife in general, and birds in particular.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan

April 2001

11.1.3 Ensure that birds are incorporated into BC Parks initiatives

BC Parks in Victoria is actively pursuing wildlife viewing ethics strategy (C. Kissinger, pers. comm.). It is important that information that is produced by BC Parks be incorporated in to any outreach programs where the public may come into contact with wildlife. Such examples are Project Watershed's boater information pamphlet and the proposed information that is intended for marinas in the area (see Section 11.3). Efforts should be made ensure that these complementary outreach messages are delivered at the same time if possible.

11.2 Water quality amelioration

Water quality issues have received considerable attention in the Baynes Sound/Lambert Channel areas. While considerable progress has been made, there is a need for the continuation of existing programs, the expansion of others, and the initiation of new and innovative projects.

11.2.1 Failing septic systems

11.2.1.1 Septic seminars/socials

Throughout the region an initiative developed by CVCARE and Project Watershed demonstrates the proper care and maintenance of a septic system and provides residents with information kits that focuses on homeowner and consumer responsibilities regarding household waste. This work has also been extended into local elementary schools. One of the goals of the program was to connect the issue of failing septic systems with closures of productive shellfish beds due to fecal coliform contamination. This program is an extremely important ameliorative tool in the Baynes Sound area. It is extremely important that this initiative continue in order that it reaches each community in the Baynes Sound/Lambert Channel area.

11.2.1.2 Union Bay waste to wealth project

This project will research innovative approaches to the treatment of wastewater that will develop value-added by-products from what was previously considered waste. The project will produce a design prototype for the Union Bay community that will include constructed wetlands, solar greenhouses and vermi-composting. The design prototype will also determine feasibility of including an education and research centre, providing opportunities for schools, collaborations with post-secondary institutions, training for technical groups and others to directly experience and test these innovations in wastewater treatment. The Waste to Wealth project in Union Bay could represent a significant contribution to water quality amelioration in the region. Should this program prove successful it could be used as a model for similar sized communities in the region.

11.2.1.3 Hornby Island constructed wetland and grey water treatment system

This pilot project conducted by CVCARE is examining the feasibility of using a small, constructed wetland and grey water treatment system to treat waste from individual residences. This kind of project is extremely important project for four distinct reasons: 1) it is non-proprietary and can therefore be easily transferred to other communities; 2) it does not require the depth of native soil that is required for conventional septic systems and as a result is well suited for conditions of poor or shallow soils (the latter is a common condition on many of the islands in the Strait of Georgia); 3) it costs significantly less because the system does not require large amounts of soil that would otherwise be needed for a conventional system and; 4) it has the potential to treat water to an extremely high quality.

11.2.1.4 Storm water runoff and failing septic systems: biofiltration wetlands

One of the approaches to dealing with storm water runoff and failing septic systems used in the Baynes Sound/Lambert Channel area is the construction of biofiltration wetlands. Constructed wetlands improve the water quality of stormwater runoff and wastewater effluent, while creating valuable wildlife habitat. These projects provide environmental benefits, and offer a cost-effective alternative to traditional stormwater management designs. Project Watershed in conjunction with the Department of Highways

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

have constructed one biofiltration wetland in the region and a second one is planned. There are numerous additional areas that could benefit from these projects.

11.2.1.5 Boater waste

Project Watershed in conjunction with community partners has planned the construction of boater pump out facilities at each end of Baynes Sound (Comox Harbour and Deep Bay). These facilities will provide an alternative to dumping raw sewage into the marine waters of Baynes Sound.

11.2.2 Hazardous Waste disposal

The problems associated with improperly disposed and misused toxic chemicals have been addressed by a three-way alliance between the community, local government and the business sector, facilitated by CVCARE. The program involved the development of an education campaign that focused on raising awareness of the misuse of these chemicals, and offer information on using safer alternatives. The campaign culminated in a hazardous waste drop-off day for all citizens of the Comox Valley. This pilot project may be repeated in following years, pending long term funding.

11.3 Outreach/Stewardship

11.3.1 Clean Boating handbook

The Baynes Sound Boaters Guide produced by Project Watershed, outlines responsible boating etiquette including such activities as sewage and engine waste disposal, and boat maintenance. Copies of this booklet have been distributed in various places within the community. Future editions could include a wildlife-viewing component either as an addition to the original document, or as an insert (e.g., BC Parks Living with Wildlife).

