
GWAII HAANAS

NATIONAL PARK RESERVE AND HAIDA HERITAGE SITE

2007 State of the Protected Area Report



Protected through the cooperation of the
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ARCHIPELAGO MANAGEMENT BOARD

Canada



Haida
Nation

Gwaii Haanas
National Park Reserve and Haida Heritage Site

2007 State of the Protected Area Report

September 2007

Editor: N.A. Sloan

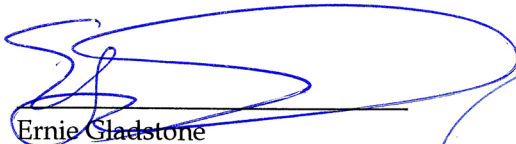
Authors: K. Alexander, P.M. Bartier, D.W. Burles, L. Dick, D.W. Fedje, A. Gajda, B. Johnston, P. Lee, C.L.K. Robinson, N.A. Sloan, I.J. Walker, B. Wilson

Acknowledgements: for their reviews and comments we thank D. Henderson of the National Historic Sites Directorate; S. McCanny, P. Nilsen, D. Petersen, B. Smid, C. Spence, S. Woodley of the National Parks Directorate; and C. Dumouchel, S. McLeod O'Reilly of the External Relations and Visitor Experience Directorate. We also thank the Gowgaia Institute, Queen Charlotte for the imagery developed under contract with them.

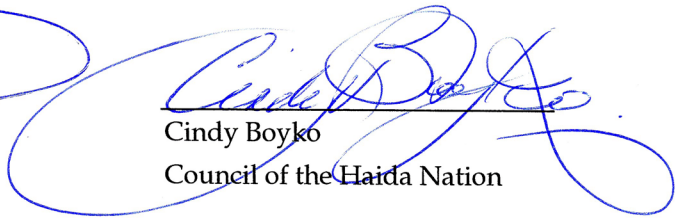
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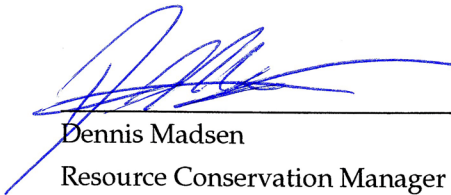
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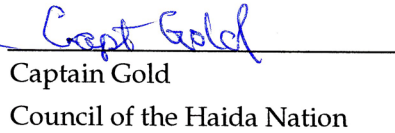
Ernie Gladstone
Field Unit Superintendent



Cindy Boyko
Council of the Haida Nation



Dennis Madsen
Resource Conservation Manager



Captain Gold
Council of the Haida Nation

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The Haida family crest of Gwaii Haanas acquired through potlatch.

Images of the sea otter (*Enhydra lutris* / in Haida **kūu**) and red sea urchin (*Strongylocentrotus franciscanus* / in Haida **guuding aay**) by the artist **Giitsxaa**. These animals were chosen for Gwaii Haanas by Haida Elders as they resonate in local history, reminding us of the vulnerability of species and ecosystems. Red sea urchins abound around Haida Gwaii because their predator, the sea otter, was extirpated during the fur trade era.

EXECUTIVE SUMMARY





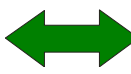
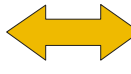

This is the first State of the Protected Area Report (SoPR) for Gwaii Haanas National Park Reserve and Haida Heritage Site (Gwaii Haanas). We describe Gwaii Haanas' ecological state, to assess effectiveness of management towards ensuring Ecological Integrity (EI) and to describe appreciable gaps in ecological knowledge. As they are central to overall management and to fostering public support, we also include assessments of Visitor Experience, Public Education, and Cultural Resources.

Illustrated on the front of the two-sided Figure 1 is the Haida Gwaii (Queen Charlotte Islands) archipelago viewed from space, featuring land topography and surrounding ocean depths with inset photographs of Gwaii Haanas' indicator ecosystems. This image underscores the oceanic nature of Gwaii Haanas' greater park ecosystem with its exposure to the open North Pacific and Hecate Strait along 1,700 km of coast, with less than 50 km of terrestrial border on Moresby Island connecting to the rest of the archipelago. On the other side of Figure 1 is a schematic cross-section diagram of Gwaii Haanas showing the key landscape and maritime features for more context on indicator ecosystems.

Based on analyses of Gwaii Haanas' research and monitoring programs, the status and trend of our seven indicator ecosystems vary (Table 1). Given that this is our first SoPR, and that the monitoring program is still under development, data gaps do limit the comprehensiveness of this EI assessment. A Technical Compendium produced alongside this SoPR contains key technical context - history of datasets and their analyses. Some datasets, fostered by other agencies, go back almost 50 years. The condition of the technical information base is good, given the relatively recent establishment of Gwaii Haanas. With our commitment to the geographic information system underlying our spatial information base, we have a solid foundation.

Forest occupies almost 90 % of Gwaii Haanas' landscape and the rolled-up status and trend from the forest's seven measures is "fair" and "deteriorating" respectively (Table 1). The next largest indicator ecosystem (8.9 %) is non-forested (mostly high elevation), for which the status and trend are both "unknown." The effects of browsing by hyperabundant introduced deer in forested and non-forested ecosystems is the single most important effect on Gwaii Haanas' EI. The next most important influence on EI is likely climate change that could, among other effects,

Table 1. The state of Indicator Ecosystems in Gwaii Haanas.

Indicator Ecosystem (% of park area ¹)	Condition ² and Trend ³	Rationale for Rating
Forest (89.4)		Hyperabundant introduced deer severely affect forest vegetation and overall EI. Past logging and mining areas are recovering, but to a deer-affected state. Natural processes, including insect and disease outbreaks, appear to be within historic levels.
Non-forested (8.9)		Little monitoring has been conducted in the alpine and subalpine tundra regions. Deer browsing affects vegetation and climate change may result in a rise in tree line.
Lake and Wetland (1.3)		Monitoring has just begun in these ecosystems. EI concerns include encroachment by non-native frogs and deer browsing on wetland vegetation.
Stream, River, Estuary (0 ⁴)		Gwaii Haanas' streams have high water quality. The number of salmon spawning in these streams is on the rise, but remains well below historic levels.
Shoreline (0 ⁴)		Shoreline measures, such as well-being of Peale's Peregrine Falcon, nesting seabirds, Black Oystercatcher and Steller sea lion, are in good condition. EI concerns include the effects of visitors at camping areas, the potential spread of invasive plants and the accelerated effects of coastal erosion triggered by climate change.
Marine [intertidal and subtidal] (0 ⁵)		Eelgrass ecosystems are in good condition, with low human-related disturbance, healthy eelgrass and associated fish communities. Stocks of Pacific herring, a key forage species in the marine food chain, are well below historic levels.
Park-wide		Monitoring is just beginning for measures relevant to all ecosystems. Of greatest concern are ecological effects of non-native mammals (rats, raccoon, squirrel, deer).

1 Approximately 0.4% (5.2 km²) of the park consists of islets less than 4 ha in area

2 Condition classes are: Green = good / Yellow = fair / No color = insufficient information

3 Trend classes are: Horizontal arrow = stable / Falling arrow = deteriorating / Box = insufficient information

4 Linear features (no area estimate) of 3,123 km of streams and rivers and 1,700 km of marine shoreline

5 Adjacent to Gwaii Haanas and within the 3,400 km² of proposed National Marine Conservation Area Reserve

raise the treeline into the non-forested ecosystem and increase erosion along the shoreline.

As key elements towards maintaining public support for Gwaii Haanas, we also profile assessments of Visitor Experience, Public Education, and Cultural Resources. The state of these facets of management is listed in Table 2.

The overall rank for Visitor Experience is “good,” as Gwaii Haanas is fulfilling or exceeding most of our visitors’ expectations, judging from consistently high satisfaction

ratings. The Backcountry Management Plan enables us to gather data on visitors in order to inform management.

Figure 1 (on following page). The Haida Gwaii archipelago viewed from space with insets showing Gwaii Haanas’ indicator ecosystems. On the overleaf is a diagrammatic cross section with further information on the indicator ecosystems (imagery by Gowgaia Institute).

Table 2. The state of Visitor Experience, Public Education and Cultural Resource indicators for Gwaii Haanas.

Indicator	Condition ¹	Rationale for Rating
<i>Visitor Experience</i>		
Understanding Visitors	Good	We collect origin/activity data for almost 100% of visitors, plus more information through voluntary Trip Log surveys. Visitors are well served by a wide variety of targeted communications.
Providing Opportunities	Good	We have a limited range of visitor opportunities due to Gwaii Haanas’ remoteness, although our visitors are happy with the experience.
Delivering High Quality Service	Good	We score well above targets for overall visitor satisfaction.
Connecting Visitors Personally with the Place	Good	We have a high visitor return rate, and surveys show visitors support management priorities, but our remoteness limits stewardship opportunities.
Overall Condition of Visitor Experience	Good	Most visitors’ expectations are met or exceeded.
<i>Public Education</i>		
Understanding Our Audience	Fair	Little audience research has been completed, except for visitor programs.
Extending Our Reach	Good	We reached all target audiences for public education in 2006 and multiple partnerships have helped, although many partners have limited resources.
Facilitating Understanding	Fair	Our visitor /outreach programs aid audience learning, although we lack data on success of learning objectives (except for visitor orientations).
Influencing Attitudes	Fair	Although backcountry monitoring suggests visitors are caring and responsible, no formal attitude survey has been done for local audiences.
Overall Condition of Public Education	Fair	We reach audiences through different media; program direction is based more on management plan objectives than on audience knowledge.
<i>Cultural Resource</i>		
Pre-contact Archaeological Sites	Good	The status of 70% (620) of sites is “good” and “fair” for another 17%; the “poor” sites are coastal and experience erosion from sea level rise.
Post-contact Historic Archaeological Sites	Fair	The overall status of these 80 sites is “fair” with 10% and 7% experiencing high levels of natural and visitor threats respectively.
Haida Use Sites and Villages	Fair	Year-round occupation ceased in the late 1800s and sites are being eroded by rising sea levels and wave action. Some Haida burial sites have been disturbed by visitors with Haida Elders advising on care of remains and Watchmen seasonally attend five village sites as stewards.
Remains at Haida Sites	Good	Poles and house frames continue to return to the Earth - as culturally accepted. Yearly conservation continues on wood remains and paths are aligned to minimize visitor effects.
Haida Place Names	Fair	Elders at the Skidegate Haida Immersion Program are the last generation to grow up with the language and live off the land with their extended families. Elders record place names, meanings, locations and pronunciation.
Haida Knowledge Gathering	Fair	Haida knowledge has been recorded since the 1880s by visiting scholars. Now, Haidas guide the process, such as information for brochures and publications.

¹ Condition classes are: Green = good / Yellow = fair



SHORELINE

The 1,700 kilometres of shoreline in Gwaii Haanas represent a biologically complex land-to-sea transition zone, and is where the highest levels of current and historical human use occur.

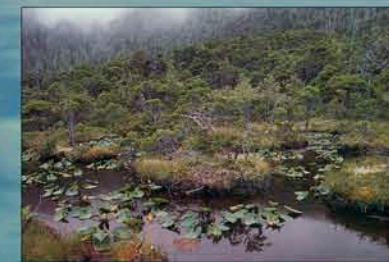


NON-FORESTED

High elevation, non-forested alpine tundra with plant communities rich in rare species such as alpine azalea, Arctic daisy and netted willow.

131.6 km² = 8.9% of Gwaii Haanas

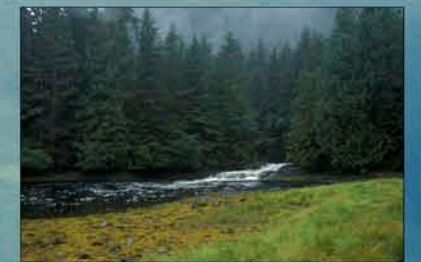
Gwaii Haanas management is guided by the close relationship between land & sea



LAKE & WETLAND

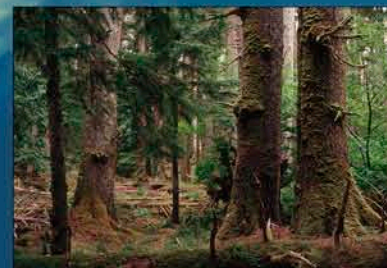
Lakes and wetlands are found at all elevations throughout the area. Though they are relatively few in proportion to the total area, their ecological value is very high.

19.8 km² = 1.4% of Gwaii Haanas



STREAM, RIVER & ESTUARY

The steep rocky terrain in the area contains 3,123 kilometres of water courses, through which very high flows run after heavy rain. Salmon swimming through the estuaries and into streams transfer enormous amounts of nutrients into riparian forest areas.



FOREST

Coastal temperate rainforests are dominated by three species of conifer trees — hemlock, spruce, and cedar.

1,318.7 km² = 89.4% of Gwaii Haanas

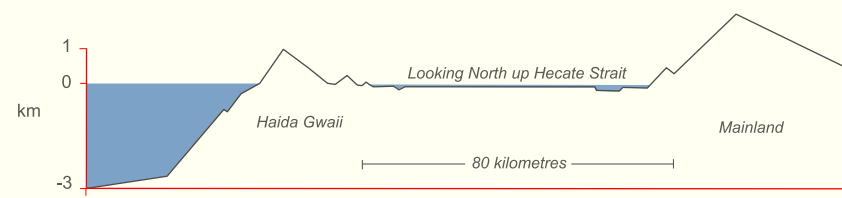


MARINE

Gwaii Haanas has intertidal and subtidal zones that host productive, biologically diverse ecosystems. They include eelgrass meadows and kelp forests near shore down to deep continental slope waters.



RELATIONSHIP OF HAIDA GWAII TO THE MAINLAND COAST OF CANADA (exaggerated vertically)



Gwaii Haanas is a serene and wild place where natural processes occur... and where humans accept that they are part of this natural order.

a. NON-FORESTED

Susceptible to climate change effects such as rising tree line.

The Black bear is a sub-species unique to Haida Gwaii and it ranges from alpine to shoreline throughout the year.

b. FOREST

The browsing of vegetation by deer, an introduced species, severely affects all terrestrial ecosystems.

Marbled Murrelets depend on old-growth trees for nesting.

Natural disturbances are small-scale landslides and blowdown events – not fire.

c. LAKE & WETLAND

The Western toad is the only amphibian native to Haida Gwaii.

The Pacific Tree frog and the Red-legged frog were introduced to the Islands.

d. SHORELINE

Haida village sites have seasonally resident Watchmen for protection of the sites.

Black Oystercatchers are good indicators of the health of rocky intertidal ecosystems.

Predation by raccoons and rats (introduced species) threaten small bird and mammal species and breeding colonies of sea birds throughout the area.

e. STREAM, RIVER & ESTUARY

Freshwater invertebrates are a good indicator of stream health and water quality.

Five species of salmon migrate into streams to spawn and in the process transfer massive amounts of marine nutrients into watersheds.



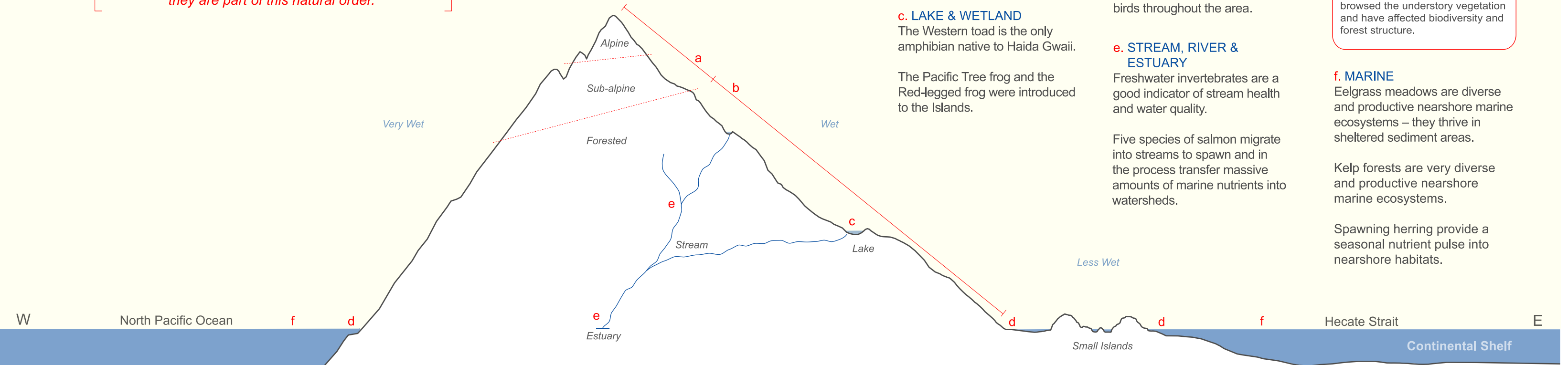
Introduced deer have heavily browsed the understory vegetation and have affected biodiversity and forest structure.

f. MARINE

Eelgrass meadows are diverse and productive nearshore marine ecosystems – they thrive in sheltered sediment areas.

Kelp forests are very diverse and productive nearshore marine ecosystems.

Spawning herring provide a seasonal nutrient pulse into nearshore habitats.



CROSS SECTIONAL DIAGRAM OF THE GWAII HAANAS ECOSYSTEM

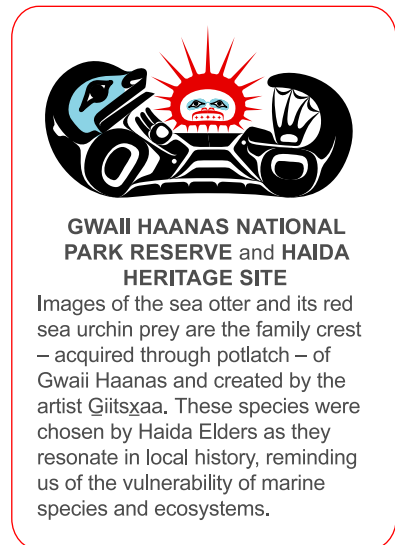
To maintain and restore the ecological integrity of the landscape is our first management priority.

Management Plan for the Terrestrial Area (Archipelago Management Board 2003a)

We monitor long-term trends in ecological integrity by measuring a set of ecological indicators to determine trends in biodiversity, environmental processes and stresses.

As part of the Pacific Coast Bioregional Monitoring Program, there are six indicators of Ecological Integrity: Forest; Non-forest; Lake & Wetland; Stream, River & Estuary; Shoreline; and Marine.

We use Adaptive Management (learning by doing) methods to manage visitor impacts on the environment. Information collected through monitoring the indicators informs our ongoing efforts to adjust and improve management policies and practices.



GWAII HAANAS NATIONAL PARK RESERVE and HAIDA HERITAGE SITE

Images of the sea otter and its red sea urchin prey are the family crest – acquired through potlatch – of Gwaii Haanas and created by the artist Giitsxaa. These species were chosen by Haida Elders as they resonate in local history, reminding us of the vulnerability of marine species and ecosystems.

The overall rank for Public Education is “fair.” Because staff focused on visitor management in the years following establishment, outreach education is not developed to the same extent. We offer a wide range of programming, based on management plan commitments, although we lack audience research. Now that programs are running, they warrant review towards ensuring communication objectives are being met. We are learning more about our audiences, their responses to our programs and adapting or replacing programs to better facilitate learning.

Cultural Resources are a strength of Gwaii Haanas (Figure 2). The goals of cultural resource management are the protection and long-term stewardship of archaeological knowledge (pre- and post-contact) and material resources in their original context. The ranks for the 886 pre-contact

and 80 post-contact archaeological site types are “good” and “fair” respectively. The rank for other Cultural Resources (Haida places, names and knowledge) is between “good” and “fair.” We foster the recording and use of traditional Haida knowledge and are at the beginning of gathering this knowledge to compliment natural science information towards management. Progress on this front respects the Canada-Haida co-operative management partnership.

In closing, key issues emerging from this, our first SoPR, are the effects of introduced species (e.g., hyperabundant deer on vegetation or rats on seabird colony islands), likely climate change effects, the prospect of integrated land-sea conservation with the proposed National Marine Conservation Area Reserve and implications of co-operative management with the Haida Nation.



Figure 2. Totem poles at SḠang Gwaay Lnagaay (Nan Sdins National Historic Site of Canada and United Nations Educational, Scientific and Cultural Organization SḠang Gwaay World Heritage Site) in Gwaii Haanas (photo: Rebecca Cummings 2005).

1. INTRODUCTION

This State of the Protected Area Report (SoPR) includes an assessment of the ecological integrity (EI) of Gwaii Haanas National Park Reserve and Haida Heritage Site (hereafter: Gwaii Haanas) based on research and monitoring information. This is the first SoPR for Gwaii Haanas, although there has been a terrestrial ecosystem classification (AMB 1994), a terrestrial ecosystem conservation strategy (Golumbia 2001), an interim Ecological Integrity Statement (Golumbia 2002) and the Management Plan for the Terrestrial Area (AMB 2003 a). Accompanying this SoPR is a separate Technical Compendium that provides much more scientific context, data and statistical background relating to all the EI indicators, as well as measures under development.

This SoPR also includes assessments of Visitor Experience, Public Education, and Cultural Resources. Creating and maintaining public support through these three key facets of management is a vital part of fostering EI. Evaluations of these programs are ongoing. Data gaps will be filled in future reports as the programs of this relatively new protected area mature.

Critical context to understanding Gwaii Haanas is that it was among the first of the national parks to be cooperatively managed between a First Nation and Parks Canada Agency in southern Canada. The legal coastal (seaward) boundary is the “ordinary high water mark” stipulated in the federal-provincial *South Moresby Agreement* of 1988 that created Gwaii Haanas. Predating this agreement was the Haida Nation’s declaration of the entire southern Moresby Island area as a Haida Heritage Site in 1985. Since 1993, Gwaii Haanas’ lands and fresh (non-tidal) waters have been cooperatively managed by the Government of Canada (represented by Parks Canada Agency) and the Council of the Haida Nation (CHN) through the *Gwaii Haanas Agreement*. This agreement created the Archipelago Management Board (AMB) of two CHN and two Government of Canada representatives (from Gwaii Haanas) that make all management decisions.

Other key context is the prospect of creating a National Marine Conservation Area Reserve (NMCAR) surrounding Gwaii Haanas. Indeed, the footprint of the proposed Gwaii Haanas NMCAR was legally defined in the *South Moresby Agreement* along with a commitment to create a “national marine park.” The prospect of a marine conservation area was later reaffirmed

in the *Gwaii Haanas Agreement*. Gwaii Haanas’ terrestrial management plan (AMB 2003 a) does not include marine waters, but, critically, states that; “... it cannot help but recognize the close relationship that exists between land and sea.” Therefore, the inseparability of land and sea towards an integrated management approach over the long term characterizes Gwaii Haanas’ management ethic. Certain influential marine issues must be considered when contemplating management of Gwaii Haanas’ lands and are recognized as part of management. Examples would be colonies of nesting seabirds on land or the distribution of marine nutrients in riparian (near-stream) forests by spawning salmon. Finally, within the spirit of the cooperative management arrangement, both western science and traditional Haida knowledge sources are to be used and respected in aid of management decision-making (AMB 2003 a). We are at the outset of gathering this knowledge towards fully respecting its use in decision-making.

The conservation continuum envisioned, that is, the union of Gwaii Haanas with the proposed NMCAR, will span alpine to deep-sea ecosystems. The extent of the combined area, ~5,000 km² (lands plus ~3,400 km² of sea area), and the breadth and completeness of the ecosystem coverage will be globally unique for a temperate coastal rainforest park.

The EI vision for Gwaii Haanas is articulated in the terrestrial management plan (AMB 2003 a). The philosophy is that: “Respect for the area developed through knowledge and understanding will be the surest means of protection for Gwaii Haanas.” The Plan has a vision that looks to 2010 and beyond with a suite of guiding principles, a land use approach respecting the Gwaii Haanas’ essentially wilderness character and the imperative of ecosystem-based management. This builds upon the original ecological vision, articulated in Golumbia (2002), as follows:

Gwaii Haanas protects the exceptional ecological diversity of southern Haida Gwaii where temperate coastal rainforest merges with the North Pacific in an isolated archipelago at the northwestern edge of British Columbia’s continental shelf. Gwaii Haanas’ conservation program will protect, maintain, or restore integrity to terrestrial ecosystems by maintaining viable populations of indigenous flora and fauna within the context of the whole archipelago. The AMB will manage to the principles and ideals of ecosystem-based management, recognizing that people, the economy and the environment of Gwaii Haanas and

Haida Gwaii are inter-related. Gwaii Haanas is an important element of the archipelago's ecosystem and the park will be integrated into the broader landscape context, transcending administrative boundaries and working cooperatively with adjacent stakeholders. For over 10,000 years, human activities have been, and will continue to be, part of this ecosystem. We will continually improve our ecological knowledge in order to manage our actions in ways that respect and maintain natural diversity. Our understanding of Gwaii Haanas and its surrounding landscape will grow through research and monitoring, direct experience and communications. Collectively we aspire to improve stewardship of the region's ecosystems and restoration of natural processes in disturbed sites. Gwaii Haanas is a wild place where natural processes occur unimpeded and where humans accept being part of this natural order.

An important process outside Gwaii Haanas is the Haida Gwaii land use planning (HG/QCI 2005) initiated by the parties in May 2007. Planning is centred on government-to-government (British Columbia - CHN) negotiations and this co-managed process yielded a separate Haida Land Use Vision (CHN 2004) that will also influence Gwaii Haanas' future.

