Vegetation Resources Inventory Strategic Inventory Plan (VSIP) for Haida Gwaii

June 20, 2011

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1.0 Introduction

In the province of British Columbia, the Vegetation Resources Inventory (VRI) is a strategic level inventory designed to support, among other things, the Timber Supply Review (TSR) process, and is the current Provincial standard for forest inventory in B.C. The primary objectives of this project are to:

1. create a complete, seamless, reliable Phase I (photo-interpreted) inventory which meets provincial VRI standards for the entire land area of Haida Gwaii.

2. conduct Phase II sampling with a Net Volume Adjustment Factor (NVAF) component to audit the accuracy of the new photo-interpreted attributes and inventory volumes, and develop statistically accurate tree volume adjustment factors.

The existing forest cover data sets for Haida Gwaii vary in format and content, and much of the content dates back prior to 1970, i.e. is now more than 40 years old. These existing inventory data sets have not been updated for growth or depletion over the past decade and none meet current VRI Standards. A notable aspect of the Phase I design is the inclusion of additional photo-interpreted ecological and tree attributes which provide more information about forest structure and productivity, secondary and non-commercial species, habitat suitability and biomass than the existing forest inventories of Haida Gwaii.

Further information about the design and data collected in both VRI phases can be found at: http://www.for.gov.bc.ca/hts/vri/index.html

To meet the need for up-to-date, reliable and seamless data to support all aspects of the implementing the Haida Gwaii Strategic Land Use Agreement (SLUA) signed in 2007, including the requirement for data to support Ecosystem-Based Management (EBM), a new consistent forest cover inventory is needed encompassing the entire land base of the archipelago, irrespective of tenure and/or administrative boundaries. The new inventory will support future timber supply analysis to replace the one currently being undertaken using existing sub-standard, inconsistent data. It is important that the residents of Haida Gwaii have full confidence in the completed VRI and in order to achieve this, the Council of the Haida Nation (CHN), through the HG Solutions Table, is engaged in the planning and execution of the project.

In anticipation of a VRI project to replace all existing forest cover inventories, new colour photography covering the entire land base was flown in 2007. This imagery has been scanned and processed into ortho-photography and digital stereo models ready for use. In addition, a complete set of hard copy photo prints is available to support the VRI project.

2.0 Background Information

2.1 Strategic Land Use Planning Process and Reconciliation Protocol

In 2001, the Haida Nation and the Province of British Columbia jointly entered into a community-based, strategic-level land use planning process based on protocol agreements signed in April of that year. The Parties made a commitment to cooperatively develop a strategic land use plan which would be guided by an ecosystem-based management framework. The planning process extended over several years culminating in the signing of the Haida Gwaii Strategic Land Use Agreement (SLUA) in December 2007. Work then began to protect areas of critical significance and establish forest management objectives for cultural, aquatic, biodiversity and wildlife values.

One specific aspect of the SLUA was an agreement to initiate a process to determine the long term timber supply for Haida Gwaii, i.e. a timber supply analysis (TSR) across the entire operating land base as determined through the SLUA.

Following the completion of the SLUA, a Reconciliation Protocol was signed by the Haida Nation and the Province in December, 2009 which enshrined joint decision-making respecting the lands and natural resources on Haida Gwaii. Among other provisions, the Protocol established a Haida Gwaii Management Council as the joint decision-making body and a commitment to provide a forest tenure of 120,000 cubic metres to the Haida Nation.

On December 17, 2010 the Land Use Objectives Order legally established ecosystem-based management on Haida Gwaii by setting standards for;

- Haida traditional heritage and forest features, culturally modified trees, cedar and yew
- Aquatic habitats including fish habitat, active fluvial units, upland stream areas and sensitive watersheds
- Forested swamps and several plant communities
- Black bear dens, marbled murrelet, goshawk, great blue heron and saw-whet owl habitat.

2.2 Project Land Base

The total land area of Haida Gwaii, including all fresh water bodies, is considered to be 1,004,000 hectares or sixty seven (67) 1:20,000 scale BCGS full map sheet equivalents. The only part of this area which is not included in the photo-interpretation phase of this project is Lyell Island, situated within Gwaii Haanas National Park Reserve/ Haida Heritage Site ("Gwaii Haanas"). This island covering approx.17,000 hectares was re-interpreted to VRI Standards in 2009 under a contract let and funded by Parks Canada.

The map in Figure 1 shows the existing tenure and administrative boundaries on Haida Gwaii and those areas that are Parks and Protected Areas as defined in the Strategic Land Use Agreement (SLUA).

