

# PROJECT COMPLETION REPORT

PHASE 1 – VEGETATION RESOURCES INVENTORY (VRI)  
PHOTO INTERPRETATION and DIGITAL MAP PRODUCTION  
of  
**HAIDA GWAI**  
2011-2013



2013 Air Call Program looking south down Darwin Sound

for

**The Ministry of Forests, Lands and Natural Resource Operations;  
Council of the Haida Nation; Parks Canada (Gwaii Haanas  
National Park Reserve and Haida Heritage Site)**

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Timberline Forest Inventory Consultants**

# 1. Introduction

## 1.1 Purpose

The purpose of this project completion report is to document and provide a historical reference of the area of interest, project personnel and activities associated with the completion of the Haida Gwaii Vegetation Resources Inventory (VRI). For the Haida Gwaii VRI, this encompassed the Queen Charlotte Timber Supply Area (TSA), Tree Farm Licences (TFL) 58 and 60, Gwaii Haanas National Park Reserve and Haida Heritage Site\*, Naikoon Provincial Park, Duu Guusd Conservancy, Tlall Conservancy, Yaaguun Suu Conservancy, Daawuuxusda Conservancy, Vladimir J Krajina Ecological Reserve, half a dozen smaller conservancies on Graham and Morseby islands, and all private and federal lands.

\*Lyell Island which was previously inventoried to VRI specifications by IRC under contract to Parks Canada in 2009-2010, was integrated into the Haida Gwaii VRI as part of this contract.

## 1.2 Timeframe

Work on the Haida Gwaii VRI commenced on July 28, 2011 and was completed in December, 2013.

## 1.3 Project Administrators

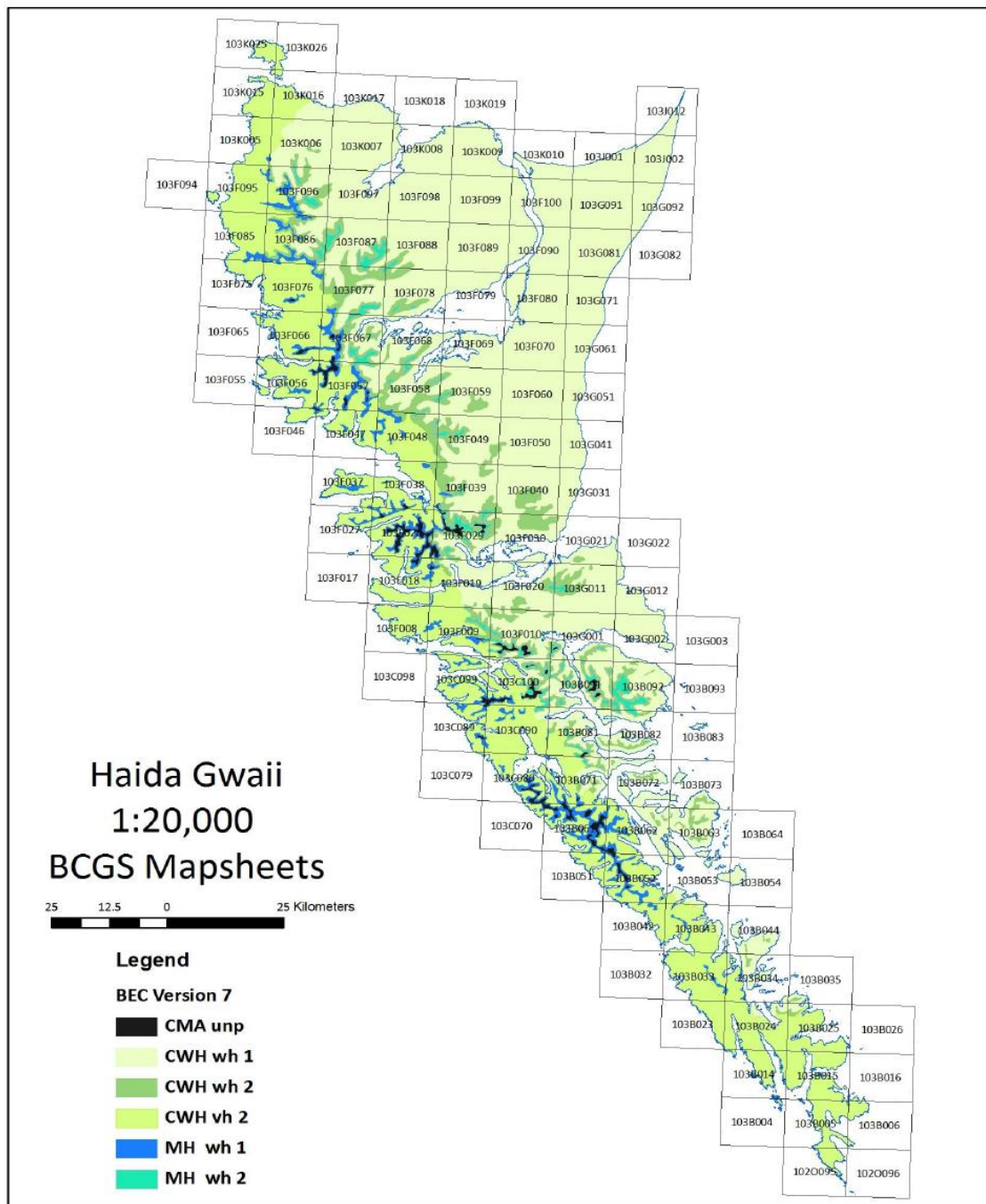
Mike Sandvoss, RFT and John Cosco, RPF of Teco Natural Resource Group (Project start-up to October 2011) and ultimately Timberline Forest Inventory Consultants (November 2011 to December 2013) were the consultant leads for this VRI project. Roman Bilek, RFT was the Ministry of Forests, Lands and Natural Resource Operations (MoFLNRO) VRI Project Manager.

## 1.4 Planning Documents (Background)

### 1.4.1 VPIP

Haida Gwaii is an archipelago of more than 150 islands lying approximately 90 km's west of BC's north coast. Varying sources put the total land area at anywhere between 1,007,252 to 1,018,000 hectares. Haida Gwaii occupies portions of 126 BCGS map sheets or 67 full map sheet equivalents (FME). The area inventoried under the Haida Gwaii VRI contract totaled 987,730 ha (65.85 FME) due to the exclusion of the previously completed Lyell Island VRI. Figure 1 (Figure 2 from the VSIP) shows the Haida Gwaii archipelago under the BCGS map sheet grid.

The existing forest cover inventories covering Haida Gwaii were from six different inventories of varying dates and standards, all of which were out of date and didn't meet current VRI standards (with the exception of the Lyell Island VRI). For more detail on the old forest cover inventories, see section 2.4 of the Haida Gwaii VRI Strategic Inventory Plan (VSIP). The Letter of Understanding (LOU) between the project partners is in Appendix 1. The entire Haida Gwaii VSIP and VRI Project Implementation Plan (VPIP) documents can be found in Appendix 2 and 3 respectively.



**Figure 1. Excerpted from the Haida Gwaii VSIP – Attachment A, showing the Haida Gwaii archipelago, BEC units, under the BCGS map sheet grid.**

The VRI Phase 1 was implemented by the MoFLNRO, in partnership with the Council of the Haida Nation (CHN) and Parks Canada with the intent to produce a seamless Phase 1 VRI for all of Haida Gwaii. This new inventory would support land use plan implementation, timber supply analysis, and other specific needs as described in section 3.0 of the Haida Gwaii VSIP that were not being fully met by the existing forest cover inventories.

### 1.4.2 Aerial Photographs

A new set of 1:20,000 colour aerial photographs were acquired for all of Haida Gwaii in the summer of 2007. In addition to a hardcopy set, the aerial photo negatives were scanned at a resolution of 12 microns, aerial triangulated, and produced into digital image and model files for subsequent use in softcopy systems. The total number of photographs acquired and scanned to digital models was 1748. Some of the aerial photo specifications were exceeded by the aerial photo contractor, but on review by GeoBC and FAIB staff, were passed based on mitigating factors.

The Lyell Island VRI was completed using the same 2007 digital image files as was used for the Haida Gwaii VRI. A few smaller outlying islands along the east and south coast were not flown by the aerial photo contractor and thus had to be interpreted using the document aerial photographs. This was a simple solution as the islands were small vegetation free, wave scoured rock outcrops.

Low clouds clinging to the south west coast area produced minor obscuring of the a few hundred meters of coastal polygons, but much of this was within the vegetation free splash zone and could be worked around easily.

With some exceptions the photos had good colour rendition, and were bright enough except along steep north facing slopes, that due to the severity of the terrain rarely receive direct sunlight. Image brightening and contrast adjustment within the softcopy environment were used to mitigate most of the heavily shadowed areas.

### 1.4.3 Base Maps

North American Datum (NAD) 83, TRIM I base maps, constructed in ~1989 from 1986 1:65,000 scale aerial photographs, were available for the entire project area. No TRIM upgrades or updating had been done since they were produced, and deficiencies were noted before the VRI was started. Most of these could be attributed to the small scale photographs used in their production and in some cases simply due to the 21 years between projects and sections of active coastline.

Roads not captured in the original TRIM production (missed), or incorrectly captured, or roads constructed subsequent to the 1986 photo acquisition date, were captured in softcopy during the Phase I VRI delineation phase and made available to the MoFLNRO as an Arc Shape file in fiscal year 2012 / 2013. A final 'New Roads' file was provided as a final deliverable at project completion. GIS statistics indicate 3945 new road segments for 2451.8 added or correctly aligned roads.

Misaligned lakes and shorelines were captured as VRI type line adjustments during both the delineation and attribution phases of the Phase I VRI. No separate shape file of the adjustments was created as the process would have been excessively laborious given the magnitude of some of the adjustments.

### 1.4.4 Existing Calibration Data Sources

There were a significant number (2868) historical air calls, ground calls, and permanent sample plots (PSP's) available as supplementary calibration information, distributed across the TSA, TFL's, Gwaii Haanas, Naikoon Provincial Park, and the many conservancies. The attribute information for these were recorded, from available document aerial photographs, to the standard MoFLNRO VRI attribute spreadsheet, and digitally captured to a historical data source geodatabase as project deliverables.

Data from numerous other ground sample types (listed in section 2.3 of the Haida Gwaii VPIP) were made available to the VRI contractor as shapefiles and were used as applicable during attribution.

The location and distribution of the historic data sources factored in the layout of the VRI calibration plots.

#### 1.4.5 RESULTS Information

RESULTS spatial and attribute data were made available for the TSA and to a lesser degree within the TFL's and previously harvested areas within Gwaii Haanas. Spatial data was referenced during the delineation to address the different internal polygon rules for non free to grow and free to grow blocks. Aspatial data was incorporated according to RESULTS integration rules, which can be found in: **Appendix A – Photo Interpretation Guidelines for Integrating RESULTS Information, Version 2, March 2011** for map sheets completed in fiscal years 2011/12 and 2012/13, and **Appendix A – Photo Interpretation Guidelines for Integrating RESULTS Information, Version 3, March 2013** for map sheets completed in fiscal year 2013.

## 2. Project Area Description

Haida Gwaii is an archipelago on the north coast of British Columbia. It is made up of several large islands (Graham Island to the north and Moresby Island to the south), a few other major islands (Louise, Lyell, Kunghit, Burnaby, Langara, Chaatl, and Hibben) and approximately 150 smaller islands.

The islands that make up Haida Gwaii are separated from the mainland, approximately 90 km's to the east, by Hecate Strait. Queen Charlotte Sound separates it from Vancouver Island to the south, and Dixon Entrance separates it from the southern tip of the Alaska panhandle to the north.

The climate of the archipelago is typical temperate northern coastal rainforest, much like the mainland coast, and is moderated by the North Pacific Ocean Current. This produces the heavy rainfall, periodic sunshine, and moderate temperatures throughout the year.

The tree species present on Haida Gwaii are Sitka spruce, western redcedar, hemlock, yellow cedar, shore pine, red alder, and some mountain hemlock in the higher elevation stands.

Haida Gwaii covers numerous administrative units including the Haida Gwaii TSA, TFL's 58 and 60 located in the south central area of Graham Island and the north central area of Moresby Island, Gwaii Haanas National Park Reserve and Haida Heritage Site occupying the south third of the archipelago, Naikoon Provincial Park covering the north east edge of Graham Island, Duu Guusd Conservancy along the northwest coast of Graham Island, Daawuuxusda Conservancy along the southwest coast of Graham Island and northwest coast of Moresby Island, Yaaguun Suu Conservancy located northwest of Queen Charlotte, Tlall Conservancy on Graham Island between Tlall to the north and Queen Charlotte to the south. Half a dozen other smaller conservancies and one ecological reserve can be found on both of the main islands.



Figure 2 is a map produced by the Integrated Land Management Bureau (ILMB) showing the Haida Gwaii archipelago and the location of the Haida Gwaii TSA (non designated area – TFL's not shown) and surrounding parks, conservancies, and ecological reserve.