As national parks strive to become "centres of ecological understanding" recommended in the report on EI (PCA 2000), inventory and monitoring are crucial. We must define what we are protecting and be able to assess park well-being over time by comparisons with a sound baseline. Monitoring enables measuring long-term trends in ecosystem properties, assessing management effectiveness as well as evaluating economic effects, community attitudes, involvement and compliance. Monitoring is part of adaptive management (learning-by-doing) that structures management as an experiment in which hypotheses are formulated, findings are used to test these hypotheses and failed hypotheses are discarded. Monitoring facilitates the feedback necessary to guide adjustments to this experiment. Further to knowledge gathering, Gwaii Haanas has assembled a regional bibliographic database of over 13,000 items and a document archive exceeding 6,000 titles (over 2,000 in electronic format).

Public Education and Visitor Experience are crucial parts of Gwaii Haanas' mandate, and foster ecological and cultural integrity. The Backcountry Management Plan (AMB 2003 b) aids controlling visitor effects on Gwaii Haanas, primarily through education. Participation in an orientation session is mandatory for all

visitors. Access is controlled through allocations for tour operators and a reservation service for independent visitors. There are minimal visitor facilities and no personal interpretation delivered by staff within Gwaii Haanas. However, the Haida Gwaii Watchmen Program (under the Haida Tribal Society and funded by Gwaii Haanas since 1990) increases visitors' awareness of the area's strong Haida cultural connections. Gwaii Haanas has produced interpretive and ethics publications along with a web site. The Gwaii Haanas Marketing Strategy (AMB 2006) guides investment in marketing activities in order to increase awareness and (if appropriate) visitation. Parks Canada outreach education comprises the web site, local and regional public presentations, a community relations program, media program and school programs. Also, starting in 2007, programming and exhibits about Gwaii Haanas will feature in the new Haida Heritage Centre at Kaay Lnagaay (hereafter: Kaay Centre).

Gwaii Haanas received the highest score out of 55 national parks in the United States and Canada in a survey by National Geographic Traveler (July/August 2005). The survey focused on environmental quality and the relationship of each park with its gateway communities. Some comments from the 300 experts surveyed included: "high cultural integrity"; "Haida are very involved in park management"; "Beautiful and intact. A great model for other regions."

2. ECOLOGICAL AND CULTURAL CONTEXTS

2.1. Ecological

Gwaii Haanas comprises the southern portion of Moresby Island and associated islands in Haida Gwaii (Queen Charlotte Islands) off the northern British Columbia mainland coast (Figure 3). Gwaii Haanas' west coast is highly exposed to the open North Pacific and has a narrow continental shelf and slope descending rapidly to more than 2,000 m depth within 10 km offshore. The east coast faces the Hecate Strait across some 100 km to the northern British Columbia mainland; these are shallow continental shelf waters mostly less than 150 m depth.

Access to Gwaii Haanas is by boat and aircraft only. The park has relatively little human infrastructure with two Operations Stations and five Haida Gwaii Watchmen camps (Figure 4). The camps are staffed by Haida persons that "act as hosts and guardians" for

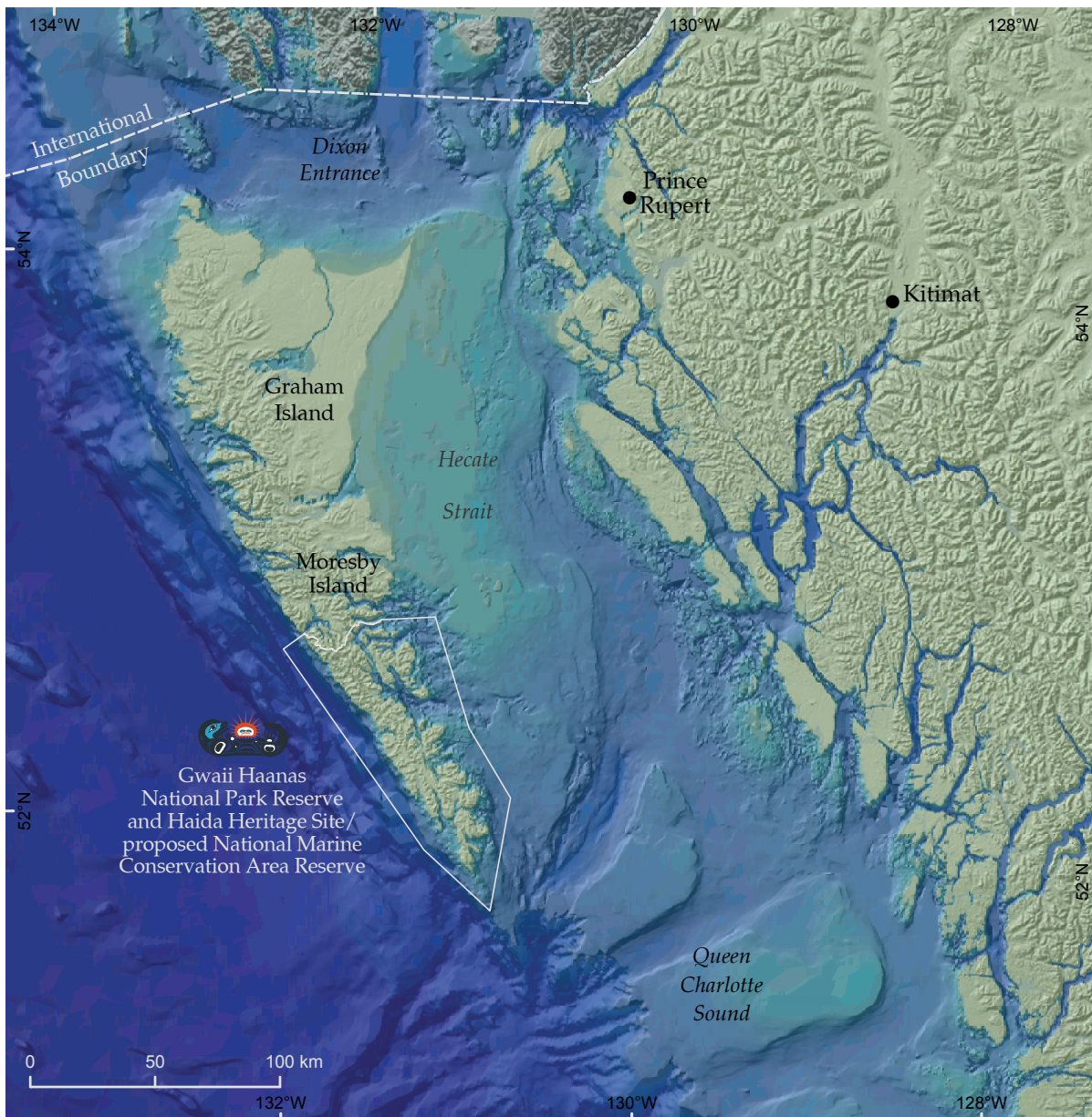


Figure 3. Map of the Haida Gwaii (Queen Charlotte Islands) region including Gwaii Haanas National Park Reserve and Haida Heritage Site and the proposed Gwaii Haanas National Marine Conservation Area Reserve. The continental shelf (less than 200 m depth) and the deep continental slope are indicated by the shading of the bathymetric surface.

these cultural (village) sites during the main visitation season of May to September.

Gwaii Haanas incorporates approximately 1,500 km² of land including over 200 islands exceeding 1.0 ha in area, with 1,700 km of shoreline punctuated by streams draining some 780 small watersheds of which over 100 support spawning salmon (*Oncorhynchus* spp.) returning from the ocean (Krishka 1997). Besides Krishka's (1997) freshwater inventory, there is a complete biophysical (species/substrate) inventory of

the shoreline in Gwaii Haanas' geographic information system (GIS) (Sloan 2006).

Three landform types characterize Haida Gwaii (Figure 5). The Queen Charlotte Lowlands to the northeast occur at <500 m elevation. The Skidegate Plateau includes hills to ~700 m elevation whose rounded tops were covered during the last glaciation. The steep Windward Queen Charlotte Ranges have two peaks exceeding 1,100 m elevation and the areas above 900 m were likely not covered during

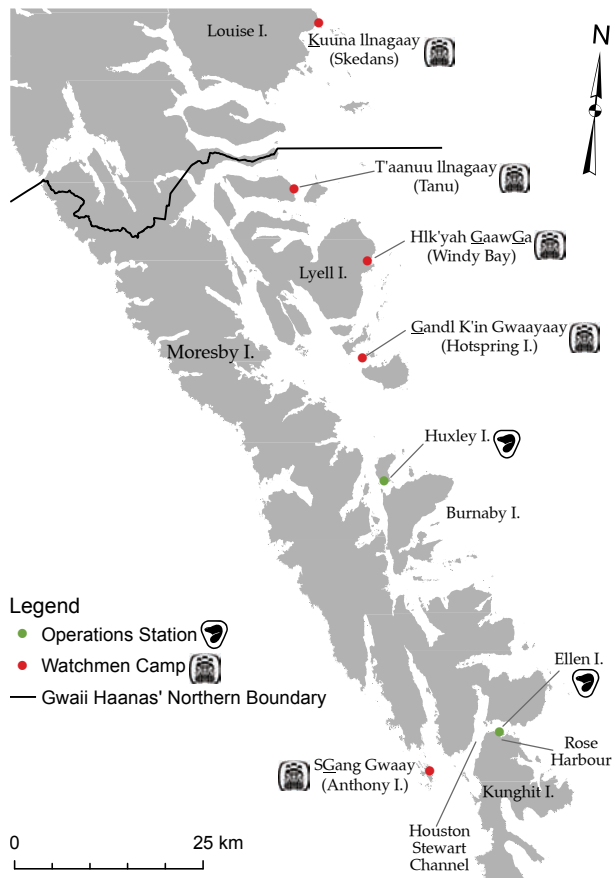


Figure 4. The two Parks Canada Warden Operations stations and five Haida Gwaii Watchmen camps in, or associated with, Gwaii Haanas.

the last glaciation. The Plateau and Ranges land-forms that dominate Gwaii Haanas' landscape give the park its rugged topography.

The archipelago is exposed to powerful, saline sea winds and heavy rains which strongly influence zoning based on a combination of geology, biology and climate. The Coastal Western Hemlock zone represents most lands and is divided into two sub-zones (Figure 5). The Very Wet Hypermaritime Coastal Western Hemlock sub-zone represents the windward west coast, and is dominated by boggy woodlands. The Wet Hypermaritime Coastal Western Hemlock sub-zone represents the leeward eastern side of the archipelago and is typical coastal temperate rainforest dominated by large hemlocks, spruces and cedars. The Mountain Hemlock and the Alpine Tundra zones combined occur at elevations exceeding 550 m.

Haida Gwaii has been subject to great environmental change since the end of the last ice age. Maximum coldness occurred between

20,000 to 16,000 years before present (BP). At that time, the British Columbia mainland was ice-covered and glaciers likely flowed out Dixon Entrance to the edge of the continental shelf. The extent of ice cover on Haida Gwaii is uncertain but, at a minimum, there was an ice-cap on the archipelago's mountainous spine and glaciers flowing seaward down valleys (Figure 6). Whether a biological refuge persisted in the lowlands of Haida Gwaii is uncertain. Many authors suggest, but cannot confirm, the possibility of a full glacial refuge (Fedje and Mathewes 2005). Ice disappeared from the archipelago's coast by 16,000 to 15,000 BP and the Hecate and Dixon lobes receded from the Hecate Strait - Dixon Entrance area by 14,500 BP.

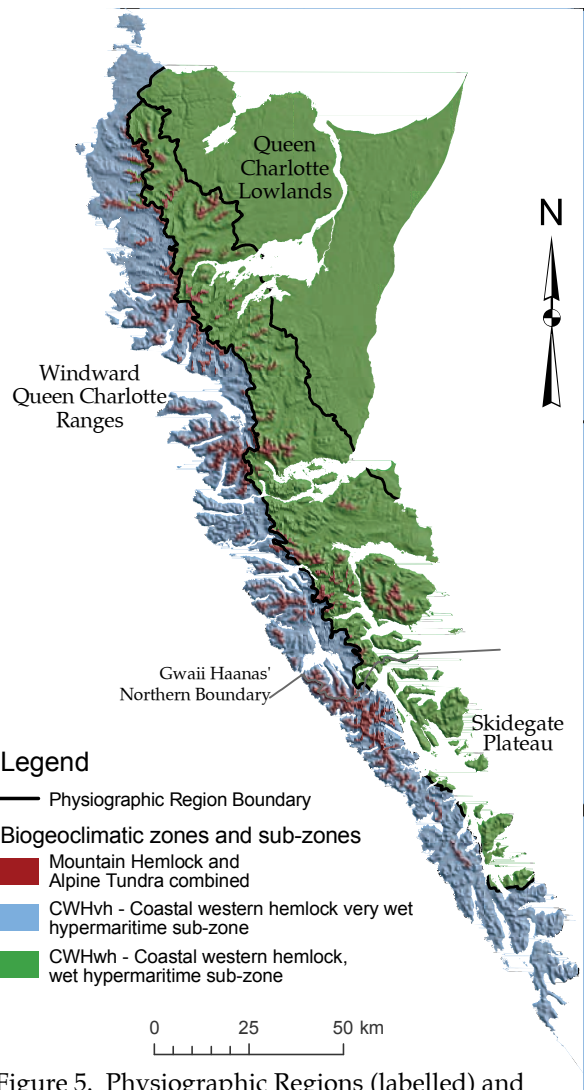


Figure 5. Physiographic Regions (labelled) and Biogeoclimatic zones and subzones of Haida Gwaii. Data from Research Branch, British Columbia Ministry of Forests.

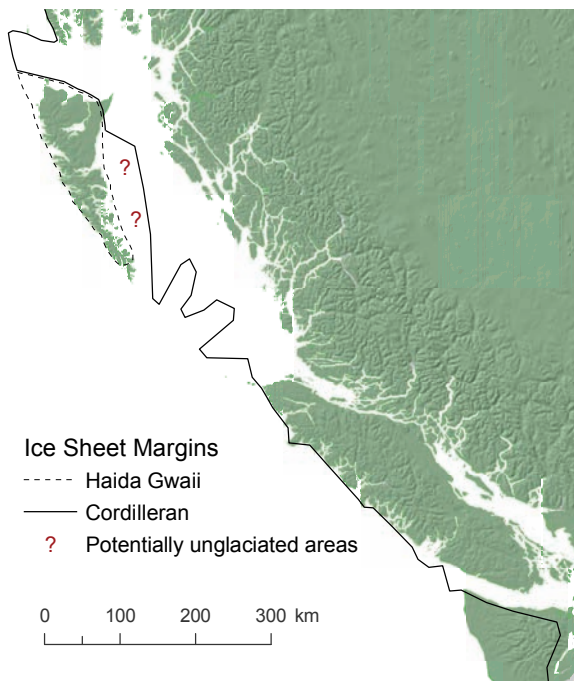


Figure 6. Possible Ice Sheet margins at maximum extent (from Sloan 2006). Considerable uncertainty exists as to the seaward extent of the ice margins.

Haida Gwaii exhibited a cool tundra-like environment from 16,000 to 13,000 BP. Vegetation was dominated by herbs, grasses and dwarf willow. The earliest evidence of forest development is on the west coast where pine was present by 13,000 BP. Open pine parkland was gradually replaced by open spruce parkland around 11,000 BP. During 10,600 to 10,000 BP, the climate became cool

to cold resulting in lowered treelines and an increase in herb and shrub vegetation. After this time, environmental conditions ameliorated rapidly and closed western hemlock-spruce forests became dominant. During the relatively warm period between 9,500 to 7,000 BP, treelines rose to elevations considerably above those of today. Cool, wet conditions, similar to now, developed 6,000 BP and red cedar (*Thuja plicata*) arrived about 5,000 BP.

Contemporary with these rapid changes in climate and ecology were rapid changes in sea level. The relative position of sea level around Haida Gwaii is poorly known for the early post-glacial period of 16,000 to 12,500 BP. The shoreline was somewhat lower than present day and then fell to at least 150 m below the current level by 12,500 BP (Figure 7). After 12,000 BP, sea level began to rise and reached modern levels by 9,400 BP and its highest point (15 m above modern) by 9,000 BP. Relative sea level remained 15 to 14 m above modern until ~5,000 BP and then fell gradually to its modern position.

Although Gwaii Haanas is largely a wilderness, its EI is greatly influenced by that human folly common to island ecosystems - introduced species. The introduction of predatory mammals such as rat (*Rattus* spp.), racoon (*Procyon lotor*) and the herbivore Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) have had great effects as documented in detail by the Research Group on Introduced Species in which Gwaii Haanas plays a key role (Gaston et al. 2007). Rats likely came with early European visitors and racoons were

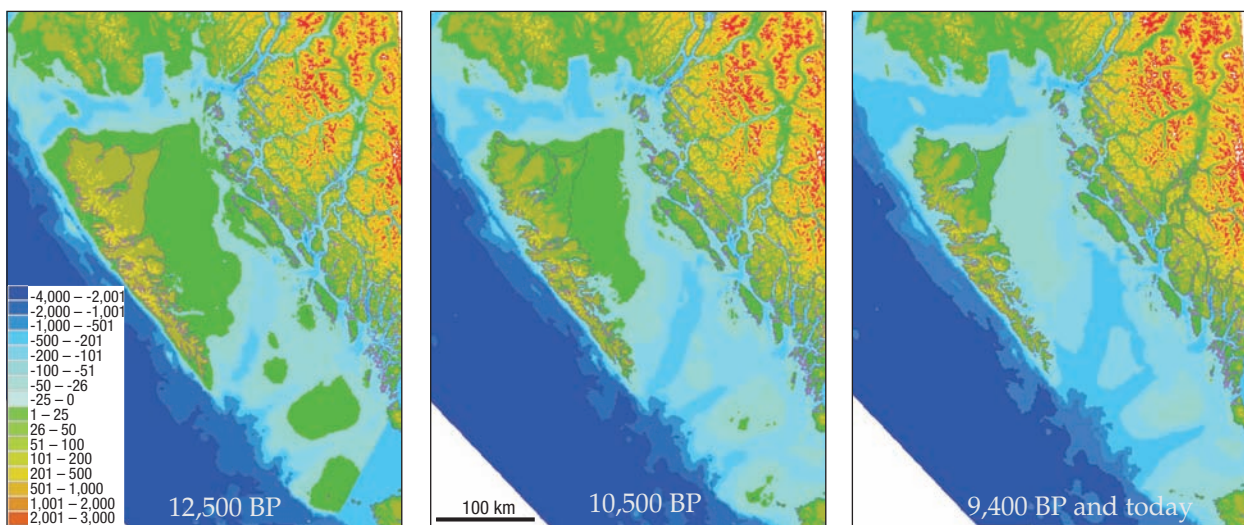


Figure 7. Haida Gwaii and Hecate Strait proposed shoreline configuration according to different dates in years before present (BP) (courtesy of D. Fedje and G. MacMillan, Parks Canada). Colour legend is in metres above and below sea level at those dates.

introduced in the mid-20th century for the fur trade. Substantial populations of both species prey particularly on ground-nesting sea birds and have been implicated in major declines their populations (Harfenist et al. 2002). Similarly, deer were introduced in the late 19th century and are well established throughout Haida Gwaii. Deer have significantly altered the terrestrial plant ecosystem through over-browsing of vegetation, including many species traditionally important to the Haida (Gaston et al. 2007).

The Gwaii Haanas II, a 18.5 m, 60 ton displacement “Reef Class” coastal patrol vessel, is the largest ship in Parks Canada’s fleet (Figure 8). The vessel, managed by our Technical Services group, plays a key role in many programs, including logistical support for management, visiting researchers, the Watchman program and emergency response.

2.2 Cultural

Parks Canada has played a leading role in understanding the 12,000 years of confirmed human occupation of Haida Gwaii (Fedje et al. 2001; Fedje and Mathewes 2005). Indeed, Haida Gwaii is important to theories about coastal human migration to North America from northeastern Asia 14,000 to 10,000 BP (Mandryk et al. 2001). The Haida Gwaii coast is very archaeologically rich - Gwaii Haanas alone has over 600 coastal archaeological locations recorded in our GIS. Interior areas, however, are less well inventoried. This inland cultural resource knowledge gap is gradually being addressed, mainly by working with academic partners. Cooperative research with interdisciplinary academic and professional



Figure 8. The Gwaii Haanas II, tied up at Ellen Island Operations Station opposite Rose Harbour, with other operations vessels during the summer field season.

partners is also fostering integration of the archaeological record with environmental history.

The pre-historic cultural history of Haida Gwaii is divided into the following four eras, based primarily on stone tool technology: (1) Kingii Complex (before 9,000 BP), (2) Early Moresby Tradition (8,900 to 8,000 BP), (3) Late Moresby Tradition (8,000 to 5,000 BP), and (4) Graham Tradition (5,000 to 200 BP) divisible into early and late components (Fedje and Mathewes 2005).

Parks Canada has supported archaeological studies of the early (transitional) contact era (Orchard 2007). Preliminary results indicate that Haida economic adaptations changed during the early contact period as revealed from the contact-era sites. Faunal and floral remains revealed a late pre-contact environmental baseline that aids understanding ecological changes that occurred in Gwaii Haanas after contact.

The first recorded European (Spanish) contact occurred in 1774, and led to trade with a dramatic shift in the Haida’s economy. Parks Canada has reported on American and British traders’ demand for sea otter (*Enhydra lutris*) pelts (for the China market) that greatly increased hunting by the Haida from the 1790s to about the 1840s (Dick 2005). This was part of the maritime fur trade on the northwest coast of North America and the main focus of contact between Europeans and coastal First Nations for the next 50 years. By the late 19th century, sea otters were extirpated coast-wide including Haida Gwaii. Surviving ships’ logs and archaeological evidence record the earliest visits by Europeans, which brought desired trade goods to the Haida but also disease epidemics that decimated their populations in the 19th century. The removal of sea otters, a keystone predator within kelp forest ecosystems, likely had a major ecological effect along the archipelago’s coast (Sloan 2006; Orchard 2007).

Parks Canada has also recorded settlers’ (post-contact) history in Gwaii Haanas from the 19th to the late 20th centuries (Morton 1992; Dick and Sumpter 2000). Mining, fish processing and logging brought social and ecological changes, including employment for Haida workers. This was especially the case with forest industry logging in the Gwaii Haanas area (Figure 9). Indeed, it was a dispute over logging that precipitated the national park’s establishment in 1988 (E. May 1990). As well, the Rose Harbour whaling station (and its Graham Island counterpart at Naden Harbour), commissioned the slaughter of over 8,100 whales between 1910 and 1943 (Heise et al.

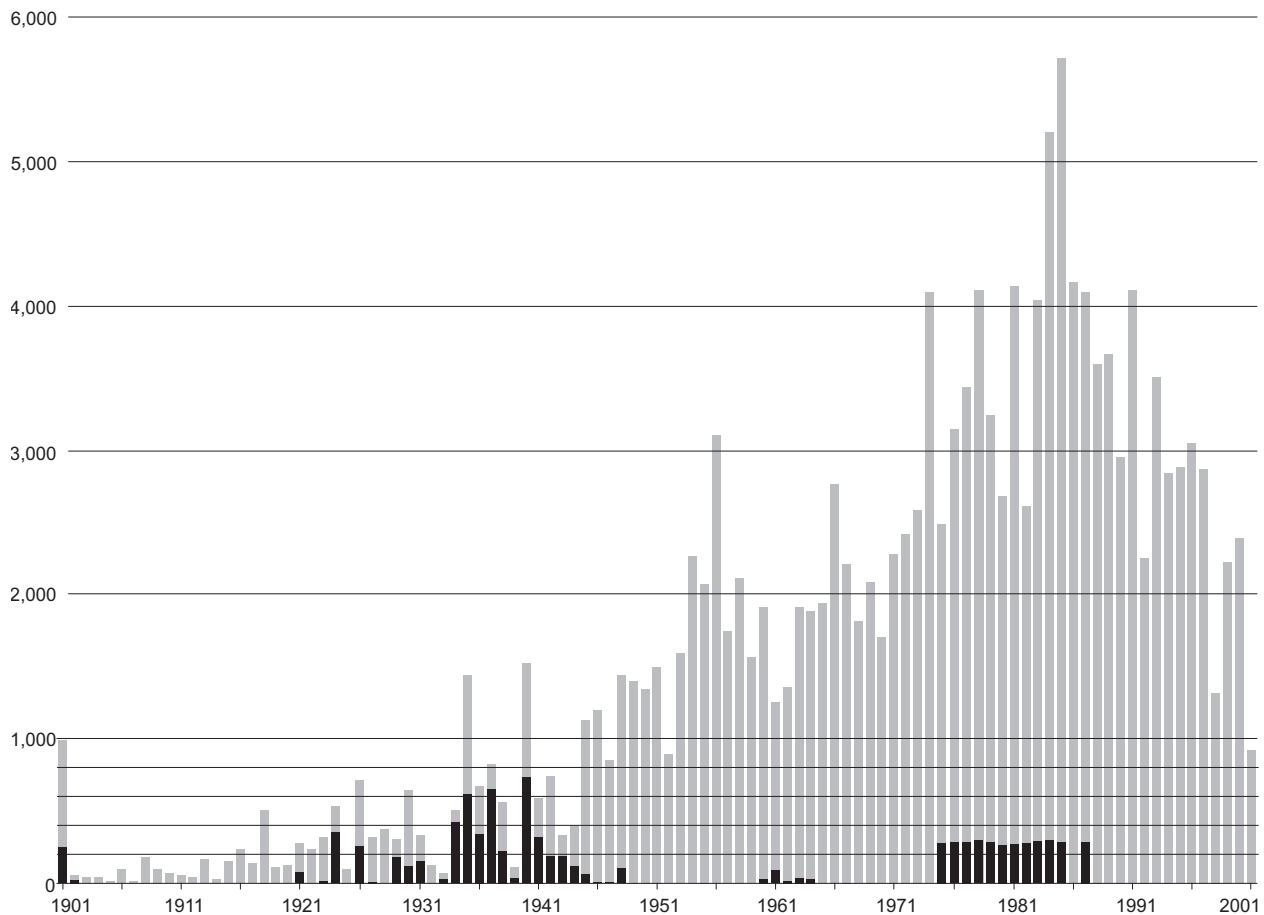


Figure 9. The area in hectares of Haida Gwaii logged each year from 1901 to 2001 (data courtesy of the Gowgaia Institute). Grey bars are all of Haida Gwaii – black bars are Gwaii Haanas area only.