11.3.2 Sound management of marinas

Project Watershed is in the early development stages of a program that will provide educational opportunities to marina operators, via workshops and access to Best Management Practices information. This program will focus how marina operators can carry out business in an ecologically sensitive manner. If feasible this program will be extended to boaters, both recreational, and commercial. This program will have a significant impact on water quality issues in the region.

11.3.3 Disturbance to wildlife

The disturbance to wildlife in the Baynes Sound/Lambert Channel area is an issue that will undoubtedly escalate as the popularity of wildlife viewing increases, and as the population in the area increases. It is therefore important that the public be made aware of how disturbance affects wildlife, and how to share the waters with wildlife without causing undue disturbance. BC Parks in Victoria has initiated a program in this area. Presently this program has produced a general set of guidelines that are intended specifically for the wildlife-viewing public. The production of information packages should also be considered for distribution to tour operators and business that rent watercraft in the region. Signage would also be beneficial at local boat launching areas and marinas, and within high use areas (e.g., Provincial Parks). This material should illustrate the potential impact of recreational boating as well as wildlife viewing on wildlife, especially for wintering and nesting birds. It should also contain detailed information on how to recognize the signs of disturbance (e.g., how to determine when one is too close to wildlife by evaluating behaviours). The amelioration of disturbance at, and around heron colonies may have to be addressed separately from the general disturbance from the wildlife viewing community due largely to the fact that colonies are often on private property, and that disturbance is not necessarily related to wildlife viewing.

11.3.4 Foreshore stewardship

One of the most important activities that should be addressed in this region is a foreshore stewardship program. Significant progress has been made in various parts of BC regarding the integration of shoreline habitat with urban or suburban development. One component of this program is the mapping

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

and inventory of foreshore wetlands, and wildlife habitat for government and private landowners. This is a project that is being proposed by Project Watershed. In addition, the marine section of the Living by Water Program initiated by the Federation of BC Naturalists could be modified and expanded in order to more thoroughly address marine issues such as the alteration of marine wetlands, the role of large trees as potential heron and raptor nest sites, and disturbance of sensitive wildlife habitat areas such as herring spawning areas and heron colonies.

11.3.5 Increased awareness of birds in winter

The aggregation of birds in the wintertime in the Baynes Sound/Lambert Channel area implies a certain notoriety for the communities in this region. Consideration should be given to the generation of signage in appropriate locations to promote the area as a globally important wintering area for waterbirds. In addition connections to major limiting factors (e.g., clean water, herring, appropriate shoreline development) should be considered as content material for these signs. Due to past vandalism of interpretative material/structures in this area, careful consideration of the placement of signs is advised.

11.3.6 Connection of birds with shellfish growing operations: within and outside the BCSGA

Presently the BCSGA, the BC IBA program and the CWS are working together to develop a wildlife (waterbird) supplement for the voluntary guidelines that BCSGA is developing for member growers. This supplement will integrate waterbird natural history with shellfish growing operations in order to minimize the conflict between shellfish growing operations and birds. While this information will reach a large number of shellfish growers, numerous businesses are not members of the growers association. It is therefore imperative that this material be extended to those growers that do not belong to the BCSGA.

11.3.7 Business Partners for Clean Water

This program initiated by Project Watershed will involve local businesses in the automotive, marine, landscaping, building maintenance, construction, and other business sectors whose activities contribute to water quality problems in Baynes Sound. At least 200 businesses will be invited to participate as “Business Partners”, and will receive best management information that will prevent and/or reduce levels of toxic substances entering wastewater disposal systems as a result of their business activities. As companies agree to develop water quality plans for new or improved practices that reduce their contamination of wastewater they will be acknowledged with certificates, media profiles, and other forms of public recognition. “Business Partners” will also be invited to “adopt an outfall”, and will sponsor ongoing water quality monitoring activities at selected municipal stormdrain outfalls.

11.4 Research and Monitoring

11.4.1 Exploration of the relationship between shellfish growing activities and waterbird biology

There is a need for a comprehensive research project in the Baynes Sound/Lambert Channel area that examines the interrelationship between shellfish growing operations and local flora and fauna. Within the Sound there is a perceived conflict between shellfish growing operations and the foreshore environment. This present conflict between the shellfish growing industry and the residents not belonging to this industry has been exacerbated by the recent approvals of shellfish lease expansions. To some these expansions are being approved without careful consideration regarding the potential impact on the waterbirds that inhabit this area.

