VEGETATION RESOURCES INVENTORY FOR THE TERRACE COMMUNITY FOREST

FINAL REPORT

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- Kim Haworth, RPF, Terrace Community Forest Ltd., for his involvement in the project and for his help with access to the Deep Creek parcel.
- Larry McCulloch, RPF, of LM Forest Resource Solutions Ltd., who served as Project Manager. Larry provided valuable early support and guidance related to current access within the TCF. Additionally, he provided TCF data, and local knowledge to help improve species identification.
- Terrace Community Forest Ltd., for funding this forest inventory project, and for the use of their softcopy viewer sets and LIDAR data set.
- Lakelse Air Ltd. Helicopter Services for their assistance in the air call program.

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1 INTRODUCTION

Looking towards their upcoming timber supply review (TSR) and beyond, Terrace Community Forest Ltd. (TCF) expressed interest in improving their forest inventory using their recently acquired imagery and Light Detection and Ranging (LIDAR) data sets. Ecora Resource Group Ltd. (Ecora) was asked to review the forest inventory data currently available for the analysis and to make recommendations on what actions will economically provide the best benefit.

The existing forest inventory for the area now held by the TCF was an amalgamation of Forest Cover inventories completed in 1963, 1976, 1989 and 1994, along with various disturbance updates completed between 1988 and 1997, numerous silviculture updates completed between 1979 and 2011, and a small Vegetation Resource Inventory (VRI) project completed in 1997 in the TCF's Kitimat parcel.

The TCF is located in the Coast Mountains Resource District and Kalum Timber Supply Area (TSA). Forest Analysis and Inventory Branch of the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) have no immediate plans to undertake a VRI project in either location.

Given that the TCF owns both 2013 LIDAR data and 2013 aerial digital frame imagery, that ecosystem mapping attributes may enable subsequent timber supply analyses to use Site Index by Site Series (SIBEC) for managed stand yields, and that improving managed stand yields and completing a VRI would likely increase the harvest level supported by the land base, Ecora proposed to:

- Complete a full VRI using new imagery, LIDAR, and Reporting Silviculture Updates and Land status Tracking System (RESULTS) information to improve the attribution reliability and improve the accuracy of the VRI stand-level attributes; and
- Provide final VRI delineation for the TCF to add ecosystem mapping attributes to each VRI polygon.

1.1 Project Objectives

The objectives of the VRI project for the TCF were to:

- Delineate the TCF to current VRI standards using the 2013 imagery;
- Collect sufficient field data to calibrate the photo interpreters;
- Provide a full VRI attribute label for every polygon in the TCF, referencing field calibration, RESULTS and LIDAR data where possible and appropriate; and
- Deliver a seamless VRI with accompanying report for use in a timber supply analysis.

1.2 Description of Project Area

The TCF is located in the Coast Mountain Resource District, managed by MFLNRO. It is divided into three parcels situated north (Deep Creek), west (Shames) and south (Kitimat) of the community of Terrace, BC, as illustrated in Figure 1 below, and encompasses a forested land base of approximately 25,165 ha.