Most of Haida Gwaii is located in the Coastal Western Hemlock Biogeoclimatic zone. The remainder of the area, at elevations generally above 650 metres, is within the Mountain Hemlock and the Coastal Mountain-Heather Alpine zones.

These broad biogeoclimatic zones are further subdivided into subzones and variants that

reflect local climatic conditions. The variants are distinguished by the different climax plant communities found on similar soil and moisture conditions. The representation of these biogeoclimatic subzones and variants by area across Haida Gwaii is shown in Table 1.

Table 1: Biogeoclimatic Units of Haida Gwaii

Biogeoclimatic Variants		Area (ha)
Coastal Mountain-Heather Alpine Undifferentiated	CMAunp	9967
Coastal Western Hemlock – Montane Wet Hypermaritime Variant	CWHwh2	84113
Coastal Western Hemlock - Submontane Wet Hypermaritime Variant	CWHwh1	554956
Coastal Western Hemlock – Central Very Wet Hypermaritime Variant	CWHvh2	303448
Mountain Hemlock - Wet Hypermaritime Subzone	MHwh	52497
Total Area		**1,004,981**

2.3 Tenure and Administrative Units of Haida Gwaii

Tenure units and their boundaries have been in a state of flux over recent years and this situation will likely continue as the Haida Nation gains acquires additional forest tenures. As of December 31, 2010, the current situation regarding management units and their approximate areas is shown in Table 2 below.

Table 2: Tenure and Administrative Units of Haida Gwaii

Tenure/Administration Unit as Identified by the Crown	Tenure Holder	Area (ha)
Haida Gwaii Timber Supply Area (TSA)	CHN, Husby FP, BCTS and others	566,737
Tree Farm Licence (TFL) 60	Western Forest Products	177,608
Tree Farm Licence (TFL) 58	Teal-Jones Group	25,143
Gwaii Haanas National Park Reserve/Haida Heritage Site		147,000
Naikoon Provincial Park		67,088
Ecological Reserves		9,520
Fee Simple Lands		8,366*
Indian Reserves/Federal Lands		5,790
Total area		**1,007,252**

* this number does not include some areas of fee simple lands located within the boundaries of Gwaii Haanas, Naikoon Park and TFL 60. The actual total area of fee simple lands exceeds 20,000 ha.

Also note that the above numbers do not reflect Crown land deletions made under the Land Act from TSA and TFLs when new protected areas were established under the terms of the SLUA.