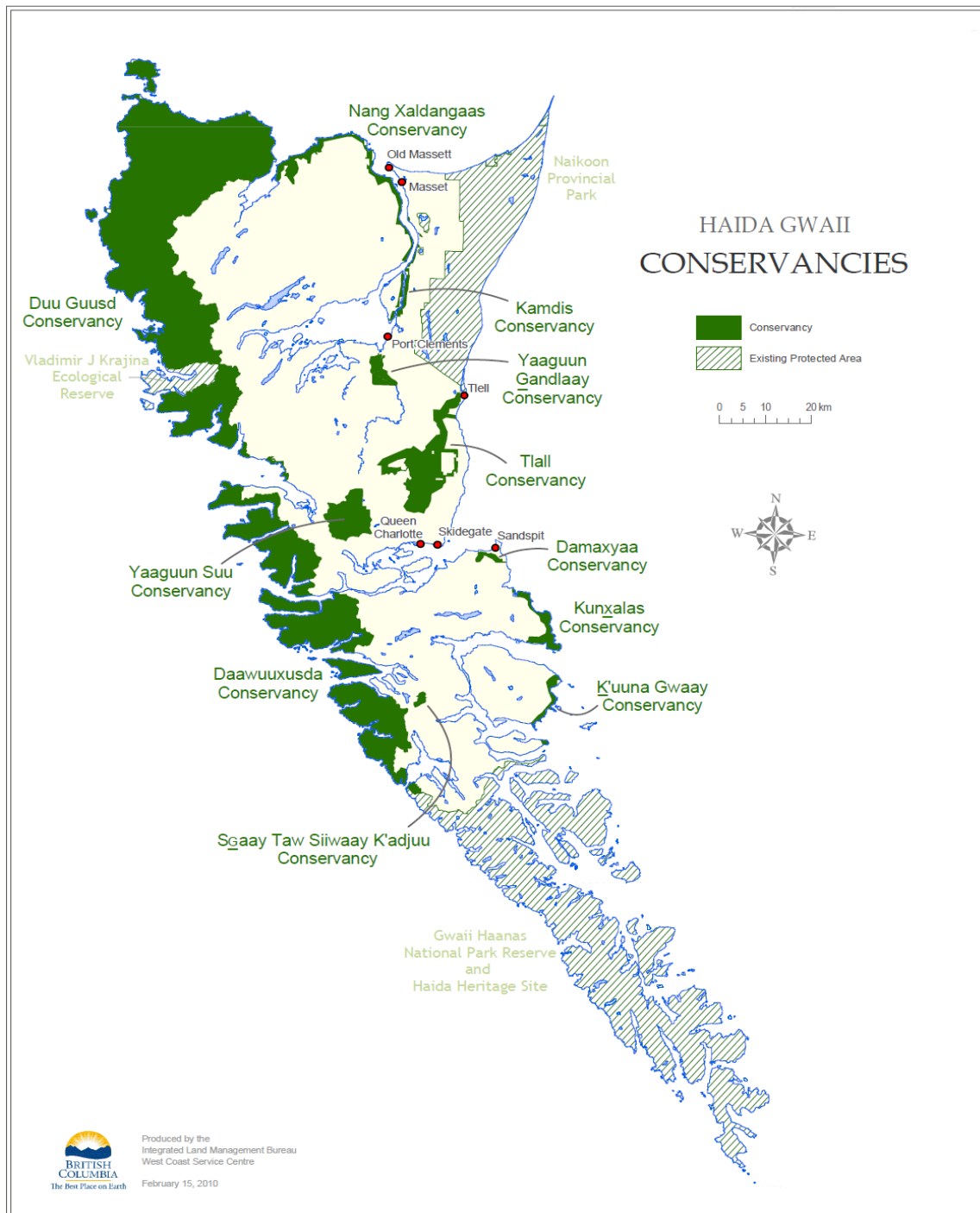
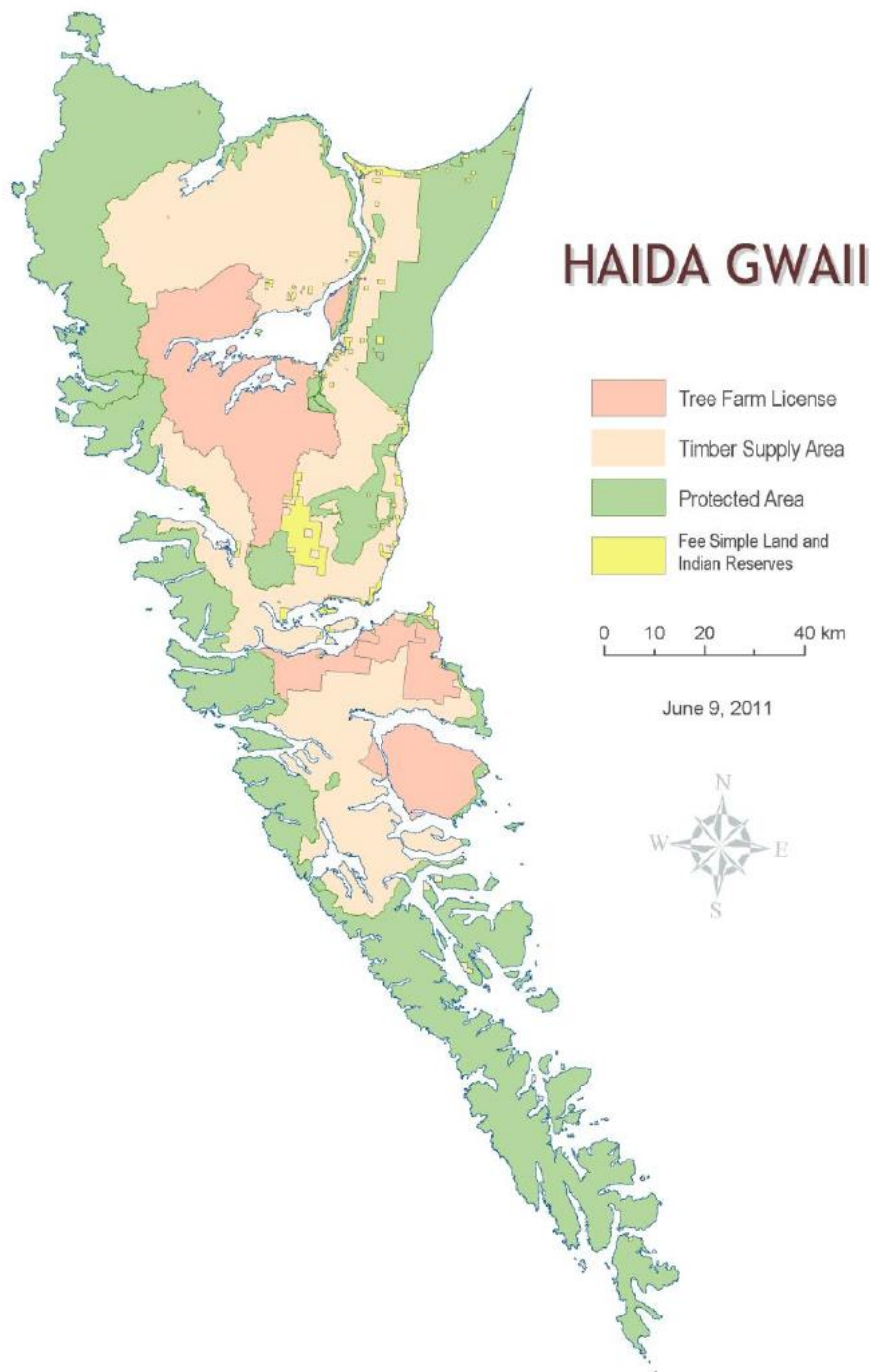


Figure 2. Parks and conservancies on Haida Gwaii.



**Figure 3. Excerpted figure from the Haida Gwaii VPIP showing the Location of the Haida Gwaii TSA, TFL's, Protected Areas, Fee Simple Lands and Indian Reserves.**

<b>Tenure / Administrative Unit</b>	<b>Tenure Holder</b>	<b>Area (ha)</b>
Haida Gwaii TSA	CHN, Husby Forest Products, BCTS and others	566,737
TFL 60	Western Forest Products	177,608
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 (excluding those within parks and TFL 60)		8,366
Indian Reserves / Federal Lands		5790
<b>Total Area</b>		<b>1,007,252</b>

**Table 1. Ownership, Tenure and Administrative Units of Haida Gwaii by area (from the Haida Gwaii VRI Phase 1 VPIP)**

## **3.0 The 2011-2013 VRI**

### **3.1 Project Personnel**

The Haida Gwaii VRI was completed between July 2011 and December 2013. While the contract was started with Teco Natural Resource Group and in November was transferred to Timberline Forest Inventory Consultants, the same staff who started the project completed it.

#### **VRI Project Admin - Ministry of Forests, Lands and Natural Resource Operations**

Roman Bilek RFT - VRI Contract Manager

#### **Teco Natural Resource Group Ltd. / Timberline Forest Inventory Consultants**

John Cosco RPF - Project Manager and VRI Certified Photo Interpreter  
Mike Sandvoss RFT – Project Manager and VRI Certified Photo Interpreter  
Andy Ferguson RFT - VRI Certified Photo Interpreter  
Francois Rosa - VRI Certified Photo Interpreter  
Rob Oran RPF - VRI Certified Photo Interpreter  
Jouni Tanskanen - VRI Certified Photo Interpreter (2012/13 - 2013)  
Mike Mastine - VRI Certified Photo Interpreter  
Bruce McClymont RPF – VRI Certified Photo Interpreter (2012/13 - 2013)  
Mitchell Grant - VRI Certified Photo Interpreter (2011/12)

#### **3<sup>rd</sup> Party QA Personnel**

Frank Scheithauer RPF - VRI Certified Photo Interpreter



## 3.2 Annual VRI Project Completion

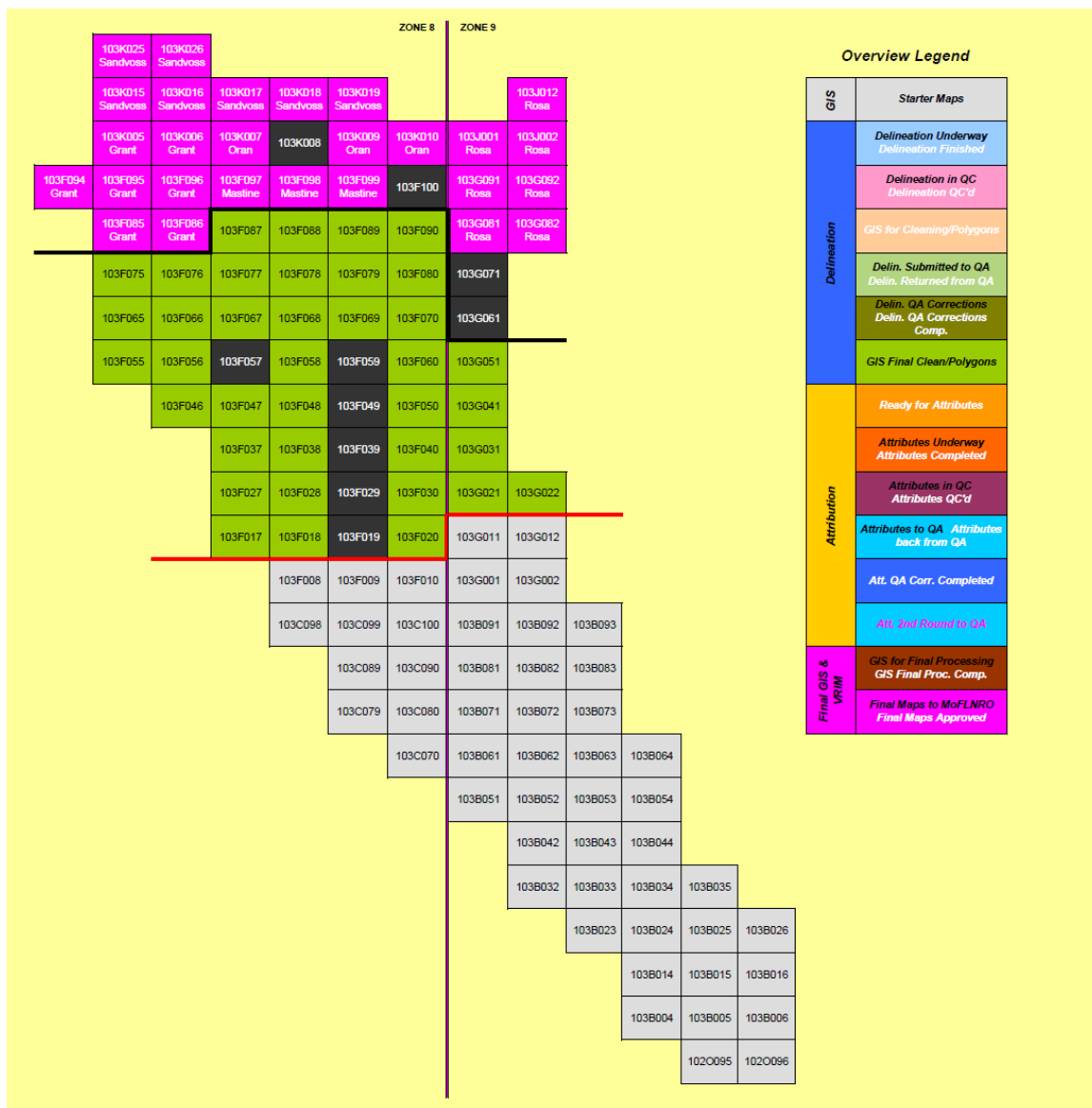
### 3.2.1 Fiscal Year 2011 / 2012

The VRI started in late July 2011 with a first of four field programs, of the northern portion of Graham Island (including Naikoon Provincial Park and the northern Conservancies), planned for mid September. This required the completion and QA of 31 map sheets (16.53 FME) or 247,944.5 ha of delineation and associated field plan prep for ground call and air call programs, by the first week of September. This was accomplished and the field program was successfully completed at the end of September, 2011 (despite near gale force winds).

Field calibration plans were submitted digitally (as .shp files) to the MoFLNRO (Roman Bilek) for review and approval by the MoFLNRO, CHN, and MoE (Parks) representatives to ensure plot distribution and that sensitive sites were avoided. No field work was planned or completed in private lands. An MoFLNRO supplied digital excel spreadsheet was produced and submitted as a 2011/12 project deliverable, along with a .gdb showing the final location and call type of all VRI calibration points. Fiscal year 2011/12 saw the completion of 171 ground and 336 air calibration points. The project plan called for 20% of **all** ground calibration plots to be 3-point plots, placed in the more species and structurally diverse types encountered. All field data was collected as per the MoFLNRO standards for ***VRI Field Calibration Procedures for Photo Interpretation, Version 1.1 April, 2011***

Attribution of this area, with the exclusion of four map sheets (103F100, 103K008, 103G071, and 103G061) accounting for 38,034 ha or 2.54 FME was completed and QA'd by fiscal year end. The above four maps sheets were added to the fiscal year 2012 / 2013 attribution. Attribution was completed as per the ***VRI Photo Interpretation Procedures, Version 2.7 April 2011*** and quality assurance checked according to the ***VRI Photo Interpretation Quality Assurance Procedures and Standards, Version 3.4 April 2011***.

Delineation of the remainder of Graham Island (with the exception of map sheets 103F019, F029, F039, F049, F057 and F059) was completed in preparation for the second Haida Gwaii field program scheduled for May 2012. The six excluded maps were delineated at the start of fiscal year 2012/13. Figure 4 shows completion status at Fiscal Year end 2011 / 2012.



**Figure 4 Fiscal Year End 2011 / 2012 project completion status.**

### 3.2.2 Fiscal Year 2012 / 2013

Year two of the Haida Gwaii VRI started in early April 2012 with attribution of the four remaining north Graham Island map sheets (103F100, 103K008, 103G071, and 103G061), delineation of the six remaining south Graham Island map sheets (103F019, F029, F039, F049, F057 and F059). Field planning for the second of four field programs (south Graham Island), planned for mid May / early June was completed in April.

The third of four field programs to complete Graham Island and the north end of Moresby Island down to the Gwaii Haanas park boundary was completed in late July 2012. The field plan for this field program was submitted in June. Field calibration plans were submitted digitally (as .shp files) to the MoFLNRO (Roman Bilek) for review and approval by the MoFLNRO and CHN representatives to ensure plot distribution and that sensitive sites were avoided. No field work was planned or completed in private lands. An MoFLNRO supplied digital excel spreadsheet was produced and submitted as a

2012 / 2013 project deliverable, along with a .gdb showing the final location and call type of all VRI calibration points. Fiscal year 2012/13 saw the completion of 385 ground and 794 air calibration points. All field data was collected as per the MoFLNRO standards for ***VRI Field Calibration Procedures for Photo Interpretation, Version 1.2 April, 2012***

Attribution of the 2012 / 2013 fiscal year area (44 map sheets (29 FME) or 435,489 ha) commenced after the June field program and was completed and QA'd by fiscal year end. Attribution was completed as per the ***VRI Photo Interpretation Procedures, Version 2.8 April 2012*** and quality assurance checked according to the ***VRI Photo Interpretation Quality Assurance Procedures and Standards, Version 3.5 April 2012***.