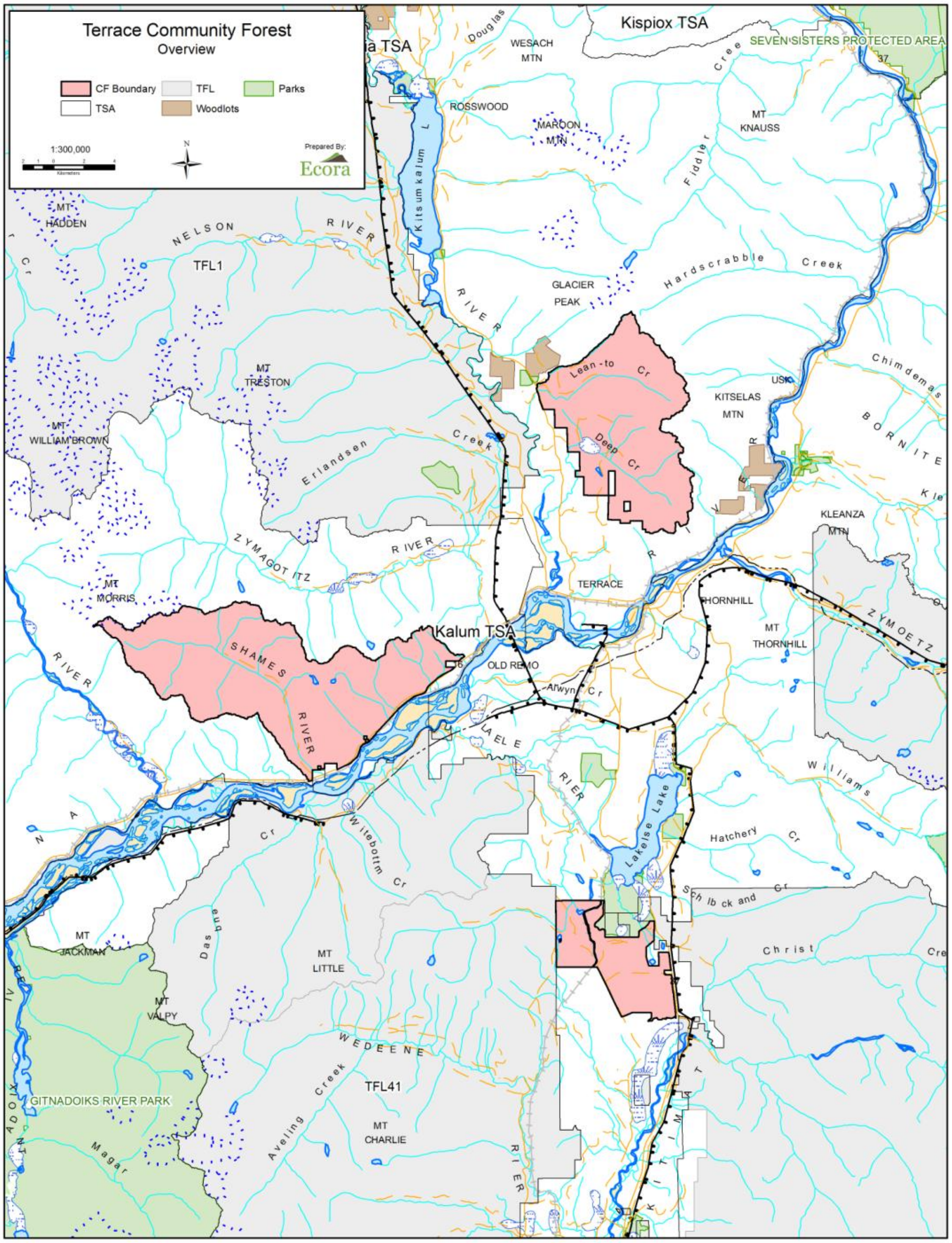

Figure 1: Terrace Community Forest overview

The dominant coniferous tree species throughout the sampled portions of the TCF forest is western hemlock with lesser amounts of mountain hemlock, amabilis fir, Sitka spruce, and western red-cedar. Red alder occasionally represented a sub-component and is locally common in some areas of rich soil. Lodgepole pine is infrequent within the TCF, occurring primarily on the very driest and wettest portions of the landscape. Paper birch and black cottonwood occur sporadically within the TCF.

2 METHODS

The following section provides a detailed synopsis of the methodology used to produce the VRI for the TCF. For clarity, the combined Forest Cover / VRI covering the TCF is referred to as the *existing* inventory, while the inventory completed by Ecora in 2014 is referred to as the *new* VRI.

2.1 Standards

The new VRI was produced in accordance with Ecora's project plan, and following the current versions of the relevant Provincial VRI procedures, standards and guidelines below:

BC Ministry of Forest, Lands and Natural Resource Operations. 2014. Vegetation Resources Inventory Photo Interpretation Procedures, v.3.0. Forest Analysis and Inventory Branch, Victoria, BC.

BC Ministry of Forest, Lands and Natural Resource Operations. 2013. Photo Interpretation Guidelines for Integrating RESULTS Information. Forest Analysis and Inventory Branch, Victoria, BC.

BC Ministry of Forest, Lands and Natural Resource Operations. 2014. Vegetation Resources Inventory Photo Interpretation Quality Assurance Procedures and Standards, v.3.7. Forest Analysis and Inventory Branch, Victoria, BC.

BC Ministry of Forest, Lands and Natural Resource Operations. 2014. Vegetation Resources Inventory Field Calibration Procedures for Photo Interpretation, v.1.4. Forest Analysis and Inventory Branch, Victoria, BC.

BC Ministry of Sustainable Resource Management. 2002. Vegetation Resources Inventory - The BC Land Cover Classification Scheme, v.1.3. Terrestrial Information Branch, Victoria, BC.

BC Ministry of Forests and Range. 2009. VRIMS Personal Geodatabase Structure and Use, v.1.2. BC Ministry of Forests and Range, Victoria, BC.

BC Ministry of Forests and Range. 2013. VRIMS Vegetation Cover Polygon Validation Rules, v.1.7.4. BC Ministry of Forests and Range, Victoria, BC.

BC Ministry of Forests and Range. 2009. Vegetation Resources Inventory Preparing a Project Implementation Plan for Photo interpretation, v.2.3. Forest Analysis and Inventory Branch, Victoria, BC.

2.2 Base Data

A variety of base data sources were gathered for this inventory to facilitate all phases of the project.

The following datasets were acquired from the Province's GeoBC online digital data warehouse, and clipped to the TCF boundary:

- Community Forest Agreement K1X boundary
- RESULTS Forest Cover
- RESULTS Openings
- Forest Tenures (FTEN) Cut Blocks
- Terrain Resource Information Management (TRIM) II water features

- TRIM II transportation features
- External boundary of the Shames recreational reserve
- Forest inventory data for BCGS map tiles 103I.027, 103I.028, 103I.037, 103I.038, 103I.045, 103I.046, 103I.047, 103I.055, 103I.056, 103I.057, 103I.058, 103I.067 and 103I.068; projected to 2013
- Provincial biogeoclimatic ecosystem classification (BEC) polygons

The TCF provided the following data sets:

- Road network maps for field calibration planning
- 2013-vintage 2 ppm LIDAR data
- 2013-vintage 25 cm GSD 4-band (RGBI) digital frame imagery and related softcopy viewer set files

2.3 Softcopy System

All polygon delineation, field calibration planning and polygon attribution was completed in a virtual environment using PurVIEW v.1.2.0.54 softcopy software on an ESRI ArcMap 9.3.1 platform.

