Background Report

Haida Gwaii/ Queen Charlotte Islands 
Land Use Planning Process

December 2003
Disclaimers

The information in this document is for the sole purpose of informing the Land Use Planning Process, does not serve to limit or define Haida Aboriginal Rights or Aboriginal Title, and is without prejudice to any position taken by the Haida or the Province with respect to Aboriginal Rights or Aboriginal Title. For greater clarity, descriptions of authority or jurisdiction of any of the Province, Canada or the Haida Nation in this document do not constitute admissions by the Province or the Haida with respect to the existence, scope, limits, content or extent of authority or jurisdiction of any of those entities. The references in this document to authority or jurisdiction must be taken to be based on a recognition of the fact that the Province and the Haida Nation (and perhaps Canada) have differing views about those subject matters and that those differences are, in part, the subject of litigation between the Province, Canada and the Haida Nation. Statements about the authority or jurisdiction of the Province, Canada or the Haida Nation that appear in this document are made on a non-admissions basis in order to allow the Province and the Haida Nation to move beyond those differing views in order to work cooperatively on a land use planning process. References to historic use or occupation of Haida Gwaii/Queen Charlotte Islands do not constitute admissions of fact or serve to define the scope or extent of use and occupation of Haida Gwaii/Queen Charlotte Islands by the Haida Nation or by the Province.

The Haida Gwaii/Queen Charlotte Islands Land Use Planning process is being co-managed by the Haida Nation and the Province of British Columbia. It is acknowledged that these two governments may often have differing perspectives on issues related to the management of land and resources. The two parties have agreed to put forward this document as background information for the process, recognizing that not all of the information contained within it is necessarily agreed to or supported by both parties.

Not all of the information, maps or webpages put forward by the Province have been verified by the Haida Nation. The facts and/or opinions expressed on the maps, information or webpages have not been confirmed, by the Haida, as accurate. The Haida Nation does not necessarily concur with the information put forward by the Province.
# Table of Contents

1. **INTRODUCTION AND PURPOSE OF REPORT** ................................................................. 1

2. **OVERVIEW OF THE REPORT AREA** ........................................................................... 3
   
   2.1 **THE ISLANDS** ........................................................................................................ 3
   
   2.2 **COMMUNITIES** ....................................................................................................... 3
   
   2.3 **CURRENT ECONOMY AND EMPLOYMENT** .......................................................... 9
       
       2.3.1 **Overview of economy and employment** ............................................................ 9
       
       2.3.2 **Community Stability and Economic Development Initiatives** ....................... 11
   
   2.4 **LOCAL GOVERNMENT AND COMMUNITY REPRESENTATION** ......................... 13

3. **THE HAIDA NATION** ................................................................................................... 15

4. **ECOSYSTEMS OF THE ISLANDS** ............................................................................. 21
   
   4.1 **GEOLOGY AND SOILS** .......................................................................................... 21
       
       4.1.1 **Tectonics** ........................................................................................................... 21
       
       4.1.2 **Bedrock geology** ............................................................................................. 21
       
       4.1.3 **Glaciation** ......................................................................................................... 22
       
       4.1.4 **Surficial Geology** ............................................................................................ 23
       
       4.1.5 **Soils** .................................................................................................................. 24
   
   4.2 **TERRESTRIAL ECOSYSTEMS** .............................................................................. 27
       
       4.2.1 **Provincial Ecosystem Classification Systems** ....................................................... 27
       
       4.2.2 **Ecosystem Descriptions** .................................................................................. 31
       
       4.2.3 **Natural Disturbance Processes** ........................................................................ 35
       
       4.2.4 **Human influences on ecosystems** ................................................................... 41
   
   4.3 **TERRESTRIAL WILDLIFE** .................................................................................... 45
       
       4.3.1 **Overview of Species** ....................................................................................... 45
       
       4.3.2 **Species at Risk** ................................................................................................. 51
       
       4.3.3 **Other Species of Interest** .................................................................................. 57
       
       4.3.4 **Introduced Species** ........................................................................................... 58
       
       4.3.5 **Assessing Wildlife Habitat Values** .................................................................... 63
   
   4.4 **HYDRORIPARIAN ECOSYSTEMS** ....................................................................... 65
       
       4.4.1 **Ecosystem Descriptions** ................................................................................... 66
       
       4.4.2 **Structure and function of hydoriparian ecosystems** ........................................ 73
       
       4.4.3 **Natural disturbance processes in hydoriparian ecosystems** ......................... 75
       
       4.4.4 **Human Influences on hydoriparian ecosystems** .............................................. 77
   
   4.5 **FRESHWATER & ANADROMOUS FISH** ............................................................... 81
       
       4.5.1 **Overview of freshwater fish species** ................................................................ 81
       
       4.5.2 **Life histories of freshwater fish** ....................................................................... 83
       
       4.5.3 **Salmonid fish species** ...................................................................................... 85
TABLE 32. SERAL STAGE DISTRIBUTION BY BIOGEOCLIMATIC VARIANT ........................................ 137
TABLE 33. SERAL STAGE DISTRIBUTION IN 2003 BY FOREST MANAGEMENT UNIT ...................... 138
TABLE 34. FPC DEFINITION OF RIPARIAN CLASS AND RIPARIAN MANAGEMENT AREA .............. 141
TABLE 35. WILDLIFE HABITAT AREAS DESIGNATED AS OF JULY, 2003 .................................. 143
TABLE 36. RECREATIONAL AREAS IN THE ISLANDS ............................................................. 146
TABLE 37. RECREATION TRAILS ON GRAHAM AND MORESBY ISLANDS .............................. 150
TABLE 38. COUNCIL OF BC YACHT CLUBS LIST OF BOAT HAVENS ....................................... 152
TABLE 39. TOURISM ACTIVITIES ON THE ISLANDS IN 2003 ................................................ 154
TABLE 40. DATA ON WILDLIFE HARVEST ON THE ISLANDS IN 2002 FOR MANAGEMENT UNITS 6-12 (MORESBY ISLAND) AND 6-13 (GRAHAM ISLAND) .............................................. 163
TABLE 41. COMMUNITY WATERSHEDS ON THE ISLANDS .................................................. 185
Acronyms

AAC  Allowable Annual Cut
ALR  Agricultural Land Reserve
AOA  Archaeological Overview Assessment
AIA  Archaeological Impact Assessment
AMB  Archipelago Management Board
BEC  Biogeoclimatic Ecosystem Classification
BEI  Broad Ecosystem Inventory
BEOs Biodiversity emphasis options
BEU  Broad Ecosystem Unit
CA  Conservation Acquisition
CBM  Coalbed methane
CDC  BC Conservation Data Centre
CFS  Canadian Forest Service
CHN  The Council of the Haida Nation
CHNFG Council of the Haida Nation Forest Guardian
CIT  Coast Information Team
COSEWIC Committee on the Status of Endangered Wildlife in Canada
CSSP  Clayoquot Sound Scientific Panel
CTRF  Coastal temperate rainforest
CWD  Coarse woody debris
CWS  Canadian Wildlife Service
CMT  Culturally Modified Tree
DFO  Fisheries and Oceans Canada
ER  Ecological reserve
FIA  Forest Investment Account
FPC  Forest Practices Code (BC)
FRPA  Forest and Range Practices Acr
GIAPC  Graham Island Advisory Planning Commission
GIS  Geographic Information System
HFP  Haida Fisheries Program
HPA  Haida Nation Protected Area
HLUV  Haida Land Use Vision
HG/QCI Haida Gwaii/Queen Charlotte Islands
HTS  Haida Tribal Society
ICSI  Islands Community Stability Initiative
IWMS  Identified Wildlife Management Strategy
LRMP  Land and Resource Management Plan
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUP</td>
<td>Land Use Plan</td>
</tr>
<tr>
<td>MELP</td>
<td>BC Ministry of Environment, Lands and Parks</td>
</tr>
<tr>
<td>MOF</td>
<td>BC Ministry of Forests</td>
</tr>
<tr>
<td>MSRM</td>
<td>BC Ministry of Sustainable Resource Management</td>
</tr>
<tr>
<td>MWLAP</td>
<td>BC Ministry of Water, Land and Air Protection</td>
</tr>
<tr>
<td>MU</td>
<td>Management Unit (for wildlife)</td>
</tr>
<tr>
<td>NDT</td>
<td>Natural Disturbance Type</td>
</tr>
<tr>
<td>NOI</td>
<td>Notation of Interest</td>
</tr>
<tr>
<td>PAS</td>
<td>Protected Areas Strategy</td>
</tr>
<tr>
<td>PEM</td>
<td>Predictive ecosystem mapping</td>
</tr>
<tr>
<td>PSARC</td>
<td>Pacific Scientific Advances Review Committee</td>
</tr>
<tr>
<td>OIC</td>
<td>Order in Council</td>
</tr>
<tr>
<td>QCC</td>
<td>Queen Charlotte City</td>
</tr>
<tr>
<td>QCI</td>
<td>Queen Charlotte Islands</td>
</tr>
<tr>
<td>RGIS</td>
<td>Research Group on Introduced Species</td>
</tr>
<tr>
<td>RIC</td>
<td>Resources Inventory Committee</td>
</tr>
<tr>
<td>RDA</td>
<td>Regional District Area</td>
</tr>
<tr>
<td>RPAT</td>
<td>Regional Protected Areas Team</td>
</tr>
<tr>
<td>SQCRD</td>
<td>Skeena-Queen Charlotte Regional District</td>
</tr>
<tr>
<td>SMFRA</td>
<td>South Moresby Forest Replacement Account</td>
</tr>
<tr>
<td>TAC</td>
<td>Transfer of Administration under S6 of the <em>Land Act</em></td>
</tr>
<tr>
<td>TAC-DUA</td>
<td>TAC via Designated Use Area under S13 or 17 of the <em>Land Act</em></td>
</tr>
<tr>
<td>TEM</td>
<td>Terrestrial Ecosystem Mapping</td>
</tr>
<tr>
<td>TFL</td>
<td>Tree Farm Licence</td>
</tr>
<tr>
<td>TSA</td>
<td>Timber Supply Area</td>
</tr>
<tr>
<td>TSR</td>
<td>Timber Supply Review</td>
</tr>
<tr>
<td>TUS</td>
<td>Traditional use study</td>
</tr>
<tr>
<td>VIA</td>
<td>Visual impact assessment</td>
</tr>
<tr>
<td>VQO</td>
<td>Visual quality objective</td>
</tr>
<tr>
<td>WHA</td>
<td>Wildlife Habitat Area</td>
</tr>
<tr>
<td>UREP</td>
<td>Use, Recreation and Enjoyment of the Public</td>
</tr>
</tbody>
</table>

**Biogeoclimatic subzones:**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWH</td>
<td>Coastal Western Hemlock</td>
</tr>
<tr>
<td>CWHvh</td>
<td>Coastal Western Hemlock very wet hypermaritime</td>
</tr>
<tr>
<td>CWHwh</td>
<td>Coastal Western Hemlock wet hypermaritime</td>
</tr>
<tr>
<td>MHwh</td>
<td>Mountain Hemlock wet hypermaritime</td>
</tr>
<tr>
<td>AT</td>
<td>Alpine Tundra</td>
</tr>
</tbody>
</table>
1. Introduction and Purpose of Report

This Background Report (“the Report”) provides an overview of the natural, cultural, and socio-economic features of Haida Gwaii / the Queen Charlotte Islands (“Haida Gwaii/QCI”, or “the Islands”). It also provides a summary of current land uses and resources management.

This report is not intended to be a decision-making document nor is it intended to replace a Land Use Plan or other strategic level planning process. It is a technical document prepared by participating governments and outside reviewers to provide background information to participants in the Haida Gwaii/QCI Land Use Planning process.

The key components of the document are:
1. A summary of the features, resources, values and current conditions of the Islands; and
2. A description of how the Haida Nation and Provincial Governments currently approach their respective mandated responsibilities to manage lands and resources.

The Report provides information for the Land Use Plan area (hereafter called the Plan Area), which includes all lands on the Islands above the high tide line, with the exception of fee simple and other lands within the jurisdiction of local communities, and Gwaii Haanas National Park Reserve and Haida Heritage Site. The Report may provide information about areas such as Gwaii Haanas or intertidal areas where the information is relevant and important to land use decisions that may be made on adjacent lands within the Plan Area.

The information in this document was drawn from published journals, books, and other documents, such as the draft socio-economic base case,¹ and current inventory information. Local knowledge is also included, where appropriate, and its source noted. Local knowledge will also come forward through discussions and reviews facilitated by the Land Use Planning process. The Haida Nation has provided an overview of the Haida Nation (Section 3).

The information in this report represents a snapshot in time of the current state of resources and human activities on the Islands. It is also important to note the social and political context within which this report was prepared, including the recent TFL 39 court case in relationship to Accommodation and Consultation, other aboriginal rights related court rulings, as well as current litigation brought by the Haida Nation to determine aboriginal title. Assessment of projected outlook & trends of communities, economy and environmental condition will be provided in a socio-economic and environmental base case.

¹ Holman, 2003. Note that socio-economic information is only briefly summarized in this report. More complete information will be included in the final draft of the socio-economic base case.
2. Overview of the Report Area

2.1 The Islands

Haida Gwaii/QCI is an archipelago of 150 islands and hundreds of islets with a total land area of approximately 1,005,056 hectares (Map 1). The archipelago is approximately 250 kilometres long and 80 kilometres wide. There are about 4,700 kilometres of shoreline and approximately 4000 waterbodies of varying sizes. Hecate Strait separates the Islands from the mainland by 60 nautical miles. The State of Alaska is located immediately to the northeast of Haida Gwaii/QCI at a distance of some twenty nautical miles.

There are two main islands in the archipelago - Graham to the north and Moresby to the south. The geography of the archipelago is quite similar to that of the coastal mainland of BC, or the southern regions of Alaska, with mountainous terrain, deep fjords, bog lowlands, temperate rainforests, sub-alpine tundra, and salmon spawning streams. However, the ecology of the area is quite unique due to differences in the history of glaciation and the isolation of the Islands from the adjacent mainland. There are a large number of species and sub-species of plant and animals that are only found on the archipelago, resulting in the area being known as “the Galapagos of the North.”

Dida cwa Gwaayee was the Haida name most preferred by the supernaturals for the Islands. Xaadlaa gwaayee (out of concealment) is another ancient name for the Islands that are now known also as Haida Gwaii (or “Islands of the People”). The name Queen Charlotte Islands was given to the archipelago in 1787 by Captain Dixon of the King George Sound Trading Company, after his ship, the “Queen Charlotte”. The entire archipelago is within Haida traditional territory (see Section 3: The Haida Nation). The Islands have also become home to a number of other communities.

According to Canada Census, 4935 people lived in the Islands in 2001. The population density of the Plan Area is less than one person per square kilometre. The number of residents increased by about 5% over the 1991-1996 period, but decreased by almost 12% between 1996 and 2001 resulting in a net decrease in population of 7% over the 1991-2001 period (Table 1) (Canada Census, 2001).

2.2 Communities

Graham Island has six population centres with year-round residents: Masset, Old Massett, Port Clements, Tlell, Skidegate, and Queen Charlotte City/Skidegate Landing. Additional seasonal communities appear on the Yakoun (Graham Is.) and Copper (Moresby Is.) rivers. There is one year-round community, Sandspit, on Moresby Island. The population of Graham Island is roughly split in half between those living at the north end of the island (in Masset and Old Massett) and those living at the south end (in Queen Charlotte City/Skidegate Landing and Skidegate). Port Clements and Tlell are located midway between the two: Port Clements on the southern shore of Masset Inlet and Tlell at the mouth of the Tlell River on the east coast.
Masset

Masset is located at the north end of Graham Island on the eastern shore of Masset Inlet. Census Canada reported the population of Masset as 926 in 2001, while more recent statistics collected by the Village of Masset report the population to be slightly higher, at around 1100\(^2\). Services in the community include an elementary and secondary school, hospital, airport, harbour facilities, industrial park, and a full range of commercial accommodation and other services. The military base, Canadian Armed Forces Station (CFS) Masset, was an economic mainstay of Masset until operations were closed down between 1996 and 1998. Over 300 local jobs were lost, and Census data indicates a population decline in Masset by 28% between 1996 and 2001 (Canada Census, 2001). In the years since the closing of the base, the town has undertaken a number of initiatives to revitalize and diversify the local economy, including improving the airport, taking over the sea plane base and main Masset dock, and selling all of the 190 houses left vacant with the base closure. The CFS hospital, recreation centre and office buildings were also transferred to the community and continue to provide valued infrastructure.

Commercial fishing and some forestry activities have been important sources of employment in Masset. Although primary activities in these sectors have declined in recent years, growth in value-added processing has occurred. The area now supports two fish processing plants and a custom fish packing plant and fish boat harbour and several small-scale wood manufacturers. Local tourism enterprises have been growing in recent years. Commercial recreational fisheries in the area have also been growing, although benefits to the local economy are minor.

Old Massett is a Haida community located just north of Masset. The Old Massett population is 765. Current business activities include two gas stations with additional food and convenience sales, numerous artist studios, a full season gallery outlet for books, arts and crafts, two Bed and Breakfast operations, the islands only coffee bean roaster and a well stocked dessert storefront. A major canoe manufacturing and fibreglassing plant continues the maritime heritage in Old Massett.

As with Masset, fishing and forestry have been important sources of employment for Old Massett people. However, local government accounts for the single largest all season source of employment. Seasonal employment and the harvesting of foods and natural products from the land is a vital aspect of the Old Massett economy. The manufacturing of canoes and totem poles continues to grow as a significant contemporary economic sector. The formal witnessing feasts associated with these projects result in major local economic activity. A single totem pole feast can easily generate in excess of $40,000 in gifts and supplies, most of which is circulated into the local economies. One feast in Massett (2001) circulated over $75,000 worth of goods in a single evening. Old Massett is undertaking a number of economic development initiatives to address high unemployment rates and an increasing population. The Old Massett Village Council and Development Corporation are working on developing front-country tourism opportunities, with an initial focus on Hiellen and Tow Hill. The Council is also involved in value-added forestry projects, silviculture, roadside salvage, stream work and road deactivation.

The community is expanding a major new residential development south of Masset and has plans for a major cultural heritage site which will include administrative offices, a variety of accommodations, small business centre, museum, feast house and a monumental carving shed.

Map 1: Plan Area

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
Unlike every other community on the Islands with the exception of the other Haida village of Skidegate, Old Massett does not have a wharf or docking facility.

**Port Clements** is located on Masset Inlet on the estuary of the Yakoun River. It has a population of 516. Services in the community include an elementary school, community centre and community park, small retail stores, oceanside pub, general store, restaurants and coffee shops, health clinic, public wharf, gas station and industrial park.

Forestry is still the mainstay of the community, with most people employed in logging, a small local sawmill and related construction and transportation. Associated with the sawmill on the town’s industrial park are dry kilns, two dry land sorts, four custom cut micro sawmills and a scrap metal yard. A co-generation plant using wood waste to supply electricity to the island grid is in the final financing stages. In 2002, a locally-owned pole peeling plant started operations in the area.

Tourism-related businesses include a small destination fishing lodge and retreat located near the mouth of the Kumdis River, a motel, several bed and breakfasts, an RV park, a picnic site and walking trails on Masset Inlet, a museum, guiding services and forestry tours.

**Rural Graham Island (SQCRD Area D)** includes the rural, unincorporated communities of Tlell, Tow Hill, Miller Creek and Lawn Hill and has an overall population of 538 (Canada Census, 2001). **Tlell** is the largest of these rural communities, with a population of 223 in 2001. The community is situated 43 km north of Skidegate Landing at the southeast corner of Naikoon Provincial Park. Tlell is the headquarters of Naikoon Park and many of the businesses in the community are tourism-oriented, including artisan studios, small retail outlets and B&Bs and lodges. Tlell is the farming centre of the Islands and houses a veterinary clinic and animal/pet supplies. Services are limited in both Tlell and residents travel to Masset or Queen Charlotte City for banking, health services and to attend school.

**Skidegate** is the Haida community on the northern shore of Skidegate Inlet (south end of Graham Island). The village has a population of 743, and plans for further residential expansion. Services include a gas bar and a business mall with offices, retail and grocery stores, a new elementary school and bowling alley.

Fishing and forestry remain important economic mainstays of the community as the Council owns fishing licenses, has fish processing capabilities and is involved in stream rehabilitation, road deactivation and active in forestry related projects.

Construction is underway on a $19.2 million cultural centre called Qayll'nagaay that will extend the existing museum and house the offices of Parks Canada, Gwaalagaa Naay Development Corp. (economic development) and Haida Gwaii Watchmen. There are also plans for a hotel complex, feast house, monumental carving shed and mortuary house.

Tourism-related businesses include sports fishing charters, weekly Haida dancing and feasts and retail outlets. The manufacturing of totem poles continues to grow as a significant contemporary economic sector. The formal witnessing feasts associated with these projects continues to result in major local economic activity.

**Queen Charlotte City (QCC) and Skidegate Landing** are located on the southern end of Graham Island on Skidegate Inlet.

Founded in the late 1800s, Queen Charlotte City was the first townsite settled on the Islands. With a population of 1045 in 2001 (Canada Census, 2001), QCC has a secondary school, an
alternate school, Northwest Community College, a hospital, credit union, community hall, tennis
courts, baseball field, liquor store and a number of other community and commercial services.
The town is the main point of connection to the BC mainland, with a ferry terminal to Prince
Rupert and Moresby Island located at Skidegate Landing. There is also a boat harbour and
float plane service to Mainland and to remote parts of the Islands.

The public sector, forestry, fishing and the service sector are the main employers of the town.
Most of the offices of federal and provincial government agencies and a Visitors Information
Centre are located in QCC. There is a fish processing plant with retail outlet and a number of
tourism-related businesses, including restaurants and a range of commercial accommodations.

Skidegate Landing is the site of the BC Ferry terminal. In previous years, it was known as the
“oil works” for the dog fish oilery located there. A small coffee shop, a bed and breakfast
operation, a rock quarry and a major fuel depot are current business operations.

**Sandspit** is the main community on Moresby Island. The unincorporated community of 435 is
strongly dependent on the forestry sector, as well as tourism. Sandspit has the regional airport
for the Islands, and the town’s services include an elementary school, community centre,
grocery store, gas station, marina, hotel, bed & breakfasts, several restaurants and coffee
shops, and a golf course. The town is serviced by 20-minute ferry route on an hourly basis to
Graham Island.

As shown in Table 1, there have been significant declines in the populations of some
Exceptions are the Haida communities of Old Massett and Skidegate, Port Clements and Tlell,
due primarily to high natural increases, low out-migration and Indian Act amendments restoring
status rights to aboriginal women married to non-aboriginal men.

The average age on Islands was 33 in 1996 (BC Stats, 2002). In 2002, 33% of the Islands
population was less than 25 years of age and 60% was between the ages of 24 and 64. Only
7% of the Island’s population was over 65 years of age (BC Stats, 2002). Retirees are not a
large segment of the population, probably due to the relative remoteness of the Islands and the
lack of certain types of health care facilities. However, the Islands population is gradually aging,
following the trend for the rest of BC. This can have important implications for the type of goods
and services demanded and the economic diversity of local economies. Approximately one-
third of the population on the Islands is of Haida descent. The remainder are a mixture of
origins, including European, Chinese and Filipino (BC Stats website, 2003).
Table 1. Population Change on the Islands 1991 – 2001

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Graham Island</td>
<td>4343</td>
<td>4552</td>
<td>4980</td>
<td>4475</td>
<td>+ 3.0</td>
<td>-10.1</td>
</tr>
<tr>
<td>Masset</td>
<td>1569</td>
<td>1476</td>
<td>1293</td>
<td>926</td>
<td>- 41.0</td>
<td>- 28.4</td>
</tr>
<tr>
<td>Old Massett Village</td>
<td>580</td>
<td>632</td>
<td>692</td>
<td>707</td>
<td>+ 21.9</td>
<td>+ 2.2</td>
</tr>
<tr>
<td>Port Clements</td>
<td>380</td>
<td>483*</td>
<td>558</td>
<td>516</td>
<td>+ 35.8</td>
<td>- 7.5</td>
</tr>
<tr>
<td>Tlell</td>
<td>100</td>
<td>138</td>
<td>185</td>
<td>223</td>
<td>+123.0</td>
<td>+20.5</td>
</tr>
<tr>
<td>Other Graham Island (RD Area D –Lawn Hill, Miller Creek and Two Hill) excluding Tlell</td>
<td>335</td>
<td>315</td>
<td></td>
<td></td>
<td>-6.0</td>
<td></td>
</tr>
<tr>
<td>Skidegate Village</td>
<td>322</td>
<td>469</td>
<td>695</td>
<td>743</td>
<td>+ 130.7</td>
<td>+ 6.9</td>
</tr>
<tr>
<td>Queen Charlotte City (RD Area F)</td>
<td>1070</td>
<td>933</td>
<td>1222</td>
<td>1045</td>
<td>- 2.3</td>
<td>- 0.9</td>
</tr>
<tr>
<td>Moresby Island (RD Area E)</td>
<td>1278</td>
<td>764</td>
<td>618</td>
<td>460</td>
<td>- 64.0</td>
<td>- 25.6</td>
</tr>
<tr>
<td>Sandspit</td>
<td>754</td>
<td>702</td>
<td>568</td>
<td>435</td>
<td>- 42.3</td>
<td>- 23.4</td>
</tr>
<tr>
<td>Other Moresby Island</td>
<td>524</td>
<td>62</td>
<td>50</td>
<td>25</td>
<td>- 95.2</td>
<td>- 50.0</td>
</tr>
<tr>
<td>Total</td>
<td>5621</td>
<td>5316</td>
<td>5598</td>
<td>4935</td>
<td>- 12.2</td>
<td>- 11.8</td>
</tr>
</tbody>
</table>

Source: Statistics Canada Census Data

* Port Clements amalgamated with Juskatla in 1985.
** Tlell area and other rural communities on Graham Island were reported as RDA D in the 2001 census. Data for RDA D not available for entire 1981-2001 period, but is available for Tlell area.

2.3 Current Economy and employment

2.3.1 Overview of economy and employment

The economy of the Islands is primarily based on resource extraction (logging and fishing), government and tourism and related services. Table 2 summarizes the labour force between 1981 and 2001. The labour force data includes both employed and unemployed and allocates numbers of people (as opposed to person-years) to various industries based on their primary activity. Because the data is by person rather than person-years, the table does not make a distinction between year-round and seasonal or part-time work. It also does not capture activities related to the informal economy, such as mushroom picking.

The largest sector is the government (health, education, public administration) at 26% of total labour force. The resource sector (agriculture, forestry, fishing and trapping) follows at 20%. Services such as food and accommodation, which are strongly correlated with tourism activity, (7%), wholesale and retail trade (13%) and other services (24%) together account for the largest share of the labour force. More details about economic activity in individual communities will be provided in the Socio-Economic Base case Report for the HG/QCI – Haida Gwaii Land Use Plan (Holman, 2003, In prep).
While the service sector is the largest employer on the Islands, the average service sector wages are significantly lower than for goods producing industries. In addition, some service industries are dependent on incomes generated by basic goods producing sectors.

In 2002 the average employment income on the Islands was estimated at $26,420, which is slightly lower than the BC average of $27,903. The rate of unemployment was 6.8% in four quarters to September, 2002 (BC Stats website, 2003). Although this is higher than the provincial rate for the same period (3.6%), it is not uncommon for a resource-dependent area. Unemployment rates are higher in Haida communities than for the Islands as a whole. For example, Skidegate had an unemployment rate of 21% in 2001.

Table 2. Experienced labour force breakdown and trends on the Islands (1981 – 2001)\(^a\) (from Holman, 2003)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GOODS PRODUCING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry, Agriculture, Fishing &amp; Trapping</td>
<td>660</td>
<td>580</td>
<td>480</td>
<td>20%</td>
<td>- 27%</td>
</tr>
<tr>
<td>Mining</td>
<td>140</td>
<td>10</td>
<td>0</td>
<td>0%</td>
<td>- 100%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>135</td>
<td>65</td>
<td>140</td>
<td>6%</td>
<td>+ 4%</td>
</tr>
<tr>
<td>Construction</td>
<td>70</td>
<td>85</td>
<td>125</td>
<td>5%</td>
<td>+ 79%</td>
</tr>
<tr>
<td>Utilities</td>
<td>n.a.</td>
<td>55</td>
<td>10</td>
<td>0%</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>SERVICES PRODUCING</strong></td>
<td>1,420</td>
<td>1,725</td>
<td>1,695</td>
<td>69%</td>
<td>+ 19%</td>
</tr>
<tr>
<td>Transp., Storage &amp; Commun.</td>
<td>230</td>
<td>200</td>
<td>220</td>
<td>9%</td>
<td>- 4%</td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>210</td>
<td>250</td>
<td>330</td>
<td>13%</td>
<td>+ 57%</td>
</tr>
<tr>
<td>Finance, Insurance, Real Estate</td>
<td>45</td>
<td>60</td>
<td>70</td>
<td>3%</td>
<td>+ 56%</td>
</tr>
<tr>
<td>Accommodation &amp; Food</td>
<td>160</td>
<td>240</td>
<td>160</td>
<td>7%</td>
<td>0</td>
</tr>
<tr>
<td>Business, Personal, Misc. Services</td>
<td>110</td>
<td>165</td>
<td>300</td>
<td>12%</td>
<td>+ 173%</td>
</tr>
<tr>
<td>Health &amp; Education</td>
<td>265</td>
<td>335</td>
<td>380</td>
<td>16%</td>
<td>+ 43%</td>
</tr>
<tr>
<td>Public Administration(^d)</td>
<td>400</td>
<td>475</td>
<td>235</td>
<td>10%</td>
<td>- 41%</td>
</tr>
<tr>
<td>Undefined</td>
<td>60</td>
<td>0</td>
<td>25</td>
<td></td>
<td>- 58%</td>
</tr>
<tr>
<td><strong>TOTAL LABOUR FORCE</strong></td>
<td>2,485</td>
<td>2,520</td>
<td>2,465</td>
<td>100%</td>
<td>- 0.08 %</td>
</tr>
</tbody>
</table>

\(^a\) Source: Statistics Canada Census. Industry classifications changed between 1981 and 2001. An attempt has been made to present comparable data, but there are still some discrepancies (e.g. “undefined” in 1981).
(b) Excludes labour force data for Old Massett. Also, more detailed 2001 labour force data by industry not yet available for comparison to previous years.

(c) Percentages of defined labour force which may not add due to rounding error.

(d) Includes federal, provincial, local governments.

### 2.3.2 Community Stability and Economic Development Initiatives

Community stability can be a reflection of a variety of factors, but economic factors such as steady, long-term employment opportunities is one of the most influential factors. Since the early 1900s, the communities of the Islands have been largely dependent on primary resource development for their employment opportunities and stability. Mining, timber harvesting and processing, and fishing have been the historical mainstay of the island economy. More recently, employment opportunities in government, retail/commercial, and service sectors have become important in the local economy.

In response to changes in the local economy, a number of special accounts and initiatives have been developed that are aimed at restoring the local economy and improving community stability (see below). In addition, lobbying continues to plan the community forest, improve local access to timber, increase value-added manufacturing, and increase the proportion of local economic benefits derived from timber harvesting. A number of initiatives are also underway related to value-added or specialty products within the local forestry sector.

The following are some of the key initiatives underway:

**Gwaii Trust**

The 1987 designation of the Gwaii Haanas National Park Reserve and Haida Heritage Site set into motion a series of initiatives that led to the establishment of the Gwaii Trust Fund. The Gwaii Trust Fund was established as a locally controlled, interest-bearing fund to advance economic diversification and sustainable development on Haida Gwaii/Queen Charlotte Islands. Further, the Fund was established to enhance understanding between the communities and cultures of the Islands through the process of joint community economic planning and development. The mission of the Gwaii Trust is to enhance environmentally sustainable social and economic benefits to the Haida Gwaii/Queen Charlotte Islands (see gwaiitrust.com).

The Gwaii Trust fund was established with a seed amount of $38 million and has grown to about $60 million currently. The average annual interest/dividend amount generated has been between $2.8 million and $3.0 million but the amount available yearly is investment driven. This amount is allocated each year, by a local board. This is a unique trust fund, which makes a significant contribution to the communities on the Islands.

**South Moresby Forest Replacement Account (SMFRA)**

The South Moresby Forest Replacement Account (SMFRA) is a multi-year forestry enhancement fund of $24 million established under the Gwaii Haanas Agreement and administered by Ministry of Forests and the Canadian Forest Service. The SMFRA focuses on research and development, inventory, incremental silviculture, public education and supporting public involvement in land and resource use decisions. The fund has created roughly 25 person-years of employment annually since 1988.
This fund was administered by a board in Victoria, BC and was due to expire in March of 2000. Because of the cooperative effort by Island communities SMFRA will continue with local, provincial, and federal representation on the board. SMFRA is currently under restructure.

**Islands Community Stability Initiative (ICSI)**

The Islands Community Stability initiative (ICSI) was formed in the fall of 1995. The ICSI board was made up of representatives from the Haida village councils, municipalities and regional electoral areas of the Islands. Its purpose was to create a forum to express the collective will of the Islands people in addressing the social, economic and environmental issues resulting from resource extraction and to participate in designing a future that will support a healthy environment and create a self-sustaining Islands economy. Its goals were:

- To ensure the long term health of the forest and the stability of the resource-based economy by establishing an inventory and planning process to determine sustainable levels of harvest;
- To provide greater local employment and economic benefits to communities through small business forestry interests having greater access to wood;
- To promote processing and manufacturing of timber resources on the Islands;
- To ensure a cooperative and responsible forest management system that incorporates the Island Community's values and knowledge; and
- To chart a long-term land-use option for presentation to the Council of the Haida Nation and the Province that will bring greater certainty and alleviate resource conflict.

To further its goals ICSI created a Consensus Document (see Appendix A) that was presented to the Council of the Haida Nation and the Province in January 1996. From this document a Memorandum of Understanding between ICSI and the Ministry of Forests was negotiated and signed in September 1996. ICSI, with agreement-in-principle from the Haida Nation, was successful in acquiring a Ministry of Forests Community Forest Pilot Project. This was handed off to Haida Gwaii Community Futures Development Corporation to establish a community forest corporation board and to negotiate a community forest tenure. ICSI also formed the Islands Forest Council, which provided comments on Timber Supply Reviews and Forest Development Plans on behalf of the Islands Community. ICSI also worked with the Province in attempting to develop an island wide land use planning process that would be acceptable to the communities. Though ICSI still exists as a non-profit society, it is no longer active as an organization.

**Greater Masset Development Corporation**

The Greater Masset Development Corporation (GMDC) was formed to create a partnership between the villages of Masset and Old Massett for the purpose of managing the assets of the CFS Masset, formerly owned by the Canadian Government. The Corporation runs the Masset recreation centre and owns all the former military facilities. Most of the buildings are now leased or rented and the Corporation sold the 190 houses that were once part of the military housing. In addition, funding for specific projects has been provided through the federal Western Economic Development program.
Haida Gwaii Community Futures Development Corporation

The Haida Gwaii Community Futures Development Corporation assists small business in developing business plans and funding proposals and provides loans to small businesses that would not be able to secure funding through mainstream financial institutions. CFDCs are non-profit organizations funded by the Western Economic Development Diversification Canada and Human Resources Canada.

Other economic development initiatives

A number of community organizations operate to enhance the business environment. For example, the Masset Economic Development Office is part of the village of Masset and is aimed to promote and develop the local economy. Its focus is on tourism and industrial and small business development. The Haida Gwaii Tourism Association and the Cultural Heritage Tourism Strategy Group have been organized to look at growth potential, management of tourism and addressing possible barriers to tourism.

Various re-training processes are also underway for former forestry and fishery workers. Forest Renewal BC funds provided funding to prepare reports such as the Queen Charlotte Islands-Haida Gwaii Small Business Forest Sector Directory. Documents such as this assist the business community in networking and knowing what local resources are available.

2.4 Local Government and Community Representation

Haida Gwaii/QCI is within the Skeena Queen Charlotte Regional District (SQCRD). The SQCRD also includes the incorporated communities of Prince Rupert and Port Edward and the electoral areas of Dodge Cove and Oona River in the North Coast. The Islands contribute one representative from each electoral area (Areas D, F, and E) and the incorporated communities (Masset and Port Clements) each nominate one representative to the Board. The City of Prince Rupert nominates two of their Council members. Regional districts are an intermediate scale of planning and management between provincial and local governments. They handle issues related to rural and unincorporated areas.

Local governments on the Islands include Haida Village Councils, Municipal Governments, Management Committees and Advisory Planning Commissions.

Masset and Port Clements are incorporated communities, and, as such, are governed by an elected Mayor and Council.

Old Massett and Skidegate each have their own elected Village Council and Chief Councillor.

Sandspit (Electoral Area E) and Queen Charlotte City/Skidegate Landing (Electoral Area F) remain unincorporated and are administered by the SQCRD through locally elected Management Committees. Management Committees were developed as by-laws of the SQC Regional District and have authority to administer services, address local issues and hire staff but all monies and infrastructure are held in trust for the communities by SQCRD.

Electoral Area D represents all other unincorporated areas on Graham Island including Tlell, Tow Hill, Lawn Hill and Miller Creek. The Graham Island Advisory Planning Commission
(GIAPC) is an elected board, which advises the Area D Regional District Director and makes recommendations on land use issues.

These various local governments focus on the planning and provision of infrastructure for individual communities. The local governments provide services for their respective communities such as land use planning (zoning, subdivisions, official community plans), building inspection, business licenses, sewer and water services, road maintenance, emergency services, parks, recreation, waste collection and economic development. They may strike committees to look at health care, safety, tourism, transportation and more.

Further information on the role and mandate of local governments is provided in Appendix B.
3. The Haida Nation

The Haida Nation has prepared the following overview of Haida National governance and management of land and resources. This overview is reflective of the Haida view of their authority and jurisdiction and historic use and occupation of Haida Gwaii / QCI and is expressly subject to the disclaimers set out at the beginning of the Background Report.

I. HAIDA PROCLAMATION

“The Haida Nation is the rightful heir to Haida Gwaii. Our culture is born of respect and intimacy with the land, sea and air around us. Like the forests, the roots of our people are intertwined such that the greatest troubles cannot overcome us. We owe our existence to Haida Gwaii. The living generation accepts the responsibility to ensure that our heritage is passed on to following generations. On these islands our ancestors lived and died, and here too, we will make our homes until called away to join them in the great beyond”. Constitution of the Haida Nation

II. HAIDA TERRITORIES

Haida Gwaii - "Islands of the People" - is an archipelago 100 kilometres off northwestern coast of British Columbia. The archipelago consists of an isolated group of over 200 islands, large and small, totalling approximately 3750 square miles or 1,000,000 hectares. The territory of the Haida Nation includes the entire land of Haida Gwaii, surrounding waters, sub-surface and the air space and the Kaigani Archipelago, recognizing the independent jurisdiction of the Kaiganii. The waters include the entire Dixon Entrance, half of the Hecate Strait, halfway to Vancouver Island and westward into the abyssal ocean depths.

III. THE PEOPLE

All people of Haida Ancestry are citizens of the Haida Nation. Every Haida Citizen has the right of access to all Haida Gwaii resources for cultural reasons, and for food, or commerce consistent with the Laws of Nature as reflected in the Laws of the Haida Nation.

IV. HAIDA GOVERNANCE

1. The Constitution of the Haida Nation

The Constitution of the Haida Nation, adopted by the House of Assembly, identifies the principles and structure by which the Haida Nation governs.

2. House of Assembly (HOA):

The House of Assembly, comprised of the Haida Citizens, meets annually or as otherwise determined by the House, to enact Haida legislation in accordance to the Constitution of the Haida Nation.
3. **Council of the Haida Nation (CHN)**

CHN, the governing body of the Haida Nation meets quarterly and is elected by voting Citizens over the age of 16. CHN consists of the Offices of the President, the Vice President, Regional Representatives each elected within Old Massett and Skidegate, and Representatives proportionately distributed to off-Island Regional Councils and one appointment by each of the Village governments of Old Massett and Skidegate.

The President of the Haida Nation sits as the Chief Executive Officer and is the political leader and first speaker of the Haida Nation. The President is responsible to regulate the activities of CHN in a manner consistent with the Constitution of the Haida Nation. The term of office of the CHN President is two years.

**The Mandate** of the Council of the Haida Nation is Haida Gwaii and surrounding waters and includes:

- Perpetuation of Haida heritage and cultural identity, and enactment of Policies for same.
- Protection of the Domestic and Foreign interests of the Haida Nation and Territories through long-term strategies, negotiations, and steps consistent with the objectives of the Haida Nation.
- Promotion of a peaceful co-existence with other people and governments.

4. **Hereditary Chief's Council**

The Potlatched Hereditary Chiefs will assemble as the Hereditary Chief's Council to address the issues of the Haida Nation. The Hereditary Chief's Council is integral to the workings of the Haida Nation.

A. **Haida Clans:**

Under the matrilineal Haida society's moieties of Raven and Eagle there are 33 clans. Of these clans, there are 13 potlatched Chief's. Clan issues are addressed through the internal workings of the Haida Nation.

5. **Village Councils**

Old Massett Village Council (OMVC) and Skidegate Band Council (SBC) elected by their membership as determined by their election Acts, are village governments. Councils are responsible for the well-being of the communities and enact legal policies and programs in the areas of Infrastructure, Education, Membership, Health, Social Development, Cultural Programming and Economic Development initiatives.

6. **SECRETARIAT**

As the Secretariat of the Haida Nation, the Haida Tribal Society (HTS) administers the finances, and staff activities of the CHN. HTS is comprised of representatives from CHN, SBC and OMVC. Activities include:
1. **CHN Forest Guardians:** The CHN Forest Guardians track forest activities ensuring protection of ecological interests and Haida values. Included in their work is the monitoring and review of all proposals and plans that potentially affect the forest.

2. **CHN Culturally Modified Trees (CMT) and Archaeology:** The CMT/Archaeology staff addresses Haida Heritage issues. The objectives are to survey, identify, map, buffer, document, monitor, and protect CMTs and other archaeological sites. *See 5.1, Cultural Resources for Additional Information*

3. **CHN WEYCO Liaison:** The CHN WEYCO Liaison staff oversees Haida concerns within Weyerhaeuser's operation areas.

4. **CHN Fisheries Guardians:** The Haida Fisherie's Guardians are involved in conducting aquatic research and survey studies on Haida Gwaii.

5. **Gwaii Haanas**

A. **Gwaii Haanas Historical Sketch**

In 1974, the dispute over the future of South Morseby Island began with the advent of logging plans and a public proposal to protect the "South Morseby Wilderness Area". In 1985, the Haida Nation designated the area a "Haida Heritage Site". Logging continued in the area in the face of legal and political controversy until July, 1987, when Canada and British Columbia signed the South Moresby Memorandum of Understanding. One year later, the South Morseby Agreement was signed, providing Canada's designation of a "National Park Reserve".

While negotiations between Canada and the Haida Nation progressed, temporary measures were put in place to facilitate co-operative management. In January, 1993, the Gwaii Haanas Agreement was signed. The agreement expresses respect for both Canadian and Haida interests and designations, and includes a mutual commitment to the protection of Gwaii Haanas (see Appendix C).

The history of Gwaii Haanas provides a model of a respectful relationship between human beings and the earth, a place where people can now learn about a way of life where humans are a part of nature, and where they can experience Haida culture and respect sacred and spiritual values. Traditional activities continue to take place there as part of the living and evolving culture of the Haida. (www.pc.gc.ca/edu/TRC/htm/fgwaii).

B. **Gwaii Haanas Archipelago Management Board**

The Gwaii Haanas management board (Archipelago Management Board AMB) is comprised of an equal number of representatives from the Haida Nation and the Canadian Government. The Mandate of the AMB is defined by the commitment in the Gwaii Haanas Agreement and the existing laws and policies of the parties. Under the terms of that Agreement, the AMB examines all initiatives and undertakings relating to the planning, management and operation of Gwaii Haanas. Decisions of the Board are made by consensus.
C. Haida Gwaii Watchmen

Watchmen act as guardians to protect the natural and cultural heritage of key sites in Gwaii Haanas and act as point of contact for visitor information or emergencies.

Watchmen are located at K’uuna (Skedans), T’aanuu (Tanu), Hlk’yah (Windy Bay), Gandle K’in (Hotspring Island) and SGaang Gwaii. While T’aanuu and K’uuna are outside the Gwaii Haanas boundaries they are within the Haida Heritage Site boundaries.

VII. OLD MASSETT AND SKIDEGATE PROGRAMS

Working within the framework of the Haida Nation laws, the following village programs receive political support of the Council of the Haida Nation and the Haida All Leaders process as required.

1. Haida Repatriation Committee

In the early 1900’s, many items - from totem poles to sculpture, regalia, baskets and canoes - were taken from Haida Gwaii and placed in private collections or museums around the world, including Britain, Russia, America and France. Along with pieces of Haida culture, numerous Haida ancestral remains were also taken from burial grounds.

The Haida Repatriation Committees consist of volunteers committed to bringing back to Haida Gwaii, ancestral remains and cultural treasures.

2. Skidegate and Old Massett Haida Language Programs

Through the Skidegate Haida Immersion Program (SHIP) and the Old Massett Education Program the Haida people work to revitalize the Haida language. Activities include immersion projects in the day care and pre-schools, and a variety of course work for elementary and high schools, youth groups, adults and seniors’ groups. University accredited course work in linguistics is offered on Haida Gwaii. Both villages are involved in audio recording of the dialects.

3. Economic Development Programs

Within the structure of the Haida Nation’s land and resource principles, the Village Councils are implementing Economic Development initiatives, both within their respective Villages, as well as in joint ventures.

A. Old Massett Development Corporation (OMDC)

OMDC is developing an economic development model that includes; sustainable management of the resources, harvesting, local processing, value-added, and development of a local label marketing strategy on finished products.

B. Gwaalagaa Naay (Ambitious House) Corporation – Skidegate

The Corporation operates several businesses including Taaw Naay Enterprises Ltd. Several new businesses have utilized the Corporation’s help in starting up, including a clothing store,

The Corporation also offers advisory services for new business, assistance with preparation of business plans and financing applications, and business training workshops.

Two large projects are in the business planning stage and will combine both cultural and economic development components. The Qay’llnagaay village Heritage Centre will include a museum, interpretive centre, program management centre and the Bill Reid teaching centre, as well as the Qay’llnagaay Lodge hotel and restaurant project.

C. Old Massett Heritage Resources Program

A fifty-hectare parcel of land adjacent to Old Massett has been singled out to construct an economic centre. The name of site is Tluu Laanas (Canoe Village). The Tluu laanas Community Development Corporation will manage the development and administration of this site. There will be four cultural buildings constructed at this site.

The Cultural Centre- will be the place for conducting research on Haida genealogy, northern Haida culture, and focused research projects for various educators, universities and scholars.

The Monumental Carving House- will be where pieces, such as totem poles and canoes will be produced by carvers and their apprentices. The Old Massett Museum- will be concentrated solely on the collections that are in museums and institutions around the world. It will also hold future collaborations, travelling exhibits and objects repatriated to Haida Gwaii.

The Community Feast House- this building will be the official gathering place for Old Massett community and will accommodate potlatches and other feasts such as-pole raisings, memorials, and name giving ceremonies. This building will be a place where the community shows their support as witness of their respective events.
4. Ecosystems of the Islands

4.1 Geology and Soils

4.1.1 Tectonics

The slow movement of the plates that make up Earth’s crust is primarily responsible for the formation and evolution of the Islands. Over the past 200 million years, the convergence of the North American Plate, the Pacific Plate and the Explorer Plate has brought together older bedrock terranes that were originally formed elsewhere in the Pacific Ocean. Plate collision resulted in the formation of new igneous rocks, crustal uplift, subsequent erosion and the creation of new sedimentary deposits. Since 25 million years ago, the Islands have moved over the “Anahim mantle hotspot” marked by a belt of surface volcanoes along the interior and coast of western North America.

The active Queen Charlotte Fault is the most significant tectonic feature of the Islands. The fault runs offshore and parallel to the western coasts of Graham and Moresby Island. Along the Queen Charlotte Fault, the Pacific plate slides northwest past the North American plate at a rate of about 5.5 cm per year. Further south, the plate interaction is more complex with the convergence of three plates.

The physiographic evolution of the Islands has been influenced by faulting and by the accompanying under-thrusting of the Pacific plate beneath the North American plate. These processes have operated for millions of years, elevating the Tertiary Queen Charlotte land mass while depressing Hecate Strait and Queen Charlotte Sound. Increased relief has resulted in rapid erosion and deposition of sediment into Hecate Strait.

Frequent earthquakes along the Queen Charlotte Fault make this region the most seismically active in Canada. Seismic activity has been higher on the Islands than anywhere else in onshore British Columbia (with the possible exception of Vancouver Island). One of the largest recorded earthquakes occurred beneath northwestern Graham Island and registered 8.1 on the Richter Scale.

4.1.2 Bedrock geology

The first thorough descriptions and mapping of the geological units of the Islands was undertaken by Sutherland Brown (1968). This work remains the principle reference for all of the subsequent studies undertaken since 1968. Sutherland Brown and Yorath updated the theories on geological structure and history in 1989. Research conducted by the Geological Survey of Canada (GSC), continues to modify the geological concepts of the Islands. Highlights from this research can be found in the GSC’s annual reports from 1988 to 1993. The GSC completed new mapping on the islands in 2002.

The oldest rocks on the Islands occur on Moresby Island. There are small deposits of unnamed marine sedimentary and volcanic rocks, about 323 to 245 million years old, and one area hosts minor dioritic intrusions about 323 to 290 million years old.
The second oldest rocks, exposed on Moresby Island are basaltic lavas of the Karmutsen Formation, about 225 million years old. These basalts were formed on the ocean floor creating a submarine plateau upon which marine deposition took place. Massive grey limestones formed with the accumulation of shells and organic debris as well as shales, sandstones and argillites.

Volcanism in the early Jurassic Period (about 210 to 175 million years ago) laid down additional lava over the submarine deposits on northern Moresby and southern Graham Islands (Skidegate Plateau).

Quartz diorite intrusives were emplaced into the overlying rocks during a period of uplift. Most intrusive rocks occur in the Queen Charlotte Ranges on western Moresby Island and southwestern Graham Island. Others are located near Sandspit, the west side of Louise Island, the south end of Kunghit Island and the east side of Burnaby Island.

During the Cretaceous (145 to 65 million years ago), it is believed that the rising sea level created conditions beneficial for the accumulation of shallow marine sediments. The Longarm Formation and the Queen Charlotte Group of this period consist of coarse conglomerates overlain by thick accumulations of dark grey sandstones, mudstones, and siltstones. These are found mainly on northern Moresby and southern Graham Islands.

The final phase of deposition occurred during the Tertiary Period about 65 to 2 million years ago with outpourings of sub-aerial lava and intrusions of coarse-grained granitic rocks along the fault zones. These occur on central and northern Graham Island. As the rifting and volcanism subsided, basins were in-filled with thick layers of sand and mud (Skonum Formation) which eroded from the raised Tertiary surface. This sedimentary deposition occurred until the onset of glaciation.

4.1.3 Glaciation

While tectonism provided the basic elements for shaping the landscape of the Islands, it was glaciation and the accompanying erosion, sediment deposition and sea level fluctuations during the Quaternary time (present to about 2 million years ago) that modified the area into its present form. The glacial history of the Islands is considerably different from that of the mainland, which was repeatedly covered by the Cordilleran Ice Sheet.

The Islands were only marginally affected by the Cordilleran glaciation. Ice accumulated independently in the Queen Charlotte Ranges and flowed from high peaks into valleys, sometimes forming piedmont glaciers (a glacier that spreads out at the foot of mountains, formed by the coalescence of two or more valley glaciers).

These glaciers coalesced with part of the mainland ice-sheet when it was at its maximum. Certain parts of the Islands, such as the highest peaks and areas in the northeast of Graham Island may have provided small, harsh areas that remained ice-free. The last glacial period, the Fraser Glaciation (11,000 to 30,000 years ago) probably commenced later on the Islands than elsewhere in British Columbia but may have reached its maximum earlier than in southern parts of the province.

Sea-level fluctuations during the Quaternary history caused shifting shorelines. During periods of glaciation, shallow parts of the sea floor bordering the Islands were dry. During most of the post-glacial time, the sea level was higher than today and present-day coastal areas were
submerged. The Islands were under different glacio-isostatic influences (the load on the Earth's crust as a result of glaciers) than the mainland and changes in sea level related to the Island's land mass were markedly different from other coastal areas of B.C.

During the Fraser Glaciation, sea levels dropped more than 100 metres as water was locked up in the massive continental ice sheets. On the mainland coast, this drop in sea level did not reveal new land because the weight of the continental ice sheet depressed the land. However, the Islands were under a different situation. With the smaller ice sheets of the Islands and less weight pushing downwards and their location off shore and away from the continent, the land mass of the Islands is thought to have risen, as much as 42 metres by some accounts. Following the glacial period, the situation reversed and the present day land mass was left.

4.1.4 Surficial Geology

Surficial geology is very important on the Islands because the mild climate, high rainfall and seismic activity accelerate surficial processes, resulting in major events such as mass wasting and landslides.

The most common materials found on the Islands, particularly in the Queen Charlotte Lowlands and the Skidegate Plateau areas, are glacial till and colluvium (deposits accumulated through the action of gravity). Fluvial (produced by the action of a river or stream) and organic materials are less widespread, and marine, eolian (wind transported) and exposed bedrock are least common.

Glacial till deposits have been transported and subsequently deposited by ice from the last glaciation. These are found predominately in valleys, on slopes, and occasionally on hilltops. The nature of these deposits (texture, compactness, coarse fragment content, etc.) can vary considerably depending on their origin. Whether the material was transported on, under, beside, within, or in front of a glacier, the amount of chemical weathering since deposition, together with other soil-forming processes, will affect the physical and chemical nature of the material.

Colluvial deposits are the result of materials moving down-slope under the force of gravity. These materials occur as thin veneers that thicken downslope and reach maximum thickness at the toe of steep slopes. This process is active, therefore colluvial materials are loose and non-cohesive. They are usually well-drained and well-aerated. The abundance of colluvial material on the Islands and the prevalence of weathering, mass wasting, soil creep and other processes is an indication of the inherent instability of the upland landscape.

Landslides are mass movements involving the downward sliding or falling of masses of rock and overlying debris. A regional mass wasting inventory done for the Islands in 1988 by Gimbarzevsky, confirmed that landslide activity is prevalent throughout the Queen Charlotte Ranges (see also Section 4.2.3: Natural disturbance processes).