Delineation of the remainder of map sheets of the southern half of the archipelago was completed in preparation for the third Haida Gwaii field program scheduled for July 2012. Figure 5 shows completion status at Fiscal Year end 2012 / 2013.

Field planning of the fourth of four field calibration programs started in October 2012 with liaison with Parks Canada staff as all field work conducted in Gwaii Haanas had to be vetted through Parks staff. Parks Canada personnel were extremely helpful in assisting the field planning with and providing planning materials (restricted air and ground access zones) as well as facilitating the permitting process for ground and air access to the park. The final field calibration program was reviewed by MoFLNRO, CHN, and Parks Canada and approved with only minor modifications suggested and implemented.

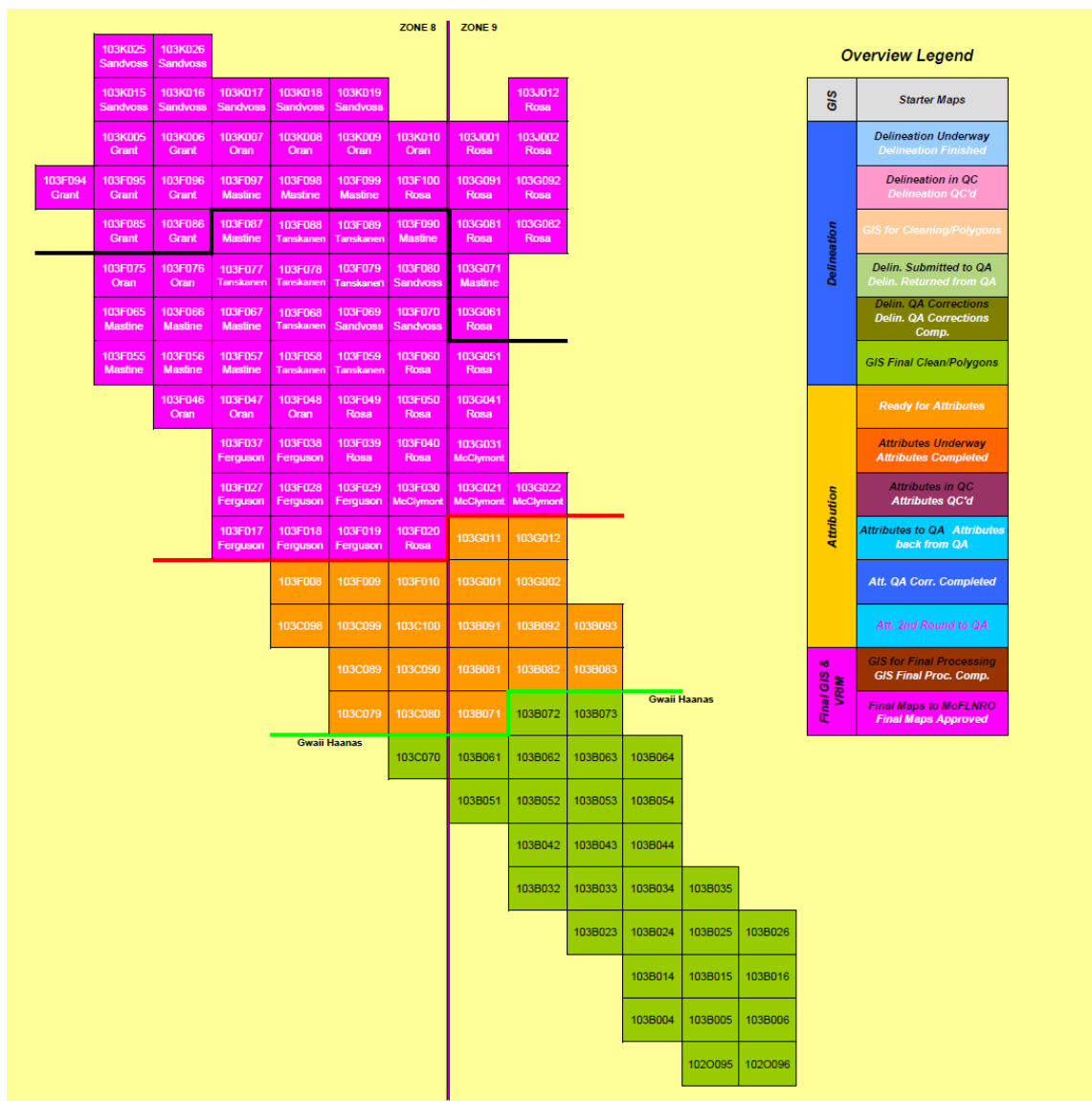


Figure 5 Fiscal Year End 2012 / 2013 project completion status.

### 3.2.3 Fiscal Year 2013

Year three of the Haida Gwaii VRI started in early April 2013 with attribution of map sheets from the north end of Moresby Island that had been field calibrated in July 2012. Field planning had been completed the previous fiscal year, so all that remained was to wait for the start of the program planned for mid May. No field work was planned or completed in private lands. Fiscal year 2013 saw the completion of the remaining 112 ground and 211 air calibration points. An MoFLNRO supplied digital excel spreadsheet was produced and submitted as a 2013 project deliverable, along with a .gdb showing the final location and call type of all 2013 completed VRI calibration points. A final all inclusive .gdb showing all ground and air call locations (2011-2013) was a final project deliverable. All field data was collected as per the MoFLNRO standards for **VRI Field Calibration Procedures for Photo Interpretation, Version 1.3 April, 2013**.

Attribution of the 2013 fiscal year area (51 map sheets (20.29 FME) or 304,295.8 ha) commenced in early April and was completed and QA'd by December 20<sup>th</sup>, 2013.

Attribution was completed as per the **VRI Photo Interpretation Procedures, Version 2.9 April 2013** and quality assurance checked according to the **VRI Photo Interpretation Quality Assurance Procedures and Standards, Version 3.6 April 2013**.

Figure 6 shows completion status as of the project end date. Appendix 5 shows a tabular record by map sheet (annual) of the major work phases and assigned interpreter.

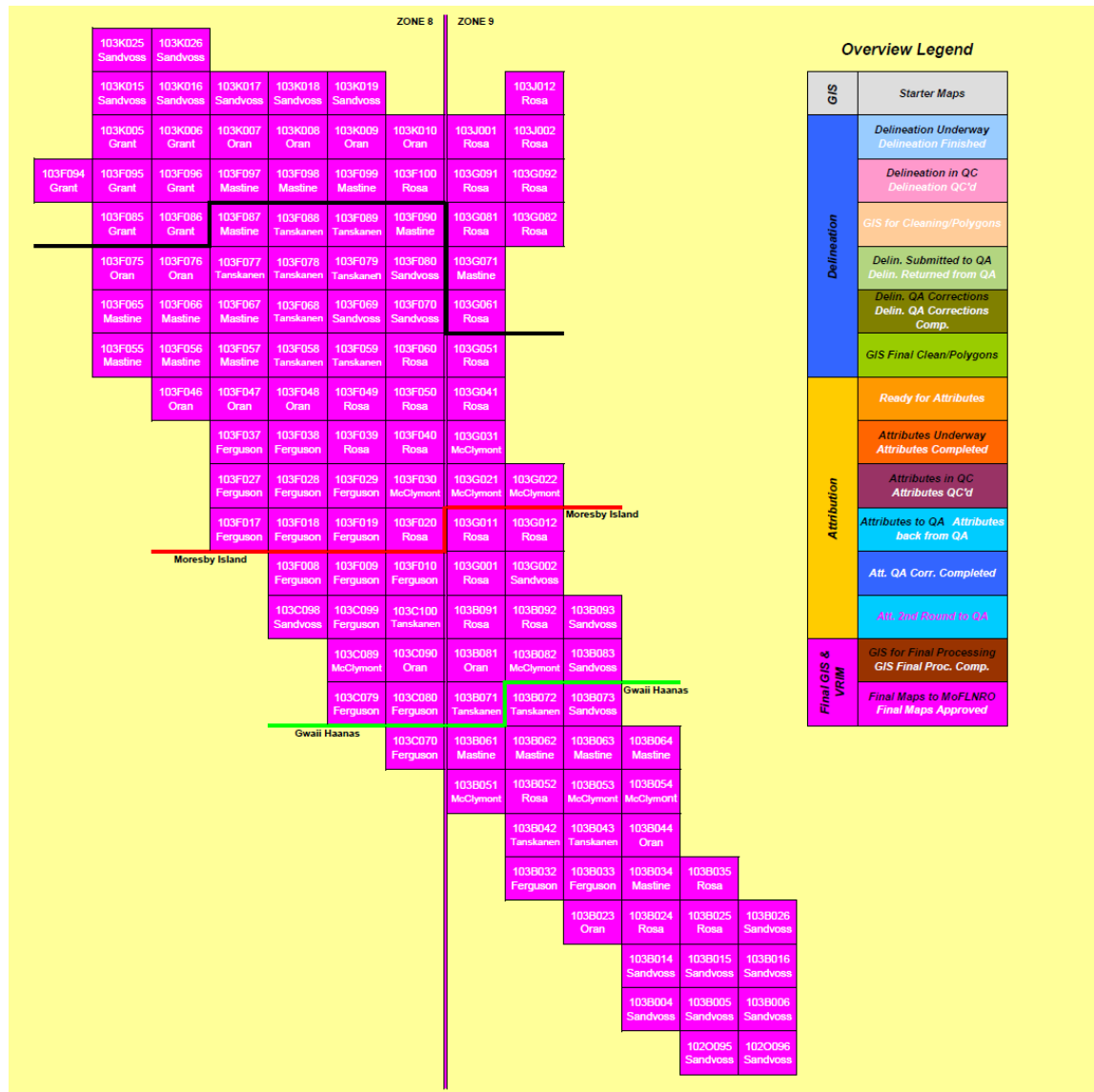


Figure 6 Project End 2013 completion status.

## 4.0 Deliverables

VRI deliverables for each map sheet, each project year included the following:

- Original hard copy field forms for all field calibration data (ground call and air call tally sheets)
- Hardcopies of orthophoto map plots used for fieldwork.



- A digital copy of all field calibration data in MS Excel spreadsheet format (template provided by MoFLNRO – FAIB)
- A geodatabase (.gdb) with location of all established calibration points from 2001-2013
- A shapefile (.shp) of all added and re-aligned roads and mapable trails across Haida Gwaii
- Each map sheet in Arc personal geodatabase (.mdb) MoFLNRO VRIMs file format
- All 3<sup>rd</sup> party quality assurance documentation for each phase (by submission batch) of the project.

## 5.0 Quality Assurance

Project quality assurance was provided by Scheithauer Forest Consultants Ltd. throughout the duration of the project according to the most recent VRI quality assurance procedures available in any of the project years. Major work phases that underwent quality assurance were delineation, field calibration, and attribution. Historical data source capture was also quality assurance checked.

All quality assurance batch reports and comparison table documentation was provided to the MoFLNRO monthly. A final QA summary report was provided at the conclusion of quality assurance checking in December 2013 (Appendix 4).

## 6.0 Conclusions and Recommendations

The VRI is the provincial forest inventory in partnership with the Council of the Haida Nation, but each land base introduces a unique set of parameters, from the local geography, geology, and accessibility of the area being inventoried, to the variety of tenure / ownership (i.e. strictly a TSA or a mixture of TSA, TFL, private land, parks, etc...). As far as Haida Gwaii was concerned, the landscape variability was extreme from the wetlands of the Queen Charlotte Lowlands at the northeast corner of Graham Island to the knife edge like San Christoval Range of the Queen Charlotte Mountains on the west side of Moresby Island. The mountainous areas and dense stands with few natural openings provided extremely limited access to mid-slope types. Only where recent harvesting activities provided road cuts and landings could these locations be ground calibrated, a phenomenon that carried forward from all previous ground calibration programs.

The road (truck) accessibility of Haida Gwaii was limited to the east side of Graham Island and north east side of Moresby Island. The remainder of the project area was accessible only by helicopter with boat access being dismissed as it would be unnecessarily time consuming and only provide limited east coast access.

Haida Gwaii is made up of the TSA, three TFL's, a national park of world wide recognition, a provincial park, numerous conservancies, an ecological reserve, private and fee simple lands, and Indian reserves. Each tenure / ownership provided varying objectives for the VRI, which were expressed in the delineation within each tenure / ownership category.

After the delineation and attribution of a number of map sheets, several issues pertaining to TRIM lakes was raised during one of the monthly project conference calls; the minimum polygon size of TRIM lakes incorporated as polygons in the VRI (1 ha as per VRI delineation guidelines) and the spatial accuracy of the TRIM capture (not specific to lake shorelines only). Lakes  $\geq 0.5$  ha were requested to be included in the VRI. This was agreed to and the lakes were cut into existing delineation and added to the starter maps of those map sheets that had not yet been delineated.

The spatial representation of the lakes was reviewed and found to be wanting in many cases, some of which were no doubt related to the vintage of the TRIM mapping as well as the small scale of the aerial photographs used in their construction. Shorelines were adjusted if found to be significantly 'off'. Appendix 6 includes some softcopy screen captures showing a few examples of TRIM lake, double sided streams, and shoreline issues that were discussed during the monthly project conference calls.

Rose Spit, a very active sand spit at the north east corner of Graham Island (in Naikoon Provincial Park) had moved significantly since it captured by the TRIM aerial photos in the mid 1980's. The shoreline had to be adjusted to allow for the interpretation of the vegetation cover and beach elements that it is comprised of.

Other active shorelines were redrawn to reflect the current position of the shoreline. Non active shoreline elements were also redrawn as it was obvious that steep sided mountain shadows and not the actual shoreline had been mapped, particularly along east west oriented fjords. None of these incorrectly mapped features were a fault of the TRIM mapping itself, but the scale of the photos used for the program.

Final submissions for 2013 integration into the provincial VRI database ran into a small snag in early December when it was noted that the many non standard VRI rock islets (smaller than 0.5 ha) found in the TRIM coverage had not been copied up to the VRI. These were all subsequently copied up and VRI attributed (100% bedrock).

# Appendices

# Appendix 1

## Haida Gwaii VRI Letter of Understanding (2009)

### Letter of Understanding

Consistent with the Kuunst'aa guu-Kunst'aay.ah Reconciliation Protocol (the Protocol), dated December 11, 2009, the Haida Nation and the Province of British Columbia will plan, implement, and evaluate the 2011 Haida Gwaii Vegetation Resource Inventory (VRI) through the shared decision making body and process of the Solutions Table. The VRI project will cover the entire land base of Haida Gwaii not already completed by the recent Parks Canada VRI project on Lyell Island, and will provide accurate and reliable information to support all future natural resource planning and management.