2.4 Polygon Delineation

Polygon delineation is the process of segregating the land base into uniform polygons in accordance with provincially defined criteria. Polygon delineation is based on observable differences in vegetated or non-vegetated covers using mid-scale aerial photography or digital frame imagery.

VRI polygon delineation is based on the BC Land Cover Classification Scheme (BCLCS), which includes both vegetated and non-vegetated cover classes. Polygons identified in accordance with the BCLCS are sub-divided into similar vegetated or non-vegetated polygons based on Provincial criteria, with additional Provincial criteria dictating the delineation of treed (≥ 10% crown closure) polygons.

Delineating polygons provides logical units for the estimation of attributes.

There was generally strong spatial agreement between the existing inventory delineation and the land cover types visible on the 2013 imagery. As such, the polygon delineation phase was a review and rationalization of the existing inventory delineation.

Polygons were generally delineated at a scale of 1:3500, but larger scales of up to 1:1000 were used to delineate distinct boundaries such as cut block edges.

TRIM water features (lakes ≥ 2.0 ha and double-line rivers) were incorporated into the delineation as VRI polygons and remained spatially unaltered in accordance with Provincial requirements. TRIM lakes < 2.0 ha were not incorporated as VRI polygons in accordance with Provincial requirements.

RESULTS Forest Cover (not to be confused with the existing Forest Cover inventory) polygon delineation was incorporated as supplied, with subsequent boundary alterations based on visual inspection. RESULTS Opening and FTEN polygon delineation was generally not incorporated as they are known to be less spatially reliable than the RESULTS Forest Cover polygons.

The polygon delineation in the Shames and Deep Creek parcels was not edge-tied to the delineation beyond the TCF boundary, as the external delineation was completed to the now-obsolete Forest Cover standard. The polygon delineation beyond the TCF Kitimat parcel boundary, however, was completed to VRI standards, and so the Kitimat parcel polygon delineation was edge-tied to the external delineation where appropriate.

2.5 Field Calibration

Field calibration is a vital component of all VRI projects, and is the basis for accurate and consistent attribute estimation. It provides:

- Calibration information for subsequent photo interpretation by the individuals conducting the field work;
- Photo interpreters with a knowledge of the different vegetation types and site conditions in the project area;
- Correlations between vegetation attributes on the ground and their signatures on mid-scale aerial photography or digital frame imagery; and
- Useful data sources for the current inventory and any subsequent inventories.

The existing inventory within the TCF includes approximately 180 inventory field calibration data sources completed to the now-obsolete Forest Cover standard. However, the geographic coordinates of these point and strip samples are not included in the inventory and the location of the source document photos capturing that information has been lost to history. Thus, only the extent of the existing inventory polygons with those historic data sources is known.

TCF VRI field calibration was completed between 17 and 24 August 2014, and included the installation of 35 air calls and 17 enhanced one-point ground calls. The field sampling plan was supplied to TCF representative for review prior to the field work. Changes were requested and incorporated into the plan. The distribution of ground calls was restricted to road and trail access. The Shames Mountain ski resort area was excluded from both air and ground call sampling at the request of the TCF. The guiding principle for selecting air and ground call locations was to sample a wide variety of treed polygons outside the footprint of areas with historic inventory data sources. The sample plan was produced as a geo-referenced PDF map and loaded onto an iPad Mini for use in the field.

The 17 ground calls installed in 2014, one-point ground calls completed to the Provincial standard, were enhanced with four to six additional prism sweeps away from the measure plot in order to better explore the variation within the polygon. Species, age, height and diameter data was collected at the measure plot, while the additional prism sweeps were used to gather additional species and basal area data.

The 35 air calls installed in 2014, similarly completed to the Provincial standard, were conducted primarily to gather data in polygons at higher elevations in the Shames and Deep Creek parcels, and away from road access in the Kitimat parcel. The air call program included a review and revision of the existing inventory species composition and age attributes, and a review the first iteration of LIDAR generated height values. Additional data was collected on non-tree and non-vegetation attributes.

Ground call data was recorded on VRI field cards, and office reviewed for completeness and accuracy at the conclusion of each field day. Age cores were placed in plastic sleeves and office counted with 3.5X magnification. Heights were measured with a Vertex hypsometer calibrated at least once daily. Plot location was captured with the iPad and recorded with a recreational-grade GPS with an expected accuracy of < 5 m. Species composition and basal area was calculated using all prism sweeps within the polygon. Density was calculated for ground calls using the collected diameter data. Density was not calculated for ground observations, as no diameter data was collected. Age correction was completed using Ministry of Forests Research Branch SiteTools v.3.3 software.

Air call data, collected on paper forms that met the Province's general requirements for air calls, was office reviewed for completeness and accuracy at the conclusion of the sampling day.

Air call and compiled ground call data were assembled in a Microsoft Excel spreadsheet and translated into an ESRI shape file for reference during the polygon attribution phase.

2.6 Polygon Attribution

VRI polygon attribution involves assigning descriptions that are either estimates of polygon characteristics or contain other information relating to the polygon.