The resolution of this conflict is problematic because it is unclear if the data that presently exist (e.g., Christmas bird counts, periodic surveys from government and non-government agencies) will enable a regulatory agency to assess the long-term patterns of bird distribution in the area. As a result it may not be possible to determine if there have been changes in bird numbers and distributions over time and/or what human induced changes in the environment has led to changes in bird numbers and

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

distributions. Presently the Coastal Waterbird Survey that is being conducted with local natural history organizations in conjunction with Bird Studies Canada will help address potential changes in bird distribution. It is critical that this program continues as it is currently providing data that may help address changes in abundance and distribution. It is important to note that these surveys do not cover the entire area bounded by these two IBAs, and it will take many years before they can be used to determine changes in distribution and abundance of birds. Furthermore, these surveys may not be able to attribute the changes in bird abundance and distribution to any one factor, especially the potential effects of the aquaculture industry due to their low statistical power.

Recent Canadian Wildlife Service surveys have further illustrated the correlation between bird numbers and herring spawn (Sullivan et al., *In press-a*). However, it is clear that a carefully thought out and well planned long term research project will be necessary to address the concerns that have been raised by numerous individuals (government and non-governmental) within the region. It is necessary that this project be designed to test specific hypotheses regarding the relationship between the aquaculture industry and waterbirds. This will require specific, detailed studies in this area and control areas (e.g., where no shellfish farming is presently underway), including both intensive/extensive surveys along with behavioural studies linked to aquaculture operations. Consequently, partnerships with research agencies and the shellfish growing industry (e.g., the BCSGA) will be paramount. In the recent review of the potential impacts of the aquaculture lease operations on marine and shorebird species in Baynes Sound area Axys Consulting (Axys 2000) concluded that a long-term research program should also be initiated and suggested a number of research questions. The following is a list of research topics that could be addressed in this region. This list is from a combination of sources including Axys (2000).

- an examination of the habitat use, energetics, behaviour of marine foreshore and aquatic habitats by both diving ducks and shorebirds (Black Turnstones), especially those likely impacted directly by shellfish operations (e.g., those species that eat shellfish)
- the quantification of both the potential foraging habitat for diving ducks (e.g., suitable substrates and depths) and the habitat that has been ‘eliminated’ by predator netting—this would require determining the precise areas under nets opposed to calculating the area that is included in shellfish leases as not all areas within shellfish leases prevent foraging by diving ducks;
- an examination of the optimum distribution of covered and uncovered areas both in terms of providing foraging habitat and growing opportunities within individual leases;
- an examination of the diversity and potential forage available to birds in the benthic communities in, and adjacent to, shellfish tenures;
- an examination of the effects of different net mesh sizes and material on foraging opportunities;
- the quantification of mortality rates of birds by different net mesh sizes and material, particularly seine netting ;
- an exploration of the carrying capacity of Baynes Sound to support both a commercial shellfish aquaculture industry while maintaining marine bird population at present population levels;
- a study that examines the nocturnal foraging behaviour of shorebirds;
- a study that examines the response of foraging shorebirds to disturbance from shellfish growing operations ;
- an examination of the effects of raft culture on the diversity and quantity of fish and invertebrates available to diving birds and;
- an examination of the effects of clam and oyster culture on adjacent eelgrass habitats.

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001

11.4.2 Other research and monitoring opportunities

11.4.2.1 Great Blue Herons

A careful examination of the Great Blue Herons in this region is also warranted. Recent changes in the status of colonies, not only in the Baynes Sound/Lambert Channel area, but also throughout coastal BC suggest that heron numbers are declining (R. Butler, pers. comm.). These declines have been linked with human disturbance at colony sites and the effects of predation by Bald Eagles (R. Butler, pers. comm.). Predation of juvenile herons by Bald Eagle has been recorded in various places in coastal BC. The rate of predation of herons by eagles has also thought to have increased, primarily because the eagle numbers throughout coastal BC have increased in recent years. Research issues to be addresses could include:

- documentation of past and active colonies throughout the Baynes Sound/Lambert Channel area
- surveys of foraging herons at low tide to delineate foraging areas during the nesting season in accordance to the survey areas laid out by the coastal water bird survey
- an assessment of the ratio of adult to juveniles in order to ascertain an index of productivity in the region
- an assessment of the foraging behaviour of Bald Eagles in order to determine what factors, if any, are leading to the increased predation rates of Great Blue Heron young (e.g., are eagle numbers increasing due to human related issues such as access to garbage?).