The Council of the Haida Nation Natural Resource Department, MFLNRO Forest Analysis and Inventory Branch (FAIB), and the Haida Gwaii Natural Resource District's specialists will be jointly responsible for implementation and delivery of the VRI project through the Solutions Table based on the principles described below. The CHN and the Province will provide additional natural resource specialist technical support as required.

### Principles

- A jointly prepared Vegetation Strategic Resource Inventory Plan (VSIP) will guide the project.
- A detailed jointly prepared VRI Project Implementation Plan (VPIP) will be prepared for the Photo Interpretation Phase (Phase I) and potential future Ground Sampling Phase (Phase II).
- Confidentiality agreements will be made between the Parties where there are issues of limitations for the distribution of proprietary data (ex. licensee operational data or culturally sensitive data).
- The criteria for all contracts necessary to deliver the VRI will be developed by FAIB and CHN Natural Resource Department through the Solutions Table. Successful bidders will be subject to eligibility criteria developed in the aforementioned manner.
- The Solutions Table and FAIB staff will work jointly in the contract award process.
- The Solutions Table and FAIB staff will work jointly to ensure implementation of all plans is in accordance with Haida principles and values, and is consistent with the Reconciliation Protocol, the Haida Stewardship Law<sup>1</sup>, and the most current MFLNRO - Forest Analysis and Inventory Branch VRI Standards and Procedures, including respective Quality Assurance processes.

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<sup>1</sup> KaayGuu Ga ga Kyah ts'as – Gin 'inaas 'laas 'waadluwaan gud tl'a gud gidaa (Stewardship Law)

- The Solutions Table will provide qualified personnel to participate during the field data gathering stage of the project where ground calibration field work is conducted within culturally and archaeologically sensitive areas.
- Jointly developed field calibration plans will indicate how Haida technicians will be engaged by the contractor(s) for technical support and field work opportunities.
- The Solutions Table may identify qualified personnel to support the project.
- Final contract deliverables will be made available to both parties and final photo interpretation products that meet VRI standards will be publicly available.



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**Appendix 2**  
**Haida Gwaii VRI Strategic Implementation Plan (VSIP)**

**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
<b>Total Area</b>		<b>1,004,981</b>

### 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 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**

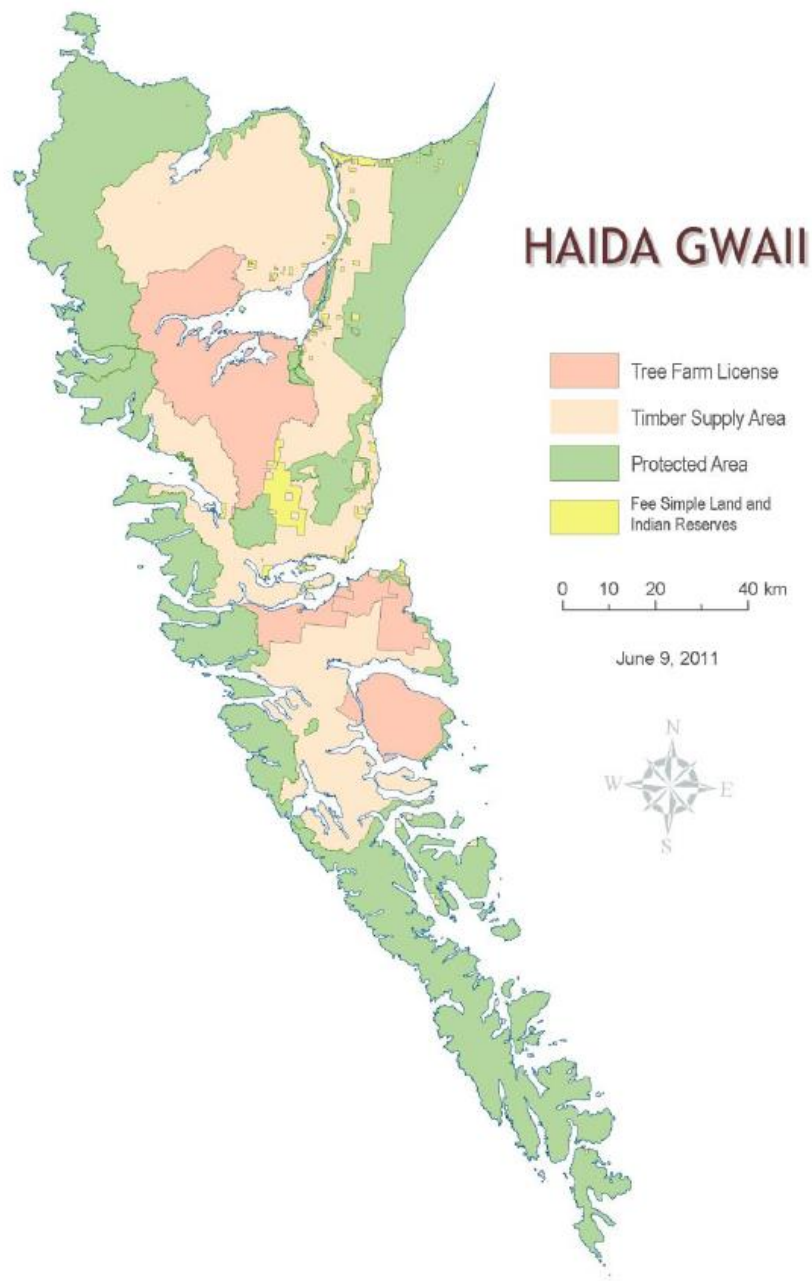
Tenure/Administration Unit as Identified by the Crown	Tenure Holder	Area (ha)
Haida Gwaii Timber Supply Area (TSA)	CHN, Husby FP, BCTS and others	566,737
Tree Farm Licence (TFL) 60	Western Forest Products	177,608
Tree Farm Licence (TFL) 58	Teal-Jones Group	25,143
Gwaii Haanas National Park Reserve/Haida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

\* 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.

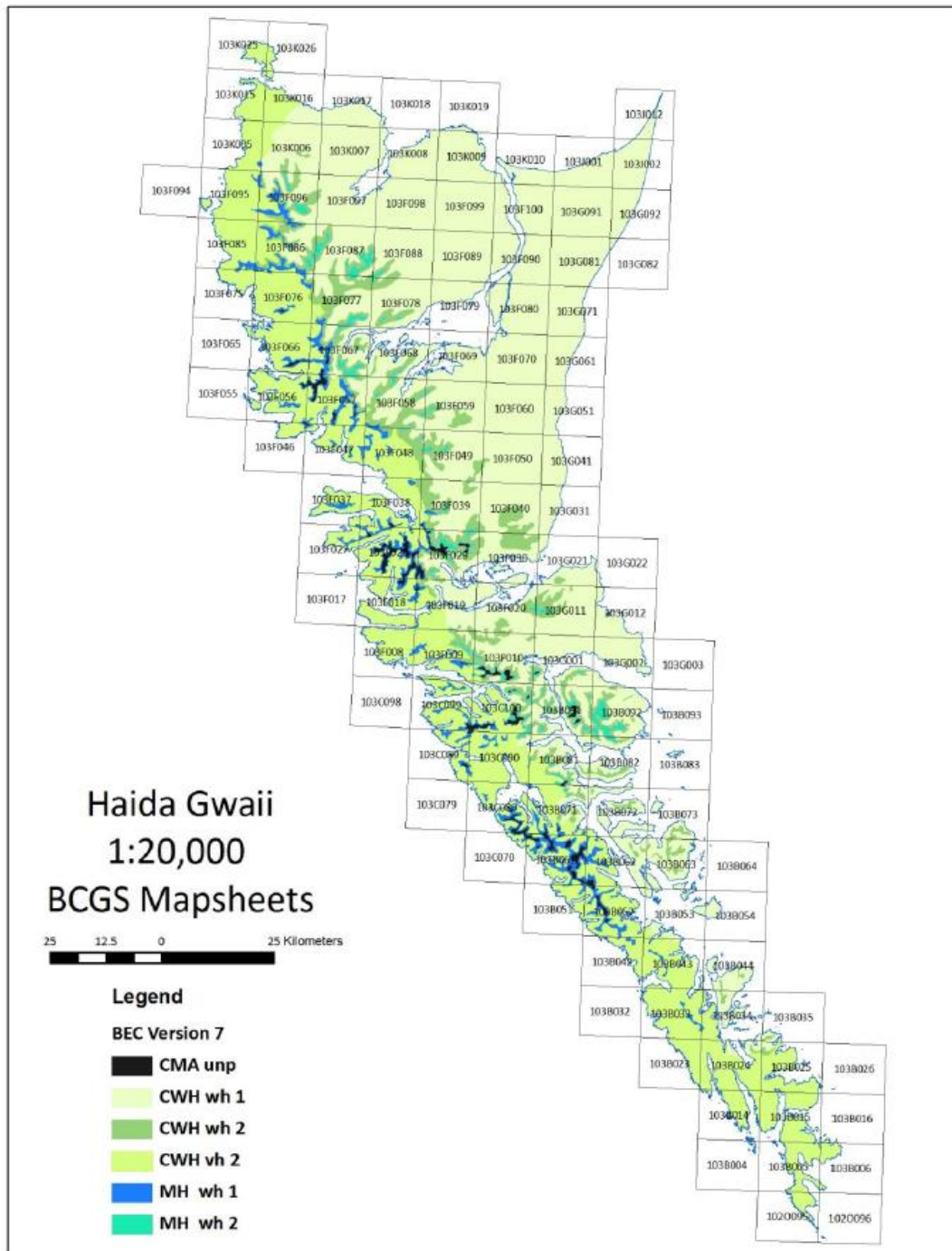
Also note that the above numbers do not reflect Crown land deletions made under the Land Act from TSA and TFLs when new protected areas were established under the terms of the SLUA.



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 (VIP) 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 <sup>1</sup>
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
<b>Total cost excluding photos<sup>1</sup></b>				<b>2,005,000</b>

<sup>1</sup> 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*  
*Vice-President,*  
*Council of Haida Nation*

\_\_\_\_\_  
*Date*

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.

\_\_\_\_\_  
*Albert Nussbaum, RPF*  
*Director,*  
*Forest Analysis and Inventory Branch,*  
*Ministry of Forests*

\_\_\_\_\_  
*Date*

## Appendix 3

### Haida Gwaii VRI Project Implementation Plan (VIP)

# **Vegetation Resources Inventory Photo Interpretation (Phase 1) Project Implementation Plan for Haida Gwaii**

June 20, 2011

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## **1.0 Introduction**

### **1.1 Background Information**

The primary objective of this project is to create a reliable photo interpreted vegetation inventory (Phase 1) that meets provincial Vegetation Resources Inventory (VRI) standards and the needs of the Council of the Haida Nation and Parks Canada, who are partners with the Province in implementing this work.

The existing vegetation inventory data covering Haida Gwaii is comprised of six different inventories with varying data standards, all of which are out-of-date and do not meet current Ministry standards. Section 2.4 of the Haida Gwaii VRI Strategic Inventory Plan (VSIP) describes these existing inventories and outlines their deficiencies.

Implementation of Phase I of this VRI project is the responsibility of the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO), in partnership with the Council of the Haida Nation (CHN) and Parks Canada through their office in Skidegate on Haida Gwaii. As noted in Sections 2.2 and 2.4.6 of the VSIP, a portion of Gwaii Haanas National Park Reserve/Haida Heritage Site ("Gwaii Haanas") had Phase I VRI completed in 2009-2010 through a contract funded and administered by Parks Canada. Completion of a VRI on the rest of Haida Gwaii will be undertaken by the MFLNRO in partnership with both CHN and Parks Canada. Parks Canada and the MFLNRO are currently discussing possible funding support in fiscal 2012-2013 for Phase I work in Park areas. A budget request to the Federal government will be made for this purpose.

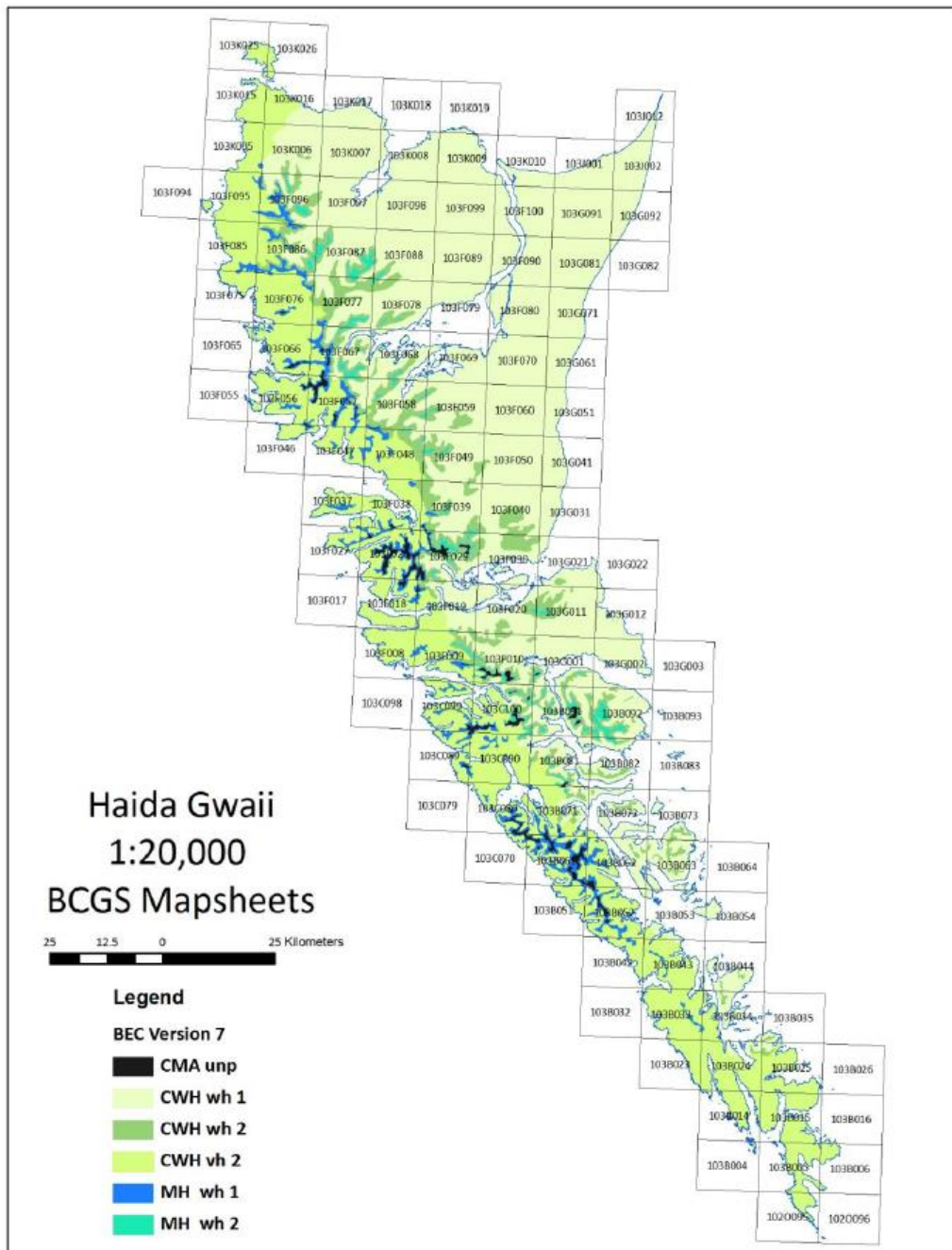
It is important to note that in Section 3.5 Roles and Responsibilities the communications and working relationships identified apply to all stages in this plan.