Fluvial or alluvial deposits are materials transported by streams and rivers. As such, these materials are most commonly found adjacent, or near, to present-day riparian systems. However, some fluvial materials were deposited during the melting of the last glaciation. These materials, termed fluvial-glacial, may not correspond to current drainage systems. For example, the underlying materials of the Argonaut Plain and some other areas of the Queen Charlotte Lowlands are fluvial-glacial deposits.
Fluvial materials can vary in texture due to sedimentation processes. If the stream gradient is steep and velocity great, then coarse materials are deposited. If the gradient is near level with a slow velocity, then deposits will be fine sands or silts. In stagnant back-waters and channels, clay may settle out. Clay deposits are prone to slumping and liquefaction.

Marine and eolian deposits are usually in the vicinity of present-day shorelines. However, because of isostatic rebound following the last glaciation and changes in erosion-deposition patterns along the coast, these deposits may be found inland and at elevations well above present-day sea-level.

Marine deposits have settled out of suspension or accumulated along shorelines in a saltwater or brackish environment. Sand dunes are eolian, transported and deposited by wind action. Marine deposits are considered inactive, whereas dunes may be active or inactive depending on the degree of colonization and stabilization by plants.

The Paleozoic and Mesozoic volcanic rocks on Moresby Island are hard, with a high resistance to weathering and a slow production of surficial material. The Tertiary volcanic rocks of Graham Island (i.e., Masset Formation) are softer, deeply fractured and highly weathered, and are therefore prone to mass wasting processes.

The intrusive granites and granite-like rocks are massive and very resistant to weathering and erosion. Only shallow veneers of weathered surficial materials are produced and rock outcrops are common.

4.1.5 Soils

The Ministry of Forests Field Guide for Site Identification and Interpretation for the Vancouver Forest Region (Green and Klinka, 1994), provides a good overview of soil properties and associated physiographic properties affecting soil regimes. A 1989 paper entitled Vegetation and Soils of the Queen Charlotte Islands: Recent Impacts of Development, by Banner et. al., also provides a useful overview of soils. The soil classification relies primarily on the Canadian system of soil classification, developed by the Canadian Department of Agriculture in the late 1970’s.

The soil texture affects soil water-holding capacity, soil nutrient-holding capacity, soil drainage, soil porosity and aeration and soil bearing strength. The coarse fragment content affects soil water-holding capacity, soil nutrient-holding capacity, soil drainage, porosity and aeration, and soil bearing strength. Coarse fragments are greater than 2mm.

Humus form affects soil nutrient regime as well as soil temperature, soil moisture, and soil aeration. Three humus forms are noted: Mor, Moder, and Mull. Mors are the least biologically active, with slow rates of decomposition and nutrient cycling. Mulls are most biologically productive.

In general, there is an association between the physiography, local climate, vegetation cover and soils and as such, there are references to be found between the biogeoclimatic zonation and the distribution of soils. Examining the ecosystem associations (e.g. Spruce-hemlock-sword fern) of the biogeoclimatic zones provides a more refined distribution of the soils. However, because only a few areas of the islands have been mapped at the detailed association level (generically referred to as ecosystem mapping), this discussion of soils will remain at the broad zone and variant level (i.e. CWHvh2, wh1, wh2; MHwh1,wh2; AT).
Coastal Western Hemlock zone (CWH)

The coastal western hemlock wet hypermaritime (wh1, wh2) zone is widespread and includes a variety of soils, but loamy Humo-Ferric and Ferro-Humic Podzols are most common. Typic Folisols and Dystric Brunisols are also to be commonly found. The predominant humus form, ranging between 10 and 25 centimetres in thickness, are the Humimors and Hemihumimors. While there is a trend towards the development of a thickening humus layer, this is counteracted by disturbance from windthrow and soil creep.

On upper slopes and well-drained ridgecrests of the CWH zone, Folisols and Podzols can be occasionally found. More common are the areas on middle to toe slopes and on active alluvial landforms, intermittent or constant (depending on the level of moisture) lateral flow of mineral seepage provides a turnover of nutrients and ensures adequate soil aeration. Repeated erosion and deposition of alluvial sediments and soil mixing from colluvial action and windthrow are characteristic. Typical soils in these active alluvial landforms are Dystric and Sombric Brunisols and Regesols with Mormoder, Mullmoder and Rhizomull humus forms. Podzols with humimors characterize inactive alluvial landforms. Gleyed Ferro-Humic Podzols, Dystric Brunisols, and Folisols with Humimor, Hydromor, and Mormoder humus forms support moist, rich ecosystems on colluvial and colluviated morinal deposits.

Where alluvial influenced sites are flat (no slope) in the CWH zone, the typical soils are Orthic Dystric and Sombric Brunisols and Orthic Regosols. These are often found adjacent to streams and rivers on recently deposited alluvial materials and are very productive growing sites. In areas with poorly drained, gently undulating to flat terrain, Gleyed Podozols, Gleysols and Organic soils (Mesisols, Humisols) are to be found.

Throughout the lowlands of northeast Graham Island the CWH zone covers extensive wetlands of bogs, fens, marshes, and swamps. Raised Sphagnum bogs with Typic and Terric Mesisols soils are common. Fens are infrequent and localized along water courses and lake margins and freshwater marshes are rare and also localized. Fen soils are thought to be mostly Mesisols and Humisols consisting of non-sphagnic peat and marsh soils are more typical of Gleysols.

The wetter variant of the CWH zone, the very wet hypermaritime (CWHvh2) occurs on gentle to moderate slopes of the western side of the islands and encompassing the Queen Charlotte Mountains. Soil forming processes in this zone are dominated by the continuous gradual build-up of organic matter on the ground. These soils are cool and wet but typically freely-drained, and have a thick (20-50 cm) organic layer. Typical soils are Folisols developed over rock or unconsolidated mineral material or folic phases of Podzols, Gleysols, and Brunisols.

Dry areas of CWHvh2 are rare, but some rapidly drained sites on ridges show low nutrient subxeric soils of Dystric Brunisols. The more common soils are the Podzols, Folisols, and Brunisols on freely drained slopes over colluvial morainal material, Gleysols, Podzols and Folisols on poorly drained slopes and level areas over organic, morainal and colluvial blankets and fluvial fans, and Gleysols, Mesisols, Folisols, Podzols, and Brunisols on gently sloped, poorly drained slopes of organic and morainal veneers and blankets.

Much of the CWHvh2 zone is covered by blanket bog over Mesisols and Humisols. Shallow, minerotrophic bogs with very little peat accumulation are more common. Soils are variable and include peaty and gleyed mineral soils and Folisols.
Mountain Hemlock zone (MH)

The terrain in the Mountain Hemlock zone is usually steep or hummocky on upper slopes and ridges. The common soils of this zone are imperfectly drained Folisols and shallow, gleyed Ferro-Humic Podzols, often with thick, compacted forest floor material (forest litter, decomposed fermented layer, well decomposed humic layer).

Alpine Tundra (AT)

The Alpine Tundra zone above 650-800 metres mainly occurs over the Queen Charlotte Ranges. On the exposed westcoast of Moresby Island, plant communities of rocky headlands, steep rugged slopes, and blanket bogs extend from sea level to ridgetop. The soils of the herb meadows are usually the deepest found in the alpine zone and often have a well developed surface horizon, resulting from the decomposition of grass and herb roots. Humic Regosols and Sombric Podzols are noted in the herb meadows. Typic Folisols consist of very thin and discontinuous veneers of material over bedrock or course colluvium. Many alpine soils, especially on rocky steeplands, would be termed “non-soil” because they are less than 10 cm of organic matter over rock.
4.2 Terrestrial Ecosystems

4.2.1 Provincial Ecosystem Classification Systems

Two of the most common methods for describing the ecosystems of British Columbia are the Ecoregion Classification system and the Biogeoclimatic Ecosystem Classification (BEC) system. The Ecoregion Classification system stratifies terrestrial and marine ecosystems into discrete physiographic and climatic units. The BEC system classifies ecosystems to a finer level of resolution according to a combination of climate, elevation, soil and associated plant communities. The BEC system and Ecoregion Classification system are compatible and are used extensively on the Islands and throughout BC in forest, range and wildlife management.

4.2.1.1 Ecoregion Classification

The Ecoregion Classification system is a method of describing ecosystems based on their physiography and climatic influence (described in Demarchi, 1996). This system is designed to “bring into focus the extent of critical habitats and their relationship with adjacent areas” (Demarchi et al, 1990). The Ecoregion Classification system has five nested levels of zoning: ecodomains, ecodivisions, ecoprovinces, ecoregions and ecosctions. Ecodomains and ecodivisions are very broad (e.g. four ecodomains are found in BC) and place the province in a global context based on broad geographical relationships. The remaining three levels place the province in context with the rest of the continent or relate areas within the province to each other. These lower levels divide the province based on areas of similar climatic processes, physiography, and wildlife potential (Meidinger and Pojar, 1991).

Haida Gwaii/QCI overlaps with one ecoregion and three ecosctions (Table 3). The Queen Charlotte Lowland ecosction occurs to the northeast of the plan area, and the Skidegate Plateau and Queen CharlotteRanges ecosctions to the south (Map 2).

Table 3. Ecoregion and ecosction zones

<table>
<thead>
<tr>
<th>Ecoprovince</th>
<th>Ecoregion</th>
<th>Ecosction</th>
<th>Ecosction Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coast and Mountains</td>
<td>Gwaii Haanas (Beautiful Island)</td>
<td>Queen Charlotte Lowland</td>
<td>An area of low relief, poor drainage and extensive muskegs and wetlands in the northeastern part of the Islands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Skidegate Plateau</td>
<td>A plateau in the lee of the Queen Charlotte Mountains. Precipitation is somewhat reduced here.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Queen Charlotte Ranges</td>
<td>The very wet, rugged western side of the Islands</td>
</tr>
</tbody>
</table>
4.2.1.2 Biogeoclimatic Ecosystem Classification

The BEC system (described in Pojar et al, 1987) delineates areas into biogeoclimatic zones according to climate, elevation, soils and potential climax vegetation\(^3\). There are three levels of stratification within biogeoclimatic ecosystem classification:

**zone:** an area that shares the same dominant climax tree species and regional climate.

**subzone:** an area within a zone that shares climax vegetation cover and sub-regional climate.

**variant:** a further division that delineates areas within subzones that vary slightly by climate (e.g., drier, wetter, warmer, or colder areas).

Haida Gwaii/QCI has three biogeoclimatic zones: Coastal Western Hemlock (CWH: 94%), Mountain Hemlock (MH: 5%) at higher elevations, and non-forested Alpine Tundra (AT: 1%) (Table 4; Map 2). There are three BEC variants in the CWH (CWHwh1, CWHwh2 and CWHvh2) and two variants in the MH (MHwh1 and MHwh2).

<table>
<thead>
<tr>
<th>Biogeoclimatic subzone/variant</th>
<th>% of the total landbase</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWHvh2</td>
<td>30.0%</td>
</tr>
<tr>
<td>CWHwh1</td>
<td>56.0%</td>
</tr>
<tr>
<td>CWHwh2</td>
<td>8%</td>
</tr>
<tr>
<td>MHwh1</td>
<td>3%</td>
</tr>
<tr>
<td>MHwh2</td>
<td>2%</td>
</tr>
<tr>
<td>AT</td>
<td>1%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
</tr>
</tbody>
</table>

BEC variants can be further stratified into **site series**, which are sites within a variant that are physically and biologically similar enough that they have or would have similar vegetation in a mature, or climax, state. Site series are classified based on site and soil conditions (e.g., soil moisture and nutrients) and the associated vegetation community. Site series mapping can be used as the basis for ranking resource values or indicating sensitivities in the landscape. Uses include ecosystem representation analysis and habitat suitability and capability mapping. There are two ways of mapping site series:

- **Terrestrial ecosystem mapping (TEM)** is a detailed method of mapping site series that stratifies the landscape at a scale of 1:20,000 according to a combination of ecological features, primarily climate, physiography, surficial material, bedrock geology, soil and vegetation. TEM has been completed to varying standards for the TFL’s, but only for a small portion of the TSA.

---

\(^3\) Note: The term “potential climax vegetation” describes the more stable plant communities of later successional stages. The climax vegetation described for a zone may be different from what is currently growing on a site.
Map 2: Ecosystems of the Islands

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
• Predictive Ecosystem Mapping (PEM) uses available spatial data and knowledge of ecological-landscape relationships to automate the computer generation of site series maps. The technique is more cost and time-effective than terrestrial ecosystem mapping, but is less accurate since it involves less on-site inventory work. Small scale PEM has been completed for the entire plan area. PEM has no scale; although it is typically presented at 1:20,000 and one of its major inputs is forest cover, which is at 1:20,000.

4.2.2 Ecosystem Descriptions

This section describes the ecosystems on the Islands by biogeoclimatic zone. This summary draws on some of the many reports and studies on the ecosystems of the Islands. The 1977 Natural History Report, prepared by Bristol Foster and Jim Pojar for Parks Canada, provides a comprehensive overview of the vegetation on the Islands. Ecosystems of the Islands, and Gwaii Haanas specifically, have also been described in Calder and Taylor (1968), Banner et al (1989); Meidinger and Pojar (1991); Westland Resource Group (1994); and Golumbia, (2001b).

This section describes ecosystems in their natural state. Human activities and introduced species have had a significant influence on the ecosystems of the Islands and these influences are described in Section 4.2.4.

4.2.2.1 Coastal temperate rainforest: Coastal Western Hemlock (CWH)

Haida Gwaii/QCI lies within the Perhumid Coastal Temperate Rainforest (CTRF). Coastal temperate rainforests are characterized by an over-abundance of moisture throughout the year (>1400mm) and the absence of catastrophic fire as a major ecological factor. These forests occur primarily on the west coast of continents, where they are subject to westerly winds and cyclonic storms coming of the oceans. The presence of mountains captures rain-laden cloud, resulting in the characteristic high rainfall. There are three types of coastal temperate rainforest along the west coast of North and South America: subpolar, perhumid and seasonal.

The largest contiguous coastal temperate rainforest in the world stretches from Northern California to the Kenai Peninsula in Alaska.

The perhumid coastal temperate rainforest runs from Yakutat Bay in SE Alaska to the northern tip of Vancouver Island. These forests are characterized by old-growth conifer stands with a complex structure, often including very large, very old trees. The complexity of the temperate rainforest is due to its age and disturbance regime. The wet coastal climate results in a low frequency of fire. For the most part, forests are replaced in piecemeal fashion by the death and replacement of individual trees, although larger-scale disturbances such as windthrow and landslides also occur occasionally. This ongoing pattern of small-scale disturbance events and the occasional large stand-replacing event results in patches and layers of vegetation at various stages of succession, with a range of tree sizes and ages. Wildlife in these forests are adapted

---

4 a. Subpolar rainforests occur along the coasts at the highest latitudes (58ºN – 61ºN). They are characterized having the wettest summers, coolest temperatures, greatest snowfall, and the least stature and diversity of the temperate rainforests.

b. Perhumid rainforests are the most common type globally. Summer precipitation 10 – 20% of annual rainfall and mean temperatures of the warmest month are 12 – 16ºC.

c. Seasonal rainforest is transitional between temperate rainforest and mesophytic temperate forest. Has high rainfall (>1400mm per year), but summer temperatures are high (up to 20ºC or more), and summer droughts are common. Fire is often an important aspect of the ecology of these forests. Includes the coastal forests of Oregon, Washington, and southern BC. (Veblen and Alaback, 1996)
to this landscape pattern and structural diversity, which provides habitat to a diverse array of
birds and other terrestrial animals. Riparian ecosystems are highly important, playing key roles
in ecosystem function (Pojar, 2003a)

The coastal temperate rainforest is a globally rare biome (Pojar, 2003a). By 1992, over half of
the world’s temperate rainforest had already logged or converted to other uses (Ecotrust, 1992).
The CTRF in North America represents 40-50% of the world’s remaining coastal rain forests
(Kellog 1992). British Columbia contains large tracts of undeveloped temperate forest,
particularly north of southern Vancouver Island and including the central and north coasts of the
mainland and the Islands. There are just over 10 million ha of land in the CTRF in BC. As of
2003, 9.52% of this had been protected in provincial and national parks and park reserves,
ecological reserves, recreation areas, and areas declared as protected areas under the
Environment and Land Use Act. There are 930,000 ha of Perhumid Coastal Temperate
Rainforest on the Islands, which equates to 8.9% of the provincial CTRF. 212,000 hectares of
the coastal temperate rainforest on the Islands (22.75%) is currently under protected status.

The coastal temperate rainforest is equivalent to the Coastal Western Hemlock (CWH)
biogeoclimatic zone, and comprises 94% of the forested landbase in the plan area (Table 4,
Map 2). The CWH is sub-divided into three biogeoclimatic variants, which differ in elevation,
location, and vegetation:

• The **Central Very Wet Hypermaritime Coastal Western Hemlock variant (CWH vh2)** occurs
  along the windward side of the Queen Charlotte Ranges, except for south Moresby Island
  where it covers much of the windward and leeward sides of the area. The elevation limits
  range from sea level to about 500 metres. The forests in this BEC variant catch the full
  brunt of weather off the Pacific ocean and are, therefore, very wet. Fog, cloud and
  precipitation are common throughout the year but precipitation levels vary widely. Forests in
  CWHvh2 are dominated by redcedar, western hemlock, with Sitka spruce occurring in minor
  amounts. Major understory species include salal, Alaskan blueberry, false azalea and deer
  fern. Extensive bog associations are found in subdued terrain. Productive tree growth
  occurs on steep, well-drained slopes and floodplains.

• The **Submontane Wet Hypermaritime Coastal Western Hemlock variant (CWHwh1)** only
  occurs on the Islands, where it occurs at lower elevations on the leeward side of the Queen
  Charlotte Ranges. The elevation ranges from sea level to about 350 metres. Forests in this
  variant are dominated by western hemlock, red cedar, and Sitka spruce. Mosses dominate
  the understory. The herb and shrub layers are very sparse (probably due to deer browsing).
  Subdued terrain on the lowlands and the eastern Skidegate Plateau have extensive bogs
  and poor to very poor nutrient soils.

• The **Montane Wet Hypermaritime Coastal Western Hemlock variant (CWHwh2)** also only
  occurs on the Islands. The CWHwh2 occurs above the CWHwh1 throughout the eastern
  Skidegate Plateau and the eastern Queen Charlotte Ranges. Elevation limits range from
  approximately 350 to 600 metres. This variant is found in cooler and wetter climatic
  conditions than the CWHwh1. The forests of this variant are dominated by western
  hemlock, redcedar, with yellow-cedar becoming more common and Sitka spruce becoming
  less common with elevation gain. Occasionally, mountain hemlock may be found. The
  understory is dominated by mosses and liverworts and the herb and shrub layers are
  sparse, again likely due to heavy deer browsing.

---

5 Statistics provided by Resource Management Division, Ministry of Sustainable Resource Management.
4.2.2.2 Subalpine forest: Mountain Hemlock (MH)

The subalpine forest of the Mountain Hemlock (MH) biogeoclimatic zone occurs above the Coast Western Hemlock zone at an elevation of 500 to 1000 metres. The wh1 variant is situated on the windward side of the Islands, while the wh2 variant is found on the leeward side. There is very little difference in the composition of the two variants.

Long, very wet, cold winters are typical for this zone. Frozen soils are rare but growing seasons can be curtailed by frosts. Snowfall packs can extend into July. The forests are dominated by mountain hemlock and yellow-cedar with Alaska blueberry and sphagnum mosses common in the understory. Vegetation and stand characteristics are strongly influenced by local topography, which affects the timing and pattern of snowmelt. On the western side of the islands, subalpine vegetation can be found descending to near sea level, particularly along avalanche chutes and streams.

The closed subalpine forest thins out to clumps of trees and open heather meadows at higher elevations, where the snowpack is much greater and takes longer to melt. The best examples of this subalpine parkland are found on the high montane areas of the Skidegate Plateau and around Takakia Lake.

A characteristic bog, the blanket bog, is found within the subalpine Mountain Hemlock zone (see Section 4.4: Hydoriparian Ecosystems).

4.2.2.3 Alpine Tundra Zone

The Alpine Tundra Zone comprises a very small part (1%) of the plan area. This zone occurs above 650-800 meters in elevation. There are three main alpine areas: on southwest Graham Island; on Moresby Island opposite Louise island, and; south of Tasu in the San Christoval Range. Haida Gwaii/QCI does not have a true alpine climate, with low growing season temperatures, wide temperature extremes and short frost-free periods. The development of alpine or alpine-like vegetation in the Queen Charlotte Mountains is determined largely by an “oceanic-alpine” type of climate with heavy precipitation, deep, wet, and long-lasting snowpack, and extreme exposure to high winds and cool, humid air (Banner et al. 1989).

Herb meadows, alpine heath (dwarf evergreen scrub), and rocky steeplands make up the three broad types of alpine ecosystems on the Charlottes (Banner et al.1989). Some tree species such as mountain hemlock and sitka spruce may occur in the zone although they are restricted to lower elevations and are most often stunted and in krummholz form (Golumbia 2001).

4.2.2.4 Rare and Distinctive Ecosystems and Plants

Vegetation on the Islands is generally typical of the growth that is found throughout the rugged North Pacific coniferous forests. However, Haida Gwaii/QCI is recognized as one of the most intriguing floristic regions in North America due to the presence of several endemic and disjunct species of flora and fauna (Lomer and Douglas, 1999). A widely held hypothesis, supported by scientific evidence and Haida oral history, is that glacial refugia existed on both Graham and Moresby Islands during the last period of glaciation (Warner et al, 1982; Scudder et al, 1989). The relative isolation of the Islands has provided conditions for many rare and/or sensitive species to flourish.
There are 665 species of vascular plants (Lomer and Douglas 1999) and 459 known species of non-vascular plants (Schofield 1989) on Haida Gwaii/QLC. 13 plant taxa were originally considered endemic to the Islands (Calder and Taylor, 1968) but over time, they have been found in adjacent regions (Vancouver Island, north BC coast, and southeast Alaska). *Sinosenecio newcombei* is the only vascular plant species still considered endemic to Haida Gwaii.

Five non-vascular plant species are endemic to the Islands and seven are disjunct (occurring elsewhere but outside the western hemisphere). There are 54 disjunct taxa of lichens and lichenicolous flora (Brodo 1995).

The tree species of the Islands are similar to those on the adjacent BC mainland, except that three species commonly found on the mainland do not occur on the Islands: amabilis fir (*Abies amabilis*), Douglas-fir (*Pseudotsuga menziesii*), and bigleaf maple (*Acer macrophyllum*). While these trees are naturally absent from the forest profile, several other plant species commonly found on the mainland coast are sparse or missing from the Islands because of isolation and biogeography or as a result of deer browsing.

42 plant species and 14 plant community types on the Islands are listed by the BC Conservation Data Center (CDC) as elements of conservation concern (see Appendix D). Seven of the plant species and two of the plant community types are red-listed. Almost all of the plant community types listed by the CDC occur in the CWHvh2 and/or CWHwh1 and are Sitka spruce forests (spruce, cedar or hemlock leading). Some of these are productive forest types (big, old trees) that are rare because they have been the target of logging, both on the Islands and on the mainland. Several occur on wetter sites e.g., floodplain, alluvial/colluvial or estuarine ecosystems. Others occur in salt-spray zones along windward shores or in brackish shoreline habitats.

It is important to note that there are more species and ecosystems of conservation concern on Haida Gwaii than are listed by CDC. Appendix D provides a comprehensive list of plant species of conservation concern. These include several non-forested community types (minerotrophic fens and marshes as at Tlell Pontoons, some alpine community types, beach dunes), some subalpine forest types, and karst ecosystems.

The principal proximate threats to native and endemic plant species and plant communities on the Islands are forest harvesting (conversion of forests from old growth to young simple-structured stands), introduced animals (especially black-tailed deer), and introduced invasive plants (Pojar, J. 2003b). Climate change is the ultimate threat.

The following is a description of some of the rare ecosystems on the Islands.

a. *Sitka spruce riparian forests* are found on alluvial flats and terraces beside river and creeks. Sitka spruce dominates, but red alder (*Alnus rubra*) and western redcedar are common. The largest conifer specimens can be found in this habitat along the rivers. In unmanaged forests, this forest type is best developed along larger streams with low gradient floodplains and some protection against strong winds. The Yakoun and Tlell Haida Protected Areas corridors provide good examples of this type of forest.

---


The trees in Sitka spruce riparian forests are heavily draped with epiphytic bryophytes, lichens and ferns, but grasses dominate the understory vegetation and bryophyte and lichen ground-cover is generally sparse. Foster and Pojar (1977) suggest that this forest type is a zooclimax type resulting from over-browsing by numerous introduced deer and possibly historically by the Dawson caribou. Generally, this is an uncommon forest type in B.C. as most alluvial coastal forests have luxuriant understories of shrubs, forbs, and bryophytes.

b. Sitka spruce-sea spray/fog forests develop on old stabilized sand dunes and are dominated by Sitka spruce. Some of the stands are pure spruce. These forests are most extensive on the uplands of northeastern Graham Island. However, there are patches of this forest type at the head of bays and inlets such as Taalungslung (Lepas Bay) and Peril Bay on Graham Island (both in the Duu Guusd Haida Protected Area), Flamingo and Louscoone inlets on Moresby Island, and Howe and Luxana bays on Kunght Island. Another characteristic sea-spray and fog-influenced Sitka spruce forest, with well-developed shrub (especially Gaultheria shallon) and herb (especially Calamagrostis nutkaensis) layers is found in strips along exposed outer islands and headlands and wind-blasted hillslopes, in particular on the west side of the archipelago.

c. Limestone bedrock at low elevations close to the coast, e.g., Limestone and South Low Islands, supports rare plant species. Limestone Island, for example, supports two species found nowhere else on the Islands (Geranium richardsonii, and Anemone multifida). Similarly, limestone bedrock at high elevations supports hotspots of plant species diversity and rarity.

d. Shallow, protected inshore marine and estuarine ecosystems are relatively rare and of limited extent. These ecosystems are highly productive and biologically important. They are keystone ecosystems in that their impact on the landscape is disproportionately large relative to their abundance (Pojar, 2002). The Yakoun River estuary (Haida Protected Area), Kumdis Slough (Haida Protected Area), Naden Harbour, and Delkatla Slough are examples of this type of ecosystem.

Because tidal marshes and estuaries are the only extensive lowland meadows on the Islands, they provide important habitat for mammals and resident and migratory wetland birds. They also provide critical habitat and rearing areas for juvenile salmonids (see Section 4.5: Freshwater and Anadromous Fish). These ecosystems are very sensitive to marine pollution and development activities, including log booming and roads (Pojar, 2002).

4.2.3 Natural Disturbance Processes

The composition and structure of the forests on the Islands have been historically shaped by natural disturbances. Natural disturbances are relatively distinct events, such as landslides or fire, that disrupt ecosystems and alter the availability of suitable habitat and/or the physical environment (Parminter and Daigle, 1997). Natural disturbances can cause severe damage to forests but they are also agents of diversity and renewal that ensure a steady supply of important habitat elements such as snags, fallen trees, and browsing opportunities for many species (Dorner and Wong, 2003).

The types of natural disturbances that have historically occurred on the Islands include windthrow, geomorphic disturbances (e.g., landslides), flooding, wildfire, outbreaks of insects and disease. Fires are rare due to the wet climate and most disturbances are due to wind, landslides and flooding. For this reason, a large majority of the openings created by natural
disturbance are small gaps (< ten trees). This small gap pattern of disturbance creates the characteristic features of coastal temperate rainforests i.e., contiguous tracts of old forest having very large, very old trees and complex multi-storied stands with patches and layers of vegetation at various stages of succession (Dorner and Wong, 2003).

4.2.3.1 Wind

Blowdown is caused by wind and is one of the prime agents of disturbance. The Islands are subject to prevailing westerly winds during the summer and strong south-southeast winds during the rest of the year. Exposed islands, such as Xaangitt (Cape St. James) and Kiis Gwaii (Langara Island), are among the windiest places along the Pacific coast. These winds are as high as any place in Canada (Foster and Pojar, 1977). The vast majority of windthrow events result in small canopy gaps (< ten trees) that happen at a frequency that is considered endemic. Larger patches of partial or complete canopy blowdown also occur but less frequently. The severity of wind effects is determined by topographic exposure, tree species and growth form, stand structure, and site characteristics, as well as the amount of precipitation accompanying the storm (Dorner and Wong, 2003). Stands dominated by cedar tend to be more windfirm than those dominated by western hemlock.

Windthrow events play an important role in the ecology of coastal forests. Stem snap is the primary cause of tree death during windstorms, while approximately 10% of trees are uprooted (Lertzman et al, 1996; Verben and Alaback.) Foliage and lichens blown down during storms provide an important winter food source for deer (Harris, 1989, cited in Dorner and Wong, 2003). Uprooted trees, as coarse woody debris, are an important source of soil nutrients, provide a substrate for tree regeneration, provide structural habitat features, and contribute to natural stream morphology. The uprooting of trees during blowdown events is an important source of soil mixing, as mineral soils are brought to the surface of thick organic layers.

A recent study by Rollerson et al (2002) indicates that the coastal lowland areas on the Islands are less prone to windthrow than low relief ridges, or moderate relief hills and ridges. Dense stands were found to be less vulnerable to windthrow than moderately dense stands and multi-storied stands were found to be more vulnerable than uniform stands which are mostly located in the coastal lowland. The windfirmness of the coastal lowland forests may be attributed in part to their shorter height compared to the taller multi-storied stands located on upland sites.

The Rollerson study also found that stands dominated by cedar tend to be more windfirm than those dominated by western hemlock. Imperfectly and poorly drained soils were found to have less windthrow than well-drained soils. This may be explained however by the presence of taller trees on well and imperfectly drained soils compared to more poorly drained soils, even though rooting depths tend to be deeper on well than poorly drained soils (Rollerson et. al., 2002).

4.2.3.2 Mass wasting

Mass wasting is the dominant geomorphic process on the Islands. Rugged terrain, large amount of rainfall, and intense storms lead to widespread slope failures. “Mass wasting” encompasses a variety of processes by which masses of soil, water, rock and debris are transported downslope primarily by gravity (Schwab, 1998). The processes classified by

---

8 On the west coast winds average 32 km/hr on an annual basis with gusts reaching 193 km/hr (Golumbia, 2001b)
Varnes (1978, cited in Schwab, 1998) include debris slides, debris avalanches, debris flows, debris torrents, bed-rock slumps and slides, and slump earthflows.

Gimbarzevsky (1988) suggests that the terrain of the Islands has a susceptibility to mass wasting processes that is probably among the highest on the continent. He determined the frequency of slope failure average 2.6 per square kilometre, compared to 2.17 per km$^2$ in other parts of BC, Oregon and Washington.

Approximately one-third of the landscape on the Islands is subjected to active hillslope failure processes (Schwab, 1998). The highest rates of slope failure occur in the zone of highest annual rainfall along the mountainous west coast (Rood, 1990), where precipitation ranges from 3000-5000 mm compared to 1200 mm on the east coast. Earthquakes can also trigger mass wasting. Based on correlational data, Schwab (1998) speculates that intense precipitation is the trigger of mass wasting events rather than seismic activity.

Mass wasting modifies both landform and forest structure, disturbing soils and delivering sediment and woody debris considerable distances to valley floors where they alter stream channels and floodplains (Naiman et al. 2000, as cited in Dorner and Wong, 2003). Mass wasting is a stand-initiating event, removing nearly all the pre-existing vegetation and exposing bare mineral soil. Succession after landslides is dominated by early seral communities of deciduous shrubs and red alder. Light-tolerant species such as Sitka spruce, western hemlock and redcedar are the first tree species to regenerate (Smith et al. 1984, cited in Dorner and Wong, 2003).

Jams of large woody debris can alter flow patterns and provide protection against flood scour, which allows vegetation to develop downstream (Dorner and Wong, 2003). When these debris dams break, a torrent of water, collected sediment and organic material rush downstream, scouring stream channels and depositing organic materials in fans or lake bottoms.

4.2.3.3. Flooding

Flooding in the Islands is generally caused by either rainstorms, rain on snow events, rapid snowmelt or the tidal flooding of estuaries$^9$. Debris jams that become established on water courses can act like dams, and are therefore also instrumental in flooding. This is particularly evident on the Tlell River.

Flooding and associated mass movements are confined to specific landscape positions, and typically influence only a small proportion of area in a watershed (Donner and Wong, 2003). Flood plains and fans that are developed from regular flooding are highly productive and support forests of various composition and ages depending on frequency and severity. On well-drained areas of flood plains widely spaced Sitka spruce and western hemlock are common (Dorner and Wong, 2003). Flooding can cause tree death, however unless it triggers debris flows or torrents, it rarely causes substantial amounts of mortality.

---

$^9$ Septer and Schwab (1995) have compiled historical reports of important rainstorm and flood events in Northwest British Columbia and the Queen Charlotte Islands for the years 1891 to 1991.
4.2.3.4 Fire

Historically fires have played a minor role as a natural disturbance regime (Banner et al., 1989). The rarity of natural fire events in coastal forests has been demonstrated in a study by Lertzman et al (2002). The study, which looked at coastal western hemlock forests (CWHvm1) in the Clayoquot Valley, the time since last fire (TSF) ranged from 290 to 12,220 calendar years with a median of 1300 years. The maximum TSF represents nearly the entire period of time since glaciation, which began roughly 13,000 calendar years ago (Booth, 1987, cited in Lertzman et al, 2003). The fires that were detected rarely extended more than 500 meters (Gavin et al., in press, cited in Lertzman et al, 2002).

The scarcity of fire on the Islands contributes to the characteristic age and large structure of its forests. When fires do occur, they make an important contribution to the ecosystem structure and function. There is often a large amount of remnant structure carried over from the previous stand, including residual dominant trees, snags and large coarse woody debris. This remnant structure contributes to the structural diversity so important for wildlife habitat. Burning encourages the establishment of early seral plants such as Vaccinium, which provide nutritious forage for bears and deer (Gray and MacKenzie, 2001, cited in Dorner and Wong, 2003). Fires can help to maintain forest health by removing disease- or insected-infested trees.

The Haida people practiced controlled burning to stimulate berry habitat, so the effects were very limited in nature (Haida oral history). Around 1840 a large fire is reported to have swept from the East Coast around Lawn Hill up to Massett Inlet. The cause of this fire is unkown.

There have been several large fires over the years that have started in logging slash either accidentally or by escapes while slashburning e.g., a post-logging fire burned nearly 5,000 hectares around Skidegate Lake in 1940s and 1950s (Banner et al., 1989). The King Creek fire was also started by a logging crew. Fire suppression has reduced the incidence and severity of fires. Recent industrial fires are very small, and are most commonly started among felled and bucked timber by chainsaws, logging equipment and road construction (e.g., blasting).

The Gwaii Haanas Terrestrial Ecosystem Conservation Strategy (2001) directs preparation of a joint Haida/Canada Fire Contingency Plan to address human-caused fire. Within provincially designated parks, the intent is to control fires that threaten human safety or property and natural ecosystem processes. Under provincial policy, all fires within Naikoon Park that are outside of the Wilderness Recreation Zone will be suppressed. Within the Wilderness Recreation zone, a spot decision will be made about whether or not to allow a fire to run its natural course.

4.2.3.5 Insects

The western blackheaded budworm (Alceris gloverana) is currently the most active forest insect on the Islands. These native insects periodically cause extensive defoliation to western hemlock and Sitka spruce (Koot, 1991). Infestations tend to occur in 10-12 year cycles and last 4 – 5 years. The most recent outbreak collapsed in 2001 and lasted five years (Table 5). Budworm populations are held in check naturally by cold, wet summers as well as insect parasites and predators (Koot, 1991). Outbreaks of the western blackheaded budworm can occur simultaneously with the hemlock sawfly (Neodiprion tsugae). This leaf defoliation and, in

---

10 Only four lightening-caused fires were recorded over a 42-year period between 1940 and 1982 and none exceeded 0.1 ha in size (Parminter, 1983).
more extreme conditions, tree death is a significant contributor of nutrients and humus to the forest soil.

Table 5. Year of defoliation by intensity, and total area (hectares) defoliated in the Islands by blackheaded budworm and hemlock sawflies, 1996-2001.

<table>
<thead>
<tr>
<th>Intensity of defoliation</th>
<th>Number of hectares defoliated (ha) by year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>8100</td>
</tr>
<tr>
<td>Moderate</td>
<td>1180</td>
</tr>
<tr>
<td>Severe</td>
<td>180</td>
</tr>
<tr>
<td>Total</td>
<td>9460</td>
</tr>
</tbody>
</table>

The budworm feeds preferentially on new growth but, when numerous, will feed on older foliage. Heaviest feeding occurs in the upper crowns (Koot, 1991). The defoliation can reduce harvestable volume by up to 20%. Many trees recover, however some have dead tops or crooked stems, which ultimately may result in reduced log length and value (Koot, 1991).

Budworm activity has mainly been observed in mature forest. However, recent outbreaks have caused dramatic defoliation in juvenile stands of western hemlock and there is an apparent trend of greater overall impacts to trees in spaced stands. Defoliation in previous outbreaks was first observed on the southern Moresby archipelago and has progressed northward in subsequent years (Turnquist et al., 2001). The even age characteristics of second growth stands may provide greater susceptibility to insect feeding.

The recent discovery of the Cooley spruce gall aphid (*Adelges cooleyi*) on mature Sitka spruce growing near planted Douglas-fir highlights the potential for spruce pests to become established on the Islands through planting of non-native tree species with their attendant pests (Turnquist et al. 2001). During the 1980s, tree species not native to the islands were planted in some locations. However, since that time, replanting has been regulated to ensure that ecologically-appropriate species are planted that are genetically suited to the site. Spruce aphid (*Elatobium abietinum*), has caused chronic damage in the past, but has rarely been detected in recent surveys. Spruce weevil (*Pissodes strobe*) does not occur on the Islands, but there is concern that it will be accidentally introduced. Spruce weevil has caused significant damage to regeneration elsewhere in BC (Turnquist et al., 2001).

Standing dead trees as the result of insect attacks can offer food and shelter for many organisms (Lofroth, 1998, cited in Dorner and Wong, 2003).
4.2.3.6 Pathogens

Although the wet coastal climate is very conducive to the development and spread of fungal infections (Dorner and Wong, 2003), the forests of the Islands are more remarkable in their relative lack of root rot, and butt rot, when compared to other areas. Phellinus is entirely absent and cedar butt rot is much less common than elsewhere.\(^{11}\)

There are several rots on the Islands that are at endemic levels. The most prolific is *Heterobasidion annosum*, which causes root and butt rot in conifers. Airborne spores from this fungus infect freshly cut stumps or bole wounds where it can grow into the roots and spread to adjacent healthy trees at root contacts. Another common rot is *Inonotus tomentosus* which causes mortality, growth reduction, butt rot, and predisposition to windthrow and possibly insects, mainly in spruce (Canadian Forest Service website). These endemic levels have the potential to be increased with the number of freshly cut surfaces of stumps made available through spacing and logging\(^{12}\).

Infestations of hemlock dwarf mistletoe are variable across the landscape\(^{13}\). Although dwarf mistletoe is more prevalent in older and all-aged stands it will also affect younger stands (Garbutt, 1998, cited in Dorner and Wong, 2003). Hemlock dwarf mistletoe produces ‘brooms’ which are swellings and abnormal growth on boles and branches. Severe infection slows down tree growth and weakens the bole of the tree around infection points (Ministry of Forests, 2001a, cited in Dorner and Wong).


---

\(^{11}\) Personal communication. Mark Salzl, Stewardship Forester, Ministry of Forests

\(^{12}\) Personal communication. Mark Salzl, Stewardship Forester, Ministry of Forests

\(^{13}\) Ibid
4.2.4 Human influences on ecosystems

Human-caused disturbances have helped to shape the landscapes dating back to gardening and select timber harvest by the Haida. In the last hundred years, accelerated logging, mining and clearing have introduced extensive change to the ecology of the Islands. Introduced plant and animal species, in particular deer, have altered the balance of ecosystems with associated impacts on indigenous flora and fauna. There are perhaps only one or two islands in the archipelago that have not been significantly impacted by one or more of these intentionally introduced species.

4.2.4.1 Industrial Timber Harvesting and Silviculture

Most of the logging that has occurred on the Islands has been on the Skidegate Plateau ecossection on Graham Island and north Moresby Island. Industrial logging, as defined by large-scale clearcut harvesting and extensive road development into previously undeveloped areas, began approximately 70 years ago and has had a significant influence on ecosystems.

Large-scale forestry in coastal areas has introduced spatial and temporal patterns of disturbance that deviate from natural processes. One of the main impacts of logging has been in changing the age-class distribution of forests across the landscape, replacing old forest with young forests that may be compositionally similar to old forests but lacking the structure and late successional elements (Pojar, 2003b). Clearcut forests, in particular, are much less diverse in structure than natural forests. These forests are commonly uniform in age, creating a single, closed canopy layer. Woody debris, such as snags and logs are less common. Managing to a rotation age of less than 80 years (as compared to >500 years disturbance return interval in unmanaged forest) does not allow time for forests to return of the massive structure and diversity of old growth forests (Franklin, 1992). The introduction of variable retention systems of harvesting may have increased the amount of windthrow, and studies have since been undertaken to assess the situation.

Industrial forestry may also impact non-forested ecosystems, such as intertidal zones and sub-marine systems. Another significant impact resulting from clearcutting and road construction has been an increase in mass wasting events. This is particularly true in the Islands, where the rate of mass wasting events is high compared with other areas on the coast (Gimbarzevsky, 1988). A number of studies have been carried out to assess the impact of logging operations on slope stability. A 1983 study by Schwab in Rennell Sound showed a 15-times greater rate of mass wasting on human-modified terrain than on forested terrain. Debris avalanches were 43 times larger for clearcuts and 17 times larger for roads than compared to unmodified terrain. Relative to forested terrain, transportation of large volumes of material occurred 46 times more often from clearcuts and 41 times more often from roads. The length of stream scoured by debris torrents was 7 times greater in clearcuts and 21 times greater in roads (Scwab, 1983). Rood (1984) showed that the overall effect of logging increases the frequency of landslides by 34 times over a 7.3 year period. Changes in the management of logging have resulted in a reduced rate of failures in recent years (Schwab, 1998), particularly as a result of more accurately assessing terrain conditions, so that potential failure zones can be avoided.

For the most part, plant species composition has not changed permanently or significantly at a landscape scale as a result of logging (Pojar, 2003b). However, deer browsing on logged openings, as well as silviculture practices that encourage commercially preferred species over the pre-logging profile, can change plant species composition considerably on a stand-by-stand
basis. For example, the combined effect of removing mature cedars and loss of young cedars to deer is expected to result in a significant portion of the area occupied by cedar on good and moderate sites converting to spruce and hemlock after harvesting. Also, since the 1980s, harvested areas on the Islands have mainly been regenerated artificially. The primary tree species planted include western redcedar and Sitka spruce, although a small amount of western hemlock and lodgepole pine are also planted. Stand management practices such as thinning may favour commercially preferred species such as spruce. This shift in plant species composition has important cultural as well as ecological implications. The QCI Forest District has recently updated its Cedar Policy, in place since 1995, to require that the amount of cedar planted reflect the amount of cedar harvested (by volume). The Cedar Policy also requires that a certain number of cedar/ha be established that are above deer browse height (1.2m).  

In the last decade, forest management has increasingly focussed on managing forestry activities to maintain the natural diversity of ecosystems. This requires an understanding of natural disturbance dynamics and the ways that current habitat patterns and attributes of the landscape have been produced by historical natural disturbance regimes (Rogers 1996, cited in Parminter and Daigle, 1997). One of the fundamental assumptions behind the application of coarse filter biodiversity strategies under the BC Forest Practices Code is that the more managed forests resemble the forests that were established through natural disturbances, the greater the probability that all native species and ecological processes will be maintained (MoF and MELP, 1995a). Section 5.3.7.1: Forestry and Forest Management describes current forest management to maintain biodiversity.

4.2.4.2 Introduced plant and animal species-

**Introduced plant species**

Introduced plants comprise 22% of the known plant species on the Islands. Engelstoft (2002) compiled a list of 215 introduced vascular plants. 41 of these have the actual or potential ability to alter native vegetation (J.Pojar pers comm 2002, cited in Engelstoft 2002).

Where introduced species thrive, they may displace certain native and endemic plant species, thereby altering the natural diversity of the Islands. A change in the composition of plant species can impact wildlife where habitats and food sources are altered or reduced. Introduced species also provide vectors for insect pests that may potentially impact native forests, e.g., woolly algids transfer from ornamental Douglas fir to Sitka spruce.

Introduced plant species of main concern include broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), Canada thistle (*Cirsium arvense*), marsh thistle (*C. palustre*), Japanese knotweed and Himalayan (sp) knotweed, (*Polygonum cuspidatum*) (Pojar, 2003b). Broom is considered to have had the most effect on native vegetation to date, invading several beach ecosystems, including open spruce forest and stabilized dune habitats (Pojar,2003b). A list of introduced vascular plant species of management concern is shown in Appendix E.

Pojar (2003b) notes that, potentially, the most dangerous species to the Islands would be a shade-tolerant shrub or herb that is unpalatable to deer and has a good dispersal mechanism, since such a species could rapidly take over the over-browsed and under-developed understory of native forests. To date, most weedy invaders have done well in open, disturbed habitats such

---

14 Mark Salzl, Stewardship Forester, Ministry of Forests. Personal communication.
as roadsides, clearings, gravel pits, fields and pastures, but have not survived in the forest understory.

**Introduced animal species**

There are many introduced animal species on the Islands. A number of these have had a significant impact on local ecosystems. Introduced animal species and their influence on local ecosystems is described in Section 4.3: Terrestrial Wildlife.

**4.2.4.3 Climate change**

Temperature and precipitation on coastal BC has been increasing. Climate models project that, by the end of the 21st century temperatures in BC will have increased by 1 - 4º Celsius from the existing average (Ministry of Water, Land and Air Protection, 2002). By 2050 winter precipitation on the north coast of BC is predicted to increase by as much as 40% from current levels. Predictions for summer precipitation are less consistent and range from a 30% decrease to a 30% increase. However, summer drought conditions are predicted to increase (Taylor and Taylor, 1997). The sea level on the North Coast is predicted to rise by 30 cm by the year 2050 (Environment Canada, 1997).

As climate is an important driver for various aspects of natural disturbances (Dorner and Wong, 2003), one can expect that the dynamics of natural disturbance regimes will change as well. The predicted increase in temperature may cause an increased frequency and intensity of forest fires. An increase in forest disease and insect infestations may occur as warmer summers place additional stress on trees and warmer winters increase pest survival (Government of Canada Climate Change website).

The predicted increase in precipitation may cause increased mass wasting in the landslide prone terrain of the Islands and, in combination with increased temperature, may contribute to increased spring flooding. Increased sedimentation and coastal flooding is predicted in low gradient intertidal areas (Environment Canada, 1997).

The Aleutian Low Pressure System, which influences the climate of the Islands during the winter is predicted to intensify, resulting in more severe winter storms (Taylor and Taylor, 1997, cited in Dorner and Wong, 2003). Consequently the extent and frequency of windthrow may be increased.

Biodiversity is expected to be greatly impacted by climate change. Changes in growing conditions will favour some species over others, affecting ecosystem composition and species range limits (Canadian Forest Service, 1999). Tree growth rates will change as the climate variables change and the growing season is lengthened. One model predicts that CWH forests may experience a catastrophic collapse, as trees become highly susceptible to frost events because of an inadequate chilling period to induce winter cold hardiness in western hemlock (Burton and Cummings, 1995 cited in Dorner and Wong, 2003). Western red cedar may play a greater role in the CWH forests of the future because of its superior adaptation to drought.

Studies of past climate change effects indicate that tree lines will rise in British Columbia (Pellat and Mathewes, 1996). Warmer weather will also favour the growth of western hemlock at higher elevations pushing the lower limit of the MH zone higher (Hedba, 1997). Increased temperatures may effect fish and wildlife populations as well, e.g., increases in sea level and...
more severe storm events could cause die back in waterfowl and migratory bird populations
(Environment Canada, 1997).

A team of researchers from the University of Victoria and Geological Survey of Canada is
commencing a three-year research project to investigate the impacts of climate change, both
environmental and socio-economic, on the northeast shores of Graham Island. This area, with
its extreme winds, energetic waves, and very high tides, has been identified by the Geological
Survey of Canada as one of the areas in Canada most sensitive to climate change. The area is
important ecologically, with its sensitive coastal wetlands, and is also the location of
considerable human activities and infrastructure, all of which could be significantly disrupted as
a result of climate change. The research team intends to work closely with local communities to
gain information on climate-related changes and to develop adaptation strategies for the future.
The work is intended to lay important groundwork for future work on sea-level risk impacts in
remote coastal communities in Canada (Walker, 2003).
4.3 Terrestrial Wildlife

4.3.1 Overview of Species

Haida Gwaii represents a unique array of terrestrial wildlife species. The Islands are host to a number of endemic species that are distinct from continental forms. As well, numerous introduced species are present, some of which are threatening the viability of endemic species. In addition, there is a conspicuous absence, especially in the alpine and subalpine communities, of some birds and mammals that are commonly found in these areas on the adjacent mainland (Cowan, 1989)

4.3.1.1 Mammals

Table 6 lists the 13 species or sub-species of mammals that are native to the Islands (Cowan, 1989). These mammals exhibit a remarkable degree of endemism, differing from their counterparts on the mainland in such respects as color, size, shape and habitat use. There are more unique sub-species on the Islands than in any other equal-sized area in Canada (Foster, 1982, cited in Golumbia et al, 2003). The separation of native species into endemic sub-species is now being tested by DNA analysis. The Dawson caribou was also endemic to the Islands but is now extinct, the last one being shot in 1908.

Table 6. Native Mammals of the Islands

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dawson caribou (extinct)</td>
<td>Rangifer tarandus dawsoni</td>
</tr>
<tr>
<td>River otter</td>
<td>Eumetopias jubata</td>
</tr>
<tr>
<td>Haida ermine</td>
<td>Mustela erineas haidarum</td>
</tr>
<tr>
<td>Pine marten</td>
<td>Martes Americana nesophilla</td>
</tr>
<tr>
<td>Haida Gwaii (Queen Charlotte Islands black bear)</td>
<td>Ursus americanus carlottae</td>
</tr>
<tr>
<td>Shrew (2 sub-species)</td>
<td>Sorex obscurus elassodon</td>
</tr>
<tr>
<td>Deer mouse (2 sub-species)</td>
<td>Sorex obscurus prevontensis</td>
</tr>
<tr>
<td>Bats</td>
<td>Myotis californicus caurinus</td>
</tr>
<tr>
<td>California myotis</td>
<td>Myotis keenii keenii</td>
</tr>
<tr>
<td>Keen’s long-eared myotis</td>
<td>Myotis lucifugus alascensis</td>
</tr>
<tr>
<td>Little brown bat</td>
<td>Lasionycteris noctivagans</td>
</tr>
</tbody>
</table>

The distinct physical characteristics of some mammals on the Islands, including black bear, weasel and marten and one race of shrew (S.o. elassodon), and genetic evidence of separate west coast lineages of these animals, suggest that they evolved as a result of isolation and survival in Pleistocene glacial refugia (Warner et al. 1982 as cited in Pojar 2003c). During this period the Islands were a refugium from the continental ice sheet that covered most of western North America and Hecate Strait and separated these species from their mainland kin. Haida
oral history also speaks of this phenomenon. Not all of the distinct species found on the Islands can be explained by glacial isolation. Since the deer mouse and the other race of shrew (S.o. prevosyensis) tend to evolve rapidly, a long period of isolation would not necessarily explain their present form and distribution. Insular forms of stickelback fish and ground beetle also appear to be the result of rapid evolution post-glacially (Moodie and Reimchen 1976, Clarke et al 2001 as cited in Pojar 2003c).

The number of native mammal species found on the Islands is small compared to the mainland, where twenty additional mammals species are known to occur. It is important to note the absence of brown lemming (Lemmus sibiricus), northern bog lemming (Synaptomys borealis), heather vole (Phenacomys intermedius), hoary marmot (Marmota caligata), and pika (Ochotona princeps) from the alpine habitats, mink (Mustela vison) from the shoreline and northern red-backed vole (Clethrionomys rutilus) from the forests (Cowan, 1989). Red squirrel (Tamiasciurus hudsonicus) occur naturally on the mainland, but have been introduced to the Islands.

4.3.1.2 Amphibians

The western toad (Bufo borealis) is the only native amphibian on the Islands. The absence of amphibians such as the tailed frog and the cloud salamander is a defining characteristic of the the Islands’ forested ecosystems.

4.3.1.3 Birds

The islands are known for their large populations of bird species. Although the number of species is smaller than on the adjacent mainland (remote islands predictably have fewer species), millions of birds visit or nest in the archipelago every year. Over 283 species have been recorded on the islands and adjacent waters since about 1890 and seventy-five species are known to nest on the Islands (Hamel and Hearne 2003). Thirty-five of these nesting species are water or marine birds, including ducks, geese, loons, gulls, shorebirds, seabirds and others; forty species are terrestrial birds including hawks and raptors, songbirds, woodpeckers and others.. Almost every one of the bird families is represented (Hamel and Hearne 2003).

There are three well-defined sub-species of bird that are known to be endemic to the Islands (CDC, 2003). These are the Northern (Queen Charlotte) Saw-whet Owl (Aegolius acadicus brooks); the (Queen Charlotte) Hairy Woodpecker, picoideus subspecies (Picoides villosus picoideus); and the (Queen Charlotte) Steller’s Jay, carlottae subspecies (Cyanocitta stelleri carlottae) (Cowan, 1989). The Pine Grosbeak (Pinicola enucleator carlottae) is found on the Islands and Vancouver Island and is also thought to occur on the BC mainland (CDC, 2003).

As noted in Sections 4.3.2.4 and 4.3.2.5, there are 19 species of birds nesting on Haida Gwaii that are red or blue listed by the Conservation Data Centre.

This section is divided into land birds and marine birds. However, it is important to recognize that, although a number of birds are classed as seabirds, they nonetheless nest on shore and are therefore potentially affected by land management decisions.

15 The 75 species recorded as nesting by Hamel and Hearne includes three species that are not included in the Checklist of the Birds of Haida Gwaii (Morris, 2001) but does not include the Savannah Sparrow (recorded by Morris as nesting) or the non-native introduced Ring-necked Pheasant. If the non-native nesting species are included, the number of nesting species is 76. If the Savannah Sparrow is included the number of nesting species is 77.