11.4.2.2 Marbled Murrelets

It has been suggested by members of local natural history organizations that there may be nesting Marbled Murrelet breeding activity on Hornby Island (Mt. Geoffrey). This possibility should be examined.

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

Table 3. Conservation Goals and Objectives

Category	Objective	Action Required	Name of specific initiative	Status	Key contact	What is required for continuance
Program integration	integrate the various different programs operating in the area	development of an information management system (GIS based)	State of the Sound	In progress	PW	Secure funding
	ensure birds incorporated in to stewardship material	discussions with pertinent action-based NGOs regarding upcoming projects		In progress	BCIBA, CVNS	Continued dialogue
	ensure birds incorporated BC Parks viewer management material	discussions with pertinent action-based NGOs and I Parks		In progress	BCIBA, CVNS, HICS	Continued dialogue
Water quality amelioration	mitigate failing septic systems	Development of an outreach program for septic system users	Septic seminars/ socials	In progress	CVCARE	Secure funding to expand program
	explore delivery of waste management program at community level	research and design of waste management disposal system for Union Bay	Union Bay Waste to Wealth	In planning stages	CVCARE	Secure funding to ensure program development
	Develop alternatives to conventional disposal systems	development of wetland and grey water treatment systems for individual households	Hornby I. wetland project	In progress	CVCARE	Secure funding to implement program in other areas
	mitigate failing septic systems and stormwater runoff	Amber Way wetland	Amber Way wetland and others yet to be planned	Ships Point complete, Amber Way planned, others pending	PW	Secure funding
	facilitate recreational boater waste clean-up	construction of pump out facilities in Baynes Sound	Comox and Deep Bay pump out stations	Completed	PW and others	Funding for maintenance
	develop a mechanism for dealing with hazardous wastes	develop educational material regarding the use of toxic material and designate a day and a location for hazardous waste drop off	Hazardous Waste drop off day	pilot project completed	CVCARE	Funding for future drop off days

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

Table 3. Conservation Goals and Objectives continued

Category	Objective	Action Required	Name of specific initiative	Status	Key contact	What is required for continuance
Outreach and Stewardship	Boater education	Development and distribution of information pamphlet about responsible boater etiquette	Baynes Sound Boaters Guide	Completed	PW	Funding for future updates or reprints
	Sound management of marinas	Distribution of information regarding the responsible operation of marinas to be distributed to all local marinas (e.g., Best Management Practices for marinas)	Best management practices for marinas	Proposed	PW	Funding for initial work up and development of material
	Reduce disturbance by recreational boaters in region	Distribution of information pamphlet produced by BC Parks and the development and distribution of information specific to Baynes Sound. Signage at specific locations	BC Parks: Living with Wildlife	Some initial work done by BC Parks, more required	BC Parks, HICS, CFDCS, CVNHS	Funding for initial work up and development of material
	Foster responsible foreshore development	map and inventory foreshore, wetlands, and wildlife habitats to provide information to local government and private landholders	Sensitive Habitat Inventory and Protection	Proposed	PW	Funding for collection of pertinent information work
		Develop and deliver material for marine stewardship initiative. Contacting landowners regarding possible use of covenants to protect special habitat features e.g., heron nesting areas, herring spawning sites	Living by Water: shoreline ambassadors	Proposed	FOC, HICS, DICS, CFDC CVNS CVLT	Funding for initial work up and development of material

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

Table 3. Conservation Goals and Objectives continued

Category	Objective	Action Required	Name of specific initiative	Status	Key contact	What is required for continuance
Outreach and Stewardship continued	Increased Awareness of Birds in Winter	Signage at various locations within IBA, promote herring/bird viewing possibilities		Proposed	IBA, CVNS, DICS, HICS BC Parks	Funding for initial work up and development of material. Consultation for planned signage
	Outline means by which marine birds can be incorporated into shellfish growing operations for members of the BCSGA	Development of wildlife supplement to voluntary guidelines that is being produced by and for the members of BCSGA	Voluntary guidelines for BCSGA	In progress	IBA/BCSGA/CWS	none
	Outline means by which marine birds can be incorporated into shellfish growing operations for growers outside the BCSGA	Dissemination of the material mentioned above to growers outside the BCSGA. Information may need to be streamlined somewhat.		Needed	IBA, BCSGA CFDCS CVNS, DICS, HICS	Funding for revision of material intended for members of BCSGA and dissemination of this material
	Reduce, or prevent toxic wastes from entering waste water disposal systems from local businesses	Develop and disseminate best management practices for businesses	Business partners for clean water	proposed	PW	funding for project initiation