### **1.2 Project Land Base**

As described in the VSIP, the total project area covers all 1.004 million hectares of Haida Gwaii and involves 127 BCGS 1:20,000 map sheets (see Appendix 1). This area is equivalent to 67 full map sheets of 15,000 hectares each. Accounting for the area of Lyell Island already photo-interpreted in 2009-2010, the remaining area to be completed is 987,000 hectares or 66 full map sheet equivalents, including delineation and attribution on fee simple lands.

**Figure 1: Overview map of Haida Gwaii** (note: updated version will be included in final version)

**Figure 2: Map of Haida Gwaii showing BCGS Map Sheets and BEC Units**



## **2.0 Photo Interpretation Plan**

### **2.1 Project Objectives**

The primary objective of this project is to produce a consistent, accurate, seamless Phase I inventory for Haida Gwaii to support land use plan implementation, timber supply analysis and other needs as described in section 3.0 of the Haida Gwaii VSIP. Other data needs which may be identified by CHN and Parks Canada will be addressed to the extent that is practicable. The project partners will have an active role in the planning and implementation of this project.

A field calibration program will be designed and implemented to provide additional data to add to that available from existing inventories. Other data sources which are identified as reliable for calibration purposes will supplement new and existing inventory calibration points. Those sources identified to date are listed below in Section 2.4.

The most current VRI Phase I Standards and Procedures will be followed and these can be accessed and downloaded from the following MFLNRO web site:

<http://www.for.gov.bc.ca/hts/vri/standards/index.html#photo>

- *VRI Photo Interpretation Procedures*
- *VRI Photo Interpretation Quality Assurance Procedures and Standards*
- *VRI Field Calibration Procedures for Photo Interpretation*
- *Digital Data Standards for VRI Map File Production*
- *VRIMS Personal Geodatabase Structure and Use*
- *VRIMS Vegetation Cover Polygon Validation Rules*
- *VRI Contract Source Data*

### **2.2 Aerial Photographs and Base Mapping**

#### **2.2.1 New Photography**

In anticipation of a future VRI project, 1:20,000 scale colour photography was flown for all of Haida Gwaii in 2007. The photos were scanned at a resolution of 12 microns, aerial triangulation (AT) completed, and Digital Image Analytical Photogrammetry (DiAP) models produced. The photos are available in softcopy format as well as in hard copy as a reference source. The total number of photo frames and thus digital stereo models covering Haida Gwaii is 1748. Subtracting those photo frames already utilized for the Lyell Island work from the total leaves +/- 1675 photo frames to be handled in future contracts.



Subsequent to processing and delivery to GeoBC in 2007 by the photo flying contract manager, a subset of these photos were found to have been flown at a sun angle below the minimum allowed value of 38 degrees. Most of the non-conforming photos were flown within 1 degree of the critical sun angle and those that further exceeded this threshold were over subdued terrain where shadowing was not a concern. Review of this photo set by FAIB cleared all photos in the set as suitable for VRI purposes.

### **2.2.2 Base Mapping**

Base mapping is available for all project map sheets from GeoBC in TRIM NAD83 format. These map bases meet TRIM I specifications and were constructed from 1:65,000 scale black and white photography flown in 1986. No upgrading of these bases has been done since they were produced circa 1989 and there are known deficiencies which are largely a result of the use of small scale photography. Roads not identified in the current TRIM file will be captured through this Phase I project by the interpreters and will be made available as an Arc shape file to the CHN, the MFLNRO, and to GeoBC.

### **2.3 Existing Calibration Data Sources**

There are two broad types of existing calibration data covering Haida Gwaii:

- a) inventory ground and air calls located within the current and previously existing areas of the TSA, together with all areas which are now or were previously within the boundaries of the three TFL units.
- b) other types of ground data including cruise plots, growth and yield plot measurements, second growth samples, previous audit and Phase II samples, silviculture surveys (see RESULTS section below), site index adjustment samples (including SIBEC)

A significant number of air and ground calls collected for earlier inventories, growth and yield sample data, operational cruise plot data, and inventory ground samples exist in the TSA, the TFLs, and the Gwaii Haanas Park, and will serve as useful calibration data. These data will be available prior to preparation of the field calibration plans. Any additional data that can be provided prior to the completion of a calibration plan can be considered as well.

### **2.4 Integrating RESULTS Information**

The inclusion of RESULTS Forest Cover spatial and attribute data will be carried out in accordance with the "Photo Interpretation Guidelines for Integrating RESULTS Information – Version 2, March 2011". Approximately 6000 RESULTS silviculture openings were identified for integration into the Haida Gwaii VRI inventory of which approximately 2000 are Free Growing.

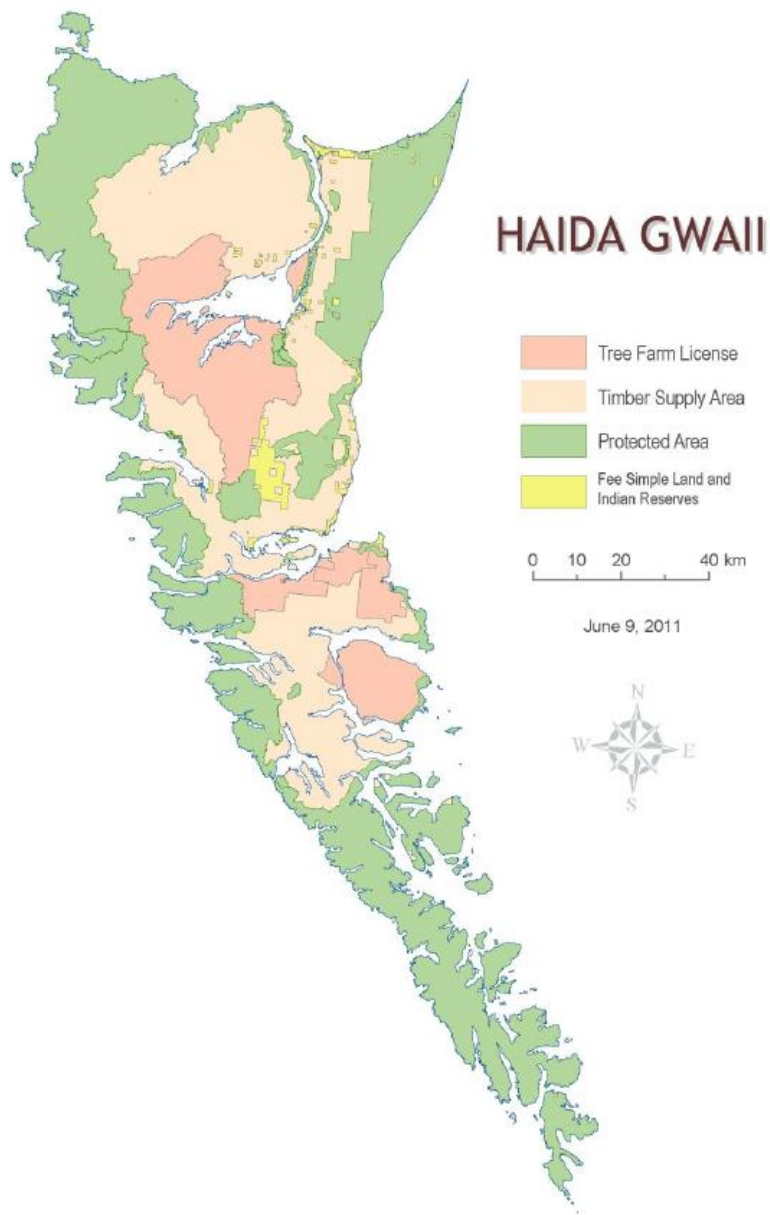
To complete an effective field calibration plan, the integration of the RESULTS spatial files must be completed during the delineation stage of the project.

## 2.5 New Field Calibration

A data source review will need to be completed to determine the type, number and locations for new calibration data. An increased intensity of ground/air calibration will be targeted in areas that lack existing valid data sources, areas of uncertainty, and where enhanced information is required.

The guideline set out for new calibration in the Standards is for the establishment of 10 ground calls and 20 air calls per full map sheet equivalent. The exact number and distribution of calls will be finalized once existing data sources have been accessed and evaluated as part of preparing the field calibration plan. Funding availability will also influence the final number of calls which will be established.

Prior to the initiation of the field calibration program, a Field Calibration Plan (FCP) will be prepared in accordance with MFLNRO guidelines and submitted by the contractor to the Project Manager for approval. This plan should include a map of the unit documenting the general location and distribution of the calibration points.



## **3.0 Project Implementation**

### **3.1 Pre-work meeting**

A Pre-work meeting is required as part of this project. At a minimum, the Pre-work meeting will include the VRI Project Manager, the Phase I contractor and the Phase 1 Quality Assurance (QA) contractor. If the CHN Technical Representative is unable to attend this meeting, he will be consulted and will be included in all decisions coming out of this meeting. A Project Pre-work Checklist will be provided by MFLNRO and signed-off by all attendees at the meeting.

### **3.2 Scheduling and Costs**

Phase I work will proceed over three fiscal years according to the following proposed schedule, starting in June, 2011 and completing in December, 2013:

#### **Project Delivery Schedule**

##### **Year One Mapsheets – 2011-2012:**

There are 31 mapsheets which represent 16.5 full mapsheet equivalents (FMEs):

- 103F085, 086, 094-100
- 103G061, 071, 081-082, 091-092
- 103J 001-002, 012
- 103K 005-010, 015-019, 025-026

The 16.5 FMEs represent 247,945ha or about 25% of the Haida Gwaii land base.

The Year 1 priorities are as follows:

1. Delineation (inclusive of data source transfer and incorporation of RESULTS spatial files with emphasis on external opening boundaries) on the entire Haida Gwaii land base (127 maps);
2. Calibration in the 31 maps (16.5 FMEs); and
3. Attribution of maximum number of calibrated maps without compromising delineation of the entire land base in year 1 – estimate 16.5 FME maps to be attributed.

##### **Year One Project Schedule – 2011-2012:**

Project Component	Milestone date	Comments
Pre-work Meeting	TBD	
Polygon delineation, data source transfer	March 31, 2012	127 maps for 66 full map equivalents (FMEs)
Field calibration data collection	September 30, 2011	For 16.5 FMEs
Polygon attribution and digital mapping	March 2, 2012	For 16.5 FMEs
Final delivery of maps	March 31, 2012	Polygon delineation and data source transfer for 66 FMEs and polygon attribution and digital mapping for 16.5 FMEs

**Year Two Project Schedule – 2012-2013:**

Project Component	Milestone Date	Comments
Pre-work meeting	April 5, 2012	
Field calibration data collection	August 31, 2012	For 49.5 full map equivalents (FMEs)
Polygon attribution and digital mapping	March 2, 2013	For 36 FMEs
Final delivery of maps	March 31, 2013	For 36 FMEs

**Year Three Project Schedule – 2013-2014:**

Project Component	Milestone Date	Comments
Pre-work meeting	April 5, 2013	
Polygon attribution and digital mapping and QA	December 2, 2013	For 13.5 FMEs
Final delivery of maps	December 31, 2013	For remaining 13.5 FMEs

Appendix A lists all maps and areas included in the project.

**3.3 Quality Assurance**

Approximately 10% of the total budget will be required for the QA component. It will be the responsibility of the Project Manager to ensure that all VRI Phase I Standards and Procedures are followed. To this end, an agreed upon independent third party photo interpretation company or individual will be hired conduct all required QA. The QA contractor will be in place before the project starts and will attend the Pre-work meeting.

The QA contractor will conduct the QA for the field data collection, polygon delineation and attribute estimation. Efforts must be made to sample a portion of the work done by each crew or photo interpreter. In addition to providing a QA role, the intent is that he will also provide project technical support and mentoring and monitor the work to ensure that the procedures and standards for VRI work are being followed as detailed in the contract.

The QA contractor will develop a schedule for the work that is designed to 'shadow' the photo interpretation contractor's delivery. Timely follow up by the QA contractor and good communication with all project team members will be a condition of this contract.

The QA contractor will be responsible for providing complete records of QA activities to the Project Manager.



### 3.4 Deliverables

The following is a list of products that will be delivered to MFLNRO. At each stage, project coordination, photo interpretation and quality control work, and all project deliverables will be signed off by an agreed upon Registered Professional Forester. Two (2) copies of each deliverable are required:

- Complete VRI data files in the format specified in "VRI Phase 1 Digital Data Deliverables Format" Standards;
- VegCap validation reports;
- Hardcopy tally sheets or digital equivalent for each ground and air calibration point;
- Digital field summary for all calibration points per MFLNRO VRI requirements. (This is for the VRI "Calibration Tile");
- Photo Interpretation Contractor Project Completion Report. Detailed requirements will be verified at the Pre-Work meeting for this project. It should be noted that the Project Completion Report is the responsibility of the proponent, but may be written by the Contract Administrator or VRI Contractor, with input from the MFLNRO VRI Staff and QA Contractor;
- QA Contractor documentation for each phase of the VRI project
- Update new roads previously not in TRIM – shape file

### 3.5 Roles and Responsibilities:

1. Ministry of Forests, Lands, and Natural Resources and Council of Haida Nation Technical Representatives through the Solutions Table:
  - Review and approve the Vegetation Resources Inventory Strategic Inventory Plan, Vegetation Resources Inventory Implementation Plan, Letter of Understanding, and all contract tender documents.
2. CHN Technical Representative (Nick Reynolds):
  - With the Project Manager, the CHN Technical Representative is responsible for project monitoring, communications to the Haida co-chair for the Solutions table and ensuring project updates for the Haida Gwaii Solutions Table.
  - Ensures LoU Principles are respected, adhered to, updated where required. Any variances to these Principles would require recommendation and approval through the Solutions Table and the MFLNR;
  - Jointly participate in project planning, information session, tender evaluation, pre-work sessions, review of field calibration plans. CHN decisions regarding contract evaluations and awarding to be directed through the Haida co-chair of the Solutions table.
  - Ensures Haida staff are identified and available for the planning and field work identified in the LoU and Field Calibration plans;



- Assists in coordinating technical expertise where required
3. Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) Project Manager (Roman Bilek)
    - The Project Manager is the technical specialist and single point of contact for the MFLNRO
    - With the CHN Technical Representative, the Project Manager provides overall communication and coordination of inventory activities with, contractors, and MFLNRO staff
    - With the CHN Technical Representative, the Project Manager provides adequate time for plans and decisions requiring review by the Haida Gwaii Solutions Table
    - The Project Manager ensures all inventory activities completed to VRI standards, Quality Assurance is completed and reporting meets the needs of the CHN Technical Representative, contractors, and MFLNRO staff
    - The Project Manager ensures deliverables received and provided to the Forest Analysis and Inventory Branch Update staff for validation and acceptance
  4. Ministry of Forests, Lands and Natural Resource Operations, Haida Gwaii district staff (Alvin Cober)
    - Jointly participate in project planning, information session, tender evaluation, pre-work sessions, review of field calibration plans.
    - Assists in coordinating technical expertise where required.
  5. VRI Contractor
    - Works with the Project Manager to ensure the planning, coordination, production and delivery of all VRI products to the current VRI standards
    - Works with the Project Manager to ensure the LoU Principles and specific arrangements identified in the LoU are implemented as defined
    - Delivers all VRI products to the Project Manager for Quality Assurance and Ministry validation and acceptance, and corrects as required
  6. VRI QA Contractor
    - Works with VRI Contractor and Project Manager to ensure all VRI activities Quality Assured using current VRI standards
    - Works with Project Manager to ensure that Quality Assurance reports meet VRI standards, and makes corrections as required

## **4.0 Project Sign-Off Sheet**

### **Haida Gwaii Vegetation Resources Inventory Photo Interpretation Project Implementation Plan**

It is the intention of the three partners, MFLNRO, the Council of the Haida Nation and Parks Canada to implement the Haida Gwaii VRI Photo Interpretation Project Implementation Plan (VPIP) as described.