16 Hamel and Hearne list 8 species that they consider to be endemic subspecies on Haida Gwaii – Northern Saw-whet Owl, Hairy Woodpecker, Steller’s Jay, Brown Creeper, Swainson’s Thrush, Varied Thrush, Townsend’s Warbler and Pine Grosbeak. They point out that the Northern Saw-whet is being considered as a possible separate species.
**Land Birds**

All of the nesting species use the terrestrial habitats of the islands. Some that are considered seabirds or waterbirds actually nest deep in the forest. Others are considered terrestrial bird species. They are supported by a range of habitats and habitat features, including early and old seral forests, riparian areas, forest edges, estuaries, bogs and other wetlands or particular structures within these habitats, like snags, large branches, or thickets of shrubs. Several of the land bird species are discussed in more detail later in Sections 4.3.2.4 and 4.3.4.5 of this report. Table 7 summarizes nesting land birds on the islands, based on a checklist prepared by M. Morris (2001).

Table 7. Land birds of the Islands

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald eagle</td>
<td>Haliaeetus leucocephalus</td>
<td>Brown Creeper</td>
<td>Certhia americana</td>
</tr>
<tr>
<td>Sharp-shinned hawk</td>
<td>Accipiter striatus</td>
<td>Winter Wren</td>
<td>Troglodytes troglodytes</td>
</tr>
<tr>
<td>Northern goshawk</td>
<td>Accipiter gentiles</td>
<td>American Dipper</td>
<td>Cinclus mexicanus</td>
</tr>
<tr>
<td>Red-tailed hawk</td>
<td>Buteo jamaicensis</td>
<td>Golden-crowned Kinglet</td>
<td>Regulus satrapa</td>
</tr>
<tr>
<td>Peale’s peregrine falcon</td>
<td>Falco peregrinus pealei</td>
<td>Swainson’s Thrush</td>
<td>Catharus ustulatus</td>
</tr>
<tr>
<td>Blue Grouse</td>
<td>Dendragapus obscurus</td>
<td>Hermit Thrush</td>
<td>Catharus guttatus</td>
</tr>
<tr>
<td>Northern Saw-whet owl</td>
<td>Aegolius acadicus</td>
<td>American Robin</td>
<td>Turdus migratorius</td>
</tr>
<tr>
<td>Rufous Hummingbird</td>
<td>Selaphorus rufus</td>
<td>Varied Thrush</td>
<td>Ixoreus naevius</td>
</tr>
<tr>
<td>Belted Kingfisher</td>
<td>Ceryle alcyon</td>
<td>Cedar Waxwing</td>
<td>Bombycilla cedrorum</td>
</tr>
<tr>
<td>Red-breasted Sapsucker</td>
<td>Sphyrapicus ruber</td>
<td>European Starling</td>
<td>Sturnus vulgaris</td>
</tr>
<tr>
<td>Hairy Woodpecker</td>
<td>Picoides villosus</td>
<td>Orange-crowned Warbler</td>
<td>Vermivora celata</td>
</tr>
<tr>
<td>Northern Flicker</td>
<td>Colaptes auratus</td>
<td>Townsend’s Warbler</td>
<td>Dendroica townsendi</td>
</tr>
<tr>
<td>Pacific-slope Flycatcher</td>
<td>Empidonax difficilis</td>
<td>Wilson’s Warbler</td>
<td>Wilsonia pusilla</td>
</tr>
<tr>
<td>Tree Swallow</td>
<td>Tachycineta bicolar</td>
<td>Fox Sparrow</td>
<td>Passerella iliaca</td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>Hirundo rustica</td>
<td>Song Sparrow</td>
<td>Melospiza melodia</td>
</tr>
<tr>
<td>Steller’s Jay</td>
<td>Cyanocitta stelleri</td>
<td>Lincoln’s Sparrow</td>
<td>Melospiza lincolnii</td>
</tr>
<tr>
<td>Northwestern Crow</td>
<td>Corvus caurinus</td>
<td>Dark-eyed Junco</td>
<td>Junco hyemalis</td>
</tr>
<tr>
<td>Common Raven</td>
<td>Corvus corax</td>
<td>Pine Grosbeak</td>
<td>Pinicola enucleator</td>
</tr>
<tr>
<td>Chestnut-backed Chickadee</td>
<td>Parus rufescens</td>
<td>Red Crossbill</td>
<td>Loxia curvirostra</td>
</tr>
<tr>
<td>Red-breasted Nuthatch</td>
<td>Sitta canadensis</td>
<td>Pine Siskin</td>
<td>Carduelis pinus</td>
</tr>
</tbody>
</table>
Marine Birds

Approximately 1.5 million seabirds from 12 species nest on the Islands (Table 8). Nest sites have been recorded on Graham and Moresby Islands and on more than 200 of the offshore islands and islets in the archipelago (Harfenist 2003). Major breeding populations exist on Langara, Frederick, Hippa, Lyell, Rankine and Kerouard Islands and Anthony Islets. The Islands support one half of the global breeding population of ancient murrelets and are the only place in Canada where this species nests (Gaston, 1994, cited in Harfenist et al, 2002). One fifth of the world’s breeding Cassin’s auklets nest in the archipelago (Rodway, 1991, cited in Harfenist et al, 2002). The Islands have one of only two confirmed nesting sites for horned puffins in Canada (the other is Triangle Island, north of Vancouver Island), one of only three confirmed nesting sites for common murres in BC, and one of the major rhinoceros auklet colonies in BC.

The area also supports millions of other marine birds. These include non-breeding individuals from species that breed in the region as well as species that breed in other regions (e.g., arctic, sub-arctic, and northern boreal habitats) but stop at the Islands to feed during their seasonal migration. Many of the migratory bird species migrate and overwinter in large aggregations (Harfenist et al 2002). Seabirds provide an important prey base for a variety of raptors and avian predators. The Islands are home to at least 75% of the BC population of Peale’s peregrine falcons (van Drimmelen 1986, cited in Harfenist et al, 2002). The estimated number of active nest sites surveyed between 1971 and 2000 has varied between 56 and 79 (Harfenist et al. 2002). There are 638 known bald eagle nest sites, although much of the coast and interior of Graham Island and northern Moresby Island have not been surveyed (Harfenist et al. 2002).

Because seabirds nest on land but feed at sea, they are vulnerable to a variety of challenges. Introduced animals, primarily rats and raccoons, pose a serious land-based threat to seabirds nesting on the Islands. Both rats and raccoons kill adults, chicks and eggs in their burrows and kill birds on the surface (Harfenist 2003). The introduction of these predators to islands with nesting colonies can cause dramatic reductions in the local seabird populations. For example, the introduction of raccoons to Helfesen Island caused an 83% reduction in ancient murrelets, 95% reduction in Cassin’s auklet and 79% reduction in rhinoceros auklets over seven years (Gason and Masselink 1997, cited in Harfenist 2003).

Land-based activities by humans that impact nesting seabirds include habitat loss and degradation and recreational activities. Forestry activities cause a reduction in the big-structured stands that act as nesting habitat for marbled murrelet and beach salvage operations can impact seabirds nesting close to the shoreline (e.g., ancient murrelets, Cassin’s auklets, and rhinoceros auklets). Other developments that alter shorelines, such as lodge development, recreation sites, and mariculture sites, may also impact habitat quality. In addition, birds may be disturbed by recreationists during vulnerable periods. Noises, physical disturbance, and lights can disturb and disorient birds, causing them to leave their nests or hurt their young or themselves (Harfenist 2003).
Table 8. Breeding seabirds on the Islands, based on information in *Seabird Colonies Background Report for the Haida Gwaii/Queen Charlotte Islands Land Use Plan* (Harfenist 2003). Note, the estimated numbers of common murre, pigeon guillemot and marbled murrelet is of individual birds and not breeding pairs due to challenges with locating and counting nests.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Northern Haida Name</th>
<th>Southern Haida Name</th>
<th>Scientific Name</th>
<th>Estimated # of breeding pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fork-tailed Storm-petrel</td>
<td>st’quana</td>
<td>jiik’iiga, sdaagwaana, jiik’iida</td>
<td>Oceanodroma furcata</td>
<td>53,400</td>
</tr>
<tr>
<td>Leach’s Storm-petrel</td>
<td>st’quana</td>
<td>jiik’iiga, sdaagwaana, jiik’iida</td>
<td>Oceanodroma leucorhoa</td>
<td>103,000</td>
</tr>
<tr>
<td>Pelagic Cormorant</td>
<td>kelow</td>
<td>k’yaaluu</td>
<td>Phalacrocorax pelagicus</td>
<td>280</td>
</tr>
<tr>
<td>Glaucous-winged Gull</td>
<td>skun</td>
<td></td>
<td>Larus glaucescens</td>
<td>164 birds</td>
</tr>
<tr>
<td>Common Murre</td>
<td>gwaah</td>
<td></td>
<td>Uria aalge</td>
<td></td>
</tr>
<tr>
<td>Pigeon Guillemot</td>
<td>skadwa</td>
<td>sgaaxudaawa, jaadxaws, sgaaxadawaa</td>
<td>Cepphus columba</td>
<td>Approx 5100 birds</td>
</tr>
<tr>
<td>Marbled Murrelet</td>
<td>tilum</td>
<td>ts’alang.ah</td>
<td>Brachyramphus marmoratus</td>
<td>8500 – 9500 birds</td>
</tr>
<tr>
<td>Ancient Murrelet</td>
<td>saduna</td>
<td>sgin xaana, skin xaana</td>
<td>Synthliboramphus antiquus</td>
<td>256,000</td>
</tr>
<tr>
<td>Cassin’s Auklet</td>
<td>hutso</td>
<td>hajaa</td>
<td>Ptychoramphus aleuticus</td>
<td>297,000</td>
</tr>
<tr>
<td>Rhinoceros Auklet</td>
<td>hlagwaats’ii</td>
<td></td>
<td>Cerorhinca monocerata</td>
<td>23,900</td>
</tr>
<tr>
<td>Horned Puffin</td>
<td></td>
<td></td>
<td>Fratercula corniculata</td>
<td>Breeding on the Islands has not been confirmed</td>
</tr>
<tr>
<td>Tufted Puffin</td>
<td>quana</td>
<td>kuxana</td>
<td>Fratercula cirrhata</td>
<td>560</td>
</tr>
</tbody>
</table>

17 This published estimate (Rodway 1988) is thought to be low because most cave-nesting pairs were missed during surveys (Harfenist 2003)
18 Estimates for pigeon guillemots may be inaccurate because nests are difficult to find and bird counts are used as a substitute for nest counts (Harfenist 2003)
19 Is based on counts of individual birds on the water and does not represent an estimate of breeding birds (Harfenist 2003)
20 Local data indicates that the observed numbers of rhinoceros auklets far exceeds the number of inventoried breeding pairs (Peter Hamel, Ornithologist, personal communication)
21 This estimate of breeding pairs is a rough approximation based on counts of the number of birds standing around burrows (Harfenist 2003)
4.3.2 Species at Risk

There are a number of endemic and non-endemic species on the islands that are considered to be at risk, either because of conflicts with human activities or alterations or loss to their habitats. A comprehensive list of COSEWIC and CDC-listed species (animal and plant) is provided in Appendix D.

4.3.2.1 COSEWIC

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) provides advice to governments on the status of wildlife species in Canada. COSEWIC assesses the level of risk of extinction for wildlife based on the best available scientific, traditional and community knowledge on the status of these species. COSEWIC produces a national list, which classifies species into categories based on level of risk. The five “risk” categories are defined as follows:

- Extinct - a species that no longer exists.
- Extirpated - A species no longer existing in the wild in Canada but occurs elsewhere.
- Endangered - A species facing imminent extirpation or extinction.
- Threatened - A species likely to become endangered if limiting factors are not reversed.
- Special Concern - A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Species at Risk Act (SARA)

The federal Species at Risk Act (SARA) was proclaimed on June 5, 2003. SARA aims to protect wildlife at risk from becoming extinct or lost from the wild, with the ultimate objective of helping their numbers to recover. The Act covers all wildlife species listed as being at risk nationally and their critical habitats.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is given legal status under SARA. The assessments by COSEWIC on the status of wildlife species will form the basis for the Minister of Environment’s recommendations to the Governor-in-Council for the List of Wildlife Species at Risk.

4.3.2.2 BC Conservation Data Centre

In BC, the Conservation Data Centre (CDC), in the Ministry of Sustainable Resource Management, assigns the provincial rank, which is based solely on its status within BC. The CDC ranks plants and plant communities as well as wildlife, sorting species into groups (lists) with similar conservation risks. The three lists that have been created are described as follows:

- Red list - species that have been legally designated as Endangered or Threatened under the Wildlife Act, are extirpated, or are candidates for such designation.
- Blue List - species not immediately threatened, but of concern because of characteristics that make the particularly sensitive to human activities or natural events.
4.3.2.4 Red-listed Species

The following is a brief description of CDC red-listed mammals and birds that breed on the Islands and the management issues associated with them.

**Haida Ermine**

The Haida ermine (*Mustela erminea haidarum*) is recognized as an endemic sub-species of ermine. Early records suggest that the ermine was once plentiful. Around the turn of the century, Haida ceremonial robes and blankets made of ermine skins were common. The population decreased dramatically after the 1920s and only a few records of the Haida ermine have been reported since the 1960s (Golumbia 2001a). Cowan (1989) describes it as “an extremely rare animal, perhaps the rarest of all British Columbia mammals.”

Ermine are thought to have a broad distribution on both Graham and Moresby Islands as well as Louise and Burnaby Islands (Reid et al, 1999). They have been observed in both forested and shoreline habitat primarily in the lower elevation CWHwh1. Available potential prey for ermine on the Islands include a few endemic small mammals (e.g. deer mouse), rats, birds, eggs, and invertebrates (Reid et al. 1999).

There are several suspected reasons for the rarity of ermine. Ermine are not particularly well adapted to catching any of the prey species listed above and therefore their food sources are limited and they need to resort to scavenging. Another factor is competition with other predators such as the pine marten, red squirrel, roof rat and the racoon. Lastly ermine are prey to domestic and feral cats, and potentially bald eagles, Queen Charlotte goshawks, sharp-shinned hawks, red tailed hawks and marten (Reid et al. 1999).

The ermine is considered a red-listed species (rare) in B.C. and is classified as threatened by COSEWIC.

**Keen’s Long-eared Myotis**

Keen’s long-eared myotis (*Myotis keenii*), or Keen’s myotis are small bats weighing between 4 and 6 grams. These bats have one of the most restricted distributions of any North American bat, being found primarily in the coastal temperate rainforests. However, due to their secretive nature, little is known of their distribution and abundance. The limited information available suggests that reproductive Keen’s myotis show high fidelity to maternity roosts (Burles et al. *in prep.*).

The only maternity colony known for the species is located at Gandll K’in Gwaayaay (Hotsprings Island) in the Gwaii Haanas. Both Keen’s myotis and little brown bats were found there roosting under large boulders, in crevices and in a small cave that were all geothermally heated by a hot springs (Firman et al. 1993; Burles 2001, cited in Burles et al. *in prep.*). A study carried out between 1998 and 2000 indicated that there were at least 40 Keen’s myotis and 70 little brown myotis adult females using the roosts to raise their young at Gandll K’in Gwaayaay (Burles 2001 cited in Burles et al., *In prep.*).
It is speculated that Keens’ myotis may hibernate in tree snags along the shoreline because the ocean would moderate temperatures there (Burles et al., In prep). Their diet is suspected to consist of moths, spiders and other insects.

The species has red-listed status in B.C. due to its restricted distribution, apparent rarity and their uncertain population status.

**Queen Charlotte Goshawk**

The Queen Charlotte goshawk (*Accipiter gentilis laingi*) is a coastal sub-species of the northern goshawk that occurs on the Islands, Vancouver Island, SE Alaska and probably on the adjacent BC mainland. This raven-sized bird is primarily adapted to forest habitats where its short, rounded wings, long tail, and powerful flying action make it an hunter, capable of quick acceleration and excellent maneuverability through the forest (Mahon et al, 2003). The goshawk’s main prey are small animals associated with mature forests such as red squirrels, forest passerines (e.g. thrushes, woodpeckers) and grouse (Doyle and McLennan *in prep.*). In coastal areas, goshawks also hunt marbled murrelets and northwestern crows (Lewis 2001 cited in Doyle and McLennan *in prep.*).

Goshawks nest in even-aged mature and old growth coniferous forests with closed canopies and open understories. The breeding season for the Queen Charlotte goshawk is generally from March 15 through September 1, however, breeding times may vary yearly and by site (MFor/MELP, 1999).

The home range is composed of nest sites, nest areas, a post-fledging area and a foraging area. The nest area has multiple nests and estimates of its size range from 8 ha (Reynolds 1983 cited in Doyle and McLennan *in prep.*) to 50 ha (McCarthy et al 1989 cited in Doyle and McLennan *in prep.*). Goshawks exhibit a strong fidelity to their nest areas (Reynolds et al. 1983 cited in Doyle and McLennan *in prep.*).

The post-fledging area surrounding the nest area is used by juvenile goshawks once they have fledged from the nest but before they disperse from the area. Post-fledging areas are estimated to range from 170 ha (Kennedy et al. 1994 cited in Doyle and McLennan *In prep.*) to 240 hectares (BC Ministry of Forests 1999).

The foraging area is the entire area used by adults and occupies about 9000 – 10,000 hectares (Doyle, *In prep*). Studies have shown that goshawks prefer to hunt in mature, even-aged, closed canopy forests with a clear understory, even when prey is more abundant elsewhere. This habitat that allows goshawks to move freely under the canopy, allows good visibility of its prey and also provides ample perches from which it hunts (Squires and Reynolds 1997 as cited in Mahon et al, 2003).

Six goshawk nests have been identified to date on the Islands (Doyle, *In prep*). Based on spacing and distribution of remaining suitable habitat, this equates to an estimated 20 – 30 pairs in the Skidegate Plateau ecossection and up to 18 in the other two ecossections. All of the six known nests are in old growth (*Doyle, In prep*). Using the best and worst known adult and immature survival rates from other studies and combining it with the know reproductive success

---

22 It is uncertain which of the two BC subspecies of goshawk lives on the coastal mainland, but it is probably the laingi subspecies (Cooper and Stevens, 2000 as cited in Mahon et al, 2003).
of goshawks on Haida Gwaii, goshawks are thought to be declining by between 3-21% annually (Doyle, In prep).

Queen Charlotte goshawks are a red-listed species because its population is sparse, restricted to coastal forest, and heavily reliant on mature to old-growth forest.

**Marbled Murrelets**

Marbled murrelets (*Brachyramphus marmoratus*) are small seabirds that nest in coastal old-growth forests using large mossy branches for their nesting platforms. They are the only seabird species to nest in older-aged coniferous forests throughout most of their range (Nelson and Hamer, 1995). Although marbled murrelets are difficult to census because of their nest location, it is estimated that the Islands support approximately 6,800 marbled murrelets, which is about 10% of the BC breeding population (Burger 2002 cited in Harfenist et al. 2002). They probably nest where suitable habitat exists on the larger islands of Haida Gwaii/QCI (Harfenist et al. 2002).

The marbled murrelet spends the majority of its time at sea, where it feeds on small ocean fish such as sand lance and herring. The birds are usually found close to shore where they tend to forage in waters less than thirty meters in depth (Burger 2002 cited in Harfenist et al. 2002). The reproduction rate is very low with only one egg per year (Harfenist 2003).

Marbled murrelets are listed as a threatened species by COSEWIC and a red-listed species in B.C. The primary threats to this species are considered to be the loss of nesting habitat in old-growth forests and at-sea mortality caused by gill-netting and oil spills.

The marbled murrelet is designated as an “Identified Wildlife” species under the *Forest Practices of BC Act* (see Section 5.3.7). As a result of growing concern over the loss of marbled murrelet habitat, the Forest Practices Board has recently released a special report (2003) that assesses the effectiveness of the Forest Practices Code in conserving habitat for this species. The report found that conservation planning for marbled murrelets under the Code has not worked very well to this point. The existing regulatory and approval process under the Code allowed forest practices to be approved while marbled murrelet habitat conservation awaited inventory and passed through a complex, slow impact assessment process. As a result, future options for habitat conservation have been rapidly lost.

The Board suggested that Wildlife Habitat Areas (WHA) should be established more quickly and encouraged forest industry licensees and government to explore incentives and innovative approaches to collecting information, so that interim habitat areas can be refined and areas that are not suitable nesting habitat can be removed from habitat reserves.

**Other Seabirds**

Other seabirds that are red-listed and breed on the Islands include, the Common Murre (*Uria aalge*), Pelagic Cormorant (*Phalacrocorax pelagicus pelagicus*), and Horned Puffin (*Fratercula corniculata*). A more detailed description of these species is available in the report “Seabird Colonies Background Report for the Haida Gwaii/Queen Charlotte Islands Land Use Plan” (Harfenist 2003) Although red-listed, local data supports substantial numbers of the common murre and pelagic cormorant in Haida Gwaii.

---

23 Personal communication. Peter Hamel, Ornithologist.
The greatest concern for nesting seabirds on the Islands are predatory racoons (*Procyon lotor*) and rats (*Rattus spp.*). These introduced predators have caused significant reductions, and in some cases complete loss, of breeding populations on some islands in the archipelago (Harfenist, 2003). Human impacts include removal of vegetation that provides habitat; disruption as a result of tourism and recreation activities, boating, fishing, and aircraft flying over nesting sites; and oil spills and other pollution. The degree of impact depends on numerous factors such as the time of year, the species involved and the location of the colony.

**Marine mammals**

A number of marine mammals that frequent the waters off of Haida Gawii/QCI are red-listed. These include the sea otter (*Enhydra lutris*), northern sea lion (*Eumetopias jubatus*), northern right whale (*Eubalaena glacialis*), and two populations of killer whale (northeast Pacific resident population and west coast transient population). Marine mammals are not discussed in this document.

**4.3.2.5 Blue Listed Species**

There are 14 blue-listed bird species that breed on the Islands. Four or these are described below. There are no blue-listed terrestrial mammals on the Islands, but a number of blue-listed marine mammals (grey whales, sperm whales, humpback whales, and offshore killer whales) frequent the waters offshore. Two species of freshwater fish are blue-listed: a sub-species of cutthroat trout (*Oncorhynchus clarki clarki*) and Dolly varden (*Salvelinus malma*).

A complete list of blue-listed species is provided in Appendix D. Detailed information on blue-listed marine birds can be found in Harfenist (2003) or in *Living Marine Legacy of Gwaii Haanas. III: Marine Bird Baseline to 2000 and Marine Bird-related Management Issues throughout the Haida Gwaii Region* (Harfenist et al. 2002).

**Peale’s Peregrine Falcon**

The Peale’s peregrine falcon (*Falco peregrinus pealei*) is a marine raptor found on the coast from the Aleutian Islands to southern Vancouver Island (Nelson 1990, Harfenist et al. 2002). This year-round resident of the Islands nests primarily on cliff ledges, usually near seabird colonies. The peregrine falcon is a highly specialized hunter of small seabirds such as the ancient murrelet.

Extensive falcon research, including a annual censuses, has taken place on Langara Island. Since the 1970’s, B.C. Wildlife Branch surveys around the Islands have occurred every five years. Survey results for Haida Gwaii/QCI in 2000 indicate 76 eyries. The exact location of eyries (nests) is usually kept secret for the security of the eggs and young from poachers, (Harfenist et al. 2002), and from hikers, photographers and others who, by incautious visits near nests, may cause nesting failures. Because of citizen and agency surveillance, little poaching has occurred in recent decades. Nesting falcons are easily alarmed by human activities near eyries and such activities may result in chilling and death of eggs or nestlings. If disturbance is persistent, it can lead to abandonment of the nesting territory (Golumbia 2001a, Nelson, pers. comm.).

The population of nesting peregrine falcons on the Islands has declined since the 1950s and their numbers appear to have stabilized at a much lower density (Golumbia 2001a). The decline in the nesting population of falcons appears to be primarily due to reduced numbers of their
seabird prey. The populations of ancient murrelets and other small seabirds on Haida Gwaii have been reduced by the introduced rats and raccoons that kill large numbers of eggs and adults in the seabird colonies. Some measures (poisoning and shooting) have been successful in removing or reducing this predation from several seabird colonies, but logistical difficulties with the control measures may mean that some seabird colonies are unlikely to persist (Gaston 1994, Kaiser et al. 1997, Lemon and Gaston 2003).

The perpetuation of the peregrine falcon population on Haida Gwaii will be best served by five measures: (1) preventing developments and other disturbances near traditional falcon nesting cliffs, (2) protecting the seabird colonies from logging or other physical disturbance, including space for nesting colonies to expand, (3) eradication or maintenance-removal of rats and raccoons from seabird nesting islands, (4) preventing the loss of seabirds at sea by gill netting or by oiling or other industrial accidents, and (5) continued vigilance by citizens and government for activities that threaten the falcon-seabird-ocean ecosystem\(^\text{24}\).

The peregrine falcon has been designated as a Species of Concern and its prey, the ancient murrelet, has been designated as Vulnerable, by COSEWIC.

**Sandhill Crane**

The sandhill crane is a blue-listed species because of habitat loss, and the degradation of habitat in other parts of the province, and lack of data on breeding populations. Cranes roost and feed in open wetland areas such as bogs, swamps, marshes, estuaries, fens, and dry upland areas. They nest in secluded freshwater wetlands that are surrounded by forest cover. In B.C., the sandhill crane is a solitary nester with breeding pairs sparsely distributed across available habitat. Nests are large heaps of vegetation in water, surrounded by a screen of emergent vegetation.

Sandhill cranes nest throughout the extensive coastal bogs of the Queen Charlotte Lowlands ecosction. Cranes have also been observed in similar wetland habitats within the Skidegate Plateau ecossection although these non-forested areas are much more limited in extent on the rolling plateau areas. Very high concentrations of cranes are found in Delkatla and environs\(^\text{25}\). The Rose Spit ER is an important staging area for the birds.

**Ancient murrelets**

Ancient murrelets (\textit{Synthliboramphus antiquus}) are small seabirds that feed largely on plankton, normally more than 2 km off shore (Harfenist 2003). The birds only come to land to breed between March and late-June. They are burrow-nesters and breed up to about 500 metres inland on islands covered by temperate rainforests. Within 2 days of hatching, the chicks leave the colony on foot and do not return to land until about 3 years of age when they attempt to breed.

The Islands are the only place in Canada where ancient murrelets nest. Approximately 256,000 pairs of ancient murrelets nest there (Harfenist et al. 2002). About half of these nest off the west coast of Graham Island and on Langara, Frederick and Hippa Islands. The 33 known breeding colonies on the Islands support half of the world’s total breeding population (Harfenist 2003).


\(^{25}\) Personal communication. Peter Hamel. Ornithologist.
The ancient murrelet is a blue-listed species due to the distribution of nests (most concentrated in a few sites) and due to threats from introduced predators such as rats and raccoons (Harfenist 2003). Oil spills, human disturbance mortality in gill nets and habitat loss due to logging are also considered threats.

The Laskeek Bay Conservation Society has been carrying out a long-term research and monitoring program involving the ancient murrelet population on East Limestone Island. The work of the Society began in 1990 and is the longest continuous monitoring program for this species in the world.

**Cassin’s Auklet**

Cassin’s auklet (*Ptychoramphus aleuticus*) is a small seabird that feeds along most of the outer coast in off-shore waters. It comes to land only to breed, from late spring through summer. It is a burrow-nester, occupying sites with grassy or low shrub cover. The chicks are fed in their burrows for several weeks before departing with their parents to the ocean and they don’t return until about age 3, when they are ready for breeding.

Cassin’s auklet is the most abundant breeding seabird on the Islands, with an estimated 297,000 pairs nesting at 45 colonies. This represents about 18% of the world’s breeding population (Rodway, 1991, cited in Harfenist, 2003). Most colonies on the Islands are located on the perimeter of forested islands. Some colonies are small with 1000 to 5000 birds. Other larger ones such as on Rankine, Frederick, Hippa and Langara Islands have up to 60,000 birds.

The Cassin’s auklet is a blue-listed species because a large proportion of the population is concentrated in a few colonies making it vulnerable to catastrophic events such as oil spills; threats from introduced predators and human disturbance are also reasons (Harfenist 2003).

**4.3.3 Other Species of Interest**

**Haida Gwaii Black Bear**

The Haida Gwaii black bear (*Ursus americanus carlottae*) is a recognized sub-species of the American black bear. It is an insular race that is characterized by a massive skull, large molars and black colour phase only. It is believed that bears on Vancouver Island and the Islands have retained more of their ice-age characteristics than mainland bears because of a long period of isolation from continental populations (BCMELP 2001).

Although inventory on black bears on the Islands has not been undertaken, population densities of bears are considered high in prime areas. In Gwaii Haanas, the black bear is thought to utilize the alpine areas of the San Christoval Mountains in spring and early summer and then move down to salmon spawning streams in late summer and autumn. The inter-tidal zone is also used for foraging by some bears (Golumbia 2001a).

The spread of human activity through the islands has led to an increase in bear-human interactions and an associated increase in risk of bear mortality. Hunting pressures, changes in seral stage distribution, ecosystem fragmentation, loss of critical habitat and increased human access are potential threats to the species. The interaction with introduced deer is poorly understood. While some predation and scavenging is known to occur, the deer have also reduced opportunities for foraging of plant foods.
The species may merit COSEWIC designation if the sub-specific status is determined (Golumbia 2001a).

### 4.3.4 Introduced Species

As a result of human travel and global trade, wildlife species are introduced to areas outside of their native regions. Introduced species often thrive in these new environments, being freed from the predators or parasites of their area of origin. Natural processes can be disrupted and habitat destroyed as a result of such invasions. This can be catastrophic for native species and it is a major cause of extinction throughout the world (Golumbia et al, 2003).

Islands such as Haida Gwaii/QCI are especially vulnerable to the effects of introduced species because of their isolation. Non-native species were mainly introduced to the Islands by the early European settlers. Since European contact in the late 18th century, ten mainland mammals, two amphibians, three birds and five domestic animals have been introduced to the Islands (Table 9) through human settlement patterns and active introductions (Engelstoft, 2002).

Table 9. Introduced Vertebrate Fauna to the Islands

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
<th>Earliest Known Date of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitka black tailed deer</td>
<td>Odocileus hemionus sitkensis</td>
<td>1878</td>
</tr>
<tr>
<td>European red deer</td>
<td>Cervus elaphus elaphus</td>
<td>1919</td>
</tr>
<tr>
<td>Rocky Mountain elk</td>
<td>Cervus elaphus nelsoni</td>
<td>1929</td>
</tr>
<tr>
<td>Raccoon</td>
<td>Procyon lotor vancouverensis</td>
<td>1940’s</td>
</tr>
<tr>
<td>Beaver</td>
<td>Castor canadensis leucodontus</td>
<td>1936</td>
</tr>
<tr>
<td>Muskrat</td>
<td>Ondatra zibethica osoyoosensis</td>
<td>1924</td>
</tr>
<tr>
<td>Red squirrel</td>
<td>Tamiasciurus hudsonicus anuginosus</td>
<td>1947</td>
</tr>
<tr>
<td>Black rat</td>
<td>Rattus rattus</td>
<td>1919</td>
</tr>
<tr>
<td>Norway rat</td>
<td>Rattus norvegicus</td>
<td>1922</td>
</tr>
<tr>
<td>House mouse</td>
<td>Mus musculus domesticus</td>
<td>1901</td>
</tr>
<tr>
<td>Pacific tree frog</td>
<td>Hyla relicula</td>
<td>1964</td>
</tr>
<tr>
<td>Red-legged frog</td>
<td>Rana aurora</td>
<td>2002</td>
</tr>
<tr>
<td>Ring necked pheasant</td>
<td>Phasianus colchicus</td>
<td>1913</td>
</tr>
<tr>
<td>House sparrow</td>
<td>Passer domesticus</td>
<td>1900?</td>
</tr>
<tr>
<td>European sparrow</td>
<td>Sturnus vulgaris</td>
<td>1980</td>
</tr>
<tr>
<td>Feral cattle</td>
<td>Bos taurus</td>
<td>1893</td>
</tr>
<tr>
<td>Feral goats</td>
<td>Capra hircus</td>
<td>1976</td>
</tr>
<tr>
<td>Feral dogs</td>
<td>Canis familiaris</td>
<td>No Date</td>
</tr>
<tr>
<td>Feral cats</td>
<td>Felis catus</td>
<td>No Date</td>
</tr>
<tr>
<td>Feral rabbits</td>
<td>Oryctolagus cuniculus</td>
<td>1884</td>
</tr>
</tbody>
</table>

*Source: Adapted from Golumbia et al, 2003*
Some introduced species have remained in localized populations around human settlement, while other more invasive species have spread throughout the entire archipelago. Studies of the potential destructive impact of introduced species on native flora and fauna have concentrated on those species with the widest range and that have had the greatest impacts. Other introduced species have had little attention and their effects on the environment are poorly understood (Engelstoft, 2002).

Since 1996, the Research Group on Introduced Species (RGIS), an international research group, has been studying how species introduced since European contact have changed the ecology of the Islands. The results of this research can be viewed on the RGIS website (www.rgisbc.com).

**Sitka Black-tailed Deer**

Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) were first introduced to the Islands in 1878 and on four occasions between 1911 and 1925. The deer’s ability to swim has allowed it to spread to most islands in the archipelago, with only 7 small offshore islands known to be deer free (Golumbia et al, 2003). Current estimates of the deer population on the Islands are as high as 60,000 individuals (S. Sharpe Pers. Comm. in Golumbia 2001a).

Deer have had an enormous impact on the ecosystems of the Islands. Observations by early foresters suggest that forests originally had a very dense understory, with an abundance of the species typical of coastal forest ecosystems such as salal, huckleberry, and devil’s club (Pojar, 2003b). In contrast, the deer-browsed forests have been described as park-like due to the paucity of trees and shrubs (Veblen and Alaback, 1996).

The Research Group on Introduced Species has conducted numerous studies on introduced deer and their impacts, including the establishment of numerous deer exclosures for long-term monitoring. Results show that deer actually eliminate redcedar regeneration in old growth forests while severely reducing it in secondary forests. Deer delay the recruitment of the other canopy trees and severely reduce the amount, the structural heterogeneity, and the diversity of plants found in the understory and on the shorelines, leading to significantly reduced abundance and vigour of shrub, fern and herb communities (Pojar and Banner, 1984; Pojar, 2003b). Secondary effects of a reduced forest understory are expected to result in changes to the availability and quality of habitat for indigenous wildlife such as black bear, Haida ermine, small mammals, ground-nesting and ground-feeding birds, the boreal toad and various species of microfauna.

The Council of Haida Nations Forest Guardians have undertaken several projects focused on restoration associated with deer impacts. Two deer exclosures have been constructed to protect culturally valuable plants from deer browse. One near the mouth of the Yakoun River is 30m X 30m in size. The other near Yakoun Lake is 2.5 hectares in size. The success of the exclosures in preventing deer browse and the restoration of culturally valuable plants is being monitored over time.

The results of these various studies will be used to better understand forest ecology and the impact of overabundant herbivores as well as to reduce biological, economic and cultural losses in the forests of the Islands. Although population density and dynamics and the seasonal movements of deer on the Islands are not yet fully understood, it is clear that the density and persistence of deer has a profound and long-term ecological effect.
Many people on the Islands rely on deer as a source of food. The annual harvest (excluding harvest by Haida) averaged 1286 animals during the period 1988 to 1998. However, hunting pressure as a means of controlling the deer numbers appears only to be successful in localized areas for short periods of time (Golumbia et al, 2003).

Community groups, agencies, and individuals were interviewed for their opinions on how best to reduce deer browsing effects (Buck and Henigman, 2000, cited in Golumbia et al. 2003). Responses ranged from doing nothing to creating a commercial venison industry. Many felt that population reduction rather than eradication was appropriate as the concept of eradication is thought to be untenable and deemed to be logistically impossible except in small areas.

The economic impacts of deer browsing include the cost to forest licensees of browse protection and replanting browsed stands. There are also economic benefits to forestry since there is no need vegetation management (e.g., brushing) in browsed areas. There is also an economic benefit from hunters coming to the Islands to hunt deer.

**Raccoons**

Raccoons (*Procyon lotor*) were introduced to Graham Island for trapping in the early 1940’s (Golumbia et al, 2003). Their range has now expanded to include Moresby Island and many of the smaller islands (Harfenist et al. 2000, cited in Golumbia et al, 2003).

Raccoons prey on eggs, and birds found in ground nests and burrows. Raccoons have had a significant impact on seabird colonies (Golumbia et al, 2003). Almost 100% of seabirds on the Islands nest in or on the ground with little natural defence to predation (Golumbia 2000, cited in Golumbia et al, 2003). Raccoons are also known to feed on marine invertebrates in the intertidal areas. In the freshwater lakes and streams, raccoons feed on fish, snails and frogs (Golumbia et al, 2003).

A management plan and monitoring protocol has been established to address the raccoon presence in seabird colonies. The elimination of raccoons from selected seabird colonies and the adjacent shorelines has resulted in significant improvements to the conservation of seabirds and their habitat (Gaston and Masselink 1997, cited in Golumbia et al, 2003). Ongoing monitoring and restoration of these seabird colonies is needed as well as management of the impacts of raccoons on other species (Golumbia et al, 2003).

**Beaver**

Beaver (*Castor canadensis leucodontus*) was introduced in the 1920’s at the Ain River. Beaver are now thought to occupy all low-lying areas of Graham Island, especially within and adjacent to Naikoon Park. They are also found on northern Moresby Island as far south as Louise Narrows and on Louise Island (Golumbia et al, 2003).

On the Islands beaver feed on the inner cambium layer of alder (Alnus rubra), willow (Salix sp.) and crabapple (Malus fusca) as well as cedar and yew (Taxus brevifolia). They also graze on various herbs, sedges and shrubs found in the riparian area (Golumbia et al, 2003). Beaver also use the fallen tree trunks and branches to build their burrows.

In the Queen Charlotte Lowlands, beaver activity has resulted in extensive flooding of forests and bogs adjacent to lakes and streams which in turn affects water quality and primary productivity (Reimchen 1992). In areas of low gradient, dams as small as 30 cm can cause...
widespread flooding and drowning of vegetation (Golumbia et al, 2003). Beaver dams in Naikoon Park have changed the natural direction of drainage on some streams. Throughout the higher relief Skidegate Plateau and Queen Charlotte Ranges ecossections, beaver activity has markedly increased the local water table where dams are present and changed local hydrology to result in siltation of spawning gravels for fish and, in some cases, creation of long-term barriers to fish movement upstream. Alternately, beaver activity can also create habitat beneficial to fish; for example, in a system with sufficient fish spawning habitat, beaver-ponded water can increase the amount of overwinter rearing habitat as well as holding habitat for spawners moving upstream. Beaver activity can also increase the amount if LWD in a stream and beaver droppings and accumulation of fine sediment in ponds may enrich pond productivity (Cedarholm et al. 2000).

In Naikoon, wire mesh exclosures are being used at Mayer Lake to protect crabapple trees from beaver feeding and some trapping of beavers is undertaken (Golumbia et al, 2003). Beaver damage to crabapples has ecological implications for species such as pine grosbeak that are dependent upon crabapples for their survival. Studies on beaver populations and their effects on fish and vegetation are being undertaken.

With respect to logging, beaver activities have been accentuated in streams that were logged to the banks and at poorly constructed road crossings. The revegetation of the stream bank with deciduous trees, herbs and shrub species provides abundant food for beavers. Beaver dam-building activities then impound water, raise the water table upstream, and flood previous forest lands, significantly changing local ecological conditions.

**Rats**

Both the ship rat (*Rattus rattus*) and the Norway rat (*Rattus norvegicus*) have been accidentally introduced to the Islands. Rats were likely first introduced to the islands when the first European sailing ships arrived (Bertram and Nagorsen 1995, cited in Harfenist, 2003). Rats have been found to inhabit 21 of the islands in the archipelago, although they have now been eradicated from four of them (Golumbia et al, 2003).

Rats, like racoons, have had a devastating impact on seabird colonies. Rat predation has caused the extirpation of Fork-tailed and Leach’s storm-petrels, Cassin’s auklets and tufted puffins from Langara Island (Bertram 1995, cited in Harfenist et al. 2002). Ancient murrelets suffered a significant reduction in their population on Langara Island, declining from historical levels of about 200,000 pairs to about 14,600 pairs by 1993 (Harfenist 1994, cited in Harfenist et al. 2002). Rats are suspected to have caused reductions in seabird colonies at Murchison, Lyell and St. James Islands (Golumbia et al, 2003). They are also believed to have caused the disappearance of deer mice on Langara Island (Kaiser et al. 1997, cited in Golumbia et al, 2003).

The largest rat eradication program in the world*26* has been undertaken by the Canadian Wildlife Service on a number of offshore islands. Poison bait has been used to eradicate rats on Langara, Cox, and Lucy Islands as well as at Cape St. James. The Langara Island program was a considerable accomplishment, since the island is ten times larger than other islands from which rats have been eradicated*27*. Although these programs appear to have been successful, the colonies are being monitored to see if they remain rat free and if the seabirds recover.

---

*26* Personal communication, Keith Moore. Consulting Biologist
Further eradication programs are planned within Gwaii Haanas (Golumbia, 2001).

**Red Squirrels**

Red squirrels were intentionally introduced to the Islands in 1950 (Carl and Guiget 1972, cited in Golumbia et al, 2003). Six squirrels were released by the Game Commissioner at Queen Charlotte City and others are thought to have been released by the BC Forest Service to facilitate the collection of spruce cones on the remote islands (Golumbia et al, 2003). Squirrels are now widespread on Moresby, Graham and many smaller islands, and are found as far south as Rose Inlet and Burnaby Island (Golumbia et al, 2003).

It is suggested that the introduction of red squirrels may have created a larger prey base for the marten, which has led to a larger, healthier marten population (Moore 1988, Edie and Burles 2002, cited in Golumbia et al, 2003). The increase in marten numbers may be putting downward pressure on the ermine population (McTaggart-Cowan pers. comm. In Moore 1988, cited in Golumbia et al, 2003).

Red squirrels also prey on songbird nests, which are more vulnerable in deer-browsed areas due to the reduced vegetation. Comparative studies undertaken by the RGIS have found that these combined factors are instrumental to the decline of songbird populations (Martin et al. 2001, cited in Golumbia et al, 2003).

**Amphibians**

The pacific tree frog (*Hyla regella*) was introduced on Graham Island in 1964. In 2002 the red-legged frog was identified in several locations near Port Clements and Juskatla (Ovaska , pers. comm., cited in Golumbia et al, 2003)). The distribution of the tree frog is now widespread on Graham Island and northern Moresby Island (Reimchen 1990, cited in Golumbia et al, 2003). The impacts of tree frogs have not been studied. It has been recommended that studies should be carried out to determine if the tree frog is displacing the endemic boreal toad (Golumbia et al, 2003).

**Domestic Animals**

Domestic animals have also been introduced to the Islands, with effects to local ecosystems. Goats were abandoned on Ramsay Island in 1976, rabbits have been introduced on Graham, Lyell and Murchison islands (Golumbia et al, 2003) and cats have been reported on Murchison, Lyell, Kunghit, Hot Springs, and St. James islands (Moore 1988, cited in Golumbia et al, 2003). Rabbits do not appear to be successful on the islands but cats are considered a serious threat to birds, seabirds and small mammals. Feral cattle in the Tiell area are reported to be causing forage and hoof-related damage along the beach benches of eastern Naikoon (Golumbia et al, 2003).

**Introduced Birds**

There is little information on the current populations of house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*) and the ring-necked pheasant (*Phasianus colchicus*). Both the house sparrow and the European starling are considered nuisance species. The European starling has been implicated in declines of native species elsewhere, particularly secondary cavity nesters. (Campbell et al. 1997, cited in Golumbia et al, 2003).
4.3.5 Assessing Wildlife Habitat Values

When managing for wildlife values, it is not only important to know what species live in an area and their population trends, but also what type of habitat they require and where this habitat lies in the landscape.

4.3.5.1 Habitat capability and suitability

Without sufficient habitat, a species’ population will decrease and may ultimately disappear from an area. The relative importance of various ecological units (habitats) to wildlife populations can be estimated using habitat capability and suitability ratings. These ratings can also be used to provide information on how various management activities affect wildlife populations.

Habitat suitability ranks the present quality of habitat; habitat capability ranks the quality of potential habitat when vegetation is at its optimum seral stage for that particular species. An area may have a high capability, but due to its present vegetation structure, it will not have high suitability. The ratings are provincially based and thus reflect the potential of an area to support a particular species by comparing habitats of interest to the best available for that particular species in the province.

Habitat effectiveness is also considered when rating habitats. Effectiveness is based on the human factors that displace animals. For example, an area may have high habitat suitability but due to the pressure of a mainline road, the habitat does not get used to its full potential, thus it has a lower effectiveness rating. Conversely, habitat effectiveness may increase other factors, such as the presence of spawning salmon.

It is important to note that habitat suitability and capability mapping provides an initial attempt at identifying potential areas where certain wildlife species may occur. Because these maps are based on interpretations of vegetation patterns, they are not always precise depictions of ground-based conditions, particularly when based on ecosystem mapping at a broad scale, such as 1:250,000. Local knowledge is used to improve model reliability.

Habitat capability and suitability is derived from ecosystem mapping. There are three types of ecosystem mapping commonly used to map habitat: broad ecosystem inventory (BEI), terrestrial ecosystem mapping (TEM), and predictive ecosystem mapping (PEM). Other derivations are possible using combinations of data such as forest cover attributes, biogeoclimatic units, bedrock geology, digital elevation modeling, etc.

4.3.5.2 Ecosystem Inventory

Broad Ecosystem Classification or Broad Ecosystem Inventory (BEI) is an ecologically based classification system that provides an ecosystem perspective for resource management and land use planning. The unit of classification in this system is the Broad Ecosystem Unit (BEU). A BEU “is a permanent area of the landscape that supports a distinct type of dominant vegetation cover, or distinct non-vegetation cover (such as lakes or rock outcrops)” (RIC, 1998), and is generally named after the dominant climax vegetation within the unit. BEUs emphasize the site characteristics that determine the function and distribution of plant communities in the landscape. Each BEU is an amalgamation of biogeoclimatic ecosystem (BEC) units. Mapping of BEUs combines the Ecoregion Classification system (Demarchi, 1996) and the Biogeoclimatic Ecosystem Classification (BEC) system (Meidinger and Pojar, 1991).
4.3.5.3 Terrestrial / Predictive Ecosystem Mapping

A more detailed method of determining habitat suitability uses Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) as their foundation. Wildlife habitat ratings are applied to each ecosystem unit to evaluate its value for a particular wildlife species. TEM and PEM are a more detailed level of mapping than Broad Ecosystem Inventory and are believed to provide more reliable estimates of habitat capability and suitability.
4.4 Hydroriparian Ecosystems

The term *hydroriparian* comes from the Greek word *hydor* meaning water and the Latin word *riparius* meaning of or belonging to the bank of a river. Hydroriparian ecosystems occur wherever land and water interact and include aquatic ecosystems plus those of adjacent terrestrial environments that are influenced by and that influence the aquatic system\(^\text{28}\). They extend along stream courses from steep alpine slopes to the ocean, transporting water, sediment, nutrients, organisms and wood through watersheds. They also occur around lakes and wetlands, and along estuarine and ocean shores. They extend horizontally to the edge of the influence of surface water bodies and wetlands on the land, and of the land on those water bodies. They extend vertically below ground into a hyporheic zone inhabited by invertebrates and other microbial organisms and above the surface toward the vegetation canopy. Hydroriparian zones are defined by the physical areas of land and water occupied by biophysical hydroriparian ecosystems.

Hydroriparian ecosystems continually change, modified by disturbance effects of flooding, erosion and sedimentation and the ecological processes of recovery and succession. In the wet Central and North Coast of British Columbia, the distinction between upland and wetland is often unclear and riparian ecosystems can extend considerably beyond channels and wetlands.

The landscape and hydroriparian ecosystems within it can be divided into watersheds, the boundaries of which are defined by the height of land draining precipitation into the ocean from the same stream mouth. The watershed is further delineated into three “process zones” based on differences in material transfer between streams and the adjacent land, especially with respect to sediment and wood: (1) source zone, (2) transport zone and (3) deposition zone. Hydroriparian functions, processes and associated risks of human activities vary among the three zones\(^\text{29}\).

The **source zone** comprises upland areas, including all hillslopes within the watershed. Source zone channels are small headwater streams where channelled drainage begins. Channels in source zones receive material directly from hillslopes through mass wasting processes (debris slides, landslides, rockfall, etc) and snow avalanches. They deliver fine sediments and nutrients to larger channels continually, and large sediment and organic debris episodically through debris flows. In wetland source zones, streams may receive mainly organic materials, and may transport only fine organic material. Source zone channels are generally small but comprise the majority of channel length within a watershed. Small streams in the source zone provide a particular challenge to land management planning since most cannot be identified by remote means, and field surveys of entire watersheds are not feasible. In parts of the source zone, small streams will be so dense that hydroriparian zones will overlap.

The **transportation zone** occurs in valleys, include the valley flat or floodplain. The term refers to the fact that stream channels here receive material from source zone channels and directly from adjacent riparian zones, then transport them to deposition zones downstream. Transport zone channels may be partly confined by hillslopes, migrate

\(^{28}\) The following paragraph description of hydroriparian ecosystems was taken from the Coast Information Team (CIT) *Hydroriparian Planning Guide Version 3.6*.

\(^{29}\) Descriptions of process zones taken from the CIT *Hydroriparian Planning Guide Version 3.6*. 

---
across valley floors, or alternate between confined and unconfined, so they may still receive some inputs directly from adjacent hillslopes. Associated floodplains, which provide critical fish habitat, can be continuous or discontinuous.

The **deposition zone** is the unconfined valley bottom where rivers are characterised by horizontal migration across floodplains, including alluvial fans and estuaries. Deposition zone channels receive material from source and transport zone channels as well as from adjacent riparian areas.

Compared to watersheds on a province-wide scale, those on the Islands are considered relatively small. The largest watershed on the Islands is the Yakoun, with an area of 56,632 ha. There are three other watersheds with areas greater than 20,000 ha: Tlèll at 31,687 ha, Ain at 28,662 ha and Hancock at 20,189 ha. On the Islands, there are only 30 watersheds with an area greater than 5000 ha and many of the well known and important watersheds are less than 5,000 ha: for example, Government Creek, Windy Bay Creek, Security Inlet, Kootenay Inlet and Salmon River. In contrast, on the North Coast, there are 100 watersheds greater than 5,000 ha in area, 33 of these are greater than 20,000 ha, four of which are larger than 100,000 ha (Moore 1991).

### 4.4.1 Ecosystem Descriptions

Haida Gwaii/QCI is separated into three terrestrial ecosections, each with different physiographic characteristics that influence the riparian ecosystems that occur: (1) Queen Charlotte [QC(HG)] Lowlands (2) Skidegate Plateau and (3) Queen Charlotte [QC(HG)] Ranges. The lowland areas feature low relief, cool wet weather and generally nutrient-poor bedrock. Consequently, the QC(HG) Lowlands ecosection is dominated by extensive blanket bogs, shallow lakes and scrub forest interspersed with patches of productive forest in better drained areas and on richer bedrock. The more mountainous areas, Skidegate Plateau and QC(HG) Ranges, feature steep, rugged topography and cool, wet weather with deep snow at higher elevations. Steep headwater streams and gullies drain the mountainsides, carrying water, sediment and organic materials to the fans and floodplains that line valley bottoms. Lakes head some valleys and small wetlands are common on floodplains and wet mid-slopes; however, extensive wetlands are uncommon. The Skidegate Plateau is generally lower relief than the QC(HG) Ranges and generally encompasses both the most productive forest lands and most productive fish-bearing streams on the Islands.

Table 10 illustrates the differences in hydoriparian feature types present in each of the three ecossections of the Islands.

---

30 These watershed areas provided by the Process Technical Team for the Haida Gwaii/QCI Land Use Plan, July 2003.
Table 10. Hydroriparian features by ecosection

<table>
<thead>
<tr>
<th>Hydroriparian Feature</th>
<th>Ecosystem</th>
<th>QC(HG) Lowlands</th>
<th>Skidegate Plateau</th>
<th>QC(HG) Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td># lakes</td>
<td></td>
<td>1566</td>
<td>256</td>
<td>1414</td>
</tr>
<tr>
<td>Total lake area (ha)</td>
<td></td>
<td>3,549.95</td>
<td>6,210.51</td>
<td>3,171.09</td>
</tr>
<tr>
<td># wetlands</td>
<td></td>
<td>3859</td>
<td>644</td>
<td>594</td>
</tr>
<tr>
<td>Total wetland area (ha)</td>
<td></td>
<td>44,171.90</td>
<td>2,281.46</td>
<td>2,518.65</td>
</tr>
<tr>
<td>Length of TRIM stream (km)</td>
<td></td>
<td>4,439.90</td>
<td>6,933.32</td>
<td>8,546.52</td>
</tr>
<tr>
<td>Total Ecosystem Area (ha)</td>
<td></td>
<td>325,433.82</td>
<td>327,845.00</td>
<td>342,953.97</td>
</tr>
<tr>
<td>Lakes (% of Ecosystem area)</td>
<td></td>
<td>1.09%</td>
<td>1.89%</td>
<td>0.92%</td>
</tr>
<tr>
<td>Wetlands (% of Ecosystem area)</td>
<td></td>
<td>13.57%</td>
<td>0.70%</td>
<td>0.73%</td>
</tr>
<tr>
<td>Streams (% of total TRIM stream length for HG/QCI)</td>
<td></td>
<td>22.21%</td>
<td>34.69%</td>
<td>42.76%</td>
</tr>
</tbody>
</table>

4.4.1.1 Lakes

There are over 220 lakes on the Islands and most of them are small, oligotrophic (nutrient-poor, oxygen-rich) waterbodies. Lakes provide critical habitat for numerous fish species, nesting and foraging birds, amphibians, mammals and a host of other invertebrate species (Northcote et al. in Scudder and Gessler 1989). Table 11 lists the eight largest lakes on the Islands by surface area and their associated ecossections.

In the QC(HG) Lowlands, there are numerous small, shallow, low elevation lakes. Many of the lakes associated with extensive wetlands are very acidic at between 3.9 and 5 pH value, but a few are more neutral. Studies by Reimchen (1992) in Naikoon show that these lakes are critical habitat for many aquatic and bird species and in fact, house some of the most acid-tolerant fish species known in the world. Thirty-six species of aquatic birds were noted throughout the Naikoon lakes, including nesting red-throated loons, feeding and nesting common loons, nesting and feeding Canada geese, feeding common mergansers, and sandhill cranes. These lakes also provide critical habitat for endemic forms of threespine stickleback, some of which have resulted from rapid, post-glacial evolution, and others that are suspected to be of more ancient origins. Included in these endemic sticklebacks is the giant black stickleback, which has been listed as “rare” by the Committee on the Status of Endangered Wildlife in Canada (Reimchen 1992). Kokanee or landlocked sockeye, have been documented in Wiggins Lake and local reports suggest the presence of kokanee in other lakes within this ecossection. Drizzle Lake is a
provincial ecological reserve. Mayer and Pure Lakes have high recreational value and Mayer Lake is also known to provide habitat for sockeye salmon.