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

Table 3. Conservation Goals and Objectives continued

Category	Objective	Action Required	Name of specific initiative	Status	Key contact	What is required for continuance
Monitoring and research	Assessment of shellfish growing activities	Initiation of research project designed to answer specific questions pertaining to the relationship between waterbirds and shellfish growing operations.		Review finished, research proposed	CWS, MELP, BCSGA	Funding for design and implementation
	Waterbird monitoring	Data collection/synthesis	Coastal waterbird survey	Ongoing	CVNS, HICS, DICS, BSC	None
	Research regarding the relationship between waterbirds and aquaculture	Development of a, carefully thought out and well planned long term research project that poses specific questions to be answered		Needed	CWS, FOC, BCSGA, UBC, SFU	Funding, broad consultation with industry, government, local community and academics
	Great Blue Heron/Bald eagle research	Assessment of heron colonies, document heron foraging areas, Bald eagle foraging study	?	Some heron monitoring on going, other needed	CWS, MELP, local Natural History Societies	Funding for volunteer coordinator
	Determine if Marbled Murrelets are nesting on Hornby Island	Surveys to be conducted during appropriate season	?	Needed	CVNS, HICS, DICS	Minimal

BSC= Bird Studies Canada, CFDCS=Community Futures Development Corporation of Strathcona, CVCARE=Comox Valley CARE, CVHNS=Comox Valley Naturalists Society, CVLT=Comox Valley Land Trust. CWS=Canadian Wildlife Service, FOC= Fisheries and Oceans Canada, DICS=Denman Island Conservation Society, HICS=Hornby Island Conservation Society, MELP=Ministry of Environment, Lands and Parks, PW=Project Watershed

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

12. Evaluating success

The Baynes Sound/Lambert Channel-Hornby Island Waters IBAs encompass a large geographic area that contains a complex array of conservation concerns and opportunities. One of the ways to gauge the success of this conservation plan will be the formation of new partnerships, and the integration of ongoing projects. Several new connections have already been made between organizations within and outside of the region and more are likely to follow. An additional measure of success of this plan will be the ability of the organizations currently doing conservation related work in this area to draw additional funding to this region in order to complete on-going projects and to initiate new projects that are in the early planning stages.

13. Acknowledgements

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BC Shellfish Growers Association
Comox Valley Citizens for Action on Recycling and the Environment
Community Futures Development Corporation of Strathcona
Comox Valley Naturalists
Comox Valley Land Trust
Comox Valley Project watershed Society
Canadian Wildlife Service
Denman Island Conservancy
Fisheries and Oceans Canada
Ducks Unlimited
Environment Canada
Federation of BC Naturalists
Hornby Island Conservation Society
Ministry of Environment, Lands, and Parks
Millard Creek Stewards
The Nature Trust of BC
Wild Bird Trust of BC

**Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001**

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April 2001**

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Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan
April 2001

Appendix 1: Common and latin names used in this text

Plants

Eel grass	<i>Zostera marina</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>
Gary Oak	<i>Quercus garryana</i>

Fish

Pacific herring	<i>Culpea pallasi</i>
sandlance	<i>Ammodytes hexapterus</i>
eulachon	<i>Thaleichthys pacificus</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Chum salmon	<i>Oncorhynchus keta</i>
Pink salmon	<i>Oncorhynchus gorbuscha</i>
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Sockeye salmon	<i>Oncorhynchus nerka</i>
Cutthroat trout	<i>Oncorhynchus clarki</i>
Steelhead trout	<i>Oncorhynchus nykiss</i>
Six-gill sharks	<i>Hexanchus griseus</i>

Birds

Pacific Loon	<i>Gavia pacifica</i>
Western Grebe	<i>Aechmophorus occidentalis</i>
Great Blue Heron	<i>Ardea herodias</i> ssp. <i>fannini</i>
Pelagic Cormorant	<i>Phalacrocorax pelagicus</i>
Brant	<i>Branta bernicla</i> ssp. <i>nigricans</i>
Trumpeter Swan	<i>Cygnus buccinator</i>
Mew Gull	<i>Larus canus</i>
Glaucous-winged Gull	<i>Larus glaucescens</i>
Thayer's Gull	<i>Larus thayeri</i>
Black Turnstone	<i>Arenaria melanocephala</i>
American Coot	<i>Fulica americana</i>
Sanderling	<i>Calidris alba</i>
Dunlin	<i>Calidris alpina</i>
Common Murre	<i>Uria aalge</i>
Surfbirds	<i>Aphriza virgata</i>
Black-bellied Plovers	<i>Pluvialis squatarola</i>
Pigeon Guillemots	<i>Cephus columba</i>
Oldsquaw	<i>Clangula hyemalis</i>
Bufflehead	<i>Bucephala albeola</i>
Common Goldeneye	<i>Bucephala clangula</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>
Common Merganser	<i>Mergus merganser</i>
Surf Scoter	<i>Melanitta perspicillata</i>
White-winged Scoter	<i>Melanitta fusca</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Harlequin Duck	<i>Histrionicus histrionicus</i>