Figure 1: Overview map of Haida Gwaii

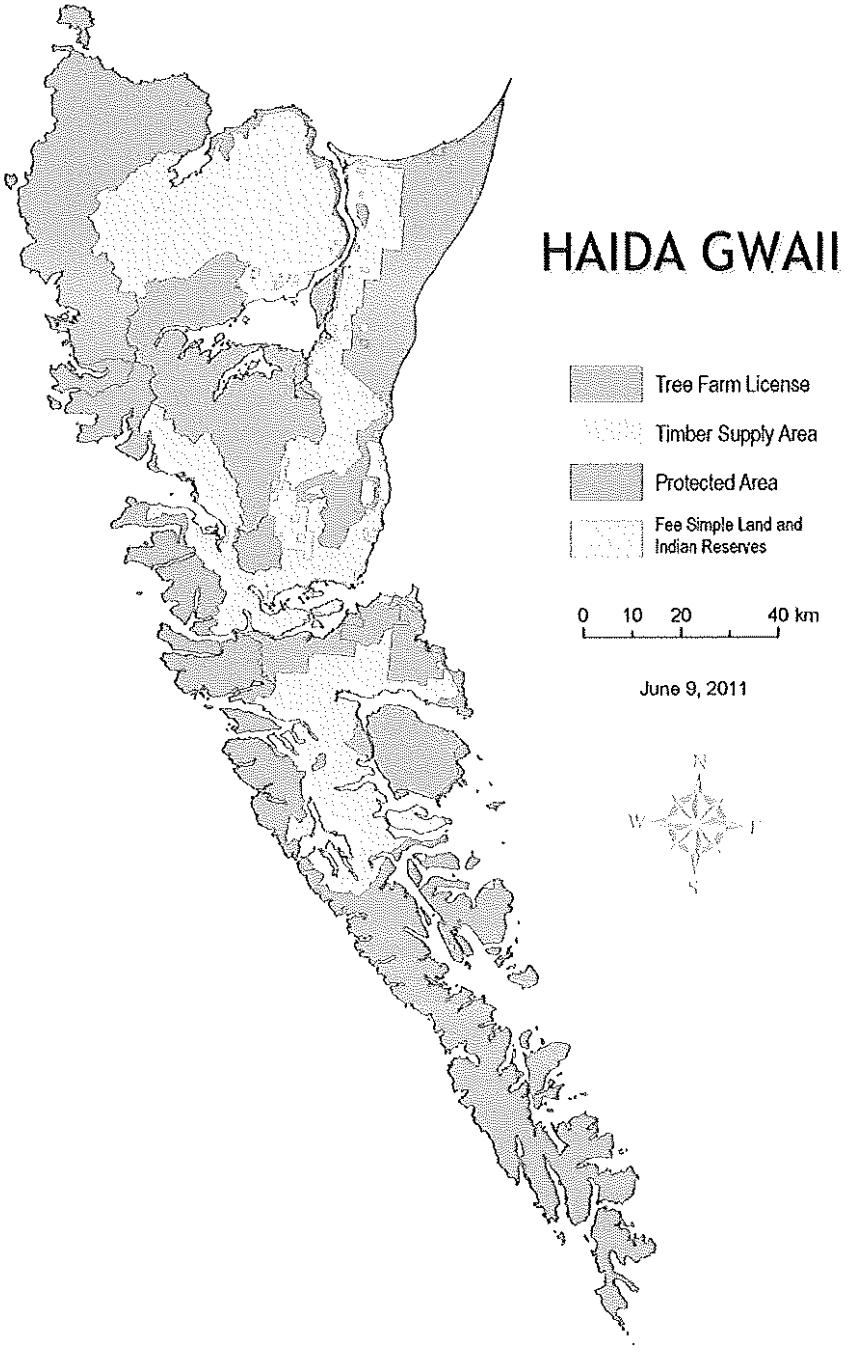
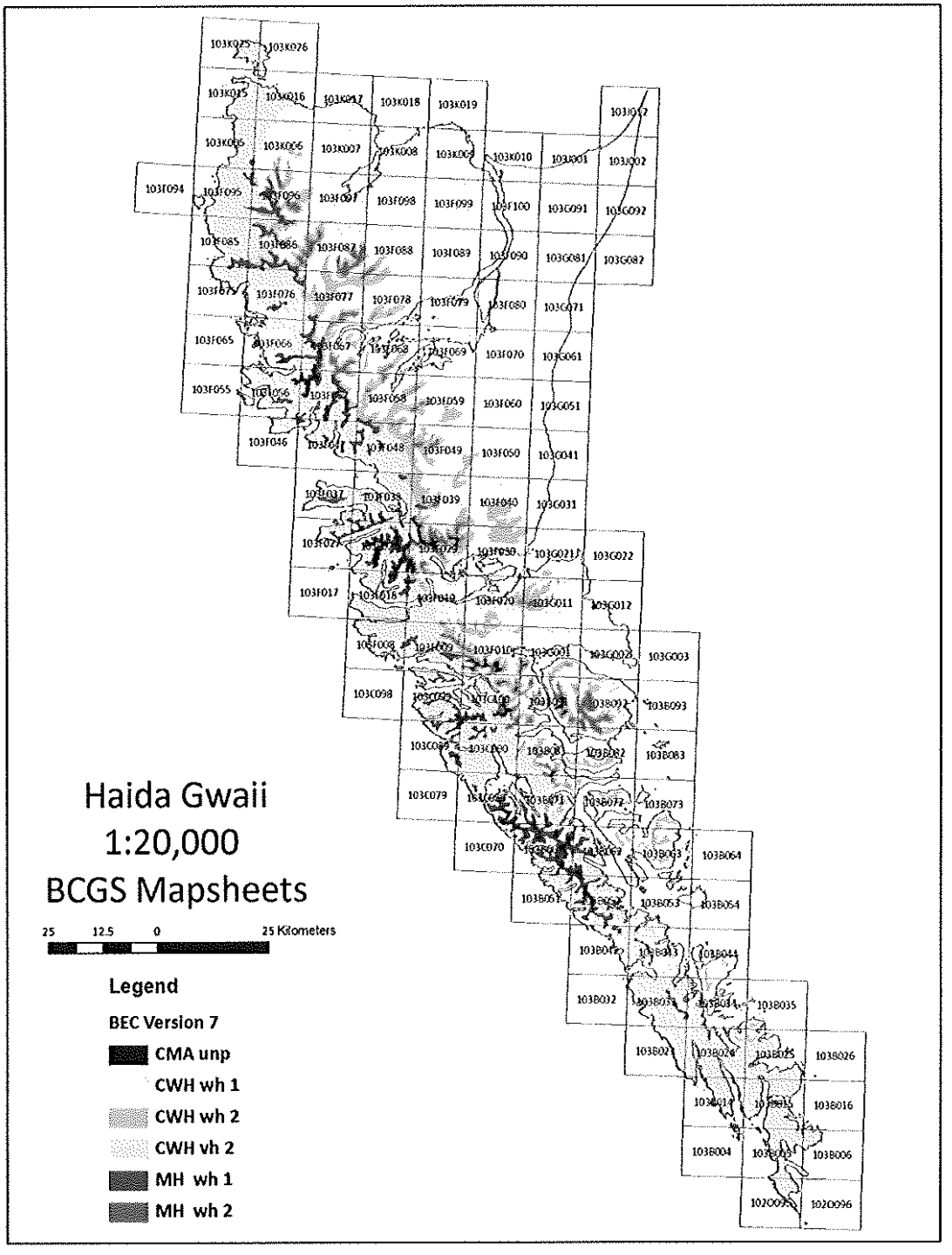