In the Skidegate Plateau, lakes are less abundant but generally larger, deeper, more complex and more neutral (6 to 7 pH) than QC(HG) Lowlands lakes. All of the largest lakes on the Islands, including all the major sockeye salmon systems, are located within this ecosection. These lakes provide important habitat for a wide range of aquatic and terrestrial wildlife species, in addition to high recreational values including fishing, boating, wildlife viewing, hiking, family outings and hunting. Notable lakes for recreational use include Yakoun, Skidegate, Mosquito and Spirit.

Lakes in the QC(HG) Ranges are generally small, generally neutral (6 to 7.5 pH) and range in elevation from close to sea level to high mountain elevations. In general, low elevation lakes to approximately 100m would be expected to have fish species present, with the probability of fish use decreasing with elevation. Three of these lakes, Mercer, Fairfax and Gudal, are known to provide habitat for sockeye salmon. Moresby Lake is used to generate electricity for Sandspit and the Queen Charlotte City – Skidegate – Tlell settlement corridor. Few of the lakes in this ecosection are readily accessible for recreation, although some recreational use is known.

Table 11. Large lakes and associated surface areas

<table>
<thead>
<tr>
<th>Lake</th>
<th>Surface Area (ha)</th>
<th>Ecosection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ian</td>
<td>1,473</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Skidegate</td>
<td>885</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Yakoun</td>
<td>837</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Mayer</td>
<td>673</td>
<td>QC(HG) Lowlands</td>
</tr>
<tr>
<td>Eden</td>
<td>652</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Awun</td>
<td>610</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Mosquito</td>
<td>584</td>
<td>Skidegate Plateau</td>
</tr>
<tr>
<td>Mathers</td>
<td>225</td>
<td>Skidegate Plateau</td>
</tr>
</tbody>
</table>

4.4.1.2 Wetlands

Wetlands are areas of permanent or intermittently standing water that lack significant channel flow and can be defined as “lands that are wet enough or inundated frequently enough to develop and support distinctive natural vegetative cover that is in strong contrast to the adjacent matrix of better drained lands” (from Runka and Lewis 1981 in Millar et al. 1997). Wetlands types are diverse and their common denominator is generally soil or substrate that is at least periodically saturated with or covered by water. The wetlands of the Islands are similar to those found along the BC west coast from the Nawhitti Lowland of northern Vancouver Island to those in the Alaska Panhandle.
Recognized classes of freshwater wetlands include bog, fen, swamp, marsh and shallow open waters. On the Islands, bogs and fens are most common with shallow open water, marshes and swamps occurring to a lesser extent. Widespread beaver activity has caused localized flooding of the landscape, resulting in an increase in the number of shallow open water ponds, which eventually develop into fens or marshes.

Wetlands provide important habitat features in the landscape including:

- **Open water**, which when accessible, is used for rearing, spawning and holding for various fish species; reproduction of toads and introduced frogs; other vertebrates and numerous invertebrates.

- **Flow regulation**, dissipating flow energy and storing significant volumes of water during high flow periods, gradually releasing it downstream in dryer periods.

- **Recharge areas**, where local precipitation or groundwater collects in natural depressions, supplementing stream base flows.

- **Food source**, providing an abundance of insects, other invertebrates and detritus to support aquatic food chains.

- **Water quality control**, by filtering out waterborne pollutants and fine sediments, and bioaccumulating other contaminants (Millar et al. 1997).

**Bogs**

Bogs are wetlands filled with poorly to moderately decomposed sphagnum-derived peats. Often, bog surfaces are raised or level with their immediate surrounding and are thus little affected by nutrient-rich groundwater from the surrounding mineral soils. Precipitation, which is relatively poor in dissolved ions, is the major water source, thus the upper peat layer of bogs is low in nutrient and highly acidic. Bogs may be treed or treeless and are usually covered with sphagnum moss. Bog forms can be grouped into sloped, flat, domed, and plateau types. Slope bogs, one of the more common on the Islands, are best developed in areas with a series of low hills and as the slope increases, the peat becomes shallower and the proportion of forest cover increases.

Much of the QC(HG) Lowlands of northeastern Graham Island is best described as a mosaic of flat and raised bogs. The pattern of bogs have a complex micro-topography with low evergreen shrubs and stunted bonsai conifers growing out of water-saturated hummocks, small ponds and pools with aquatic and semi-aquatic plants, numerous small rivulets, beds of sphagnum moss and islands of scrubby bog forest dominated by lodgepole pine and red cedar. Bog forest occurs as small and large wooded islands scattered throughout the bog community and in the transition zone between open bogs and closed coastal forest.

In the Skidegate Plateau and QC(HG) Ranges ecosections, the blanket bog is characteristically found within the subalpine Mountain Hemlock biogeoclimatic zone. Shallow peat deposits cover undulating to steep rocky terrain. Blanket bog vegetation is similar to the lowland bogs but also contains subalpine plant species. Blanket bogs have much richer flora owing to a greater variety of habitats than found in lowland bogs. Although blanket bogs are found on both east and west

---

31 The following definitions of wetland types are taken from Chapter 19: Non-tidal Wetlands by Pojar in BC Ministry of Forests (1991) and Pojar (2002).
coast subalpine areas, the best-developed blanket bogs are located along the western flanks of the Queen Charlotte Range. Here, very high precipitation and strong, persistent westerly winds promote bog development. In many areas of the west coast, the blanket bogs are more or less continuous from sea level to alpine. Some of the best examples of blanket bogs in the Pacific Northwest are located on the Islands.

**Fens**

Fens are wetland areas filled with well to poorly decomposed, non-sphagnum peats, with a high water table that is usually at the surface. Fen waters come mostly from groundwater and runoff from adjacent mineral-rich uplands, resulting in less acidity and more minerals than found in bogs. Fen vegetation can be dominated by grasses, sedges and rushes, low shrubs or trees, and often underlain by mosses. Sphagnum mosses are uncommon except in fens that are transitional to bogs.

Fens are not generally common on the Islands with the notable exception of the Tlell Pontoons, a large nutrient-rich fen-marsh complex. All other fens are relatively small in scale, resulting from localized ecological conditions.

**Swamps**

Swamps are forested wetlands dominated by 25% or greater vegetation cover of trees or tall shrubs, and characterized by periodic flooding and nearly permanent subsurface water flow through various mixtures of mineral sediments and peat. Swamps, like fens, are mineral and nutrient-rich. Characteristic water movements through swamps make them better aerated than fens, and swamp waters have sufficient dissolved oxygen levels to support tall shrubs or trees. Conifer swamps are fairly common on the Islands but they do not dominate the landscape like bogs.

**Marshes**

Marshes are permanently or seasonally inundated wetlands with nutrient-rich water that support extensive cover of emergent herb and shrub vegetation (i.e., plants rooted in bottom substrate and extending upwards above the water surface) rooted in mineral-rich substrates. Although the water level of marshes varies seasonally and from marsh to marsh, saturation persists near the surface. Emergent vegetation covers more than 10% of marsh surfaces and rushes and sedges are often the dominant vegetation. Ecological conditions on the Islands favoured the formation of organic substrates and dominantly bog and fen formation. Overall, marshes are a minor component of the landscape mostly localized to stream and lake margins, even in the QC(HG) Lowlands where they are most frequent. The most common marshes on the Islands are sedge marshes.

**Shallow open waters**

Shallow open waters are defined as areas of permanent, shallow (less than 2m at midsummer levels), standing water that lacks significant emergent plant cover. Vegetation cover can range from 0 to 10% surface cover of emergent vegetation. These areas often include various submerged and floating aquatic plants. The physical characteristics of shallow open waters are variable and can be classified according to water chemistry and bottom substrate. Thousands of shallow open water bog ponds exist in the QC(HG) Lowlands, most of which are temporary, seasonally dry and without inlet or outlet stream flows.
4.4.1.3 Streams

Streams are key components of hydoriparian ecosystems characterized by flowing surface water within a defined channel. Larger, perennially wetted streams that result from the coalescing of smaller streams are generally called rivers (Millar et al. 1997). Natural stream systems can be considered a gradient of process zones from headwaters to mouth, both hydrologically and ecologically.

Many headwater streams are strongly influenced by riparian vegetation, which shades the stream thus reducing photosynthetic activity, but provides abundant input of small organic debris (SOD) thus encouraging decomposition processes (heterotrophic energy production). As stream size increases, the relative importance of SOD input decreases as the canopy becomes more open, allowing more light to reach the stream, facilitating more photosynthetic production of nutrients (autotrophic energy production). Additional nutrients are also transported from upstream. As the streams get larger to become large rivers, the balance of nutrient cycling changes back to dominance by heterotrophic energy production; photosynthesis (primary production) is limited by water depth and turbidity and large quantities of fine particulate organic debris are brought from upstream processing of SOD and woody debris (Vannote et al. 1980). This last transition back to heterotrophic production may not be significant for streams and rivers on the Islands as it generally occurs in sixth order drainages or larger; the largest drainages on the Islands are only fourth order.

Stream systems influence watersheds and landscapes by:

- **Transporting water** downstream above and below the ground. Forest canopies intercept a portion of precipitation, moderating surface water flows. Forest soils further store water and modulate runoff.

- **Transporting sediment** downstream, modifying ecosystems as it moves. Sediment can increase productivity (eg. by creating fans and floodplains in valley bottoms, renewing moderate gravel deposits along streams) or reduce productivity (eg. by inundating stream channels with gravel, covering stream beds with fines, hence reducing fish habitat). Sediment input also influences channel morphology, channel stability, and aquatic habitat quality, particularly gravel substrate in which invertebrate biota live and fish spawn. The rate of sediment input depends on the type, frequency and intensity of disturbance in riparian forests and on steep upland slopes.

- **Transporting small organic material** from small headwater streams to hydoriparian ecosystems downstream. This movement is particularly important in nutrient-poor systems like many on the coast.

- **Transporting downed wood** that accumulates in channels, on fans and on floodplains. Large woody debris (LWD) influences channel morphology, stream flow and sediment dynamics, especially flood dynamics. Large woody debris also stores sediment, provides food and shelter for a variety of organisms, and is critically important to channel and floodplain complexity.

- **Serving as corridors** for plant and animal movement. A variety of invertebrates and vertebrates feed and travel along hydoriparian ecosystems, and riparian areas serve as corridors for plant distribution.

---

32 The following points adapted from the CIT Hydoriparian Planning Guide, Version 3.6.
Streams may have perennial, intermittent or ephemeral flow. Perennial streams have a continuous channel and flow year-round, vary in size from small to very large, and are generally fed by many smaller intermittent or ephemeral streams. Intermittent streams have channels located at or near the groundwater table, vary in size from small to large, and flow when snowmelt, precipitation or groundwater seepages raise the level of the water table above the channel bed. Ephemeral streams have channels located above the groundwater table, are generally small and flow only in direct response to intense precipitation, thus they are typically dry on an irregular or seasonal basis (Millar et al. 1997).

Stream channels are often classified by stream order set to a predetermined map scale and its associated streamlines. Initial undivided headwater or source streams are designated as first-order streams. When two first-order streams join, the stream below is considered a second-order stream. When two second-order streams join, the stream below is designated a third-order stream, and so on (Miller et al. 1997). If a stream of a lower order joins with a stream of a higher order, the stream below is designated the larger order of the two; for example, if a first order stream flows into a second-order stream, the stream below remains a second-order stream. As a general rule, the smaller the watershed, the smaller the order of the stream at its mouth. The largest and higher order watersheds on the Islands are located in the Skidegate Plateau and QC(HG) Lowlands. More numerous smaller-order watersheds are found in the QC(HG) Ranges.

4.4.1.4 Riparian areas

Riparian areas are defined by the extent of the influence of water on land. Riparian zones have strong influence on the organization, diversity, and dynamics of communities associated with aquatic ecosystems. Because of these dynamic interactions, they possess distinct ecological characteristics whose boundaries can be defined by changes in soil conditions, vegetation, terrain, and other factors. The inherent variability of physical conditions in riparian forests results in a variety of microclimate conditions that result in some of the most biologically diverse wildlife habitats found in the landscape. Riparian areas are vital to maintaining the health of the landscape and its aquatic environments (Naimen, 2000).

Riparian areas provide essential habitat to a large number of species. In the Pacific Coastal Ecoregion, approximately 29% of wildlife species found in riparian forests are “riparian obligates” meaning that they depend upon riparian and aquatic resources and experience severe population declines when riparian forests are removed (Kelsey and West, 1998). In addition, of the 30 amphibian species found in the ecoregion, 60% require aquatic habitat for reproduction and of the approximately 230 bird species found throughout the ecoregion, one-third are classified as riparian obligates (Ibid).

4.4.1.5 Rare ecosystems associated with hydroriparian areas

Due to the high diversity and spatial limits of hydroriparian areas on the Islands, they contain many of the rare ecosystems found, both locally and provincially. In addition, due to their accessibility and high productivity, many of these ecosystems have been targeted by logging and are rare in their old growth condition.

The BC Conservation Data Centre lists most rare hydroriparian ecosystems of the Islands as red- and blue-listed plant communities. Rare ecosystems not listed by the CDC include fluvial/colluvial systems that develop along gullies with creeks in steep, unstable terrain; riparian fens along sluggish streams in the QC (HG) Lowlands, and one-of-a-kind systems such as the stream fens of the Pontoons. Note that most of the plant associates represented in the latter
two ecosystems are not rare on BC or on the coast overall, but their combined expression in
these ecosystems is rare on the Islands i.e., they are regionally rare\textsuperscript{33}.

Descriptions of rare hydoriparian ecosystems can be found in Section 4.2.2.4 and are listed in
Appendix D. A number of rare ecosystems are captured in proposed protected areas. These
are noted in Section 5.1: Protected Areas.

4.4.2 Structure and function of hydoriparian ecosystems

Hydoriparian ecosystems have a high structural and species diversity and, therefore, are
hotspots of biodiversity. Periodic flooding, debris flow, lateral river migration, downed wood and
animal activity coupled with the high productivity of these areas, results in a “mosaic of non-
equilibrium ecosystems of various physical conditions” (Price and McLennan 2001). The result
is a diversity of forest ages, plant species and structural attributes. This diversity, as well as
proximity to water, provides critical habitat for a wide variety of animal and plant species. It is
estimated that between 50 and 75% of terrestrial vertebrate species use hydoriparian areas
(Bunnell et al. 1999; CSSP 1995; and Morgan and Lashmar, 1993 as cited in Price and
McLennan 2001). On a watershed scale, a fully-functioning hydrological regime that provides
water quality and quantity and associated habitat through time is critical to the ecological health
of hydoriparian ecosystems.

Functional characteristic of hydoriparian ecosystems can be summarized into four concepts:
(1) Land influences adjacent water; (2) Water influences adjacent land; (3) Hydoriparian
ecosystems link landscapes; and (4) Hydoriparian ecosystems are important centres of
biodiversity\textsuperscript{34}:

\textbf{Land influences water} by providing downed wood, organic material, and associated nutrients;
providing shade to moderate light and temperature; filtering sediment and dissolved materials;
stabilizing banks and reducing erosion caused by flooding; regulating water quality
characteristics; and facilitating water storage and water flow from the land. By definition,
hydoriparian ecosystems are coincident with the principal flow pathways of water through the
landscape. Prolonged contact of water with mineral and organic matter, and amount of shading
establishes the quality of water, including temperature, odour, colour, and dissolved mineral and
organic content. For example, in the QC(HG) Lowlands, waters are generally tannin-stained and
acidic due to long residence time in bogs. In the QC(HG) Ranges, abundant water moves
relatively quickly through most drainage basins and waters remain nutrient-poor and neutral to
basic depending on adjacent substrate.

The ecological functions of riparian forests includes:

- \textbf{Regulation of physical stream channel structure}. The input and characteristics of large
  woody debris in a stream channel and on floodplains partly controls sediment storage and
  transport, local stream flow characteristics and creates fish habitat.
- \textbf{Maintenance of bank and channel stability}. Solid root masses and ground cover increase
  the resistance of stream banks to the erosive forces of water flow through the stream
  channel. The larger and more stable the root masses along the stream banks, the more
  stable the banks.

\textsuperscript{33} J. Pojar. Regional ecologist, Prince Rupert Forest Region. Personal communication.
\textsuperscript{34} The following sections about hydoriparian function are adapted from Price and McLennan (2001), Ministry of
• **Regulation of stream temperature.** The amount of stream shading or canopy closure influences localized light and climate conditions, affecting stream temperature. The more shaded a stream, the less variation in water temperature throughout the day, and water temperature is less likely to reach those detrimental to fish and other stream fauna. Stream temperature influences aquatic invertebrate communities, fish and other organisms.

• **Regulation of instream biological productivity.** Riparian vegetation determines the input of small organic debris, including leaves, detritus, terrestrial insects, large woody debris and dissolved organic carbon, to the stream channel. This organic material, provided by riparian vegetation and transported throughout a watershed by stream flow, supports hydroriparian food webs throughout a watershed. Organic matter recruitment is relatively more important to small streams, but the effect is also important in larger channels downstream.

• **Regulation of instream algal production.** The amount of stream shading determines the amount of sunlight reaching the stream channel and therefore the amount of photosynthesis occurring in the stream section.

• **Filtering of fine sediments.** The velocity of surface water flow is reduced as it runs over riparian vegetation, thus filtering out sediment and reducing the amount of fine sediment entering the stream. Sediment interception is important in steep terrain and on fans, helping to retain dissolved nutrients in riparian soils and plant communities. The filtering effects extend variable distances from stream channels, depending on topography and water circulation pathways.

**Water influences land** by providing moisture and nutrients, thereby increasing productivity; promoting the accumulation of organic material in poorly drained soils; and modifying the microclimate of the adjacent land. Water creates gradients for air, soil and surface temperatures, relative humidity, and solar radiation, all of which affect the microclimate of riparian forests, which in turn has ecological consequences. In wet coastal forests, the function of microclimate modification is thought to be less dramatic than in warmer, drier climates.

In salmon-bearing stream reaches, nutrients from salmon spawners returning upstream is key to the well-being of the adjacent riparian forest. Born in freshwater streams and lakes, salmon leave the stream to gain more than 95 % of their body mass feeding in the ocean, then return to the streams to spawn, bringing with them a wealth of marine nutrients. This marine-derived nutrient can provide up to 25% of the nitrogen used by riparian ecosystems. Additionally, spawning salmon provide food for a large number of riparian animals and invertebrates. The net effect of the increase in nitrogen availability is faster tree growth in the riparian area relative to adjacent upland areas (Naimen et al. 2000).

A critical component of hydroriparian zones that link the riparian to aquatic systems is the hyporheic zone, the “saturated sediment beneath a river channel and under the riparian zone that contains some proportion of water from the surface channel” (Naimen et al. 2000). Assisted by the great surface area available for microbial colonization, biological activity is stimulated by water in the hyporheic zone, which is a blend of both groundwater and surface water that differs significantly in origin and chemical composition. For example, it has been shown that streams with extensive hyporheic zones retain and process dissolved nutrients more efficiently than those without, and that decomposition in these zones can double a stream’s ability to eliminate organic wastes. Very little field research has been conducted on hyporheic zones in the Pacific Northwest and there is no specific information available about hyporheic zones and their role in maintaining hydroriparian ecosystem health on the Islands.

**Hydroriparian ecosystems link landscapes** through the transport of water, sediment, downed wood and small organic material. They also act as movement and transport corridors for
animals (vertebrates and invertebrates) and plants. As riparian corridors span most elevations within a watershed, a wide range of temperatures and precipitation conditions are available for regional plant communities. The abundance of non-native species in riparian corridors suggests that they may also serve to move non-native plant species through the landscape.

**Hydroriparian areas are important centres of biodiversity** with the structural and functional diversity providing habitat to a wide variety of species. For many species, this habitat is critical. Hydroriparian areas:

- **House biodiversity hotspots**, containing the most diverse structure, vegetation and animal communities of the coastal temperate rainforest. These characteristics are the consequence of their dynamic nature, due to flooding, debris flows, downed wood, animal activity, productivity, landform and elevation. These factors collectively create “a mosaic of nonequilibrium habitats of various physical conditions that allow a large number of species to coexist” (Naimen et al. 2000). Most coastal terrestrial vertebrates use hydroriparian ecosystems and invertebrate diversity is also high.

- **Contain rare ecosystems**. Several shoreline, fan and floodplain ecosystems in old structural stage are listed as rare in BC. On a larger scale, their extent is defined by BC biogeoclimatic ecosystem classification (BEC) site series; field indicators would be necessary to define these ecosystems on a smaller scale.

- **House rare and important species**, including plants, fish, amphibians, birds and mammals listed by the Conservation Data Centre as threatened or at risk. Estuaries are used by most salmonids and listed birds, streams are used by salmon and salmon predators including black bears, river otters, eagles and seagulls. The extent of this habitat is variable and some habitat suitability models exist for species such as marbled murrelet and Northern goshawk.

- **Provision of wildlife habitat** includes coarse woody debris on the forest floor, wildlife trees, nest and perch sites, cavity nesting sites, summer and winter denning, forage areas, large woody debris in streams and more. The characteristics of the riparian forest including stand structure, seral stage, tree and other plant species and spatial patchiness, determine the type, quality and quantity of habitat available for different wildlife species.

### 4.4.3 Natural disturbance processes in hydroriparian ecosystems

Natural disturbance processes within hydroriparian systems on the Islands include debris flows, windthrow, bank erosion, flooding, lateral river migration, animal activities and to a less frequent extent, fire. Disturbance type, frequency and scale, moisture gradients, temperature, amount of precipitation and elevation, all play a role in determining the riparian forest types that occur. Distinctive communities develop in areas such as stream channels, active floodplains, contemporary floodplains, and low-terrace and high-terrace landforms of smaller channels. In general, riparian areas experience more frequent but lower intensity disturbances than upland areas. Key ecological functions of natural disturbance in hydroriparian ecosystems are regulation of large woody debris, sediment and nutrient inputs and persistence of habitat heterogeneity over time.

Debris flows are a primary agent for moving sediment and wood in high relief landscapes. Debris flows occur when exceptionally heavy rainfall or snowmelt results in the sudden movement of surface materials from channel heads or hillslopes, or less commonly, when it breaches a landslide-created dam existing in a stream. The resulting torrent of water, sediment and wood quickly scours the channel and may have severe and long-term effects on the

---

35 Information in this section adapted from Naimen et al. (2000), Millar et al. (1997) and Cedarholm et al. (2000).
adjoining riparian area. The relative importance of debris flows as the source of sediment and wood for small to mid-sized streams varies according to local geology, topography, soils, and hydrologic characteristics of each watershed. The rate of recovery from these events is related to channel gradient and spatial configuration within the watershed. Massive inputs of sediment over short periods of time or continual deposition may cause local channel bed aggradation, altering channel type and form, and riparian characteristics (Naimen et al. 2000).

Debris flows, windthrow, bank erosion, lateral river migration and fire (more detailed descriptions of these natural disturbance processes can be found in Section 4.2.3) are important to hydoriparian ecosystems because they are processes that affect the delivery of wood and sediment into stream channels and floodplains, thus exerting significant control on the physical characteristics of a stream. Wood and sediment input and output for a stream system tends to be episodic, not constant, through time and space. The persistence of large woody debris in a stream channel is of fundamental ecological importance because of its influence on channel dynamics and the subsequent succession of riparian vegetation. The riparian forest community thus shapes stream characteristics partly by determining the size and species of wood that will be provided to the stream channel. For example, pacific coastal hardwoods are depleted from stream channels faster than conifers and smaller diameter wood tends to be transported downstream faster than larger diameter wood. The deposition of large logs with intact root wads initiates the formation of stable debris jams that change local channel hydraulics, controlling the spatial pattern of scour and deposition, causing pool and riffle formations, and providing critical fish habitat features. These stable features can then facilitate the colonization of vegetation to form “islands” that can grow as more sediment accumulates downstream and plants continue to colonize. Alder and spruce saplings are tree species often noted colonizing these sites.

Flooding is a natural disturbance that, by definition, is unique to hydoriparian ecosystems. The effects of flooding vary widely depending on local topography of the stream channel and adjacent riparian area, and on channel substrate type. When stream channels are situated in relatively flat areas, their adjacent land areas are known as floodplains. Floodplains are ecologically and geomorphologically dynamic hydoriparian features that are actively modified by period inundation with water (flooding) when the stream overtops its banks in response to heavy rainfall or snowmelt36. The dynamic nature of floodplains and high nutrient input results in vegetation and microclimate conditions that are often more diverse than those found in upland areas. Importantly, floodplains are areas within which natural river channels migrate laterally in response to flows and stream processes.

Flood frequency is often the factor used to classify floodplains since the magnitude, frequency and duration of floods diminish with lateral distance from the channel, and these disturbance regimes are reflected in the riparian vegetation. For example, the Clayoquot Sound Scientific Panel divided floodplains into two classes: active and dry. The active floodplain defined as being inundated by flowing or standing water on average once in five years. Soils in this area are mineral to organic with flood-tolerant vegetation and the presence of off-channel fluvial features such as sidechannels, oxbows and ponds. The dry floodplain is above the active floodplain and subject to only occasional inundation between 1 in 5 and 1 in 30 years. The Scientific Panel further defined the contemporary floodplain as “the valley bottom adjacent to a stream channel that is subject to inundation in the contemporary streamflow regime and that, consequently, has soils composed of recently deposited sediments.” This area encompasses both the active and dry floodplains and is defined as being flooded greater than 1 in 30 years, up to 1 in 200 years.

36 Information on floodplains adapted from Millar et al. (1997) and Gregory et al. (1991).
Floodplain ecosystems can also be classified into high, middle and low floodplain benches using BC’s BEC to define the boundaries of floodplain benches by riparian ecosystem types (Price and McLennan 2002).

4.4.4 Human Influences on hydoriparian ecosystems

Human influences specific to hydoriparian ecosystems are outlined in the following section; further detail and sections overlapping with human influences in terrestrial ecosystems are described in Section 4.2.4: Terrestrial Ecosystems. Impacts of human activities on hydoriparian ecosystems can be grouped into 6 categories: (1) logging, (2) introduced animals, (3) introduced plants, (4) recreational and other human use, (5) Haida use, and (6) climate change.

4.4.4.1 Forestry development

Timber harvesting impacts occur on both a local site-specific scale and, collectively, over a larger landscape scale. In addition to the issues raised in Section 4.2.4, logging can have particularly detrimental effects on hydoriparian ecosystems when streams are logged to the stream banks. Although fish-bearing streams larger than 3m channel width and streams larger than 5m channel width without fish could not be logged to the banks following implementation of the Forest Practises Code in the early 1990s, banks of smaller streams continue to be logged. Despite the riparian reserves left standing along larger streams, windthrow, debris flows or water erosion have created additional disturbances following logging activities.

The most direct and immediate result of logging activities is site alteration of the riparian forest characteristics. This change then affects the quantity, quality and rate of LWD and sediment delivery to the stream channel; stability of stream banks, floodplain and sidewalls; in-stream fish habitat structures; water quality; primary productivity rates; and rates of sedimentation; thus changing the adjacent hydoriparian ecosystems (Young 2001). Roads and associated culverts also impact hydoriparian ecosystems by disturbing site hydrology including the interception of groundwater flow; concentration of ground and surface water flow through culverts, forming new channels downstream (particularly evident on hillslope roads); disturbance of lateral river migration patterns; increasing rates of sedimentation, especially chronic fine sediment introduction from active roads; and restriction of stream channel flow through road crossings. Roads may have permanent impacts on drainage pathways and timing of water flow within any watershed. There are also numerous ecological features of hydoriparian ecosystems for which there are no studies about the effects of logging specific to the Pacific Northwest including: bryophytes, fungi, lichens and hyporheic communities (Price and McLennan 2002).

The local rate of recovery of various hydoriparian functions depends on the size, scale and site characteristics of the disturbance (Table 12). As an example, the following are rough ranges of recovery for a variety of functions outlined in the Coast Information Team Hydoriparian Planning Guide, Version 3.6:
Table 12. Rate of recovery of various hydoriparian functions

<table>
<thead>
<tr>
<th>Hydoriparian function</th>
<th>Timeframe of recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare and important habitat</td>
<td>250+ years with the possibility of some obligate populations never recovering from widespread disturbances</td>
</tr>
<tr>
<td>Rare ecosystem sites</td>
<td>250+ years</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>&lt;50 to 250+ years</td>
</tr>
<tr>
<td>LWD input</td>
<td>100+ years</td>
</tr>
<tr>
<td>Water quality</td>
<td>10+ years</td>
</tr>
<tr>
<td>Water transport pathways</td>
<td>10 to 25+ years</td>
</tr>
<tr>
<td>Sediment transport pathways</td>
<td>10 to 100+ years</td>
</tr>
<tr>
<td>Wildlife corridors</td>
<td>5 to 200+ years, depending on species</td>
</tr>
<tr>
<td>Sediment filtration</td>
<td>5 to 50 years</td>
</tr>
<tr>
<td>Stream temperature</td>
<td>5 to 15 years</td>
</tr>
<tr>
<td>Biological activity</td>
<td>5 to 15 years for initial recovery but reduced in mid-seral stage closed canopy forests</td>
</tr>
</tbody>
</table>

On a limited scale, these disturbances may have little impact on the ecological health of a watershed; however, the broader the logging-related disturbance, the greater the likelihood of affecting ecological and geomorphological watershed processes. On a landscape scale, extensive and widely distributed logging of hydoriparian and upland terrestrial ecosystems will have negative implications for large-scale features and processes such as watershed hydrological regime; rate and magnitude of mass wasting; movement corridors for wildlife; loss of interior forest conditions associated with natural forests adjacent to hydoriparian ecosystems; and quantity and quality of critical fish and wildlife habitat. “Ecologically healthy watersheds require the preservation of lateral, longitudinal, and vertical connections between system components as well as the natural spatial and temporal variability in those components” (Naimen et al., 1992 as cited in Young 2001).

On the Islands, a significant amount of hydoriparian ecosystem has been altered by logging activities, particularly those associated with extensive floodplains and fans on valley bottoms that were originally dominated by large alluvial spruce forests. Logging in the mid-1900s targeted these large spruce trees for “airplane spruce”. In the logging process, stream channels were used as “roads” to float and haul logs out of the watershed and gravel was dredged from stream channels to build roads. Until the late 1980’s, streams were commonly logged to the stream banks. In active floodplains and fans, logging activities have altered these old spruce forests into deciduous alder flats, significantly changing the local ecology, wildlife habitat, and fish habitat for the long-term.
Logging has also had significant impacts on the hydric riparian ecosystems of smaller streams. Throughout industrial logging history, small streams, whether directly providing fish habitat or not, have been commonly logged to the streambanks. The extent of logging impacts on the hydric riparian ecosystems of the Islands has not been quantified; of interest to planning would be an analysis of the hydric riparian ecosystem types over the landscape, the percentage that have been logged, and where remaining forests are still in old seral stage.

4.4.4.2 Introduced animals

Several of the animals introduced to the Islands have had dramatic affects on the hydric riparian ecosystem. The following paragraphs address only specific impacts to hydric riparian areas with details of animal introductions and other impacts located in Section 4.2.4. Introduced animals can have remarkable impacts on all ecosystems, affecting plant species composition, nutrient cycling rates, soil fertility and biological activity, and extent of hydric riparian ecosystems.

American beavers are introduced species that have significantly altered the hydric riparian since their introduction at Mayer Lake in 1949. (see Section 4.3: Terrestrial Wildlife for a description of beaver and their impacts).

Muskrats were first introduced in 1926 at a homestead near the mouth of the Oeanda River (Reimchen 1992). They have since spread throughout the Islands with sightings in lakes and streams from Masset to north Moresby Island (Skidegate Lake). The ecological impact of muskrat on native flora and fauna has not been studied to date.

Wapiti or Rocky mountain elk were introduced near Lawn Point on the east coast of Graham Island (Cowan in Scudder and Gessler 1989). A population has persisted on Graham Island, centered in the Tlell River Pontoons fen-marsh complex. Elk are relatively common in the Tlell Pontoons during the low flow summer season, with elk bedding areas and trails observed throughout. No population census has been conducted and their impacts on local ecology have not been studied.

Tree frogs were introduced from Vancouver Island by a resident of Port Clements in the early 1960s. They have spread from their area of introduction throughout hydric riparian areas on Graham island. The tree frog and the native toad (the only native amphibian on the Islands) both eat plankton as tadpoles and eat insects as adults, thus competition between the two species is probable; however, the ecological impacts of tree frog introduction have not been studied (Reimchen 1992). The red-legged tree frog (Rana aurora), a more recent frog introduction that has been positively identified in the field, is also centred around Port Clements.

Introduced Sitka black-tailed deer, raccoon, red squirrel and European roof rat also impact hydric riparian ecosystems; however, their impacts are not specific to these ecosystems and are described in Section 4.3.4.

4.4.4.3 Introduced plants

Introduced plants have the potential to change local and broader scale ecological characteristics of an area. In general, highly disturbed sites such as riparian areas, forest clearcuts, gravel pits, cleared fields and roadsides tend to harbour the highest number and cover of introduced plants. Because riparian areas also tend to provide more light than upland forests and cover a broad range of ecological conditions from seaside to mountaintop, it is thought that they are natural corridors for dispersal of introduced species throughout the landscape (Naimen et al. 2000 and
Price and McLennan 2002). Some introduced species such as thistle have been noted present in many riparian areas of undeveloped watershed areas, however their specific ecological impacts are not known. See section 4.2.4 for a general summary of introduced plants.

4.4.4.4 Recreational and other human use

Recreational use specific to freshwater hydoriparian areas includes fishing, boating, family outings, hunting and hiking. Other human uses includes trapping for beavers and river otters; trapping for marten also occurs but is not limited to hydoriparian ecosystems.

4.4.4.5 Climate change

See section 4.2.4 for a summary of climate change issues. Climate change will affect water quality and hydrological regime, thus having associated impacts reflected in hydoriparian ecosystems. Specific impacts of climate change on hydoriparian ecosystems on the Islands have not been inferred.
4.5 Freshwater & Anadromous Fish

4.5.1 Overview of freshwater fish species

Fourteen freshwater fish species representing five different families have been documented on lakes and streams of the Islands, eight of which are salmonids (all five species of Pacific salmon, two species of trout and one species of char) with anadromous forms (Table 13). Three stream species, one lamprey and 2 cottids, are restricted to freshwater habitats. Eight species have been recorded during sampling of lakes. Fish species diversity is less on the Islands than on Vancouver Island due to isolation, high salinity waters around the Islands and lack of fish species introductions.

Table 13. Freshwater fishes recorded in rivers, streams and lakes.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western brook lamprey</td>
<td>Lampetra richardsoni</td>
</tr>
<tr>
<td>Pacific lamprey</td>
<td>L. tridentate</td>
</tr>
<tr>
<td>Coastal cutthroat trout</td>
<td>Oncorhynchus clarki clarki</td>
</tr>
<tr>
<td>Rainbow trout (Steelhead)</td>
<td>O. mykiss</td>
</tr>
<tr>
<td>Pink salmon</td>
<td>O. gorbuscha</td>
</tr>
<tr>
<td>Chum salmon</td>
<td>O. keta</td>
</tr>
<tr>
<td>Coho salmon</td>
<td>O. kisutch</td>
</tr>
<tr>
<td>Sockeye salmon (Kokanee)</td>
<td>O. nerka</td>
</tr>
<tr>
<td>Chinook salmon</td>
<td>O. tshawytscha</td>
</tr>
<tr>
<td>Dolly Varden char</td>
<td>Salvelinus malma</td>
</tr>
<tr>
<td>Eulachon37</td>
<td>Thaleichthys pacificus</td>
</tr>
<tr>
<td>Threespine stickleback</td>
<td>Gasterosteus aculeatus</td>
</tr>
<tr>
<td>Coast range sculpin</td>
<td>Cottus aleuticus</td>
</tr>
<tr>
<td>Prickly sculpin</td>
<td>C. asper</td>
</tr>
</tbody>
</table>

Two lamprey species are noted on the Islands. However, Beamish collected specimens from the Copper River watershed that may be a new species (Beamish and McDermott 2002). The Haida Fisheries Program (HFP) collected more samples for identification in 2003 and results of taxonomy are forthcoming38.

Reimchen (1992) described numerous endemic forms of threespine stickleback in the QC(HG) Lowlands including the giant black stickleback and Charlotte stickleback, which are both listed as species of Special Concern by the BC Conservation Data Centre (Appendix D). DNA analysis of threespine stickleback populations indicate two distinct lineages, one that derives

37 Eulachon have only been caught in surface trawls at the mouth of the Yakoun River and have never been recorded upstream so it is thought that they do not reproduce here (Northcote et al. 1989).
38 Personal communications with Peter Katinic, Haida Fisheries Program Biologist. 2003.
from its marine ancestor and another that diverged from the marine ancestor about 1.2 million years ago. Reimchen (1992) postulates that the presence of the divergent DNA form supports the existence of an ice-free refugia in the northeastern QC(HG) Lowlands through the last period of glaciation. Stickleback forms with DNA similar to the marine ancestor, including the giant black stickleback, would have evolved rapidly following retreat of the last glaciers 10,000 years ago.

Some differences in fish species distribution are apparent through the different ecossections. The following summary is based on the percentage occurrence of each species in streams sampled in each ecossection as presented in Table 9 of Northcote et al. (1989):

- The occurrence of *pink and chum salmon* is most common in streams of the QC(HG) Ranges, decreasing in the Skidegate Plateau and lowest in the QC(HG) Lowlands;
- *Coho salmon* occur in a high percentage of streams throughout all ecossections;
- *Sockeye* also occur in limited distribution throughout all the ecossections. With the exception of the Mercer River watershed, all of the major sockeye producing watersheds (Yakoun, Copper, Ain, Awun, and Mathers), have lakes within the Skidegate Plateau. Minor sockeye stocks occur in other lake systems and very minor riverine sockeye populations are thought to exist throughout Island streams. Some important sockeye stocks on the Islands are significantly reduced from their historical runs and may be related to the sensitive nature of sockeye to habitat disturbance. Much of this trend is known based on current stock assessment as well as historical and current local observations (e.g., during Haida food fishing)\(^ {39} \).
- The only endemic and sizable population of *Chinook salmon* occurs in the Yakoun, the largest watershed on the Islands. Chinook stock from the Quimsam River on Vancouver Island was introduced to Pallant Creek in the mid-1980s and the population still persists today. Extensive local knowledge has been gathered about Chinook in the Naden, Mamin and Deena watersheds.
- *Rainbow trout* occur mostly in the QC(HG) Ranges and the Skidegate Plateau with lesser occurrence in the QC(HG) Lowlands. Recreationally important steelhead trout systems include the Yakoun, Mamin, Tlell, Copper and Mathers Rivers;
- *Coastal cutthroat trout* are widespread in the QC(HG) Lowlands but largely absent in the QC(HG) Ranges;
- *Dolly Varden char* occur commonly throughout all ecossections;
- *Coast range sculpin* appear to occur more commonly in the QC(HG) Ranges, decreasing through the Skidegate Plateau to the QC(HG) Lowlands; and prickly sculpin appear to have the opposing distribution, being more common in the QC(HG) Lowlands and Skidegate Plateau and less so in the QC(HG) Ranges.
- *Threespine stickleback* occur more frequently in QC(HG) Lowlands and much less frequently in the Skidegate Plateau and QC(HG) Ranges.

\(^ {39} \) Peter Katinic. Program Biologist. Haida Fisheries Program.
In addition to freshwater fishes, a few marine fish species that are tolerant of lower salinity waters have been noted in the lower tidal reaches of larger rivers (Table 14). Staghorn sculpin and starry flounder occur fairly commonly; however, the remainder of the marine fishes have limited occurrences. In general, marine fishes are found more commonly in the lower stream reaches of the QC(HG) Lowlands and Skidegate Plateau than in those of QC(HG) Ranges (Northcote et al. 1989).

### Table 14** Marine fishes recorded in the lower reaches of Islands streams.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staghorn sculpin</td>
<td><em>Leptocottus armatus</em></td>
</tr>
<tr>
<td>Starry flounder</td>
<td><em>Platichthys stellatus</em></td>
</tr>
<tr>
<td>Sharpnose sculpin</td>
<td><em>Clinocottus acuticeps</em></td>
</tr>
<tr>
<td>Tidepool sculpin</td>
<td><em>Oligocottus maculosus</em></td>
</tr>
<tr>
<td>Speckled sanddab</td>
<td><em>Citharichthys stigmeus</em></td>
</tr>
<tr>
<td>Pacific sanddab</td>
<td><em>Citharichthys sordidus</em></td>
</tr>
<tr>
<td>Pacific saury</td>
<td><em>Cololabis saira</em></td>
</tr>
<tr>
<td>Tubesnout</td>
<td><em>Aulorhynchus flavidus</em></td>
</tr>
<tr>
<td>Bay pipefish</td>
<td><em>Sygnathus griseolineatus</em></td>
</tr>
<tr>
<td>Smalifish sp.</td>
<td><em>Liparis sp.</em></td>
</tr>
<tr>
<td>Snake prickleback</td>
<td><em>Lumpenus sagitta</em></td>
</tr>
<tr>
<td>Crescent gunnel</td>
<td><em>Pholis laeta</em></td>
</tr>
<tr>
<td>Smelt sp.41</td>
<td>n/a</td>
</tr>
</tbody>
</table>

40 Table 13 adapted from Table 10 in Northcote et al. (1989).
41 The Tlell Watershed Society documented the occurrence of a smelt in an inclined plane trap used to catch outmigrating salmon smolts in May 1996. This specimen was not kept for identification but was likely a night smelt which are known to occur in Hecate Strait (Hart 1973).

### 4.5.2 Life histories of freshwater fish

Freshwater fishes in BC exhibit two main life history types: (1) anadromous and (2) freshwater resident. These terms refer to where the fish spends different parts of its life cycle, from hatching and rearing through to spawning.

Anadromous fish are those that start their life in freshwater, go out to sea, then return to spawn in freshwater again. Freshwater resident (referred to as ‘resident’ in this report) fish spend their entire life cycle, from hatch to spawn, in freshwater.

A more detailed description of the life histories of smolomid species relevant to the Islands (the five Pacific salmon species, coastal cutthroat trout, rainbow/steelhead trout, Dolly Varden char) is provided in Appendix F.


Pacific salmon

All five species of Pacific salmon are anadromous. Pacific salmon spawn in gravel beds of river and streams or along lakeshores, spend a varied amount of their early freshwater life (0 to 3 years) in streams or lakes before heading out to sea for 1 to 7 years. The length of time they spend in freshwater and in the sea before returning to their natal streams to spawn depends on the species, form and availability of food.

The physiological changes fish undergo when they adapt from living in a freshwater to a saltwater environment is called smolting. Upon returning to spawn as mature adults, each species of salmon has a preferred habitat type, time of year and general location in a watershed where it prefers to spawn. All Pacific salmon species exhibit strong sexual dimorphism (the physical appearance of males and females is very different) during the spawning period and die after they spawn.

Anadromy and the strong homing tendency of Pacific salmon have resulted in the evolution of many reproductively isolated sub-populations, which are referred to as stocks (Groot and Margolis 1991). Because Pacific salmon must swim up from stream mouths to spawning grounds further upstream, they may be limited in their upstream migration by barriers to fish passage such as falls, cascades, beaver dams and perched culverts. The different species have varying abilities to navigate upstream, thus a barrier to one species may not necessarily be a barrier to another.

Trout and Dolly Varden char

The two trout species and Dolly Varden char can be either anadromous or resident. In other words, trout and char may or may not go out to the ocean before they spawn and, unlike Pacific salmon, trout and char live to spawn several times over their lives. Within a watershed, downstream of barriers to fish migration, trout and char may be anadromous or resident. Upstream of barriers to fish migration, persistent populations of trout and char must have a reproductively successful resident population; however, some individuals in the population may be swept downstream of the barrier, allowing them to become anadromous. On the Islands, Dolly Varden char are commonly found upstream of barriers to all anadromous salmonids and in fact, can be found in headwater streams up to almost 30% gradient. Resident cutthroat trout are present in the Skidegate Plateau but rare in the QC(HG) Ranges. Resident rainbow trout populations have been noted in Rennell Sound watersheds in the QC(HG) Ranges but are generally less common in the Skidegate Plateau and Lowlands.

Eulachon

Eulachon are anadromous members of the smelt family that generally school in very large groups. There are a number of eulachon spawning rivers on the mainland side of Hecate Strait, including the Nass River and tributaries of the Skeena River and the eulachon harvest is integral to the Indigenous Peoples in that area. No spawning populations of eulachon are known on the Islands, however, as footnoted in Section 4.5.1, eulachon have been caught in surveys off the mouth of the Yakoun River (hence their inclusion in the list of freshwater fishes of the Islands). There is a Haida story of eulachon spawning in the Yakoun River sometime in history⁴².

⁴² Schools of eulachon are reputed to sometimes spawn only once in rivers where they have never been known to spawn before.
Pacific lamprey

The Pacific lamprey is also an anadromous fish. Once hatched, toothless Pacific lamprey larvae (ammocetes) spend at least 5 years in freshwater habitat, generally buried in well-aerated fine sand and mud bottom in backeddies and pools. Metamorphosis of the larvae into the juvenile form with teeth occurs sometime after 5 years, at which point the juvenile migrates downstream to begin parasitic life in the ocean. When mature, adults return to spawn in streams and, like salmon, die after spawning (Hart 1980). It is suspected that lamprey may be able to navigate upstream of barriers to anadromous salmonids because of their ability to suction onto rocks with their mouths.

Freshwater sculpin and Western brook lamprey

As noted in Section 4.5.1, the freshwater sculpin species and the Western brook lamprey are resident fish, spending their entire lives in freshwater.

Threespine stickleback

Threespine stickleback are found commonly in both freshwater and saltwater environments. In freshwater, they form distinctive populations in different waters and different habitat niches. They can be found in brackish water of estuaries and nearshore environments, as well as far out to sea. They breed in both fresh and salt water, although the success of saltwater reproduction is questioned (Hart 1980). Thus, stickleback can be resident fish living out their lives entirely in freshwater, or anadromous, or live entirely in the marine environment.

4.5.3 Salmonid fish species

Eight freshwater salmonid species are found on the Islands. These include five species of Pacific salmon (Chinook, coho, sockeye, pink and chum), two trout species (coastal cutthroat and rainbow trout), and one char species (Dolly Varden). Salmonid production is affected by their survival rates in freshwater and in the ocean. Eggs and juveniles depend on cold, clean, oxygen-rich water and sufficient habitat quality and quantity. Ocean survival is affected by ocean conditions and predation.

Salmon spawner escapement data (the number of spawners returning to a stream system to spawn) is collected each year by DFO for salmon population estimates and to help determine when and where terminal commercial fisheries may take place. Haida Fisheries (HFP) also conducts salmon escapement surveys to manage traditional sockeye fisheries and to cooperate in DFO data collection. Although there are limitations to this data, it is often the only estimate available. Adult salmon counting fences may give a more accurate estimate of salmon escapement. These fences are run by DFO, HFP and watershed stewardship/salmon enhancement community groups. Fences operating on Islands streams include the Chown (coho), Nadu (coho), Yakoun (pink, chinook), Tiell (coho, pink), Jungle (coho), Copper (sockeye), Pallant (chum, coho, pink, chinook) and Mathers (chum, coho). The Chown fence has also operated a downstream smolt fence in conjunction with the adult spawner fence to estimate ocean survival rates.

It is now recognized that Pacific salmon are a keystone species that link marine and terrestrial ecosystems and play a critically important role in the nutrient and trophic dynamics of hydoriparian ecosystems. Pacific salmon acquire the majority of their body mass in the ocean, return to their natal streams to spawn and die, thus transferring large amounts of marine
nutrients to the terrestrial system. Salmon-derived nutrients are transferred from the stream to the riparian area in three ways: (1) deposition of carcasses in the riparian area during high flows; (2) transport of dissolved nutrients from carcasses into the hyporheic zone beneath the hydoriparian area, making these nutrients available to riparian vegetation through roots; and (3) transport of spawners and carcasses by predators and scavengers from the stream into the riparian area. Subsequent deposition of waste products in the scat of fish-eaters carries salmon-derived marine nutrients even further away from the stream channel (Naimen et al. 2000). In total, pink and chum salmon stocks provide the largest input of marine-derived biomass into riparian areas throughout the Islands. All salmon spawners provide an important food source for a large variety of mammals, birds and macroinvertebrates. On the Islands, the most notable and common example is the black bear: In one season, a single bear can carry 3,500 pounds of salmon ‘fertilizer’ into the forest\footnote{This estimate taken from the Nature of Things television series episode called \textit{The Salmon Forest}, based partly on the research into the interactions of black bears and spawning salmon conducted by Dr. Tom Reimchen at the University of Victoria.}.

Although logging activities can have significant impacts on the number and species of Pacific salmon returning to spawn in a watershed, these are complicated analyses that are beyond the scope of this report. There is little to no long-term baseline data on populations of cutthroat and rainbow trout and Dolly Varden char on the Islands.

The general life history characteristics for each freshwater salmonid species is summarized in Table 15 and in more detail in Appendix F. The information in Table 15 is summarized from Groot and Margolis (1991), Scott and Crossman (1979) and Hart (1980). Local information is provided on each salmon species in the following pages based on technical reports as well as local knowledge and personal communications with local fisheries experts.
### Table 15. General life history characteristics of freshwater salmonid species of the Islands

<table>
<thead>
<tr>
<th>Salmonid Species</th>
<th>Freshwater Residence (months)</th>
<th>Estuary Residence (months)</th>
<th>Saltwater Residence (years)</th>
<th>Spawning Season</th>
<th>Spawning Requirements</th>
<th>Substrate</th>
<th>Watershed Distribution of Spawners</th>
<th>Life History</th>
<th>Specific critical Habitat Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinook salmon</td>
<td>approx. 3</td>
<td>0.25 to 2</td>
<td>1.5 to 6.5</td>
<td>August to October</td>
<td>Mainstem of larger HG/QCI rivers in waters with good subgravel flows and of varying depths.</td>
<td>Cobble and gravel</td>
<td>Strong swimmers and jumpers, generally spawning in mid to upper mainstem reaches. Good subgravel flow is critical at spawning locations.</td>
<td>Anadromous</td>
<td>Healthy estuaries for rearing of fry. Good subgravel water flow for aeration of eggs.</td>
</tr>
<tr>
<td>Coho salmon</td>
<td>6 to 36</td>
<td>0 to 2</td>
<td>0.5 to 1.5</td>
<td>September to December</td>
<td>Generally in smaller streams and tributaries to rivers and lakes at the tailout of pools.</td>
<td>Coarse gravel mixed with sand and cobble</td>
<td>Throughout all accessible portions of a watershed including very small tributaries.</td>
<td>Anadromous or Resident</td>
<td>Instream structure and cover, overstream cover, deep pools, slow flowing backwaters and off-channel habitat.</td>
</tr>
<tr>
<td>Sockeye salmon</td>
<td>12 to 36</td>
<td>0 to 0.5</td>
<td>1.5 to 4.5</td>
<td>September to October</td>
<td>Generally either in tributaries to lakes; in areas of upwelling along the lakeshore; or in rivers between lakes or at lake outlets.</td>
<td>Coarse gravel mixed with sand and cobble</td>
<td>Juvenile sockeye generally rear in lakes for 1 to 3 years after hatching, thus spawning generally occurs in tributaries to the lake, lake outlets, or along lakeshores with abundant upwelling.</td>
<td>Anadromous or Resident</td>
<td>Healthy stable lake systems with constant nutrient flow and clean water.</td>
</tr>
<tr>
<td>Chum salmon</td>
<td>0 to 1</td>
<td>0 to 2</td>
<td>1.5 to 4.5</td>
<td>August to October</td>
<td>Areas of upwelling such as pool tailouts or immediately upstream of turbulent water.</td>
<td>Gravel and cobble</td>
<td>Strong swimmers but reluctant jumpers, generally confined to the lower reaches of a river and its tributaries. Known to spawn in the intertidal.</td>
<td>Anadromous</td>
<td>Healthy estuary and adjacent nearshore for rearing of fry.</td>
</tr>
<tr>
<td>Pink salmon</td>
<td>0 to 0.5</td>
<td>0 to 2</td>
<td>1.5</td>
<td>August to October</td>
<td>Fast moving shallow water either in riffles or on the border between riffles and pools.</td>
<td>Coarse gravel mixed with sand and cobble</td>
<td>Generally confined to the lower reaches of a river and its tributaries, although they may travel a long distance up a watershed. Known to spawn in the intertidal. Limited ability to navigate upstream of waterfalls or velocity barriers.</td>
<td>Anadromous</td>
<td>Healthy estuary and adjacent nearshore for rearing of fry.</td>
</tr>
<tr>
<td>Coastal cutthroat trout</td>
<td>12 to 60</td>
<td>12 to 60</td>
<td>1 to 5 (in coastal waters)</td>
<td>January to May</td>
<td>Generally in smaller streams and in tributaries to rivers and lakes.</td>
<td>Gravel mixed with sand</td>
<td>Throughout all accessible portions of a watershed including very small tributaries. Often found as residents above impassible barriers</td>
<td>Anadromous or Resident</td>
<td>Instream structure and cover, overstream cover, deep pools, slow flowing backwater and off-channel habitat.</td>
</tr>
<tr>
<td>Rainbow/steelhead trout</td>
<td>12 to 48</td>
<td>unknown</td>
<td>1.5 to 5.5</td>
<td>March to June</td>
<td>Resident forms generally in smaller streams and tributaries to rivers and lakes. Anadromous steelhead in main rivers and tributaries.</td>
<td>Gravel mixed with sand</td>
<td>Throughout all accessible portions of a watershed including very small tributaries. Often found as residents above barriers to anadromous fish.</td>
<td>Anadromous or Resident</td>
<td>Instream structure and cover, overstream cover and deep pools.</td>
</tr>
<tr>
<td>Dolly Varden char</td>
<td>36 to 48</td>
<td>2 to 6</td>
<td>0.2 to 0.5 (in coastal waters)</td>
<td>September to November</td>
<td>Generally in smaller streams and tributaries to rivers and lakes.</td>
<td>Gravel mixed with sand</td>
<td>Throughout all accessible portions of a watershed including very small tributaries. Often found as residents above barriers to anadromous fish.</td>
<td>Anadromous or Resident</td>
<td>Instream structure and cover, overstream cover, deep pools, slow flowing backwater and off-channel habitat.</td>
</tr>
</tbody>
</table>
4.3.5.1 Chinook salmon

The only endemic chinook salmon population known on the Islands occurs in the Yakoun River watershed, the largest watershed. Chinook salmon generally spawn in larger river and stream channels. Concerns about decline of the chinook population led to stock enhancement by the Old Massett Village Council through the Salmonid Enhancement Program of Fisheries and Oceans Canada, starting in the mid-1980s. Decline of this chinook population may have resulted from past excessive sportsfishing of Yakoun chinook that were holding in specific areas of Masset Inlet prior to migration upstream. In recent years, there has been no retention of Chinook salmon in Massett Inlet; however, Yakoun Chinook stocks are caught in the intensive recreational fishery between Langara Island and Old Massett. Other potential influences are logging-related impacts to the Yakoun River mainstem, commercial fishing and effects of climate and ocean conditions. Haida Fisheries currently operates a counting fence on the Yakoun River for even-year pink salmon; however, chinook data is also collected whenever possible as the timing for these pink and chinook salmon runs overlap.

