



**Ministry of Forests, Lands and Natural
Resource Operations**

**SUBMITTING FOREST COVER TO RESULTS
FOR OPENINGS WITH TREED RETENTION**

Edition 1.4

May 5, 2016

Acknowledgments

The assistance of the following individuals is gratefully acknowledged:

2009

Editors:

Craig Wickland
Christine McClarnon

Reviewers:

Dave Weaver
Nancy Densmore
Barb Wadey
Allan Powelson
Ralph Winter
John Wai
Darren Bonar
Scott Killam
Stacey Gillan
Mike Grainger
Tina Pearson
Catherine Bealle Statland
John Gallimore
Darcy Lillico
Jo Ellen Floer
Donald Robinson

2014

Update Editors:

Dave Weaver
Caroline McLeod

Reviewers

Craig Wickland
Barb Wadey
Tom Bradley
Paul Barolet

MFLNRO contact for questions and comments:

David Weaver: David.Weaver@gov.bc.ca

Table of Contents

ACKNOWLEDGMENTS	II
1. SCOPE	2
2. INTRODUCTION	2
3. LIST OF TERMS USED – DEFINITIONS AND EXPLANATIONS	3
4. EXAMPLES	8
4.1. Long Term Retention (Reserves)	9
4.1.1. Group	9
4.1.2. Dispersed	10
4.1.3. Retention (long term) silvicultural system	11
4.2. Short Term Retention (as part of a silvicultural system)	13
Uneven-aged	13
4.2.1. Single Tree Selection	13
4.2.2. Group Selection	14
Even-aged	17
4.2.3. Intermediate Cuts or Commercial Thinning - No regeneration objectives	17
4.2.4. Unharvested Stems (may or may not contribute to stocking)	19
APPENDIX A: TREE COVER PATTERN	21
APPENDIX B: CROWN CLOSURE	22

1. Scope

This document supplements the *RESULTS Information Submission Specifications: Licensee, Government and Woodlot Submissions* (RISS) documents¹ by providing examples of how to prepare RESULTS forest cover submissions for harvesting associated with silvicultural systems and harvest practices that contain some kind of retention in the form of long term treed residuals (reserves for the entire rotational planning cycle) or short term treed residuals (with anticipated subsequent harvest removals prior to the end of the rotational planning cycle). The examples span a range of retention levels from low (> 5 m² per ha) basal area (BA) retention to high BA retention.

2. Introduction

Forest cover data submitted to RESULTS, the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) primary silviculture information system, is used by the Chief Forester to complete timber supply reviews and set allowable annual cuts (AAC) in forest management units (i.e., timber supply areas and tree farm licenses) throughout British Columbia (BC). Forest cover data submitted to RESULTS must be accurate and consistently formatted to ensure that it reflects current management practices and can be used to support the timber supply review process.

When the MFLNRO first began developing silviculture information systems, the predominant silvicultural system practiced in BC was the clear-cut system. At that time, some allowance was made for the possibility of other kinds of silvicultural systems and harvest practices, but the silviculture information requirements were primarily designed to facilitate reporting of forest cover data (regeneration) following harvesting under the clear-cut system.

Over the last decade, the variety of silvicultural and harvest systems practiced in BC has increased. Some nomenclature around silvicultural systems has evolved, while the database structure and nomenclature in RESULTS has largely remained intact. RESULTS field names have not been changed to align with evolving silvicultural systems nomenclature. This is partly because of complexity and high cost of redesigning a database intricately tied to licensee legal obligations². For this reason, the MFLNRO policy is that rather than change the database fields themselves, it is more practicable to update the policy for reporting to these fields to accommodate the full range of silvicultural systems and harvest practices.

RESULTS has no forest cover fields to identify the name of the silvicultural system that is represented by the forest cover data submitted. At this time, the *Reserve Type*, *Reserve Objective*, and multi-layer forest cover fields are used to infer the kind of system.³

These guidelines are designed to help users prepare submissions under the existing design of the RESULTS database so that the data can be reported and interpreted consistently and reliably in the timber supply review process.