Figure 2: BEC Units of Haida Gwaii and Map Sheet Grid



2.4 Status of the Current Inventories

Existing forest inventory data for Haida Gwaii is comprised of the following six separate data sets having different origins and designs: Some data sets are of more recent origin while others are now over 40 years old.

1. Haida Gwaii TSA (including woodlots and Ecological Reserves, Naikoon Provincial Park and fee simple lands)
2. TFL 60, previously TFL 39 Block 6
3. TFL 58, previously TFL 47, Block 18
4. TFL 25, Block 6 (now part of Haida Gwaii TSA)
5. Gwaii Haanas National Park Reserve/Haida Heritage Site (except Lyell Island)
6. Lyell Island

Summarized below is what is known about these six inventories:

2.4.1 Haida Gwaii TSA

This unit has an inventory combining data from two projects done in 1967 and 1990-1993. The entire TSA covering 89 map sheets was re-inventoried in 1967 using photography flown in 1964 and 1966. Subsequently, 41 of these 89 map sheets were re-inventoried starting in 1990 using black and white 1:15,000 scale photos flown for this purpose in 1989. The other 48 maps were re-digitized onto the new TRIM base maps and updated to 1992 for depletions and changes to other data layers. Subsequently, regular forest cover updates were undertaken by MOF (now MFLNRO) up to about 2000, but since then only intermittent and incomplete updating of the forest cover has occurred.

An inventory audit conducted by MOF in 1997 examined the statistical accuracy of mature volumes and attributes in the Operable and Marginally Operable area of the TSA. The findings were that tree volumes were on average overestimated by 7%. When bias associated with the volume calculation model was removed, the overestimate due to attribute errors (heights, ages, stand density) was closer to 13%. A significant problem was noted related to the actual percentage of Sitka spruce on the land base. Of the twelve stands indicated by the inventory as spruce leading by volume, the audit found only one to actually be spruce leading. The actual average spruce component was 60% in the inventory, but only 24% on the ground.

With the deletion of WFP's TFL 25 Block 6 and its incorporation into the TSA in July 2010 and deletions of areas from TFL 60 in December 2010 the TSA inventory can now be considered to have four components. Information related to the recent ex-TFL additions is presented in the sections below.

2.4.2 TFL 60 (WFP)

This area now covers 177,608 hectares (previously 240,311 hectares) with a photo-interpreted "average volume line" inventory produced by the original licensee, MacMillan Bloedel (MB), in 1964/65 covering what was then considered commercially accessible or operable forest. The photo interpretation was supported by extensive volume sampling and inventory cruise plots. Later, in 1982, a photo interpreted inventory without sampling was done for those areas previously categorized as "inaccessible or inoperable". Data from an Operational Cruise (OPC) program initiated in 1979 was used to update the inventory and

this data upgraded the original attributes and volumes for some mature stands. About 25% of remaining (unlogged) mature stands in TFL 60 have had their volumes updated with OPC data.

A program of sampling immature (previously logged) stands provided estimates of species, basal area, age and height once these stands reached an age of 31 years. The immature stands not sampled were re-mapped and re-labelled from orthophotos using sample data as a reference. Changes in volume and attributes of the immature component have not been projected over time to account for growth.

Some key attributes carried by MOF forest inventories on the TSAs (both VRI and the earlier FIP standard) were not captured from photo interpretation in the MB inventory standard, although some were subsequently derived mathematically. The attributes in question include stand height, species percent and crown closure.