Chinook stock from the Quimsam River on Vancouver Island was introduced to Pallant Creek in the mid-1980s for enhancement purposes. Active enhancement was stopped after a few years but the population naturally persisted. Since 1998, under operation of Haida Fisheries, Pallant Creek Fish Hatchery has conducted broodstock collection of chinook for enhancement.

Commercial fisheries around the Islands primarily target chinook stocks migrating to spawn in streams on the Mainland and Vancouver Island.

4.5.3.2 Coho salmon

Coho salmon are common in streams throughout all ecosections of the Islands. Strong swimmers and jumpers, they can be found throughout the anadromous range of salmon in a watershed, although they prefer to spawn in smaller tributary channels and will migrate upstream of lakes to spawn in tributaries of lakes. Abundant good quality overwinter rearing habitat is critical to coho freshwater survival; this habitat includes places where coho juveniles can hold during winter floods such as off-channel areas, deep pools, log jams, sidechannels, backeddies, lakes and wetlands. Floodplains and fans provide particularly important overwintering habitat for coho.

Coho salmon are one of the most common species targeted for small-scale salmonid enhancement projects (e.g., community or logging company-based). Coho populations on small stream systems throughout the Islands have been negatively impacted by highway and logging road construction with inadequate stream crossing structures. In fact, local information suggests that many small coho stocks on the Islands have become extirpated by poor road construction practises, particularly on the east coast of Graham Island and along Masset Inlet. In some cases, hatchery-reared coho are introduced into stream reaches in coho-bearing systems upstream of natural barriers to coho migration because it was felt that enhanced coho juveniles would fare better in areas without competition from wild coho juveniles (eg. Blackwater Creek on the Mamin River and Coates Creek upstream of the barrier falls). In other cases, coho stocks are enhanced to try and offset negative impacts of logging or to ensure that systems with very few fish do not become extirpated.

44 Personal communications with Pat Fairweather, Haida Fisheries Program Manager.
Pallant Creek Hatchery, a former DFO facility that is now operated by Haida Fisheries (HFP) is the largest producer of hatchery coho on the Islands. The hatchery now produces both chum and coho both to help fund its operations and to facilitate a commercial terminal net and troll fishery in Cumshewa Inlet. The hatchery also serves as a satellite hatchery to raise chum and coho from the Mathers Creek watershed on Louise Island in Cumshewa Inlet (also operated by the HFP). Years of commercial terminal fisheries targeting Pallant Creek salmon has resulted in decline and possible extirpation of many small coho stocks within Cumshewa Inlet.

Fisheries and Oceans Canada is compiling a coho salmon stock status report for the Islands; results are forthcoming.

### 4.5.3.3 Sockeye salmon

Major sockeye salmon populations are associated with lake systems, although smaller sockeye runs are present in many riverine systems. All known major sockeye stocks on the Islands are associated with lakes in the Skidegate Plateau: Yakoun, Skidegate, Awun, Ian, Eden and Mathers. The Yakoun, Awun and Ain (Ian Lake) River stocks are both important food fish resources for the river gillnet fishery. In recent years, however, there has not been a successful traditional sockeye fishery at the mouth of the Ain River due to significant population decline and the HFP is currently working on a sockeye recovery plan for the Ain River. Haida also river gillnet sockeye on the Copper, Naden and Jaawlin rivers. Food fishing using seine boats offshore targets sockeye stocks migrating south.

Mayer Lake in the QC(HG) Lowlands also supports a sockeye run; however, a population survey has never been completed and dark, tannin-stained waters create impossible stream spawner counting conditions. In the QC(HG) Ranges, at least three sockeye populations are known: Fairfax, Mercer and Gudal. These stocks are considered minor in terms of population size.

Kokanee are self-sustaining resident sockeye populations that rear in lakes and spawn in tributaries to the lake or along areas of lakeshore with appropriate spawning gravels and good upwelling. Local information reports kokanee in Mosquito Lake and in a small QC(HG) Lowlands lake along the east coast of Graham Island.

In the Yakoun and Copper (Skidegate Lake) systems, a residual form of sockeye has been reported. Residuals are very small sockeye that have never migrated to the ocean and mature and spawn in lakes. It is thought that residuals can be precursors of kokanee populations in a lake.\(^{45}\)

Riverine sockeye are those that live in systems without lakes. Riverine sockeye are thought to occur widely along the BC coast; however, their population sizes are not large. On the Islands, sockeye have been noted in a few river systems including the Tlell, Deena, and Mamin Rivers. Only the latter has been recognized as a riverine population (Reimchen 1992) and it is unknown if the observations in the Tlell and Deena are simply strays or self-sustaining populations. The occurrence of riverine sockeye on the Islands is likely more widespread than currently documented.

Very little sockeye salmon enhancement work has been done on the Islands. Small-scale incubation project were conducted by the HFP in the mid- to late 1990s on the tributaries of

---

\(^{45}\) Personal communications with Paul Rankin, researcher at the Pacific Biological Station in Nanaimo, BC.
Skidegate Lake (Copper River system) as part of a sockeye research program. Through the early and late 1970s and mid-1980s, DFO conducted lake fertilization of five nutrient-poor lakes to enhance sockeye juvenile production throughout the BC coast, including the Yakoun (1983-86), Eden (1979-85), Mercer (1979), Awun (1979-85) and Ian (1979-83). Skidegate Lake was not fertilized as it is a naturally productive lake system. In general, lake fertilization was found to increased juvenile sockeye production over the period of fertilization. Whether increased juvenile sockeye also led to increased numbers of returning sockeye spawners is unknown as insufficient spawner information was available to compare with years of enhancement\textsuperscript{46}.

Fisheries and Oceans Canada, in conjunction with Haida Fisheries, are working together on a sockeye salmon status report for the Islands with an expected completion time of either fall 2003 or spring 2004.

### 4.5.3.4 Chum salmon

Chum salmon are relatively large and are strong swimmers; however, they dislike jumping and are restricted by relatively small obstructions. They use the lower reaches of a river system to spawn and prefer to spawn in mainstem and main tributary stream channels. Chum are very commonly found throughout streams of the QC(HG) Ranges, with decreasing occurrence through the Skidegate Plateau into the QC(HG) Lowlands. Nutrients provided by returning chum salmon are particularly critical to the hydoriparian health of small coastal watersheds where their nutrient inputs are key to the wildlife, invertebrate and forest communities of hydoriparian ecosystems.

As with all salmon, chum salmon is a Haida a food source. Some small watersheds have tens of thousands of chum return to spawn, whereas others that are much larger, like the Yakoun, only see about 500 chum spawners a year. Curiously, no chum salmon have been reported in east coast Graham Island streams.

Chum salmon are one of two species that have been the main focus of salmonid enhancement work on the Islands. Numerous community-based and logging-company based projects have worked to enhance chum salmon over the past 20 years. Often, enhancement work has been undertaken to address a specific issue, such as helping to restore a stock negatively impacted by the highway crossing or from terminal commercial fisheries; in these cases, when the chum population appears to he self-sustaining again, enhancement efforts are often stopped. Pallant Creek Hatchery is the major producer of hatchery chum salmon both to help fund the hatchery and to facilitate a commercial terminal net and troll fishery in Cumshewa Inlet.

### 4.5.3.5 Pink salmon

In northern BC, pink salmon abundance occurs in two-year cycles such that even years have very large runs and odd years have very small runs to no fish returning at all. Pink spawners tend to arrive at the stream to spawn within a short time period such that they will push upstream to further spawning grounds if there are abundant spawners returning. For example, when close to 2 million pinks arrived in the Yakoun River one year, pink salmon were noted spawning in tributaries upstream of Yakoun Lake.

Like chum, pink salmon generally occur more commonly in the QC(HG) Ranges, followed by the Skidegate Plateau, then the QC(HG) Lowlands. Unlike chum, they have been noted in East

\textsuperscript{46} Personal communications with Paul Rankin, researcher at the Pacific Biological Station in Nanaimo, BC.
Coast Graham Island streams, although not in the large numbers found in the Ranges. For example, the Tlell River, a large Island watershed, has only about 5,000 pinks spawners each even year, whereas a much smaller watershed like the Salmon River in South Moresby might have tens of thousands returning. Like chum salmon, pink salmon are particularly critical to hydoriparian health in the small watersheds of the QC(HG) Ranges.

Little pink enhancement activity occurs. Recently, DFO and a local community group, the Hecate Strait Streamkeepers, attempted to restore a pink salmon run to Jungle Creek, a watershed which used to have pink salmon but has not had returns for decades due to improper culverts placed at the highway crossing.

4.5.3.6 Coastal cutthroat trout

Coastal cutthroat trout are common throughout coastal BC. On the Islands, they are curiously absent in most of the QC(HG) Ranges, more common in the Skidegate Plateau and most common in streams of the QC(HG) Lowlands. Both anadromous and resident forms occur, with resident forms common in the steep headwater creeks of watersheds where they are present. For example, in the Tlell River watershed, a resident population exists from the Tlell falls upstream to the headwaters; in some step-pool headwater streams, they occurred up to 25% average gradient, with only 1 or 2 small mature cutthroat present in any single pool, dependent on the size of the pool. Reimchen (1992) conducted long-term studies of predator-prey interactions at selected lakes in the QC(HG) Lowlands, including ecological work on cutthroat trout. Otherwise, there is a paucity of information on cutthroat trout populations and ecological interactions on the Islands.

4.5.3.7 Rainbow/ steelhead trout

Rainbow trout are referred to as rainbow trout when they are juveniles and when they have a freshwater resident life history. Anadromous rainbow trout are referred to as steelhead trout. On the Islands, rainbow trout are common throughout streams of the QC(HG) Ranges, fairly common in the Skidegate Plateau, and less common in the QC(HG) Lowlands. In the Lowlands, the anadromous form is most common, whereas in the QC(HG) Ranges, resident and anadromous forms are both fairly common. In the Lowlands, it also appears that rainbow have only been reported in larger, generally less-acidic waters. Like cutthroat trout, rainbow trout are not well studied and little is known about the Islands’ populations and ecological interactions.

In watersheds where the distribution of rainbow/steelhead and coastal cutthroat overlap, it is thought that there may be a limited amount of cross-breeding between the species to form a juvenile with characteristics of both rainbow and cutthroat trouts. Although there are many streams with both cutthroat and rainbow trout in reaches downstream of barriers to anadromous fish, resident cutthroat trout and resident rainbow trout have not been noted in the same stream reaches upstream of these barriers; however individual species have been noted with resident Dolly Varden.

---

47 Coastal cutthroat and rainbow trout have recently been moved to the “salmon” genus. However, they are still commonly referred to as “trout”.

48 Personal communications with Lynn Lee, contract biologist. Observed during field work for the Reconnaissance Fish and Fish Habitat Inventory for the Timber Supply Area portion of the Tlell River watershed.

49 Local knowledge passed on to Lynn Lee, Consuting Biologist, personal communication.
4.5.3.8 Dolly Varden char

Dolly Varden char, like coho salmon, are widely distributed throughout all ecossections of the Islands. Both anadromous and resident forms are common. Resident Dolly Varden char are common throughout all fish-bearing headwater streams and in one case, were found to reside in a stream with almost 30% in average gradient.

4.5.4 Rare freshwater fish species

Dolly Varden char (Salvelinus malma) and coastal cutthroat trout (Oncorhynchus clarki clarki), are both blue-listed by the BC CDC because of their vulnerability to habitat changes, including disruption of migration routes, sedimentation, increases in water temperature and road-related impacts.

Giant back stickleback are listed as ‘rare’ by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Reimchen 1992), equivalent to its listing as a species of ‘special concern’ in the BC CDC. The Charlotte stickleback are also listed as a species of special concern.

Beamish and McDermott (2002) speculate that a new lamprey species, Skidegate Lake lamprey, exists in the Copper River watershed. The original specimens were taken years ago and have since disappeared but new specimens were collected by the HFP in 2003 for taxonomic identification.

Eulachon (Thaleichthys pacificus) are blue-listed in BC. No further comments will be made on eulachon because they are not known to spawn in streams of the Islands.

4.5.5 Fish habitat values

Habitat is the natural home of an animal or plant, encompassing all large and small scale physical, chemical and biological elements within the environment that are necessary to maintain that life. For fish, the geology, climate, topography, disturbance regime, marine nutrients from returning salmon, and characteristics of the riparian vegetation govern the characteristics and distribution of habitat types found in a watershed (Cedarholm et al. 2000). Components of freshwater fish habitat include\(^50\):

- **Physical characteristics** – channel width and depth, substrate composition, pool and riffle frequency, pool types, channel roughness, stream gradient, water velocity, upwelling and groundwater flow, channel confinement, lake and wetland types

- **Water quality and quantity** – temperature, dissolved oxygen, dissolved nutrients, dissolved and particulate organic matter, pH, sedimentation/siltation, hydrography including flood characteristics

- **Cover factors** – interstitial spaces (spaces between substrate particles), undercut banks, large and small woody debris, log jams, overstream vegetation, boulders, water surface disturbance, canopy closure

\(^{50}\) Adapted from Cedarholm et al. (2000),
• **Biological factors** – abundance and type of food available, salmon carcass nutrient inputs, competition within and between species, predation, disease, parasites, stream productivity, functioning riparian conditions.

Different fish species have differing habitat requirements. This summary will focus on the habitat needs for different salmonid species, since salmonids have been the focus of forestry and fisheries related research and abundant information is available. The importance of other fish species is also recognized; however, fewer habitat and ecological data exist for these other species.

All fish generally require clean, oxygenated water to survive, although they will have different tolerances for habitat conditions and water quality characteristics. At different stage of their life cycle, different elements of their habitat are critical to survival. Table 16 summarizes critical habitat features for different stages of salmonid life cycles. The relative importance of each factor in salmonid survival depends partly on how long the species spends at each life history stage and in which environment.

Table 16. Summary of critical habitat features for different life stages of salmonid life cycles.

<table>
<thead>
<tr>
<th>Life Stage and Function</th>
<th>Critical Habitat Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg Incubation and Fry Emergence</td>
<td>Cool, clear water; High levels of oxygen; Steady streamflow through gravels to aerate and prevent eggs from freezing; Good, clean substrate; Fairly stable water flows to prevent scouring of eggs out of substrate, or drying of spawning gravels</td>
</tr>
<tr>
<td>Juvenile Freshwater Rearing</td>
<td>Cool, clear water; Instream and overstream cover for protection, shading and food; Food sources; Steady stream flow for oxygenation; Abundant fish habitat diversity</td>
</tr>
<tr>
<td>Downstream Fry or Smolt Migration and Estuary Rearing</td>
<td>Clear, good quality water; Steady freshwater flow to facilitate transition from fresh to salt water; Food sources; Healthy estuarine ecosystem</td>
</tr>
<tr>
<td>Ocean Rearing</td>
<td>Food sources; Protection from predation; Ocean conditions</td>
</tr>
<tr>
<td>Adult Spawner Upstream Migration</td>
<td>Cool, clear water; High levels of oxygen; Instream and overstream cover to hide from predators and maintain cool temperatures; access upstream to spawning grounds; Relatively stable water levels; Deep holding pools and backwater areas to hold during high water</td>
</tr>
<tr>
<td>Adult Spawning</td>
<td>Cool, clear water; Species appropriate spawning gravels; Sufficient amount of spawning habitat; Overstream cover from predators</td>
</tr>
</tbody>
</table>

### 4.5.5.1 Freshwater habitat

Many of the functional and structural attributes of fish habitat are created and maintained through interactions of the aquatic habitat with riparian vegetation. Riparian areas influence streams and therefore fish habitat in several ways:

- **Shade** – moderates seasonal and diel changes in stream temperature, and controls relative amounts of primary and secondary production.

---

51 The following adapted from Cedarholm et al (2000)
- **Streambank stabilization** – provides erosion resistant roots that resist bank undercutting and assist in bank building during high flow events by slowing stream velocities and allowing sediments to deposit. These functions are particularly important to the maintenance of floodplains, fans and islands.

- **Sediment control** – regulates sediment flow from upland areas and from bank erosion.

- **Organic litter input** – contributes a significant amount of organic matter to aquatic habitats and is an important food source for aquatic communities.

- **Large woody debris input** – provides important structure to the stream channel for energy dissipation, fish habitat features, and salmon spawner carcass retention.

- **Nutrient input** – mediates the flow of nutrients to the stream, thus regulating stream production. Some early successional riparian species such as red alder fix atmospheric nitrogen and provides an important nitrogen source to hydriparian communities. Riparian vegetation has been shown to be the single most important structural element for retention of organic matter transported by the stream during high flows. Additionally, riparian areas have profound effects on water chemistry through the uptake and storage of nutrients carried by surface water and groundwater through the hyporheic zone.

- **Microclimate regulation** – streamside soils and vegetation can significantly moderate hydriparian zone climates.

As noted in the hydriparian section, floodplains provide particularly important habitat for many salmonid species including critical overwintering habitat for coho, cutthroat trout and Dolly Varden char.

### 4.5.5.2 Estuary habitat

Estuaries are areas where ocean water is measurably diluted by freshwater runoff from the land within a constricted body of water. They are generally characterized by very high habitat complexity, abrupt changes in water velocity, and low-velocity off-channel habitats. Habitat elements of Pacific Northwest estuaries include: subtidal distributaries; mud and sand flats; gravel-cobble beaches; low elevation emergent marshes; high elevation emergent marshes; forested and shrub swamps; eelgrass; and kelp (Cedarholm et al. 2000).

The most fundamental aspect of estuarine ecology of juvenile salmon is that the salmon interact with a mosaic of local habitat conditions that change in response to tidal cycles and freshwater runoff events. River flow and tide, physiological change, prey and predator distributions, and likely metapopulation genetic structure, all affect the rate of salmonid movement through the estuary. Estuarine seascape features include tidal-freshwater and brackish rearing zones, low-velocity refugia, migratory corridors and foraging areas. Feeding behaviour and diet of juvenile salmon passing through and rearing in estuaries often targets specific types, species and life history stages of prey organisms (Cedarholm et al. 2000).

On the Islands, estuaries can be critically important to juvenile salmonids because they:

---

52 Although estuarine habitats are obviously coastal, this section has been included due to the critical importance of estuaries to some salmonids species.
provide habitat for rearing pink and chum fry that leave the stream shortly after emerging from spawning beds;

provide habitat for coho smolts for up to several months prior to their departure to the ocean;

provide year-round rearing areas for cutthroat trout, Dolly Varden char and coho salmon jacks;

provide habitat for overwintering coho, steelhead, cutthroat and Dolly Varden that are forced downstream during high river flows;

contain complex low-velocity refugia such as off-channel sloughs and LWD;

allow migrating juveniles to adapt physiologically as they migrate from fresh to salt water;

trap and concentrate drift insects due to flow reversal during flood tides, providing abundant food; and

settle out suspended sediments and detritus, which can fuel soft-sediment habitat formation and detritus-based food webs used by salmon\(^{53}\).

### 4.5.5.3 Ocean habitat

Ocean survival of salmon is a very complex issue. Different salmonid species spend their oceanic life in different parts of the ocean: coho and chinook tend to spend their life closer to the continental shelf; pink, chum, sockeye and rainbow head out to the open Pacific Ocean; coastal cutthroat and Dolly Varden char spend their time in coastal waters. Documented shifts in ocean condition have had concurrent effects on populations of marine fish and salmon, although the mechanisms and fidelity of these relationships is not well known. Survival of salmon in the ocean is dependent upon many interrelated factors including: predation; type and availability of food; upwelling regimes; and ocean climate regimes (Cedarholm, 2000).

### 4.5.6 Influence of human activities on fish and fish habitat

#### 4.5.6.1 Impacts of timber harvesting and road development on fish

Knowledge is variable about the impacts of logging on different freshwater fish species of the Islands. For example, little to no information is available about the impacts of logging on lamprey, cottids and threespine stickleback. Little specific information is available about impacts to cutthroat, rainbow trout, and Dolly Varden char populations, although some impacts can be inferred from life stage requirements. Abundant information has been documented about impacts of logging activities of different salmon species; however, impacts are variable across watersheds and streams with different characteristics in different ecological zones. To complicate the issue, salmon survival is linked to numerous interrelated factors, notably ocean conditions, predation in the ocean including fishing mortalities.

---

\(^{53}\) Adapted from Cedarholm et al. (2000) and Groot and Margolis (1991).
In general, impacts of logging and other land uses have accelerated the rate of occurrence of some disturbance types within hydroriparian areas, resulting in the replacement of primarily old seral stage riparian forest with establishment of broader areas of early successional communities (Cedarholm et al. 2000). The following describe some general impacts on fish and fish habitat due to logging related activities in Pacific Northwest forests. Cumulative long-term impacts of logging, including changes to watershed hydrology, on freshwater survival of salmonids are not well understood, particularly when compounded by ocean survival factors.

For all salmonid species, increases in water temperature due to riparian logging can cause more rapid incubation of eggs and earlier fry emergence. This result may have detrimental effects as salmonids may hatch too early for optimal survival e.g., amount and type of food may not be available; and spring floods may wash fry out of the stream system (Scrivener and Brown 1992).

For all salmonids, road building activities have caused access problems for both adult and juvenile fish; created chronic sedimentation problems on active roads and long-term potential problems for abandoned roads; facilitated beaver related flooding by use of culverts for dam placement; changed local hydrology; restricted lateral stream channel migration in floodplains and fans; and blocked fish access into former off-channel rearing areas particularly on floodplains and fans (Stanley and Wilson, 2001).

Coho salmon, cutthroat and rainbow trout, and Dolly Varden char all spend a significant portion of their life cycle in stream channels. As such, they are most sensitive to long-term changes in fish habitat quantity and quality in the stream. As described in the hydroriparian section of this report, past logging of riparian areas to the streambanks has had detrimental impacts on fish habitat throughout the Islands. In general, past logging practises of cross-stream yarding, using stream channels as transport corridors and removing gravel from stream channels for road construction, as well as DFO removal of log jams through to the early 1980s, resulted in a loss of fish habitat complexity in impacted reaches, generally resulting in reduced habitat quality for these species. With loss of LWD, pool frequency and depth decrease, riffle areas increases, cover decreases and channel depth to width ratios decrease (ie stream channels get wider and shallower). Over the long term, the ability of the riparian forest to deliver LWD into the stream channel is truncated for hundreds of years.

In recent years, the contribution of small streams to the production of coho salmon and cutthroat trout has been increasing recognized. Rosenfeld et al. (2002) found that stream length was a more accurate indicator of total contribution to cutthroat trout summer rearing habitat than water surface area, such that small streams are very important in the summer and winter rearing of coho and cutthroat. In addition, small headwater streams are important to resident populations of cutthroat, rainbow and Dolly Varden. Throughout the history of industrial logging in BC, riparian areas around small streams have been regularly logged to the banks, even when they provide direct fish habitat. In turn, there are potentially detrimental long-term impacts to the fish populations dependent on those small stream habitats.

4.5.6.2 Impacts of other human activities

A detailed summary of impacts for other human activities is beyond the scope of this report. As outlined in the hydroriparian section, other human activities and their consequences include introduced animals, introduced plants, recreational fishing and hunting, trapping, mining and climate change. A few relevant comments are made below.
Beavers have had a marked effect on the quantity, quality and distribution of fish habitat features, particularly in areas that have been logged to the stream banks. Beaver dam building activities have changed spawning beds to rearing ponds, restricted juvenile coho access into rearing areas, restricted adult spawner access to spawning grounds, and silted previously good quality spawning habitat. In areas where abundant spawning gravel is still available, beavers may have a net positive effect on coho juvenile production by providing good quality rearing habitat with abundant food. In contrast, beaver activities can also have net negative impacts on coho juvenile production by silting spawning beds, reducing local stream flow and restricting access to spawning areas.

Mining has impacted hydoriparian systems in Harriet Harbour (Jedway mine site), Fairfax Inlet (Tasu mine site), Mitchell Inlet, and in the Yakoun River watershed (formerly active gold mine). In the Yakoun River, leachate from tailings pond continue to impact aquatic communities in a tributary to the Yakoun River. Northcote et al. (1989) felt that the Tasu iron mine site probably had some minimal impact on sockeye and other salmonid populations in the system; however, the long-term impacts of the now abandoned site are likely minor.

Recreational steelhead fishing occurs on several major stream systems of the Islands including the Tlell, Yakoun, Pallant and Copper. Most of the fishing is catch and release, although the impacts of this fishery on steelhead populations are not well-studied.

The Haida system of wier trapping fish (evidenced throughout the island) was designed to ensure ecologically responsible harvest in that only those fish that were needed and that could be prepared were taken, while the others were released to spawn the next generation.
5 Resource Uses and Management

5.1 Protected Areas

5.1.1 Canadian and British Columbia Legislated protected areas

Within the terrestrial portion of the Islands, there are currently 224,994 hectares under various types of protection as legislated or declared by the province and federal governments or the Haida Nation (Map 3). This represents approximately 22% of the archipelago. The largest protected area is the Gwaii Haanas National Park Reserve and Haida Heritage Site, which includes the entire southern portion of Moresby Island and numerous adjacent off-shore islands. Naikoon was designated by the province as a Provincial Park in 1973, and includes the north eastern portion of Graham Island. Within Naikoon there are two small Ecological Reserves: Tow Hill E.R. which is west of the Haida community of Yakan Point, and Rose Spit E.R. at the extreme northeast tip of Graham Island. The largest Ecological Reserve on the Islands is Vladimir J. Krajina E.R. on the west coast of Graham Island. Other Ecological Reserves include Drizzle Lake and an island in Lepas Bay. Table 17 summarizes the protected areas as legislated through provincial or federal systems. This table does not include the 14 additional site designations made by the Haida Nation (see 5.1.2).

Table 17. Federal and provincial legislated protected areas

<table>
<thead>
<tr>
<th>Protected Area</th>
<th>Size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwaii Haanas National Park Reserve and Haida Heritage Site</td>
<td>147,000</td>
</tr>
<tr>
<td>Naikoon Provincial Park</td>
<td>68,600</td>
</tr>
<tr>
<td>Pure Lake Provincial Park</td>
<td>130</td>
</tr>
<tr>
<td>Vladimir J. Krajina Ecological Reserve</td>
<td>7800</td>
</tr>
<tr>
<td>Drizzle Lake Ecological Reserve</td>
<td>840</td>
</tr>
<tr>
<td>Tow Hill Ecological Reserve</td>
<td>450</td>
</tr>
<tr>
<td>Rose Spit Ecological Reserve</td>
<td>170</td>
</tr>
<tr>
<td>Lepas Bay Ecological Reserve</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>224,994</strong></td>
</tr>
</tbody>
</table>

*All listed Canadian and Provincial Protected areas are subject to to proof of Haida aboriginal title.

Table 18 shows the distribution and area of provincially and federally legislated protected areas by ecoregion and eosection.
Table 18. Area of Protection by Ecoregion and Ecosection

<table>
<thead>
<tr>
<th>Ecoregion/Ecosection Unit</th>
<th>Size of Unit (ha)</th>
<th>Area under protection (ha)</th>
<th>% of unit currently protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queen Charlotte (Haida Gwaii) Lowland Ecoregion</td>
<td>327,360</td>
<td>67,600</td>
<td>21%</td>
</tr>
<tr>
<td>Skidegate Plateau Ecosection</td>
<td>331,930</td>
<td>37,200</td>
<td>11.2%</td>
</tr>
<tr>
<td>Queen Charlotte (Haida Gwaii) Ranges Ecosection</td>
<td>347,360</td>
<td>108,300</td>
<td>33%</td>
</tr>
<tr>
<td>Island Total</td>
<td>1,005,750</td>
<td>213,100</td>
<td>22%</td>
</tr>
</tbody>
</table>

5.1.1.1 Gwaii Haanas Haida Heritage Site and National Park Reserve

Gwaii Haanas is designated by the Haida Nation as a Haida Heritage Site and by Canada as a National Park Reserve. The Gwaii Haanas Agreement establishes common objectives for the care, protection and use of Gwaii Haanas. Gwaii Haanas includes the entire area south of the height of land on the Tangil Peninsula on Moresby Island.

Gwaii Haanas encompasses approximately 1900 islands and islets with a terrestrial component of 1470 km$^2$ (147,000 ha), with over 1600 km of shoreline. The proposed Gwaii Haanas National Marine Conservation Area Reserve (NMCAR) is 3467 km$^2$. Once the NMCAR is established, Gwaii Haanas will be nearly 500,000 ha in size, providing a representative protected area that runs from mountain top to ocean floor$^{54}$.

Gwaii Haanas has been home to the Haida people for hundreds of generations. There are archaeological sites throughout the Gwaii Haanas and a number of historical Haida village sites. In 1991 the island of Sgang Gwaay was jointly declared a World Heritage Site by UNESCO and the Haida Nation. Gwaii Haanas is an area of international importance offering exceptional opportunities for visitors, including local persons, to connect with undisturbed nature as well as to meet members of the Haida community at the various village sites.

The planning, management and operation of Gwaii Haanas occurs through a consensus decision-making process by the Gwaii Haanas Archipelago Management Board, with equal representation from the Haida Nation and the Canadian Government. The Gwaii Haanas Strategic Management Plan, developed in 1996, sets out the strategic objectives for appropriate use and protection of Gwaii Haanas and outlines the underlying philosophy, vision, guiding principles, and management goals for the area. In addition, the Gwaii Haanas Backcountry Management Plan sets out criteria for defining appropriate levels of visitor use and evaluating the appropriateness of new and existing visitor activities.

$^{54}$ Prime Minister Chretien formally announced intent to establish the Gwaii Haanas NMCAR on October 2, 2003. The reserve will be established once a management plan is negotiated with the Haida Nation.
Map 3: Protected Areas

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
Gwaii Haanas is managed to ensure that ecological and cultural integrity is protected, maintained, and, where possible, enhanced for present and future generations. In Gwaii Haanas, the specific management prescriptions and directions of the Gwaii Haanas Agreement apply. In 2001, the Archipelago Management Board commissioned the Gwaii Haanas Terrestrial Ecosystem Conservation Strategy to focus program initiatives to most effectively meet the conservation goals for Gwaii Haanas. Conservation strategies were assessed in five areas: ecosystem planning and management, flora, fauna, landscape management and aquatic ecosystems (Golumbia, 2001a).

5.1.1.2 Provincial Protected Areas

The Parks and Protected Areas Section of the Ministry of Water, Land and Air Protection are responsible for the provincial management and conservation of ecological reserves and parks located on the Islands. Management plans prepared, by the agency outline the objectives for conservation, development, and operations within each park, consistent with the overall Ministry goals of:

- protecting and managing for future generations a wide variety of outstanding park lands which represent the best natural features and diverse wilderness environments of the province; and

- providing province-wide opportunities for a diversity of high quality and safe outdoor recreation that is compatible with protecting the natural environment.

A provincial Management Plan has been prepared for Naikoon and Parks Management Direction Statements have been prepared or are underway for the other provincial protected areas on the Islands. Haida citizens have continued to carry out traditional use activities within provincial parks. These activities are not inconsistent with park objectives.

**Naikoon Provincial Park**

Naikoon (house point or Rose Spit) is a gathering place of the supernatural and also the name of the village at the very north east corner of the island. The Province designated the 68,600 hectare Naikoon Provincial Park in 1973, without concurrence of the Haida Nation.

Naikoon includes extensive coastal bog forests (CWHwh1), over 100 kilometres of sandy beaches, sand dune complexes, important foreshore habitats and important physical and cultural features such as the Spit and Tow Hill. The Park also contains three watersheds that provide representative examples of coastal temperate rainforests. Naikoon is an important area for recreation and commercial and food gathering. Use is primarily concentrated in the beach or near-beach areas.

A Management Plan was completed for Naikoon Provincial Park in 1999 to guide the management of natural, cultural and recreational resources over a 10-year period. The Management Plan was completed with extensive local involvement. The Management Plan describes the resource values in the Naikoon, outlines its conservation and recreation roles, and identifies four management zones: wilderness recreation, special features, intensive recreation and natural environment. There are 22 parcels of fee simple land within Naikoon boundaries that existed at the time the park designated. These are outside the jurisdiction of the Park Management Plan. In addition, the Naikoon foreshore boundary excludes razor clam beds,
which are managed by the Haida Nation and the federal government (Fisheries and Oceans Canada) for commercial harvesting.

**Pure Lake Provincial Park**

Pure Lake Provincial Park was designated in 1981 for local recreation and also serves as a rest-stop for highway travellers. Its 130 hectares protects the small lake, a small beach that was supplemented with ocean beach sand, an open pine forest variety of bog, and a closed cedar-pine-hemlock forest surrounding the lake. There is no Management Plan in place for Pure Lake.

**Ecological Reserves**

There are five ecological reserves on the Islands that have been designated to ensure the long-term maintenance of their ecological values. Ecological reserves are open to the public for non-destructive pursuits such as hiking, nature observation and photography. Consumptive activities (e.g., hunting, freshwater fishing, camping, and gathering of plants) are prohibited by regulation. Motorized vehicles are not allowed.

There are two ecological reserves within Naikoon Provincial Park. These Reserves are distinct administrative units (i.e., they are not actually part of Naikoon Park proper). The Tow Hill E.R., adjoining the Haida community at Yakan Point, protects a sand dune ecosystem and inland moor bogs. The reserve is about 450 hectares in size. The Rose Spit E.R. is about 170 hectares in size and protects a sandy, coastal marine environment and its associated flora and fauna.

The Vladimir J. Krajina E.R. at Port Channel on the west coast of Graham Island is about 7,800 hectares in size. The Reserve protects representative coastal ecosystems, rare genetic resources, and outstanding biological phenomena. 130 species of vascular plants have been identified, several of which have forms endemic to the Islands and are rare in B.C. The area has approximately 180 species of liverworts and mosses, of which 40 species are considered rare. The reserve includes Hippa Island, which supports large nesting colonies of ancient murrelets and Cassin’s auklets. Hippa Island is also used by Steller sea lions for winter haulouts. Four species of Pacific salmon spawn (coho, sockeye, pink, and chum) spawn within the reserve. The Mercer Lake system is important for up to 8,000 sockeye whose young spend a year in the lake before migrating to the ocean as smolts.

Drizzle Lake E.R. protects about 840 hectares of undisturbed lake and bog ecosystems of the Argonaut Plain and provides a research area for unique stickleback populations and their predators. Drizzle Lake is also noteworthy for the habitat it provides for at least 36 species of aquatic birds.

Lepas Bay E.R. protects a small island (about 4 ha) that supports nesting seabirds, mainly petrels, and their habitat. The island is one of only 8 storm-petrel nesting sites in B.C. and may be the largest mixed-species petrel site in the province.

A number of ecological reserves were designated around Gwaii Haanas including Copper and Rankine Islands, Keruard Islands and Anthony Islets.
5.1.2 Haida Nation Protected Areas (HPA)

Haida Culture is seen as the relationship of the people to the lands and the fate of the land intricately tied to the fate of the culture. The Haida Nation has designated a number of Haida Protected Areas because of their concerns about the whole scale changes to the landscape by industrial logging.

The Haida Nation has designated 14 areas outside Gwaii Haanas that are to remain free of industrial activity. These areas comprise roughly 243,600 hectares or 20 per cent of the land base of Haida Gwaii, in addition to the 24 per cent already protected under Canadian and Haida legislation. The values and significance of these areas will be described in greater detail in the Haida Land Use Vision, which is currently under preparation.

Table 19. Haida Nation Protected Areas

<table>
<thead>
<tr>
<th>Area Name</th>
<th>English Name</th>
<th>Size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duu Guusd</td>
<td>Duu Guusd</td>
<td>148,800</td>
</tr>
<tr>
<td>Tllall</td>
<td>Tlell Watershed</td>
<td>31,400</td>
</tr>
<tr>
<td>7AgangGuu</td>
<td>Government Creek</td>
<td>1,800</td>
</tr>
<tr>
<td>Kun Xalaas</td>
<td>Grey Bay – Cumshewa</td>
<td>4,900</td>
</tr>
<tr>
<td>Gwaii Gawgaay</td>
<td>Kootenay Inlet</td>
<td>4,000</td>
</tr>
<tr>
<td>Yaagun Siwaay</td>
<td>Yakoun Lake Watershed</td>
<td>6,900</td>
</tr>
<tr>
<td>Yaagun Siwaay</td>
<td>Yakoun River Corridor</td>
<td>11,400</td>
</tr>
<tr>
<td>Nang Xaldangaas</td>
<td>Naden Harbour – Masset Inlet</td>
<td>21,800</td>
</tr>
<tr>
<td>Kamdis</td>
<td>Kumdis Slough</td>
<td>1,100</td>
</tr>
<tr>
<td>Qaysun (Kitgoro-Niisii)</td>
<td>Kitgoro – Niisii</td>
<td>1,700</td>
</tr>
<tr>
<td>Qaysun</td>
<td>Kaisun</td>
<td>3,100</td>
</tr>
<tr>
<td>Tsuuguus Gandll</td>
<td>Security Inlet</td>
<td>7,900</td>
</tr>
<tr>
<td>Qanuu Gandll</td>
<td>Kano (Givenchy Anchorage)</td>
<td>700</td>
</tr>
<tr>
<td>Qanuu</td>
<td>Carew Bay</td>
<td>2,100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>247,600</strong></td>
</tr>
</tbody>
</table>

Many of these areas are still considered inventory by the Provincial Ministry of Forests (i.e., they are still part of the timber harvesting land base). However, with the exception of small areas in Kootenay Inlet and Duu Guusd, forest development has avoided these areas entirely to date. Duu Guusd has been temporarily removed by the Provincial Cabinet under Part 13 of the provincial Forest Act for the period of March 2003 to December 2004, to enable interim protection of this area while the Land Use Planning process is underway. Those Haida Protected Areas that intersect Tree Farm License 39 are also removed or “partitioned” from the cut. The one area that the Haida Nation has agreed in principle to some ecologically responsible logging is in parts of the Tlaal HPA, pending a development plan.
The Haida Nation has notyet made any declarations onprotected areas in the marine and submerged portions of Haida Gwaii.

5.1.3 Provincial Protected Areas Strategy Study Areas

In 1996, as part of the provincial Protected Areas Strategy, Haida Gwaii/QCI was assessed for how well the existing provincial and federal protected areas represent the variety of ecosystems, special features and recreational uses. This regionally-based project, called a “Gap Analysis”, identified a number of candidate sites, called Study Areas, that have features or characteristics that may warrant additional protection. The Study Areas have been formally approved by the provincial Cabinet and interim management applied to ensure that the ecological, cultural heritage, and recreational values of these areas are not compromised until such time as land use planning is completed.

A Gap Analysis report, prepared by the Regional Protected Areas Team (RPAT), identified three Goal 1 and thirteen Goal 2 Study Areas for the Islands (Map 3). Goal 1 areas are intended to complete ecosystem representation objectives and tend to be quite large (several thousand hectares). Goal 2 are intended to provide representation of recreation, cultural heritage and special natural features and are usually small (< 1000 ha). The Gap Analysis for the Islands is summarized in Appendix G.

These areas will be discussed as part of the Land Use Planning process. In the interim, tenure applications are assessed on a case-by-case basis by the Interagency Management Committee (IAMC) and the Regional Protected Areas Team (RPAT). Applications are assessed based on the nature of the tenure and the Study Area values that might be affected. RPAT makes a recommendation to the IAMC, which might include conditions to be attached to the tenure if it proceeds.

There is a certain amount of overlap between the Haida Protected Areas and the Study Areas identified under the BC Protected Area Strategy (Table 20, Map 3). In most cases the Study Areas are smaller.

---

55 A full explanation of the Protected Area Strategy and the regional study area project can be found in A Protected Areas Strategy for British Columbia: The Prince Rupert Region PAS Report (RPAT, 1996).
Table 20. Protected Areas Strategy Study Areas

<table>
<thead>
<tr>
<th>Study Area</th>
<th>Haida Protected Area overlap</th>
<th>Forest tenure overlap</th>
<th>Ecosection</th>
<th>Study Area size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal 1:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yakoun Lake</td>
<td>Yaagun Siwaay</td>
<td>TFL 39</td>
<td>Skidegate Plateau</td>
<td>8060</td>
</tr>
<tr>
<td>Northwest Graham Island, including Suskwaa-Frederick Island ERP</td>
<td>Duu Guusd</td>
<td>TSA</td>
<td>QC (HG) Ranges</td>
<td>62,000 (31,400 terrestrial and 30,600 marine)</td>
</tr>
<tr>
<td>Gudal Bay/ Marble Island</td>
<td>-</td>
<td>TSA</td>
<td>QC (HG) Ranges</td>
<td>8330 (1870 terrestrial and 6460 marine)</td>
</tr>
<tr>
<td><strong>Goal 2:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stuyges Bay/ Maast Island</td>
<td>Nang Xaldangaas</td>
<td>TSA</td>
<td>QC (HG) Lowlands</td>
<td>8 plus marine</td>
</tr>
<tr>
<td>Naden Harbour/Davidson River Estuaries</td>
<td>-</td>
<td>TSA</td>
<td>QC (HG) Lowlands</td>
<td>54 plus marine</td>
</tr>
<tr>
<td>Eden Lake – south end</td>
<td>-</td>
<td>TSA</td>
<td>Skidegate Plateau</td>
<td>100</td>
</tr>
<tr>
<td>Boulton Lake ERP #107</td>
<td>Adjacent to Kamdis HPA</td>
<td>TSA</td>
<td>QC (HG) Lowlands</td>
<td>20</td>
</tr>
<tr>
<td>Kumdis Slough-Yakoun Bay</td>
<td>Kamdis</td>
<td>TSA</td>
<td>QC (HG) Lowlands</td>
<td>133 plus marine</td>
</tr>
<tr>
<td>Tlell River Pontoons ERP #318</td>
<td>Tlall</td>
<td>TSA</td>
<td>QC (HG) Lowlands</td>
<td></td>
</tr>
<tr>
<td>Survey Creek, upper Tlell River</td>
<td>Tlall</td>
<td>TFL 39</td>
<td>QC (HG) Lowlands</td>
<td>490</td>
</tr>
<tr>
<td>Shingle Bay/ Spit Point</td>
<td>-</td>
<td>TFL 47</td>
<td>QC (HG) Lowlands</td>
<td>50 plus marine</td>
</tr>
<tr>
<td>Tana Bay</td>
<td>-</td>
<td>TSA</td>
<td>QC (HG) Ranges</td>
<td>70</td>
</tr>
<tr>
<td>Gray Bay/ Cumshewa Head</td>
<td>Kun Xalaas</td>
<td>TFL 39</td>
<td>Skidegate Plateau</td>
<td>1200</td>
</tr>
<tr>
<td>Kitgoro Inlet</td>
<td>Qaysun</td>
<td>TSA</td>
<td>QC (HG) Ranges</td>
<td>1875</td>
</tr>
<tr>
<td>Takakia Lake ERP #25A</td>
<td>-</td>
<td>TFL 39</td>
<td>Skidegate Plateau</td>
<td>610</td>
</tr>
<tr>
<td>Kootenay Inlet ERP #25B</td>
<td>Gwaii Gawgaay</td>
<td>-</td>
<td>QC (HG) Ranges</td>
<td>2075</td>
</tr>
<tr>
<td>Lepas Bay and Slough</td>
<td>-</td>
<td></td>
<td>QC (HG) Ranges</td>
<td></td>
</tr>
</tbody>
</table>
5.1.4 Other Conservation Lands

Over the years, a variety of land designations have been made under the Provincial *Wildlife Act* and the *Land Act* in order to preserve lands that have high wildlife habitat values, such as areas of seasonal water bird congregations, critical habitats for seabird nesting colonies and other unique or sensitive habitats. The following is a brief description of the designations that are administered under these two Provincial Acts. A list of these other designated conservation areas is provided in Appendix H. This list was adapted from the Provincial Conservation Lands list. A project is currently underway to verify the information on this list and confirm the current status for each area under the *Land Act*.

5.1.4.1 Wildlife Act Designations

*Wildlife Management Areas*

Wildlife Management Areas (WMAs) are designated under Section 4 of the *Wildlife Act*. In WMAs, conservation and management of wildlife, fish and their habitats is a priority but other uses may be permitted.

There are three WMAs on the Islands that were designated in 1990 under a single Order in Council as part of fulfilment of the terms of the South Moresby Agreement. The Limestone Islands WMA is 64 hectares in size. These offshore Islands provide habitat for seabirds, small forest birds, eagles, peregrine falcons, Stellar’s sea lions, harbour seals, and river otters. The Reef Island WMA and the Skedans Island WMA were designated to provide offshore island habitat for seabirds. They are 250 hectares and 38 hectares in size respectfully. All of these islands have been the site of extensive, long-term research and monitoring activities by the Laskeek Bay Conservation Society and the Research Group on Introduced Species.

There are three areas on the Islands that are suspected to have been designated as WMAs, despite being listed as “Transfer of Administration and Control” designations on the Provincial Conservation Lands list. These are Low Island, Low Island South, and Langara Island. The current project to review the Conservation Lands on the Islands will clarify the actual conservation designations for these areas.

*Conservation Acquisition*

Lands that the former Wildlife Branch of MELP required for the purposes of accessing or managing wildlife were purchased using the Habitat Conservation Trust Fund under Section 3 of the *Wildlife Act*. These areas are now administered by MWALP. A portion of the Delkatla Slough was purchased in 1972 for the protection and enhancement of waterfowl and ownership was subsequently transferred to the Village of Masset (see Section 5.1.4.3).

*Leased Lands*

These fee simple lands are owned, often by The Nature Trust of BC, but have been leased by WLAP under Section 3 of the *Wildlife Act* to manage under a 99 year lease. The Kumdis Slough is a 26.5 hectare estuary important to waterfowl and fish. The Slough and associated uplands, have been leased from the Nature Trust since 1993.
Wildlife Sanctuaries and Critical Wildlife Areas

Under Section 5 of the Wildlife Act, all or a portion of a WMA can be listed as a Wildlife Sanctuary or as a Critical Wildlife Area. In a Wildlife Sanctuary it becomes an offence to hunt, take, trap, wound or kill wildlife. A Critical Wildlife Area can be designated if it is required for a species designated as endangered or threatened. Some Wildlife Sanctuaries have been designated on the Islands and are shown in the provincial hunting regulations, but there are no provincially designated Critical Wildlife Areas on the Islands.

5.1.4.2 Provincial Land Act Tenures or Designations

As referenced in the disclaimer at the beginning of this Report, the Province and the Haida Nation continue to hold different views on the extent of each other’s jurisdiction and authority over land and resource use decisions and different views of the scope and extent of aboriginal title and the decision-making authority that aboriginal title carries with it.

Transfer of Administration and Control

The Transfer of Administration and Control (TAC) is a conservation mechanism that allows the Minister of the Ministry of Sustainable Resource Management to transfer administration of land, under Section 106 to MWLAP. Transfers of Administration and Control normally have a term of 30-60 years. Prior to 2001, a transfer of administration was accomplished using Section 17 and a Designated Use Area (DUA) was established.

A Transfer of Administration and Control is generally used under the following circumstances:

- where a Wildlife Management Area is proposed;
- where MWLAP has entered into a third party agreement for management purposes;
- where land is contiguous to other lands managed by MWLAP and integrated management is proposed; or
- where active management, development, or improvement is planned.

There are seven areas designated as either Transfer of Administration and Control or Designated Use Area on the Islands. The Naden Harbour TAC is the largest at 1214 ha in size. The estuary and intertidal mudflats provide protection of waterfowl nesting and feeding habitat, especially for Canadian Geese. Two other larger ones are the Kumdis Slough Designated Use Area (435 ha), which was designated for the protection of waterfowl habitat and the Langara Island TAC area (530 ha), which is considered a bird sanctuary (see also Section 5.1.5.1: Lease Lands). See Appendix H for the full list of TAC and DUA areas.

Order in Council Reserves

An Order in Council (OIC) Reserve is designated under Section 15 where no significant management or development of an area is proposed and there are regionally significant values such as wildlife. The term of the withdrawal is generally long term but ranges from 5 to 60 years. Ecological Reserves can also be designated by Order in Council, but they are usually designated under the Ecological Reserve Act. There are two Orders in Council on the Islands. The OIC located at Louise Island is 28.12 ha in size and was designated for the purpose of
salmonid enhancement. The OIC on Lucy Island, located between Langara and Graham Islands, is 30.0 ha in size and protects valuable nesting and breeding grounds for migratory birds.

**Map Reserves**

Map reserves are designated by the Province under Section 16 of the *Land Act* for the temporary withdrawal of lands and from disposition. These reserves are made where there is no significant management, development or improvement proposed and regionally significant resource values dictate a temporary withdrawal. They may be used to reserve land while preparing documentation for an Order in Council reserve or a Transfer of Administration and Control. They generally have a term of five years.

There are four Map Reserves on the Islands listed on the Provincial Conservation Lands list. Most are designated for the protection and enhancement of waterfowl habitat in Lina Island Narrows. The largest is at Bearskin Bay and is 314 ha in size.

**U.R.E.Ps**

U.R.E.P reserves (Use, Recreation and enjoyment of the Public) were designated under Section 15 or 16 of the *Land Act* to keep areas with significant recreational potential as publicly accessible. Some UREPs also specifically recognize fish and wildlife values.

There are approximately 31 UREPs on the Islands (See Appendix I), including a recreation site at the north end of Yakoun Lake.

**Notations of Interest**

A Notation of Interest (NOI) is designated under administrative policy only. Where a Ministry has designated a Notation of Interest, they are assured of receiving referrals for all applications under the *Land Act* that fall upon this area. The applicants are then made aware of the noted interest and any comments the Ministry may have regarding the application. There is one Notification of Interest listed on the Provincial Conservation Lands list at the entrance to the Yakoun River. This area (308 ha) is a resting, feeding and staging area for waterfowl and also habitat for anadromous fish.

**5.1.4.3 Municipal conservation lands**

The Delkatla Wildlife Sanctuary is owned by the Village of Masset. The 290 hectare Sanctuary protects an important coastal wetland and open marsh area for migratory birds and includes uplands, estuary, and intertidal ecosystems. At least 132 species of birds have been reported and there are 33 species confirmed to use the area for nesting. Tidal flushing of the estuary was impeded and marsh conditions were diminished with the construction of a road into Masset in 1964. The area was restored between 1988 and 1995, when considerable effort and funding went into removal of the causeway. The Sanctuary is managed by the Village of Masset and is supported by the Delkatla Sanctuary Society.\(^{56}\)

---

\(^{56}\) Information on the Delkatla Wildlife Sanctuary provided by Margo Hearne, Director: Dalkatatla Sanctuary Society and Trevor Jarvis, Administrator, Village of Masset.
5.2 **Culture and Heritage**

5.2.1 **Overview of culture and heritage**

The Islands reflect a rich and varied history, both of Haida Nation culture and heritage and that of other communities. In managing for culture and heritage resources, there are three key categories:

a. **Archaeological sites**

These are sites that contain the physical remains of past human activity. Examples include villages, camps, caves, resource management areas and mortuary sites. Archaeological Overview Assessments (AOAs) bring together contemporary information on known sites from surveys, assessments, archives and oral history. They serve as a database of known sites and of areas where evidence of past use has been found. In conjunction with living knowledge, an Archaeological Overview Assessment may assist in assessing the potential for finding sites and features in unexamined areas. Accordingly this helps to determine the need for more detailed archaeological impact assessments (AIAs) where new human activities are proposed.

An Archaeological Overview Assessment was initiated by the Haida Tribal Society in 2000, for all of Haida Gwaii except Gwaii Haanas and Naikoon. The project built on previous pilot overviews, research, oral histories and archival information continues to be built as new information is brought forward. Although the AOA map is helpful in identifying sites, the Haida perspective is that a single resource management site (for example a fish camp) is significant because of its surroundings, the river and is much more than an isolated dot on a map. The Haida Nation and the Province have similar data files and restrict access to Haida Gwaii AOA data on a strict confidentiality basis.

b. **Haida Traditional Use Sites**

From a Haida perspective, specific uses in particular sites can be discussed as “Traditional Use Sites” but must be considered in the context that the Haida Nation uses the whole island. The Haida Nation is the custodian of information on traditional use sites on Haida Gwaii. Examples of such sites include fishing sites, hunting camps, trails, tree, food and medicinal harvesting areas, narrative and intellectually important sites, etc. Currently recognition and protocols are being developed between the Haida and the Province in regards to these sites.

A pilot project in 1999 mapped the probable location of traditional uses on 22 in-progress map sheets in the Timber Supply Area.

c. **Historic Sites**

These are usually sites with historic significance associated with the settler communities such as old homesteads and relics, as well as shipwrecks, throughout the Islands. Canadian cultural heritage resources may be formally designated under the provincial Heritage Conservation Act or the federal Historic Places Initiative and associated legislation (see Appendix J).
5.2.2 Management and conservation of cultural heritage features

Management and conservation of cultural heritage features is best achieved through education and public awareness. The Haida Nation, as well as the Province, has laws and programs to protect such features. The Queen Charlotte Islands Forest District, the Haida Nation and local licensees have agreed on local guidelines to protect Culturally Modified Trees (CMTs) (see Appendix K for copy of Agreement).

a. Haida Nation Management:

The Haida Nation requires that all archaeological research done on the Islands be permitted through the CHN. Any archaeological work done without Haida Nation participation and/or authorization is not considered a valid representation by the Haida Nation. Management policy and carried out by the Forest Guardians, Culturally Modified Trees (CMT) and Archaeology and the Haida Gwaii Watchmen Programs. These seek to protect sites by surveying, identifying, mapping, buffering, documenting and monitoring and managing related human activities.

b. Provincial Management:

The Archaeology and Registry Service Branch of the Ministry of Sustainable Resource Management manages archaeological sites and information under the Heritage Conservation Act. Some cultural heritage resources receive Provincial protection under the Heritage Conservation Act. These include:

- all pre-1846 archaeological sites and artefacts
- all aboriginal rock art
- any burial places with historical or archaeological value

When cultural heritage resources are inadvertently encountered, there is a legal requirement to report the discovery and to cease activities until the significance of the find can be evaluated.