Polygon attribute descriptions were recorded using Ecora's EDIT data entry tool. Polygons were inspected at scales of 1:3500 to 1:5000 to estimate the general ecology and land cover attributes, larger scales of ~1:1000 to determine species composition and crown closure, and even larger scales of ~1:500 to measure heights.

2.6.1 Polygon Attributes

The general ecology, land cover component, non-tree vegetation and non-vegetation attribute descriptions were photo-interpreted for all VRI polygons.

The general ecology attributes include surface expression, modifying process, site position meso, alpine designation and soil nutrient regime, while the land cover component description includes soil moisture regime[1]. These attributes were described in accordance with the Provincial procedures.

2.6.2 Tree Layer Attributes – Natural Stand Polygons

In VRI, all of the tree attributes are interpreted for only those trees in the dominant, co-dominant and high intermediate crown classes as these are generally the trees that are visible on mid-scale aerial photos or digital frame imagery, and not obscured by the main canopy crowns and shadows during the photo interpretation process. Figure 2 below provides an illustration of the trees considered visible for interpretation and description.

[1] VRI SMR values range from 0 to 8, unlike the Provincial Land Management Field Guides where the values range from 0 to 7.

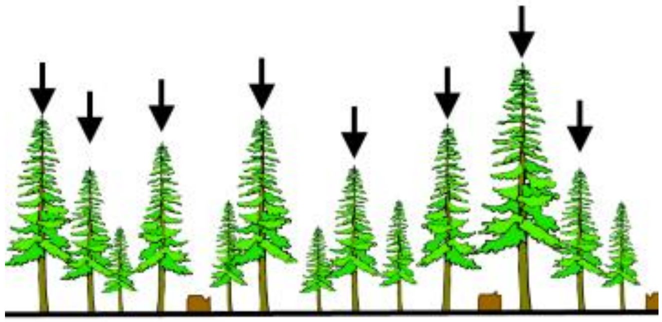

Figure 2: Trees visible for interpretation and description

Natural stand polygon species composition was photo-interpreted where 2014 VRI air and ground call data sources were not available. VRI species composition estimates are based on the basal area occupancy (i.e. a tally) of trees in the three visible crown classes described above, and not on their relative volume as per the now-obsolete Forest Cover standard.

Where 2014 ground call data was not available for a polygon, leading and second species age was photo interpreted in a two-step process. First, an age was derived from species-appropriate site index curves using the species' height and a photo-estimated nominal site index value based on site characteristic. The age was then adjusted (up or down) based on stand characteristics such a size and frequency of snags, size and condition of live crowns, general appearance of the stand, and its appearance and height relative to its neighboring polygons.

Height was assigned in one of three ways using:

- 2014 VRI ground data sources where that data was available; or
- LIDAR top-height and mean tree height measurements as a guide; or
- Photogrammetric height measurement in polygons with high vertical complexity as LIDAR measurements generally underestimates mean tree height in these polygons.

Basal area and density were assigned using 2014 VRI ground call data when available; otherwise they were estimated through photo-interpretation and visual comparison with neighboring polygons.

Crown closure, vertical complexity, cover pattern and snag density were photo-interpreted.

2.6.3 Tree Layer Attributes – Managed Stand Polygons

The attribution of managed stand polygons was completed In accordance with Provincial requirements.

Species composition was generally taken from RESULTS Forest Cover, if available. The leading and second species age assigned was the difference between the reference year (year the imagery was flown - 2013 in this case), and the disturbance start year described in RESULTS Openings. Leading species height was derived using the assigned age, RESULTS Forest Cover site index value, and Ministry of Forests Research Branch SiteTools v.3.3 software. Leading species height was assigned to the second species, unless the second species and its height were discernably different. Density values were taken from RESULTS Forest Cover.

Species, age and density values were taken from the existing inventory in the absence of RESULTS Forest Cover and / or RESULTS Openings data, while height was either derived or measured. Use of existing inventory polygons required a corresponding silviculture data source code and a very strong spatial agreement between the existing inventory polygon and the VRI managed stand polygon.

Occasionally, 2014 VRI ground calls were installed in silviculture polygons and this data was incorporated where possible. Conversely, no species composition was assigned where trees were too small to photo interpret and a species data source was unavailable.

Crown closure, vertical complexity, cover pattern and snag density were photo-interpreted.

RESULTS Opening ID values were assigned where they were available, as not all openings appeared in the RESULTS data sets available from GeoBC.

2.6.4 Data Source Codes

Data source codes describe the primary source of information used to describe an attribute or attributes. The Province currently has 23 data sources codes used to describe the origin of various attribute descriptions. Examples include 0 for photo interpreted, 7 for RESULTS data and 18 for VRI air call data. There are six attributes that require a data source code: general ecology, species composition, height, age, basal area and density.

The attribution for the TCF followed the Provincial procedures and standards throughout the process, with the following exception around LIDAR height data and height data source codes in the Deep Creek and Shames parcels.

There are attributes that can be measured (e.g. height, density) or derived (e.g. basal area) from LIDAR data. However, the Province does not currently have data source codes for LIDAR measured or derived attributes. In the absence of those data source codes, a data source code value of 3 (which is obsolete) was used as a surrogate.

2.7 LIDAR Integration

Tree height values were directly calculated from LIDAR data, and integrated into the new VRI for the Deep Creek and Shames parcels during the polygon attribution phase. LIDAR data for the Kitimat parcels was not available for this project.