I have reviewed the Haida Gwaii Vegetation Resources Inventory Photo Interpretation Project Implementation 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*  
*Vice-President,*  
*Council of Haida Nation*

\_\_\_\_\_  
*Date*

I have reviewed the Haida Gwaii Vegetation Resources Inventory Photo Interpretation Project Implementation Plan. I will be advising the appropriate contacts that the work proposed in this plan meets Vegetation Resources Inventory Standards the needs of the Ministry of Forests, Lands, and Natural Resources Operations.

\_\_\_\_\_  
*Albert Nussbaum, RPF*

\_\_\_\_\_  
*Date*

*Director,*  
*Forest Analysis and Inventory Branch,*  
*Ministry of Forests, Lands, and Natural Resources Operations*

## **Appendix 1: Map Sheet List with Area by Map**

<b>DIST</b>	<b>MOE_REG</b>	<b>Map No.</b>	<b>Sheet</b>	<b>F_AREA</b>	<b>Area_ha</b>
DQC	R6	103K.025	25	20032615.8600	2003.26
DQC	R6	103K.026	26	8625154.9043	862.52
DQC	R6	103K.015	15	43486029.6865	4348.60
DQC	R6	103K.016	16	73932378.6643	7393.24
DQC	R6	103K.017	17	57320634.3720	5732.06
DQC	R6	103K.018	18	2395079.0540	239.51
DQC	R6	103K.019	19	6121243.4643	612.12
DQC	R6	103J.012	12	14957309.1150	1495.73
DQC	R6	103K.005	5	51651049.9835	5165.10
DQC	R6	103K.006	6	145804448.4490	14580.44
DQC	R6	103K.007	7	141079863.0180	14107.99
DQC	R6	103K.008	8	98313604.6220	9831.36
DQC	R6	103K.009	9	118488074.5510	11848.81
DQC	R6	103K.010	10	41759736.9513	4175.97
DQC	R6	103J.001	1	71040411.8963	7104.04
DQC	R6	103J.002	2	78389234.5734	7838.92
DQC	R6	103F.094	94	8486.6840	0.85
DQC	R6	103F.095	95	98593561.6096	9859.36
DQC	R6	103F.096	96	146151864.5510	14615.19
DQC	R6	103F.097	97	126691987.7500	12669.20
DQC	R6	103F.098	98	142641791.3090	14264.18
DQC	R6	103F.099	99	146151864.5510	14615.19
DQC	R6	103F.100	100	128264600.5250	12826.46
DQC	R6	103G.091	91	146151864.5510	14615.19
DQC	R6	103G.092	92	51346177.2106	5134.62
DQC	R6	103F.085	85	88864160.5269	8886.42
DQC	R6	103F.086	86	146498816.2230	14649.88
DQC	R6	103F.087	87	146498816.2230	14649.88
DQC	R6	103F.088	88	146498803.0030	14649.88
DQC	R6	103F.089	89	145571324.6410	14557.13
DQC	R6	103F.090	90	128736035.8570	12873.60
DQC	R6	103G.081	81	128155439.2020	12815.54
DQC	R6	103G.082	82	2765679.1299	276.57
DQC	R6	103F.075	75	30811078.4559	3081.11
DQC	R6	103F.076	76	140056801.2610	14005.68
DQC	R6	103F.077	77	146845302.4450	14684.53

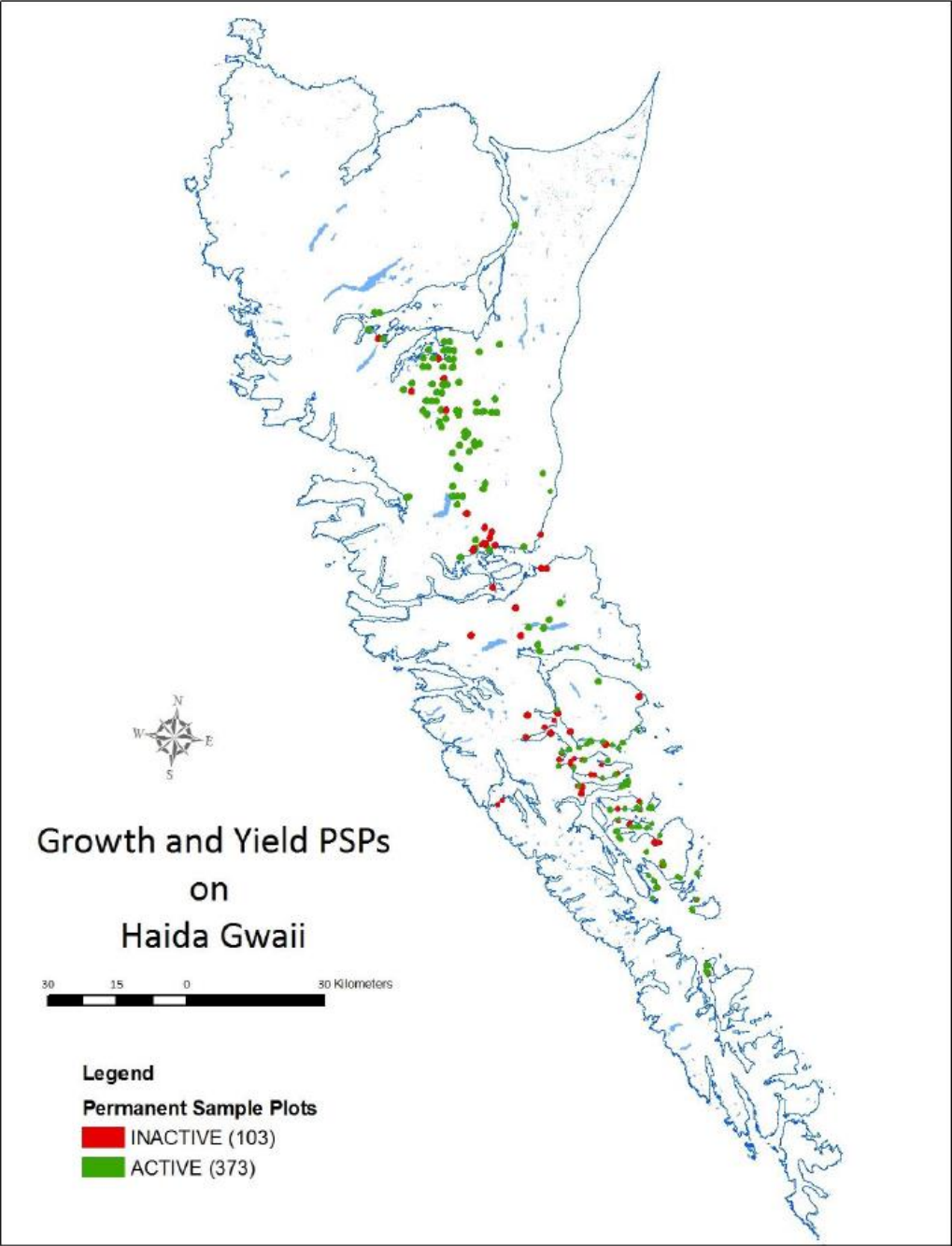
DQC	R6	103F.078	78	133848898.2550	13384.89
DQC	R6	103F.079	79	53798509.5809	5379.85
DQC	R6	103F.080	80	136379341.0210	13637.93
DQC	R6	103G.071	71	89836860.3475	8983.69
DQC	R6	103F.065	65	2649696.3018	264.97
DQC	R6	103F.066	66	111980601.9580	11198.06
DQC	R6	103F.067	67	141251398.5260	14125.14
DQC	R6	103F.068	68	85665227.5318	8566.52
DQC	R6	103F.069	69	81710826.2869	8171.08
DQC	R6	103F.070	70	143081034.3300	14308.10
DQC	R6	103G.061	61	63925584.8442	6392.56
DQC	R6	103F.055	55	619460.4019	61.95
DQC	R6	103F.056	56	97905627.1925	9790.56
DQC	R6	103F.057	57	143981446.1970	14398.14
DQC	R6	103F.058	58	143182759.2060	14318.28
DQC	R6	103F.059	59	147536874.4560	14753.69
DQC	R6	103F.060	60	147536874.4560	14753.69
DQC	R6	103G.051	51	44243424.2438	4424.34
DQC	R6	103F.046	46	18175189.8398	1817.52
DQC	R6	103F.047	47	66607124.2824	6660.71
DQC	R6	103F.048	48	138360813.7340	13836.08
DQC	R6	103F.049	49	147881958.2100	14788.20
DQC	R6	103F.050	50	147881958.2100	14788.20
DQC	R6	103G.041	41	55276756.9939	5527.68
DQC	R6	103F.037	37	50295958.9396	5029.60
DQC	R6	103F.038	38	97964433.6787	9796.44
DQC	R6	103F.039	39	148226572.4430	14822.66
DQC	R6	103F.040	40	148226572.4430	14822.66
DQC	R6	103G.031	31	43428632.7428	4342.86
DQC	R6	103F.027	27	30689799.9401	3068.98
DQC	R6	103F.028	28	136914491.9990	13691.45
DQC	R6	103F.029	29	135606194.3360	13560.62
DQC	R6	103F.030	30	93471786.6686	9347.18
DQC	R6	103G.021	21	54556641.8757	5455.66
DQC	R6	103G.022	22	2769789.7972	276.98
DQC	R6	103F.017	17	94152.5689	9.42
DQC	R6	103F.018	18	92480403.8732	9248.04
DQC	R6	103F.019	19	129386926.3480	12938.69
DQC	R6	103F.020	20	115608331.9070	11560.83
DQC	R6	103G.011	11	148830343.9360	14883.03
DQC	R6	103G.012	12	48689274.1636	4868.93
DQC	R6	103F.008	8	71534425.2711	7153.44

DQC	R6	103F.009	9	121168076.5540	12116.81
DQC	R6	103F.010	10	146624735.7450	14662.47
DQC	R6	103G.001	1	107864515.5500	10786.45
DQC	R6	103G.002	2	79818390.2658	7981.84
DQC	R6	103G.003	3	1.6923	0.00
DQC	R6	103C.098	98	2242.3919	0.22
DQC	R6	103C.099	99	86909120.6458	8690.91
DQC	R6	103C.100	100	130876197.6640	13087.62
DQC	R6	103B.091	91	134376997.6920	13437.70
DQC	R6	103B.092	92	127587275.7140	12758.73
DQC	R6	103B.093	93	407098.0371	40.71
DQC	R6	103C.089	89	47858598.1491	4785.86
DQC	R6	103C.090	90	139379854.3250	13937.99
DQC	R6	103B.081	81	114336133.6770	11433.61
DQC	R6	103B.082	82	57969097.8615	5796.91
DQC	R6	103B.083	83	2599523.6069	259.95
DQC	R6	103C.079	79	640714.1541	64.07
DQC	R6	103C.080	80	71523600.5826	7152.36
DQC	R6	103B.071	71	121756522.8240	12175.65
DQC	R6	103B.072	72	66282328.0986	6628.23
DQC	R6	103B.073	73	27813274.1088	2781.33
DQC	R6	103C.070	70	8913573.6281	891.36
DQC	R6	103B.061	61	115769224.1240	11576.92
DQC	R6	103B.062	62	108515093.1600	10851.51
DQC	R6	103B.063	63	85164531.2804	8516.45
DQC	R6	103B.064	64	22291.5394	2.23
DQC	R6	103B.051	51	28095642.4553	2809.56
DQC	R6	103B.052	52	116615054.4810	11661.51
DQC	R6	103B.053	53	31735258.2279	3173.53
DQC	R6	103B.054	54	11686441.1336	1168.64
DQC	R6	103B.042	42	34766747.3175	3476.67
DQC	R6	103B.043	43	105490712.0860	10549.07
DQC	R6	103B.044	44	40848672.9186	4084.87
DQC	R6	103B.032	32	72758.7906	7.28
DQC	R6	103B.033	33	118670036.1310	11867.00
DQC	R6	103B.034	34	65074742.6541	6507.47
DQC	R6	103B.035	35	8778819.7543	877.88
DQC	R6	103B.023	23	37186432.9496	3718.64
DQC	R6	103B.024	24	126318752.5880	12631.88
DQC	R6	103B.025	25	80560874.9534	8056.09
DQC	R6	103B.026	26	40206.2080	4.02
DQC	R6	103B.014	14	46186372.4244	4618.64

DQC	R6	103B.015	15	96050034.5019	9605.00
DQC	R6	103B.016	16	1704685.7481	170.47
DQC	R6	103B.004	4	1429204.5354	142.92
DQC	R6	103B.005	5	55366790.9863	5536.68
DQC	R6	103B.006	6	15866801.7290	1586.68
DQC	R6	102O.095	95	20193329.8921	2019.33
DQC	R6	102O.096	96	102329.0278	10.23
		map count = 127		TOTAL	1004981.40



Appendix 2: Distribution of Existing Growth and Yield PSPs on Haida Gwaii



# Appendix 4

## Haida Gwaii VRI Quality Assurance Summary Report

*Scheithauer Forest Consultants Ltd.*  
704-327 Maitland Street  
Victoria, B.C. V9A 7G7

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December 23, 2013

Mr. Roman Bilek  
Ministry of Forests, Lands and Natural Resource Operations  
Forest Analysis and Inventory Branch  
PO Box 9512, Stn Prov Govt  
7<sup>th</sup> Floor 727 Fisgard Street  
Victoria, B.C. V8W 9C2

### **Haida Gwaii Phase 1 VRI – Quality Assurance Summary Report**

#### **1. INTRODUCTION**

The Quality Assurance (QA) review of all of the major work phases of the Haida Gwaii Phase 1 Vegetation Resource Inventory (VRI) project has been completed and the results are summarized in this report.