Under section 13 of the Heritage Conservation Act, permits are required to authorize any actions affecting culturally modified trees pre-dating 1846. Culturally modified trees include bark stripping, test holes, logs beginning to be carved into canoes, standing planked trees, notched trees, and pitch removal scars, and stumps having sections removed.
5.3 Forestry and Forest Management

5.3.1 Forest Tenures – Historical and Current

The forests of the Islands have long provided the Haida with building materials, canoes, clothing, medicines and foods as well as regulating water flows for domestic use and spawning streams.

In the late 1800s, local sawmills began to supply local markets and this stimulated a small timber rush, resulting in the highest valuable stands of timber being staked out by surveyors and timber cruisers (Dalzell, 1968), under Provincial permits.

During World War I, mills on both Moresby and Graham Island logged Sitka spruce for building aircraft. Numerous small-scale logging operations were active during the 1920s and early 1930s, mostly involving A-frames operating from floating camps (Dalzell, 1968).

Railroad logging began in the late 1930s at Cumshewa Inlet, followed by the advent of truck logging in the mid 1940s (Dalzell, 1968). The 1950's and 1960's saw Haida logging to accommodate construction of a large commercial fishing fleet. These activities included numerous boat sheds, slipways, docks and sawmills. None remain in existence today. Also, during the 1950s and 1960s, three large integrated forest companies consolidated their holdings and operations on the Islands. The Province created area-based Tree Farm Licence (TFL) tenures and today the three TFLs cover 321,373 hectares or 32% of the total land area (Map 4).

5.3.1.1 Provincially Issued Tree Farm Licences

Tree Farm Licences granted by the Province are large areas of land over which companies are granted exclusive harvesting rights in renewable 21 year licences. The tenures are area-based i.e., set for a defined area of land rather than a volume of timber. Companies are directly responsible for management, restoration, and stewardship of the forest resource in TFLs and for developing inventories and Management and Working Plans from which the Chief Forester sets the Allowable Annual Cut. Over the years, there have been many changes of ownership and amalgamation of tenures amongst Tree Farm Licence holders operating on the Islands. A brief description and history of the three Tree Farm Licences is provided here.

Tree Farm Licence 39

TFL 39 comprises seven separate blocks located on Vancouver Island, the Sunshine Coast, the Mid Coast, and the Islands. Block 6 of TFL 39 is the largest single tenure on the Islands and covers 240,311 hectares of forests. Most of Block 6 lies on Graham Island, with smaller portions on northern Moresby Island and Louise Island. The majority of the tenure lies in the Yakoun and Tlell River watersheds.

The TFL was originally awarded to MacMillan Bloedel Ltd. in 1961. The tenure was transferred with the sale of MacMillan Bloedel to Weyerhaeuser Company Ltd in 1999.
Tree Farm Licence 25

TFL 25 consists of five separate blocks located on Vancouver Island, the Central and North Coasts and the Islands. Block 6 consists of two designated parcels in the north Moresby and Talunkwan Islands.

Block 6 was originally part of TFL 24, which was awarded in 1958 to Alaska Pine and Celullose. TFL 24 was entirely on Moresby Island, adjacent to Talunkwan, Lyell and Burnaby Islands. The most recent tenure holder is Western Forest Products Ltd. With the creation of Gwaii Haanas National Park Reserve and Haida Heritage Site in 1987, an area covering 58,802 hectares was removed from TFL 24, leaving a tenure of 53,364 hectares. In 1999, the two timber supply blocks that remained in TFL 24 (at Mosquito Lake and Sewell Inlet) were amalgamated with TFL 25, an off-Island tenure also held by Western Forest Products. The entire Islands component of the amalgamated tenure became Block 6 of TFL25 (Map 4).

Tree Farm Licence 47

TFL 47 consists of 14 supply blocks in five management units located on the mainland coast and the Islands. The management unit for the portion of TFL 47 on the Islands is referred to as Block 18 or the Moresby Island Management Unit. Block 18 consists of several watersheds, the main drainages being 7AgangGuu (Government), Deena and Copper Creeks (Map 4). The entire Block is 27,154 hectares in size.

Block 18 of TFL 47 was originally part of TFL 2, which was first awarded to Crown Forest Industries Ltd (CFI). In 1993, the tenure was assumed by Timberwest Forest Ltd. Timberwest now holds the TFL in the name of TFL Forest Ltd. In March of 1999, Timberwest contracted J.S. Jones Timber Ltd. to manage and carry out operations on Block 18. J.S. Jones Timber Ltd. does so under a related company called Teal Cedar Products Ltd.

5.3.1.2 Queen Charlotte Timber Supply Area

The largest single forestry administrative unit on the Islands is the Timber Supply Area (TSA). The TSA covers 460,091 hectares, most of which is on Graham Island, with a relatively small portion occurring along the northwest coast of Moresby Island (Map 4). The Queen Charlotte TSA is administered from the local Forest District Office in Queen Charlotte City, with planning done at the Coast Forest Regional office in Nanaimo. A number of Forest Act (BC) tenures, such as Forest, Timber, Timber Sale and Woodlot Licences are held within the TSA.

Forest Licences

Forest Licences are volume-based rather than area-based. A Forest Licence provides an individual forest company with a specified volume of timber within the TSA. However, unlike an area-based tenure, it is the Ministry of Forests that does the long-term planning and harvest level calculations for the TSA as a whole, not the licensee.

Over the years, there have been many changes of ownership and amalgamation of tenure amongst forest tenure holders operating in the TSA. A brief description of the largest licensees is provided here.
Map 4: Forest Tenures

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
Haida Gwaii/ Queen Charlotte Islands Background Report

Husby Group of Companies

The Husby Group of Companies (Husby) holds several forest tenures in the TSA under different names. They include Forest Licence (FL) A16869 in the name of Husby Forest Products Ltd., FL A16871 in the name of Sitkana Timber Ltd., and replaceable Timber Sale Licence (TSL) A16873 in the name of Dawson Harbour Logging Company Ltd. The largest licensee in the TSA, based on allowable annual cut apportionment, is Husby Forest Products Ltd (see Table 24).

The chart area for Forest Licence A16869 is located on the northwest portion of Graham Island. This area is accessed from Naden Harbour and is managed from the camp at Eden Lake. This licence includes former FL A16872, which was a chart area held by Husby in the Davidson, Cave, Haines and Stanley watersheds to the west of Naden Harbour. In 2001, the two Forest Licences were combined to give Husby more operational flexibility to harvest the AAC of the two licences.

The chart area for Forest Licence A16871, Sitkana Timber Ltd., is located in the vicinity of Tartu Inlet on the west coast of Graham Island.

Part of Husby’s license area overlaps with the Duu Guusd Haida Protected Area. The current Part 13 Designation for Duu Guus’d prohibits harvesting in the area for the duration of this designation.

TFL Forest Ltd.

Timber West Forest Ltd. holds FL A16870 in the name of TFL Forest Ltd. The history of the ownership of this licence is similar to that of TFL Forest Ltd.’s other tenure on the Islands. This provincially issued tenure is also managed by J.S. Jones Ltd. under their related company Teal Cedar Ltd. The chart area for this forest licence is located in the vicinity of Skidegate Inlet.

BC Timber Sales

BC Timber Sales (BCTS), formerly known as the Small Business Forest Enterprise Program, also plays a major role in the TSA. Through BCTS timber is made available to market loggers, small sawmill operators, lumber re-manufacturers, specialty wood products manufacturers, and salvage operators. The three stated major objectives of BCTS are: to provide a credible reference point for costs and pricing of timber harvested from land in BC; to generate the best possible return to the province, and; to provide opportunities for customers to purchase timber in an open and competitive market.

BC Timber Sales issues harvesting rights through auctioning of a number of types non-replaceable Timber Sale Licences under the Forest Act (BC). The main Timber Sale Licences are Section 20 and Section 21 sales:

- Section 20 sales are awarded on the basis of the highest stumpage bonus bid. These sales are made available to market loggers and small primary sawmill owners registered in the program. Most of the Section 20 sales on the Islands are harvested by on-Island contractors, but the logs generally are barged to Vancouver Island or the Mainland for milling.
• Section 21 sales were awarded to firms who plan to maintain, expand or build a value-added facility. Participants in these sales must own or lease a timber processing facility or commit to building or leasing one if awarded the tenure. As a result of recent changes to the Forest Act, Section 21 sales will no longer be awarded. Timber Sales will be awarded primarily to the highest bidder for Section 20 sales.

In October of 2002 there were a total of 45 local residents registered in the BC Timber Sales program in the QCI Forest District. Thirty-five of these were market loggers and 10 owned timber processing facilities.

**Woodlots**

A Woodlot License is an agreement between the Ministry of Forests and an individual or group whereby the licensee is allowed to harvest the timber on an area of land. In return, the licensee agrees to manage the land, plus any suitable fee simple land that they might wish to include under the agreement. The management must be for the primary purpose of sustaining the production of forest products, while integrating other values.

The non-fee simple portion of a woodlot must be less than 400 hectares on the Coast (less than 600 hectares in the Interior). A woodlot licence has a term not exceeding 15 years and requires a management plan. The District Manager sets the Allowable Annual Cut for woodlot licenses. There are four woodlots on the Islands with a total AAC of 9118 m³/year (Table 21).

**Table 21. Woodlots on the Islands**

<table>
<thead>
<tr>
<th>Woodlot #</th>
<th>Start date of tenure</th>
<th>Fee simple component</th>
<th>Non-fee simple component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Area (ha)</td>
<td>AAC (m³/yr)</td>
</tr>
<tr>
<td>W0162</td>
<td>April, 1985</td>
<td>65</td>
<td>241</td>
</tr>
<tr>
<td>W1841</td>
<td>March, 1999</td>
<td>77.9</td>
<td>620</td>
</tr>
<tr>
<td>W1840</td>
<td>March, 1999</td>
<td>25.1</td>
<td>0</td>
</tr>
<tr>
<td>W0161</td>
<td>August, 1988</td>
<td>82</td>
<td>956</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>250</td>
<td>1817</td>
</tr>
</tbody>
</table>

**Timber Licences**

Timber Licenses (TLs) were implemented in 1979 under the provincial Forest Act to replace an array of “old temporary tenures.” These tenures are intended to convey “exclusive rights” to harvest merchantable timber from a specified area of land. TLs that are part of a TFL are managed in accordance with the approved TFL management plan. For TLs not in a TFL, the licensee is responsible for protection, operational planning, road building, and reforestation. When a TL expires (after harvest and reforestation), the TL area either remains within the TFL or is added to the TSA. There are six Timber Licences still active on the Islands (Table 22).
Table 22. Active Timber Licences at March 14, 2003 (outside TFLs)

<table>
<thead>
<tr>
<th>Licence</th>
<th>Licensee</th>
<th>Initial Area</th>
<th>Obligation Area</th>
<th>Eliminated Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0207</td>
<td>TFL Forest Ltd.</td>
<td>1,701</td>
<td>957</td>
<td>743</td>
</tr>
<tr>
<td>T0920</td>
<td>Weyerhaeuser Co. Ltd.</td>
<td>437</td>
<td>382</td>
<td>55</td>
</tr>
<tr>
<td>T0924</td>
<td>Weyerhaeuser Co. Ltd.</td>
<td>251</td>
<td>114</td>
<td>137</td>
</tr>
<tr>
<td>T0184</td>
<td>TFL Forest Ltd.</td>
<td>3,939</td>
<td>1,564</td>
<td>2,374</td>
</tr>
<tr>
<td>T0253</td>
<td>TFL Forest Ltd.</td>
<td>1,374</td>
<td>916</td>
<td>458</td>
</tr>
<tr>
<td>T0279</td>
<td>TFL Forest Ltd.</td>
<td>996</td>
<td>996</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>8698</td>
<td>4929</td>
<td>3767</td>
</tr>
</tbody>
</table>

5.3.1.3 Forest Service Reserve

7125 m3/year of the AAC for the Queen Charlotte TSA is left unallocated to allow removal of timber under special provincial licenses such as salvage of wood following major blowdown events or to allow individuals one time opportunities to remove timber.

5.3.1.4 Tlell Community Forest Proposal

Community forests are area-based tenures held by a delegated body within local communities. This local control over decision-making regarding forest management also includes responsibility for the benefits and costs of those decisions. Profits generated by timber harvesting and any subsequent processing are intended to remain in the community.

The Tlell watershed is one of the Haida Protected Areas (HPA). In 1999 the CHN agreed that a community forest concept within the Tlell was consistent with the principles of the HPA. Following that, the BC Minister of Forests agreed (approval-in-principle) to an application submitted by the Islands Community Stability Initiative (ICSI), a body consisting of representatives of local governments.

The tenue comprises 23,931.6 hectares of old growth, fire-initiated second growth, some regenerating clear-cuts, and the fens (pontoons), although the discussions concerning the exact boundaries have not been concluded. The proposed administrative structure for the tenure is a Community Forest Corporation Board (CFCB), which would decide on plans and operations by the Community Forest staff and contractors. A tenure has not been issued at this time.
5.3.1.5 Timber harvested from fee simple lands

The following table summarizes the amount of timber harvested from fee simple lands between 1999 and 2003, based on BC Ministry of Forest records for fee simple land billings.

Table 23. Volume of timber harvested (m³) from fee simple lands (1999 – 2003)

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003 (to date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume harvested (m³)</td>
<td>31,320</td>
<td>64,742</td>
<td>4,225</td>
<td>15,012</td>
<td>23,993</td>
</tr>
</tbody>
</table>

* All logs, species grades and special forest products, including waste and reject

5.3.2 Harvest Levels

Allowable harvest levels are determined for each forest management unit (TFLs & TSA) by the Chief Forester for the BC Ministry of Forests. The Chief Forester must review and determine an Allowable Annual Cut (AAC) for each TSA and TFL at least once every five years, to account for changes in land use allocation and resource management practices that may affect timber supply. In the lengthy Timber Supply Review process, the Chief Forester considers technical reports, analyses and public input, as well as government’s social and economic objectives in determining AAC’s.

Table 24 summarizes the various administrative units related to forestry on the Islands and their associated allowable harvest levels. Note that TFLs do not have individual AACs: rather the harvestable volume is a contribution for the Harvest Block to the overall AAC for the TFL. Note that, even though TFLs collectively only represent 32% of the total land area, they contribute 74% of the allowable annual harvest for the Islands. Conversely, the TSA comprises 46% of the land area and only 26% of the allowable annual harvest (Table 24). This is because only a small amount of land in the TSA is operable, relative to the proportion of operable landbase in the TFLs (see Section 5.3.3: Harvesting Operability, Table 29).

5.3.2.1 Allowable annual harvest levels for TFLs and TSA

Tree Farm Licence 39

In 2001, as a result of TSR2, the Chief Forester determined an AAC of 3,660,000 m³/yr for TFL 39 as a whole, including supply blocks on the coastal mainland. This total was subsequently reduced in 2002, to 3,369,000 m³/yr, due to a Part 13 designation on the Central Coast. The contribution of Block 6 (the Islands portion) to the total AAC for TFL 39 is estimated at 1,150,000 m³/yr, including a BC Timber Sales component of 56,324 m³/yr.

---

57 Fee Simple lands refers to lands held in private ownership in fee.
Table 24. Area and harvest contribution /AAC by administrative unit

<table>
<thead>
<tr>
<th>Administrative Unit</th>
<th>Total Land Area</th>
<th>TFLs –Volume Contribution to TFL AAC</th>
<th>TSA – Allowable Annual Cut</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ha</td>
<td>% of total land area</td>
<td>(m³/yr)</td>
</tr>
<tr>
<td>TFL 39 (Block 6) Weyerhaeuser Co.</td>
<td>240,311</td>
<td>24%</td>
<td>1,150,000</td>
</tr>
<tr>
<td>TFL 25 (Block 6) Western FP</td>
<td>53,364</td>
<td>5%</td>
<td>115,000</td>
</tr>
<tr>
<td>TFL 47 (Block 18) TFL Forest</td>
<td>27,154</td>
<td>3%</td>
<td>100,000</td>
</tr>
<tr>
<td>TSA:</td>
<td>416,727</td>
<td>41%</td>
<td>361,000</td>
</tr>
<tr>
<td>Forest Licenses</td>
<td></td>
<td></td>
<td>330,845</td>
</tr>
<tr>
<td>A16869 Husby FP</td>
<td></td>
<td></td>
<td>284,918</td>
</tr>
<tr>
<td>A16870 TFL Forest</td>
<td></td>
<td></td>
<td>21,312</td>
</tr>
<tr>
<td>A16871 Sitkana Timber</td>
<td></td>
<td></td>
<td>23,493</td>
</tr>
<tr>
<td>BC Timber Sales</td>
<td></td>
<td></td>
<td>121,818</td>
</tr>
<tr>
<td>Timber Sale Licences (&lt;10,000m³)</td>
<td></td>
<td></td>
<td>8,712</td>
</tr>
<tr>
<td>A16873 Dawson HL</td>
<td></td>
<td></td>
<td>7,956</td>
</tr>
<tr>
<td>A16874 Sound Spars Ent.</td>
<td></td>
<td></td>
<td>272</td>
</tr>
<tr>
<td>A16876 Kano Logging Co.</td>
<td></td>
<td></td>
<td>484</td>
</tr>
<tr>
<td>Forest Service Reserve</td>
<td></td>
<td></td>
<td>7,125</td>
</tr>
<tr>
<td>Woodlot Licences (total area)</td>
<td>1842</td>
<td>&lt;1%</td>
<td>8317</td>
</tr>
<tr>
<td>Timber Licences (outside of the TFL)</td>
<td>4,929</td>
<td>&lt;1%</td>
<td></td>
</tr>
<tr>
<td>Pure Lake &amp; Naikoon Provincial Parks</td>
<td>68,730</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Ecological Reserves</td>
<td>9264</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Gwaii Haanas</td>
<td>147,000</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Fee Simple and Municipal Lands and Indian Reserves (minus Woodlots)</td>
<td>35,735</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Total Land Base</td>
<td>1,005,056</td>
<td>100%</td>
<td>1,727,817</td>
</tr>
</tbody>
</table>

Note: Volumes for TSA include partitioned (75,000 m³/yr) and conventional apportionment (400,000m³/yr)

* The AAC shown in for the TSA is temporary and is a reflection of the volumes reapportioned by the Minister of Forests in April 2003 as a result of the establishment of Duu Guxsd as a designated area under Part 13 of the Forest Act. The AAC shown in brackets is the original AAC, prior to the apportionment.
Haida Protected Areas (HPA's) cover about 12.9% of the THLB for Block 6. The licensee Weyerhaeuser Company, Ltd, has not harvested in these areas since 1974. The results of the Timber Supply Analysis for TFL 39 indicated that, if these areas were excluded from calculations of the current timber supply, the contribution of Block 6 to the AAC would be reduced immediately by 11 percent. A partition of 125,000 m$^3$/yr was therefore, attributed to these areas. However, the licensees are not obligated to harvest in the HPA and the partition will not, of itself, interfere with the licensee removing the full AAC volumes within a more restricted land base.

In June of 2002, as a result of discussions with the Haida Nation, Weyerhaeuser reduced their annual harvest level on the Islands by 50%, to a maximum of 600,000 m$^3$/yr, until such time as a sustainable harvest level is determined following completion of the Land Use Plan.

**Tree Farm Licence 25**

The AAC for Block 6 of TFL 25 is 115,000 m$^3$/yr, including a BC Timber Sales component of 10,335 m$^3$/yr. The last AAC determination for this TFL was made on April 30, 1995 when the tenure was still TFL 24 and solely contained on the Islands.

The second timber supply review process is currently underway for TFL 25 and an AAC determination is anticipated by December 2003.

**Tree Farm Licence 47**

TFL 47 is also comprised of supply blocks situated in coastal BC. The AAC determination, effective December 1996, partitioned 100,000 m$^3$/yr in Block 18. BC Timber Sales does not have an allocation within this block as the tenure holder voluntarily returned 5% from Block 18 to become part of the TSA to meet “take-back” requirements. A Haida Protected Area is situated at Jiininga (or Government Creek) and has impacts on this TFL.

The second timber supply review process was recently completed for TFL 47 and the AAC was determined by the BC Chief Forester to be 780,000 m$^3$/year for all supply blocks combined. The contribution of the Moresby Island Management Unit was maintained at 100,000 m$^3$/yr.

During the timber supply review, the Haida Nation provided information regarding the need to reduce the cut from 100,000 m$^3$/yr to at least 30,000 m$^3$/yr in order to retain adequate levels of old growth in the tenure area. In his determination, the Chief Forester required that no more than 60,000 m$^3$ of old-growth timber be harvested per year, on average, in the Moresby Island Management Unit during the time the AAC is in effect.

**5.3.2.2 Allowable Annual Cut for the Queen Charlotte TSA**

In 1996, the AAC for the Queen Charlotte TSA was determined by the Chief Forester to be 475,000 m$^3$/year. The AAC was partitioned so that 75,000 m$^3$/yr would be required to be harvested from low volume cedar stands. The intent of the partition was to disperse the harvest into low volume areas that contribute to the AAC and help to reduce pressures incurred in some parts of the conventional timber harvesting land base. These stands make up approximately 5% of the existing timber harvesting landbase (THLB) (MoF, 2000a).

---

58 Haida Protected Areas as declared by the CHN and approved by the House of Assembly

59 definition needed here
In December 1999, the Chief Forester temporarily reduced the AAC for the TSA by 24\% (114,000 \text{m}^3) to 361,000 \text{m}^3/yr to declare Duu Guusd a designated area under Part 13 of the \textit{Forest Act} (BC) while forest management issues were being resolved between the Province and the Haida Nation. Duu Guusd is one of fourteen specific areas established by the Haida Nation as a Protected Area, strategic planning issue: industrial activity within Haida Protected Areas (see Section 5.1.3: Protected Areas). The partitioned cut for the low volume stands was proportionally reduced to 57,000 \text{m}^3/yr.

The Part 13 Designation for the Duu Guusd area was re-established by Order-in-Council on March 7, 2003 to enable interim protection of this area while strategic land use planning is underway. A temporary AAC of 361,000 \text{m}^3/yr was re-established and will remain in effect from April 30, 2003 until the Duu Guusd ceases to be a designated area. The Order-in-Council designating the Duu Guusd is currently in effect until December 2004. A new Section 8 AAC determination for the Queen Charlotte TSA is not required until two years after the expiry (December 2004) of the designation.

The Ministry of Forests will re-apportion volumes amongst its forest tenure holders in the TSA in response to the re-instated reduction in the AAC. The re-apportionment of volumes in May 2000, in response to the original reduction in AAC was as follows:

- the allocation for replaceable Forest Licences within the TSA was reduced from 330,845 \text{m}^3/yr to 247,600 \text{m}^3/yr;
- the allocation for BC Timber Sales was reduced from 121,818 \text{m}^3/yr to 91,063 \text{m}^3/yr; and
- the low volume cedar partition was spread equitably between the licences in the TSA based on their proportion of cut within the TSA.

The second Timber Supply Review began in 1999. In October 2000 the Timber Supply Analysis, Social-Economic Analysis and Public Discussion Paper were released. No AAC determination has yet been released by BC’s Chief Forester.

### 5.3.2.3 BC Timber Sales allocations

BC Timber Sales has allocations within both the TSA and TFL s. These are summarized in Table 25. Table 26 shows the volume and types of Timber Sales sold over the past 5 fiscal years.

#### Table 25. BC Timber Sales allocations based on the 1996 AAC and subsequent adjustments

<table>
<thead>
<tr>
<th>Forest tenure</th>
<th>BC Timber Sales allocation (m$^3$/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queen Charlotte TSA</td>
<td>121,818</td>
</tr>
<tr>
<td>Block 6 of TFL39</td>
<td>56,324</td>
</tr>
<tr>
<td>Block 6 of TFL 25</td>
<td>10,335</td>
</tr>
<tr>
<td>Block 18 of TFL 47</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>188,497</strong></td>
</tr>
</tbody>
</table>
Table 26. Number and Breakdown of Timber Sales sold under BC Timber Sales

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Market Logger Sales (Section 20)</th>
<th>Value Added Sales (Section 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># Sales</td>
<td>Sold Volume (m³)</td>
</tr>
<tr>
<td>1996-97</td>
<td>16</td>
<td>70,800</td>
</tr>
<tr>
<td>1997-98</td>
<td>10</td>
<td>59,900</td>
</tr>
<tr>
<td>1998-99</td>
<td>17</td>
<td>99,900</td>
</tr>
<tr>
<td>1999-00</td>
<td>16</td>
<td>101,775</td>
</tr>
<tr>
<td>2000-01</td>
<td>18</td>
<td>139,661</td>
</tr>
</tbody>
</table>

5.3.2.4 Comparison of AAC and actual harvest

In March of 2003, the Province announced amendments to the Forest Act (BC) to adjust cut control rules. Under the old rules licensees were required to harvest within 50% of their AAC (or apportionment) in any given year, and within 10% of their AAC within a 5 year cut control period. This meant that licensees were required to log even when demand and prices were low due to depressed markets or oversupply. Introducing more wood into a sluggish market forced prices even lower, driving down the value of forest products. Under the new cut control rules, licensees no longer have to harvest a minimum amount, but can instead decide to harvest when prices and market conditions are suitable. There will be no penalties for failing to cut timber, but licensees may be required to return uncut portions to the Province. There will continue to be maximum cut controls to maintain harvest levels within AAC limits. Table 27 summarizes the cut control performance for the TSA since 1992.

All of the three TFLs include lands that are not within the Islands i.e., the BC mainland and Vancouver Island. Cut control standards and the associated provincial legal accountability apply to the TFL as a whole, and not to single supply blocks. However, each company does have a harvest allocated to the supply block on the Islands that can be used to track whether the volume harvested approximates the allocated cut. In addition, Weyerhaeuser has made a commitment in their approved management plan to manage TFL 39 on a supply block basis (Ministry of Forests, 2001b). Table 28 summarizes each supply block’s volume contribution to the TFL AAC compared to the volume harvested from that supply block since 1992.

Table 27. Recent Cut Control Performance for Queen Charlotte TSA

<table>
<thead>
<tr>
<th>Management Unit</th>
<th>Year</th>
<th>Allowable Annual Cut Available</th>
<th>Actual Harvest (Chargeable Cut to AAC)</th>
<th>Actual Harvest as a Percentage of AAC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1992</td>
<td>514,335</td>
<td>513,080</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1993</td>
<td>514,335</td>
<td>626,221</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1994</td>
<td>514,335</td>
<td>371,079</td>
<td></td>
</tr>
</tbody>
</table>
### Table 28. Contributing Volume to AAC Compared to Volume Harvested for TFL 39(Bk 6), TFL 25 (Bk 6) and TFL 47 (Bk18)

<table>
<thead>
<tr>
<th>Management Unit</th>
<th>TFL Cut Control Period</th>
<th>Contributing Volume to AAC</th>
<th>Actual Harvest (Chargeable Cut to AAC)</th>
<th>Actual Harvest as a % of Contributing Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFL 39(Bk 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td>1,362,346</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td>1,134,244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td>1,010,729</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>1,254,633</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 1, 1996</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>1,210,000</td>
<td>994,742</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>1,210,000</td>
<td>746,629</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>1,210,000</td>
<td>884,756</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>1,210,000</td>
<td>956,073</td>
<td></td>
</tr>
<tr>
<td>Management Unit</td>
<td>TFL Cut Control Period</td>
<td>Contributing Volume to AAC</td>
<td>Actual Harvest (Chargeable Cut to AAC)</td>
<td>Actual Harvest as a % of Contributing Volume</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>----------------------------</td>
<td>----------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>TFL 25 (Bk 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>115,000</td>
<td>107,028</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>115,000</td>
<td>122,031</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>115,000</td>
<td>97,102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>115,000</td>
<td>124,426</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>115,000</td>
<td>117,635</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>115,000</td>
<td>123,212</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total for cut control period 1994-1998</td>
<td>575,000</td>
<td>516,680</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>115,000</td>
<td>43,216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>115,000</td>
<td>34,640</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>115,000</td>
<td>121,102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>115,000</td>
<td>54,579</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total this CC period to 2003</td>
<td>345,000</td>
<td>253,537</td>
<td>73%</td>
<td></td>
</tr>
<tr>
<td>TFL47(Bk 18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>132,000</td>
<td>87,525</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>132,000</td>
<td>194,238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>132,000</td>
<td>123,980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>132,000</td>
<td>145,051</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>129,282</td>
<td>68,078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>100,000</td>
<td>79,522</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>100,000</td>
<td>3,211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>100,000</td>
<td>68,799</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total for cut control period 1995-1999</td>
<td>561,282</td>
<td>364,661</td>
<td>65%</td>
<td></td>
</tr>
</tbody>
</table>
5.3.3 Harvesting Operability

The area of operable forest is determined based on the presence/absence of physical barriers or limitations to timber harvesting, the types of logging methods used, and the merchantability of stands. The operable area includes areas harvested by conventional (ground-based) methods and by helicopters. The operable landbase is not static; the area changes with innovations in harvesting technology and the market value of commercial timber.

Harvesting operability is derived from a consideration of both physical and economic limits:

*Physical operability limits:* Areas harvested by conventional harvesting systems (road access) are constrained in large part by slope and accessibility to water dumping and log storage facilities. Areas harvested by non-conventional harvesting systems (helicopter logging) the Islands mainly use roads and landings for drop sites (rather than water). The economics of helicopter logging are largely driven by the distance to fly the harvested timber, the value of the wood, and its piece size.

*Economical Operability Limits:* All forest cover stands are assessed for volume and average market value conditions collected over time. If the operational cost of harvesting the stand exceeds the assessed market value of the stand then it does not meet the economical operability limits.

Timber operability acts as the base for defining the timber harvesting landbase (THLB). The THLB is the area of operable landbase that remains once various netdowns have been removed. Netdowns are areas that are not harvested, such as riparian reserve zones, sites of low productivity, and archaeological sites. These are defined in the Timber Supply Analyses for each of the TSA and three TFLs. The THLB reflects the assumptions used at the time it was derived; the boundaries change as assumptions about economics, physical operability and environmental and cultural constraints change.

Table 29 shows the breakdown by management unit of the timber harvesting land base on the Islands. As shown in the table, approximately half of the land area in each of the TFLs is harvestable, whereas only 18% of the land area in the TSA is harvestable. Therefore, although the TFLs comprise a smaller landbase than the TSA, the amount of timber that can be harvested from these areas is proportionally much higher. The TFLs, collectively, contribute 63% of the total THLB for the Islands and 74% of the allowable annual harvest (see Section...
5.2.2: Harvest Levels). The entire THLB within the four forestry management units is 244,004 hectares.

Table 29. THLB Summary by Management Unit: Queen Charlotte Islands Forest District (Fee simple and municipal lands and Gwaii Haanas not included)

<table>
<thead>
<tr>
<th>Management Unit</th>
<th>THLB (Contributing landbase) (ha)</th>
<th>Forested non-contributing landbase* (ha)</th>
<th>Gross landbase (ha)</th>
<th>% of Management Unit that is THLB</th>
<th>% contribution to overall THLB</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSA</td>
<td>81,905</td>
<td>284,706</td>
<td>423,248</td>
<td>18</td>
<td>34</td>
</tr>
<tr>
<td>TFL 39</td>
<td>119,663</td>
<td>74,733</td>
<td>240,311</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td>TFL 25</td>
<td>25,040</td>
<td>23,210</td>
<td>53,364</td>
<td>47</td>
<td>10</td>
</tr>
<tr>
<td>TFL 47</td>
<td>17,396</td>
<td>8276</td>
<td>27,154</td>
<td>64</td>
<td>7</td>
</tr>
<tr>
<td>Provincial parks and ERs</td>
<td>-</td>
<td>55,884</td>
<td>77,994</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>244,004</td>
<td>446,809</td>
<td>858,056</td>
<td>N/a</td>
<td>100</td>
</tr>
</tbody>
</table>

* Area of “Contributing” and “Non-contributing” is derived based on the THLB definition used for the TSR in each Management Unit. Excluded areas (non-forested or outside of the landbase) have been removed from calculations of Contributing and Non-Contributing Forest but are included in the Gross Landbase.

5.3.4 Timber Harvesting

5.3.4.1 Harvest Profile

In the ten year period between 1992 and 2001, approximately 14.3 million m³ of timber was harvested from the four management units on the Islands. Of this, western red cedar and yellow cypress comprised 46% of the species harvested, while western hemlock 40% and Sitka spruce comprised 16%. Table 30 summarizes the distribution of leading tree species in each forest management unit by area. Note that a direct comparison between the harvest and actual profiles of leading tree species is not possible because the harvest profile is based on volume and the actual species profile is based on area.

Table 30. Profile of leading tree species in each forest management unit by area

<table>
<thead>
<tr>
<th>Management unit</th>
<th>Western redcedar</th>
<th>Alder</th>
<th>Mountain hemlock</th>
<th>Western hemlock</th>
<th>Lodgepole pine</th>
<th>Sitka spruce</th>
<th>White spruce</th>
<th>Yellow-cedar</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSA</td>
<td>53%</td>
<td>1%</td>
<td>0%</td>
<td>30%</td>
<td>2%</td>
<td>9%</td>
<td>0%</td>
<td>4%</td>
<td>53%</td>
</tr>
<tr>
<td>TFL 39</td>
<td>25%</td>
<td>2%</td>
<td>0%</td>
<td>54%</td>
<td>1%</td>
<td>13%</td>
<td>0%</td>
<td>6%</td>
<td>100%</td>
</tr>
<tr>
<td>TFL 25</td>
<td>23%</td>
<td>4%</td>
<td>1%</td>
<td>38%</td>
<td>0%</td>
<td>20%</td>
<td>0%</td>
<td>13%</td>
<td>100%</td>
</tr>
<tr>
<td>TFL 47</td>
<td>23%</td>
<td>2%</td>
<td>0%</td>
<td>46%</td>
<td>0%</td>
<td>25%</td>
<td>0%</td>
<td>4%</td>
<td>100%</td>
</tr>
<tr>
<td>OVERALL</td>
<td>41%</td>
<td>1%</td>
<td>0%</td>
<td>38%</td>
<td>2%</td>
<td>12%</td>
<td>0%</td>
<td>6%</td>
<td>100%</td>
</tr>
</tbody>
</table>
The vast majority of the timber harvested on the Islands is in old forest. Recently there has been harvesting in second growth stands that originated from the large fires that occurred in the 1800’s. To date there only a few stands of second growth forest have been harvested that originated from post-harvesting regeneration.

5.3.4.2 Harvesting Operations

The majority of the available timber is accessed from a network of industrial roads on Graham, Moresby and Louise Islands. However, there are many remote areas where the harvesting operations require logging camps and access to the area is by water or air. This includes Naden Harbour, Dinan and McClinton Bay and Tartu Inlet of Graham Island, Sewell Inlet on Moresby Island and Louise Island.

Due to the rugged terrain, road construction for forestry operations is difficult and expensive. Most harvesting is done by hand felling trees and extracting with the use of conventional harvesting methods such as grapple or tower yarding, hoe forwarding or by non-conventional methods using helicopters. A recent survey of harvesting methods used the Islands (Von Schilling, in preparation) showed the following profile for the sample cutblocks that were surveyed:

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoe forwarding</td>
<td>40%</td>
</tr>
<tr>
<td>Cable</td>
<td>55%</td>
</tr>
<tr>
<td>Helicopter</td>
<td>5%</td>
</tr>
</tbody>
</table>

5.3.4.3 Silviculture Systems

Until recently, the primary silviculture system employed on the Islands was clearcutting. Since that time, an increasing proportion of clearcut with pocket reserves and retention systems have been utilized.

Clearcut with reserves is now a more common system than straight clearcut with the requirements of the BC Forest Practices Code to retain wildlife tree patches within or adjacent to cutblocks. “Retention” refers to a relatively newly developed silviculture system that is being used by some forest licensees in BC, including on the Islands. The Operational and Site Planning Regulation under the Forest Practices Code of BC defines the “retention system” as a system that is designed to (a) retain individual trees or groups of trees to maintain structural diversity over the area of the cutblock for at least one rotation, and (b) leave more than half the total area of the cutblock within one tree height from the base of a tree or group of trees, whether or not the tree or group of trees is inside the cutblock.

Variants of the retention system exist, such as “group” retention or “dispersed” retention. In dispersed retention, individual or small groups of trees are left to distribute structural elements throughout the future stand. In group retention (often called aggregated retention), groups that are typically at least 0.25 hectares in size, sufficiently large to retain undisturbed understory vegetation and coarse woody debris (Mitchell and Beese, 2002).

---

60 A clearcutting system removes an entire stand of trees from an area of one hectare or more, and greater than two tree heights in width, in a single harvesting operation.

Clearcut with reserves is a variation of the clearcutting system, in which a variable number of trees are retained, either uniformly or in small groups for purposes other than regeneration.
The report (Von Schilling, In preparation) reviewing the various silvicultural systems and harvesting practices recently in use on the Islands will provide further information on what the systems look like, their objectives, extent of application, and issues and problems associated with each.

5.3.5 Timber Processing

It is estimated that 97 – 98% of the timber harvested on the Islands is processed elsewhere. All of the timber from the TFLs and almost all of the timber from the TSA is transported to mills on the BC Lower Mainland and Vancouver Island.

The largest sawmill on the Islands is the Abfam Enterprises Ltd. mill at Port Clements. Abfam, located on the outskirts of Port Clements, is locally owned and operated. The mill saws western red cedar, western hemlock and lodgepole pine. Abfam has recently installed two dry kilns capable of drying 50,000 board feet of lumber at a time. This has allowed them access to the Japanese market and the dried lumber has reduced their freight costs (Spruce Roots, 2002).

From 1984 to 1994 Abfam’s timber supply came from a ten year, non-renewable, Opportunity Wood Licence for 40,000 m$^3$ per year. The tenure of this licence expired in 1994. Currently, Abfam must bid for timber sales provided by the BC Timber Sales.

Aside from the two main sawmills already mentioned, there are a number of micromills (sawmills employing less than 20 people). There are 14 micromills identified locally.

Graham Island Forest Products Ltd. operates a shingle mill in Masset, and there is a shake mill in Port Clements operated by Bruce Brown. There are also eight secondary manufacturers producing products such as pallets, custom millwork, kiln drying, mouldings, custom furniture and cabinets, drums, specialty wood products for furniture and architectural pieces, hobby wood for wood craft market, and shakes and shingles on a commercial basis.

Local artists and artisans use red and yellow cedar, driftwood, alder and yew for weavings, carvings, poles, canoes, traditional buildings and other wood products. Haida wood products continue to be a strong market.

5.3.6 Silviculture

5.3.6.1 Basic silviculture

A significant factor in the composition of forests on the Islands is the regeneration of forests on harvested areas. Silvicultural treatments play a significant role in the regeneration of the forests. Basic silviculture consists of surveys, site preparation, planting, brushing, cone collecting and some spacing. Enhanced or intensive silviculture includes spacing, fertilization and pruning. Generally, harvested blocks are planted quite promptly, although sometimes they are left to regenerate naturally for a few years and then fill-planted where needed. This latter practice is becoming less common, since early green-up is a primary interest.

Since the 1980s, forest licensees have been required to re-plant harvested areas in ecologically-appropriate species that are genetically suited to the site. This involves collecting seeds from the area. Seeds are germinated off-island and returned to the appropriate site for planning as seedlings. The most problematic sites for regenerating forest stands have been low
lying cedar-salal sites, primarily due to competition with other vegetation. The regeneration performance in these sites tends to be very low. The Ministry of Forests, Queen Charlotte Forest District has established a Cedar Policy which states that, for biodiversity and ecological reasons, western redcedar and yellow-cedar must be maintained on the landscape. The policy outlines minimum densities of cedar to be re-established on harvested areas. The policy also describes varying densities of cedar to be established based on the ecosystem and the proportion of cedar in the mature stand. Since the cedar policy was put into place in 1996, the amount of cedar planted has changed little, but the amount of cedar seedlings protected by barriers (tubes) has risen to protect the seedlings from deer browse. This makes cedar the most costly to plant (about $3 to $5 per seedling).

TFL licensees are responsible for basic silviculture on the TFLs. Basic silviculture in the TFLs accounts for significant employment. Licensees plant on average about 1,300 hectares per year (700,000-1,000,000 seedlings) and undertake protector maintenance on about half of that area. This accounts for roughly 3,500 worker-days per year. As well, approximately 2,000 hectares per year are surveyed, accounting for 50 to 100 worker-days per year (rough approximation) and roughly 100 hectares per year are brushed (about 300 worker-days per year). Minor amounts of site preparation and fertilizing are done but probably accounts for less than 50 worker-days per year.

In the TSA, the major licensees and BC Timber Sales are responsible for basic silviculture. Planting on BC Timber Sales areas averages roughly 150,000 seedlings per year, which works out to 700 worker-days per year. Approximately 300 hectares a year of BCTS blocks are addressed in surveying, planting, brushing, and protector maintenance. Generally one or two surveying contracts are issued per year amounting to between $10,000 and $30,000 in total or 15 worker-days per year.

Protector maintenance (browse protection measures) expenditures for BCTS areas average about $120,000 per year which results in 250 worker-days. Approximately 30 hectares per year are brushed accounting for 75 worker-days for a total of $33,000 per year. In total, worker-days are in the neighbourhood of 1,040 per year.

5.3.6.2 Incremental Silviculture

Prior to 2001, incremental silviculture activities such as spacing, fertilization and pruning were conducted by the Ministry of Forests on the TSA lands and by licensees on the TFL lands. However, with the cessation of funding from FRBC and South Moresby Forest Replacement Account (SMFRA) in 2001, little has been done in the way of non-essential silviculture work.

Prior to program cutbacks, the Ministry of Forests averaged $50,000 of FRBC funding per year on spacing and pruning within the TSA, accounting for about 75 worker-days per year while this funding was available. Further, the Ministry of Forests directly administered approximately $100,000 per year of SMFRA funding for these activities, accounting for an additional 200 worker-days per year. About 700 to 1,000 hectares per year were spaced, accounting for between 1,400 and 2,000 worker-days per year. In total, approximately 7,000 worker-days were averaged for both basic and incremental silviculture activities.
5.3.6.3 Forest Investment Account

The Forest Investment Account (FIA) is the successor to the FRBC program. The FIA is a provincial government mechanism for promoting sustainable forest management in BC. FIA funding is provided to the licensees for certain forest management programs both on the TSAs and on the TFLs.

FIA funding covered $11.2 million in projects on TFL 39 on the Islands in fiscal 2002/2003. $1.75 million of FIA funding was spent on projects in TFL 47 and $1.2 million in the TSA. No numbers were available for the Islands portion of TFL 25.

FIA funded projects are primarily allocated under the Land-Base Program. Projects were funded under this program in the following areas:

- Strategic resource planning (e.g. Sustainable Forest Management Plans)
- Stand establishment and treatment (e.g. backlog reforestation, rehabilitation, surveys, fertilization)
- Restoration and rehabilitation (e.g. road deactivation, landslide rehabilitation, planting or rehabilitation where site productivity is an issue)
- Information gathering and management (e.g. stand treatment and forest health monitoring, biodiversity/wildlife habitat monitoring, archaeological overview assessments)
- Infrastructure (e.g. maintenance and development of recreation sites, trails and facilities).

5.3.7 Current Provincial Legislation and Policy Related to Management of Forest Resources

The Forest Practices Code legislation and guidebooks have been developed based on current theories around a coarse- and fine-filter approach to management for ecosystems and wildlife. “Coarse filter management” is based on the assumption that, by managing to maintain the natural diversity of structures within stands and the natural diversity of ecosystems across the landscape, the habitat requirements of most native species will be met. Coarse filter management is guided by the Forest Practices Code Biodiversity Guidebook and the Riparian Management Area Guidebook and is described in greater detail in the following two sections.

“Fine filter management” is directed towards particular habitats or individual species whose habitat requirements are not adequately addressed by a coarse filter approach. Because of their specialist habitat needs, these habitats may be critical in some way or the species threatened or endangered. Fine filter management is described in the Forest Practices Code manual Forest Practices Code Managing Identified Wildlife: Procedures and Measures and is discussed in Section 5.3.7.3.

Management for terrain stability is described in Section 5.3.7.4.
Requirements under the Forest and Range Practices Act (FRPA) were being developed at the time of preparing this report. It is expected that default management for riparian areas and for biodiversity under FRPA will be consistent with the Forest Practices Code.

5.3.7.1 Management for biodiversity

In Island forests, large natural catastrophic disturbances are rare and forest succession occurs, for the most part, by a complex and seemingly random process of tree death and replacement. The resulting forests are very old with a mix of tree ages. Large openings are rare. Table 33 summarizes the proportion of old forest within each management unit, indicating the large amount of old forest across the landbase.

Forestry activities change the structural composition of coastal forests. Clearcutting creates large openings, replaced by more even-aged stands. Over time, the profile of the forest in the timber harvesting landbase changes. One theorized long-term effect of harvesting will be a landscape mosaic where the operable areas are in second growth, managed stands (< 80 years old) interspersed with Riparian Reserve Zones, Wildlife Tree Patches, non-operable leave zones and other special leave zones. Forest outside of the timber harvesting landbase may continue to cycle through natural disturbance processes in a mosaic of age classes, with older age classes (> 250 yrs) dominating.

Understanding the theories of landscape ecology can improve a manager’s ability to exercise professional judgement during landscape-level planning and can also enhance the exchange of information between planning team members, interest groups and the public (Daigle and Dawson, 1996). Important biological concepts are documented in the BC Ministry of Forests Research Program Extension Notes. The biological concepts documented as individual notes are:

- Landscape Ecology (Daigle and Dawson, 1996)
- Natural disturbance ecology (Parminter and Daigle, 1997)
- Spatial patterns (Eng, 1997)
- Connectivity (Dawson, 1997)
- Riparian areas and Wetlands (Banner and MacKenzie, 1998)
- Interior habitats and edge effects (Voller, 1998)
- Seral stages across landscapes (Yearsley and Parminter, 1998)

The series is based on Voller and Harrison's Conservation Biology Principles for Forested Landscapes (1998). This should be referred to for those wanting a more “in-depth” understanding. Another useful information source is Conserving Forest Biodiversity: a comprehensive multi-scaled approach by Lindenmayer and Franklin (2002).
Landscape units and biodiversity emphasis options

The Queen Charlotte Islands Forest District has mapped draft landscape units and assigned draft biodiversity emphasis options for the entire district, including the TFLs, consistent with the direction in the provincial Landscape Unit Planning Guide (1999). Landscape units are areas of land and water for long-term planning of resource management activities with a priority or focus on biodiversity conservation. They include objectives and strategies for landscape-level biodiversity and for managing other forest resources. The Islands have been stratified into 24 landscape units based on the principles specified in the Landscape Unit Planning Guide and in BC Chief Forest direction. Landscape units are watershed or amalgamated watershed-based using heights-of-land and broad ecosystem information. Table 31 lists the landscape units on the Islands.

Draft biodiversity emphasis options (BEOs) have been assigned, but not implemented, for each landscape unit based on ecological and socio-economic criteria (Table 31). The FPC of BC Act Biodiversity Guidebook outlines a range of three options for emphasizing biodiversity at the landscape level. The three BEO options are low, intermediate and high.

The lower BEO may be appropriate for areas where other social and economic demands, as set by the Province, such as timber supply, are the primary management objectives. This option will provide habitat for a wide range of native species, but the pattern of natural biodiversity will be significantly altered, and the risk of some native species being unable to survive in the area will be relatively high.

The intermediate BEO is a trade-off between biodiversity conservation and timber production. Compared to the lower BEO, this one will provide more natural levels of biodiversity and a reduced risk of eliminating native species from the area.

The higher BEO gives a higher priority to biodiversity conservation but would have the greatest impact on timber harvest. This option is recommended for those areas where conservation is a high management priority.

In reality, these options are points on a continuum, and in between lie a range of options that may be selected depending on the relative priority allocated to biodiversity conservation and timber production in an area (BC Ministry of Forests, 1995b). The BEOs for the Islands are only draft and will be confirmed through the Land Use Plan.

Table 31. Summary of the landscape units and draft biodiversity emphasis options

<table>
<thead>
<tr>
<th>Landscape Unit</th>
<th>Draft Biodiversity Emphasis Options</th>
<th>Total Forested Area (Ha)</th>
<th>Gross Area (Ha)</th>
<th>Total forested area as a % of gross area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Althow Bay</td>
<td>Low</td>
<td>32,784</td>
<td>48,068</td>
<td>68</td>
</tr>
<tr>
<td>Beresford</td>
<td>Intermediate</td>
<td>54,117</td>
<td>60,592</td>
<td>89</td>
</tr>
<tr>
<td>Eden Lake</td>
<td>Intermediate</td>
<td>43,587</td>
<td>50,513</td>
<td>86</td>
</tr>
<tr>
<td>Gudal</td>
<td>Low</td>
<td>20,006</td>
<td>29,771</td>
<td>67</td>
</tr>
<tr>
<td>Hibben</td>
<td>High</td>
<td>29,599</td>
<td>45,688</td>
<td>65</td>
</tr>
<tr>
<td>Honna</td>
<td>Intermediate</td>
<td>27,964</td>
<td>30,624</td>
<td>91</td>
</tr>
<tr>
<td>Ian</td>
<td>Intermediate</td>
<td>24,294</td>
<td>31,620</td>
<td>77</td>
</tr>
<tr>
<td>Jalun</td>
<td>Low</td>
<td>25,299</td>
<td>31,632</td>
<td>81</td>
</tr>
</tbody>
</table>
### Landscape Unit

<table>
<thead>
<tr>
<th>Landscape Unit</th>
<th>Draft Biodiversity Emphasis Options</th>
<th>Total Forested Area (Ha)</th>
<th>Gross Area (Ha)</th>
<th>Total forested area as a % of gross area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louise Island</td>
<td>Low</td>
<td>24,781</td>
<td>29,078</td>
<td>85</td>
</tr>
<tr>
<td>Lower Yakoun</td>
<td>Intermediate</td>
<td>25,761</td>
<td>29,457</td>
<td>87</td>
</tr>
<tr>
<td>Masset Inlet</td>
<td>Low</td>
<td>48,754</td>
<td>54,850</td>
<td>89</td>
</tr>
<tr>
<td>Naikoon</td>
<td>Low</td>
<td>78,688</td>
<td>111,284</td>
<td>71</td>
</tr>
<tr>
<td>Otun</td>
<td>Low</td>
<td>54,054</td>
<td>71,814</td>
<td>75</td>
</tr>
<tr>
<td>Rennell</td>
<td>Intermediate</td>
<td>33,012</td>
<td>39,082</td>
<td>84</td>
</tr>
<tr>
<td>Sewell</td>
<td>Intermediate</td>
<td>38,437</td>
<td>42,908</td>
<td>90</td>
</tr>
<tr>
<td>Skidegate Lake</td>
<td>Low</td>
<td>46,093</td>
<td>51,973</td>
<td>89</td>
</tr>
<tr>
<td>Tasu</td>
<td>Low</td>
<td>27,246</td>
<td>34,041</td>
<td>80</td>
</tr>
<tr>
<td>Tlell</td>
<td>Intermediate</td>
<td>38,546</td>
<td>42,730</td>
<td>90</td>
</tr>
<tr>
<td>Yakoun Lake</td>
<td>High</td>
<td>22,549</td>
<td>27,070</td>
<td>83</td>
</tr>
</tbody>
</table>

**Gwaii Haanas National Park Reserve and Haida Heritage Site**

<table>
<thead>
<tr>
<th>Landscape Unit</th>
<th>Draft Biodiversity Emphasis Options</th>
<th>Total Forested Area (Ha)</th>
<th>Gross Area (Ha)</th>
<th>Total forested area as a % of gross area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bigsby</td>
<td>N/A</td>
<td>Not available</td>
<td>27,124</td>
<td></td>
</tr>
<tr>
<td>Gowgaia</td>
<td>N/A</td>
<td>Not available</td>
<td>41,078</td>
<td></td>
</tr>
<tr>
<td>Kunghit Island</td>
<td>N/A</td>
<td>Not available</td>
<td>13,131</td>
<td></td>
</tr>
<tr>
<td>Lyell Island Group</td>
<td>N/A</td>
<td>Not available</td>
<td>24,073</td>
<td></td>
</tr>
<tr>
<td>Skincuttle</td>
<td>N/A</td>
<td>Not available</td>
<td>41,067</td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td></td>
<td></td>
<td>1,005,056</td>
<td></td>
</tr>
</tbody>
</table>

### Zoning and objectives for biodiversity

Biodiversity planning in British Columbia is based on the principle that “the more that managed forests resemble the forests that were established from natural disturbances, the greater the probability that all native species and ecological process will be maintained.” There are six basic elements of biodiversity planning under the Forest Practices Code. These include the following:

**Old growth retention**

Areas of old forest, called old growth management areas (OGMAs), are to be identified in each landscape unit and set aside from timber harvesting. The minimum amount of old seral forest included in OGMAs in each landscape unit is defined by the BEO for the landscape unit. Where possible, OGMAs are located outside of the timber harvesting landbase or in areas of minimal impact to timber supply. Old growth representation in OGMAs is to the level of biogeoclimatic variant. As of 2003, OGMAs have not been implemented on the Islands.
Wildlife tree retention

Wildlife trees are standing live and dead trees that provide habitat for many species of wildlife, birds and invertebrates. Stand structure is retained within individual cutblocks, either as individual trees or as patches of trees. Targets for wildlife tree retention within each cutblock are determined by landscape unit and are based on previous harvesting patterns. Wildlife tree retention levels by landscape unit have been communicated to provincial tenure holders on the Islands and are being applied during forestry activities.

Distribution of cut and leave areas over space and time

The pattern and timing of provincially approved timber harvesting has a large influence on the size and distribution of forest patches across the landscape. Patch size targets permit a range of opening sizes, from small to very large, with the intent of mimicking the range of natural patterns of disturbance across the landbase as well as providing economic efficiency for harvesting operations.

Connectivity

Connectivity is provided by continuous areas of mature and old forest cover. In the mountainous topography and where contiguous blankets of old forest cover are the norm, important elements of connectivity include riparian areas and forested cover linking watersheds (e.g., over low elevation passes) and connecting valley bottom and upper elevation areas.

Species composition

The intent of objectives for species composition is that a significant component of the landscape unit be maintained in communities with plant species composition similar to that in communities that have developed through natural succession. This includes maintaining a mix of deciduous and coniferous trees, where appropriate.