2.7.1 LIDAR Processing

Ecora received a LIDAR data set for the TCF which included laser (LAS) point cloud files, hill shades and 25 cm resolution orthorectified imagery.

The processing of the source LIDAR included:

- Creating a complete LAS dataset in ArcMap from the source point cloud;
- Generating a new digital elevation model (DEM); and
- Generating an updated hill shade.

The LAS point cloud data provided was classified into the following four categories:

- Processed but unclassified non-ground returns;
- Ground returns;
- Noise returns; and

- Water.

To calculate height, two separate grids were created, one of the bare earth terrain model (DEM) and the other a canopy surface model or digital surface model (DSM). The DEM was generated using only the ground returns while the DSM was classified using the first return values representing the tops of the canopy. The resulting DEM was subtracted from the DSM to generate a height grid.

2.7.2 LIDAR Iterations

There were two iterations of LIDAR height data produced; the first before and the second after the field calibration phase.

The first iteration of heights were reviewed during the air call program and found to be an underestimate. A comparison with the ground call heights revealed a similar trend.

The second iteration of heights were compared to photogrammetric heights in randomly selected polygons and to the ground call heights. This second iteration was found to be very close to the measured heights, and was adopted for integration into the new VRI.

2.7.3 LIDAR Integration

The process of integrating LIDAR data into the new VRI involved:

- Segregating the current LIDAR data using the new VRI inventory polygons;
- Identifying treed polygons within the new VRI while excluding treed polygons within this subset where height and density values were captured through field calibration;
- Calculating a top height and mean height value for each treed polygon from the LIDAR data; and
- Applying those values to the corresponding new VRI polygon.

2.8 Quality Control

Internal quality control was undertaken through all phases of this project and the final deliverables were subject to a quality control process before final submission. During this project, the following quality control measures were completed:

- Polygon delineation was completed as a polyline feature class and then vector cleaned before being converted a polygon feature class;
- All polygons less than 0.5 ha were visually inspected and merged into the most similar neighbor polygon where appropriate;
- Field cards were reviewed for accuracy and completeness at the conclusion of each field day;
- Plot locations were office reviewed to ensure accurate coordinate transfer;
- Polygon attribution was subject to frequent peer reviews;
- The spatial vs. attribute polygon data was checked to ensure a 1:1 link of the final polygons;
- EDIT attribute databases were converted to VRIMS databases and subjected to the Province’s spatial and attribute validation routines, and then to Ecora’s proprietary spatial and attribute validation routines; and

- A final review was conducted of the flat file database for overall completeness.

2.9 Quality Assurance

A third-party quality assurance review was completed by Larry McCulloch, RPF. His findings were reviewed and incorporated where possible, and subsequent changes were made to polygons beyond the scope of his review in light of his findings.

3 FINDINGS

3.1 Polygon Delineation

The current VRI delineation standards specify three minimum polygon sizes: 2.0 ha for areas with distinct boundaries (e.g. new cut blocks), 5.0 ha for areas with indistinct boundaries (e.g. dense timber with a gradual height change, wetlands, treed alpine areas); and 0.5 ha for polygons on the project boundary or map sheet neat line.

The mean polygon size for the existing inventory was 22.6 ha, while the mean polygon size for treed (≥10% crown closure) polygons was 16.2 ha. The TCF does not have a disproportionality large number of managed stands, though there are large alpine areas in the Deep Creek and Shames parcels. Additionally, 83 polygons were < 0.5 ha, possibly the result of clipping the existing inventory to the TCF boundary.

The mean polygon size for the new VRI is 16.4 ha, with a mean polygon size of 14.0 ha for treed polygons. There are 17 polygons < 0.5 ha, largely due to edge-tying with the existing VRI external to the Kitimat parcel.

Table 1 below illustrates the difference in polygon sizes between the existing and new inventories, where treed is defined as ≥ 10% crown closure.

Table 1: Comparison of existing Forest Cover and 2014 VRI polygons

Description	Forest Cover	2014 VRI
Mean Polygon Size (All)	22.6 ha	16.4 ha
Mean Polygon Size (Treed)	16.2 ha	14.0 ha
Sub-Minimum Polygons	83	17
Total Polygon Count	1128	1530

Although the TCF boundary formed by the railway concession right-of-way passing through the Kitimat parcel appears to be spatially incorrect, alterations to the TCF boundary were beyond the scope of this project.

3.2 Field Calibration and Other Data Sources

The distribution of the 35 air calls and 17 ground calls by parcel is presented in Table 2 below.

Table 2: Distribution of VRI air calls and ground calls by parcel

Parcel	Number of VRI Air Calls	Number of VRI Ground Calls
Deep Creek	15	7
Shames	15	7
Kitimat	5	3
Total	35	17

With the exception of the 2013 imagery and LIDAR, data sources referenced to varying degrees during this VRI project and available for subsequent inventories include RESULTS Forest Cover and Opening polygons, FTEN cut block polygons and existing inventory polygons with historic data sources. Their distribution in the Deep Creek, Shames and Kitimat parcels is illustrated below in Figure 3, Figure 4 and Figure 5, respectively.