2003). Industrial activity also brought members of other cultures to Haida Gwaii, including European, Japanese, and Chinese workers.

Canada has entered a new era of natural resource management that recognizes traditional Aboriginal knowledge as a key consideration. Berkes (1999) defines this knowledge as: “A cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission (usually oral), about the relationship of living beings (including humans) with one another and with their environment.”

Traditional Haida knowledge remains insufficiently represented within the total knowledge mix needed to underpin Gwaii Haanas’ decision-making over the long-term. Traditional Haida knowledge is complementary to western science, and both can form layers in a GIS. Gwaii Haanas is actively fostering recording such knowledge and we have made a start with the Haida place names project as

shown in Figure 10. A major cruise with Haida Elders into Gwaii Haanas for place-name and traditional knowledge gathering was completed in June/July of 2007. Thus, efforts are under way to record the knowledge of living Haida Elders and we will also assess audiotapes of deceased Elders. Accordingly, for the next SoPR (2012), we aspire to have traditional knowledge help support conclusions, where appropriate, from our monitoring program.

3. STATE OF ECOLOGICAL INTEGRITY

Respecting the Pacific Coast Bioregion, Gwaii Haanas’ monitoring program uses measures within the following indicator ecosystems:

- **Forest** - coniferous rainforest from the sub-alpine to the shoreline;
- **Non-forested** - alpine and sub-alpine highland tundra;
- **Lake and Wetland** - lakes, ponds and freshwater wetlands at all elevations;



Figure 10. Preliminary draft map of Haida place names for the eastern portion of Houston Stewart Channel, courtesy of the Skidegate Haida Immersion Program. Below Haida names, if known, are English translations in italics, followed by gazetted names in brackets, if known.

- **Stream, River and Estuary** - all water courses and marine-influenced wetlands;
- **Shoreline** - rocky to sedimentary shores at the land-sea interface;
- **Marine** - combines “intertidal” and “subtidal” Bioregional indicators, extending from the high tide line into the deep-sea; and
- **Park-wide** - measurements relevant across all ecosystems including species at risk and introduced species.

Each indicator ecosystem has between one to eight measures (total of 24 reported on here) used to assess Gwaii Haanas’ EI. A monitoring program is under development to enable reporting reliably on each indicator. As the total monitoring program is not yet fully operational, this SoPR is based on interim measures. The biodiversity, process and stressor measures are listed according to each indicator ecosystem in Table 3.

This section recounts the relevance, thresholds and assessment for the monitoring measures within each indicator ecosystem. Condition status (poor, fair, good, unknown) and

trend (deteriorating, stable, improving, unknown) are assigned to each measure.

3.1. Forest

3.1.1. Vascular Plants

Status: Poor

Trend: Deteriorating

Relevance: Gwaii Haanas’ low-elevation forests fall within the coastal western hemlock biogeoclimatic zone (Figure 5). Forests on the leeward (east) side (zone code: CWHwh) are classic coastal rainforest, dominated by large western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*) and red cedar (*Thuja plicata*). Along the windward west and south coasts, extreme exposure makes these forests more boggy and stunted (code: CWHvh). As an isolated marine archipelago, Haida Gwaii is home a unique insular biota, with for example, endemics (species not occurring elsewhere). Introduced deer have greatly influenced the vegetation structure and composition in forests (Gaston et al. 2007).

Table 3. Summary of Ecological Integrity measures for Gwaii Haanas according to indicator ecosystem.

Indicator Ecosystem	Biodiversity	Process	Stressor
Forest	<ul style="list-style-type: none"> • Vascular plants • Marbled Murrelet 	<ul style="list-style-type: none"> • Forest insects and diseases • <i>Forest structure</i>¹ 	<ul style="list-style-type: none"> • Non-native plants • Introduced deer • Human footprint
Non-forested	<ul style="list-style-type: none"> • <i>Vascular plants</i> 	<ul style="list-style-type: none"> • Extent of the alpine 	<ul style="list-style-type: none"> • <i>Non-native plants</i> • Introduced deer
Lake and Wetland	<ul style="list-style-type: none"> • <i>Vascular plants</i> • Western toad 	<ul style="list-style-type: none"> • <i>Extent of wetlands/lakes</i> 	<ul style="list-style-type: none"> • <i>Non-native plants</i> • <i>Introduced deer</i> • Non-native amphibians
Stream, River and Estuary	<ul style="list-style-type: none"> • Spawning salmon • <i>Benthic invertebrates</i> 	<ul style="list-style-type: none"> • Water quality • <i>Riparian land cover</i> 	<ul style="list-style-type: none"> • Not measured
Shoreline	<ul style="list-style-type: none"> • Black Oystercatcher • Colony-nesting seabirds • Peale's Peregrine Falcon • Steller sea lion • <i>Bat maternity colony</i> 	<ul style="list-style-type: none"> • Coastal erosion 	<ul style="list-style-type: none"> • Raccoons on seabird islands • Invasive plants • Visitor effects at campsites
Marine (Intertidal and Subtidal)	<ul style="list-style-type: none"> • CHAP² (Fish Assemblage Assessment) • Spawning Pacific herring 	<ul style="list-style-type: none"> • CHAP (Environmental Assessment) • CHAP (Eelgrass Health Assessment) 	<ul style="list-style-type: none"> • CHAP (Anthropogenic Disturbance Index)
Park-wide	<ul style="list-style-type: none"> • <i>Species at risk</i> 	<ul style="list-style-type: none"> • Not measured 	<ul style="list-style-type: none"> • Non-native mammals

1 measures not assessed in this SoPR are in *italics*, although detailed information is available from the Technical Compendium

2 CHAP (Coastal Health Assessment Program), that uses eelgrass meadows as the biological sentinel, has four measures

Thresholds: The EI metrics for plants are species richness, percent cover in various strata, and percentage similarity. Thresholds for these metrics have not yet been established.

Assessment: To assess status and trend, we used permanent vegetation plots established on Kunga Island and at Louscoone Point. Plants in forested ecosystems are in "poor" condition because of browsing by introduced deer (Section 3.1.3). While species richness and percent vegetation cover are both quite stable, percentage similarity analyses indicate that both the composition and structure of the vegetation community continue to change (Figures 11 and 12). These trends are consistent for both the CWHwh and CWHvh forests. Following the precautionary approach, the trend of forested ecosystems is "deteriorating." We stress, however, that where deer have been excluded (through culling or enclosure) vegetation rebounds are dramatic and ongoing (Gaston et al. 2007).

3.1.2. Non-native Plants

Status: Fair

Trend: Unknown

Relevance: Of all the vascular plant species recorded on Haida Gwaii, approximately

25% of them are not native (Cheney et al. 2007) and new species continue to arrive. Although only a handful of these species are "invasive" (i.e., rapidly expanding and threatening native flora and fauna through competition and habitat alteration), the presence of any non-native plant changes the floristic make-up of the area it colonizes.

Thresholds: The EI metrics for non-native plants are percent cover and species richness. By definition, non-native plants do not naturally

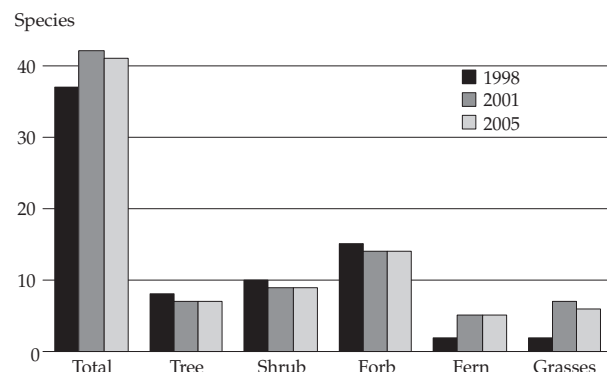


Figure 11. Species richness (total species recorded) of various plant life forms (trees, shrubs, forbs, ferns, grasses) in the 25m radius plots (N=10) at Louscoone Point.

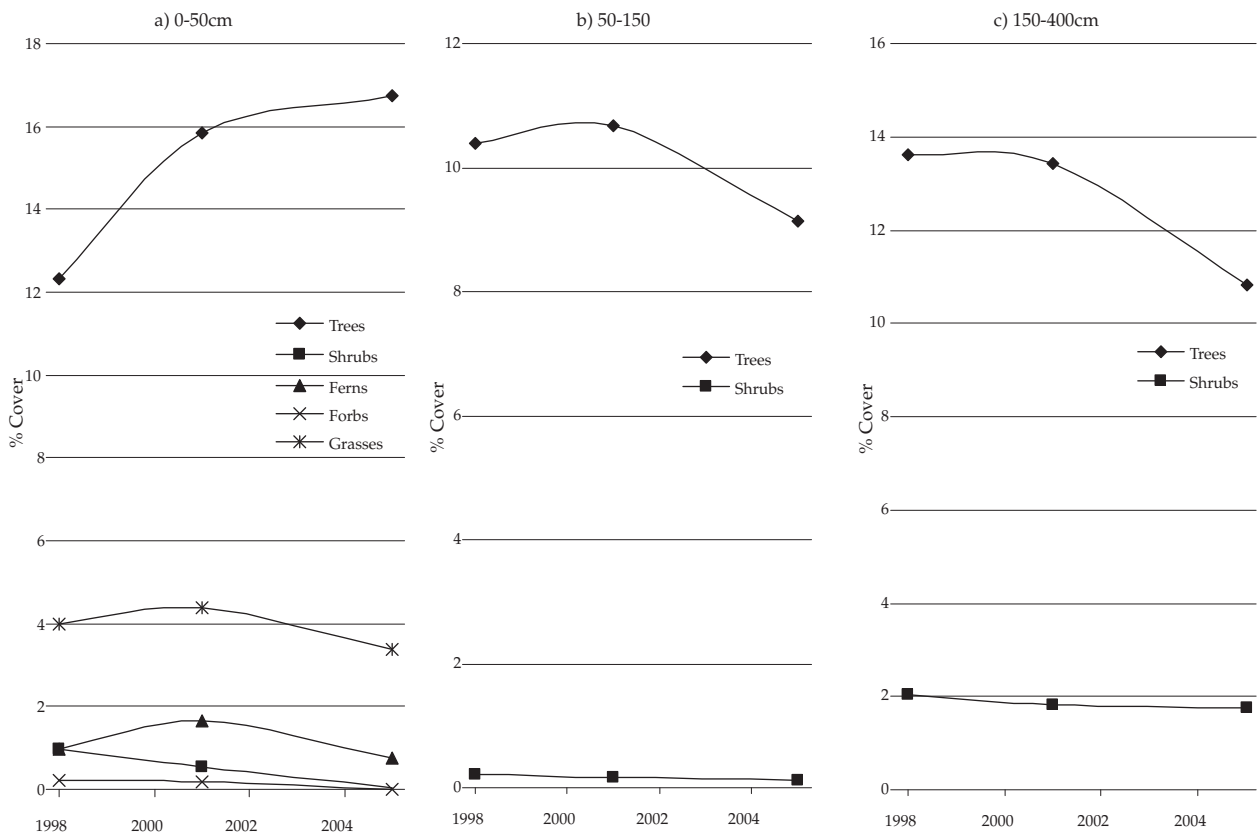


Figure 12. Mean percent cover on Kunga Island of the various plant life forms (trees, shrubs, forbs, ferns and grasses) in 3 strata: a) 0-50 cm, b) 50-150 cm, and c) 150-400 cm (N=40 plots).

occur within these ecosystems. The lower threshold (going from good to fair) is, therefore, set at zero for both percent cover and non-native species richness. The upper threshold (going from fair to poor) has tentatively been set at 10% for cover and 20% for species richness.

Assessment: To assess status and trends, we monitor percent cover and species richness in permanent vegetation plots established on Kunga Island and Louscoone Point. Very few non-native plants have become established in the undisturbed forested areas of Gwaii Haanas. To date, no non-native plants have been recorded in the smaller percent cover plots at either site. At Louscoone, there were no non-native plants found in the larger species richness plots. At Kunga, however, non-native species represent between 5 to 9 % of the total plants recorded in the species richness plots. In the most recent survey (2005), 5.1% of the species found were non-natives. Following the precautionary approach, we assess the overall status for non-native plants in forested ecosystems to be "fair," based on the metric with the poorest status. With only three years of data in hand, trend analyses cannot yet be run.

3.1.3. Introduced Deer

Status: Poor

Trend: Unknown

Relevance: Sitka black-tailed deer were introduced to Haida Gwaii in the late 1800s. The absence of predators or browsing competitors, coupled with the area's mild winters and abundant food sources, left the deer with few population constraints. Accordingly, the deer population expanded and spread unchecked until it colonized all but the most remote islands. The presence of deer has had a strong effect on vegetation, modifying plant structure and species composition. These changes affect ecosystem function, leading to indirect effects via habitat modification (Gaston et al. 2007). Because they have such a diversity of impacts and exert control on ecosystem properties, deer now play a key role in forested ecosystems. The effects of deer browsing also have cultural implications; firstly as many plant species affected are significant to the Haida, and secondly as deer are an abundant hunting resource archipelago-wide (Gaston et al. 2007).

Thresholds: Our EI metrics for deer effects on forest vegetation are species richness, percent vegetation cover, and percentage similarity. We may include pellet count density, but further assessment is needed. Because deer are not native to Haida Gwaii, EI for this measure would be assessed in good condition only when no deer or their effects were recorded. A second threshold (going from fair to poor) has not yet been determined.

Assessment: For our analyses, we compared data collected in 2005 from vegetation plots (15m x 15m) inside versus outside exclosures at Kunga Island (N=3 exclosures/control pairs) and Louscoone Point (N=3) (Figures 13 and 14). Deer effects in forested ecosystems are assessed as “poor”, based on these analyses and the abundance of research (e.g., Gaston et al. 2007) demonstrating the profound and far-reaching effects of deer on forest plants and animals. However, we currently have no information on the trend in deer populations in Gwaii Haanas so the trend is, therefore, “unknown.”

3.1.4. Forest Insects and Diseases

Status: Good

Trend: Unknown

Relevance: Because of their economic importance to commercial forests, outbreaks of insect defoliators have been monitored by the federal Canadian Forest Service (CFS) around Haida Gwaii since the 1930s. Two of the 40 recorded insect pest species have regularly caused significant defoliation. Outbreaks of the western blackheaded budworm (*Acleris gloverana*), which preferentially feeds on new foliage of hemlock and spruce, cause defoliation for about three years. Coincident with the last two budworm outbreaks, the western hemlock sawfly (*Neodiprion tsugae*), which feeds on old

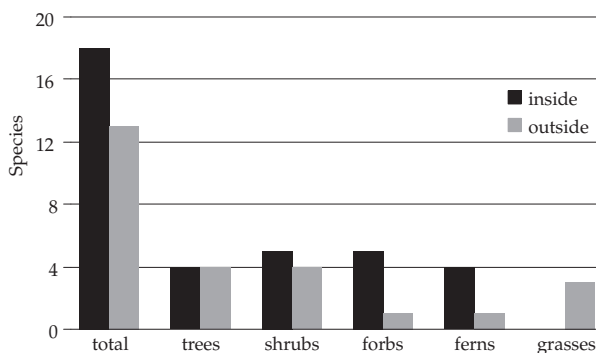


Figure 13. Species richness (total number of species recorded) of various plant life forms in plots inside and outside exclosures at Louscoone Point.

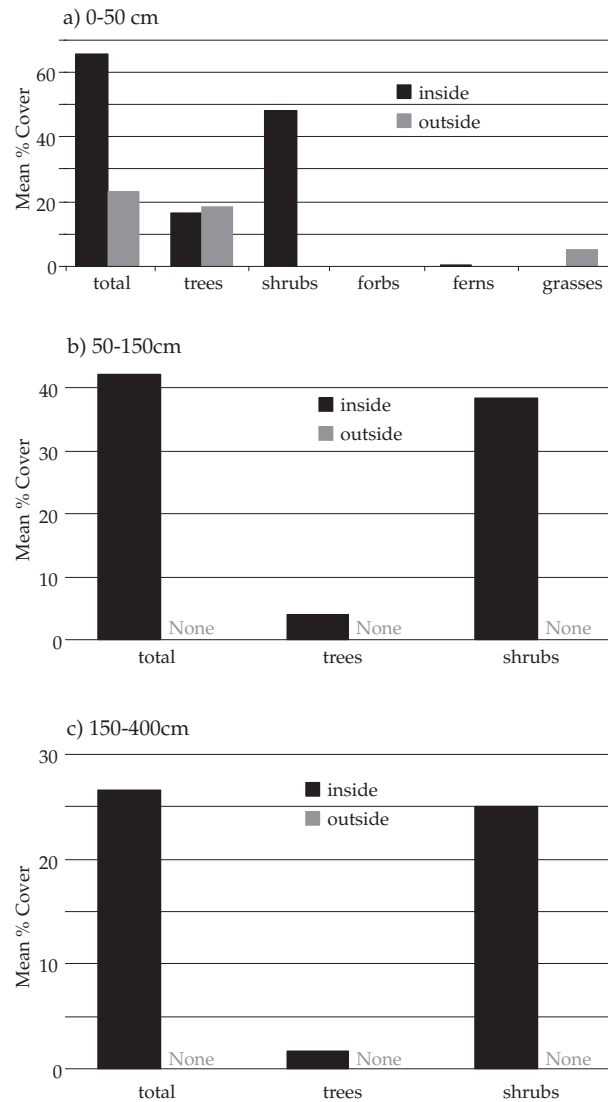


Figure 14. Mean percent cover found inside and outside 3 exclosures on Kunga Island. Percent cover is shown for the various plant life forms (trees, shrubs, forbs, ferns, grasses) in 3 strata: a) 0-50 cm, b) 50-150 cm, and c) 150-400 cm.

foliage of conifers, reached epidemic levels. These two pests together resulted in higher mortality of defoliated trees, and a significant reduction in tree growth. As well, the last two outbreaks have been more prolonged than previous ones. Although no defoliation was recorded in 2006, many adult budworm moths were captured in pheromone traps, suggesting that the next outbreak may be imminent.

Thresholds: The EI metrics proposed for monitoring this measure are the return interval for outbreaks, the duration of outbreaks, the extent of defoliation, and the extent of gray area after the outbreak. As accurate data are only

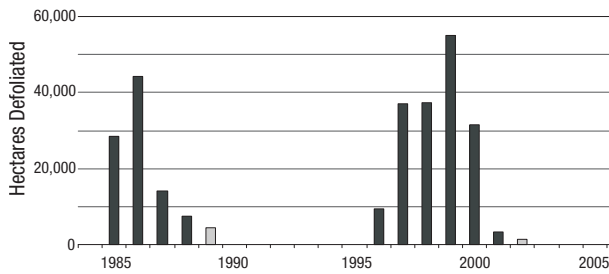


Figure 15. Extent of defoliation of coniferous forests on Haida Gwaii by western blackheaded budworm and hemlock sawfly, 1984 to 2006 (data courtesy of Canadian Forest Service). Gray bars at the end of each cycle represent the extent of forests that suffered extensive mortality or top-kill.

available for the last two outbreaks (Figure 15), it is not possible to establish thresholds.

Assessment: The status of this measure is “good.” Although there continue to be large defoliation events, these are natural occurrences that seem to fall within the biotic range of intervals and extent. The trend is “unknown” as there are insufficient time-series data.

3.1.5. Marbled Murrelet

Status: Fair

Trend: Unknown

Relevance: Marbled Murrelet (MAMU - *Synthliboramphus marmoratus*) is a high profile species in current land use planning coast-wide, including Haida Gwaii, because the fate of this species is linked directly to commercial forest practices. MAMU are unique among seabirds in their non-colonial nesting on thick, moss-covered limbs of large, old-growth trees. Primarily because of nesting habitat loss due to logging, MAMU is federally listed as *Threatened*. Approximately 40% of prime nesting habitat on Haida Gwaii has already been logged (Holt 2004). Species recovery will require identification and protection of prime nesting areas. Further, baseline population and density measurements are needed to monitor species recovery and effectiveness of management actions.

Threshold: The EI metric for MAMU is nesting density at monitoring sites. There is no density threshold for nesting MAMU deemed ideal by the Canadian Wildlife Service (CWS). However, preliminary data indicate that nesting densities coast-wide tend to cluster into two groups with Haida Gwaii and the west coast Vancouver Island supporting higher densities per hectare of suitable habitat than the rest of the British Columbia coast.

Assessment: The specialized (radar) monitoring methods and locations are in hand towards a baseline. However, the trend is “unknown,” being not yet detectable from the first two years (2004 and 2005) of monitoring whose long-term goal is detecting a 1% population change within the monitoring period. However, based on models of habitat change from 1800 to 2000 in the MAMU section of the Environmental Conditions Report (Holt 2004) for the Haida Gwaii Land Use Plan (HG/QCI 2005), MAMU habitat has declined in Gwaii Haanas, primarily in the Lyell Island Landscape Unit. Most of the other Landscape Units within Gwaii Haanas have experienced only limited decreases in suitable habitat. Reasoned speculation is that MAMU populations have declined over the last 200 years at least in the north end of Gwaii Haanas. The other main threats to MAMU are depletion of their marine food resources and exposure to contamination by spilled oil. Evidence from other species of related (alcid) seabirds suggests that the Haida Gwaii birds are not experiencing the same food shortages as are those nesting along the southern British Columbia coast. Exposure levels of Gwaii Haanas’ MAMU to oil contamination are unknown. Hence, overall status is “fair.”

3.1.6. Pre-establishment Human Footprint

Status: Fair

Trend: Improving

Relevance: The human footprint from activities occurring before establishment of Gwaii Haanas has significantly affected the land (Figure 16). Such disturbances damage wildlife habitat, fragment the landscape and act as vectors for the introduction and spread of non-native species. Cleared forest has led to a high incidence of slope failure, and mining has left numerous small and one large long-lasting footprint on the landscape. Other activities, occupying relatively small areas, include canneries/salteries, a whaling station, trails, and a lighthouse/weather station (Section 6.2).

Thresholds: EI metrics and thresholds for these past activities were not developed.

Assessment: In Gwaii Haanas 9,017 ha have been logged, representing 6.1% of the total land base. Logging has not occurred since 1987 and forests are regenerating. Although the areas first logged, about 100 years ago, have recovered visually, it will take centuries to complete the succession to climax old-growth forests. Further, browsing by introduced deer (Section 3.1.3.) means that forest regeneration can only occur to some deer-infested

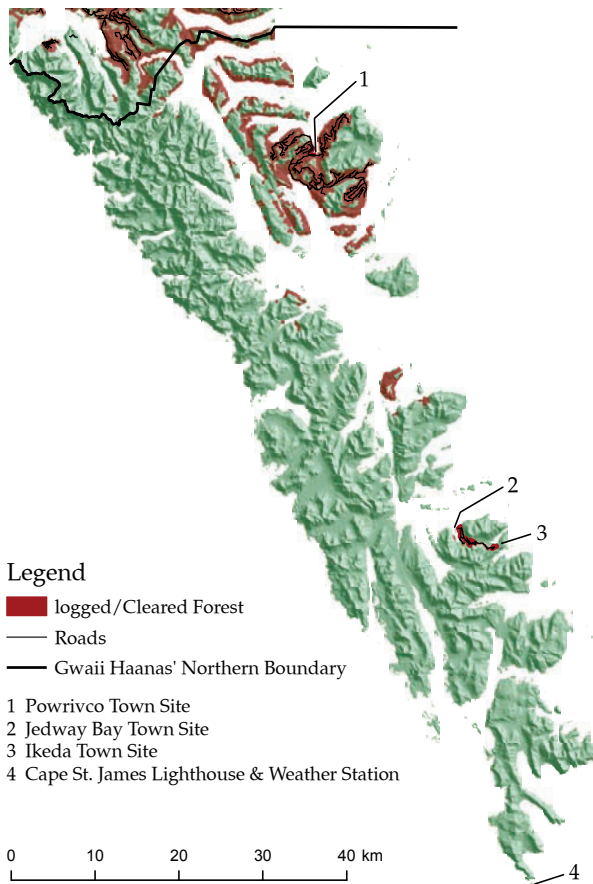


Figure 16. The human footprint in Gwaii Haanas from pre-establishment activities.

state. The status of the footprint is, therefore, “fair.” Two large producing mines (Jedway/Ikeda) and 10 smaller producing mines have operated in Gwaii Haanas. The smaller mines have left small but long-lasting changes to the landscape such as shafts, trenches and adits. The large mines have left large and permanent changes to the landscape including excavations, unstable tailing slopes, acid rock drainage, and heavy metal accumulations (Golder Associates 2003). The scale and seriousness of the Jedway/Ikeda mine area environmental degradation warrants attention although this site remains within a “Mineral Exclusion” area within Gwaii Haanas (Figure 17). Some sites have been decommissioned and restored. Lyell Island, which was clear-cut logged in the 1970s and 1980s, has undergone restoration (planted trees, decommissioned roads/culverts). The town site of Powrivco and the Cape St James lighthouse/ weather station have been decommissioned. Overall, therefore, the trend is “improving.”