Available information indicates that TFL 60 was last updated for growth and depletion in 1995.

Two inventory audits were conducted in the 1990s, one by MOF and the other done internally by MB. Both audits showed that inventory volumes were overstated within the range of 15 to 26% depending on the methodology used to match and compare the inventory and ground measured volumes.

2.4.3 TFL 25 Block 6 (previously held by WFP and formerly TFL 24)

This area covered 53,364 hectares and as noted above included the entire area previously comprising the TFL 25 Block 6 licence area previously held by WFP.

In 1999, a Phase I VRI project was initiated by WFP using hard copy photos, but the exact scope of the work is uncertain. Areas of second growth/immature forest were re-inventoried using 1996 photography, but, as was done on other TFL 25 VRI projects areas of mature/old growth may not have been re-inventoried and old delineation and possibly attribution carried forward.

A significant amount of calibration data was collected during this project, including both air and ground calls. The quantity of each calibration type is yet to be determined.

This VRI inventory was produced in WFP's own format using FRBC funding and was not subject to external QA. Neither the final Phase I digital product nor field calibration data were ever delivered to MOF at the conclusion of the project. The whereabouts of the document photos is presently unknown. Subsequently, in 2001-2002, Phase II and NVAF sampling was completed by WFP across Block 6. Acceptance by the Ministry of the final products from this project is still pending.

2.4.4 TFL 58 (Teal-Jones Group)

The existing inventory for this unit, previously known as TFL 47 Block 18, was completed in 1969 by Crown Zellerbach. Old growth areas were re-typed and intensive field sampling was carried out to produce an "average volume line" inventory similar to the MB design described above. Some of the immature areas were updated from divisional logging and forestry records at the same time. Photos flown in 1966 and 1969 were used for this re-inventory.

Available documentation indicates that the inventory was updated for logging and other changes up to 1994, but it is unclear whether further updating has occurred over subsequent years during which time the TFL licence has passed through several hands.

No inventory audit has been conducted on this unit.

2.4.5 Gwaii Haanas National Park Reserve/Haida Heritage Site

The area now within Gwaii Haanas National Park Reserve/Haida Heritage Site (Gwaii Haanas) was originally part of two different forest management/administrative units: Queen Charlotte TSA and TFL 24 (WFP). The creation of Gwaii Haanas occurred in 1988 and the area was originally referred to as South Moresby National Park Reserve before adoption of its present name. With the exception noted below related to Lyell Island, the rest of Gwaii Haanas has a composite of the old TSA and TFL inventories both dating back to 1966-1967. No updating of this data has occurred since the creation of the Park.

2.4.6 Lyell Island

In the summer of 2009, Parks Canada let a contract to re-inventory the area of Gwaii Haanas within the Lyell Island Group Landscape Unit to VRI Phase I Standards. A new inventory was required to provide a baseline data set for ecosystem restoration and monitoring projects. Field calibration was undertaken in October of that year and the completed Phase I was delivered to Parks Canada in early Spring 2010.

3.0 Identification of Key Information Issues and Drivers

As outlined in Section 2.0 – Background Information, a joint decision-making body, the Haida Gwaii Management Council will now make decisions respecting the lands and natural resources of Haida Gwaii. Completion of a seamless VRI across the entire land area of Haida Gwaii replacing the existing patchwork of out-of-date, unreliable forest inventories is essential to support the implementation of these new arrangements. The following section describes some of the specific issues and needs as well as broader forest management and economic considerations and how new data provided by completion of VRI will assist in addressing them.

3.1 Implementation of the Strategic Land Use Agreement and Land Use Objectives Order

Development and refinement of both the SLUA and LUOO have been made difficult because of inconsistent and incomplete forest cover data. Decisions flowing from these processes using deficient datasets can be refined and then implemented with greater confidence once the new Phase I inventory is completed and its accuracy established through the Phase II audit ground sampling.

3.2 Establishment of Ecosystem Based Management (EBM) and long-term monitoring

A basic requirement of establishing an EBM regime is to have accurate and up-to-date information to support an understanding of the current status of ecosystems and their components. From this starting point (baseline), monitoring of change over time resulting from logging and other activities is then conducted. A seamless VRI can provide more reliable measures of the baseline forest conditions on Haida Gwaii which, in combination with ecosystem mapping and other data, will enable change to be tracked and quantified to inform the adaptive management strategies.