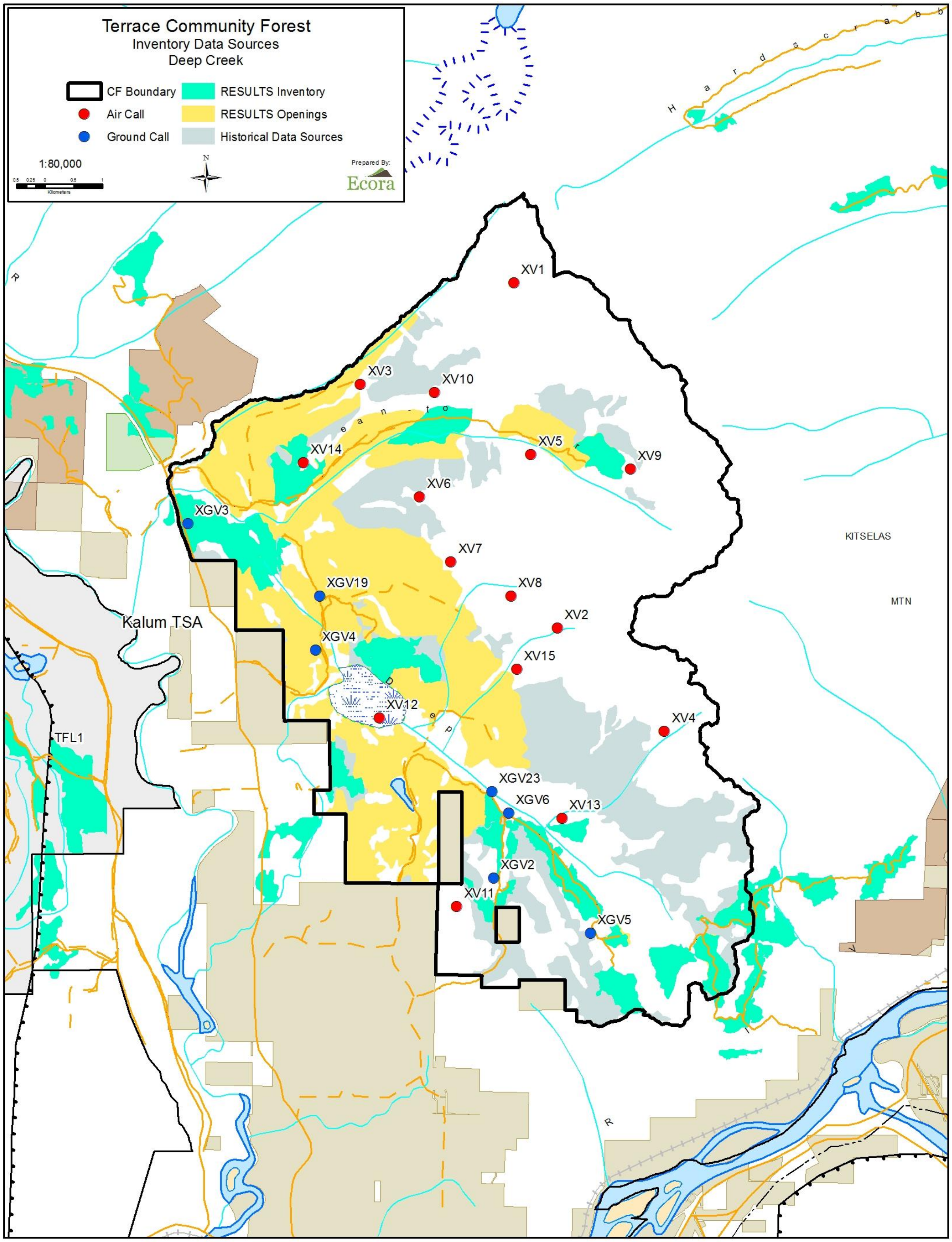

Figure 3: TCF Deep Creek inventory data sources

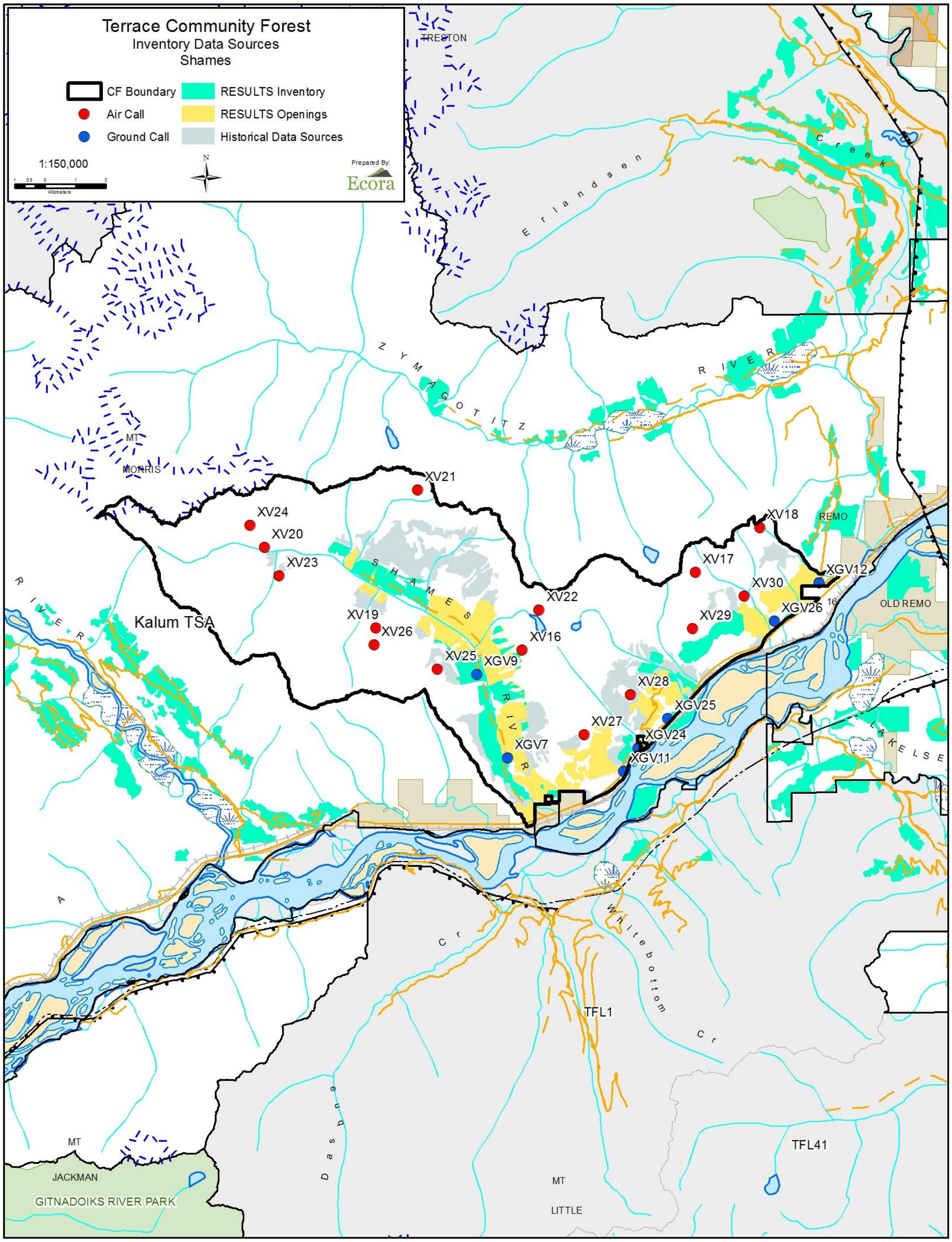

Figure 4: TCF Shames inventory data sources

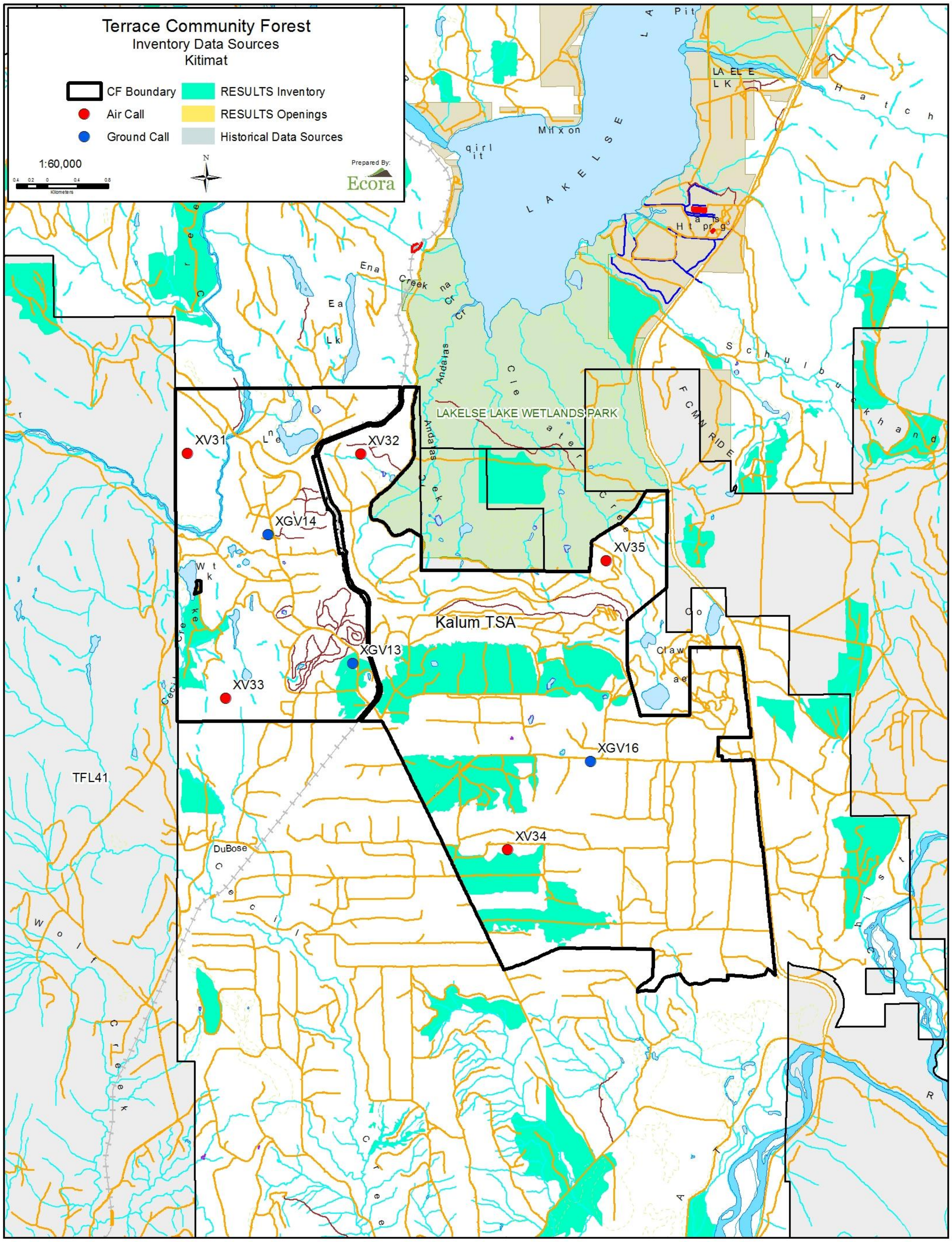

Figure 5: TCF Kitimat inventory data sources

3.3 Polygon Attribution

A summary of the Inventory Standard Code, an attribute that describes to which inventory standard a polygon was classified under, found that 839 (75%) of the polygons in the existing inventory were completed to the now-obsolete Forest Cover standard no later than 1994. The balance had partial (mostly managed stands) or full (Kitimat parcel) VRI labels. The 2014 VRI project increases the number of polygons to 1530, all with a full VRI label. Table 3 below summarizes the Inventory Standard Code attribute of the two inventories.

Table 3: Summary of TCF inventory polygons by Inventory Standard Code

Inventory Standard Code	Definition	1991 Forest Cover Polygons	2014 VRI Polygons
V	Full VRI label	245	1530
I	Incomplete VRI label	44	0
F	Forest Cover label	839	0
	Total	1128	1530

Height is a very important issue in any forest inventory as there is a direct correlation between height and volume. The TCF was interested in seeing their investment in LIDAR data incorporated into the VRI, given its strength as a data source for height measurement. Table 4 below provides a summary of the height data sources used in the 2014 VRI, and the large degree to which LIDAR was incorporated.

Table 4: VRI treed polygon tally and percentage by height data source

Height Data Source	VRI Polygons (Tally)	VRI Polygons (%)
LIDAR	717	63
RESULTS	224	20
Photogrammetric	182	16
VRI Ground Call	17	1

4 Conclusions and Recommendations