The project area covered a total area of approximately 1,004,000 hectares on portions of 126 BC Geographic System map sheets (67 full map sheet equivalents).

The VRI contractor completing the VRI work was Timberline Forest Inventory Consultants (Timberline). The photo-interpreters completing this work were Mike Mastine, Mike Sandvoss, Jouni Tanskanen, Rob Oran, Bruce McClymont, Mitchell Grant, Andy Ferguson and Francois Rosa.

The contractor completing the QA reviews was Frank Scheithauer R.P.F.

#### **2. QUALITY ASSURANCE DATA PACKAGE**

The final QA data package for the Haida Gwaii Phase 1 VRI consists of:

- This summary report;
- Individual QA Reports for each major work phase;
- All supporting documentation including records, tables and ArcMap shapefiles;
- The project tracking ledger.

### 3. METHODOLOGY

All Quality Assurance methodology used to conduct the QA reviews of the major work phases conformed to the Ministry of Forests, Lands and Natural Resource Operations' *Vegetation Resources Inventory Photo Interpretation Quality Assurance Procedures and Standards* document (version 3.4, April 2011).

### 4. RESULTS

#### 4.1 Polygon Delineation

Polygon delineation Quality Assurance review of the 126 map sheets was completed in 17 batches and reports were produced from August 31, 2011 to February 11, 2013. 114 map sheets met Ministry standards after the initial QA review. The remaining 12 maps were re-worked and met standards after subsequent QA review.

##### 4.1.1 Issues

Map sheets 103K015, 103K016, 103K017, 103K025 and 103K026 did not meet Ministry standards regarding minimum separation between type lines.

The delineation of map sheets 103F085, 103F086, 103F095, 103F096, 103F099, and 103F100 was generally overly broad and Ministry guidelines regarding RESULTS polygons were not followed.

Map sheet 103K009 did not meet standards due to issues with the separation of treed and non-treed polygons.

#### 4.2 Data Source Transfer- Historic Field Information

The data source transfer of five percent of the historic data points was reviewed and reported on March 5, 2013.

	Transfer of Coordinates	Transfer of Data
Total Points Obtained	147	126
Total Points Possible	150	150
Rating %	98.0	84.0

There are no Ministry acceptance/rejection standards for Data Source Transfer.

#### 4.2.1 Issues

It was noted that the Historic Inventory Data Source Transfer phase of the project was completed well after work on the Polygon Attribution phase had begun. This is not desirable (since the Data Source Transfer data set is used to formulate Polygon Attribute descriptions). For future projects, Data Source Transfer should be completed and approved prior to the implementation of the Polygon Attribution phase.

### 4.3 Field Data Collection

Field Data Collection Quality Assurance review was completed in four batches and reports were produced from September 2011 to May 2013. A total of 26 one-plot ground calibration points, 7 three-plot ground calibration points and 66 air calibration points were reviewed (five percent of all field data collected). All of the reviewed field data met Ministry standards with the exception of one air call.

#### 4.3.1 Issues

The initial QA review in September 2011 indicated the following issues:

- Preliminary age estimates not being conducted in the field;
- Incorrect DBH limits;
- Selection of unsuitable sample trees;
- Incorrect Density calculations.

The issues were rectified by Timberline and no major issues were noted on subsequent QA reports.

### 4.4 Polygon Attribute Descriptions

Five percent of all polygon attribute descriptions were QA reviewed in 28 batches and reports were produced from January 14, 2012 to December 20, 2013. 114 map sheets met Ministry standards after the initial QA review. The remaining 12 maps were re-worked and met standards after subsequent QA review.

#### 4.4.1 Issues

Map sheet 103F097- did not meet Ministry standards in the “Shrub Crown Closure” category;

103F098- “Shrub Crown Closure”;

103F099- “Non-veg Type and Non-veg CC”;

103K026- “Basal Area”, Tree CC”, “Herb CC” and “Bryoid CC”;

103F065 and 103F066- “Standard Attributes”;

103G031 and 103F030- “Leading Age” and “Leading Height”;

103F020- “Leading Height”;

103G001- “Leading Height” and “Standard Attributes”;

103G002- “Leading Height”;

103B072- “Leading Age” and “Leading Height”.

## 5. CONCLUSIONS AND RECOMMENDATIONS

All reviewed work for all major work phases for the Haida Gwaii Phase 1 VRI project meets Ministry standards. The work should be accepted by the Ministry after it has confirmed that all the deficiencies noted in the attached QA reports have been rectified.



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## 6. APPENDICES

### 6.1 Attachments

- Haida Gwaii VRI QA- All Polygon Delineation.zip
- Haida Gwaii VRI QA- All Polygon Attribution.zip
- Haida Gwaii VRI QA- All Field Data Collection.zip
- Haida Gwaii VRI QA- All Data Source Transfer.zip
- Haida Gwaii VRI QA- Ledger.xlsx

# Appendix 5

## Map Sheet Major Work Phases and Assigned Interpreter 2011 / 2012

Mapsheet Info			Delineation			GIS Cleaning Polygons			Descriptions			GIS for 1:1 Cleaning			Attribution QA			Maps Finalized		
Year	Mapsheet	Name	Date finished mm/dd/yyyy	ha	FME	App. Int. Y/N	OC	App. ext.	Small Lakes	Comp.	Name	Initial	# polys final count	Date Completed mm/dd/yyyy	QC	Name	Date Cleaned mm/dd/yyyy	Date QA'd mm/dd/yyyy	QA edited Pass/Fail	Name
2011-12	103F055	Rosa	8/22/2011	8,886.42	0.59	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Grant	341	12/20/2011	Y-Sandvoss	Tanskanen	1/6/2012	1/13/2012	Pass	Tanskanen
2011-12	103F056	Rosa	8/22/2011	14,649.88	0.98	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Grant	577	12/23/2011	Y-Sandvoss	Tanskanen	1/6/2012	1/13/2012	Pass	Tanskanen
2011-12	103F057	Rosa	8/30/2011	0.85	0.00	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Grant	2	12/31/2011	Y-Sandvoss	Tanskanen	1/6/2012	1/13/2012	Pass	Tanskanen
2011-12	103F058	Rosa	8/31/2011	9,859.36	0.66	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Grant	497	1/16/2012	Y-Sandvoss	Tanskanen	2/12/2012	2/3/2012	Pass	Tanskanen
2011-12	103F059	Rosa	8/31/2011	14,615.19	0.97	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Grant	738	2/5/2012	Y-Sandvoss	Tanskanen	2/6/2012	2/27/2012	Pass	Tanskanen
2011-12	103F060	Grant	9/2/2011	12,669.20	0.84	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Mastine	800	12/29/2011	Y-Sandvoss	Tanskanen	1/6/2012	1/13/2012	Pass	Tanskanen
2011-12	103F061	Grant	9/2/2011	14,264.18	0.95	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Mastine	587	1/8/2012	Y-Sandvoss	Tanskanen	1/18/2012	1/25/2012	Pass	Tanskanen
2011-12	103F062	Grant	9/2/2011	14,615.19	0.97	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Mastine	556	1/23/2012	Y-Sandvoss	Tanskanen	2/1/2012	2/7/2012	Pass	Tanskanen
2011-12	103F063	Grant	9/2/2011	12,826.46	0.85	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Mastine	634	4/20/2012	Y-Sandvoss	Tanskanen	4/26/2012	4/30/2012	Pass	Tanskanen
2011-12	103G064	McClymont	8/26/2011	6,392.56	0.42	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	489	10/3/2012	Y-Sandvoss	Tanskanen	1/19/2012	1/12/2012	Pass	Tanskanen
2011-12	103G065	Grant	9/5/2011	8,993.69	0.59	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Mastine	486	6/21/2012	Y-Sandvoss	Tanskanen	7/1/2012	9/15/2012	Pass	Tanskanen
2011-12	103G066	Mastine	9/12/2011	12,815.54	0.85	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	500	3/30/2012	Y-Sandvoss	Tanskanen	3/31/2012	4/3/2012	Pass	Tanskanen
2011-12	103G067	Grant	9/2/2011	276.57	0.16	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	41	3/12/2012	Y-Sandvoss	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103G068	Grant	9/12/2011	14,615.19	0.97	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	829	3/21/2012	Y-Sandvoss	Tanskanen	3/22/2012	3/20/2012	Pass	Tanskanen
2011-12	103G069	Mastine	9/12/2011	5,134.62	0.34	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	416	3/16/2012	Y-Sandvoss	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103J001	Mastine	8/26/2011	7,104.04	0.47	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	436	3/6/2012	Y-Sandvoss	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103J002	Grant	8/26/2011	7,538.92	0.52	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	445	2/23/2012	Y-Sandvoss	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103J003	Grant	8/24/2011	1,495.73	0.09	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Rosa	109	1/29/2012	Y-Sandvoss	Tanskanen	2/1/2012	2/7/2012	Pass	Tanskanen
2011-12	103K005	Sandvoss	8/30/2011	5,165.10	0.34	Y-Mastine	Y	Y	Y	Y	Tanskanen	Grant	297	2/12/2012	Y-Sandvoss	Tanskanen	2/14/2012	2/27/2012	Pass	Tanskanen
2011-12	103K006	Sandvoss	9/6/2011	14,580.44	0.97	Y-Mastine	Y	Y	Y	Y	Tanskanen	Grant	821	3/15/2012	Y-Sandvoss	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103K007	Rosa	9/6/2011	14,107.99	0.90	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Oran	775	3/7/2012	Y-Sandvoss	Tanskanen	3/22/2012	3/27/2012	Pass	Tanskanen
2011-12	103K008	Rosa	9/6/2011	9,831.36	0.65	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Oran	750	5/10/2012	Y-Sandvoss	Tanskanen	4/28/2012	4/30/2012	Pass	Tanskanen
2011-12	103K009	Ferguson	8/30/2011	11,848.81	0.79	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Oran	225	3/30/2012	Y-Sandvoss	Tanskanen	3/31/2012	4/3/2012	Pass	Tanskanen
2011-12	103K010	Ferguson	8/22/2011	4,175.97	0.28	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Oran	387	1/10/2012	Y-Mastine	Tanskanen	1/18/2012	1/25/2012	Pass	Tanskanen
2011-12	103K015	Sandvoss	8/19/2011	4,346.60	0.29	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	547	2/8/2012	Y-Mastine	Tanskanen	1/16/2012	1/25/2012	Pass	Tanskanen
2011-12	103K016	Sandvoss	8/23/2011	7,393.24	0.42	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	437	3/14/2012	Y-Mastine	Tanskanen	3/16/2012	3/20/2012	Pass	Tanskanen
2011-12	103K017	Sandvoss	8/24/2011	5,739.06	0.32	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	32	2/10/2012	Y-Mastine	Tanskanen	1/16/2012	1/25/2012	Pass	Tanskanen
2011-12	103K018	Sandvoss	8/25/2011	239.51	0.16	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	51	2/11/2012	Y-Mastine	Tanskanen	1/16/2012	1/25/2012	Pass	Tanskanen
2011-12	103K019	Ferguson	8/26/2011	612.12	0.04	Y-Sandvoss	Y	Y	Y	Y	Tanskanen	Sandvoss	213	2/23/2012	Y-Mastine	Tanskanen	3/16/2012	1/25/2012	Pass	Tanskanen
2011-12	103K025	Sandvoss	8/17/2011	2,003.26	0.13	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	88	2/16/2012	Y-Mastine	Tanskanen	3/16/2012	1/25/2012	Pass	Tanskanen
2011-12	103K026	Sandvoss	8/17/2011	862.52	0.05	Y-Mastine	Y	Y	Y	Y	Tanskanen	Sandvoss	13216			Tanskanen				Tanskanen
<b>totals</b>				<b>247,944.57</b>																
<b>2011-12</b>					<b>16.53</b>															
				<b>FME</b>	<b>15000</b>															

# Map Sheet Major Work Phases and Assigned Interpreter 2012 / 2013

Year		March/17	Initial Assigned	Definitive		GIS Cleaning		Description		GIS for 1:1 Cleaning		QA - 3rd party		GIS for VRIM?		Map Feedback	
Year	Month	Initial Assigned	Date finished	ha	FME	Approved Internal QC	Approved external QA	Name	Small Lakes Added	Name	Date	Date QA'd	QA edited	Name	Date Processed	Name	Date Sent
2012-13	10/01/17	Sandvoss	3/20/2012	9.42	0.006 Y-Machine	Y/N	Y	Ferguson	Y	Tanskner	Oct-12	9/30/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/18	Sandvoss	3/30/2012	9.248 04	0.5166 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Dec-12	12/10/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/19	Sandvoss	4/18/2012	12.838 69	0.828 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Feb-13	2/14/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/20	McCymont	4/13/2012	11.560 83	0.707 Y-Machine	Y	Y	Rosa	Y	Tanskner	Mar-13	3/11/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/21	Sandvoss	3/25/2012	3.068 96	0.246 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Oct-12	9/30/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/22	Sandvoss	3/29/2012	13.691 45	0.928 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Nov-12	11/1/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/23	McCymont	4/15/2012	13.560 62	0.940 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Dec-12	12/10/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/24	McCymont	3/15/2012	9.347 18	0.623 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/25	Sandvoss	3/26/2012	5.029 80	0.353 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Mar-13	3/11/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/26	Sandvoss	3/26/2012	9.796 44	0.653 Y-Machine	Y	Y	Rosa	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/27	Rosa	4/26/2012	14.892 66	0.982 Y-Machine	Y	Y	Ferguson	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/28	Rosa	3/20/2012	14.892 66	0.982 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/29	Sandvoss	3/21/2012	6.660 71	0.121 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/30	Sandvoss	3/21/2012	13.836 08	0.924 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/31	Grani	5/4/2012	14.788 20	0.959 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/32	Rosa	2/22/2012	14.788 20	0.959 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/33	Sandvoss	9/13/2011	61.95	0.041 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/34	Sandvoss	1/8/2012	9.790 56	0.652 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/35	Grani	4/23/2012	14.398 14	0.556 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/36	Sandvoss	3/19/2012	14.318 28	0.546 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/37	Sandvoss	4/27/2012	14.753 69	0.933 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/38	Rosa	2/20/2012	14.753 69	0.933 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Feb-13	2/25/2013	Pass	Tanskner	3/1/2013	Jeff NRO	3/1/2013
2012-13	10/01/39	Sandvoss	11/28/2011	264.97	0.177 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Dec-12	12/10/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/40	Sandvoss	3/26/2012	14.125 14	0.947 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/41	Grani	3/26/2012	8.566 52	0.544 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/42	Rosa	3/26/2012	8.171 06	0.544 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/43	Sandvoss	11/25/2011	14.005 68	0.937 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/44	Sandvoss	3/27/2012	14.694 53	0.970 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/45	Grani	3/27/2012	13.394 89	0.982 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/46	Rosa	8/29/2011	5.379 85	0.357 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/47	Grani	3/16/2012	13.637 63	0.902 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/48	Grani	3/16/2012	14.649 88	0.976 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/49	Grani	3/16/2012	14.649 88	0.976 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/50	Rosa	12/14/2011	14.557 13	0.976 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/51	McCymont	3/9/2012	5.455 66	0.582 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/52	McCymont	3/9/2012	12.873 60	0.976 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/53	McCymont	3/9/2012	276.96	0.357 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/54	McCymont	1/8/2012	4.342 86	0.185 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/55	McCymont	2/17/2012	5.527 68	0.285 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
2012-13	10/01/56	McCymont	9/22/2011	4.424 34	0.395 Y-Machine	Y	Y	Tanskner	Y	Tanskner	Nov-12	11/12/2012	Pass	Tanskner	12/1/2012	Jeff NRO	12/1/2012
Totals				435,489.46	29.03												
2012-13																	