3.3 Determination of a sustainable long-term timber supply

Analysis work is currently underway at the Forest Analysis and Inventory Branch (FAIB) of the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) to calculate a proposed Allowable Annual Cut (AAC) for Haida Gwaii. This analysis will be reviewed by the Haida Gwaii Management Council leading to a decision either to accept or amend the proposed harvest level.

The timber supply analysis work has run into major difficulties causing delays because of the multiple sets of inconsistent forest inventory data that had to be combined and rationalized.

Some of the problems encountered include the following:

- Overlaps and gaps at the boundaries of different forest cover datasets. This problem has caused major problems for the analysts in assembling seamless data coverage and performing a spatially-explicit timber supply analysis
- Inconsistent naming of attributes including species identifiers
- Missing key attributes in some existing inventories, e.g. stand height, crown closure and basal area which are required to run the volume prediction and analysis software
- Lack of updated forest cover, particularly for younger, dynamic second growth areas where stand composition is likely to have undergone significant change over time

- Absence of any forest cover attribute accuracy measures for most of the inventory units. Only the Haida Gwaii TSA has had a statistical audit completed for volumes and attributes, however, only part of the total area was sampled.

Completion of the VRI Phase I and Phase II components would obviate or minimise these problems and allow the timber supply analysis to be re-run with minimal time and effort to produce a much more robust output.

3.4 Protection and management of Cedar resources

Existing data only provides uncertain and inconsistent measures of both old-growth and second-growth cedar across Haida Gwaii. Given the central importance of cedar to Haida culture, more reliable measures of the presence and condition of cedar are needed to quantify what is available for monumental and large construction purposes such as canoes, poles and buildings, as well as younger trees suitable for bark stripping in the present and as a future source of monumental cedar.

According to the current inventories, young redcedar comprises approximately 6% of the stands less than 120 years old, whereas in old unlogged stands redcedar averages about 28% of the total volumes. Recent field surveys of young stands indicate that the actual presence of cedar may typically be as low as 1%. In areas recently regenerated following the implementation of the Haida Gwaii District cedar guidelines, cedar stocking may be higher, but none of the existing inventories reflect the results of this policy and whether it has been successful. Initiation of a new VRI is the opportunity to capture this vital information.

3.5 Providing better measures of forest biomass and carbon storage

There is increasing interest and recognition, globally, of the ecological and economic opportunities and benefits associated with biomass storage and utilization, carbon capture and storage, and the selling of carbon credits in the global market. Supporting such activities requires credible measurements/estimates of total forest biomass and tracking of accumulations and depletions over time. Completion of both Phases of VRI will help provide such data and could incorporate elements of monitoring to track change in the forests of Haida Gwaii. Related to this is the emerging need for reliable data to support initiatives and reporting related to climate change.

3.6 Better application of site productivity estimates

Considerable investment using public funding has been made to more accurately determine site productivity estimates for Haida Gwaii, both through SIBEC and other site index adjustment methodologies. Significant economic benefits can be realised through effective application of these estimates in timber supply modelling and other types of analysis. As these improved estimates are usually applied to forest stands based on their inventory leading species, it is important that leading species is correctly identified. As noted elsewhere, leading species accuracy is consistently weak across existing inventories and the VRI is an opportunity to upgrade this vital information.

3.7 Quantifying impacts of emerging forest health issues

Over the past two years (2009-2010), an outbreak of Western black-headed budworm has occurred, initially on Moresby Island and then rapidly spreading both south and northwards to affect areas on Graham Island. Surveys show that the affected area increased from

approximately 14,000 hectares in 2009 to almost 98,000 by the end of 2010. This defoliating insect primarily attacks western hemlock and the heaviest damage/mortality is occurring in young second-growth hemlock stands which have been previously thinned. Much of the affected area is within the commercial forest land base. Should this infestation continue through the 2011 season with repeat attacks on already affected stands and further spread into new areas, higher tree mortality will result together with top kill and deformation of tree crowns affecting future growth. The 2007 photography does not show the effects of this latest budworm outbreak, but does capture some of the impacts of an earlier outbreak (1996-2000). Ground surveys of the area would provide the interpreters with valuable information to guide their spatial and attribution interpretations. Acquisition of new high-resolution satellite imagery over these areas should be considered as it would be a cost-effective aid to capturing up-to-date information.