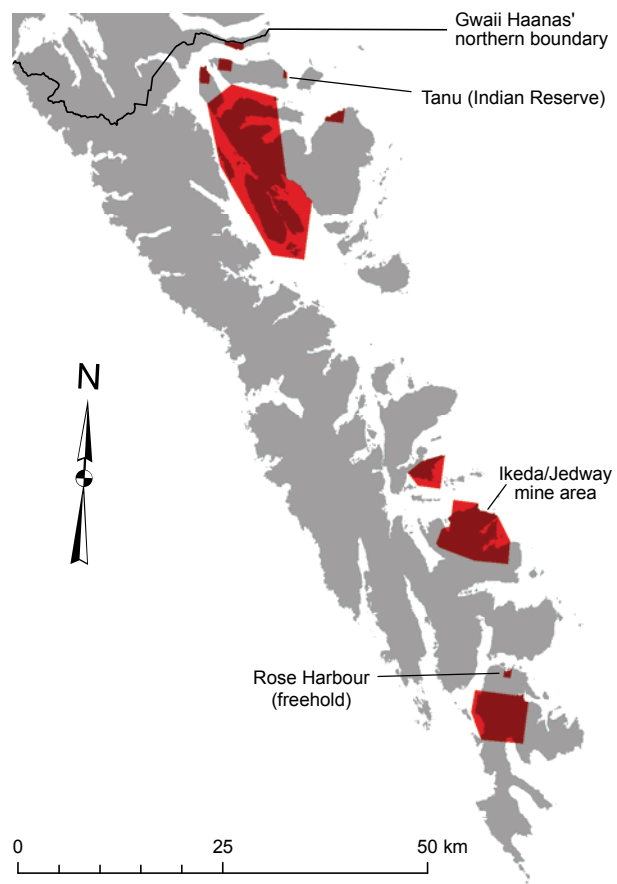


Figure 17. Areas legally excluded from Gwaii Haanas in 2000 (Canada Gazette 2000). Note that some excluded areas have a marine component.

3.1.7. Post-establishment Human Footprint

Status: Good

Trend: Stable

Relevance: The human footprint from activities that continued or began *after* the establishment of Gwaii Haanas includes campsites, trails and minor infrastructure such as Operations Stations, Watchmen camps, Swan Bay Rediscovery Camp, communications towers, Natural Resources Canada seismic stations, Environment Canada weather stations, survey monuments, Canadian Hydrographic Survey boundary markers and aids to navigation. Their individual and cumulative footprints are small, but they can be vectors for introduced species.

Thresholds: EI metrics and their thresholds have not yet been established, but the metrics will likely include length, width and condition for trails, and footprint area for structures.

Assessment: Status is “good” for, although the human footprint is increasing, it is very limited,

subject to environmental assessment, and allowed for in the management plan. The trend is “stable” because infrastructure developments, such as the Huxley Island Operations Station and SGang Gwaay Watchman camp reconstructions, are small and sanctioned. This assessment does not account for the reality that there has been significant restoration at some sites affected by human activities before establishment such as logged lands on Lyell Island.

3.2. Non-forested

3.2.1. Introduced Deer

Status: Poor

Trend: Unknown

Relevance: The effects of Sitka black-tail deer on Haida Gwaii’s forested ecosystems has been dramatic and well documented (Section 3.1.3.). To date, the effects of deer on non-forested (alpine and sub-alpine) areas have not been studied.

Thresholds: The EI metrics for deer have not yet been determined, but may include pellet count densities. However, as deer are not native to Haida Gwaii, EI for this measure will be assessed as good only when no effects of deer are recorded. A second threshold (going from fair to poor) has not yet been determined.

Assessment: Deer effects in non-forested ecosystems are assessed as “poor” based on inferred effects on vegetation generally. Results of a deer pellet group survey conducted in Gwaii Haanas in 2003 indicate that, despite the often inhospitable conditions at higher elevations, deer effects in alpine areas may be nearly as severe as in forested areas (Parker and Burles 2003). The trend is currently “unknown” because there are no estimates of deer abundance or their effects over time.

3.2.2. Extent of Alpine Zone

Status: Unknown

Trend: Unknown

Relevance: The non-forested alpine and sub-alpine tundra of Gwaii Haanas contain numerous rare and threatened plants, including at least one endemic species. Non-forested land is under pressure from advancing treeline as even a small advance could fragment this zone that is restricted to long, thin polygons (Figure 18). As tree growth in this region is closely linked to climate (Smith 1999), ascending treeline due to global warming is a real threat. Browsing by introduced

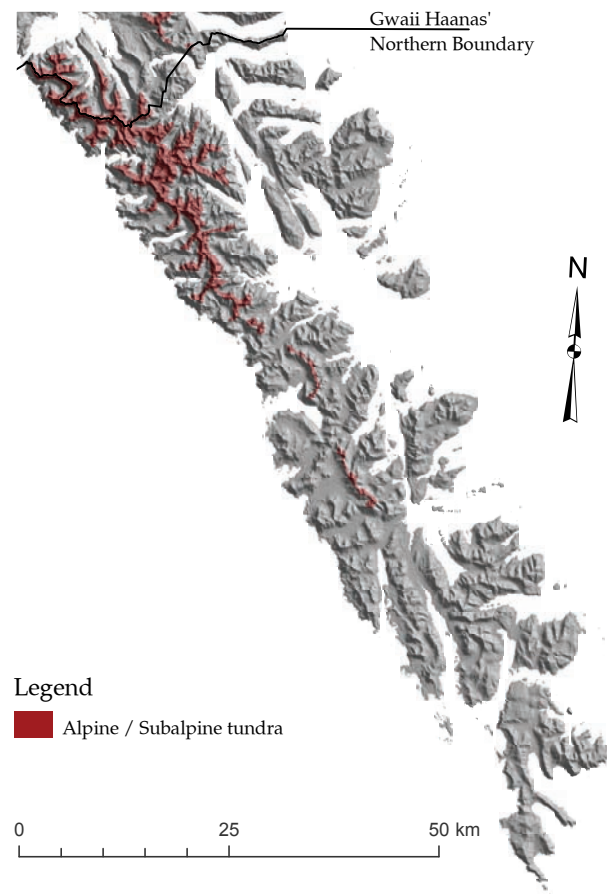


Figure 18. Alpine and sub-alpine tundra in Gwaii Haanas. Data from Research Branch, British Columbia Ministry of Forests. <ftp://ftp.elp.gov.bc.ca/dist/arcwhse/wildlife/> (last accessed May 31, 2005).

deer is also a concern, but it is unknown what effect this will have on the treeline.

Thresholds: Non-forested EI metric(s) and their thresholds will be finalized in 2008 and will likely include area, patch size distribution, patch connectivity and human disturbances. Thresholds would be based on the earliest possible baseline (aerial photography of 1933 to 1937 and 1954 to 1955) from which any measurable decrease would be considered poor.

Assessment: Currently the status and trend of this measure are both “unknown.” The alpine/sub-alpine landscape has been mapped numerous times according to various classification schemes, but because these schemes are at different scales and to different standards, they cannot be used to discern changes over time. The best current mapping of non-forested area for Haida Gwaii is the British Columbia Ministry of Forests’ “Provincial Biogeoclimatic Subzone/Variant Mapping” database at a scale of 1:250,000. According to this data set,

131.6 km² (or 8.9%) of Gwaii Haanas is alpine/sub-alpine tundra. More detailed 1:10,000 mapping for Haida Gwaii is planned by the Province within the next few years using the Provincial Vegetation Resource Inventory (VRI) standard. It should also be possible to apply this standard to past data sets, the earliest of which is aerial photography from the 1930s and 1950s. This scale should provide the detail necessary for monitoring this landscape class.

3.3. Lake and Wetland

3.3.1. Western Toad

Status: Unknown

Trend: Unknown

Relevance: Amphibians are relatively easy to detect, and, because of their reliance on aquatic habitat for breeding, they are a sensitive indicator of decline in aquatic ecosystem health (Heyer et al. 1994). The western toad (*Bufo boreas*) is the only amphibian native to Haida Gwaii, where it is eaten by introduced predators such as raccoon and perhaps in competition with introduced frog species. This toad is federally listed as a *Species of Special Concern*.

Thresholds: The EI metric is the number of active breeding sites, but thresholds are currently undefined.

Assessment: The status and trend are both "unknown." Monitoring began in 2006.

3.3.2. Non-native Amphibians

Status: Good

Trend: Deteriorating

Relevance: Two non-native frogs have been introduced to Haida Gwaii, the Pacific treefrog (*Pseudacris regilla*) and the red-legged frog (*Rana aurora*). Although they have not yet reached Gwaii Haanas, frogs are anticipated to do so within years. The potential effects of these frogs on native ecosystems and the native western toad are unknown.

Thresholds: The EI metric for non-native amphibians is their distribution in Gwaii Haanas. The upper threshold (going from good to fair) is set at "no frogs within Gwaii Haanas" (i.e., no frogs detected = good). The lower threshold is set at "no frogs at toad breeding sites" (frogs detected in Gwaii Haanas, but not at toad breeding sites = fair; frogs detected at toad breeding sites = poor).

Assessment: The status of non-native amphibians is "good" because frogs have not yet colonized Gwaii Haanas. The trend is "deteriorating" (precautionary), because Pacific treefrogs are spreading south on Moresby Island and will likely enter Gwaii Haanas within years.

3.4. Stream, River and Estuary

3.4.1. Spawning Salmon

Status: Fair

Trend: Stable

Relevance: Salmon (*Oncorhynchus* spp.) are critical to Haida Gwaii's future ecologically, culturally and economically. Among the six local salmon species, three (coho, pink, chum) have a commercial history around Gwaii Haanas. A key number for salmon management is "escapement," or the number of adults that escape from predators to spawn in streams. Escapement is the basis of salmon stock assessment and management (Riddell 2004). Commercial takes of spawning salmon only occur if there is a perceived "surplus" of escapement numbers. Along with Pacific herring spawning, salmon escapement data are the oldest annual coastal biological time series for Haida Gwaii. Further, salmon do more to link marine and terrestrial ecosystems than any other marine group.

Thresholds: There is no EI metric or thresholds developed for salmon at this time.

Assessment: The first commercial takes of pink salmon since 1990 occurred in Gwaii Haanas in 2004 and 2006. Also, chum escapement is showing some increases. Therefore, the condition is "fair." The trend is considered "stable" in that recent surveys show some positive change and an even-year resurgence in the commercial pink take. Overall, however, salmon numbers remain well below historical abundance levels.

3.4.2. Water Quality

Status: Good

Trend: Unknown

Relevance: Good quality water, and in adequate quantity, is fundamental to healthy stream ecosystems. Since the establishment of Gwaii Haanas, there has been little human activity in our watersheds.

Thresholds: The EI metric for water quality will be a spatial water quality index similar to that developed by the Canadian Council of

Ministers of the Environment (CCME). The index will be used to assess the quality of water in selected sentinel streams throughout Gwaii Haanas. Thresholds for this measure have not yet been established. While the index is in development, we will assess water quality using individual water quality variables, with thresholds set at the CCME and British Columbia Ministry of Environment established guidelines for the protection of aquatic life (CCME 2006 a,b; Nagpal et al. 2006).

Assessment: In 2006, we sampled 16 streams and analyzed the water for 20 physical and chemical parameters. Only four of these (pH, alkalinity, calcium and nitrogen) have Canadian or British Columbia guidelines. All streams fell within the guidelines for nitrogen (nitrates and nitrites), but 5 streams (31%) fell below the minimum alkalinity guideline, and 7 streams (44%) fell below the minimum guidelines for pH and calcium. Low alkalinity, pH and calcium, however, are not uncommon in coastal areas. All discrepancies from guidelines found at the Gwaii Haanas streams appear to be natural, caused by the geological nature of individual watersheds. Water quality is, therefore, assessed to be in "good" condition. The trend is "unknown" as there are no time-series data.

3.5. Shoreline

3.5.1. Black Oystercatcher

Status: Good

Trend: Stable

Relevance: Haida Gwaii contains about 12% of the global breeding population of Black Oystercatcher (BLOY - *Haematopus bachmani*) (Harfenist et al. 2002). They are a prominent species along the northeast Pacific shorelines and a particularly sensitive indicator of the overall rocky intertidal community health (Tessler et al. 2006). The number of breeding pairs has been monitored in the Laskeek Bay area since 1992. Starting in 2004, the survey area has been extended south into Juan Perez Sound.

Thresholds: The EI metric for BLOY is the number of breeding pairs (bp) per km of shoreline (bp/km) in the study area. The long-term mean, based on data from 1993 to 2006, is 0.84 bp/km (SD = 0.10). Thresholds are set at one and two standard deviations below the long-term average (0.73 bp/km = going from good to fair threshold and 0.63 bp/km = going from fair to poor).

Assessment: The BLOY population in Laskeek Bay appears "stable" and at historic levels (status "good") (Figure 19). Although the number of breeding pairs dipped below threshold levels in 2004, both the 2006 survey and the mean over the last five years remain good.

3.5.2. Colony-nesting Seabirds

Status: Good

Trends: Stable

Relevance: Monitoring began by the Canadian Wildlife Service (CWS) for three burrow-nesting species (Ancient Murrelet [ANMU - *Synthliboramphus antiquus*], Cassin's Auklet [CAAU - *Ptychoramphus aleuticus*], Rhinoceros Auklet [RHAU - *Cerorhinca monocerata*] at five "key" breeding colonies around Gwaii Haanas in 1984 and 1985. The goal was to monitor for estimates of breeding seabird populations using standardized survey techniques to enable detecting long-term population trends and to make between-area comparisons of those populations. These colonies are now in a 5-year monitoring rotation as part of the CWS' coast-wide seabird monitoring commitment (Hipfner et al. 2002). ANMU is federally listed as a *Species of Special Concern*. Only ANMU and CAAU have enough data to enable trend and power analyses.

Thresholds: The EI metric is the number of burrows recorded in permanent monitoring plots. Tentative thresholds are set at 25% (going from good to fair) and 50% (going from fair to poor) below the lowest number of burrows recorded to date.

Assessments: We have no reason to believe that the number of burrows recorded during ANMU or CAAU colony surveys falls outside the range expected. Status is, therefore, "good."

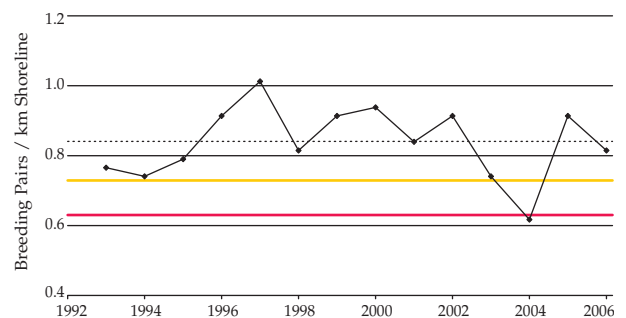


Figure 19. Black Oystercatcher breeding pairs per km of shoreline recorded in the Laskeek Bay study area between 1993 and 2006. Thresholds are indicated as one (yellow line) and two (red line) standard deviations below the long-term average (dotted line).

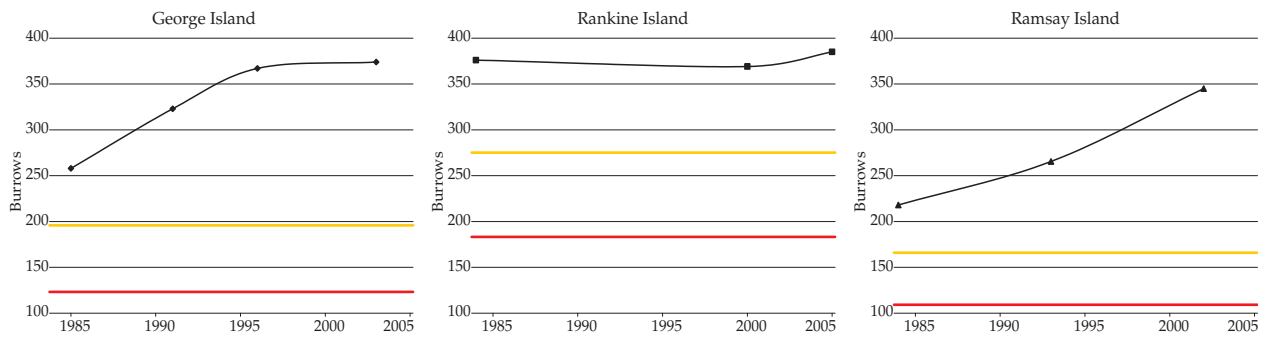


Figure 20. The total number of Ancient Murrelet burrows recorded in the monitoring plots on George, Rankine and Ramsay Islands, 1984 to 2005. The upper and lower thresholds are shown in yellow and red, respectively (data courtesy of the Canadian Wildlife Service).

The sampling interval for ANMU has been variable, ranging from 5 to 16 years (mean = 8.3 years) shown in Figure 20. While the number of burrows has remained stable on Rankine Island, on Ramsay and George Islands a significant increase was recorded between the two most recent surveys, 1993 and 2002. The sampling interval for CAAU has been variable, ranging from 5 to 16 years (mean = 9.7 years) shown in Figure 21. While the number of burrows has remained stable on Ramsay and East Copper Islands, it has decreased on Rankine Island. On Rankine Island, a significant decrease was recorded between the 1984 and 2000, after which the number of burrows stabilized. Overall, the trend is “stable” for both species.

3.5.3. Peale’s Peregrine Falcon

Status: Good

Trend: Stable

Relevance: Gwaii Haanas contains almost half of Peale’s Peregrine Falcon’s (*Falco peregrinus pealei*) recorded territories around Haida Gwaii. The archipelago accounts for 60 to 70% of the total British Columbia population (Harfenist et al. 2002). This raptor specializing on seabirds

is now federally listed as a *Species of Special Concern*. The species is a focal point for Canada-British Columbia cooperation in monitoring.

Thresholds: The EI metric is the number of occupied territories (with eyries [nests] counted every 5 years) around Haida Gwaii. The number of occupied territories has remained relatively unchanged since monitoring began in 1971. We set tentative thresholds at 1 (going from good to fair) and 2 (going from fair to poor) standard deviations below the historic mean. With a historic mean of 69.1 occupied territories (sd = 8.7), the tentative thresholds are 60 (upper) and 52 (lower) occupied territories.

Assessment: The status is “good.” The trend in the number of occupied territories since 1971 is “stable” (Figure 22).

3.5.4. Steller Sea Lion

Status: Good

Trend: Improving

Relevance: Gwaii Haanas contains a major northeast Pacific breeding rookery at Cape St. James (and three year-round haulouts)

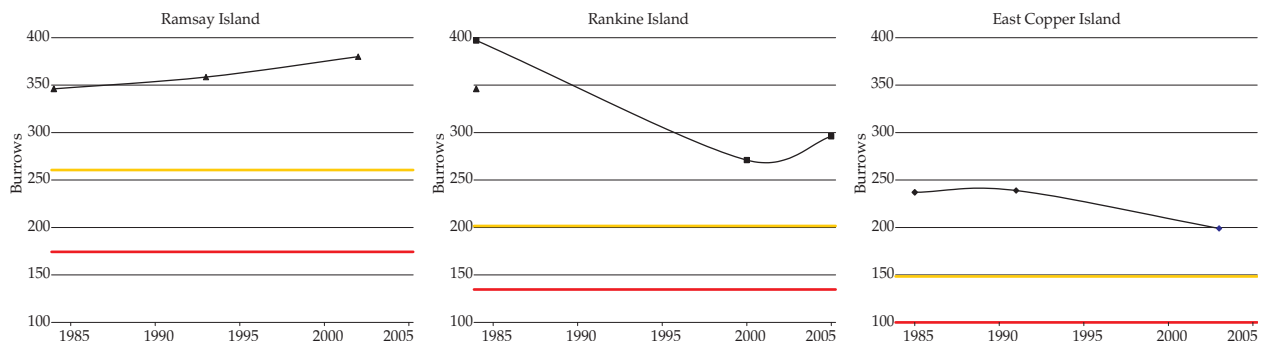


Figure 21. The total number of Cassin’s Auklet burrows recorded in the monitoring plots on Ramsay, Rankine and East Copper Islands, 1984 to 2005. The upper and lower thresholds are shown in yellow and red, respectively (data courtesy of the Canadian Wildlife Service).

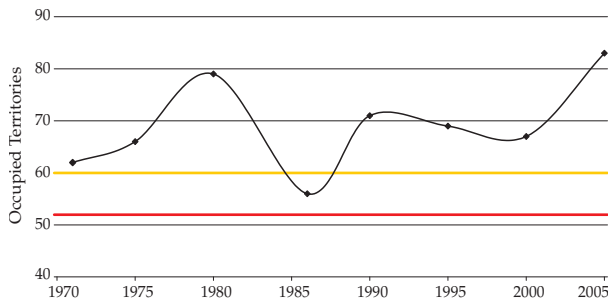


Figure 22. The number of occupied Peale's Peregrine Falcon territories recorded for all of Haida Gwaii, 1971 to 2005. The upper and lower thresholds are shown in yellow and red, respectively.

occupied by the large fish predator Steller sea lion (*Eumetopias jubatus*) now listed as a *Species of Special Concern* (Heise et al. 2003). This is a very high profile species throughout the North Pacific as some populations have been in decline, especially in western Alaska (Guénette et al. 2006).

Thresholds: The EI metric for Stellar sea lions is the number of individuals counted (every 4 years) at the sites. The number of sea lions recorded during the rookery surveys does not fall outside the range expected. We set tentative thresholds at 25% (going from good to fair) and 50% (going from fair to poor) below the lowest total count recorded to date. With a minimum total count of 831 recorded in 1973, this corresponds to an upper threshold at 623 and a lower threshold at 416.

Assessment: The status is "good" and the trend is "improving" (Figure 23). There has been a significant increase in the numbers at the rookery since surveys began in 1971. This is true for

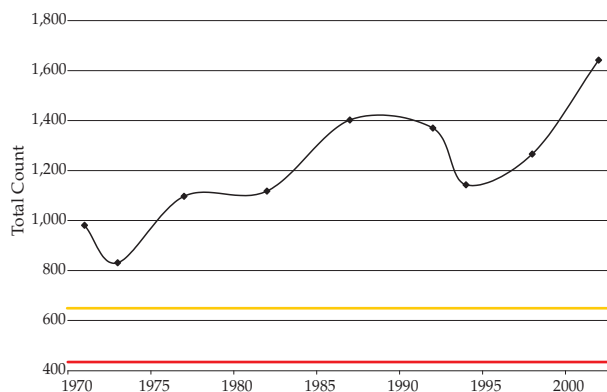


Figure 23. The total number of Steller sea lions (pups and non-pups) recorded at the Cape St. James rookery, 1971 to 2002. The upper and lower thresholds are shown in yellow and red, respectively.

the total count (pups + non-pups), non-pups (animals older than six months) and pups.

3.5.5. Coastal Erosion

Status: Fair

Trend: Deteriorating

Relevance: The coastal zone is Earth's most dynamic biophysical system, within which the effects of climate change (e.g., rising sea level, increased incidence of violent storms) will be enormous (Harley et al. 2006). Shorelines naturally strive to attain a form in balance with wind, wave, tidal and sea level regimes. The Haida Gwaii coastal zone is a linkage of terrestrial and marine ecosystems and landforms that are undergoing climate change-driven alteration (Sloan 2006; Walker and Barrie 2006). The first phase of a 5-year (2006 to 2011) monitoring project of key geoindicators linked to coastal erosion and climate change effects within Gwaii Haanas is completed (Walker 2006). This program is part of a Pacific Bioregional initiative with Pacific Rim and Gulf Islands national parks to address several key Parks Canada "geoindicators" (Welch 2002) for climate change effects monitoring.

Thresholds: There is only one year (2006) of data, so EI metrics and thresholds are not yet established.

Assessment: Monitoring sites were selected either for their cultural significance (Haida village sites) experiencing coastal erosion or sandy beach sites with a view to EI (Figure 24). At each site, a group metrics are used to assess geomorphology and erosion potential. Status is highly site-specific, but "fair" overall. Inexorable sea level rise warrants, in our opinion, stating the trend as likely "deteriorating." The Cultural Resource consequence of the eroding village sites is negative (see Section 6.3.).

3.5.6. Raccoons on Seabird Islands

Status: Good

Trend: Stable

Relevance: Raccoons, introduced onto Haida Gwaii in the 1940s, have spread widely and are now reaching some of the outer islands where they prey on ground-nesting seabirds and their eggs. Most of the estimated 750,000 seabirds that nest within Gwaii Haanas are considered to be vulnerable to raccoon predation.

Threshold: The EI metric is the presence of raccoons on seabird colony islands. The threshold for this metric is the presence of

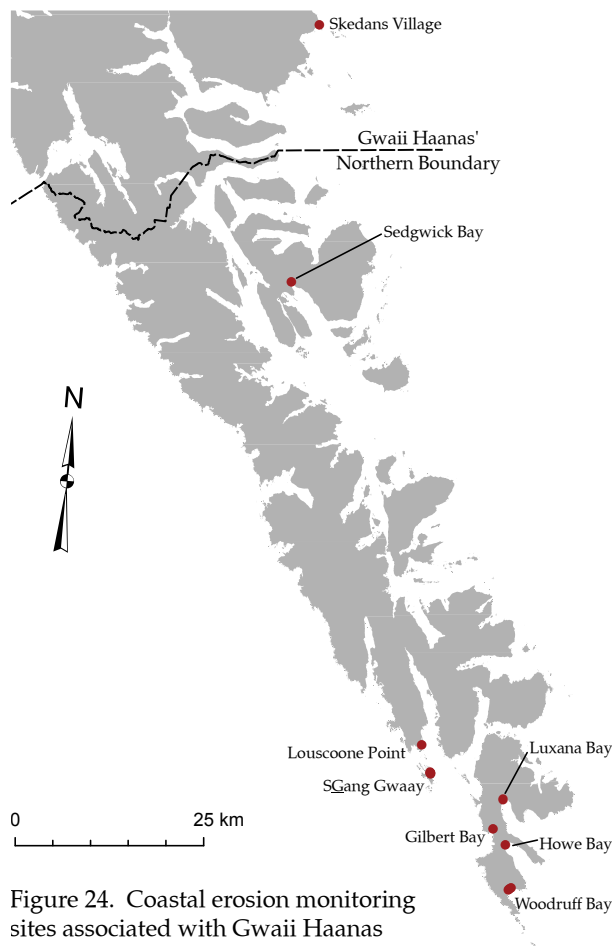


Figure 24. Coastal erosion monitoring sites associated with Gwaii Haanas (from Walker 2006).

a single individual because even just one raccoon can ravage a seabird colony. Should one be detected, we immediately trap it or shoot it during night-time spotlight circuits.