The VRI was completed on TCF using an innovative approach that considered all available information on the property to enhance the standard VRI process. After completion, the product was subject to a third-party quality assurance review which resulted in the refinement of the delineation and critical attributes.

The digital frame imagery was high resolution, high quality and had complete coverage, which will provide for a consistent product throughout the project area. It was well appreciated by the photo interpreters.

Despite its poor resolution for a coastal forest inventory application, the LIDAR data was surprisingly effective in estimating height in the dominant, co-dominant and high intermediate crown classes. Comparison of the second iteration of processed LIDAR data had a strong agreement with both photogrammetric and ground measured heights.

As noted in previous forest inventory projects, LIDAR mean tree height measurements tend to be underestimated in stands with height vertical complexity, and overestimated in silviculture polygons due to the inadvertent inclusion of taller, mature trees along polygon edges.

The existing inventory was projected to 2013, and is thought to overestimate age in higher elevation stands in the Shames and Deep Creek parcels. However, though completed to a different standard, the existing inventory did provide information on species composition which was considered in the attribution phase.

The number of air calls and ground calls installed in 2014 meets the Provincial requirements for a project area of this size. In addition to the 35 air calls and 17 ground calls installed during the new VRI, Ecora's original project plan included the installation of 15 helicopter-access one-point ground observations with measurements; eight in Shames and seven in Deep Creek. These were not proposed to the TCF in light of identified financial constraints, but we recommend that future inventory update projects consider this approach to gather valuable ground data in the more remote and isolated areas of those two parcels.