¹ See http://www.for.gov.bc.ca/his/results/RISS_ls_3a_ed_Oct1.pdf

² Every redesign of the RESULTS database impels the redesign of private sector systems (e.g., Genus, Forest Manager, Phoenix Pro, eziLink, etc).

³ The silvicultural system label that is submitted with the RESULTS Disturbance report is not referenced to any polygon, unless an optional spatial (GML) report accompanies the Disturbance report.

3. List of Terms Used – Definitions and Explanations

Note: This section describes how RESULTS nomenclature is used to ensure consistent interpretation of various Silvicultural Systems, Retention and Residuals, and their Forest Cover Attribute information.

- I. **Silvicultural systems** examples are consistent with silvicultural systems described in the publication *Silvicultural Systems Handbook for British Columbia (March 2003)*⁴.

- II. **Retention and Residuals** refer to trees remaining, either singly or in groups, after a bounded area has been subject to *stand disturbance*** . The general term "retention" meaning trees retained in a cutblock is distinguished from the more specific term "retention system" which refers to a specific silvicultural system in BC with specific stand characteristics⁴.
These guidelines pertain to residuals with a diameter at breast height (DBH) of, or exceeding, 12.5 cm, unless otherwise stated in an official plan or prescription.
 - 1) **Long term residuals or reserves** retained for an entire rotational planning cycle are referred to as "**reserves**". Reserves are understood to be not available for harvesting until the next rotational cycle for the stand.

 - 2) **Short term residuals or retention** intended to be retained (whether or not they are eventually harvested in another harvest entry) for a portion of a current rotational planning cycle, are referred to as "**residuals**" or "**retention**" or other terminology that conveys standing trees.

***Stand disturbance events include anthropogenic activities such as harvesting and farm animal grazing activities; and, natural events such as pest infestations, flooding, avalanches, fires, drought, etc. The space(s) from which trees were destroyed, felled and/or removed within a polygon that has been subject to stand disturbance is loosely referred to as "**denuded**". Denuded areas are characterised by stumps, or fallen or standing dead trees.*

- III. **Forest cover attribute** (i.e. required data elements) are described in the RISS documents⁵ and are grouped into the following 3 Components:

1) **Polygon Component (for all polygons):**

- | | |
|------------------------------|-------------------------|
| • Standards Unit (SU) ID | • Polygon (Licensee) ID |
| • Area | • Reference Year |
| • Re-entry Year ⁶ | • Stocking Status |
| • Stocking Type | • Reserve Type |
| • Reserve Objective | • Site Index |
| • Site Index Source | • Tree Cover Pattern |

⁴ See <http://www.for.gov.bc.ca/hfp/publications/00085/silvsystemshdbk-print.pdf>. See also *Silviculture Systems Guidebook (1995)* at <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/system/sstoc.htm>

⁵ Some conditions may apply per the requirements of the RISS.

⁶ For silvicultural systems in which a future harvest entry is planned as part of the rotational planning cycle. Re-entry year is entered for polygons in which Reserve Objective=TIM (timber management).

2) **Silviculture Component (for areas subject to stocking standards, where the silviculture and inventory components are not identical):**

- Layer (**S** [even-aged]; **1S, 2S, 3S, 4S** [multi-layer])
- Well Spaced***
- Average **Crop Tree** Basal Area / ha
- Species Percent⁷
- Average Height
- Incidence Percent
- Total Well Spaced***
- Free-growing***
- Species
- Average Age
- Damage Agent
- Incidence Area

***Where only a mature layer is present, report the Average **Crop Tree** Basal Area per ha in lieu of Total Well Spaced (TWS), Well Spaced (WS), and Free-growing (FG).

This is applicable specifically in situations where there are leave tree standards in accordance with FPPR, or WLPPR or where the applicable standard does not specify WS and FG trees for the mature layer (e.g., Deviation from Potential [DFP] or Single Entry Dispersed Retention Stocking Standards [SEDRSS]).