Assessment: The status of this measure is “good” as island colonies are not currently being raided. The trend is currently “stable” as there are no raccoons on any of the islands being monitored, as has been the case since monitoring began in 1993.

3.5.7. Invasive Plants

Status: Fair

Trend: Stable

Relevance: Approximately 190 non-native vascular plant species have been recorded from Haida Gwaii (Cheney et al. 2007). Many of these are concentrated along the shoreline because the unending wind and wave action promotes their dispersal. Invasive plant species threaten the integrity of the shoreline ecosystem because they can compete with native species, often altering habitats and ecosystem function.

Thresholds: The EI metric for invasive shoreline plants is the proportion of campsites with high priority invasive plants. The list of priority species is still under development and thresholds have not yet been set.

Assessment: The status of invasive shoreline plants is “fair,” based on the occurrence of numerous invasive species throughout Gwaii Haanas. There is no evidence of invaders competitively excluding native species. To date, the only invasive plants for which consistent data are available for trend analysis are thistles (*Cirsium* spp.). Since 1998, the occurrence of thistles at campsites in Gwaii Haanas has remained “stable.”

3.5.8. Visitor Effects at Campsites

Status: Poor

Trend: Improving

Relevance: The management plan vision includes each visitor sharing “the sensation of being the first person to set foot here” (AMB 2003 a). Consequently, there are no designated campsites (i.e., no directions towards any particular site) and a low tolerance for visible visitor effects. Such effects are monitored at 65 shoreline campsites.

Thresholds: The EI metrics used to assess visitor effects are: campsite condition class, length of developed trails, and extent of shoreline disturbance. For campsite condition class, the park-wide thresholds have been set in the Backcountry Management Plan (AMB 2003 b). Excluding the camping areas in close proximity to Watchman sites, no more than 20% of the campsites should have a condition class of 3 (i.e., moderately affected with 26 to 75% vegetation loss) or greater. This forms the upper (going from fair to poor) threshold, with the lower (going from good to fair) threshold tentatively set at 10%. Site-specific thresholds have also been established. For campsites in close proximity to Watchmen sites, the condition class is not to exceed 3. At other campsites, the condition class should not exceed 2 (i.e., low impact with 10 to 25% vegetation loss). No thresholds have yet been established for the trail or shoreline disturbance metrics.

Assessment: Status of visitor effects at campsites is assessed as “poor” as we are above the visitor-effects threshold set by management. In 2006, 24.4% of the camping areas away from Watchmen sites had a condition class of 3 or greater, and 20% of all campsites exceeded their site-specific condition class threshold. The AMB

asks tour operators to voluntarily reduce use at overused sites, and this approach has succeeded in allowing recovery to acceptable levels. Since 1998, both the proportion of campsites exceeding the park-wide threshold and the proportion exceeding site-specific thresholds have been decreasing (Figures 25 and 26), and there has been a decline in the total length of trail development. The total amount of shoreline disturbance has remained stable. Overall, the trend of this measure is “improving.”

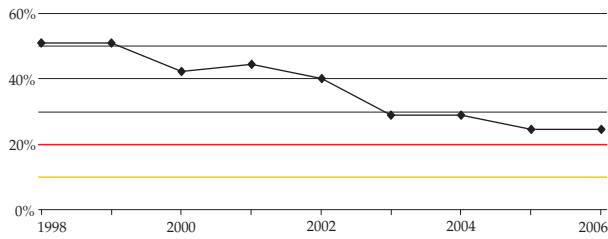


Figure 25. The percent of campsites (excluding those in close proximity to Watchmen sites) with a condition class of 3 or greater. The upper (red line) and lower (yellow line) thresholds are shown.

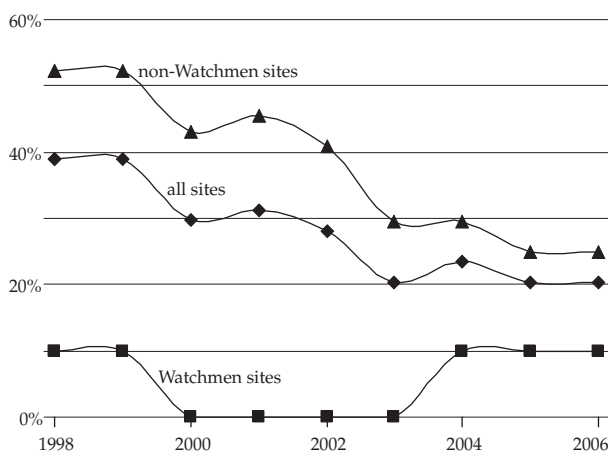


Figure 26. The percent of campsites exceeding site-specific thresholds for condition class.

3.6.1. Coastal Health Assessment Program

Status: Good

Trend: Stable

Relevance: Seagrass meadows straddle the intertidal and subtidal, and their occurrence in nearshore waters (including estuaries) positions them in the land-sea interface and as ecosystems of enormous biodiversity value (Duffy 2006).

Meadows’ strategic location renders them a globally threatened marine ecosystem particularly vulnerable to effects of human activities such as habitat destruction, sedimentation or excess nutrients (Orth et al. 2006). Since 2004, the status of coastal marine ecosystem EI in national parks within the Pacific Bioregion has been evaluated using meadows of “eelgrass” (*Zostera marina*) as a sentinel or marine indicator ecosystem. Aspects of eelgrass status comprise a suite of metrics in the Coastal Health Assessment Program (CHAP) developed simultaneously in Gwaii Haanas, Pacific Rim and Gulf Islands national parks. The CHAP approach considers multiple lines of converging evidence that comes from eelgrass ecosystems that are highly visible, easily sampled, and their properties respond relatively quickly to degradation. Further, the CHAP assesses the health of several spatially separated eelgrass meadows, including their surrounding environmental properties and fish communities, within a narrow temporal window (i.e., during mid-July low tides).

Thresholds: The EI metrics for the CHAP are the Anthropogenic Disturbance Index, Environmental Assessment, Eelgrass Health Assessment, and Fish Assemblage Assessment. As there are only three years (2004 to 2006) of data for some of these metrics, thresholds are not yet established. Threshold values for the Environmental Assessment metric are derived from the upper and lower quartiles ($\pm 25\%$ of the median) of the long-term (over 30 years) time series.

Assessment: Meadows are monitored within the CHAP for the following four metrics:

- 1) Anthropogenic Disturbance Index (ADI) is used to describe surrounding landscape or seascape human-related disturbances that a single meadow may be subjected to. The ADI consists of various measures, and each meadow is given a rank value for each measure based on a suite of information types including local knowledge and field observations. The ADI scores calculated for 16 meadows sampled in Gwaii Haanas averaged 6.5 out of a maximum possible score of 25 (Robinson et al. 2006). Figure 27 shows the median and 95% of ADI scores for the Pacific national parks, among which Gwaii Haanas had significantly lower ADI scores (i.e., relatively undisturbed) than the other parks.
- 2) Environmental Assessment is used to understand how interannual variations in broad regional climate (e.g., precipitation or sea surface temperature) may influence local

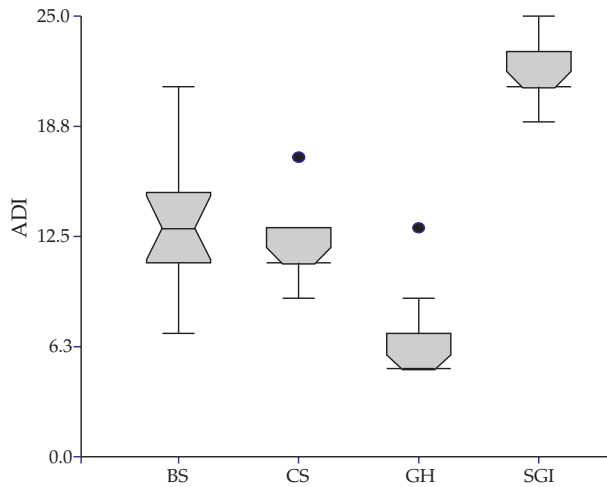


Figure 27. Box plots of Anthropogenic Disturbance Index (ADI) score distributions for four regions sampled in 2004 and 2005. The boxes represent 50% of all values (25th to 75th percentile) and the whiskers cover the range of points, while outliers are represented by dots. Gwaii Haanas' meadows have significantly lower ADI scores compared to the other three regions. The four study regions are: from Pacific Rim (BS = Barkley Sound / CS = southern Clayoquot Sound); Gwaii Haanas (GH); Southern Gulf Islands (= SGI).

environmental conditions of meadows (e.g., nutrients [nitrates] or salinity). Monthly sea surface temperature data from Langara Island lighthouse for which 2004 through 2006 data were compared to the long-term upper and lower quartile values expected for each month. If these data are above or below the long-term quartiles, then an anomalous regional climate may be influencing observed local meadow properties. The monthly sea surface temperature data indicate that the three sample years had been slightly (2 °C) warmer compared to the past 64 years (Figure 28).

- 3) Eelgrass Health Assessment has two measures reflecting the health of intertidal meadows by measuring the epiphyte load (species growing on eelgrass leaves) and eelgrass biomass. Higher epiphyte load and/or a low eelgrass biomass are potentially indicative of poor overall meadow health. Median percent epiphyte load on Gwaii Haanas' eelgrass was very low in 2004, but has been increasing at a rate of 7 to 8% annually (Figure 29). This could be related to differences in cumulative monthly precipitation. Increased precipitation leads to higher loading of nitrogen (a key nutrient for epiphytes) from surrounding watersheds. Although epiphyte percent load has been increasing in each of the last two years, load

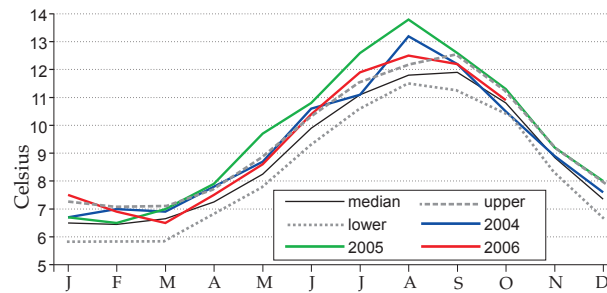


Figure 28. Comparison of monthly Langara lighthouse sea surface temperature observed during 2004 to 2006 with the long term (64-year) median and upper and lower quartile values (data from Fisheries and Oceans Canada).

percentages for Gwaii Haanas' meadows are at the lower end of values observed in the southern parks (Robinson et al. 2006).

- 4) Fish Assemblage Assessment is done because easily-sampled young-of-the-year fishes are attracted to meadows for protection from predators and for feeding. As well, fish assemblage properties are known to change with changing meadow health and changes in aspects of fish assemblages (e.g., number of juvenile rockfishes) may also indicate changes in the health of regional fish populations. To assess for the EI, three major aspects of fish community structure were evaluated over time: species similarity, dominance, and relatedness.

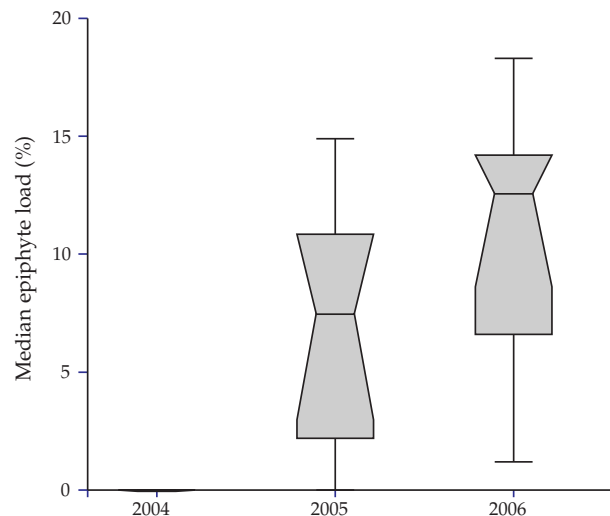


Figure 29. Box plots of median values and interquartile range (50% of all values: 25th to 75th percentile) of eelgrass percent epiphyte load (epiphyte biomass/eelgrass biomass X 100) for the same eight eelgrass meadows re-sampled in Gwaii Haanas during July 2004 to 2006. There was no detectable epiphyte load in 2004.

This approach fits better with ecosystem-level assessments compared to evaluating single species changes over time. Statistical scaling revealed that species assemblage and abundance were stable over time.

Overall status for eelgrass ecosystems is “good” and the trend “stable.”

3.6.2. *Spawning Pacific Herring*

Status: Poor

Trend: Stable

Relevance: Local Pacific herring (*Clupea pallasii*) is important both culturally and economically, and islanders have always been active in this nearshore subsistence and commercial fishery. Further, herring is ecologically important as a “forage” species eaten by a wide range of predators (Willson and Womble 2006). Herring transfers energy from lower trophic levels of their plankton food to higher trophic levels of their predators (e.g., salmon and sea lion) - particularly during early spring mass spawning events along the shoreline.

Thresholds: There are no EI metrics or thresholds developed for herring at this time.

Assessment: The total closure of the commercial fishery for 2006 and 2007 reflect low stock abundance that still cannot support a commercial take. Therefore, the condition is “poor.” The trend is considered “stable” in that recent surveys show a possibly rebuilding stock, although still below commercial abundance.

3.7. Park-wide

3.7.1. *Non-native Mammals*

Status: Poor

Trend: Deteriorating

Relevance: Haida Gwaii has a high proportion of either endemic or disjunct species (Burles et al. 2004). Most are adapted to ecosystems where competition is reduced and there are few top predators - making native species vulnerable to introduced species. Effects are particularly significant on small islands where some native species are usually eliminated by non-native species. Ten mammals (plus three birds and two amphibians) have been introduced and five domestic mammals have established feral populations (Gaston et al. 2007). Of the introduced mammals, five (Sitka black-tailed deer, Norway and black rats, raccoon,

red squirrel [*Tamiascurius hudsonicus*]) have established populations within Gwaii Haanas. Further, beaver (*Castor canadensis*) and muskrat (*Ondatra zibethica*) are expanding their ranges and may eventually reach Gwaii Haanas.

Thresholds: EI metrics and thresholds have not yet been established, but are likely to be very sensitive, given the significant effects that introduced species can have.

Assessment: The status is “poor” as five non-native mammals occur in Gwaii Haanas, and these tend to spread widely. Deer are now present on all but ten remote islands within Gwaii Haanas (Johnston 2006). Raccoon and squirrel have also spread rapidly on the major islands, but have only recently reached some of the outer islands. Rats populate the islands on which they have been introduced, but are not spreading to other islands. Overall, effects of introduced mammals are increasing, so the trend is “deteriorating.”

3.8. Indicator Ecosystem Roll-Up

To determine indicator status and trend, we applied the “roll-up” methods outlined in Chapter 7 (Combining EI Measures into Indicators) of PCA (2006 - in draft). Overall status or trend was determined only for those indicators that had two or more measures with an assessed status or trend (not “unknown”). All other indicators were given an overall status or trend of “unknown.” We followed the standard roll-up decision rules (PCA 2006) to determine the status (condition class) for each indicator (Table 4).

Trends characterize the change in the ecological status of an indicator over the last reporting cycle. The standard roll-up method for indicator trend is, therefore, based on the change in the current indicator status from its previous status (PCA 2006). Because this is Gwaii Haanas’ first SoPR, we have no previous status against which to compare the current status. For this SoPR, therefore, we calculated the indicator trends (Table 5) using parallel decision rules to those used to roll-up indicator status. For these calculations we used the current trends assessed for each measure.

As outlined in Chapter 7 of PCA (2006), “the no-colour signal [status unknown] is a special case where there is insufficient information to make a statement about the EI of an indicator. A number of reasons may lead to leaving an indicator blank. These include: completeness of the selection process for the suite of measures within an

Table 4. Roll-up for Gwaii Haanas' Indicator Ecosystem Status.

Indicator Ecosystem (number of measures)	Number of Measures According to Status				Rolled-up Status
	Good	Fair	Poor	Unknown	
Forest (7)	2	3	2	-	fair
Non-forested (2)	-	-	1	1	unknown
Lake and Wetland (2)	1	-	-	1	good
Stream, River and Estuary (2)	1	1	-	-	good
Shoreline (8)	5	2	1	-	good
Marine (2)	1	-	1	-	fair
Park-wide (1)	-	-	1	-	unknown

Table 5. Roll-up for Gwaii Haanas' Indicator Ecosystem Trend.

Indicator Ecosystem (number of measures)	Number of Measures According to Trend				Rolled-up Trend
	Improving	Stable	Deteriorating	Unknown	
Forest (7)	1	1	1	4	deteriorating
Non-forested (2)	-	-	-	2	unknown
Lake and Wetland (2)	-	-	1	1	unknown
Stream, River and Estuary (2)	-	1	-	1	unknown
Shoreline (8)	2	5	1	-	unknown
Marine (2)	-	2	-	-	stable
Park-wide (1)	-	-	1	-	unknown

indicator, development and implementation of suitable protocols for each measure, availability of data for measures, and ability to interpret the current data for patterns of ecological integrity including the lack of thresholds for the measure.” Because the monitoring program for Gwaii Haanas is still under development, some of our measures currently fall within this special case.

4. STATE OF VISITOR EXPERIENCE

4.1. Visitor Experience in Gwaii Haanas

Gwaii Haanas offers a coastal wilderness visitor experience different from other national parks in western Canada. It is accessible only by boat or floatplane, and sea conditions are often challenging. Two hours by motorboat or two days by sea kayak are needed to reach Gwaii Haanas' northern boundary from the closest boat launch at a road head. Because of this, over 70% of visitors travel with licensed tour operators, and most of the independent visitors use powerboat transportation into and/or out of Gwaii Haanas to maximize their time there.

Once in Gwaii Haanas, the rewards can be great. Visitors can experience wildlife encounters, wilderness solitude and Haida culture. The management plan's vision (AMB 2003 a) states that a visitor experiences “the sensation of being the first person to set foot here,” and thus the Backcountry Management Plan (AMB 2003 b) carefully controls visitation, limiting numbers on shore at any one place to twelve people, giving specific allocations to each licensed operator and using a reservation system to control independent visitor use. These controls, while not always popular with tour operators, have helped to preserve opportunities for quality Visitor Experience, verified through Trip Log surveys (see below).

A wide range of tourism stakeholders were consulted in drafting a Marketing Strategy (AMB 2006). This report documents available research around Gwaii Haanas' markets and target audiences, identifies our market position and the following marketing objectives:

- maintaining an appropriate level of visitation;
- ensuring high satisfaction levels through creating appropriate expectations; and

- creating awareness of place where wilderness and Haida cultural values are protected.

4.2. Services and Facilities

Visitor services include: marketing and pre-trip information, a reservation service for independent visitors, mandatory orientation sessions, interpretive and ethics publications and the Haida Gwaii Watchman Program (funded by Gwaii Haanas since 1990). Watchmen provide security for cultural resources and a Haida presence at cultural sites; they welcome visitors as “hosts and guardians” but are not required to interpret the sites. Facilities are limited to composting toilets at Watchman camps, a few mooring buoys and watering hoses, and showers and hot pools at Gandll K’in Gwaayaay (Hotspring Island). No-trace “random” camping is promoted. Interpretation programs by staff occur outside Gwaii Haanas for logistical reasons, so these are discussed in Public Education (Section 5) below.

4.3. Visitor Experience Tracking and Evaluation

Visitor data are collected through registration with staff (independents) and reports by licensed tour operators (guided). Visitation is moderate and stable at less than 2,100 people (staying for about 10,400 visitor nights) annually in recent years (Sloan 2006). The theoretical maximum of 33,000 visitor-nights (defined in AMB 2003 b) has not been reached. As long as voluntary reduction of use at overused campsites continues to work, there is capacity for growth, as visitor effects are manageable, and trends show a decline in kayak-camping visitation. Revenue from visitors in 2006 was \$70,000, or about 2% of the \$3.6M total operating budget.

Trip Log questionnaires are distributed to all independent and guided visitors, with the results assembled in annual user statistics reports. Trip Logs track indicators such as level of noise, crowding by other boats/people, and camping locations, and results show that we are achieving our objective of providing an uncrowded wilderness experience with unique opportunities to understand Haida culture. Trip Logs also collect visitor satisfaction data and solicit narrative comments for anecdotal information, which is followed up when appropriate.

A Visitor Information Survey, including an evaluation of staff and guide-led orientations, was carried out in partnership with UNBC in 2006. Results showed that both tour guides and

Parks Canada staff are successfully conveying messages in visitor orientations. This survey also provided feedback on publications and our web site, and helped determine visitor motivations and additional demographic information.

4.4. Partnering to Facilitate Visitor Experience

Many partners come together to create a positive Gwaii Haanas experience, most notably the Haida Gwaii Watchmen. Trip Log questions address visitors’ satisfaction with the Watchmen. Gwaii Haanas also has a very committed and experienced group of tour operators. These individuals are advocates for Gwaii Haanas’ ongoing protection, and create a strong connection between their clients and Gwaii Haanas, as confirmed by the 2006 survey. We work very closely with tour operators, providing listings for them on our web site and communicating with them through the Backcountry Newsletter and annual meetings. As well, Gwaii Haanas benefits from memberships in tourism groups such as Northern British Columbia Tourism Association and the Haida Gwaii Tourism Association, both through marketing opportunities and networking. Gwaii Haanas fostered the Haida Gwaii Heritage Tourism Strategy (HG/QCI 2003), supported by community organizations and referenced in archipelago-wide land use planning.

Gwaii Haanas funds two community visitor centres built through commitments made during park establishment. They are operated under the Tourism BC Visitor Info banner. The Queen Charlotte Visitor Centre is operated by a community group under a devolution agreement in which it is funded less each year. Gwaii Haanas is negotiating to similarly transfer the Sandspit Visitor Centre to the community. The operating agreement for the Haida Heritage Centre at Kaay Lnagaay provides classroom space for Gwaii Haanas’ use, and from summer 2007 onwards, we are offering visitor orientations there. This will position our visitors to learn more about Haida culture and Gwaii Haanas before their trips.

4.5. Performance Indicators for Visitor Experience

The following tables document our efforts in facilitating outstanding visitor experiences using four key performance areas and related critical success factors. Our strengths and challenges for each of these factors are discussed and a

rating is proposed. An overall indicator for the performance area is provided in each table.

4.5.1. Visitor Satisfaction

Table 6 presents service quality as determined through Trip Logs. Visitor satisfaction in Gwaii Haanas exceeds Parks Canada targets.

4.5.2. Visitor Opportunities

Table 7 lists an assessment of factors to consider in provision of opportunities, ideally transformative, targeted, unique and educational.

4.5.3. Understanding Gwaii Haanas Visitors

The ways we strive to understand visitors, and apply the information in decision-making, are summarized in Table 8.

Table 6. Delivering High Quality Service: (A) Critical Success Factors and (B) Indicator.

A) Critical Success Factors	Strengths	Challenges	Rank
Services that respond to target audiences' needs and expectations and meet corporate service standards	Our target audience is self-sufficient wilderness visitors; and judging from the high satisfaction ratings (see below), visitors get the information/services they need	Visitors' impressions of the Watchmen vary - in 2005, 58% of respondents stated "very satisfactory"	Good
B) Indicator	Discussion		Rank
85% overall visitor satisfaction with perceived service quality - at least 50% "very satisfied" from the Trip Log returns	<p>Overall visitor experience: "Satisfactory" or above: 93% (target 85%) "Very satisfactory:" 85% (target 50%)</p> <ul style="list-style-type: none"> • visitor satisfaction data come from Trip Log questionnaires handed out to all visitors (response rate in 2005 was 12.2%) and other visitor surveys • We do not participate in the standard VIP Survey because Trip Logs are distributed to all visitors - the Trip Log overall satisfaction question is asked and rated consistent with the VIP Survey 		Good

Table 7. Providing Opportunities: (A) Critical Success Factors and (B) Indicators and Measures.

A) Critical Success Factors	Strengths	Challenges	Rank
The potential for "transformative" (self-discovery) experiences and interactions with staff, local residents and authentic resources	<ul style="list-style-type: none"> • Visitors frequently refer to the power of the Gwaii Haanas experience, the authenticity of the Haida villages and Watchmen, their excellent licensed guides, and their appreciation for management strategies to preserve the wilderness experience • The Kaay Centre will strengthen the experience 	<ul style="list-style-type: none"> • Not all Watchmen are familiar with their culture or comfortable interpreting it • Staff do not deliver programming in Gwaii Haanas for logistical reasons 	Good
Opportunity for visitors to learn about EI and CI in Gwaii Haanas	<ul style="list-style-type: none"> • All visitors attend orientations and receive Visitor Handbooks and other publications • Watchmen often provide tours • Educational opportunities are offered by staff in nearby communities outside Gwaii Haanas 	<ul style="list-style-type: none"> • Watchmen are not obliged to provide interpretation, but have the option to do so, through training and mentoring • The Visitor Handbook is costly and will be replaced with a smaller "ethics" publication and a retailed interpretive guide book 	Good
Received and understood communication that allows visitors to select opportunities	<ul style="list-style-type: none"> • Audiences are monitored for levels of understanding (e.g. 2006 Visitor Information Survey), aiding improvements in communications products 	<ul style="list-style-type: none"> • Callers to Super Natural BC are not always given clear information - we are investigating use of a local reservation service for 2008 	Fair
B) Indicators and Measures	Discussion		Rank
Target segments participate in opportunities that meet their needs/ expectations measured by the level of participation by target segments and Trip Logs and other visitor surveys	<ul style="list-style-type: none"> • Target segments are ecotourists; we wish to encourage multi-day visitors over day-trippers whose travel in motorboats or floatplanes increases noise pollution • Visitor numbers have been relatively steady over the past five years and there is room for additional visitors within user-night allocations • Continual monitoring will ensure visitor impacts are kept to acceptably low levels 		Fair
The unique opportunity provided is recognized by visitors and measured by proportion of visitors indicating unique opportunities	<ul style="list-style-type: none"> • "Uniqueness" is not measured - Trip Log comments show that visitors perceive Gwaii Haanas as unique, and they support preserving the visitor experience 		Good

Table 8. Understanding Visitors: (A) Critical Success Factors, and (B) Indicator and Measures.