Under current policy, as outlined in the Landscape Unit Planning Guide (1999) old growth retention and wildlife tree retention are priorities for biodiversity planning.

Table 32 summarizes the distribution of seral stages by biogeoclimatic variant in the forested landbase. Logging on the Islands between 1940 and 1960 tended to focus on easily accessible valley bottoms and lowland river areas i.e., highly productive sites having large structured stands. As those areas were exhausted, logging moved into the upland areas, including steep terrain, where there is also high value old growth timber. This pattern of harvesting has had an effect on the distribution of age classes within the managed forest.

As might be expected, Table 32 shows that the amount of regenerating forest is highest in the biogeoclimatic variants that are subject to timber harvesting, particularly in the Coastal Western Hemlock zone. Likewise, the amount of old seral forest is highest in the Mountain Hemlock variants where less harvesting has occurred, although there may have been some old forest removal due to logging roads. Appendix L summarizes the seral stage distribution in each landscape unit in the landbase outside of Gwaii Haanas (for which data was not available).

Map 5 shows the seral stages by landscape unit. The table in Appendix L compares the amount of old seral forest in each landscape unit to the targets in the Forest Practices Code Landscape

Page 136
Unit Planning Guide and indicates those landscape units where the amount of old forest falls short of the targets established by the Province. For the most part, these targets for old seral retention can be met in all landscape units in the TSA and TFLs.

Table 32. Seral stage distribution by biogeoclimatic variant within the managed landbase

<table>
<thead>
<tr>
<th>BEC variant</th>
<th>Total forested land area (ha)</th>
<th>% in each seral stage*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early</td>
<td>Mid/ Early Mature</td>
</tr>
<tr>
<td>AT</td>
<td>228</td>
<td>0</td>
</tr>
<tr>
<td>ATp</td>
<td>164</td>
<td>0</td>
</tr>
<tr>
<td>CWH</td>
<td>4918</td>
<td>25</td>
</tr>
<tr>
<td>CWHvh2</td>
<td>167,269</td>
<td>8</td>
</tr>
<tr>
<td>CWwh1</td>
<td>429,162</td>
<td>20</td>
</tr>
<tr>
<td>CWwh2</td>
<td>66,441</td>
<td>19</td>
</tr>
<tr>
<td>MHwh</td>
<td>9697</td>
<td>4</td>
</tr>
<tr>
<td>MHwh1</td>
<td>9023</td>
<td>2</td>
</tr>
<tr>
<td>MHwh2</td>
<td>3911</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>690,814</td>
<td>17</td>
</tr>
</tbody>
</table>

* Seral stage definitions for each forested BEC unit (CWH and MH) are as per the Landscape Unit Planning Guide (1999). See Appendix L for definitions.
Data is current to the last TSR: TSA - 1997; TFL 25 – 2001; TFL 39 – 1995; TFL 47 - 1999

Table 33 summarizes the seral stage distribution within each management unit based on forest cover inventory. The figures show that the proportion of early seral is higher (and old seral lower) in the contributing landbase (THLB) relative to the non-contributing landbase. This is particularly true in the TFLs where there proportion of THLB in the management unit is highest. The distribution of seral stages in the non-contributing forest is more reflective of the natural distribution of seral stages.
Table 33. Seral stage distribution in 2003 by forest management unit

<table>
<thead>
<tr>
<th>Portion of the landbase</th>
<th>Mgmt unit</th>
<th>Total forested land area</th>
<th>% in each seral stage*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Early</td>
</tr>
<tr>
<td>Contributing forest</td>
<td>HG/QC TSA</td>
<td>81,905</td>
<td>19</td>
</tr>
<tr>
<td>Non-contributing forest**</td>
<td>284,706</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Gross landbase</td>
<td></td>
<td>460,091</td>
<td>7</td>
</tr>
<tr>
<td>Contributing forest</td>
<td>TFL 39</td>
<td>119,663</td>
<td>35</td>
</tr>
<tr>
<td>Non-contributing forest</td>
<td>74,733</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Gross landbase</td>
<td></td>
<td>240,311</td>
<td>23</td>
</tr>
<tr>
<td>Contributing forest</td>
<td>TFL 25</td>
<td>25,040</td>
<td>53</td>
</tr>
<tr>
<td>Non-contributing forest</td>
<td>23,210</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Gross landbase</td>
<td></td>
<td>52,981</td>
<td>28</td>
</tr>
<tr>
<td>Contributing forest</td>
<td>TFL 47</td>
<td>17,396</td>
<td>60</td>
</tr>
<tr>
<td>Non-contributing forest</td>
<td>8276</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>Gross landbase</td>
<td></td>
<td>26,820</td>
<td>48</td>
</tr>
<tr>
<td>Total contributing</td>
<td></td>
<td>244,004</td>
<td>33</td>
</tr>
<tr>
<td>Total non-contributing</td>
<td>446,810</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Total managed landbase</td>
<td>780,777</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

* Seral stage definitions for each forested BEC unit (CWH and MH) are as per the Landscape Unit Planning Guide (1999). See Appendix L for definitions.

Data is current to the last TSR: TSA - 1997; TFL 25 – 2001; TFL 39 – 1995; TFL 47 - 1999

** The area of “Contributing” and “Non-contributing” is derived based on the THLB definition used for the TSR in each Management Unit.

Excluded areas (non-forested or outside of the landbase) have been removed from calculations of Contributing and Non-Contributing Forest but are included in the Gross Landbase.
Map 5: Seral Stage by Landscape Unit

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
5.3.7.2 Riparian Management

Riparian ecosystems are adjacent to streams, lakes and wetlands. They are highly diverse and productive and contain many of the highest ecological values of the unmanaged forest (see Section 3.4: Hydoriparian Ecosystems). Due to their high productivity, these areas also contain very high timber values.

The management of riparian areas is a significant component of both the Forest Practices Code and the replacement Forest and Range Practices Act (to be in full effect in 2005). Part 8 of the Forest Practices Code (FPC) of BC Act Operational and Site Planning Regulation defines the classification of streams, wetlands and lakes. For each class of stream, wetland and lake, the Regulation defines the requirements for a riparian management area (RMA), which includes a riparian management zone (RMZ) and a riparian reserve zone (RRZ) within which no harvesting is permitted (Table 34). Division 2 of Part 3 of the FPC of BC Act Timber Harvesting and Silviculture Regulation regulates forest management practices within the riparian management area. Management of riparian areas under Forest and Range Practices Act had not been defined at the time of preparing this report. Interim management is according to the Forest Practices Code.

Table 34. Forest Practices Code definition of Riparian Class and Riparian Management Area

<table>
<thead>
<tr>
<th>Riparian Class</th>
<th>Size / Definition</th>
<th>RRZ (m)</th>
<th>RMZ (m)</th>
<th>RMA (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Streams</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>&gt;20m, has fish or community water</td>
<td>50</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>S2</td>
<td>5-20m, has fish or community water</td>
<td>30</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>S3</td>
<td>1.5-5m, has fish or community</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>S4</td>
<td>&lt;1.5, has fish or community</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>S5</td>
<td>&gt;3m, no fish or community water</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>S6</td>
<td>&lt;3m, no fish or community water</td>
<td>0</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Wetlands</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>&gt;5ha</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>W2</td>
<td>1-5 ha (in ecosystems found on the Islands)</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>W3</td>
<td>1-5ha (ecosystems not found on the Islands)</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>W4</td>
<td>0.25-1 ha (* in ecosystems found on the Islands)</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>W5</td>
<td>2 or more wetlands, combined size &gt;5ha</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td><strong>Lakes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Riparian Class Size / Definition RRZ (m) RMZ (m) RMA (m)

<table>
<thead>
<tr>
<th>Class</th>
<th>Size / Definition</th>
<th>RRZ</th>
<th>RMZ</th>
<th>RMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>&gt;5ha (in ecosystems found on the Islands)</td>
<td>10</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>1-5 ha (in ecosystems found on the Islands)</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>L3</td>
<td>1-5 ha (ecosystems not found on the Islands)</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>L4</td>
<td>0.25-1 ha (*in ecosystems found on the Islands)</td>
<td>0</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

* Riparian management zone width determined by the District Manager

A number of Forest Practices Code guidebooks provide guidance on management practices and assessments within riparian areas. The FPC of BC Act Riparian Management Guidebook guidance on planning and conducting operations within the RMA and fisheries- and marine-sensitive zones. Operations such as road building, stream crossing installation, and falling and yarding within the RMA are discussed. Management prescriptions to protect riparian areas, along with mapping of their location and identification of their riparian class, are contained in forest stewardship plans (FSPs).

Other FPC of BC Act guidebooks related to riparian management include the Fish-stream Identification Guidebook, Fish-stream Crossing Guidebook, Channel Assessment Procedure Guidebook, Coastal Watershed Assessment Guidebook, and Gully Assessment Procedure Guidebook.

A report in progress by Von Schilling, which examines current silvicultural and harvesting practices on the Islands, will provide an up-to-date description of management practices in riparian areas.

### 5.3.7.3 Wildlife Habitat Management related to Forestry

#### Provincial wildlife management

Wildlife habitat management by the provincial government occurs at a number of spatial scales and includes protected areas, designated management areas, such as Wildlife Habitat Areas and Ungulate Winter Range, and provisions across the landbase as identified through inventory and planning.

#### Identified Wildlife Strategy

The Forest Practices Code Managing Identified Wildlife: Procedures and Measures describes fine filter management for “Identified Wildlife” i.e., species for which specific habitat management is required over and above management for biodiversity and riparian areas.

The goals of the Identified Wildlife Strategy are to minimize the effects of forest practices on Identified Wildlife, and to maintain their limiting habitats throughout their current ranges and, where appropriate, their historic ranges. Under the FPC of BC Act, Identified Wildlife refers to those species at risk that the Deputy Minister of MWLAP, or a person authorized by that Minister, agree requires special management attention. Endangered, threatened or vulnerable species of vertebrates and invertebrates, endangered or threatened plants and plant communities, and regionally important vertebrates may be identified as Identified Wildlife.
There are currently five birds and one mammal on the Islands that are listed as Identified Wildlife: northern (Queen Charlotte) goshawk, sandhill crane, marbled murrelet, ancient murrelet, Cassin’s auklet and Keen’s long-eared myotis.

Identified Wildlife are managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs) or through management practices specified in higher level plans. Currently only 22 wildlife habitat areas have been designated on the Islands by the Province (Table 35). There are 19 additional WHAs proposed, primarily to provide habitat for marbled murrelet.

**Table 35. Number of Wildlife Habitat Areas designated by the Province on the Islands as of July, 2003**

<table>
<thead>
<tr>
<th>Identified Wildlife species</th>
<th>Number of Wildlife Habitat Areas designated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancient murrelets and Cassin’s auklets</td>
<td>11</td>
</tr>
<tr>
<td>Ancient murrelet only</td>
<td>1</td>
</tr>
<tr>
<td>Cassin’s auklets only</td>
<td>6</td>
</tr>
<tr>
<td>Marbled murrelet</td>
<td>2</td>
</tr>
<tr>
<td>Queen Charlotte goshawk</td>
<td>2</td>
</tr>
</tbody>
</table>

General Wildlife Measures (GWMs) describe the management practices that must be implemented within an approved WHA. A GWM may limit development activities partially or entirely. GWMs prescribe a level of management appropriate to the conservation needs of particular Identified Wildlife species.

The biology and management of Identified Wildlife is contained in the Identified Wildlife Species Accounts available from the MWLAP Identified Wildlife website [http://wlapwww.gov.bc.ca/wld/identified/strategy_info.htm](http://wlapwww.gov.bc.ca/wld/identified/strategy_info.htm). This website also provides information on the procedures for establishment of WHAs and updates on the implementation of the strategy.

### 5.3.7.4 Management of terrain stability

The effects of forestry activities on erosion, in particular mass wasting, on the Islands have been a political, legal and engineering concern for some time. In an assessment of cutblocks harvested from 1970 to 1982, Rood (1984) found that clearcut harvesting had the effect of increasing the volume of sediment from landslides by four times over the natural landslide rate, and road building resulted in a 62-fold increase in the volumetric landslide rate.

Sections 4 and 5 of the *FPC of BC Act* Timber Harvesting and Silviculture Practices Regulation define forest management activities on potentially unstable terrain. Sections 12, 16 and 17 of the Operational and Site Planning Regulation outline when terrain stability hazard mapping and terrain stability field assessments are required for the approval of forest development plans and cutting permits. The mapping and assessments are described in detail in the *FPC of BC Act Mapping and Assessing Terrain Stability Guidebook*. 
Management of forestry operations on landslide prone terrain on the BC coast has been described in the publication *A Guide for Management of Landslide-Prone Terrain in the Pacific Northwest* (Hogan et al., 1994). The guide addresses four topics:

- Slope movement processes and characteristics
- An office/field technique for recognizing landslide-prone terrain
- Measures to manage unstable terrain during forestry activities.
- Road deactivation and re-vegetation of unstable terrain.

The mass wasting and soil disturbance that has resulted from harvesting and road building has prompted forest managers to look at alternative methods of harvesting in order to avoid causing landslides and to minimize soil disturbance. Helicopter logging is considered a preferred alternative because it supports desired harvest volumes, and does not require roads to be built on the steep slopes since logs are fully suspended during yarding. Helicopter yarding is also compatible with a variety of partial harvesting methods. Partial harvesting allows some trees to be retained on the slopes maintaining some of the live root network, which should maintain some of the apparent cohesion gained from root strength. Helicopter yarding also allows trees to be harvested from pockets of stable ground surrounded by unstable ground (Millard and Chatwin, 2001). This has created an interest in the potential for harvesting in terrain that would have previously been considered unstable because of the mass wasting hazard posed by road construction (*Ibid*, 2001).

There are concerns regarding increased windthrow and therefore soil disturbance resulting from partial harvesting methods. Long term studies have been initiated to study the effectiveness of a variety of steep-slope harvesting methods, ranging from single tree selection to group selection and clearcuts and to investigate the success of helicopter yarding in conjunction with these different harvest methods (Millard and Chatwin, 2001).

### 5.3.8 Identified Issues Related to Forestry and Forest Management

- The Haida Nation are concerned that the current rate of timber harvesting, as reflected in the current AACs, is too high to sustain the integrity of ecological and cultural values over the long term.

- There is a concern about the ecological and cultural implications of reductions in amount and distribution of cedar as a result of silvicultural practices that favour economically-preferred tree species and deer browsing on regenerating trees. An associated concern is that harvest levels of mature cedar do not currently reflect the changing composition of second growth stands.

- Tenure re-structuring may make it difficult for local small business operators to compete with large off-Island companies.

- The effectiveness of steep slope harvesting using helicopters as an ecologically effective alternative to ground-based systems needs to be confirmed.

---

61 “Partial harvesting” or “partial cutting” refers generically to stand entries under any of the several silvicultural systems, to cut selected trees and leave desirable trees for various stand objectives. Partial cutting includes harvest methods for seed tree, shelterwood, selection and clearcutting with reserves. Partial harvest systems require that the stand profile (species and diameter class) be maintained following harvesting.
5.4 Recreation, Tourism and Visual Quality

The Islands contain some of the most beautiful and diverse landscapes along the west coast of North America and are internationally renowned. There are a number of values in the area that contribute to the wide range of opportunities for high value recreation and tourism appreciated by local residents and visitors from around the world. These include scenic viewscapes, proximity to water and comparably abundant finfish and marine species, areas of intact mature forest, a resilient and progressively assertive Haida culture, and a quintessential Island way of life. These many values contribute to the quality of life of Island residents, as well as providing opportunities to supplement and diversify the local economy through commercially-based recreational activities.

Not surprisingly, many of the recreational activities (commercial and non-commercial) are associated with the ocean. Water-based activities include commercial and non-commercial boating, kayaking, wildlife viewing (e.g. seabirds, whales, seals), crabbing, and sport fishing. Land-based activities include freshwater angling, hunting, nature photography, hiking, birding, wildlife viewing, mountain biking, mountain (alpine) climbing, and backroad driving. The Haidas and Islanders living in small coastal communities, as well as talented local artisans, add to the character and appeal of the area.

For the purposes of this chapter, the following definitions apply:

- **Recreation** is any outdoor activity enjoyed by Islanders.
- **Tourism** is the employment and income generated by the spending of visitors to the Islands on such services as accommodation and food, recreation activities, and transportation.

Many of the areas of the Islands are used for both public recreation and tourism (Map 6). It is, therefore, a challenge to separate recreation and tourism into distinct entities. The following section (5.4.1: Recreation) describes activities, features, and locations that are used for public recreation, although they may also be used for tourism. The subsequent section (5.4.2: Tourism) describes activities, features and locations that are predominantly commercial. Visual quality (Section 5.4.3) is a key management consideration for both recreation and tourism.

5.4.1 Recreation

Recreational activities are highly valued by local residents. One of the reasons people enjoy life on the Islands is because of the diverse opportunities to enjoy outdoor activities away from crowds of people. Table 36 summarizes some of the popular areas in the Islands for recreation. This list is a subset of the many areas used in the Islands for outdoor recreation.

The BC Ministry of Forest has completed a recreation features inventory and recreation opportunity spectrum (ROS) mapping for the Queen Charlotte Timber Supply Area and for each of the three Tree Farm Licenses (TFLs). The ROS classifies the range of recreational experience, opportunities and settings on a given landbase, based on the proportion of roadless wilderness areas to road-accessible recreation areas\(^{62}\). ROS mapping is useful for strategic planning and management of the kinds of recreational experiences sought in a particular area.

---

\(^{62}\) Categories of ROS include primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural and urban.
Access to, and use of, Haida Protected Areas for recreation is subject to common sense and respect for healthy ecosystems.

Table 36. Recreational areas in the Islands

<table>
<thead>
<tr>
<th>Location</th>
<th>Recreational activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Graham Island and Naikoon Provincial Park, including North Beach</td>
<td>Wide sandy beaches; hiking and viewing opportunities; ancient peat bog walks, the complex dune of ecosystems, clam digging, inshore and stream fishing and crabbing; beach driving; wild berry harvesting; scenic rock formations (Tow Hill); kayak surfing; and campgrounds near the beach</td>
</tr>
<tr>
<td>Naden Harbour, Duu Guusd Tribal Park</td>
<td>Wilderness hiking and saltwater sport fishing. The Haida request that people using these areas seek seasonally active special permits from the Council of the Haida Nation.</td>
</tr>
<tr>
<td>Delkatla Wildlife Sanctuary</td>
<td>Bird-watching, walking/ hiking, bird hunting (Oct – Jan)</td>
</tr>
<tr>
<td>Masset Inlet</td>
<td>Hiking and viewing (scenic lagoons, bays and estuaries), boating, fishing, bird hunting (Oct – Jan), beachcombing, boat touring and backcountry touring (e.g., on logging roads and clearcuts)</td>
</tr>
<tr>
<td>Yakoun Bay-Kumdis</td>
<td>Fishing, hiking, and bird-watching in one of the Haida Nation Protected Areas</td>
</tr>
<tr>
<td>Papa John’s (Yakoun River)</td>
<td>Popular campsite during the small island deer hunting and steelhead season</td>
</tr>
<tr>
<td>Tlell River</td>
<td>Recreational fishing, picnicking, hiking, canoeing in one of the Haida Nation Protected Areas</td>
</tr>
<tr>
<td>Skidegate Narrows/ Skidegate Point</td>
<td>Kayaking, sightseeing, fishing, touring rainforest in (Government Creek) Haida Protected area.</td>
</tr>
<tr>
<td>Moresby Island and Gwaii Haanas Haida Heritage Site</td>
<td>Boating, hiking, camping, fishing, hiking. Nature viewing (scenic tidal flats/lagoons, tidal bores/rapids, seal and sea lion concentrations, seabirds, scenic rock formations), Experiencing historic Haida cultural heritage including-historic and pre-historic fish traps. Visiting contemporary Haida fishing villages and a Haida salmon enhancement operation, historic mine sites, mountain biking, bird watching, mushroom picking, beachcombing. Backcountry touring (e.g., on logging roads and clearcuts) Launching point to Gwaii Haanas National Park Reserve &amp; Haida Heritage Site.</td>
</tr>
<tr>
<td>Gwaii Haanas (see Section 5.4.1.12)</td>
<td>Boating, ocean kayaking, inter-tidal exploration, Haida historic and contemporary camps and houses. See description below.</td>
</tr>
</tbody>
</table>
Map 6: Recreation and Tourism Features

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
5.4.1.1 Recreation sites and trails

There are seven recreation sites formerly managed under the Ministry of Forests Recreation Program:

- Rennell Sound, west coast of Graham Island (2)
- Kagan Bay, west of Queen Charlotte City (day use and camping)
- Moresby Island: Gray Bay, Mosquito Lake, Moresby Camp, Sheldon’s Bay (day use and camping).

Each of these sites provide day-use and camping opportunities, but are no longer being maintained by the Province. While the level of use at recreation sites has been high (4000 – 5000 user-days annually for the last five years\(^63\)), this volume of use is expected to decline over time as the provincial facilities deteriorate and basic infrastructure is removed.

Maintained camping sites on the islands include:

- Papa John’s, a popular campsite on the Yakoun River maintained by Weyerhaeuser. Receives high use during hunting and steelhead season.
- Agate Beach and Misty Meadows campsites in Naikoon (see Section 5.4.1.2: Parks)

There are also four privately owned campsites in the communities of Masset, Port Clements, Queen Charlotte City and Sandspit. In addition, the Lawn Hill Community Association maintains a day use shelter at Jungle Beach.

There are 19 recreation reserves on the Islands designated by the Province under the Land Act as Use, Recreation and Enjoyment of the Public (UREP) reserves. The purpose of designating these reserves is to prevent sale or use of land that would compromise an area’s current or potential recreation values or uses (including recreation corridors and foreshores). Any application to remove an area from the reserve must be supported by the provincial agency in whose name the UREP is designated (e.g., MWLAP) and followed by a review and referral process. Most UREP reserves are not promoted, developed or managed for recreation. The public has access to them, in most cases, but impacts from public use (e.g., garbage), are self-managed, similar to Haida Protected Areas. A full list of UREPs on the Islands and their location is provided in Appendix I.

Table 37 summarizes recreation trails on Graham and Moresby Islands. Trails have been arranged by management and frequency of use. Active trails are maintained by Haida agencies, (e.g. Kiusta/Taalangslung), provincial park staff, non profit community organizations or partnership agreements with Ministry of Forests. The remaining trails throughout the Islands are not formally managed. In the following table, trails are arranged by user frequency. Trail locations, descriptions, and conditions are described in Appendix M.

\(^{63}\) Personal communication, B. Eccles, District Recreation Specialist Queen Charlotte Islands Forest District.
Table 37. Recreation Trails on Graham and Moresby Islands

<table>
<thead>
<tr>
<th>Active Trails - Maintained</th>
<th>Frequently Used - Informal &amp; Not Maintained</th>
<th>Infrequently Used - Informal &amp; Not Maintained</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC Parks Maintained:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Tow Hill</td>
<td>▪ Kumdis Divide (Haida Protected Area)</td>
<td>▪ Delkatla Meadowview Walk</td>
</tr>
<tr>
<td>▪ Cape Fife</td>
<td>▪ Wiggins Rd-Tlell River Trail</td>
<td>▪ Four Corners</td>
</tr>
<tr>
<td>▪ East Coast</td>
<td>▪ North Rd/Pontoons (Haida Protected Area)</td>
<td>▪ White Creek</td>
</tr>
<tr>
<td>▪ Pesuta Shipwreck</td>
<td>▪ Inside Rd</td>
<td>▪ Drizzle Lake</td>
</tr>
<tr>
<td>(includes Haida and Island community involvement)</td>
<td>▪ Sleeping Beauty Mtn.</td>
<td>▪ Skonun Lake</td>
</tr>
<tr>
<td>Community-Group Maintained:</td>
<td></td>
<td>▪ Nadu-Evan’s Homestead</td>
</tr>
<tr>
<td>▪ Kiusta to Lepas Bay</td>
<td>▪ Yakoun Lake Trail Protected Area</td>
<td>▪ Woodpile Creek</td>
</tr>
<tr>
<td>(Rediscovery)</td>
<td>▪ 5 mile, Riley, Gregory, &amp; Bonanza Beach Trails</td>
<td>▪ Pott’s Purchase</td>
</tr>
<tr>
<td>▪ Simpson Trail</td>
<td>▪ Kagan Bay Shoreline</td>
<td>▪ St. Mary’s Spring Escarpment Trail</td>
</tr>
<tr>
<td>(Delkatla Sanctuary Society)</td>
<td></td>
<td>▪ Gore Brook</td>
</tr>
<tr>
<td>▪ Golden Spruce</td>
<td>▪ Massett Naden Suiwaay</td>
<td>▪ South Pontoons Trail</td>
</tr>
<tr>
<td>(Weyerhaeuser)</td>
<td>▪ Dinaan- Duu Guusd (Haida Protected Area)</td>
<td>▪ Small &amp; Stanley Lakes</td>
</tr>
<tr>
<td>▪ Tlell River Anvil</td>
<td>▪ Duu Guusd- Pivot Mountain (Haida Protected Area)</td>
<td>▪ Spit &amp; Shoreline</td>
</tr>
<tr>
<td>(Tlell Watershed Society)</td>
<td></td>
<td>▪ Cumshewa Head (Haida Protected Area)</td>
</tr>
<tr>
<td>▪ Spirit Lakes Trail</td>
<td></td>
<td>▪ Mt. Moresby</td>
</tr>
<tr>
<td>(Skidegate Band Council)</td>
<td></td>
<td>▪ Sachs Creek</td>
</tr>
<tr>
<td>▪ Dover Trail</td>
<td></td>
<td>▪ Aero Camp to Skidegate Lake</td>
</tr>
<tr>
<td>(Dover Trail Society)</td>
<td></td>
<td>▪ Heather Lake to Cumshewa Inlet</td>
</tr>
<tr>
<td>▪ Onward Point</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Moresby Island Management Committee)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>▪ Secret Cove</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Moresby Island Management Committee)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.4.1.2 Gwaii Haanas

Gwaii Haanas National Park Reserve and Haida Heritage Site

Gwaii Haanas National Park Reserve and Haida Heritage Site comprises the entire southern half of Moresby Island. Gwaii Haanas is 1470 sq km (147,000 ha) in size and encompasses roughly 1900 islands and islets. Primary attractions include rugged wilderness (striking mountains and rocky, wild coastline), abundant and uncommon wildlife and the opportunity to explore Haida historic sites and culture. Activities in the Heritage Site and Park Reserve include boating, food and other harvesting, and commercial charter sight-seeing trips. The area is typically accessible by water and air. Gwaii Haanas initially became well publicized during the 1985 confrontation between the Province and the Haida Nation. It is considered to be a significant lure for many visitors to the islands (Wight, 1999).

Gwaii Haanas is jointly managed by the Haida Nation and the Government of Canada through the Archipelago Management Board (AMB) (see Section 5.1: Protected Areas). According to the AMB there were 8974 visitor days/nights for Gwaii Haanas in 2001 (equivalent to approximately 1700 people). The average length of stay in Gwaii Haanas is 8 nights for independent travellers and 3.4 nights for guided travellers. Visitors to Gwaii Haanas spend, on average, an additional 6 –7 days in the Islands outside of the Gwaii Haanas (based on AMB statistics).

Human use of Gwaii Haanas is managed using a permit system. The Gwaii Haanas Backcountry Management Plan sets out criteria for defining appropriate levels of visitor use and evaluating the appropriateness of new and existing visitor activities. Sites and areas of use are monitored and levels of permitted use are adjusted, as necessary, to minimize impacts to cultural and ecological values.

The following is the recorded distribution of visitor activities in Gwaii Haanas in 1997 (from Wight, 1999):

<table>
<thead>
<tr>
<th>Activity</th>
<th>% use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kayaking</td>
<td>41%</td>
</tr>
<tr>
<td>Power-boating</td>
<td>28%</td>
</tr>
<tr>
<td>Sailing</td>
<td>20%</td>
</tr>
<tr>
<td>Air transport, followed by power-boating</td>
<td>7%</td>
</tr>
<tr>
<td>Kayak mothershipping</td>
<td>2%</td>
</tr>
<tr>
<td>Other/ unknown</td>
<td>2%</td>
</tr>
</tbody>
</table>

Between 20 and 30 businesses are licensed to operate commercial air or boat trips in Gwaii Haanas in any given year. Each operator is allocated a specific number of user days/nights, ranging from 15 to 2,856 per operator. The Gwaii Haanas Tourism Operators Association fosters quality, ethics and communication amongst tour operators in Gwaii Haanas and represents the interests of tour operators regarding issues related to the area.

The Council of the Haida Nation and Parks Canada have identified the waters around Gwaii Haanas National Park Reserve and Haida Heritage Site as having potential as a marine conservation area reserve (NMCAR). The planned addition of a marine component to the protected area will add 3,467 km$^2$ of marine protected area to the overall site.
5.4.1.3 Provincial Designated Parks

**Naikoon Provincial Park**

Naikoon Provincial Park comprises 72,640 hectares of predominantly low, flat land on the east side of Graham Island. The Park is named after the Haida name for one of its prominent features, Nai kun also known as Rose Spit. This region is primarily known for its 100 kilometres of sandy beaches, which are used extensively by Island residents and visitors for clam digging, crabbing, fishing (fresh- and saltwater), beach combing, trail hiking, and camping. Tow Hill, a large outcrop of 100m high basalt columns on North Beach, is one of the landmarks in the park. Naikoon is an excellent spot for observing migrating birds travelling south on the Pacific Flyway.

The Naikoon Provincial Park Master Plan sets out zoning and objectives within the park (see Section 5.1: Protected Areas). The park is heavily used and most use occurs during the summer months, although the area is accessible year-round. Approximately 85 percent of the visitation to the park is for day use. Campgrounds are located at Agate Beach and Misty Meadows and wilderness camping is permitted throughout. Agate Beach and Misty Meadows campgrounds collectively host between 2500 and 4000 visitors a year. In 2002, 2585 parties stayed at the campgrounds between May and September, generating approximately $30,000 in revenue. Recent data suggests that the level of day use and camping in the park has declined by about a third in the last 10 years (Holman, 2003).

**Pure Lake Provincial Park**

Pure Lake Provincial Park, located between Port Clements and Masset on Graham Island, was designated in 1981 for local recreation and also serves as a rest-stop for highway travellers. The 130-hectare park, which was previously named White Lake after Henry White of Old Massett, is a popular destination for local residents who enjoy fresh water swimming and picnicking. No camping facilities are available at the park, but public toilets, picnic tables and fire pits and imported beach sand are provided.

5.4.1.3 Yachting

There are many safe anchorages on the islands known to the local maritime community. Additionally the Council of BC Yacht Clubs has identified fifteen safe anchorages (boat havens) for the Islands. Almost all of these are natural coves and many provide fair bottom and refuges from storms.

Fifteen of the anchorages have been categorized into: A) destination harbours; B) temporary or overnight anchorages, and; C) temporary or emergency anchorages. The Council of BC Yacht Clubs is asking government’s co-operation in maintaining the scenic values around these sites as much as possible. Table 38 lists these identified sites, categories and locations.

Table 38. Council of BC Yacht Clubs List of Boat Havens

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>CBCYC Category</th>
<th>Local comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keeweenah Bay</td>
<td>Kunghit Island / 52 06N 130 57W</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Small Cove</td>
<td>Louscoone Inlet / 52 08N 131 13W</td>
<td>A</td>
<td>Too small</td>
</tr>
<tr>
<td>Sperm Bay</td>
<td>Flamingo Inlet / 52 13N 131 21W</td>
<td>C</td>
<td>Storm anchorage</td>
</tr>
<tr>
<td>Ikeda Cove</td>
<td>Moresby Island / 52 18N 131 95W</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

---

64 Local comments on anchorages provided by Barb Rowsell, Anvil Cove Charters
### Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>CBCYC Category</th>
<th>Local comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bag Harbour</td>
<td>Burnaby Strait / 52 21N 131 22W</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Soulsby Cove</td>
<td>Gowgaia Bay / 52 24N 131 33W</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Goski Bay Cove</td>
<td>Gowgaia Bay / 52 26N 131 33W</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Hoya Passage</td>
<td>Darwin Sound / 52 39N 131 42W</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Anna Inlet</td>
<td>Darwin Sound / 52 42N 131 50W</td>
<td>A</td>
<td>Blow hole. Not good in a storm.</td>
</tr>
<tr>
<td>Two Mountain Bay</td>
<td>Tasu Sound / 52 48N 132 00W</td>
<td>B</td>
<td>Good storm anchorage</td>
</tr>
<tr>
<td>Cecil Cove</td>
<td>Selwyn Inlet / 52 51N 131 52W</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Gordon Cove</td>
<td>Gillatt Arm / 53 02N 132 02W</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Security Cove</td>
<td>Englefield Inlet / 53 04N 132 17W</td>
<td>C</td>
<td>Good storm anchorage</td>
</tr>
<tr>
<td>Clapp Basin</td>
<td>Shields Bay / 53 18N 132 26W</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Givenchy Anchorage</td>
<td>Kano Inlet / 53 18N 132 33W</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>

#### 5.4.2 Tourism

##### 5.4.2.1 Overview of the Tourism Industry

Tourism has been one of the most significant growth sectors and a source of economic diversification on the Islands. This growth and diversification is considered all the more important given the declines in traditional economic sectors (commercial fishing and forestry) in recent years. Growth in the tourism industry is evident in the increase in tourism-dependent services and visitation rates over the last 20 years. Visitors are drawn to the Islands by opportunities for camping and beach activities, wilderness and human cultural tours, fishing, hunting, wildlife and scenic viewing. The remoteness, sense of wilderness, dramatic scenery, and abundant fish and wildlife provide natural attractions. The dynamic presence of Haida society, uncrowded areas, artisans and the Islands’ unique mystique, combined with the many natural attributes, provide a compelling destination that draws visitors from around the world.

Tourism represented about 8 percent of the economic activity on the Islands in 1996 (BC Stats, 2003). Total basic employment in tourism in 1996 was 420, which is approximately 18% of the total basic employment on the Islands (BC Stats, 2003)\(^{65}\). The basic income from tourism, on the other hand, was only 9% of the total basic income (BC Stats, 2003)\(^{66}\). The proportion of basic income is lower than the basic employment due to the seasonal nature and lower average incomes of tourism-based activities relative to other sector. 2001 Economic Dependency statistics were not available at the time of publishing this report.

---

\(^{65}\) Basic employment includes employment in "export" industries such as forestry and tourism, as well as the government sector, because activity levels in these sectors are determined by outside factors. Basic employment figures do not distinguish between full or parttime and year-round or seasonal employment.

\(^{66}\) Basic income is defined as employment income and non-employment income (e.g., pensions and investments) flowing into Haida Gwaii/QCI, or income that is determined by factors from outside the area.
There are six broad categories of tourist use on the Islands: commercial goods and accommodation in the main communities (which includes business travellers); fresh- and saltwater angling; guided hunting, including trophy hunting for black bear; cultural tourism, adventure tourism (e.g., kayaking, diving, and mountain biking), and other outdoor recreational activities (e.g., beach and car camping). There is a certain amount of overlap among these categories. For example saltwater fishing (angling) is associated with fishing lodges (accommodation). Statistics show that the number of visitors to the Islands by ferry and plane has remained relatively constant over the last five years (Holman, 2003). This follows a period of continuous growth in the 1980s and early 1990s. While the overall growth in tourism in the Islands has been significant in the past 20 years, it is small compared to centres offering similar products, such as Tofino. Some of the challenges to growth in the tourism industry include the logistics and cost of getting to the Islands, distance from major population centres, and a lack of the tourism products, services and infrastructure expected by some travellers.

Table 39 summarizes information gathered in 2003 on tourism operations and services active on the Islands. Because a number of operators offer a variety of activities, the total number of activities shown in this table greatly exceeds the number of tourism operators on the Islands. As shown by the figures in this table, a significant proportion of tourism operations are based on saltwater activities, including fishing, sailing, kayaking, heritage viewing and motor boat touring. This list is not comprehensive and may have missed some tourism activities.

Table 39. Tourism activities on the Islands in 2003

<table>
<thead>
<tr>
<th>Tourism activity/ service</th>
<th># of operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodation - B&amp;B, Other &lt; 5 rooms</td>
<td>34</td>
</tr>
<tr>
<td>Accommodation - Hotel, Motel, Other &gt; 5 rooms</td>
<td>11</td>
</tr>
<tr>
<td>Fishing Lodges</td>
<td>17</td>
</tr>
<tr>
<td>Camping&lt;sup&gt;67&lt;/sup&gt;</td>
<td>7</td>
</tr>
<tr>
<td>Marina</td>
<td>3</td>
</tr>
<tr>
<td>Museum</td>
<td>3</td>
</tr>
<tr>
<td>Golf course</td>
<td>2</td>
</tr>
<tr>
<td>Air Transport / Tours&lt;sup&gt;68&lt;/sup&gt;</td>
<td>7</td>
</tr>
<tr>
<td>Land Transport / Tours</td>
<td>11</td>
</tr>
<tr>
<td>Motor Boat Tours</td>
<td>8</td>
</tr>
<tr>
<td>Saltwater Fishing Charters</td>
<td>33</td>
</tr>
<tr>
<td>Sailing Adventures</td>
<td>6</td>
</tr>
<tr>
<td>Sea kayaking</td>
<td>12</td>
</tr>
<tr>
<td>Scuba diving</td>
<td>2</td>
</tr>
<tr>
<td>Freshwater Fishing Charters</td>
<td>6</td>
</tr>
</tbody>
</table>

<sup>67</sup> Camping in this Table refers to a business that requires a fee for service, and not to free public camping.

<sup>68</sup> Air transportation includes transportation on and off the Islands by larger carriers. There are 2 local iar charter companies that conduct air tours.
<table>
<thead>
<tr>
<th>Tourism activity/ service</th>
<th># of operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritage Viewing</td>
<td>25</td>
</tr>
<tr>
<td>Hiking / Nature Viewing</td>
<td>6</td>
</tr>
<tr>
<td>Guided hunting</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>198</strong></td>
</tr>
</tbody>
</table>

There are several tourism associations and committees that are actively working to promote, coordinate and manage tourism activity on the islands, including the following:

- The **Haida Gwaii Tourism Association**, which represents a number of island-based tourism operators in marketing and managing tourism on the islands. Over the last few years the Tourism Association has focused on joint marketing strategies.

- The **Gwaii Haanas Tour Operators Association**, which was formed to foster quality, ethics and communication amongst Gwaii Haanas tour operators and to represent the interests of the tour operators, their clients and the public to the Haida Nation, the BC government and Federal government, regarding issues related to Gwaii Haanas;

- The **Masset Tourism Association**, which actively works to promote tourism opportunities for the Village of Masset.

- The **Sports Fishing Institute of BC**, a provincial organization which has as its objective to ensure the sustainability and protection of fish stocks and the continued growth of anglers' expectations and opportunities to enjoy the resource.

- The **Heritage Tourism Strategy Working Group** worked with local residents, tourism operators and the Haida to develop the **Haida Gwaii/Queen Charlotte Islands Heritage Tourism Strategy**. The Strategy is described below.

The Visitor Information Centres in Masset, Sandspit and Queen Charlotte City also provide a critical service to the tourism industry in disseminating information to visitors on tourism services and activities.

**Haida Gwaii/ Queen Charlotte Islands Heritage Tourism Strategy**

Local residents recognize that growth in tourism also has the potential to impact their quality of life. The **Haida Gwaii/ Queen Charlotte Islands Heritage Tourism Strategy** was completed in January 2003 by local tourism operators and residents, with extensive local consultation, to promote tourism development that is respectful of, and appropriate to, the Islands way of life. The Strategy contains a number of objectives and associated actions to educate tourism operators and their clients about respect for the Islands heritage and to encourage sustainable tourism development, through increased local participation and increased communication between locals and tourism interests. According to the Strategy, the Islands “heritage” has five elements that include: the relationship between healthy ecosystems and the way of life of local residents; a deep and profound respect for Haida culture; a strong determination to preserve the unique island way of life; an inspired relationship to place; and community integrity and the importance of that which is local. One of the desired outcomes of the process is “a code of ethics for visitors and tourism operators and guidelines for local residents that encourage respect for local culture and marine and terrestrial ecosystems.”
5.4.2.2 Sports Fishing

Saltwater sports fishing

Saltwater sport fishing represents the most significant area of growth in the tourism sector over the last 15 years. Salmon and halibut are both popular game fish. Chinook and coho are the most targeted of the salmon species, with some pink and chum and (less frequently) sockeye. As shown in Table 39 some 33 operators offer saltwater fishing charters, in addition to the sports fishing lodge operations. Between 1994 and 2001 angler effort averaged at around 43,000 angler days per year (Holman, 2003), although the take of individual fish species can vary greatly. Langara Island, Naden Harbour, Masset Inlet, Rennell Sound, Skidegate Inlet, and Cumshewa Inlet are popular fishing areas.

Lodges

Over the past decade, growth in the saltwater sports fishing industry has resulted in the presence of numerous fishing lodges throughout the Islands. In 1985 the first sports fishing lodge began operations on Langara Island, and by 1990 there were 8 lodges operating at Langara Island, Naden Harbour and in Duu Guusd. As of 2003 there were 17 fishing lodges (12 land-based and five floating) of which some are under lease or license by the Province while others do not currently have tenure (see Section 5.4.4). The presence of these fishing lodges is highly contentious with the Haida Nation.

- Langara Island in Duu Guusd (3 land-based and 3 floating)
- Port Louis in Duu Guusd (1 land-based)
- Naden Harbour (2 land-based and 1 floating)
- Masset Sound (1 land-based)
- Masset Inlet/Kumdis River (1 land-based)
- Nesto Inlet (1 floating)
- Kano Inlet (1 floating)
- Maude Island (1 land-based)
- Tasu Sound (1 land-based)
- Englefield Sound (1 land-based)

Operations are seasonal, with no activity in the winter months. While fishing lodges can be high revenue earners, there is relatively little benefit to the local economy from lodge development. None of the lodges are locally owned most of the employees (~ 180 during the peak season) are hired off-Island, and groceries and supplies are generally brought in from off-Island.
**Freshwater Sports Fishing**

Freshwater angling for steelhead, other salmonids, and trout is important food gathering and a popular recreation activity for local residents and tourists. Virtually all of the guided steelhead effort is accounted for by visitors to the Islands.

The Islands have eight Class 2 streams under the Classified Waters System: Yakoun, Tiell, Copper, Pallant, Mamin, Honna, Deena, and Datlamen. This represents 20% of the Class 2 waters in BC. The Classified Waters System was established to ensure high quality angling opportunities for resident anglers and promote a stable angling guide system while preserving the natural character of pristine ecosystems. The classification prescribes the level of angling use and guiding activity and allocates use between classes of anglers (BC residents, other Canadians, non-Canadians). MWLAP is in the process of updating its approach to evaluating candidate classified waters and to development of angling management plans in its proposed Classified Waters Management Strategy (MWLAP, 2003). The changes to classified waters management may result in changes to the numbers of classified rivers and streams on the Islands.

Class 2 waters are considered to have high natural values that could be significantly reduced by unrestricted guiding. Although use by angling guides and guided anglers is controlled, BC resident anglers are not restricted (unlike Class 1 waters where both guided and non-guided use is restricted). Streams are generally classified from September 1 to April 30th.

For 2002/03, there were six individuals registered as freshwater fishing guides. Each were allocated a quota of 538 angler days on the Class 2 streams, resulting in an overall quota of 3228. Between 50 and 100 percent of the angling quota is used in any given year. The Yakoun River is the most heavily-fished stream on the Islands, accounting for about 50 to 70 percent of the total annual angler days over the past decade. Guides have also been issued licenses for several unclassified waterways including the Kumdis, Jalun, Ain, and Awun rivers and Mosquito and Skidegate lakes.

5.4.2.3 Adventure Tourism

Adventure, including nature-based and non-consumptive ecotourism, is one of the fastest growing sectors in the tourism industry, averaging 15 – 17% per year globally and 10 – 12% provincially (Tourism BC, 2002). The Islands are considered to have exceptional and varied opportunities for outdoor recreation in a wilderness setting.

**Kayaking**

Many places in the Islands offer superb kayaking opportunities. While Gwaii Haanas is considered a premier destination for longer kayaking trips, other areas such as Skidegate Inlet, Masset Inlet, Rennell Sound and Cumshewa Inlet also offer excellent opportunities. For the experienced paddlers, the dramatic coastline off of Duu Guusd Protected Area on the westside of Graham and Moresby islands offers more challenging kayaking.

There are currently 11 operators offering guided kayaking trips to Gwaii Haanas and 3 operators offering trips to destinations outside of Gwaii Haanas. Kayaking is also popular as a non-guided activity. Three businesses rent kayaking equipment and offer transportation to kayaking put-ins.

---

Commercial touring and nature viewing

There are currently 6 operators offering sailing tours, 8 offering motor boat tours, and 2 airline charters offering air tours around the Islands. The most significant destination for these operators is Gwaii Haanas, however Duu Guusd Protected Area and east coast of Moresby Island north of Gwaii Haanas are also important destinations. Some 11 operators offer land-based transportation and tours.

Wildlife viewing is a non-consumptive tourist activity that is increasing in popularity. Wildlife viewing on the Islands is land (bird-watching and bear viewing) and water-based (whale watching for orca, gray whales and humpback whales).

5.4.2.4 Cultural heritage attractions

There is a growing interest worldwide in cultural, educational, and experiential tourism. There are a growing number of tourist attractions in BC related to Indigenous Peoples’ art. Once an exclusive art and crafts market, visitors currently show an increasingly widespread appreciation of contemporary Peoples and how they relate to their lands. Settler history is also part of the cultural heritage attraction.

The leadership role of the Haida Nation and a well-established sense of an Islands community is a growing aspect of the tourist market. Statistics from Gwaii Haanaas indicate that meeting Haida citizens remains the highlight of most visitors’ experiences (Wight and Assoc, 1999). Tourists are already attracted from around the world to visit ancient village sites, and to view the works of the many exceptional Haida carvers, painters and other artisans. Current tourism maps show a loop drive that identifies stops of cultural significance to the Haida (e.g., a partially carved canoe, Balance Rock, and the stump of the Golden Spruce).

There are a number of settler historic sites throughout the Islands, including shipwrecks and remains of abandoned settlements, industrial sites and logged regions. The Dixon Entrance Museum in Masset, Haida Gwaii Museum in Skidegate and Port Clements Museums display information and artifacts related to the settler era on the Islands.

5.4.2.5 Wildlife viewing

Wildlife viewing is a non-consumptive tourist activity that is increasing in popularity. Wildlife viewing on the Islands is land (bird-watching and bear viewing) and water-based (whale watching for orca, gray whales and humpback whales).

5.4.3 Visual quality management

One of the main attractions to the Islands is its magnificent scenery. Management of human impacts on visual quality is a key factor in maintaining the aesthetic quality of areas important to recreation and tourism and to local communities.

Haida Protected Areas and provincial and federal parks contribute significantly to the visual quality that we appreciate today. Outside of protected areas, places considered to be important scenic areas have been identified across the landbase (Map 7), including views from communities, areas of high recreational use, and travel corridors. Within these scenic areas, visual landscape inventories have been completed to provide information about the visual condition, characteristics, and sensitivity to alteration of areas of visual importance.
Map 7: Known Scenic Areas

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
Although scenic areas have been identified and inventoried on the Islands, they have not been formally established under provincial legislation. Additional scenic areas may be brought forward as part of the Land Use Plan.

All Provincial forestry planning, including forest development plans and access plans must identify and describe known scenic areas and specify measures that will be carried out to protect those resources.

5.4.4 Current Provincial Policy and Legislation Related to Commercial Recreation

All individuals who want to operate commercial recreation/tourism businesses on land outside of provincially designated parks are required by provincial law to obtain a tenure under the Land Act, and are regulated under provincial policy on Commercial Recreation. Land and Water BC (LWBC) issues tenures in the form of short term permits, long term Licenses of Occupation for the use of extensive areas, and long term leases for the use of specific sites. Tenure applicants are required to develop management plans as part of the application process, and, in doing so, are advised to consult the Interim Wildlife Guidelines for Commercial Backcountry Recreation in BC. These interim guidelines provide recommendations for site assessment, planning and management of commercial recreation operations to avoid or mitigate potential impacts of these operations on wildlife.

On the Islands there has been, and continues to be, significant interest in and controversy related to the tenuring of sports fishing operations. In 1985 the first sports fishing lodge began operations on Langara Island, and by 1990 there were 8 lodges operating at Langara Island, Naden Harbour and in Duu Guusd. Not all of these lodges applied for or received legal foreshore tenures and a number commenced operations without any tenure.

In response to conservation and other concerns, a moratorium was established by a directive of the Crown Lands Minister in 1990, to prohibit any further allocations of sports fishing tenures on the Islands. To date, this moratorium has not been lifted and LWBC has not issued any new sports fishing tenures. However, the moratorium has been ineffective since new businesses have commenced operations without legal tenure or existing operations have expanded contrary to the use restrictions in their tenure. Self-propelled floating fishing lodges that are not affixed to the land for greater than 14 days are not regulated under the Land Act, however, if they do not move, they are required to become tenured. A provincial enforcement strategy is currently being developed by LWBC to address the issue of unlicensed operations.

One of the strategic principles of the Commercial Recreation Policy is to ensure that tenure allocation decisions are consistent with approved local, regional and provincial plans, including approved Strategic Land Use Plans, and specifically with the commercial recreation values identified in those plans. Therefore any management direction developed and approved as part of the Haida Gwaii/QCI Land Use Plan will be incorporated into all future tenure allocations and management decisions.
5.4.5 Identified Issues Related to Recreation, Tourism and Visual Quality

- Areas acceptable for long-term tourism development and growth, including fishing lodges, may be identified through the Land Use Plan.

- How to manage scenic landscapes to maintain recreation and tourism values in areas of forest development. The planning table may identify scenic areas, including viewscapes from high use recreation areas.

- The lack of enforcement of sport fishing operations and their tenuring is highly contentious with the Haida Nation. Part of the concern relates to the lack of consultation with the Haida Nation or other Island communities prior to setting up operations. Another aspect of this is the lack of accountability in untenured businesses and associated potential for environmental impacts or loss of human lives.

- The local economy of the Islands currently receives few benefits when operations are owned, staff are hired, and goods are purchased from off-Island. There is an interest in developing and applying strategies to increase local benefits from visitors to the area.

- There is a Haida concern about lack of consultation regarding the classification of angling waters and associated permitting of guided angling on classified and unclassified waterways.

- There is a concern from the Haida that the in-shore hand harvest for crab during the mating season is an unsustainable practice.
5.5 Wildlife Use and Management

5.5.1 Hunting

Hunting is an important food source for many Islanders and, to some, the recreational experience is also important. Hunting can also play a role in population management for species introduced to the Islands, i.e., deer, for which there are no natural predators.

Resident hunters (including those who live off of the Islands) make up approximately half of hunters on Haida Gwaii. Local residents hunt mainly for deer, but also hunt elk and, rarely, black bear. Non-resident hunters are mainly attracted by opportunities to trophy hunt black bear. Small game such as the blue grouse and ducks and geese are also hunted. Elk hunting is mainly confined to the Tlell watershed, whereas hunting for deer and black bear hunting occurs throughout the Islands.

Hunting on the Islands under Provincial authority is managed by the Ministry of Water, Land and Air Protection (MWLAP). The Haida Nation has taken a position opposing recreational black bear hunting, as confirmed in a resolution passed by the Council of the Haida Nation in 1995. There are two management units for the Islands: Moresby Island (MU 6-12) and Graham Island (MU 6-13). Deer is the species most commonly hunted on both islands. BC residents are allowed to harvest up to 15 deer a year on the Islands, with a possession limit of 5 (changed for 2003/2004 from 10/yr and 3 in possession). MWLAP statistics for 2002 indicate that 469 BC residents hunted deer on the Islands, which correlates with an estimated 3250 hunter days and 960 deer harvested. It is thought that most of these were Island residents. These figures do not include the Haidas, who do not report to the Province. Hunting is not permitted in Gwaii Haanas.

Table 40 summarizes the wildlife harvest on Moresby and Graham Islands in 2002. Hunting quotas are set by the Regional Manager, Ministry of Water, Land and Air Protection, based on recommendations received from species experts (See Section 5.5.4: Legislation and Policy related to wildlife harvest).

Table 40. Data on wildlife harvest on the Islands in 2002 for Management Units 6-12 (Moresby Island) and 6-13 (Graham Island)

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Management Unit (MU)</th>
<th>Est. # of Hunters</th>
<th>Est. # of Days</th>
<th>Estimated # of animals harvested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Bear</td>
<td>12</td>
<td>6</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>Black Bear</td>
<td>13</td>
<td>16</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>Total for 2002</td>
<td>22</td>
<td>96</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Blue Grouse</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Grouse</td>
<td>13</td>
<td>15</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>Total for 2002</td>
<td>15</td>
<td>214</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deer</td>
<td>12</td>
<td>230</td>
<td>1999</td>
<td>517</td>
</tr>
<tr>
<td>Deer</td>
<td>13</td>
<td>239</td>
<td>1251</td>
<td>443</td>
</tr>
<tr>
<td>SPECIES</td>
<td>Management Unit (MU)</td>
<td>Est. # of Hunters</td>
<td>Est. # of Days</td>
<td>Estimated # of animals harvested</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Total for 2002</td>
<td></td>
<td>469</td>
<td>3250</td>
<td>960</td>
</tr>
<tr>
<td>Duck</td>
<td>12</td>
<td>12</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>Duck</td>
<td>13</td>
<td>29</td>
<td></td>
<td>73</td>
</tr>
<tr>
<td>Total for 2002</td>
<td></td>
<td>41</td>
<td></td>
<td>115</td>
</tr>
<tr>
<td>Elk</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elk</td>
<td>13</td>
<td>32</td>
<td>169</td>
<td>5</td>
</tr>
<tr>
<td>Total for 2002</td>
<td></td>
<td>32</td>
<td>169</td>
<td>5</td>
</tr>
<tr>
<td>Goose</td>
<td>12</td>
<td>6</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Goose</td>
<td>13</td>
<td>8</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Total for 2002</td>
<td></td>
<td>14</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

5.5.2 Guide-Outfitters

There is one guide-outfitter on the Islands that caters to non-resident and resident hunters. There used to be two licensed guide outfitter territories in the region, one for Moresby and one for Graham, but these have now been consolidated into one guide outfitting territory. The guide outfitter advertises six-day trophy hunts for black bear and/ or Sitka black tailed deer. Elk are also potential game. The operation also offers multi-day guided freshwater and saltwater fishing packages. The guide outfitter operation is currently not affected by quotas as the level of black bear hunting overall on the Islands is considered by the Ministry of Water, Land and Air Protection to be within sustainable harvest limits 70.