3) **a) Inventory Component (for areas not subject to stocking standards; or for areas subject to stocking standards where the silviculture and inventory components are not identical):**

- Layer (**I** [even-aged]; **1, 2, 3, 4** [multi-layer])
- Total Stems
- Species
- Average Age
- Damage Agent
- Incidence Area
- Crown Closure
- Average **Total** Basal Area per ha
- Species Percent⁸
- Average Height
- Incidence Percent

b) Inventory Component (for areas subject to stocking standards, where the silviculture and inventory components are identical):

- Layer (**I** [even-aged]; **1, 2, 3, 4** [multi-layer])
- Total Stems
- Species
- Average Age
- Damage Agent
- Incidence Area
- Well Spaced***
- Crown Closure
- Average **Total** Basal Area per ha
- Species Percent⁹,
- Average Height
- Incidence Percent
- Total Well Spaced***
- Free-growing***

Notes on Forest cover attribute components

- The polygon and inventory components are submitted for areas not subject to stocking standards.
- All three components are submitted for areas subject to stocking standards¹⁰ where the silviculture and inventory components differ. Where the silviculture and inventory

⁷ In relation to basal area for Layer 1S; and to stem count for other layers.

⁸ In relation to basal area for Layer 1; and to stem count for other layers.

⁹ In relation to basal area for Layer 1; and to stem count for other layers.

components do not differ, only the polygon and inventory components are submitted; however, the inventory component also includes TWS, WS, and FG data, unless mature trees (only) are reported and WS and FG trees are not specified as part of the stocking standards for the mature layer, in which case Average Basal Area per ha is included.

- a) **Forest cover canopy layers:** Four *canopy layers* are recognized (**Error! Reference source not found.**): *Mature, Pole, Sapling, Regeneration ("Regen")*.

Table 1 Forest Cover Canopy Layers

Layer	Description	Notes
I S	Even-aged stand	Predominant stand dbh or height (depending on stand age)
1 1S ¹¹	Mature Layer – uneven-aged	Stand with trees ≥ 12.5 cm dbh – based on all commercial ¹² trees.
2 2S	Pole Layer – uneven-aged	Stand with trees 7.5 cm to 12.49 cm dbh – based on all commercial trees.
3 3S	Sapling Layer – uneven-aged	Stand with trees 1.3 m in height to 7.49 cm dbh – based on all commercial trees.
4 4S	Regen Layer – uneven-aged	Stand with trees < 1.3 m in height – based on all commercial trees.
V	<i>Veteran</i>	<i>This term is being phased out. Previously referred to a living remnant of a former stand. Combined crown closure less than 6%; at least 40 years older and 10 m taller than main stand.</i>

- b) **Stocking status and type** were, in the MFLNRO's previous database systems (ISIS, MLSIS), recorded for each canopy layer in multi-layer stands, and each layer was ranked according to order of importance for the next harvest entry. When RESULTS replaced ISIS and MLSIS, the requirement to rank the layers was removed. Stocking status and type are now described by polygon instead of by layer. Status and type refer to the cohort layer next in line for harvest in a multi-layer stand – the predominant layer with the highest site occupancy. Site index is recorded for the leading species in the layer with the highest volume, or the layer which is next to be harvested (could be a Pole, Sapling or Regen layer).
- c) **Tree cover pattern** is the horizontal spatial arrangement of residual patches of overstorey (Layer 1) in a polygon¹³. See Appendix A.
- d) **Crown closure** is the percentage of ground area covered by the vertically projected crowns of the tree cover for each inventory component tree layer within the polygon¹⁴. See Appendix B.

¹⁰ Standards with a free growing obligation; or standards subject to FPPR 44 (4) (i.e., no regeneration obligation)

¹¹ The mature Layer 1S only represents residual stems that meet the leave tree criteria and specification identified in the applicable stocking standard for the silviculture component.