A) Critical Success Factor	Strengths	Challenges	Rank
Have information to identify/profile current and potential markets and set priorities	<ul style="list-style-type: none"> Can monitor most visitor numbers and demographics through Triplogs and registration Gwaii Haanas Marketing Strategy (AMB 2006) uses these data to identify priority markets/ sectors 	<ul style="list-style-type: none"> Haida visitation is not well recorded Demographic data from guided visitors are limited 	Good
Understand and respond to changing demographics/emerging trends affecting visitor preferences or motivations for recreational or learning experiences	<ul style="list-style-type: none"> Visitation patterns/trends are closely monitored through Trip Logs, e.g., motorboat day trips are becoming more prevalent The 2006 Visitor Information Survey showed that word of mouth is the most important influence on the decision to visit New Service Centre social sciences staff may improve capacity for research and aid understanding trends affecting visitation 	<ul style="list-style-type: none"> Trending towards older visitors - currently late 40s While generating data is a strength, capacity for analyses is limited 	Good
Access to reliable, timely information about potential visitors' interests, preferences, and limitations	<ul style="list-style-type: none"> We use Tourism BC and other destination marketing organizations' monitoring of trends in the nature-based and Aboriginal tourism markets Information from Trip Logs and other surveys is a strong predictor of potential visitors, given our high repeat visitation 	<ul style="list-style-type: none"> Little research is available on the independent boating/kayaking sectors 	Fair
Advisory services from technical specialists for developing sustainable, appealing opportunities that respond to potential visitors' interests, preferences, and limitations in ways supporting our mandate	<ul style="list-style-type: none"> There is limited need for such specialists, because our current service offer closely reflects the Management Plan vision (AMB 2003 a) and visitors are very satisfied Potential for partnering with Northwest Community College through the Kaay Centre 	<ul style="list-style-type: none"> Staff capacity is limited because of an unfilled marketing/tourism position 	Fair
Information, knowledge, and understanding are needed to develop effective communications to reach target audiences before they make their travel decisions	<ul style="list-style-type: none"> We attract travellers to visit using brochures, web site, trade and consumer shows, and working with destination marketing organizations and other tourism partners Parks Canada BC/AB Marketplace meetings provide networking/training opportunities for staff 	<ul style="list-style-type: none"> Staff vacancy issue, as above Agency regulations controlling advertising make it an unwieldy tool for marketing 	Fair
Information, knowledge, and understanding are needed to develop effective communications programs to reach target audiences when they arrive	<ul style="list-style-type: none"> Staff have developed a wide range of products/services including the annual Gwaii Haanas Trip Planner, Super Natural BC Reservation Service and visitor orientations These are regularly evaluated and improved/updated While we have only moderate control over orientations provided by guides, a survey shows that they are effective 	<ul style="list-style-type: none"> Term employees with limited knowledge of the area deliver independent visitor orientations, which can affect our credibility and the effectiveness of the messages There is limited time available to allow summer staff to experience Gwaii Haanas and thus increase their credibility with visitors 	Good
Advice and service from technical specialists who can assess effectiveness of investments to monitor performance for planning and reporting, and to help guide future investment	<ul style="list-style-type: none"> Our capacity to develop and evaluate products is improved by Service Centre social science staff In 2006, University of Northern British Columbia partnered with us to develop and analyze visitor data 	<ul style="list-style-type: none"> Costs to access specialists have been high, hence the need for the university partnership 	Fair
B) Indicator and Measure	Discussion		Rank
The extent to which management decisions are influenced by knowing actual and potential visitors' needs and expectations, measured by understanding target audiences, and to put in place services and facilities needed to support identified opportunities	<ul style="list-style-type: none"> Current visitor experience is very close to the Management Plan vision. Visitor management strategies profit from consultations with the AMB, stakeholders, along with market research, cooperative management, managing for EI and cultural integrity, and supporting local sustainable tourism are major factors in decision-making Visitor research shows that our current visitors appreciate the management philosophy – "don't change" is a frequent comment Major decisions around investments are made only after considering data. For instance, the intent to change the reservation service is a result of high complaint and call-referral levels 		Good

4.5.4. Making Connections

Table 9 describes the ways we facilitate meaningful connections to Gwaii Haanas, in terms of marketing, communications, partnerships, memorabilia and involvement opportunities.

4.6. Visitor Experience: Conclusions

In summary, the overall rank for Visitor Experience is “good.” Gwaii Haanas is fulfilling or exceeding most of our visitors’ expectations, judging from consistently excellent satisfaction ratings. Visitor management strategies have enabled us to gather data on visitors, though incomplete staffing levels result in gaps in data analyses and application. For consistency, we are aligning our visitor satisfaction research more closely with the national Visitor Information Program. Another issue is the disconnect between our target audience of multi-day users and the trend towards day tripping; the new management plan should attempt to address this. The Watchman program and reservation service are other programs undergoing refinement.

Gwaii Haanas has not yet participated in a Visitor Experience Assessment. This is worth pursuing in order to confirm existing research and bring overlooked issues to Gwaii Haanas’ attention.

5. STATE OF PUBLIC EDUCATION

Public Education includes any activities by our staff and partners towards enlightening people about Gwaii Haanas’ and Parks Canada’s mandates and values. Because few people visit Gwaii Haanas, fostering public appreciation and understanding in those who cannot visit is key to maintaining public support. The audiences we target in order to generate a “culture of conservation” are members of the Haida Nation, other local citizens, Gwaii Haanas visitors, Haida Gwaii tourists, school children, and urban audiences. Further, local and regional partners in education, government and the media act as multipliers of our educational initiatives.

Table 9. Connecting Visitors With Place: (A) Critical Success Factors and (B) Indicator and Measures.

A) Critical Success Factors	Strengths	Challenges	Rank
Communicating Gwaii Haanas’ status as a protected heritage area, its unique stories, challenges and visitor opportunities before they make their travel decision, en route, upon arrival, or on site	<ul style="list-style-type: none"> We market through consumer shows, brochures, travel media, destination marketing organizations and our web site Once target audiences are contacted, they are offered the Super Natural BC Reservation Service, our Trip Planner and web site Upon arrival, almost 100% attend the orientation and receive the Visitor Handbook On site, the Haida Watchmen welcome visitors to their base camps and may provide tours We have a strong, unique image - marine wilderness, wildlife, and Haida culture 	<ul style="list-style-type: none"> Advertising is costly and the approval process unwieldy - we buy advertising only when benefits are high Our web site offers practical information about visiting, but is less successful in telling stories of place for personal connections 	Good
Providing visitors with tangible take-away memorabilia	<ul style="list-style-type: none"> All visitors get the Visitor Handbook There are gift incentives for returning Trip Logs Visitor Centres offer retail theme goods 	<ul style="list-style-type: none"> Retail program only marginally profitable; it is on hold during the transition to the Kaay partnership 	Fair
Providing opportunities for visitors to get involved, for example, through volunteering	<ul style="list-style-type: none"> Occasionally, researchers bring volunteers, usually their students or family members The Laskeek Bay Conservation Society offers monitoring opportunities, some within Gwaii Haanas 	<ul style="list-style-type: none"> Our remoteness is challenging for volunteers Volunteering directly for Gwaii Haanas tends to be limited to in-office work experience for students No formal program is in place; no research data on levels of interest 	Poor
B) Indicator and Measures	Discussion		Rank
Presence and levels of visitors’ personal connections to Gwaii Haanas using the measurement tools of Trip Logs, Registration Forms and Visitor Surveys <ul style="list-style-type: none"> Level of understanding of the importance of Gwaii Haanas Likelihood of return visit or elsewhere in Parks Canada system 	<ul style="list-style-type: none"> We far exceed satisfaction targets - Trip Logs confirm that visitors feel personally connected with the wilderness and Haida culture 2006 Visitor Information Survey confirmed that visitors support Gwaii Haanas’ protection and measures to preserve its EI and CI Return visits are tracked for independent visitors only (24% returnees in 2005) As we do not participate in the full VIP survey, we lack some data consistent with other parks regarding visitors’ level of understanding of our importance. This is being addressed in 2007 		Good

5.1. Education within Gwaii Haanas

Gwaii Haanas' staff provide educational programs, including mandatory visitor orientations, in gateway communities, but not within Gwaii Haanas. Its marine-only access, lack of a visitor information focal point, and visitor management strategies (Section 4) are all challenges. Non-personal interpretation takes the form of the Visitor Handbook and other publications. At the request of Haida Elders, Watchmen and tour operators, there are few signs and no interpretive exhibits in Gwaii Haanas.

The Haida Gwaii Watchmen are hosts and guardians at five cultural sites. Watchmen are not required to interpret the sites, though many do provide informal tours. Trip Log surveys track audience satisfaction with the Watchmen. Parks Canada has offered training for the Watchmen including special orientations, resource materials and Interpretation Canada certification. In recent years, fewer Elders have filled Watchman positions, leading to a loss of cultural continuity. Haida leaders visited the camps to discuss ways to ensure cultural knowledge, pride and presentation to visitors. Provision of cultural knowledge resources for the Watchmen should be addressed in the new management plan.

Tour operators must provide orientations to their clients under the provision of their business licenses. Some of the tours have a strongly educational focus and may feature highly qualified staff. The 2006 Visitor Information Survey rated guides' orientations somewhat higher than those by staff-the messages may come through more strongly in a wilderness, as opposed to classroom, environment, and guides are typically more familiar with the setting than our summer staff.

The campsite monitoring program has raised some concern as to whether orientations are delivering No-Trace messages adequately. The 2006 survey was generalized for all visitors, many of whom do not camp, so did not directly address camping.

Swan Bay youth cultural camp is located in Gwaii Haanas. A special orientation is given to the participants and further stewardship activities are planned with them.

5.2. Outreach Programs and Partnerships

Visitor orientations and research presentations have been offered since the mid-1990s. Regularly scheduled slide shows, guided walks, and special events started in summer,

2003. Attendance and offerings have been steadily increasing. From 2007 onward, a new summer program designed for people who are curious about Gwaii Haanas but not planning a visit will be offered daily. Gwaii Haanas publishes a community newsletter highlighting our achievements and news of interest. Local newspapers often publish our submissions.

The Kaay Centre will be Gwaii Haanas' main partner in education. Scheduled to be fully open summer 2008, with a "preview" in 2007, this \$24M facility includes offices for our staff, a large classroom for our use during summer, and will feature exhibits in a Gwaii Haanas Gallery. We will hold most interpretive programs and orientation sessions at the Centre, and will partner with Centre staff on new programming. We will adapt to our new operational mode there, before carrying out a formal evaluation in 2008. The Centre has arranged with Northwest Community College to act as a local broker for a range of educational institutions-there is much potential here for Gwaii Haanas.

Communities on Haida Gwaii each host at least one summer special event, sometimes for fundraising and often themed, e.g. Queen Charlotte Hospital Days. Gwaii Haanas takes advantage of these-and Prince Rupert's SeaFest-for outreach education and visibility.

The Coastal BC Field Unit's urban outreach officer has created opportunities for Gwaii Haanas, such as speaking engagements and exhibits in Vancouver. Vancouver Aquarium features a Parks Canada exhibit developed in the early 1990s. We are in discussion with the Aquarium about renewing our display.

We produced the award-winning video: "Gwaii Haanas: From Earth to Ocean" in partnership with Knowledge Network. It promotes the proposed NMCAR, and was distributed to a very wide range of educational and other stakeholders. As well, the community visitor centres in Sandspit and Queen Charlotte feature educational displays and videos about Gwaii Haanas.

5.3. Formal Education

Gwaii Haanas' staff co-present in-school programs throughout Haida Gwaii. In the 2005-06 school year, 540 children in grades four to seven received presentations from Gwaii Haanas staff. Most of these lessons were Gwaii Haanas contributions to wider school programs such as Forest Education and Abalone Education (in partnership with the

Abalone Stewardship Group). A local teacher schedules the programs and provides continuity. This year she is funded by School District 50, while in the past she contracted to us and other partners. While linking with these programs ensures we get into the schools, they are not primarily designed to meet our objectives. We are currently engaged in designing Gwaii Haanas lesson plans linked to provincial curricula which will be delivered locally and eventually adapted for the Parks Canada in Schools Program.

Gwaii Haanas engages almost all local elementary school children each year by organizing and funding local events for the Great Canadian Shoreline Cleanup. We have also partnered with the school district's literacy coordinator to produce natural history language cards in Haida and English. In 2005-06, Gwaii Haanas provided professional development for 27 local elementary teachers. Our Haida cultural staff are frequently called on to speak to students at regional universities.

Gwaii Haanas underutilizes the Internet as an educational tool. Our web site's visitor information is good, but we have not yet developed any web-based teacher resources, and the "Natural Wonders and Cultural Treasures" section has serious gaps.

5.4. Performance Indicators for Public Education

The following series of tables document our efforts in public education using four key performance areas and related critical success factors. Our strengths and challenges for each of these factors are discussed and a rating is proposed. An overall indicator for the performance area is provided at the base of each table.

5.4.1. Understanding Our Audience

Factors towards understanding our audience are listed in Table 10.

Table 10. Understanding Our Audience: (A) Critical Success Factors and (B) Indicator.

A) Critical Success Factors	Strengths	Challenges	Rank
Access to timely, reliable information to identify and profile current and potential audiences (needs, expectations, preferences, knowledge, interests, attitudes)	<ul style="list-style-type: none"> Anecdotal information easily obtained about audiences due to small group sizes Good demographic data are available about visitors (Section 4), tourists to Haida Gwaii and communities via Statistics Canada 	<ul style="list-style-type: none"> No formal surveys of audience needs, attitudes, etc. to our programming (except orientations - Section 4) Research needed on Aboriginal-theme tourism, i.e., those attracted to the <u>Kaay</u> Centre 	Fair
Knowledge to understand and respond to changing demographics and emerging trends affecting audience preferences/motivations for learning	<ul style="list-style-type: none"> Orientation data are sound New Service Centre staff will increase capacity for audience research 	<ul style="list-style-type: none"> Providing for "changing" demographics is a lower priority than creating a larger repertoire of programming for existing audiences Limited networking and training opportunities 	Poor
Access to reliable, timely information about current and future educational approaches/technologies	<ul style="list-style-type: none"> We have used the Hamilton Discovery Centre experience in designing <u>Kaay</u> Centre exhibits 	<ul style="list-style-type: none"> Lack of familiarity with newer/emerging technologies Little training has been available to our staff; no PCA Heritage Presentation Forum since 2003 Difficult to access Service Centre expertise 	Poor
The understanding and competence to effectively match educational approaches and technologies to target audiences	<ul style="list-style-type: none"> Traditional knowledge and expertise add to program authenticity 	<ul style="list-style-type: none"> <u>Kaay</u> Centre development has decreased our focus on other public education Co-operative management affects staffing (Haida developmental positions) 	Fair
B) Indicator	Discussion		Rank
The extent to which management decisions and planning with respect to learning experiences are influenced by an understanding of the target audiences (needs, expectations, preferences, knowledge, interests, attitudes) and of educational approaches and technologies	<ul style="list-style-type: none"> Management decisions are largely based on management plan commitments Other than attendance, we lack audience data; this is being addressed in 2007 The increase in attendance and numbers of "repeat customers" at presentations is positive Staff have an anecdotal understanding of current audiences and are able to adapt programs accordingly, but staff would benefit from additional training on educational approaches and technologies Acquiring data about each local audience before making decisions is unrealistic; at a remote FU, staff have to be generalists 		Poor

5.4.2. Extending Our Reach

Ways that we use partners to deliver our messages to target audiences are described in Table 11.

5.4.3. Facilitating Understanding

Table 12 rates factors that determine our success in transmitting messages.

5.4.4. Influencing Attitudes

Table 13 describes our ability to reach people in such a way that we influence attitudes and behaviour towards Gwaii Haanas and the Parks Canada system.

in the years following establishment, outreach education is not developed to the same extent. We offer a wide range of programming based on management plan commitments, but the program lacks audience research. Now that programs are running, they warrant review: ensuring communication objectives are in place and being met; learning more about our audiences and their response to our programs, and adapting or replacing programs to better facilitate learning. Audience surveys of local presentations are underway in summer 2007.

A public education plan is under development. This will address the issues raised in this chapter; in particular, understanding our audiences, ensuring messages are received, and “creating a culture of conservation” through partnerships that can lead to opportunities for increased engagement.

5.5. Public Education: Conclusions

The overall rank for Public Education is “fair.” Because staff focused on visitor management

Table 11. Extending our Reach: (A) Critical Success Factors and (B) Indicator.

A) Critical Success Factors	Strengths	Challenges	Rank
Staff proactively target partners with the following characteristics: <ul style="list-style-type: none"> • Support PCA mandate and objectives • Have access to PCA target audiences with a track record in reaching these audiences • Are credible and respected by the audiences • Can act as “multipliers” for the development and delivery of learning experiences • Have a history of development and delivery of effective and relevant learning opportunities 	<ul style="list-style-type: none"> • Partners mentioned in section 5.2 largely fit these criteria 	<ul style="list-style-type: none"> • Few teachers use our materials in their classrooms; we should develop better relations and resources • Since Watchmen are not mandated to educate, consistent delivery is an issue • Many partners are under-resourced and provide assistance rather than taking a lead role 	Fair
Our staff work with partners to ensure they understand our educational objectives and communicate with them in a timely and accurate fashion	<ul style="list-style-type: none"> • Partnerships are a strength of Gwaii Haanas and the future looks bright with new opportunities such as <u>Kaay</u> 	<ul style="list-style-type: none"> • Educational objectives may not be entirely understood by partners 	Good

B) Indicator	Discussion	Rank
The extent to which members of target audiences are reached through learning experiences. The measure is the number of members of target audiences reached by us and our partners	<ul style="list-style-type: none"> • The Haida Nation is reached through formal presentations, school programs, community newsletter, heritage presentations, local media, community events and the Watchmen (word of mouth) (~2,500 population) • Other locals: through newsletter, presentations, local media, events, schools (~2,500 population) • Visitors to Gwaii Haanas: orientations by guides and staff, publications, Watchmen (~2,000 annually, all receive orientations). • Tourists to Haida Gwaii: some attend presentations (857 in 2006; not all were tourists, some repeats); many see in Visitor Centres (Queen Charlotte 11,223 / Sandspit 10,065 in 2006) with GH exhibits • School children - almost all local elementary students (540) • Urban audiences: urban Vancouverites through exhibits and presentations, e.g., Mountain Equipment Co-op display (4,000 based on 2% of traffic); library (150) and university (135) presentations in 2006 • Licensed tour operators and other stakeholders are consulted - some, such as guides, are trained to present our messages (30 licensed operators each with several staff) • Media: media kit and web site: level of interest varies enormously—2005 <i>National Geographic Traveler</i> story generated global interest, as for the <u>Kaay</u> Centre in 2007 	Good

Table 12. Facilitating Understanding: (A) Critical Success Factors and (B) Indicator.

A) Critical Success Factors	Strengths	Challenges	Rank
We offer supportive environments conducive to learning (on- and off-site)	<ul style="list-style-type: none"> • Guide orientations are on-site or en route • Watchmen are on-site to provide an authentic experience • Small group size allows better interaction 	<ul style="list-style-type: none"> • No dedicated visitor centre or delivery point, the <u>Kaay</u> Centre will change that • Delivering interpretation outside Gwaii Haanas dilutes messages 	Fair
We offer engaging, challenging, entertaining and relevant learning experiences	<ul style="list-style-type: none"> • We adapt style and content to audience, aided by our small groups 	<ul style="list-style-type: none"> • Relevance more difficult to convey because off-site 	Fair
We offer a variety of learning experiences to provide participants with choice and control	<ul style="list-style-type: none"> • Wide range, from scientists' presentations, children's events, Watchmen, the Internet 	<ul style="list-style-type: none"> • Our base repertoire in personal programs is limited, especially for schools 	Fair
We offer learning experiences tailored to target audiences' various learning styles	<ul style="list-style-type: none"> • Personal programming uses props, activities, video, guided walks, visuals • Some high-tech exhibits at <u>Kaay</u> Centre 	<ul style="list-style-type: none"> • Our website is not optimized yet 	Fair
We offer a continual improvement of learning experiences through front-end, formative and summative evaluations	<ul style="list-style-type: none"> • Informal self-evaluations on presentations allow adaptation. • Multi-lesson school programs include pre- and post-testing • Orientation program has been evaluated and improved 	<ul style="list-style-type: none"> • No formal audience surveys of heritage presentation programs - addressed in 2007 • We do not use the Visitor Information Program; we could adapt Trip Logs to include learning questions 	Fair
B) Indicator	Discussion		Rank
The extent to which target audiences understand Gwaii Haanas' messages. To be measured by survey instruments that assess characteristics of learning experiences	<ul style="list-style-type: none"> • The 2006 Visitor Information Survey showed that visitors understand key messages presented in orientations, including wilderness ethics, Gwaii Haanas' cooperative management, support for conservation, etc. • That guided groups scored higher may speak to the difficulty of making classroom presentations as relevant or immediate, and the staff's lack of direct experience within Gwaii Haanas • Pre- and post-testing during the Abalone Education program shows that children are learning messages about this species at risk • We lack data on other outreach education; capacity issues mean we have leaned towards program delivery rather than audience research 		Fair

Table 13. Influencing Attitudes: (A) Critical Success Factor and (B) Indicator.

A) Critical Success Factors	Strengths	Challenges	Rank
Gwaii Haanas and its partners understand how to influence target audiences' attitudes (curiosity, connection, caring, responsibility) towards actions aiding Parks Canada's mandate and the development of a "culture of conservation"	<ul style="list-style-type: none"> • Backcountry behaviour is monitored, and results are most visitors support conservation and some assist by reporting wildlife sightings • Abalone Stewardship Program appears to change kids' attitudes; will this influence adults to reduce poaching? • Heritage Tourism Strategy (2003) demonstrates that many Islanders support ethical, sustainable tourism 	<ul style="list-style-type: none"> • Delivery of messages does not necessarily mean change in attitude, and we lack knowledge of our outreach audiences' attitudes • We lack specific objectives for attitude change in much programming 	Fair
B) Indicator	Discussion		Rank
The extent to which target audiences demonstrate attitudes (curiosity, connection, caring, responsibility) towards their natural and cultural heritage. To be measured by gauging the attitudes of target audiences	<ul style="list-style-type: none"> • Audience comments demonstrate connection • No formal attitude measurements are done for outreach. We can gauge local audiences intuitively, but we need to know more about how to best focus our efforts • Some questions are: should we "preach to the converted" (as at presentations) or "convert" those opposed to conservation? Or, is it better to target the "undecided"? • More training on how to measure attitudes and approach these questions is needed 		Fair

6. STATE OF CULTURAL RESOURCES

The primary goals of cultural resource management are the protection and long-term stewardship of archaeological knowledge (pre- and post-contact) and material resources in their original context as well as fostering the documentation, awareness and application of traditional Haida knowledge to Gwaii Haanas' management.

The archaeological locations of Gwaii Haanas span the full range of human occupation, land use and adaptation to a maritime environment. The types of sites vary from pre-contact traditional Haida habitation and resource procurement to spiritual places (e.g., burials or rock art) and an array of post-contact Haida and non-aboriginal heritage. To support management, there is both a comprehensive inventory and individual record for each of the identified cultural sites (Fedje et al. 2001). These records (paper/digital/photographic) are maintained and regularly updated.

6.1. Pre-contact Archaeology

Pre-contact site types include: habitations sites (towns, forts, shell middens [food waste heaps], rock-shelters); resource procurement sites (quarries, fish traps, blinds, culturally-modified trees [CMTs]); spiritual sites and access features (canoe skids, trails). Early Holocene (last 10,000 years of Earth's history) sites (raised beach, intertidal lithic [stone tool], drowned lithic) are generally poorly known as to function. These require careful excavation and the few investigated so far were habitation sites.

6.1.1. Condition and Significance

There are 604 archaeological locations recorded within Gwaii Haanas (Figure 30). At these locations, 966 site types (multiple site types can occur at a location) are identified as listed in Table 14. These comprise 886 pre-contact cultural site types and 80 post-contact historic sites (see Section 6.2), including nine Haida and 71 non-aboriginal. While a number of the 71 recorded Haida towns continued to be occupied into the post-contact period, they are identified as pre-contact sites.

Site conditions range from completely disturbed or destroyed to largely intact. The estimate of proportion intact is subjective. With this caveat, the status of 13% of sites is "poor." Most of these are earliest Holocene-age intertidal lithic shoreline

sites subjected to erosion from wave action and/or tidal inundation. The status of 17% of the sites is "fair" and "good" for the remaining 70%.