3.8 Other information needs

The following list identifies a range of other areas where VRI can provide improved baseline data. It is by no means exhaustive:

- Identification and management of other Haida cultural resources
- Meeting inventory requirements for international certification of forest operations and products
- Supporting local community forest-based economic initiatives
- Providing key forest attribute data for wildlife habitat suitability mapping and capability assessments, including black bear, marbled murrelet and Northern goshawk
- Identifying and monitoring forest health problems related to pests and diseases
- Providing baseline data for scientific and research projects
- Quantifying impacts of deer and other invasive species on the forest
- Providing essential data to support watershed rehabilitation and restoration projects being implemented by CHN and Parks Canada

4.0 Project Components, Estimated Costs and Scheduling

4.1 Phase I - Photo Interpretation

4.1.1 New Photography

In preparation for a future VRI project, 1:20,000 scale colour photography was flown for all of Haida Gwaii in the early fall of 2007. The photos were scanned at 12 microns resolution, aerial triangulation (AT) completed, and Digital Image Analytical Photogrammetry (DiAP) models produced. The photos are available in softcopy format also in hard copy for this project. In addition, a full set of colour orthophotos has been created for the entire land base.

4.1.2 Existing Document Photography

Historic document photography, i.e. the hard copy photos used to build the existing inventories, is available for some areas of Haida Gwaii. These photos carry the original delineation, attributes and calibration points (air and ground calls) produced by the interpreters of the day. For the TSA inventories done in 1967 and 1990, a complete set of these photo prints are housed in the Ministry archive. For the present and past TFL areas, some photo sets are known to still exist, but the extent and completeness of the coverages still needs to be determined.

4.1.3 Existing Calibration Data Sources

As with the historic photos, calibration data for the TSA areas resides in the Ministry inventory archive on the existing document photos. There are approximately 2000 existing air and ground calls marked on these photos which must be reviewed and transferred to the Provincial calibration tile as part of this project.

For the TFL areas, some calibration data including a range of field surveys and ground samples information may be recoverable from document photos or from the current licencees. This data will also be made available to the interpreters and loaded to the calibration tile as appropriate.

Further sources of useable calibration data may also exist from projects done by CHN, Parks Canada, local district staff, other agencies, researchers, etc. There is likely to be a considerable amount of growth and yield data from plot measurements held by the provincial government and licencees. Where this data can be identified and accessed, it will be added to the pool of existing calibration information.

4.1.4 Estimated Phase I Costs

Based on average costs seen over recent years and in consideration of the high access and mobilization costs and the difficult terrain, together with a lack of on-Islands resources such as helicopters, the anticipated all-in costs will likely be in the range of $1.00 to $1.50 per hectare or $1.0 to $1.5 million dollars for the entire project area. If a more extensive program of new calibration data collection is included beyond that suggested by the guidelines provided in the VRI Phase I Standards and Procedures, the costs will probably be at the top end of the range. This question will be addressed in the VRI Implementation Plan (VPIP) after consulting with project partners and stakeholders.

4.1.5 Proposed Phase I Scheduling

VRI Phase I could be completed in two years commencing in Spring 2011, but a more realistic approach in relation to resources and budgets is for a three year project. If the two year option is selected, then the proposed schedule for the first year would see delivery of 40 per cent of the project area or 27 of the 67 full map sheet equivalents (FME). The remaining 60 per cent of the area, or 40 FME, would be undertaken in the second year with planned completion of all maps by March 2013.

4.2 Phase II - Ground Sampling

Following the completion of the photo interpretation phase, ground sampling or Phase II would be initiated to provide measures of accuracy for the new inventory.

Phase II ground sampling entails the accurate measurement of selected tree characteristics based on an unbiased sample. These measurements are used to assess how much of a given tree or forest-related characteristic is present within a specific management or tenure area. The sampling design ensures that ground measurements are unbiased. VRI ground sampling consists of audit ground samples and Net Volume Adjustment Factor (NVAF) samples.

The VRI sampling design can accommodate the collection of additional data such as measures of coarse woody debris and ecology data. The extent of sample data to be collected will be addressed in the Phase II Implementation Plan.

Ground sample data are unbiased and better reflect the overall population totals than the photo estimated attributes.

4.2.1 Volume Audit Sample Description

Volume Audit (VA) sampling is ground sampling that is used to verify the accuracy of tree or stand volumes and some key attributes such as stand age, height, basal area and site index across a management unit. The results can be used to perform a volume sensitivity analysis when determining the long term timber supply. The design of VA sampling is based on current VRI ground sampling standards and procedures, which consists of a five point variable radius plot cluster. A random selection of 50 (or more) samples will be selected in the target population. A default sample size of 50 was chosen, as, in most cases, it will meet the target sampling error of +/-15%.

4.2.1.1 Volume Audit Target Population

The target population for VA sampling will be polygons with an age greater than 50 years in the vegetated treed (VT) portion of the land base.