FME 15000



# Map Sheet Major Work Phases and Assigned Interpreter 2013

Mapsheet Info		Delineation			GIS Cleaning Polygons		Descriptions			GIS for 1:1 Cleaning		QA		GIS for Final Processing		Map Finalized	
Year	Mapsheet	Initial Assigned	Date finished	ha	FME	Approved internal	Approved external	Name	Date Started	# polys completed	Date Finished	QC	Name	Date returned	QA	Name	Date Sent
2013-14	1020095	Sandvoss	5/3/2012	2,019.33	0.1346	Y-Mastine	Y	Sandvoss	8/19/2013	270	9/12/2013	Y-Oran	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/16/2013
2013-14	1020096	Sandvoss	5/3/2012	10.23	0.0007	Y-Mastine	Y	Sandvoss	9/2/2013	3	8/19/2013	Y-Oran	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/16/2013
2013-14	1038004	Sandvoss	5/4/2012	142.92	0.0095	Y-Mastine	Y	Sandvoss	9/2/2013	55	9/5/2013	Y-Oran	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/16/2013
2013-14	1038005	Sandvoss	5/4/2012	5,536.68	0.3691	Y-Mastine	Y	Sandvoss	9/2/2013	614	10/16/2013	Y-Ferguson	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/16/2013
2013-14	1038006	Sandvoss	5/5/2012	1,586.68	0.1058	Y-Mastine	Y	Sandvoss	10/17/2013	201	10/23/2013	Y-Ferguson	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/16/2013
2013-14	1038014	Rosa	5/9/2012	4,618.64	0.3079	Y-Sandvoss	Y	Sandvoss	11/28/2013	631	12/10/2013	Y-Ferguson	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038015	Rosa	5/14/2012	9,605.00	0.6403	Y-Sandvoss	Y	Sandvoss	10/24/2013	920	12/22/2013	Y-Ferguson	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038016	Rosa	5/14/2012	170.47	0.0114	Y-Sandvoss	Y	Sandvoss	10/24/2013	35	10/24/2013	Y-Ferguson	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/19/2013
2013-14	1038023	Rosa	4/30/2012	3,716.64	0.2479	Y-Sandvoss	Y	Oran	11/15/2013	548	12/14/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038024	Rosa	5/2/2012	12,631.88	0.6421	Y-Sandvoss	Y	Rosa/Sandvoss	11/23/2013	1001	12/14/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038025	Rosa	5/7/2012	8,056.09	0.5371	Y-Sandvoss	Y	Rosa	11/23/2013	524	11/22/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038026	Rosa	5/7/2012	4.02	0.0003	Y-Sandvoss	Y	Sandvoss	10/24/2013	14	10/24/2013	Y-Oran	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/23/2013
2013-14	1038032	Sandvoss	7/22/2012	7.28	0.0005	Y-Oran	Y	Ferguson	11/18/2013	9	11/18/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038033	Sandvoss	8/29/2012	11,867.00	0.7911	Y-Oran	Y	Ferguson	11/18/2013	1398	12/10/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038034	Rosa	5/16/2012	6,507.47	0.4338	Y-Sandvoss	Y	Mastine	11/20/2013	484	12/10/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038035	Rosa	5/16/2012	8,777.88	0.0585	Y-Sandvoss	Y	Rosa	11/8/2013	57	11/22/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038042	Rosa	11/26/2012	3,475.67	0.2318	Y-Sandvoss	Y	Tanskanen/Oran	10/30/2013	544	11/14/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038043	Rosa	11/26/2012	10,549.07	0.7033	Y-Sandvoss	Y	Tanskanen	11/16/2013	1165	12/12/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038044	Rosa	11/26/2012	4,064.87	0.2723	Y-Sandvoss	Y	Oran	12/26/2013	348	12/26/2013	Y-Sandvoss	Tanskanen	12/16/2013	12/20/2013	Tanskanen	12/23/2013
2013-14	1038051	Rosa	12/7/2012	2,809.56	0.1873	Y-Sandvoss	Y	McClymont	8/25/2013	366	9/25/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/19/2013
2013-14	1038052	Rosa	1/8/2013	11,441.00	0.7827	Y-Sandvoss	Y	Rosa	10/17/2013	1311	11/8/2013	Y-Sandvoss	Tanskanen	11/25/2013	11/29/2013	Tanskanen	12/19/2013
2013-14	1038053	Rosa	1/8/2013	2,741.00	0.1827	Y-Sandvoss	Y	McClymont	10/8/2013	320	11/20/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038054	Rosa	1/8/2013	1,168.64	0.0779	Y-Sandvoss	Y	McClymont	10/8/2013	94	11/24/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038061	Ferguson	11/1/2013	11,576.92	0.7718	Y-Sandvoss	Y	Mastine	9/25/2013	862	11/4/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038062	Tanskanen	2/6/2013	6,352.45	0.4235	Y-Sandvoss	Y	Mastine	11/4/2013	639	11/15/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038063	Sandvoss	1/30/2013	474.00	0.0316	Y-Tanskanen	Y	Mastine	11/15/2013	105	11/15/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038064	Sandvoss	1/30/2013	2.23	0.0001	Y-Tanskanen	Y	Mastine	11/15/2013	2	11/15/2013	Y-Sandvoss	Tanskanen	11/30/2013	12/4/2013	Tanskanen	12/19/2013
2013-14	1038071	Oran	7/17/2012	12,175.65	0.8117	Y-Sandvoss	Y	Tanskanen	9/26/2013	1131	10/29/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/19/2013
2013-14	1038072	Tanskanen	7/17/2012	4,808.00	0.3205	Y-Sandvoss	Y	Tanskanen	7/31/2013	632	9/25/2013	Y-Sandvoss	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/19/2013
2013-14	1038073	Sandvoss	1/28/2013	484.52	0.0323	Y-Tanskanen	Y	Sandvoss	7/25/2013	63	7/31/2013	Y-Oran	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/19/2013
2013-14	1038081	Tanskanen	7/11/2012	11,433.61	0.7822	Y-Sandvoss	Y	Oran	3/10/2013	1094	9/24/2013	Y-Sandvoss	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/19/2013
2013-14	1038082	Sandvoss	7/5/2012	5,796.91	0.3865	Y-Oran	Y	McClymont	6/8/2013	631	8/23/2013	Y-Sandvoss	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/19/2013
2013-14	1038083	Sandvoss	7/11/2012	259.95	0.0173	Y-Oran	Y	Sandvoss	7/25/2013	27	7/25/2013	Y-Oran	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/22/2013
2013-14	1038091	Tanskanen	6/28/2012	13,437.70	0.8958	Y-Sandvoss	Y	Rosa	8/2/2013	1543	9/9/2013	Y-Sandvoss	Tanskanen	9/28/2013	11/5/2013	Tanskanen	12/22/2013
2013-14	1038092	Sandvoss	6/30/2012	12,758.73	0.8506	Y-Oran	Y	Rosa	9/2/2013	1291	10/17/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/22/2013
2013-14	1038093	Sandvoss	6/27/2012	40.71	0.0027	Y-Oran	Y	Sandvoss	7/31/2013	17	8/1/2013	Y-Oran	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/22/2013
2013-14	1038070	Tanskanen	7/12/2012	891.36	0.0594	Y-Sandvoss	Y	Ferguson	131/12/2013	173	11/15/2013	Y-Sandvoss	Tanskanen	11/25/2013	11/29/2013	Tanskanen	12/22/2013
2013-14	1038079	Tanskanen	7/4/2012	64.07	0.0043	Y-Sandvoss	Y	Ferguson	10/25/2013	17	10/25/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/22/2013
2013-14	1038080	Tanskanen	7/6/2012	7,152.36	0.4768	Y-Sandvoss	Y	Ferguson	10/25/2013	761	13/11/2013	Y-Sandvoss	Tanskanen	11/25/2013	11/29/2013	Tanskanen	12/22/2013
2013-14	1038089	McClymont	6/16/2012	4,785.86	0.3191	Y-Sandvoss	Y	McClymont	4/19/2013	462	6/22/2013	Y-Sandvoss	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/22/2013
2013-14	1038090	Ferguson	6/22/2012	13,937.99	0.9292	Y-Sandvoss	Y	Oran	9/25/2013	1548	11/14/2013	Y-Sandvoss	Tanskanen	11/25/2013	11/29/2013	Tanskanen	12/22/2013
2013-14	1038098	Sandvoss	6/19/2012	0.22	0.0000	Y-Oran	Y	Sandvoss	3/18/2013	3	3/18/2013	Y-Sandvoss	Tanskanen	5/10/2013	5/15/2013	Tanskanen	12/22/2013
2013-14	1038099	Sandvoss	6/25/2012	8,690.91	0.5794	Y-Oran	Y	Ferguson	10/1/2013	937	10/25/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/22/2013
2013-14	1038100	Tanskanen	6/18/2012	13,087.62	0.6725	Y-Sandvoss	Y	Ferguson	4/8/2013	965	4/17/2013	Y-Sandvoss	Tanskanen	5/10/2013	5/15/2013	Tanskanen	12/22/2013
2013-14	1038108	Sandvoss	5/26/2012	7,153.44	0.4769	Y-Oran	Y	Ferguson	4/8/2013	569	4/24/2013	Y-Sandvoss	Tanskanen	5/10/2013	5/15/2013	Tanskanen	12/22/2013
2013-14	1038109	Sandvoss	6/12/2012	12,116.81	0.8078	Y-Oran	Y	Ferguson	4/24/2013	1059	8/12/2013	Y-Sandvoss	Tanskanen	9/28/2013	10/7/2013	Tanskanen	12/22/2013
2013-14	1038110	Oran	6/23/2012	14,662.47	0.9775	Y-Sandvoss	Y	Ferguson	8/12/2013	1162	9/31/2013	Y-Sandvoss	Tanskanen	10/31/2013	11/5/2013	Tanskanen	12/22/2013
2013-14	1038001	Oran	6/27/2012	10,786.45	0.7191	Y-Sandvoss	Y	Rosa	5/24/2013	1043	8/12/2013	Y-Sandvoss	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/22/2013
2013-14	1038002	Ferguson	6/28/2012	7,981.84	0.5321	Y-Sandvoss	Y	Sandvoss	3/15/2013	782	7/24/2013	Y-Oran	Tanskanen	8/6/2013	8/19/2013	Tanskanen	12/22/2013
2013-14	1038011	McClymont	5/6/2012	14,883.03	0.9922	Y-Sandvoss	Y	Rosa	3/7/2013	1086	4/6/2013	Y-Sandvoss	Tanskanen	5/10/2013	5/15/2013	Tanskanen	12/22/2013
2013-14	1038012	McClymont	5/25/2012	4,868.93	0.3246	Y-Sandvoss	Y	Rosa	4/17/2013	430	4/30/2013	Y-Sandvoss	Tanskanen	5/10/2013	5/15/2013	Tanskanen	12/22/2013
Totals				304,295.76	20.29												
2013-14										30036							



## Appendix 6

### TRIM Base Feature Alignment and Accuracy Issue Softcopy Screen Capture Examples



TRIM lake example

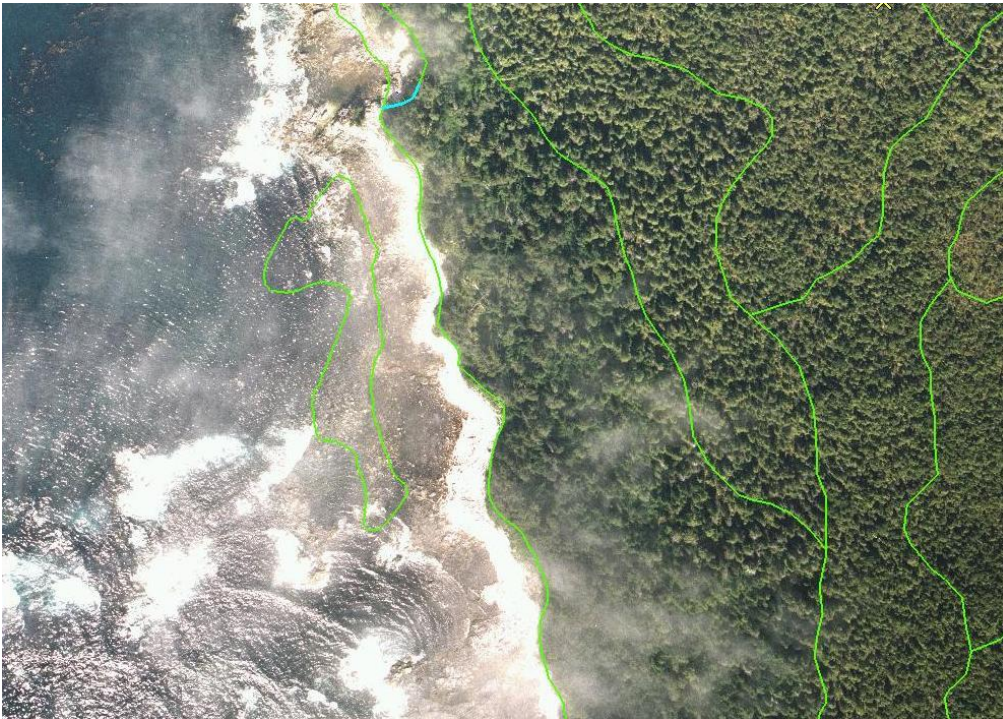


TRIM river misalignment example #1





TRIM river misalignment example #2



Off shore 'island' or shoal area indicated on TRIM example #1





Off shore 'island' or shoal area indicated on TRIM example #2



TRIM Shoreline capture example