Significance is in terms of the potential for sites to answer specific archaeological or cultural questions as to human behaviour, adaptation processes, and environmental associations, as well as enhancing public interpretation and knowledge. Other types of values and

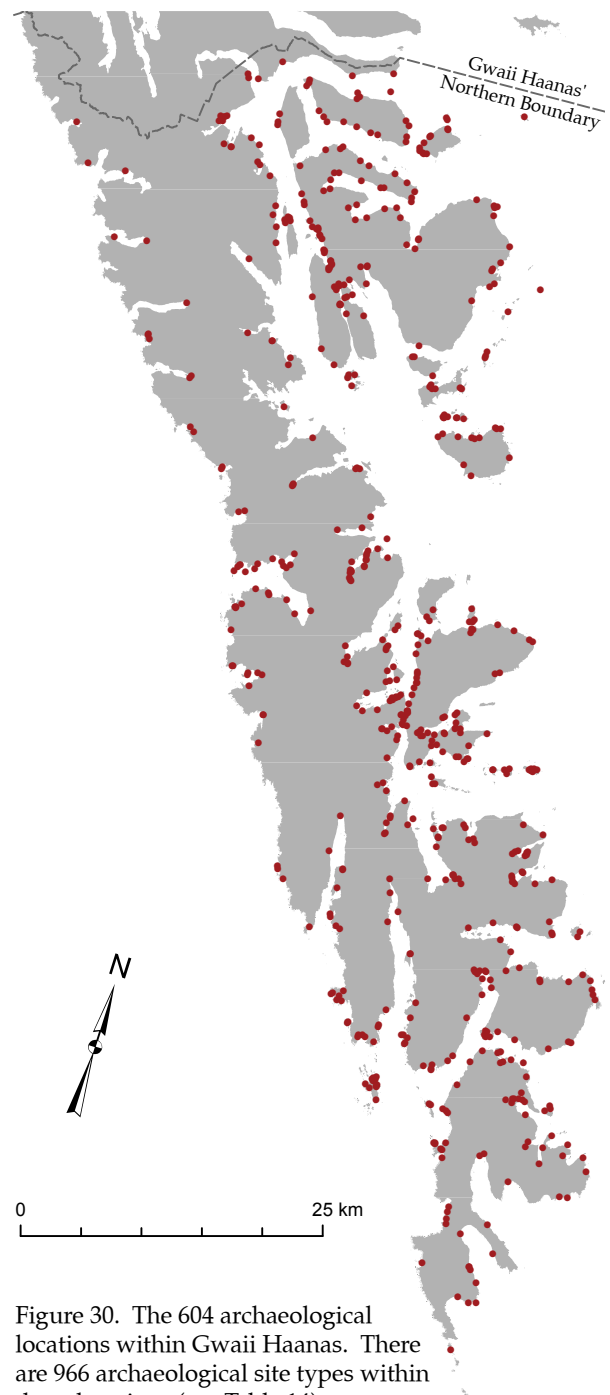


Figure 30. The 604 archaeological locations within Gwaii Haanas. There are 966 archaeological site types within these locations (see Table 14).

Table 14. The types and numbers of archaeological sites of Gwaii Haanas according to condition class, threats (natural or cultural - with level) and significance for research.

Site Type	Condition Class ¹			Natural Threat			Human Threat			Significance (Scientific)			
	Poor	Fair	Good	Low	Mod	High	Low	Mod	High	Low	Mod	High	Total
Historic ²	1	7	72	53	19	8	52	22	6	30	21	29	80
Town	2	9	60	6	37	28	22	31	18		1	70	71
Fort			9	1	7	1	7	2			4	5	9
Midden ³	4	78	282	50	269	43	223	127	12	146	140	76	362
Rock shelter		4	45	16	31	2	31	16	2		45	4	49
Raised beach	2	7	32	13	25	3	30	10	1	6	2	33	41
Intertidal lithic ⁴	109	2		21	84	6	83	23	5	72	27	12	111
Drowned lithic	1				1		1					1	1
Lithic quarry			1	1			1					1	1
Artifact	1				1			1		1			1
Burial	2	16	27	10	25	10	11	7	27			45	45
Rock art		1	1		2		1	1				2	2
Fish trap	2	39	16	5	44	8	51	6		29	25	3	57
Hunting blind			1		1		1				1		1
CMT ⁵		7	118	108	11	6	119	6		87	35	3	125
Canoe skid	1	2	4	2	5		5	2		6		1	7
Trail			3	2	1		3			3			3
Total	125	170	671	288	563	115	641	254	71	380	301	285	966

1 archaeological site condition classes are: "good" more than 50% intact, "fair" 5 to 50% intact, and "poor" less than 5% intact

2 the post-contact (historic) sites are discussed in Section 6.2

3 midden = food waste heap (shells, bones, charcoal, etc.)

4 lithic = stone tool

5 CMT = culturally-modified tree

significance, such as spiritual, will have to be determined by Haida cultural experts. Sites such as Haida towns and burial places are automatically deemed to have high knowledge significance because of their great interpretive information potential. Cultural sites such as shell middens and rock shelters vary in significance dependant upon the nature and variety of their contents. Other sites, such as single-activity procurement sites (e.g., fish traps, culturally-modified trees), can individually be of lower significance, however, when considered as a whole they are highly significant in the interpretation of past human uses.

6.1.2. Threats

Threats to sites are from natural processes or human activities (Table 14). Natural threats include primarily those from natural forces, but also threats where human effects have promoted or exacerbated the effects of natural forces on a site. Natural threats include erosion or deposition from fluvial (e.g., stream, debris-flow), marine (e.g., wave, current, inundation), or biological (e.g., sediment disturbance by shellfish or rodents, vegetation encroachment, tree blow-down) processes. Further, there is

decay or degradation from chemical weathering (e.g., oxidation, hydration, carbonate leaching), or biological (e.g., bacterial, fungal) processes.

Sites located on or near the shore are often threatened by both natural processes and human activities, while those located inland are subject to fewer threats, primarily natural. Most prehistoric sites (about 90% - excluding CMTs) are located nearshore. Shore sites are often affected by wave and tidal action, tree blow-down from wind, and human use. Both shoreline and inland sites may be subject to animal disturbance, fluvial erosion and the effects of wind (i.e., tree blow-down). Over 12% of the sites are at high risk from natural factors. These include some highly significant Haida towns, burial places, resource procurement/processing camps, intertidal lithic sites and fish traps.

Human threats include effects of park operations, traditional and commercial food harvesting and, predominantly, visitor activities. Visitor activities include camping at sites, the displacement or collection of artifacts, illegal excavation and vandalism. Overall, 7% of the sites are at high risk from visitors. Haida towns are the most vulnerable (40% at high threat level), in part

because these sites attract visitors and because town development included clearing, levelling and shell midden development. Large shell middens and burial places are also vulnerable to visitors. Some burials with exposed human remains and/or associated features have been subject to effects ranging from unintentional disturbance to desecration. Similarly, towns and shell middens are often damaged both intentionally and unintentionally. Significant degradation can occur from visitors accessing upland areas via fragile shell midden faces, preparing camp areas and moving or removing cultural features or artifacts.

Concerning resolution of threats, most cultural resources associated with these sites are *in situ* archaeological sediments and artifacts comprising vestiges of past activities. Exposure to natural and cultural processes will degrade this record. Limitation and/or mitigation of site threat is generally feasible for human effects but less so for most natural effects.

The number and dispersal of threatened sites, the violent nature of the climate and costs of protective measures limit significant protective measures. Archaeological investigation (e.g., excavations) can recover elements of the archaeological record prior to loss. Assessment through site visitation and evaluative testing, in combination with investigation of threats such as coastal erosion, allows for planning and prioritization of mitigation. To date, mitigative work on such sites has been primarily accomplished through partnership projects with academic researchers.

The effects of visitors on sites can be reduced through public education, monitoring, and access management. Ongoing programs mitigating human threats include: guide and visitor orientations, "No Trace" ethics publications, campsite monitoring, burial mitigation and access management such as camping closures. Data from Trip Log surveys is often pertinent.

6.1.3. *Communications Values*

The monumental poles of SGang Gwaay Llnagaay provide one of British Columbia's iconic images (Figure 2). "Totem" poles represent coastal First Nations culture in the minds of the public, and old ones still *in situ* (though post-contact) are rare. Communication about Gwaii Haanas' archaeological resources is given a huge boost by this level of public interest. However, we need to tread carefully. Mortuary poles are effectively

graves, and at the request of Haida Elders, will eventually return to the earth. The AMB requires a large degree of control over Gwaii Haanas' presentation of poles and other artifacts.

This public interest, and the reality of cooperative management-plus direction in the management plan-have resulted in pre-contact archaeology and Haida culture being priorities in the development of communications materials for Gwaii Haanas. Photos and information about ancient Haida sites appear in much of our public communication, ranging from orientation messages to mitigate visitor threats, to the web site, to marketing materials. We also offer public presentations about archeological research and Haida culture on a regular basis.

6.1.4. *Key Emerging Issues*

Key emerging issues relate to the high number of sites, high level of natural threats and the need to identify threats and prioritize timely mitigative actions. The protection of heritage cultural resources are directed by management plan values (AMB 2003 a) and based on the archaeological resource description and analysis (Fedje et al. 2001), annual cultural projects and co-operation with academic partners. Another emerging issue is communication of important historic values of these diverse sites to visitors and the Canadian public and the need to develop a comprehensive visitor experience and public education plan incorporating the range of cultural sites in its prescribed actions.

6.2. Post-contact Archaeology

Gwaii Haanas' post-contact archaeological sites are associated primarily with past industrial activities. Of the 80 sites or cultural features recorded, most are linked to hard rock (copper/gold) mining, marine resource processing, logging, aids to navigation and early industrial settlements (Figure 31). The activities associated with these sites exerted major cultural, social and economic impacts including the introduction of waged labour, changing settlement patterns, and the integration of Haida and other groups into the industrial workforce with its cash economy. To support management, there is a comprehensive inventory along with individual cultural resource records for each of the identified cultural sites. The records are being regularly maintained and updated.

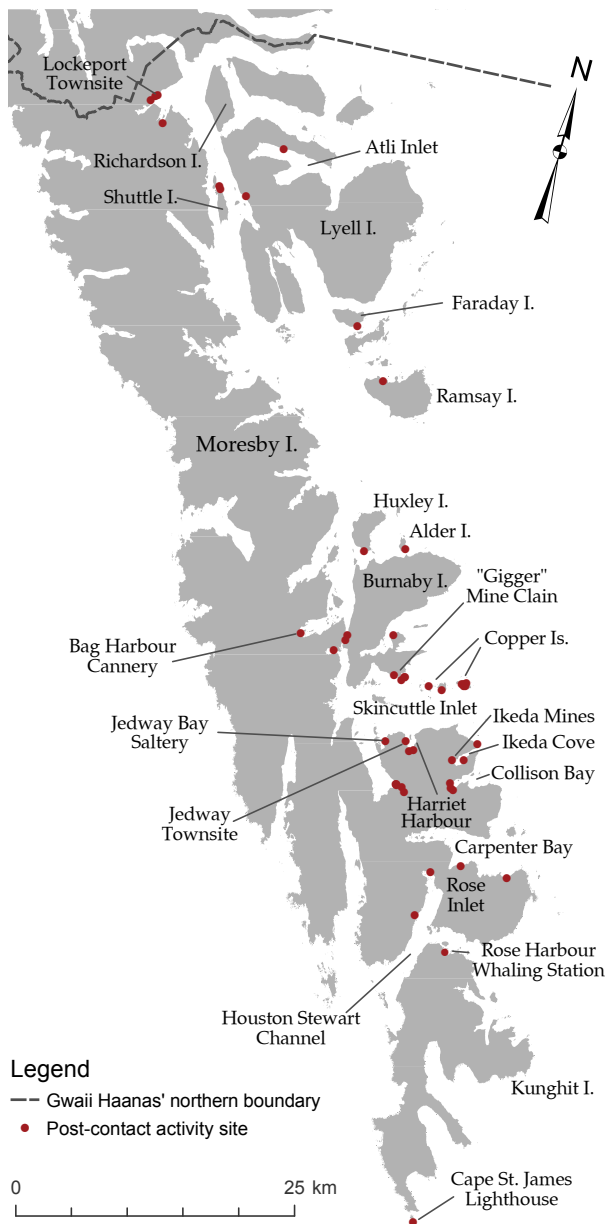


Figure 31. Post-contact industrial or habitation sites of Gwaii Haanas. Most of the unlabelled locations are copper mining sites

6.2.1. Condition and Significance

An assessment of the significance and condition of the major sites is provided in Table 15. Most of the cultural resources associated with these sites remain at the sites and are vestiges of formerly more extensive structures and objects. Exposure to natural processes will gradually degrade both organic and metal artifacts. The condition status of these cultural resources overall is "fair." Nevertheless, 10% of sites are threatened by high levels of natural disturbance and 7% are

deemed highly vulnerable to visitors. Leaving these resources in their original site contexts is important to understanding their significance as manifestations of recent human history.

6.2.2. Threats

The principal threats to sites are from natural processes and humans. Many of these sites, especially the former marine processing sites, are nearshore, and threatened by erosion from wave action, wind (tree blow-down), decay and weathering. Risks from visitors include both unintentional disturbance and souvenir hunting.

A summary of threats to sites with associated mitigation measures is listed in Table 16. Seven sites are at high risk from natural factors. These include four sites at the former Rose Harbour whaling station (unmanaged - freehold land within Gwaii Haanas). Rose Harbour, Ikeda Mine graves, Jedway town site, the Lockeport town site and the Lockeport cannery are at high risk from potential human effects. Fourteen sites are at moderate risk from natural factors and 16 sites are at moderate risk from humans. Fifty sites are ranked at low risk from natural factors and 49 are rated at low risk from humans.

Regardless of the assessed degree of threat, we lack data regarding actual impacts on these sites from either natural or human causes. Recommended mitigative measures include a combination of periodic monitoring, selection of representative indicators for assessing impacts and, using these indicators, measuring change over time to establish the extent and rate of impacts.

Mining sites include some nearshore with most inland. Being largely of rock, the nearshore sites are not threatened in the same manner as the marine processing sites, the majority of whose artifacts are metal or wood. Nevertheless, they need to be monitored periodically to identify any changes - a task which can be carried out in conjunction with site monitoring for visitor safety.

6.2.3. Communications Values

Communicating the historic values of these post-contact sites is a key part of ensuring their commemorative integrity. Currently, very little information about the sites is available to visitors or the public except through external publications (e.g., Dalzell 1993). Articles about some sites have been featured in our community newsletter and web site. These, and a brief mention of Gwaii

Table 15. Summary of assigned historical significance and condition of the major post-contact sites in Gwaii Haanas.

Resource	Value as a Documenting Resource	Condition ¹
8 buildings and structures (Haida and non-Haida)	Post-contact domestic building practices	7 good; 1 fair
42 landscapes and landscape features including mines	Mining, claims and associated work camps	37 good; 4 fair; 1 poor
8 marine processing sites (whaling, fishery salteries)	Industrial whaling and fish or shellfish processing	5 good; 3 fair
2 townsites (Jedway Bay, Lockeport)	Early settlements and their roles in regional development	Both good
2 grave sites of three Japanese mine workers (Ikeda Cove) and 1 at Jedway	Stone grave markers with Japanese inscriptions (Ikeda Cove) and a wooden marker (Jedway), also social industrial history and the multicultural workforce	2 good; 1 fair
Wireless station (Ikeda Point)	Early communications	Walls good
15 structural debris and refuse sites	Unknown land uses	12 good; 3 fair; 1 poor condition
2 sites of Haida grave houses	20 th century Haida presence	Both good

1 site condition classes are: "good" more than 50% intact, "fair" 5 to 50% intact, and "poor" less than 5% intact

Table 16. Summary of threat types (natural and/or human), their extent and immediacy at the major post-contact sites in Gwaii Haanas. Mitigation measures are similar for all sites with the need for periodic monitoring for extent and rate of impacts.

Site type	Threat type and extent	Immediacy
8 buildings and structures	Weathering (wind and precipitation) a moderate threat at 5 sites, low at 3; no visitor threats (artefact collecting or unintentional disturbance)	Low
8 shoreline marine processing sites	Wave action at 3 sites a high threat, moderate at 3, low at 2; visitor threats high at 2, moderate at 3, low at 3	Low
2 townsites ¹	Wave action a moderate threat at both; visitor threats are high	Medium to high
36 mining camps or features	Decay, exfoliation at mine sites or erosion at shore sites, and visitor threats are low to high	Low to medium
Japanese graves at Ikeda Cove and Jedway	Weathering, tree-fall moderate threat; visitor threats low at Ikeda Cove, high at Jedway	Low to medium
Two sites of Haida grave houses	Weathering, tree-fall a high threat at 1 site and low at the other; visitor threats medium	Low to medium
Former Cape St. James lightstation	Natural and visitor threats low	Low
Former Ikeda Point wireless station	Natural and visitor threats low	Low
4 logging equipment and debris sites	Weathering a moderate threat at 1 site, low at 3; visitor threats moderate at 1 site, low at 3	Low
16 structural debris and refuse sites	Weathering a high threat at 1 site, moderate at 4, low at 11; visitor threats high at 1 site, moderate at 3, low at 12	Low

1 Jedway townsites should be mapped in detail

Haanas' industrial history in visitor orientations, is currently the extent of communication on this subject, despite the Management Plan's designation of the historical value of Gwaii Haanas' industrial era sites as a key message (AMB 2003 a). Better web information, as well as a section of the proposed "Gwaii Haanas Tourbook" about post-contact history are planned

for better educating the public. Interpreting the sites on location is not practical because of Gwaii Haanas' size and remoteness.

6.2.4. Key Emerging Issues

Key issues relate to the large number of sites and the challenge of implementing a

monitoring and measurement system to identify threats to each in a timely way. Two significant historic sites, the Ikeda Mine shoreline development and Jedway townsite encompass large areas with many cultural features. Both sites warrant detailed mapping for management and protection. Other cultural resource management issues are being addressed through the resource description and analysis (Fedje et al. 2001), and its integration into the cultural resource management regime. A high priority will be communicating historic values of these diverse sites to visitors and the Canadian public generally, and the need to ensure these sites are included in a comprehensive visitor experience and public education plan for Gwaii Haanas (previous Sections 4 and 5).

6.3. Traditional Haida Knowledge, Cultural Sites and Place Names

Gwaii Haanas contains many physical remains of Haida villages, gathering (food, fibre, medicinal) camps, fish weirs, burial places and stopping places. A key threat to these remains is erosion from sea level rise and the increased incidence of storms - both driven by



Figure 32b. Shoreline erosion of the beach-side access trail at T'aanuu Llnagaay (Tanu village) National Historic Site of Canada.

climate change (Section 3.5.5.). For example, high winds and shoreline erosion have caused large Sitka spruce to fall into SGang Gwaay Llnagaay (National Historic Site of Canada and UNESCO World Heritage Site - Figure 32 a). Storm waves also damaged shore access trails to T'aanuu Llnagaay (Tanu Village National Historic Site of Canada - Figure 32 b). Tanu, being an Indian Reserve under the



Figure 32a. Shoreline erosion and weathering of totem poles at SGang Gwaay Llnagaay (Nan Sdins National Historic Site of Canada and SGang Gwaay UNESCO World Heritage Site). Insets are of a decaying mortuary pole and shoreline erosion from wave action.

Indian Act, is not technically within Gwaii Haanas, but it is a Watchman camp (Figure 4).

Within the Haida villages, there is on-going decay of wood remains - poles and house structures that date at least from the 1860s. Hereditary Leaders have requested that chemicals not be used prolong the life of wood remains. However, low-impact conservation involving removal of plants growing from the wood remains occurs each spring. Signs and trails are kept to a minimum, as per Hereditary Leaders' requests.

Managing the effects of visitors, from camping, walking through sites or disturbance of human or cultural remains is described in Section 4. The AMB has had discussions with Skidegate village women and the Elders at the Skidegate Haida Immersion Program (SHIP). A trip was made into Gwaii Haanas and guidance provided from the Elders on the protection of cultural remains - any exposed human remains are to be buried at the closest proximity to their original locations.

Partnerships with SHIP, Haida Forest Guardians, Haida Cultural Guardians and the Haida Gwaii Watchmen program are aiding the incorporation of traditional knowledge into Gwaii Haanas' management. Examples with SHIP include documenting names and uses of plants and animals and Haida place names. Mapping the place names melds 21st century computer technology (GIS) with traditional Haida knowledge. Once the Elders are fully satisfied with the positioning and spelling of place names, a second phase of attaching other knowledge types to this base GIS layer will occur.

Given the prospect of proposed NMCAR, there is a need for the traditional marine knowledge gathering. In June/July 2007, Elders toured Gwaii Haanas by boat to name and describe places of importance for various uses. As Elders are ageing, it is critical to capture this knowledge now, before they can no longer travel.

7. ASSESSMENT OF MANAGEMENT ACTIONS

The resulting management actions according to the eight management goals (each with their attendant strategies) from the Management Plan for the Terrestrial Area (AMB 2003 a) are listed in Table 17. Minor changes are made to the wording of some strategies to reflect changes in management thinking. For example, the first strategy for the goal of Protecting Natural Heritage specifies (expands) the types of information needed by managers to natural and social science plus traditional Haida knowledge - in keeping with current management ethos. Final authority on management actions resides with the Archipelago Management Board to ensure management plan objectives (AMB 2003 a) are being met under the day-to-day leadership of Gwaii Haanas' management team.

From the specifics documented in Table 17, some key underlying achievements warrant highlighting. Firstly, many management reports/strategies/plans are in hand to address specific management needs arising from priority issues, such as the Archaeological Resource Description and Analysis (Fedje et al. 2001), or the Gwaii Haanas Public Safety Plan (GH 2002), or the Backcountry Management Plan (AMB 2003 b). Secondly, there is implementing the spirit and intent of the cooperative management partnership as defined in the Gwaii Haanas Agreement. Through this, many actions respect Haida staffing, Haida culture and stimulate the gathering and application of Haida information and values towards management such as the Haida Place Names Project underway in cooperation with the Skidegate Haida Immersion Program. Thirdly, the commitment to GIS has been of fundamental importance as the prime spatial information management tool for mapping and use of database systems for storage, analyses and retrieval of natural and social science and Haida information. The net effect of progress on all these fronts is that Gwaii Haanas is indeed on track with programs related to EI, Visitor Experience, Public Education and Cultural Resource Management.

Table 17. Management actions and their effectiveness according to the eight management goals (with their attendant strategies) in the Gwaii Haanas Management Plan for the Terrestrial Area (AMB 2003 a).