4.2.2 Young Stand Audit Sample Description

Young stand audit samples are a new component of the VRI process and will be used in a similar way as volume audit samples with two exceptions: a reduced emphasis on volume and the capability for monitoring change over time. The design of young stand audit sampling is based on a large fixed area sample using the Change Monitoring Inventory (CMI) sampling standards and procedures. A random selection of 20 or more samples will be

selected in the target population. The standards and procedures guiding young stand audit sampling intensity may change by the time sampling commences on Haida Gwaii.

4.2.2.1 Young Stand Audit Sample Target Population

The target population for VA sampling will be polygons with an age between 15 and 50 years in the vegetated treed (VT) portion of the land base.

4.2.2.1 Sample sizes and estimated costs

As the new Phase I will be evaluated to some extent by the reported sampling error around the new estimates, as much as is possible, that error should be minimized. If the default sample size proves to be inadequate to provide the necessary measure of confidence, both the number of samples required and costs will be higher.

As noted above, in relation to the Phase I costs, undertaking such a project on Haida Gwaii with its geographic and logistical challenges will impose higher than average costs for field sample data collection. Costs shown in Table 3 are based on a total of 70 samples, assuming a cost of $3500 for each volume audit and young stand sample.

4.2.3 Net Volume Adjustment Factor Sample Description

Net Volume Adjustment Factor (NVAF) sampling involves detailed stem analysis of sample trees, the measurement of actual gross and decayed wood volumes, and an estimate of merchantable volume. The NVAF is used to correct for bias in the compiled volumes of the volume audit samples that is associated with hidden decay and the tree taper functions. In addition, NVAF merchantability estimates provide information that can be used to correct the volume ground sample estimates of merchantability.

Sample selection is unbiased and conducted on a subset of the volume audit samples.

Due to the unique ecological conditions of Haida Gwaii that influence tree taper and decay, the NVAFs for the major tree species must be specific to this area and cannot utilize NVAF sample trees from other coastal areas. Thus, the sample size will have to be larger than for other units in order to allow for species and age group-specific strata. The 60 sample trees selected from the former WFP TFL 25, Block 6 are available to augment NVAF sampling in the rest of the project area.

A sample size of 80 trees is proposed for Haida Gwaii and Table 3 shows the estimated cost to complete the NVAF sampling.

4.2.3.1 Net Volume Adjustment Factor Sample Target Population

The target population for NVAF sampling will be VT polygons with an age greater than 50 years in that portion of the land base in which future timber harvesting will occur.

4.3 Proposed Phase II Scheduling

VRI Phase II, including the NVAF component, would be initiated and completed within two years, commencing in late Spring of 2013. The Phase II samples would be selected and measured during the 2013 field season, extending into the following season if necessary. The NVAF component would be undertaken in the 2014 field season with all data analysis and reporting completed by the end of March 2015.

Table 3: Estimated Cost Summary

Project Component	Fiscal Year	Cost per hectare ($)	Cost per sample ($)	Total for Component ($)
Photography – acquisition and processing	2007-2008			380,000[1]
Phase I – photo-interpretation	2011-2013	1.50		1,500,000
Phase II - audit sampling: 70 samples (50+20)	2013-2014		3500	245,000
NVAF (80 trees)	2014-2015		3000	240,000
Data analysis and reporting	2014-2015			20,000
Total overall cost				2,385,000
Total cost excluding photos[1]				**2,005,000**

[1] All photo costs were incurred during fiscal 2007-2008

5.0 Project Sign-Off Sheet

Haida Gwaii Vegetation Resources Inventory Strategic Implementation Plan (VSIP)

It is the intention of the proponents to implement the Haida Gwaii Vegetation Resources Inventory Strategic Implementation Plan (VSIP) as described.

I have reviewed the Haida Gwaii Vegetation Resources Inventory Strategic Inventory Plan. I will be advising the appropriate contacts that the work proposed in this plan meets Vegetation Resources Inventory Standards and the needs of the Council of Haida Nation.

April Churchill June 22, 2011

April Churchill *Date*
Vice-President,
Council of Haida Nation
of the

I have reviewed the Haida Gwaii Vegetation Resources Inventory Strategic Inventory Plan. I will be advising the appropriate contacts that the work proposed in this plan meets Vegetation Resources Inventory Standards and MFLNRO business needs.

July 6, 2011

Albert Nussbaum, RPF *Date*

Director,
Forest Analysis and Inventory Branch,
Ministry of Forests