The current guide outfitter is hunting more intensively than past outfitters. The number of animals taken by non-resident hunters is a good approximation of guided hunting effort, since almost all non-resident hunting is guided 71. In 2001, the number of black bear taken by non-resident hunters was 39 up from 19 in 1995 and there were six deer taken in 2001 compared to none in 1995.

5.5.3 Trapping

There are about 80 registered tralines on the Islands, which provide seasonal income and a distinct lifestyle experience for a number of residents, mostly Haida. The Haida note that trapping is also an important cultural activity. Although these lines have been registered by the province, Haidas do not forward any trap statistics to BC. According to MWLAP records, only one-quarter of these tralines have had any reported harvesting over the past decade and only a few have operated fairly consistently over this period.

---

71 Some non-resident hunting is permitted through permit to accompany hunts.
MWLAP records indicate that two-thirds of the trapping has occurred on Graham Island. Marten is the single most important animal trapped, accounting for over 54 percent of the harvest. Total harvest numbers have varied from year to year however, overall, the average number of animals harvested (marten, in particular) and the number of traplines reporting harvests has declined over the 1985-1995 period. The possible reason for these trends could be a decline in marten fur prices since the mid-1980s, changing attitudes to traditional livelihoods and possible declines in animal populations due to changes in habitat.

5.5.4 Control of introduced species

Since European contact in the late 18th century a number of different animals have been introduced to the Islands through human settlement patterns and active introductions (Engelstoft, 2002). There is no current provincial legislation or policy related to the control of introduced species. However, extensive work has been done locally to assess impacts and develop strategies to address the problem. The Research Group on Introduced Species (RGIS), an international research group, has been works in partnership with local end-users and communities since 1996 to study the changes in the ecology of Haida Gwaii (Queen Charlotte Islands, British Columbia, Canada) caused by species introduced since European contact. The results of this research can be viewed on the RGIS website (www.rgisbc.com). Section 4.3.4 provides more details concerning introduced animal species and their impacts on local ecosystems.

5.5.5 Current Provincial Legislation and Policy Related to Hunting, Guide-Outfitting and Trapping

The harvest of wildlife in BC is primarily guided by the provincial Wildlife Harvest Strategy, developed in 1996. The Wildlife Harvest Strategy includes a set of Species Management Standards for large game species as well as migratory birds, upland birds, furbearers, and falconry. For each species, the strategy identifies harvest management goals and provides general guidelines for managing wildlife harvests. Key principles behind the Species Management Strategies are: that the harvest of wildlife must not impair the sustainability of any hunted wildlife species; harvest options, strategies and prescriptions must be science-based; and management should be conservative to allow for uncertainty. Red-listed (threatened and endangered) species and sub-species will be managed for recovery and will not normally be harvested. Blue-listed (sensitive or vulnerable) species and subspecies may be harvested but the harvest standards will be particularly cautious.

Hunting quotas are set by the Regional Manager of WLAP based on recommendations received from species experts. Hunting allocations are discussed with the BC Guide Outfitters Association and the BC Wildlife Federation. The allocation process recognizes priority consideration for Indigenous Peoples, followed by BC Resident hunters, and then Non-Resident hunters. The allocations to each residency group is negotiated; there are no set proportions that go to any one group.

The Skeena Hunter Advisory Committee is a group of local hunters and guide outfitters that acts in an advisory capacity to the Ministry of Water, Land and Air Protection when the Ministry intends to introduce new hunting regulations or amend existing regulations. The Committee does not play a role in reviewing allocations (quotas or LEH authorizations).
Trapping activity is largely self-managed. Under provincial management, there is generally an open season and no bag limits. Trappers are expected to manage the sustainability of the furbearers on their trapline. If MWLAP has a concern about a species, such as wolverine or fisher, the agency will regulate the season of trapping activity. The Haida note that black bears were once trapped by the Haida for ceremonial purposes.

5.5.6 Identified Issues Related to Wildlife Use and Management

- How to control the proliferation of introduced species and associated impacts on native flora and fauna.

- Haida concern with a lack of consultation in the design and application of previous or current regulations related to wildlife harvest.

- The Haida Nation has taken a clear position against commercial and recreational hunting of bears.
5.6 Mineral and Energy Resources

5.6.1 History of mining on the Islands

The Islands have long provided the Haida Nation with various minerals, including clay and argillite. The Islands have also been mined for iron ore, gold, silver, copper and coal. Exploration and mining by outside interests began on the Islands in the mid-1800s. Gold mining is recorded as early as 1859 and there were several coal mines on Graham Island in the early 1900s. A number of small iron mines (some of which also produced copper as a by-product) were active on Moresby Island. The largest mines were Jedway, operating from 1962 to 1968 and Tasu which employed 160 people from 1967 to 1983. Both produced iron and copper. Following the closure of the Tasu mine in 1983, the mining labour force on the Islands fell from 140 to 10 individuals.

There are currently provincial "No Staking Reserves" for mineral, placer and/or coal over several areas in the islands. No Staking Reserves are temporary designations that are periodically reviewed and the status maintained or removed, as appropriate. To date there has been a backlog of areas that remain under reserve status due to a lack of resources to carry out the review. Reserves issued by the Province since 1998 include an automatic review date in order to avoid this problem.

As of 2003, the only active mine on the Islands is the Slatechuck Quarry.

5.6.2 Mineral resources

Large tracts of the Islands have significant metallic and industrial mineral potential. Indicators of this potential are bedrock geology, number of recorded mineral occurrences, historic production figures, amount of investment in mineral exploration and development, and to a lesser extent, mineral tenure status. As of July 2003, according to MINFILE\(^\text{72}\), there were 157 known occurrences in the planning area which include 46 industrial mineral, eight bitumen, one hotspring, and seven coal occurrences. Of these, 18 are prospects having some dimension and value and nine are developed prospects in which there is a high degree of confidence in the tonnage and grade. There are 21 past-producing mines in the area although all but five of these have been relatively small (i.e., produced less than 500 tonnes).

Significant exploration activity occurred on about 10 properties between 1986 and 1996. Most of the activity focused on gold. During this period, the potential for exploration activity was enhanced as a result of improved mapping by the Geological Survey of Canada and increased access to backcountry areas due to an expanded network of logging roads. Today, mineral exploration expenditures have dropped to zero. There were no mineral notices of work submitted in 2001 or 2002.

ARIS is the provincial government database that tracks information about work done on mineral tenures. The information in ARIS dates back to 1947\(^\text{73}\). The planning area currently contains 410 ARIS entries with a total expenditure from 1957 to 1999 of over $17 million dollars. The

\(^{72}\) MINFILE is the provincial government database that tracks information about known mineral occurrences.

\(^{73}\) A limitation of the system is that it does not capture information about work that was not applied as assessment to keep the tenures in good standing.
area covered by mineral tenures is a reflection of the current global economic and political conditions and is not indicative of overall mineral potential. As of January 1, 1999 there were 207 mineral tenures, covering approximately 50,000 hectares, in the planning area. As of March 2003 there are 104 mineral tenures in good standing, suggesting that. Map 8 shows mineral potential and known occurrences on the Islands.

Since 1987, there has been a provincially-issued conditional No Staking Reserve (OIC 1506) in favour of BC Hydro between 53 degrees 45 minutes and 52 degrees 55 minutes, which covers a large portion of the islands. The conditional reserve allows mineral staking and exploration activities on the condition that it does not interfere with BC Hydro infrastructure.

The most significant mineral deposit on the Islands is the Specogna gold deposit on the Harmony property (previously called Cinola). It is located 18 kilometres south of Port Clements near the Yakoun River. A proposal for a large open pit operation was dropped in 1990 due to environmental concerns, including the identification of unusually high concentrations of mercury. In addition to iron-copper deposits such as Tasu and Jedway, and the gold deposits such as the Specogna, the area also has important potential for high grade copper-lead-zinc-gold deposits and low grade copper deposits similar to the potential identified at Myra Falls and Island Copper on Vancouver Island.

The Islands also contain significant potential for industrial minerals. An important quarry near Kagan Bay produces the black argillite that is so highly valued for traditional Haida carving and accessed exclusively by Haida. The argillite produced at this quarry is reputed to have unique qualities. Another quarry on Graham Island produces “picture rock” (tertiary rhyolite, which is a light coloured rock with unusual weathering patterns). Picture rock is sold in a rock and gem shop in Tlell. Other mineral activities and possibilities include diatomite, perlite, bentonite, limestone, flagstone and building stone.

The currently producing mines are limited to the Argillite quarry and two rock quarries, one located adjoining the Skidegate Reserve N0 1 and the other on fee simple lands owned by a Haida. Additionally Haidas and others quarry flagstone and building stones and sands as required. No Provincial permits are applied for or recorded for these activities.

Peat moss was briefly excavated some years ago but that operation is now completely abandoned.

5.6.3 Construction aggregate resources

Aggregate is naturally occurring, hard construction material and includes sand, gravel, crushed stone or slag, which can be mixed with cementing material to form concrete and asphalt or can be used separately in road building, railroad ballast or other construction or manufacturing activities (Edwards et al., 1985). Aggregate is an essential commodity in urban areas and despite its relatively low unit value, aggregate has become a major element in most economies. Natural aggregate is the product of unique geological processes (Langer and Glanzman, 1993). As such, this generally restricts the location for aggregate deposits to those areas where suitable environments of deposition either now exist or existed in the past.

There are 10 active permitted private quarries and sand and gravel operations producing aggregate on the Islands. The potential for aggregate deposits is largely unknown because no studies have been done.
Map 8: Mineral Potential and Known Occurrences

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
5.6.4 Energy resources (oil, gas, coalbed methane, geothermal and hydroelectric potential, alternative)

5.6.4.1 Oil and gas

Although no exploration has occurred since 1972, there have been numerous research studies conducted in the region and considerable amounts of geological and geophysical data collected (Yorath, 1987; Gordy, 1988; Thompson et al, 1991; Dietrich et al, 1992; Lyatsky and Haggart, 1993). The combined presence of reservoir strata, source rocks, trapping mechanisms and the common occurrence of oil and gas shows throughout the region reflect significant potential for petroleum accumulations in the Queen Charlotte Basin (Hannigan, et al 1998). The most prospective areas are predicted to be in the offshore shelf areas of Dixon Entrance, Hecate Strait and Queen Charlotte Sound and onshore beneath eastern Graham Island, where there are known oil seeps.

In a 1998, quantitative assessments of 6 petroleum plays by the Geological Survey of Canada provided estimates for the Queen Charlotte Basin of a total resource potential of 1,560 million m³ (9.8 billion barrels) of oil in place and 734 billion m³ (25.9 trillion cubic feet of gas (Hannigan et al, 1998). These amounts are roughly equal to all the natural gas found to date in the traditional producing area of northeastern British Columbia and about three times the oil, applying a 25% oil recovery factor.

In 1972, in response to environmental concerns, a moratorium was established by the Canadian federal government on offshore oil and gas exploration, and the transit of crude oil tankers through Dixon Entrance, Hecate Strait and Queen Charlotte Sound. The Haida Nation also passed a motion not to support oil and gas exploration. In 1981 the Province announced that it would declare a moratorium covering the same geographic areas. As of 2003, all moratoria were still in place. The federal and provincial governments are presently assessing potential development of west coast offshore oil and gas resources. The Haida Nation has not indicated any interest in having the moratorium lifted.

Exploration History

Oil and gas seeps at the surface are common in the Islands with over 50 sites identified. The Haida identify that oil-based derivatives (e.g., asphaltum) were first collected and used by the Haida in Duu Guusd. A number of exploration wells were drilled on Graham Island between 1913 and 1984. Offshore exploration occurred between 1965 and 1971, whereby a number of wells were drilled and marine seismic reflection data recorded. A 1988 marine survey collected both seismic reflection and refraction data. All of the wells drilled (both off- and onshore) were dry, although the seismic data indicated the potential for significant petroleum accumulations (Hannigan, 1998).

5.6.4.2 Oil Shale Potential

Past studies suggest some that potential for low-grade oil shale exists in the Ghost Creek-Rennell Junction Area north of Yakoun Lake on southern Graham Island. However, present data indicates this potential to exist in thin beds interspersed with strata of much lower oil content. Based on current information, unless an unforeseen area of much thicker oil shale is encountered, oil shale has limited economic potential on the Islands.
5.6.4.3 Coal and Coalbed Methane

Coal

Coal is restricted to Graham Island. The coal is either Tertiary or Jura-Cretaceous in age. Coal was first discovered on the Islands in 1865. The Cowgitz Mine operated from about 1865 to 1872 and mined a few thousand tonnes. There were a number of shafts, adits, crosscuts, and test pits excavated over the years, but no large-scale production. Mining in all areas had stopped by 1914 and only small tonnages were extracted. The potential for surface or underground coal mining is considered to be low.

There are five areas containing coal:

1) Slatechuck Creek (Cowgitz and Slatechuck),
2) Headwaters of Brent Creek (Camp Anthracite and Camp Robertson),
3) On Baddeck Creek near Yakoun Lake (Camp Trilby),
4) Near the Yakoun River on Wilson Creek (Camp Wilson).
5) Skonum point

It has been estimated that the area around the first four camps (located on southern Graham Island) contains a reserve of about 7 million tonnes. The coal outcrops in the four areas are of distinctly different ages and tectonic environments and in all locations there appears to be a single seam which is rarely more than 1 metre thick. Rank is very variable and often high because of intrusive activity and seams are often folded, faulted and steeply dipping.

The Jura-Cretaceous coals occur in the Yakoun Group and Queen Charlotte Group rocks. Correlation of coal seams is difficult because coal exposures are scarce and widely scattered in dense vegetation.

The Tertiary basin (Skonum Formation) can be divided into two sub-basins; the southern one experienced less tectonism. No thick coal beds are reported in the southern basin. In the northern basin, at Skonun Point up to 13 seams with a cumulative thickness of 6 metres occur in 60 metres of section. They are folded into a west-plunging, moderately flat-lying anticline. Nine beds of lignite are exposed interbedded with sandstone and silty shale.

Skonun Point, acquired in 1910, is located on the northeast coast of Graham Island 6.4 kilometres east of Masset. A preliminary estimate of probable mineable reserves by Mackay for the Royal Commission on coal, in 1946, was 67,200,000 tons.

Data on coal quality exists from a number of the old exploration camps. The coal from the Wilson, Robertson and Anthracite camps is high-volatile B bituminous and from Slatechuck the rank appears to be anthracite. Lignite occurs in the lower member of the Tertiary Skonum Formation which underlies the northeastern portion of Graham Island.
Coalbed Methane

The coalbed methane (CBM) potential on the Islands is low. The rank at surface is too low for thermogenic methane though there could be some biogenic methane. If the rank increases with depth to the east under Hecate Strait then there could be considerable CBM potential. For the present no CBM resource is assigned to the Skonum Point area though the probability of finding a well is considered to be better than zero.

The estimated volume of gas in place in the coalfields of Graham Island is 58 billion standard cubic feet (Bcf). This is a small volume, but it could be produced in small-scale coalbed methane production projects. This gas could be utilized locally for domestic and commercial space heating purposes or a small electrical generation project could be developed. An initial pilot project would be necessary to prove that the coal had properties allowing the gas in it to flow to a well bore before coalbed methane could be developed.

5.6.4.4 Geothermal Resources

A geothermal resource is a geothermal fluid having a temperature in excess of 80° C at surface. Geothermal energy is used in two ways. At high temperatures (>150 °C), natural steam or hot water is used to produce electricity. At lower temperatures, warm water may be used for space heating (usually 60° C) and other near site applications. Only a small percentage of geothermal energy sources are suitable for electricity generation, with the majority of the resource being best suited for space heating and recreation. High-grade resources are all those which could be used for electricity generation.

Although there is documentation of the long standing use of hot springs on Moresby Island and the Geological Survey of Canada in their review of the Geothermal Potential of British Columbia has assigned moderate geothermal potential to the area. No high-temperature resources have been identified to date.

Graham Island has not been assigned any potential but temperature gradients in petroleum exploration well bores have been recorded as ranging from 30°C to 50°C/km. The maximum bottom hole temperature recorded on Graham Island was 72° C at a depth of 1832 metres (39.3°C/km.) at WA# 380 Richfield MicMac Homestead Towhill #1, located on Rose Point. This kind of temperature range precludes its use as a source for electricity generation, but could allow use in near source space heating or for recreational purposes.

5.6.4.5 Electricity

There are two separate fossil-fuelled electric generation and distribution networks on the Islands. Masset and Port Clements are served by a diesel station operated by BC Hydro in Masset (11374 kw). Tlell, Queen Charlotte City, Skidegate and Sandspit are served primarily by a small hydro facility owned by an Independent Power Producer (Queen Charlotte Power Corporation) at Moresby Lake (11125 kw). A BC Hydro diesel station at Sandspit (7900 kw) provides backup for seasonal and peaking energy.

There have been problems in maintaining enough water in Moresby Lake to provide power through the year without backup. There is sufficient capacity to fulfill current electricity demand and known increases in the short term. However the cost of power to commercial/industrial users on the Islands is very high; approximately double the rates on the mainland grid. This is considered a serious impediment to economic development on the islands. As of March 2003,
there are no Independent Power Producer applications for the islands. There is a Community Energy Planning process currently being contemplated to address these issues.

### 5.6.4.6 Alternative energy

There has been increasing interest in exploring the capability of alternative energy options on the Islands given the challenges and costs of providing electricity to Island communities (see Section 5.6.4.5 above).

Mapping of the winds on the Islands by BC Hydro have indicated a high potential for the use of wind energy in some areas. A preliminary study is currently underway by Uniterre Resources, Ltd., to assess the power generation potential in the western Hecate Strait off the northeast coast of Graham Island. The Council of the Haida Nation is still considering the ecological and socio-economic implications of this project. Depending on the outcome of this study, due to be completed in 2005 at the latest, Uniterre may submit a proposal to Land and Water BC to construct a 700 MW wind farm project in the area. The proponent, Uniterre, intends to sell all of the power generated to the mainland grid should the project proceed.

In November 2002, feasibility studies began for district heating in Masset and a logging waste/wood-fired power plant in Port Clements. Masset was also looking into the feasibility of a 5 MW windmill.

The potential of tidal energy especially alongside Massett Inlet is considerable. The Old Massett Village Council considered tidal generators placed alongside the length of Massett Inlet, and the island power line, there is no recent information available on the status of that examination.

Biomass is another potential alternative energy source. Biomass electricity generation, or “biopower” is a multi-stage process that converts non-fossil fuel derived from organic material (waste wood, plant material, animal waste) into electricity. Biomass can also be used to produce fuels (“biofuels”) that can be used in vehicles. Because the vegetation that is the base for all biomass can be regrown, biopower and biofuels are renewable.

### 5.6.5 Current provincial legislation and policy related to approval of mineral and energy projects

#### 5.6.5.1 Mineral Exploration and Development

Access to mineral resources outside of protected areas is provided under Section 14 (5) of the *Mineral Tenure Act (BC)*, which legislates a two-zone system of land management in BC. The two-zone system ensures that mining applications are considered, subject to all applicable laws, in all areas except parks, ecological reserves, protected heritage properties or areas where mining has been prohibited by an order under the *Environment and Land Use Act*. The statutory decision maker for permitting activities related to mineral exploration and development uses direction from strategic land use plans as advice to ensure effective integration with other land uses and as a basis for recommending modified mineral exploration or development procedures.

Consistent with requirements for consultation and accommodation of Haida interests, the Council of the Haida Nation requests that all applications for mineral exploration and development are referred to the CHN. Proposals will be considered by the Haida Nation, within the scope of its asserted authority, on a case by case basis, subject to existing uses and local and community priorities.
Proposals to the Province for exploration and development of mineral are required to go through provincial permitting processes that assess impact on other resources and stipulate requirements for undertaking the activity, as regulated under the Mines Act and the Health, Safety and Reclamation Code for Mines in British Columbia. Work programs may also require permits from other ministries and is regulated wherever applicable, under the Forest Act; Forest and Range Practices Act; Forest Practices Code of British Columbia Act; Waste Management Act; Water Act; Environmental Assessment Act; and other federal and provincial statutes or processes such as the Canadian Environmental Assessment and the provincial Mine Development Review Processes.

Mineral exploration

Mineral exploration under provincial jurisdiction is conducted in accordance with the Mineral Exploration Code and Mines Act of B.C. Prior to conducting any mechanical disturbance of the land, the work program must be approved by the Ministry of Energy and Mines and sufficient reclamation securities placed to ensure that the site is reclaimed.

Full approval of a work program may also require that permits from other ministries be obtained. For example, activities on mineral tenures are managed and permitted by the BC Ministry of Energy and Mines, but off-tenure roads and timber cutting are permitted through the BC Ministry of Forests. While work programs are referred to affected agencies and the Haida for comment, the Council of the Haida Nation takes the position that they must be contacted directly by applicants.

Programs involving use of surficial water must obtain a water use approval or water licence from the Land and Water BC. Where significant volumes of mineralized rock (i.e. greater than 1000 tonnes) are to be blasted as part of a sampling program, testing for acid rock drainage potential is required. Similarly, the Ministry of Energy and Mines will request acid rock testing where road development requires blasting of mineralized rock.

Initial phases of exploration do not require the Province to enter into public consultation. However, some companies undertaking extensive exploration programs do provide information and seek public input.

Mine development

With the exception of small operations of sand and gravel, rock quarry and placer74, all mine development is subject to review under either the Mining Development Review Committee or Environment Assessment Act. Both processes are multi-agency reviews, often involving both provincial and federal agencies. Referrals are submitted to the Council of the Haida Nation however, they are not involved as an agency in the process.

Major mine projects are reviewed under the BC Environment Assessment Act and require the approval of the Ministry of Sustainable Resource Management, Ministry of Energy and Mines and the Ministry of Water, Land and Air Protection. Approval under the Mine Development Review Committee is for smaller operations and is signed off by the Minister of Energy and Mines. For a more complete description of these processes and applicable mine thresholds, please refer to the following websites and addresses:

---

74 Note: Construction aggregate (sand and gravel) is not considered a mineral under the Mineral Tenure Act
5.6.5.2 Proposed development of construction aggregate resources

Mining for construction aggregate by the private sector, individuals, local government and the Ministry of Transportation and Highways is regulated by the Ministry of Energy and Mines. Pits and quarries developed for forestry purposes are regulated by the Ministry of Forests. Large or environmentally sensitive projects are reviewed through the Environmental Assessment Process.

The resource is not considered a “mineral” under the Mineral Tenure Act, and it is Land and Water BC, and not MEM, that administers the tenure and collects revenues for these resources under the Land Act (with the exception of construction aggregate for forestry purposes). On fee simple land, no tenure (other than that of property ownership) is required.

5.6.5.3 Energy resources

Oil and gas, coalbed methane and geothermal projects are regulated by the Petroleum and Natural Gas Act and Regulations and the Geothermal Resources Act and Regulations. Most of the petroleum, natural gas and geothermal rights in British Columbia are owned by the province, with small percentages privately-owned or held by the federal government.

The Ministry of Energy and Mines, manages provincially-owned petroleum and natural gas rights. The private sector explores for, develops, produces and markets oil and gas through tenure agreements with the Province. These agreements give rights to specific areas and may include rights to all depths or may be restricted to certain geological formations.

Typically, agreements are for three to 10 years and can be renewed or extended, require exploration or development, and call for payment of rents and royalties to the Province. Although provincial tenure agreements contain obligations to conduct exploratory or development work, approval to carry out the work is not included.

Each activity, such as a geophysical survey or drilling a well, must have specific approval from the Oil and Gas Commission. The Oil and Gas Commission is a Crown corporation responsible for regulating the exploration, development, production and pipeline transportation of oil and gas in British Columbia. The Commission conducts a review process to identify any environmental sensitivities or access issues before approving any on-the-ground activities.
5.6.6 Identified Issues Related to Mineral and Energy Resources

- The Council of the Haida Nation has identified the potential for disruption of the existing argillite mine by oil shale development.

- The Council of the Haida Nation, crab fishermen, and bird enthusiasts have expressed reservations about the existing proposal for a wind energy project on Nai Kun Island.

- The issue of offshore oil and gas development is highly controversial on the Islands. Opinion is divided between those who have concerns about the potential environmental impacts of development in Hecate Strait and those who see the potential for economic development in the area. The Canadian Petroleum Association has concurred with the Haida Nation in that before any oil and gas explorations occur, that jurisdictional disputes and environmental issues must be settled.
5.7 Wild Botanicals

The Haida note that they have a long history of use of wild botanicals, including wild mushrooms, berries and other wild foods, plants used in the floral and arts industry, and for food, spiritual/ceremonial activities and medicinal plants. A basic Haida philosophical view holds that all life is sacred and wild botanicals are no exception.

Wild botanicals, also known as botanical forest products (BFPs) or non-timber forest products (NTFPs) are an important component of the local economy. In recent times, harvesting of wild botanicals has grown to become an annual or supplemental income for a number of individuals and communities. The SMFRA report *Seeing the Forest Beneath the Trees: The Social and Economic Potential of Non-Timber Forest Products and Services In the Queen Charlotte Islands/Haida Gwaii* (Tedder et al. 2000) provides the most detailed summary available on wild botanicals and its industry on the Islands. A brief synopsis from this report of the mushroom and plant harvesting industries is provided here.

The harvest of wild botanicals is currently unregulated in BC. However, the Ministry of Forests, Economics and Trade Branch, in considering initiating a number of pilot projects related to the management of this resource.

5.7.1 Wild mushrooms harvesting

Mushroom have traditionally been used by the Haida as medicines. Since the 1980’s, there has been an unregulated commercial harvest of edible wild mushrooms on the Islands. About 90% of the mushrooms harvested are Pacific golden chanterelles (*Cantharellus formosus*). They are destined primarily for the European market. Most of the other species harvested include king boletes (*Bolletus edulis*), blue chanterelles (*Polyozellus multiplex*) and chicken of the woods (*Laetiporus sulphureus*). The majority of mushroom picking activity centres on the Skidegate Lake area in the northern half of Moresby Island.

The mushroom industry on the Islands contributes to a worldwide trade in wild mushroom products; however, British Columbia’s role in this worldwide trade is relatively minor. On average 250,000 pounds of mushrooms are harvested annually on the Islands. Exceptional years have seen as much as 350,000 pounds harvested and in poor years, less than 125,000 pounds (Tedder et al, 2000). Mushrooms are shipped from the Islands to Vancouver, either by air or land, and from there shipped to their final destination.

The mushroom picking season normally starts sometime in August and lasts into October depending on conditions. Depending on the productivity of the mushroom season, as many as 300 people, about two-thirds of which are from off-Island, arrive at various times and locations to harvest mushrooms. There are generally five to eight companies that locate mushroom buyers on the Islands. There are usually about 10 field buyers and each company will have a buying station at Skidegate Lake and some will also have agents on Graham Island (Tedder et al, 2000).

Pickers receive approximately $2.50 to $4.50 per pound. Buyers generally receive $0.50 per pound to act as a company agent. The mushrooms average about $7.25 per pound when sold in the European market. Assuming an average harvest of 250,000 pounds, the average annual
value of the mushrooms is about $1.8 million (Tedder et al, 2000). This value can easily range by plus or minus 40%.

Chanterelle mushrooms from the Islands currently command a premium price over chanterelles from elsewhere. This is partly due to the chanterelles’ deeper, golden colour, stronger aroma, and the timing of harvest, which generally starts between the end of the European season and the beginning of the season in the rest of BC and the US Pacific Northwest. However, the high transportation costs of delivering mushrooms off-Island and the availability of lower cost products from elsewhere in North America, eastern Europe and Turkey, challenge the local mushroom industry to compete.

### 5.7.2 Wild plant harvesting

Plant harvesting on the Islands for retail sale has only occurred in a very minor way. It is recognized that the area has a variety and abundance of species of plants that would be suitable for the growing commercial markets in floral and decorative greenery products, landscaping, and herbal medicines.

High off-island transportation costs, environmental and socio-economic concerns as well as local social preference for land use will make connecting to these growing markets a challenge.

The Haida Nation has approved a project exploring potential economic opportunities in wild botanicals that do not conflict with Haida values as an alternatives to logging. The project is called the Cultivation Forest Project. The initial work will research potential harvesting and marketing of medicinal fungi from Haida Gwaii. Objectives of the project include (a) the incorporation of Haida traditional knowledge concerning medicinal fungi, and (b) economic development through the production and sale of neutraceuticals, herbal remedies and other natural products to larger manufacturers/wholesalers. Construction of a fungal research laboratory is underway. The feasibility of setting up an intensive indoor fungal growing facility is also being examined.

### 5.7.3 Identified Issues related to Wild Botanicals

- The commercial potential of Indigenous pharmacology has yet not been fully realized. There are a number of issues associated with the commercial harvesting of wild botanicals, including the need for recognition of the Haida claim to intellectual property rights.
5.8 Agriculture and Grazing

5.8.1 Overview of agriculture and grazing resources

Agricultural activity on the Islands originated with Haida cultivating potato and nettles, as can still be seen in the gardens that are invariably found in association with Haida village sites. Beginning in 1908, settlers began to arrive, lured by the provincial government offers of land pre-emptions based on surveys of 1891 and 1908. These early settlers had high expectations of establishing prosperous farms on the pest-free fertile “Garden of Eden”. A 1906 newspaper ad declared that “strawberries as big as your fist” and “wild celery as big as your wrist” grew on Graham Island. The pre-empted lands covered the East Coast of Graham Island from the Sangan River to Tlell and from Rose Spit to the Oeanda River, the Skonun River and Mayer Lake areas. These land offerings were not extended to the Haida.

The settlers spread out, clearing land for homes and gardens. Near the Oeanda River the remains of a drainage ditch 10 feet wide and 600 feet long can still be seen. Cattle and sheep were raised for meat and sold to local logging and mining camps as well as shipped to Prince Rupert. The majority of farms failed due to the expense of clearing the land and draining the bogs, high transportation costs, lack of reliable markets, and isolation. By 1920, most were abandoned and only a handful of settlers remained after the Great Depression of the 1930s.

Currently, agriculture and grazing is mainly active in the Tlell area, which has some of the best soils for this purpose. Much of the 40,500 ha of Agricultural Land Reserve (ALR) is in this area (Map 9). Soil capability data for the Islands as a whole suggests that some good production class soils are outside of the current ALR and require more detailed analysis75. There are currently no agricultural leases.

Grazing occurs in some areas on Graham Island, although there are currently no grazing tenures allocated under the Range Act. The Richardson Ranch in Tlell, which has been in operation by the Richardson family for six generations, raises prize-winning Polled Hereford cattle. Cows still roam parts of Naikoon and are a legacy from Haida herds, as well as from settlers who abandoned their farms selling their herds to families living in the villages. These cows have faired well on the natural grasses of the sloughs, bogs and beaches. A 1980 court ruling declared these unfarmed cows as “feral” and since then it has been illegal to hunt them.

The islands host a number of small home-farm businesses, selling a variety of produce, often organically-grown, to local stores and at local farmers’ markets. A couple of large green-houses have been built by local farmers to grow tomatoes and a large organic farm operates on Maude Island. However, much of the produce and other agricultural products is imported from off-island for local consumption.

---

Map 9: Agriculture Land Reserve

Disclaimer: The maps in this report have not been confirmed by the Haida Nation as accurate.
5.9 Freshwater Use

5.9.1 Overview of freshwater use

Freshwater is an important commodity for human uses such as drinking water and industrial use. There are currently 136 water licenses documented by the Water Management Branch of BC Environment. Most of these licenses allow individuals to draw water from a lake or creek for their own domestic (household) use. These licenses allow water usage ranging from between 500 to 1,500 gallons per day. The majority of the domestic water-use licenses are for Queen Charlotte City and many of the licenses, although not cancelled, are no longer used because people have converted to the community water system.

There are four community watersheds on the Islands, three of which supply Queen Charlotte City and one that supplies Skidegate (Table 41). Water supplies for Haida seasonal communities at the Copper and Yakoun or other sites are not included in this listing. Under the Operational Planning Regulation of the Forest Practices Code of BC Act, watersheds assessments must be conducted prior to timber harvesting or roadwork within a community watershed or other drainage basin that has significant downstream fisheries or domestic water use.

Table 41. Community watersheds on the Islands

<table>
<thead>
<tr>
<th>Name</th>
<th>Source</th>
<th>Community</th>
<th>Size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honna River CW</td>
<td>Honna River</td>
<td>Queen Charlotte City</td>
<td>4734</td>
</tr>
<tr>
<td>Queen Charlotte City CW</td>
<td>Jervis Brook</td>
<td>Queen Charlotte City</td>
<td>1633</td>
</tr>
<tr>
<td>Slarkedus CW</td>
<td>Slarkedus Creek</td>
<td>Skidegate</td>
<td>505.2</td>
</tr>
<tr>
<td>Tarundl CW</td>
<td>Tarundl Creek</td>
<td>Queen Charlotte City</td>
<td>997.3</td>
</tr>
</tbody>
</table>

Source: MSRM website: http://srmwww.gov.bc.ca/cgi-bin/env_exec/wwwapps/waterbot/cwsnew

Most of the communities on the Islands (Sandspit, Skidegate, Queen Charlotte City, Port Clements, Masset and Old Massett) are on groundwater wells, which require little treatment for health protection. Since the mid 1980’s, the Skeena Queen Charlottes Regional District has worked towards bringing the residents of Queen Charlotte City (unincorporated) onto a community water system. Initially, three wells were drilled that were expected to provide a sufficient supply for all the residents of Queen Charlotte City. However, the total water supply was below that projected and additional wells and a water treatment plant were eventually installed to meet current demands. Some residents still rely on their own water licenses for their domestic use. The Regional District has two surface water license applications on file (Honna River at 54,750,000 gallons per year and Tarundl Creek at 111,690,000 gallons per year) that will be used as improvements to the community water supply system are developed. Skidegate takes its water supply from Slarkedus Creek with 3 licences totalling 110,000 gallons per day.

---

76 A community watershed is a drainage used to supply drinking water for a waterworks purpose (town or city water supply) or a domestic purpose in which 6 or more licensees have formed a group and required community watershed status. The drainage area is to be not more than 500 km².
Some of the higher water usage licenses are issued for industrial uses and some are issued for both usage as well as storage. For example, Ain Lake has a water storage license of up to 160,000 acre-feet (equivalent to one acre area at 1 foot depth, which is equivalent to 271,478 imperial gallons) for hydro electricity purposes.

Highland Energy Systems Ltd. applied for a water licence for storage purposes on Moresby Lake in 1986 as part of the Moresby Lake hydro power generation proposal. The original plan was to construct a 4 metre high dam on the lake outlet. The company only proceeded with the dam on Moresby Lake. The application for a dam and storage on Takakia Lake was refused by the comptroller in 1988. The Skidegate Haida did not support this proposal as Takakakkia Lake is a site of spiritual importance to the Haida.

Another use identified through the record of water licenses is for forest companies to have access to water (upwards of 18,000 gallons/day in the case of MacMillian Bloedel's licence for Cyrus Creek) for fire protection and dust control. BC Hydro's back-up diesel generator plant near Sandspit has an industrial licence on Haans Creek for generator cooling purposes. A comment that this structure mixes resource uses (domestic and industrial water use) with aquatic ecosystems.
5.10 Road Access and Management

5.10.1 Overview of road access and management

There are approximately 29,214 km of road on the Islands, most of which are inactive logging roads. The one main paved highway on the Island links all year-round communities. On Moresby Island, this highway runs from the Sandspit Airport to the ferry landing at Aliford Bay. On Graham Island the highway runs from Queen Charlotte City north to Skidegate, Tlell, Port Clements, Masset, ending in Old Massett, with an additional few kilometres west towards the Saangaan River. The total length of paved road on the Islands is approximately 130 km.

Most of the secondary roads on the Islands are logging haul roads. A minor amount of isolated road was built and then abandoned for mining at Tasu or Jedway. Most of the forestry road networks link up with the highway but in the more remote areas, roads are built to tidewater and accessed by water.

An analysis of the road network indicates that about 69% of the Islands has no mapped roads. About 20% of the area has what is considered a high road density (greater than 1.2 km/ km²), indicating a relic of the past concentration of forestry activities. Due to the number of existing roads, fewer new roads are being built.

One of the main concerns with road development is the potential impact of road construction on the steep and unstable terrain in the plan area. Road deactivation and restoration activities are primarily conducted to mitigate sedimentation into waterways and reduce the risk of road failure following harvesting and silvicultural operations.

Other than for timber harvesting, forestry roads can be used extensively for such activities as recreation, hunting, mushroom picking and mineral exploration. Road deactivation limits or curtails road use and therefore affects the extent of these and other activities occurring on the land base. Road deactivation plans must balance public road use with environmental risk, safety, the cost of maintaining roads and legal requirements.

Those licensed by the Province to build a road are obligated to meet the requirements of the provincial Forest Practices Code for deactivation. Depending on the planned future use of the road, and the environmental risk involved, this could mean as little as constructing waterbars to bridge removal and road fill pullback. Licensees are also required to carry out Coastal Watershed Assessments before any forest development plan is prepared for a community watershed or a watershed determined to have significant sensitivity, significant downstream values or, licensed domestic water users.

A Coastal Watershed Assessment Procedure (CWAP) is an analytical procedure designed to help forest managers understand the type and extent of current water-related problems that may exist in a watershed, and to recognize the possible hydrological implications of proposed forestry-related development or restoration in that watershed. They are also used to prioritize watersheds for more detailed assessments and restoration works. Prioritizing watersheds for restoration is based on risk assessments as well as an assessment of the effectiveness of treatment given the funding available. For example, restoring a sensitive watershed where slope failure is just starting may be a more effective use of funds than spending a lot of money on a heavily damaged watershed where extensive erosion has already occurred.
As of September 2000, of 68 watersheds identified outside of Gwaii Haanas, 31 have had CWAPs completed, 11 new CWAPs have been initiated, updates have been identified for 9, and five watershed have been identified where no further assessment was required at that time.

The Forest Investment Account (FIA) mentioned earlier, funds certain projects that involve the restoration and rehabilitation of watersheds. Under the Terrestrial Activity Area, FIA funds both the deactivation of non-status forest roads and projects involving landslide and gully rehabilitation. During the 2002/2003 fiscal year, $4,709,848 was spent on 26 projects in TFL 39 permanently deactivating or rehabilitating 583 km of road. In TFL 47 $465,049 was spent on 2 projects to permanently deactivate or rehabilitate 54 km of road. No projects were undertaken in the TSA and no data was available for projects undertaken in TFL 25.
6. Literature Cited


BC STATS. 2002. Local Health Area 50-Queen Charlotte; Statistical Profile. BC Ministry of Management Services, Victoria, BC.


Haida Gwaii/ Queen Charlotte Islands Background Report


http://www12.statcan.ca/english/census01/Products/Standard/Index.cfm


Canadian Forest Service Website http://www.pfc.cfs.nrcan.gc.ca/pathology/rootd/index e.html


Doyle F. In preparation. Biological Review and Interim Strategy for Goshawks on Haida Gwaii/Queen Charlotte Islands. Prepared for Ministry of Water, Land and Air Protection, Environmental Stewardship Department, Smithers, BC and Ecosystem Planning and Standards Section, Victoria, BC.


Government of Canada Climate Change website
http://www.climatechange.gc.ca/english/issues/how_will/fed_bc.shtml


Mahon, T., D. Morgan. And F. Doyle. 2003 Northern Goshawk (Accipiter gentilis ??) Habitat in the North Coast Forest District. Foraging Area and Nest Area Habitat Suitability Models. MSRM, Skeena Region. Smithers, BC.(Draft)


Pellatt, M.G. and R.W. Mathewes. 1996. *Holocene Tree Line and Climate Change on the Queen Charlotte Islands, Canada*. Department of Biological Sciences and Institute of Quartenary Research, Simon Fraser University, Burnaby, BC. Quartenary Research 48, Pp 88-99.


Pojar J. 2002. *Rare ecosystems (of the CWHvh2)*.  Unpublished paper prepared for the North Coast LRMP.


7. Glossary

**Adaptive Management** — a proactive and systematic approach to managing uncertainty about the consequences of alternative resource management actions. Experimental trials are designed, implemented and monitored as a basis for learning and applying that learning in the form of revised / improved resource management actions.

**Age class** - An interval into which the age range of trees, forests, stands, or forest types is divided for classification. Forest inventories commonly group trees into 20-year age increments up to age 140 years, then a single class for trees between 141 and 250 years old, and a single class for those older than 250 years.

**Agricultural land** - Land that is used for farming, including ranching, and land that has biophysical attributes that make it suitable for agricultural use. The latter includes lands identified by the Canada Land Inventory agricultural capability classes 1 to 5, as well as unique lands that have the capability to sustain agriculture.

**Agricultural Land Reserve (ALR)** - Land designated and reserved for agricultural purposes under the provincial *Agricultural Land Commission Act* (the reserve covers about five percent of the province and includes most of BC's high quality agricultural land). It includes both fee simple and non-fee simple lands, and covers land being farmed and land with agricultural potential. Non-agricultural uses on the ALR are regulated.

**Allowable annual cut (AAC)** - The allowable rate of timber harvest from a specified area of land. The chief forester sets AACs for timber supply areas and tree farm licences in accordance with Section 7 and/or Section 170 of the *Forest Act*. The district manager sets AACs for woodlot licences. May also refer to a portion of the total AAC for the management unit (i.e. TSA) partitioned to a single harvesting agreement (i.e. forest licence, timber sale licence).

**Archaeological overview assessment (AOA)** – assess the potential for occurrence of cultural heritage resources based on known information about archaeological sites from surveys, assessments, archives and oral history combined with geographical information such as topography, distance from waterways, etc. AOAs direct more detailed archaeological impact assessments in areas of moderate or high potential where forestry activities are planned.

**Archaeological sites** – Locations containing or with the potential to contain the physical remains of past human activity. Examples include villages, camps, caves, resource management areas and mortuary sites.

**Base Case** — the environmental, social and economic conditions that can be expected to occur in the future if existing policies, plans and practices are followed. The base case description is normally used as a point of comparison (benchmark) for judging the desirability of alternative land use plan scenarios.

**Biogeoclimatic ecosystem classification** - A hierarchical classification scheme having three levels of integration: regional, local and chronological; and combining climatic, vegetation, and site factors.
Biogeoclimatic zone - A geographic area with a broadly homogeneous macroclimate. Each zone is named after one or more of the dominant climax species of the ecosystems in the zone, and a geographic or climatic modifier (e.g., Interior Douglas Fir). British Columbia has 14 biogeoclimatic zones.

Biological diversity - The diversity of plants, animals and other living organisms in all their forms and levels of organization, including genes, species, ecosystems, and the evolutionary and functional processes that link them.

Blue-listed species - Sensitive or vulnerable species as identified by the Ministry of Water, Land and Air Protection. Blue-listed species are considered to be vulnerable and "at risk" but not yet endangered or threatened. Populations of these species may not be declining but their habitat or other requirements are such that they are sensitive to disturbance. The blue list also includes species that are generally suspected of being vulnerable, but for which information is too limited to allow designation in another category.

Botanical forest product - Non-timber based products gathered from forest and range land. There are currently seven recognized categories: wild edible mushrooms, floral greenery, medicinal products, fruits and berries, herbs and vegetables, landscaping products, and craft products.

Capability (land) - The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends upon this set of conditions and site conditions such as climate, slope, landform, soils, and geology.

Coarse filter approach - An approach to maintaining biodiversity under the provincial forest practices code that involves maintaining a diversity of structures within stands and a diversity of ecosystems across the landscape. The intent is to meet most of the habitat requirements of most of the native species (see also fine filter approach).

Community watersheds – The drainage area above the most downstream point of diversion on a stream for a water use that is for human consumption and that is licenced under the Water Act for (a) a waterworks purpose or (b) a domestic purpose if the licence is held by or is subject to the control of a water users’ community incorporated under the Water Act.

Critical habitat - Areas considered to be critically important for sustaining a population and where human activity may cause an unacceptable decline in the population. A rating of the importance of the habitat (e.g., high, medium, low) may also be used.

Culturally modified tree – a tree that bears evidence of past use by the Haida. Culturally modified trees include bark stripping, test holes, logs beginning to be carved into canoes, standing planked trees, notched trees, and pitch removal scars, and stumps having sections removed.

Disjunct species – a species of plant or animal that occur elsewhere in the world, but outside of the western hemisphere.
Ecological reserve – land reserved for ecological purposes under the *Ecological Reserve Act*, including: areas suitable for scientific research and educational purposes; representative examples of natural ecosystems; areas where rare or endangered native plants or animals in their natural habitat may be preserved; and areas that contain unique and rare examples of botanical, zoological or geological phenomena.

Ecoregion classification system – a hierarchical system of ecosystem classification that place the province in a global and continental context based on broad geographical relationships. The lower levels of the classification divide the province based on areas of similar climatic processes, physiography, and wildlife potential.

Ecosystem - A functional unit consisting of all the living organisms (plants, animals and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size - a log, pond, field, forest or the earth's biosphere - but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem, or range ecosystem.

Ecosystem integrity - The soundness or wholeness of the processes and organisms composing the ecosystem. To maintain ecosystem integrity one must maintain functioning, self-sustaining ecosystems with characteristics similar to the original ones.

Endemic species – A species of plant or animal that are confined to a certain area.

Extirpation – to condition that arises from the death of the last surviving individual of a species, group or gene locally without causing extinction of that species, group or gene.

Fine filter approach - An approach to maintaining biodiversity under the forest practices code that is directed towards particular habitats or individual species whose habitat requirements are not adequately covered by the coarse filter guidelines. These habitats may be critical in some way and the species threatened or endangered (see also coarse filter approach).

Fee simple lands – Refers to lands held in private ownership in fee.

Forest land - Land classified under Section 4 of the provincial *Forest Act* that the chief forester considers will provide the greatest contribution to the social and economic welfare of the Province if predominantly maintained in successive crops of trees or forage, or both, or maintained as wilderness.

Forest licence (FL) - An agreement entered into with the Province under Part 3, Division 2 of the *Forest Act*, which grants the rights to harvest timber. A forest licence has a term not exceeding 20 years, usually specifies an allowable annual cut (a portion of the total AAC for the timber supply area) and requires a management plan.

Forest and Range Practices Act – A provincial forest and range planning and practices framework that legislates a results-based forest practices code. The results-based forest practices code is a forest management system focused on the end result of responsible forest management rather than the means by which it is achieved. The Act is anticipated to come into force in 2004 and will replace the *Forest Practices Code of BC*.
Act. Associated regulations will be developed to support this legislation and will come into force at the same time. Additional information can be obtained at:


Questions and Answers – http://www.for.gov.bc.ca/hfd/training/training.htm

Forest Stewardship Plan – The provincial cornerstone operational plan for forest licensees under the results based code. The forest stewardship plan identifies the area of operation, and measurable and enforceable results or strategies to achieve the objectives set for the forest values. The forest stewardship plan must be consistent with the standards to protect biodiversity and species at risk, and must be consistent with approved land use plans.

Hydroriparian ecosystems – These occur wherever land and water interact. They include aquatic ecosystems plus ecosystems of adjacent terrestrial environments that are influenced by and that influence the aquatic system.

Karst – an area of irregular limestone where erosion has produced sinkholes, fissures, underground streams, and caverns.

Mass wasting – Any process whereby masses of soil, water, rock and debris are transported downslope, primarily by gravity. Types of mass wasting include debris slides, debris avalanches, debris flows, debris torrents, bedrock slumps and slides, and slump earthflows.

Natural disturbance process – a natural event that disrupts ecosystems and alters the physical environment and/or the availability of suitable habitat. Examples include fire, landslides, and windthrow.

Non-fee simple lands –Because the issue of title is before the courts, there are issues associated with the term “Crown land”. Therefore, for the purpose of this document we refer to “Non-fee simple lands” in this document to refer to those lands that have not been alienated in fee for private use.

Protected Area – a designation for areas of land set aside from industrial development to protect natural heritage, cultural heritage or recreational values.

Protected Areas Strategy (PAS) - The Provincial government strategy in place to meet BC’s commitment to develop and expand the protected areas system to protect 12 percent of the province by the year 2000. The goals of the strategy are to protect viable, representative examples of natural diversity in the province, and special natural, recreational and cultural heritage features.

Provincial forest - Forest land designated by the provincial Lieutenant Governor in Council under Section 5 of the Forest Act.

Range - Any land supporting vegetation suitable for wildlife or domestic livestock grazing, including grasslands, woodlands, shrublands and forest lands.
**Red-listed species** - Threatened or endangered species identified by the Ministry of Environment, Lands and Parks. The taxa on the red list are either extirpated, endangered or threatened, or are being considered for such status. Any indigenous taxon (species or sub-species) threatened with imminent extinction or extirpation throughout all or a significant portion of its range in British Columbia is endangered. Threatened taxa are those indigenous species or sub-species that are likely to become endangered in BC if conditions are not altered.

**Regional Protected Areas Team (RPAT)** - The provincial inter-ministry committee in each region that is responsible for conducting the technical inventories and analyses required to identify gaps in the protected areas system, identify areas of interest, consult with the public and propose study areas.

**Riparian area** - Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes including both the area dominated by continuous high moisture content and the adjacent upland vegetation that exerts an influence on it.

**Riparian class** - Refers to the classification given to streams, wetlands and lakes under Part 10 of the *Forest Practices Code of British Columbia Act* Operational Planning Regulation.

**Riparian management area (RMA)** - Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as an area, of width determined in accordance with Part 10 of the regulation, that is adjacent to a stream, wetland or lake with a riparian class of L2, L3 or L4; and, consists of a riparian management zone and, depending on the riparian class of the stream, wetland or lake, a riparian reserve zone.

**Riparian management zone** - Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as that portion of the riparian management area that is outside of any riparian reserve zone or if there is no riparian reserve zone, that area located adjacent to a stream, wetland or lake of a width determined in accordance with Part 10 of the regulation.

**Riparian reserve zone** - Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as that portion, if any, of the riparian management area or lakeshore management area located adjacent to a stream, wetland or lake of a width determined in accordance with Part 10 of the regulation.

**Seral stages** - The stages of ecological succession of a plant community. e.g., from young stage to old stage. The characteristic sequence of biotic communities that successively occupy and replace each other by which some components of the physical environment become altered over time.

**Silviculture** – the art and science of managing the establishment, growth, composition, health and quality of managed forests.

**Silvicultural system** – a planned program of treatments throughout the life of a managed forest stand to achieve stand structural objectives. A silvicultural system includes harvesting, regeneration and stand-tending methods or phases and covers all forest management activities for the entire length of a rotation. The six major categories of silviculture system include clearcut, patch cut, coppice, seed tree, shelterwood and selection.
Site series – are sites within a biogeoclimatic variant that are physically and biologically similar enough that they would have similar vegetation in a mature, climax state.

Succession – the sequence of biological communities that progressively occupy an area over time; or the process by which communities replace one another.

Timber licence (TL) - Area-based tenures issued by the Province which revert to the Province when merchantable timber on the area has been harvested and the land reforested. Many of these licences have been incorporated into tree farm licences.

Timber supply area (TSA) - An integrated resource management unit designated in accordance with Section 6 of the provincial Forest Act. TSAs were originally defined by an established pattern of wood flow from management units to the primary timber-using industries. They are the primary unit for allowable annual cut determination.

Tourism - The aggregate of all business that directly provides goods or services to facilitate business, pleasure or leisure activities greater than 80 kilometres away from the home environment.

Traditional use sites - A geographically defined site that has and is traditionally used by the Haida people for some type of activity. These sites will often lack the physical evidence of human-made artifacts or structures, and the Haida maintain that these have historical, cultural and spiritual significance to the Haida people. Traditional use sites are usually documented with the assistance of field surveys, oral historical or written archival sources. Examples include: sacred sites, ritual bathing pools, resource gathering sites such as for foods, medicines, building materials, and other spiritual and cultural sites, and the site of a legendary or past event of cultural significance (see cultural heritage resource).

Tree farm licence (TFL) - An agreement entered into by the Province under Part 3, Division 5 of the Forest Act, which grants the rights to harvest timber. A tree farm licence has a term of 25 years and requires a management plan providing for the establishment, management, and harvesting of timber in a described area on a sustained or perpetual yield basis (see also allowable annual cut).

Vascular plants – plants with specialized tissue consisting of cells joined into tubes that transport water and nutrients throughout the body of the plant.

Visual impact assessment - An evaluation of the visual impact of resource development proposals on forest landscape.

Visual landscape inventory - The identification, classification, and recording of the location and quality of visual resources and values.

Visual quality - The character, condition, and quality of a scenic landscape or other visual resource and how it is perceived, preferred, or otherwise valued by the public.

Visual quality objective (VQO) - A resource management objective established by the district manager or contained in a higher level plan that reflects the desired level of visual quality based on the physical characteristics and social concern for the area. Five
categories of VQO are commonly used: preservation; retention; partial retention; modification; and, maximum modification.

**Watershed** - An area of land that collects and discharges water into a single main stream through a series of smaller tributaries.

**Wildlife habitat area (WHA)** - Defined in the *Forest Practices Code of British Columbia Act* Operational Planning Regulation as a mapped area of land that the Deputy Minister of Environment, Lands and Parks, or a person authorized by that deputy minister, and the chief forester, have determined is necessary to meet the habitat requirements of one or more species of identified wildlife.

**Woodlot licence** - An agreement entered into with the Province under Section 41 of the *Forest Act*, which grants the rights to harvest timber on a small parcel of combined fee simple and non-fee simple land. A provincial woodlot licence has a term not exceeding 15 years and requires
8. Acknowledgements

A significant number of people have contributed to the production of this Background Report and should be acknowledged for their efforts. This report was built upon a draft Background Report completed in 1999 under the coordination and direction of Dan Adamson. In late 2002, the Process Technical Team for the current Land Use Planning Process began the process of reviewing and updating that draft, to bring it to currency as of December 2003.

Writing, editing, and research were carried out by David Cruickshank and Hannah Horn. Strategic direction and overall project coordination was provided by Leah Malkinson and Tamara Rullin. Lynn Lee, Kim Lewis, Carolyn Terborg and Carolyn Hesseltine prepared written contributions to various sections of the Report. Carrie Carty, April Davis, Guujaaw, Michael Yahgulanaas, Keith Moore, Alvin Cober, Tony Hamilton, Dorthe Jakobsen, Todd Columbia, Kiku Dhanwant, Jim Pojar, Carol Kulesha, Greg Wiggins, Brian Eccles, Pete Katinic, Barb Rowsell, Urs Thomas, Rick Marshall, George Schultz, Mark Williams, Julian Wake, Gary Holman, and Cathy Rigg all provided invaluable technical review and input. And finally John Sunde and Jamie Popkin prepared many of the tables, GIS analyses and maps required for the report.

Thank you all.