Management Goal	Attendant Strategy	Resulting Management Action - <i>Impact of Action</i>
<i>Protecting Natural Heritage</i> (maintain ecosystems in perpetuity, protect biodiversity and provide a benchmark for scientific and human understanding)	Provide natural and social scientific information and Haida traditional knowledge to managers for decision-making	<ul style="list-style-type: none"> Staff do credible science (e.g., Bartier and Sloan 2007) and publish portions of our resource description and analysis (e.g., Sloan 2006) - <i>the Field Unit has become a regional leader in science publishing</i> We contract science (e.g., fungi and plant inventories) - <i>contracted science has been published (e.g. Cheney et al. 2007)</i> The geographic information system (GIS) and other databases are updated continuously - <i>our GIS is a prominent regional resource with numerous requests for access</i> Cooperation in regional species-at-risk (SAR) projects - <i>we cooperate in regional SAR initiatives and lead some (e.g., Haida ermine, Saw-whet Owl)</i> Haida traditional knowledge is being recorded - <i>place name project with Skidegate Haida Immersion Program on-going and Haida Elders traditional knowledge cruise to Gwaii Haanas in June/July 2007</i>
Identify, monitor and mitigate changes and emerging threats to ecosystems		<ul style="list-style-type: none"> The monitoring program is under development towards the 2008 deadline - <i>full-time monitoring ecologist will be recruited September 2007 to manage the whole program</i> A Deer Management Plan (Johnston 2006) is being implemented - <i>Non-native Vegetation Plan is due winter 2007</i> Campsite and visitor experience monitoring is in place - <i>an extensive multi-year GIS database is in hand for analyses</i> Oil spill preparedness has been enhanced - <i>an Oil Residence Index has been added to the coastal zone GIS database</i> The environmental assessment (under Canadian Environmental Assessment Act - CEAA) process is invoked for all projects - <i>assessments are done for all infrastructure developments and large science projects</i> After monitoring and assessment, areas affected excessively by visitors are closed or access limited - <i>closed areas are monitored for recovery which has been verified as an effective restoration strategy</i>
Enlist involvement and support of the community (in its broadest sense) in management and protection		<ul style="list-style-type: none"> Staff cooperate in many community initiatives - <i>the Haida Heritage Centre at Kaay Lnaagay, Abalone Stewardship Program, Haida Gwaii Land Use Plan (HG/QCI 2005), Moresby Camp site development, community Visitor Centres, Haida Gwaii Heritage Tourism Strategy, community events (e.g. Skidegate Days)</i> Work with tour operators on visitor management issues - <i>annual meeting with tour operators and regular Newsletter ensure good communications with, and feedback from, the industry concerning management</i> Work with UNBC on visitor communications studies - <i>these products are under active development</i>
Use communications and partnerships to promote conservation ethics and to reduce the need for direct management controls		<ul style="list-style-type: none"> Since 1996, mandatory visitor orientations (with attendant publications) have been in place - <i>these enlighten all visitors as to appropriate behaviours, and are known to help minimize management interventions</i> Haida Gwaii Watchmen interpretation training - <i>training verified as improving Watchman performance according to feedback from visitor surveys</i> School District 50 classroom programs developed - <i>positive feedback from the District</i> Web site developed - <i>> 600,000 hits in 2006</i> Outreach program in islands communities - <i>promotes EI in Gwaii Haanas</i> There is a vigorous publishing program - <i>we foster research opportunities including full participation in the national Research Permit process</i> Many researchers do public presentations of their work - <i>about six presentations annually</i>
Identify and preserve specific features based on uniqueness, endangerment, representivity		<ul style="list-style-type: none"> Site maps are among the many layers in our GIS - <i>our GIS resources are extensively developed and able to print maps at short notice</i> Some sites are closed for cultural/ ecological reasons to promote recovery - <i>closed sites are assessed for recovery</i>

Management Goal	Attendant Strategy	Resulting Management Action - Impact of Action
<i>Respecting Cultural Heritage</i> (includes pre-historic Haida and post-contact heritage towards understanding human dimensions)	Provide natural and social scientific information and Haida traditional knowledge to managers for decision-making	<ul style="list-style-type: none"> Extensive publishing - e.g., <i>pre-historic (pre-contact) archaeology resource description and analysis</i> (Fedje et al. 2001) and many <i>research publications</i> (e.g., Fedje and Mathewes 2005) Contact and post-contact eras are well recorded - see <i>publications of Morton (1992), Dick and Sumpter (2000), Dick (2005), Orchard (2007)</i> Haida information is gathered - e.g., <i>Haida Place Names Project with Skidegate Haida Immersion Program</i>
	Identify, monitor and mitigate unwanted changes or emerging threats	Pre- and post-contact archaeology sites condition assessments, visitor and climate change effects monitored - <i>monitoring data are now in a feed-back loop to management such as coastal erosion at Haida village sites</i>
	Develop plans for specific cultural sites	<ul style="list-style-type: none"> S\overline{G}ang Gwaay Lhagaay (Nan Sdins), T'aanu Lhagaay (Tanu village), and K'uuna Lhagaay (Skedans village) are National Historic Sites of Canada (Nan Sdins is also a UNESCO World Heritage Site) - <i>Consultations with Haida Elders are in process for Commemorative Integrity Statements</i> minimize visitor effects - <i>appropriate site infrastructure</i> (e.g., trails, boardwalks, toilets) in place Site management plans required - <i>completed and implemented for S\overline{G}ang Gwaay Lhagaay in 1998, G\overline{a}ndll K'in Gwaayayay (Hotspring Island) in 2001, Hlk'yah G\overline{a}ndlaay (Windy Bay)</i> Mandatory visitor orientation - <i>has emphasized cultural values since 1996</i> Partnered with the Haida Heritage Centre at Kaay Lhagaay - <i>will integrate public outreach function with the Kaay Centre in 2007</i> Interpretation training for the Watchmen program - <i>annual Watchmen training improves visitor experience</i> School programs include cultural messages - <i>Haida cultural awareness integral to school programming</i> Some slide shows and guided walks focus on Haida culture - <i>guided talks and public presentations underscore Gwaii Haanas' cultural mission</i>
	Use communications and partnership programs as the main tools to build cultural awareness and reduce the need for management control	<ul style="list-style-type: none"> Visitor use fees - <i>shared with Watchmen program</i> Gwaii Haanas' Haida staff development - <i>opportunities are at all levels and currently 50% of staff are Haida</i> Support for the SHIP program - <i>funding provided for place names project</i> Partnership and funding for the Kaay Centre - <i>Parks Canada provided \$6,000,000</i>
<i>Sustaining the Continuity of Haida Culture</i> (cultural relations with the natural world and traditional renewable resource uses)	Support Haida efforts to protect and present their culture	<ul style="list-style-type: none"> Watchmen program for site protection and welcoming visitors (4 sites in Gwaii Haanas + Skedans) - <i>funded by Gwaii Haanas since 1990</i> Trapping, Haida subsistence take (plants and animals) and ceremonial activities - <i>permitted within Gwaii Haanas</i>
	Provide for continuation of Haida cultural activities and sustainable renewable resource harvesting	<ul style="list-style-type: none"> Swan Bay Rediscovery Camp (run by Skidegate Band Council) - <i>operational for youth groups since 2000</i>
<i>Presenting Natural and Cultural Heritage</i> (creating public awareness and understanding of natural, cultural, spiritual values)	Support the idea of a cultural camp	<ul style="list-style-type: none"> Swan Bay Rediscovery Camp (run by Skidegate Band Council) - <i>operational for youth groups since 2000</i>
	Provide people with information (scientific and traditional) for better understanding and respect for Gwaii Haanas	<ul style="list-style-type: none"> Presentation of natural science, archaeology and cultural information - <i>these inform the public and visitors towards developing conservation values, through communication products described immediately below</i>
	Develop specific communications products	<ul style="list-style-type: none"> Many publications - <i>visitor handbook, annual pre-trip planner, lure brochure, media kit, community newsletter, "Rats on Board" pamphlet, S\overline{G}ang Gwaay pamphlet, etc.</i> Many initiatives - <i>mandatory visitor orientation, evening presentations, speaker series, web site, exhibits at the Kaay Centre and community Visitor Centres, school programs</i>

Table 17 continued.

Management Goal	Attendant Strategy	Resulting Management Action - Impact of Action
	Provide communications on Gwaii Haanas that link to global environmental and cultural issues	<ul style="list-style-type: none"> Much international interest in the <i>Gwaii Haanas Agreement</i> (1993) for cooperative management - specialists from Australia and New Zealand have visited Communications products stress Gwaii Haanas' uniqueness to a global audience - all of Gwaii Haanas is a proposed candidate for UNESCO World Heritage Site status
	Work with partners, communities and volunteers	<ul style="list-style-type: none"> Agreements in place for communities to run the Visitor Information Centres - Sandspit and Queen Charlotte are active Kaay Centre to open July 2007 - many outreach opportunities will unfold from the centre School District 50 (all Haida Gwaii communities) - fosters awareness among school children Haida Gwaii Watchmen Program - used for heritage presentation On-going cooperation with licensed tour operators on visitor management - efficient messaging to visitors
<i>Managing Visitor Use</i> (providing visitors with opportunities for safe and enjoyable experiences within ecological and social carrying capacities)	Provide information essential to managers' decision-making	<ul style="list-style-type: none"> Visitor satisfaction, use levels and locations are recorded in our GIS - reported on annually in our growing database Occurrence Tracking System (2003 - replaced Miles Plus System active since 1996) - reports on all public safety, law enforcement, environmental and cultural incidents
	Implement cost-recovery for visitor services	<ul style="list-style-type: none"> Visitor use fees and business licensing fees both in place since 1996 - partial cost recovery achieved
	Give visitors clear direction on appropriate uses and activities	<ul style="list-style-type: none"> Backcountry Management Plan (2nd version - AMB 2003 b) - this details strategies to prevent crowding, noise, site damage, etc. Mandatory visitor orientations and issue-specific publications - these provide direction, e.g. no-trace camping, bear safety, Watchmen site ethics, etc.
	Encourage sensitive access to Gwaii Haanas to ensure wilderness character and natural and cultural heritage are not compromised	<ul style="list-style-type: none"> Pre-visit marketing products - stress appropriate uses Campsite monitoring and trip-log surveys - results are relayed to tour operators if impacts at certain sites become unacceptable Anna Lake trail - assessment complete; use at own risk Certain culturally/ecologically sensitive sites - either closed or of limited access to visitors
	Have essential, but minimal, visitor facilities to retain wilderness character (all developments must go through the Environmental Assessment process)	<ul style="list-style-type: none"> Composting toilets and hardened trails at Watchmen sites - offset visitor effects Water hoses and mooring buoys - in place for safety Hotspring Is. developments - visitor health and safety Warden stations and warden patrols - aid visitor health and safety and science programs Moresby Camp - to be developed with local community in 2007
	Have procedures for emergency public safety	<ul style="list-style-type: none"> An assessment of risks to visitors and levels of Wardens' services - provided in the <i>Gwaii Haanas Public Safety Plan</i> (1997, updated [GH 2002]) Emergency procedures for all events (e.g., tsunami, bear attack, ground search, etc.) - in the <i>Gwaii Haanas Search and Rescue Operating Procedures</i> (GH 2005 - continuously updated, fully revised every 5 years) Permanent emergency shelter - provided at the Warden Operations Stations and Watchmen campsites

Management Goal	Attendant Strategy	Resulting Management Action - Impact of Action
<i>Providing Appropriate Tourism Opportunities</i> (ensuring environmentally friendly tourism respecting ecological and spiritual values and benefiting the islands' communities)	<ul style="list-style-type: none"> Develop and implement a business licensing system for tourism operators Market Gwaii Haanas' tourism niche as an uncrowded wilderness and Haida cultural destination Design tourism activities that respect Haida culture Enlist industry in attaining EI through marketing that reflects Haida culture and wilderness values 	<ul style="list-style-type: none"> Commercial Tour Operators' Association formed 1991 - has fostered close relations with the industry Gwaii Haanas has among the largest backcountry (wilderness camping) visitations in a national park - management actions date from 1990 and culminate in the <i>Backcountry Management Plan</i> (AMB 2003 b) which directs all aspects of visitor use levels (e.g., quotas for visitation) and the overall AMB management ethos Annual meetings with operators and a biannual newsletter - keep tour operators informed and involved in AMB decisions Collaborated with local tourism industry - drafted the <i>Haida Gwaii Heritage Tourism Strategy</i> (HG/QCI 2003) Gwaii Haanas Marketing Strategy (AMB 2006) - positions us as a destination for wilderness and Haida culture - this strategy makes EI the first priority with level of promotion depending on impacts and involved consultations with the Haida, communities, and tourism stakeholders Allocation system - is in place for independent visitors and Haida and non-aboriginal tour operators Integrated tourism strategies - done with our tourism neighbours
<i>Demonstrating Environmental Responsibility</i> (maintain the highest standards of environmental responsibility to avoid or minimize human impacts)	<ul style="list-style-type: none"> Consider environmental implications of all management decisions Meet or exceed Canadian environmental policies, laws or standards Use environment-friendly products; reduce-reuse-recycle 	<ul style="list-style-type: none"> Designated environmental assessment specialist - manages the assessment process for all alteration, restoration or development projects Lyell Island - major post-logging terrain rehabilitation since 1988 and 10 years later, stream rehabilitation began Environmental Management Action Plan (Burles and Giroux 2001) - documents and updates this commitment, of which aspects include: fuel storage tanks, hazardous materials management, contaminated site (n=8) inventories, limiting greenhouse gas emissions Compliance assured - Green Procurement and Green Buildings policies (e.g., solar panels) Participation actioned - community recycling and annual beach cleanup with schools
<i>Managing Information for Integrated Decision-making</i> (use the best information available for management decisions and fill data gaps where possible)	<ul style="list-style-type: none"> Commit to using GIS Use site-specific data on use and effects to determine suitability with EI and cultural values 	<ul style="list-style-type: none"> Commitment fully implemented - GIS is the backbone of our technical information system An example is the environmental assessment (including an archaeological survey) of the new Huxley Island Warden Station - mitigations were recommended to offset incompatible land uses

8. CONDITION OF INFORMATION BASE

Data, information and knowledge are often presented as separate layers of a pyramid with data at the base and knowledge at the peak. This separation can, however, change according to context. For example, a Haida Gwaii record of the presence of the sea palm kelp (*Postelsia palmaeformis*) would be “raw data” to most. But, to a marine ecologist, it is knowledge as the observation would represent a geographical range extension of this species and could perhaps indicate changing environmental conditions. In another example, much of the “data” for the Living Marine Legacy Series (Sloan 2006) originated from published sources, themselves normally considered as information or knowledge. With this understanding, a broad definition of information is used here. Accordingly, information includes field notes, databases, published and unpublished reports, research articles, books, newspapers, manuscripts, video, photos, prints, recordings, etc., all of which may occur in a variety of analog and digital formats.

Decisions on the management of Gwaii Haanas are made based on the best information available, thus a direct link can be established between the quality of the information base and the quality of management decision-making. A higher quality information base should result in more informed decision-making. The quality of the information base can be assessed using the following four criteria:

- Completeness - the extent to which the information base is complete, thematically, historically and geographically;
- Quality - the quality of individual items making up the information base, such as statistical properties (robustness, statistical power), standards used and the extent to which they are properly documented;
- Accessibility - the proportion of the information base that is available and the ability to efficiently search it; and
- Security - the extent to which information is protected against loss of content and meaning, and from unauthorized access.

Table 18 lists an assessment of Gwaii Haanas’ information bases according to these criteria. Although there are issues with all of the information categories listed, the following five warrant special mention:

Table 18. Summary of the state of Gwaii Haanas’ information categories within the overall information base.

Information Category	Completeness	Quality	Accessibility	Security
Bibliography	Good	Good	Good	Good
Archives	Fair	Fair	Good	Good
Cultural	Fair	Fair	Good	Good
Visitor Experience	Good	Good	Good	Good
Human Use	Fair	Fair	Good	Good
Monitoring	Fair	Fair	Good	Good
Species	Fair	Fair	Good	Good
Physical	Good	Good	Good	Good
Ecological	Fair	Fair	Good	Good

- Species information - invertebrates, fish, lichens, and fungi are poorly known relative to other groups such as vascular plants, birds and mammals;
- Coastal data gap - a conspicuous gap in base map information exists at the land-sea interface. This is a noteworthy gap as this is an area within which most human activity and impacts occur. Resolving this issue requires federal- and provincial-level cooperation and Gwaii Haanas has actively addressed this issue (Bartier and Sloan 2007). Figure 33 illustrates an example of this problem from the west coast of Gwaii Haanas.
- Scale dependency of linear measurements - several monitoring metrics directly or indirectly depend on the length of coastline. As shown in Table 19, the length of this feature (indeed, all linear features) is dependent on the scale of measurement. Therefore, care must be taken to ensure consistency when making comparisons of coastal data over time and space.

Table 19. Effect of scale on measurements of the length of the coast of Haida Gwaii, determined from selected digital data sets available from various agencies (from Bartier and Sloan 2007).

Scale	Length (km)
1:20,000	4,659.9
1:50,000	4,334.6
1:250,000	3,679.9
1:250,000	3,636.7
1:2,000,000	2,586.3
1:7,500,000	1,523.2
1:20,000,000	1,031.0

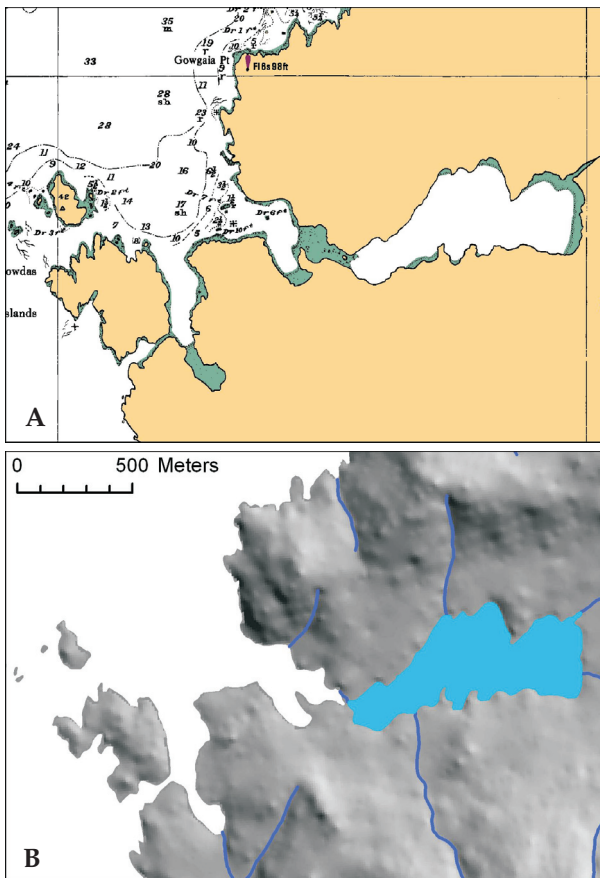


Figure 33. An illustration of the coastal information gap. (A) is from a federal Canadian Hydrographic Service chart and (B) is from a provincial TRIM (Terrain Resources Information Map) database. These represent the best base map information seaward and landward of the coastline, respectively. In addition to numerous small differences in the coastal representation, the freshwater lake drained by a short stream in (B) is correctly represented as a saltwater lagoon connected to the ocean by an intertidal area (shown in green) in (A).

- Boundary - too often the information boundary corresponds with the Gwaii Haanas boundary. This is contrary to greater park ecosystem approach and inhibits applying adaptive management and the precautionary approach. Figure 34 illustrates an example of this problem.
- Initial Conditions - there is a lack of data on "baseline" ecological conditions that existed prior to European contact and the introduction of non-native species. The availability of historical information in, for example, newspapers and journals now accessible on the internet may help.

The internet, digital publishing, the digitization of vast amounts of historical information, and

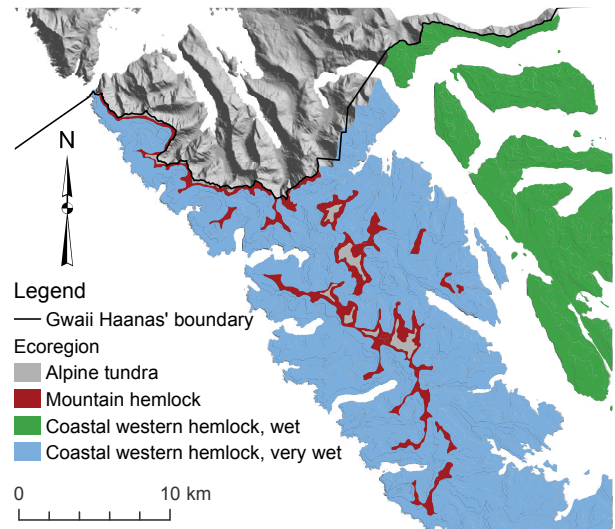


Figure 34 Ecoregions from Gwaii Haanas' terrestrial biophysical inventory data (AMB 1994). The mapping ends at Gwaii Haanas' northern boundary as it was known in 1994. A more accurate boundary, mapped in 1996, reveals that some of Gwaii Haanas is unmapped. This illustrates one example of a database ending at the boundary.

advances in search technology have increased the pool of information available to Gwaii Haanas managers several-fold. For business, this has created the "long-tail" effect (Anderson 2006). Music and book stores with a client base limited by distance, for example, tend to stock only a small proportion of the items in existence - typically 20% or less. In contrast, online retailers with a vastly greater client base are able to stock a much larger inventory. These retailers have found that having a large number of low-selling items can be as important a low number of high-selling items. This effect is shown in Figure 35. This long-tail effect similarly applies to the information available to Gwaii Haanas. Ten years ago, management decision-making was guided by relatively few

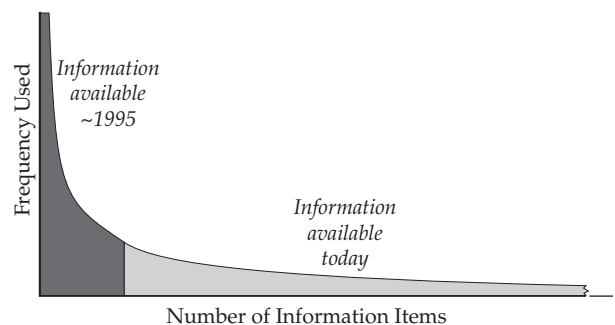


Figure 35. The long tail of information.

information sources. The information available for management decision-making today has increased enormously (Figure 36). Although this greatly expanded information base includes much obscure, historical and infrequently used items, their number is so great that their cumulative effect on decision-making could be significant. For example, the many information sources going into Gwaii Haanas' Living Marine Legacy Series would not have been available a decade ago. The long-tail analogy is relevant to ecological information management in that all information, no matter how obscure, is potentially important.

9. STRESSORS AND EMERGING ISSUES

The key stressors affecting Gwaii Haanas' EI include: effects of non-native species, use of adjacent lands and waters and climate change. These stressors will continue to pose challenges in the future and will be addressed through the goals and objective of our management plan. Where possible, Gwaii Haanas will continue to develop and implement management strategies to address stressors and their effects. Larger scale and trans-boundary threats will require regional partnerships.

9.1. Non-native Species

Non-native animals and plants pose the greatest threat to Gwaii Haanas' EI. Of the 19 mammal species currently found on Haida Gwaii, nine are not native, and, there are over 150 non-native vascular plants. With no natural predators, hyperabundant deer have browsed the vegetation until there is virtually no understorey. This has profound implications for both the natural plant communities and the animals that depend

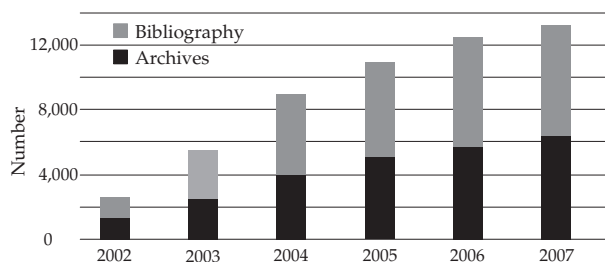


Figure 36. Growth of the Gwaii Haanas bibliography and archives, 2002 to 2007. The bibliography identifies the existence of information important to the Haida Gwaii ecoregion and the archives indicates the presence, either physical or digital, of that information available on-site at Gwaii Haanas. Data prior to 2003 are approximate.

on them. Raccoons and rats are extremely effective predators of seabirds and their eggs. They pose a threat to Gwaii Haanas' several globally significant seabird colonies. Red squirrels predate on songbird nests, affecting bird populations already reduced by the effects of deer browsing. Several particularly invasive plant species have reached the shores of Haida Gwaii. While few of these have yet become established within Gwaii Haanas, monitoring for their spread and early control are critical.

9.2. Use of Adjacent Lands and Waters

The forests along the northern boundary of Gwaii Haanas have been extensively logged. This land falls under provincial jurisdiction and forms part of the forestry land base. Here, the land has been logged from the east to west coast of Moresby Island, effectively fragmenting the continuous forested habitat that extends from the southern tip of Gwaii Haanas to its northern boundary. This has implications for the sustainability and dispersal of long-ranging animals and the spread of non-native species. On the positive side, much of Gwaii Haanas' northern boundary is by height-of-land which means relatively few shared watersheds with adjacent logged lands.

Concerning mining, several Mineral Exclusion areas occur within Gwaii Haanas (Section 3.1.6.). Exploration and extraction are potentially permitted in these areas, with possible effects to Gwaii Haanas. Although most sites remain inactive, one was reactivated in 2006 (Shuttle Island). In addition, some historic mine sites located on the excluded lands are contaminated. At Jedway, for example, there is the potential for significant environmental impacts through groundwater contamination and slumping.

The abundance of fish stocks is a key reason for proposing the NMCAR. With Gwaii Haanas' boundary set landward of the intertidal, the only effect of commercial fisheries is the extraction of salmon. That is, with fewer salmon entering the streams to spawn, less marine-derived nutrients are deposited in watersheds' riparian forests.

9.3. Climate Change

Climate change will cause a rise in sea level, increased frequency and intensity of storms, shifts in species ranges and a rise in the tree line (Sections 3.2.2., 3.5.5.). Alone, any one of these effects could have a significant influence on Gwaii Haanas' EI. Combined, the ecological consequences could be profound.

10. CONCLUSIONS

Based on analyses of Gwaii Haanas' research and monitoring programs, the status and trend of our indicator ecosystems vary individually (Section 3.8). Given that this is Gwaii Haanas' first SoPR, and that the monitoring program is still under development, data gaps do limit the comprehensiveness of this assessment. Forest occupies almost 90 % of Gwaii Haanas' landscape and the rolled-up status and trend from the seven measures is "fair" and "deteriorating" respectively. The next largest indicator ecosystem (8.9 %) is non-forested and its status and trend are both "unknown." Gaps require filling for our next SoPR in 2012, for example, the status and trend of two indicators are both "unknown" and the trend of another three indicators is "unknown".

The greatest biotic stressor is intense browsing by hyperabundant introduced deer that profoundly affects plant species composition, successional patterns and distribution in forested and non-forested ecosystems over 98% of Gwaii Haanas' area from the shoreline to the alpine. Further, introduced predators such as rats and raccoon can rapidly devastate ground-nesting seabirds and their eggs on colony islands. The other major stressor will likely be climate change. This could cause a rise in sea level, increased frequency and intensity of storms, shifts in species ranges and a rise in the treeline. Alone, any one of these effects could have a significant influence, but in combination the consequences could be profound for Gwaii Haanas' EI.

A key consideration for the next review period, besides the introduced species and climate change issues, will be melding the terrestrial EI mandate with the multiple sustainable use mandate from the proposed NMCAR. The extent of the land-sea linkage with its mountain top-to-sea-bottom scope will be unique in Canada and provide new research and management opportunities for Gwaii Haanas and the Agency as a whole.

Concerning the Visitor Experience part of our mandate, the overall rank is "good." Gwaii Haanas is fulfilling or exceeding most visitors' expectations, judging from consistently high

satisfaction ratings. Visitor management strategies facilitate data gathering on visitors, and, for consistency across the system we need to align our visitor satisfaction research more closely with the national Visitor Information Program.

The overall rank for Public Education is "fair." Because we focused on visitor management in the years following establishment, outreach education is not developed to the same extent. While we offer a wide range of programming, more audience research is needed. Now that programs are running, review is warranted to ensure communication objectives are in place and that programs meet them. A heritage presentation plan is under development. The Haida Heritage Centre at Kaay Lnagaay (opening July 2007) will appreciably augment our outreach programs with superb dedicated displays and interpretive facilities.

Concerning Cultural Resources, the rank is "good" to "fair" - Gwaii Haanas has one of the most productive archaeology (both pre- and post-contact) programs of any national park. Significant intellectual gains have been made describing the millennia of human occupation in the greater park ecosystem. As well, a sound GIS-based inventory of over 960 archaeological site types is in hand. The noteworthy threat to coastal sites is erosion by increased storm action and sea level rise due to climate change.

Haida-related cultural programs are progressing on a range of fronts. Visitor Experience and Public Education have strong Haida components, for example, contributions of the Watchmen program at major visitor sites. Aboriginal knowledge gathering that respects the innovative cooperative management agreement is well underway. Examples are the GIS-based Haida place names project and the summer 2007 Elders' field trip into Gwaii Haanas. An important goal for the next review period will be further progress on other facets of traditional knowledge such as interviewing Elders and getting other traditional knowledge types - perhaps as layers onto our base GIS place-name layer. The overall goal is towards a greater contribution of Haida knowledge, within the total knowledge mix, in aid of technical (e.g., monitoring) and cultural management.

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