Further, there are many kilometres of ecological transects installed in the TCF that would provide a valuable data set for future inventory update projects.

Our internal quality control reviews have concluded that the delineation and attribution reliably reflect ground conditions, and is consistent for each of the polygon signatures encountered. Overall, the accuracy of the new VRI product is an improvement on the existing forest inventory dataset throughout the TCF.

Moving forward, to ensure future accuracy is maintained, it is extremely important that the VRI dataset be continually updated to reflect disturbance activity.

5 DELIVERABLES

TCF specified seven deliverables for this project:

"

1. A field sampling plan.
2. A digital seamless coverage (ESRI shp files) of the forest cover maps and the associated database for the entire Comfor to a standard that will meet Vegetation Resources Inventory requirements (complete and validated digital attribute descriptions linked to the vegetation inventory base maps in the VRIMS Personal Geodatabase format).
3. A digital summary for all calibration points (including historical data sources) in the approved provincial format.
4. An ESRI shape file with final locations of air and ground call calibration points.
5. The canopy height model and any other LiDAR derived products.
6. Methodology and results for any statistical analyses.
7. All field data, notes, and project photos collected or used in the course of conducting the inventory.

"

All deliverables were posted to the TCF sub folder on the Ecora FTP site in correspondingly numbered folders at the conclusion of the project.

6 REFERENCES

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