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

Appendix 2: IBA Canada Partners

Federation of BC Naturalists (FBCN)

“To know nature and to keep it worth knowing”

The Federation of BC Naturalists is a family of naturalist organizations dedicated to fostering an appreciation and understanding of our natural environment, so that it may be used wisely and maintained for future generations. We believe that negotiation and cooperation are ways to build a lasting conservation strategy in British Columbia. Through partnerships with other organizations and governments we strive to further conservation and natural history education in the province of BC. Our membership is open without prejudice to all who share our goals.

The FBCN was founded in 1969, although many of its member clubs have been in existence for much longer. There are currently 51 federated and affiliated member clubs and approximately 5,300 members from communities all around British Columbia. The FBCN is an affiliate of the Canadian Nature Federation. The FBCN is active in nature education and conservation, and is the British Columbia lead agency for two major projects: The Living by Water Project and the BC Important Bird Areas Program. The FBCN website is www.naturalists.bc.ca

WBT Wild Bird Trust of BC

Wild Bird Trust is non-profit society dedicated to the protection of birds and their habitats, on the principle that all wildlife must benefit. This mission is carried out through the establishment and management of wildlife sanctuaries, the production of various publications that address conservation and management concerns for birds and their habitats throughout the Province, the housing of the largest regional electronic database and reference library for birds, reptiles and amphibians in the Province, school- and home-based wildlife education programs, volunteer-based inventory programs and an active Heron stewardship program in the Georgia Basin of BC.

BirdLife International

A pioneer in its field, BirdLife International (BL) is the first non-government organization dedicated to promoting world-wide interest in and concern for the conservation of all birds and the special contribution they make to global biodiversity. BirdLife operates as a partnership of non-governmental conservation organizations, grouped together within geographic regions (e.g. Europe, Africa, Americas) for the purpose of planning and implementing regional programs. These organizations provide a link to on-the-ground conservation projects that involve local people with local expertise and knowledge. There are currently 20 countries involved in the Americas program throughout North, Central and South America.

For further information about BirdLife International, check the following web site: <http://www.birdlife.net/>.

The Canadian Important Bird Areas Program has been undertaken by a partnership of two lead agencies. The Canadian Nature Federation and Bird Studies Canada are the Canadian BirdLife International partners.

The Canadian Nature Federation (CNF)

The Canadian Nature Federation is a national conservation organization with a mission to be Canada's voice for the protection of nature, its diversity, and the processes that sustain it. The CNF represents the naturalist community and works closely with our provincial, territorial and local affiliated naturalists organizations to directly reach 100,000 Canadians. The strength of our grassroots naturalists' network allows us to work effectively and knowledgeably on national conservation issues that affect a

Baynes Sound/Lambert Channel-Hornby Island Waters IBAs Conservation Plan April 2001

diversity of ecosystems and human populations in Canada. The CNF also works in partnership with other environmental organizations, government and industry, wherever possible.

Our approach is open and cooperative while remaining firm in our goal of developing ecologically-sound solutions to conservation problems. CNF's web site is <http://www.cnf.ca>.

Bird Studies Canada (BSC)

The mission of Bird Studies Canada is to advance the understanding, appreciation and conservation of wild birds and their habitats, in Canada and elsewhere, through studies that engage the skills, enthusiasm and support of its members, volunteers, staff and the interested public. Bird Studies Canada believes that thousands of volunteers working together, with the guidance of a small group of professionals, can accomplish much more than could the two groups working independently. Current programs collectively involve over 10,000 volunteer participants from across Canada.

Bird Studies Canada is recognized nation-wide as a leading and respected not-for-profit conservation organization dedicated to the study and understanding of wild birds and their habitats. Bird Studies Canada's web site is www.bsc-eoc.org/.