¹² See FIP Relational Dictionary (p. 140) for description of tree species for forest inventory
http://www.for.gov.bc.ca/hts/vridata/standards/datadictionary/rpt_fip_rddv2.pdf

¹³ Tree cover pattern is submitted for the **polygon**; not submitted for the **entire opening**. Tree cover pattern is described on pages 60-61 in the *Vegetation Resource Inventory Photo Interpretation Procedures* at
http://ilmbwww.gov.bc.ca/risc/pubs/teveg/vri-photointerp2k2/photo_interp2k2.pdf

¹⁴ See *FS660 Silviculture Survey Reference* at <http://www.for.gov.bc.ca/isb/forms/lib/FS660.PDF>

- e) **Reserve Type** and **Reserve Objective** fields in RESULTS (as defined in the RISS documents) are used to enter data for **both** kinds of residuals (long term reserves and short term retention¹⁵).

Reserve Type

RESULTS has two *Reserve Type* codes: Group (G) or Dispersed (D).

- 1) **Group:** Specify the "Group" code for mappable reserves¹⁶ 0.25¹⁷ ha and greater. No current harvesting occurs within a long term group reserve, which is not associated with a Standards Unit (SU). A "Group" reserve type classification normally denotes full retention.
- 2) **Dispersed:** Specify the "Dispersed" code for any polygon in an SU within which the denuded and residual treed portions are not individually mapped. The boundary of the entire polygon is mapped, and the denuded and residuals portions of the polygon are described in the inventory and silviculture¹⁸ component multi-layer forest cover fields. A "Dispersed" reserve type classification denotes varying degrees of partial retention, ranging from low (> 5 m² per ha)⁵⁰ to high volume.

Reserve Objective

RESULTS has several *Reserve Objective* codes. At this time, only one *Reserve Objective* field is available in RESULTS, despite that in practice, often residual stems serve multiple purposes. Select the code that best describes the primary function of the reserve.

- 1) **The reserve objective code "TIM"** (Timber Management) denotes residuals that are considered short term retention, as part of any applicable silvicultural system, and *available* for a subsequent harvest entry prior to the end of the current rotational planning cycle (whether or not they are actually harvested). Where "TIM" is specified in the reserve objective field, a re-entry year is generally entered as part of the polygon component¹⁹.
- 2) **If any reserve objective code other than "TIM"** is specified, then the residuals are considered long term retention and *not available* for a subsequent harvest entry until after the next rotational planning cycle.

¹⁵ MFLNRO will not reprogram RESULTS to create separate fields for short-term retention data at this time, given high costs associated with creating new fields.

¹⁶ Or short-term retention area.

¹⁷ RESULTS can accommodate mappable units of 0.1 ha. Licensees may choose to map to this level of detail if desired to achieve a specific or sensitive management objective.

¹⁸ Where applicable. Silviculture component applies to layers for which stocking standards have been prescribed; commonly the regeneration layer (S4); and other layers (e.g., S1, S2, and/or S3) as applicable where multi-storied stocking standards apply.

¹⁹ Stands subject to FPPR 44(4) requirements may or may not have planned re-entry years.

⁵⁰ Dispersed retention levels < 5 m² per ha do not need to be reported, although it is considered a best management practice to do so if the retention is linked to a FSP result or strategy or associated with a silviculture system (e.g., seed tree).

IV. **Interpretive note on Diagrams**

The diagrams *in this document* are conceptual diagrams. They are not to scale, and are used to illustrate tree occupancy spatial concepts. They do not represent how a polygon would appear in RESULTS.

RESULTS spatial (GML) submissions of polygons containing retention, regardless whether full or partial, appear the same on a mapped image; that is, a boundary defining the area enclosed by the reserve-classified area, regardless whether the type classification is "Group" or "Dispersed". By contrast, the diagrams in this document illustrate conceptually the tree coverage within a polygon.

The RESULTS attribute submission characterises the amount of retention on the ground. The reserve type classification "group" versus "dispersed" and the reserve objective classifications are important interpretive features, along with attributes such as density (stems/ha; BA/ha), tree cover pattern, and crown closure. These attributes guide timber supply analysts in correctly classifying the amount of area available for future timber supply. (Figure 1).

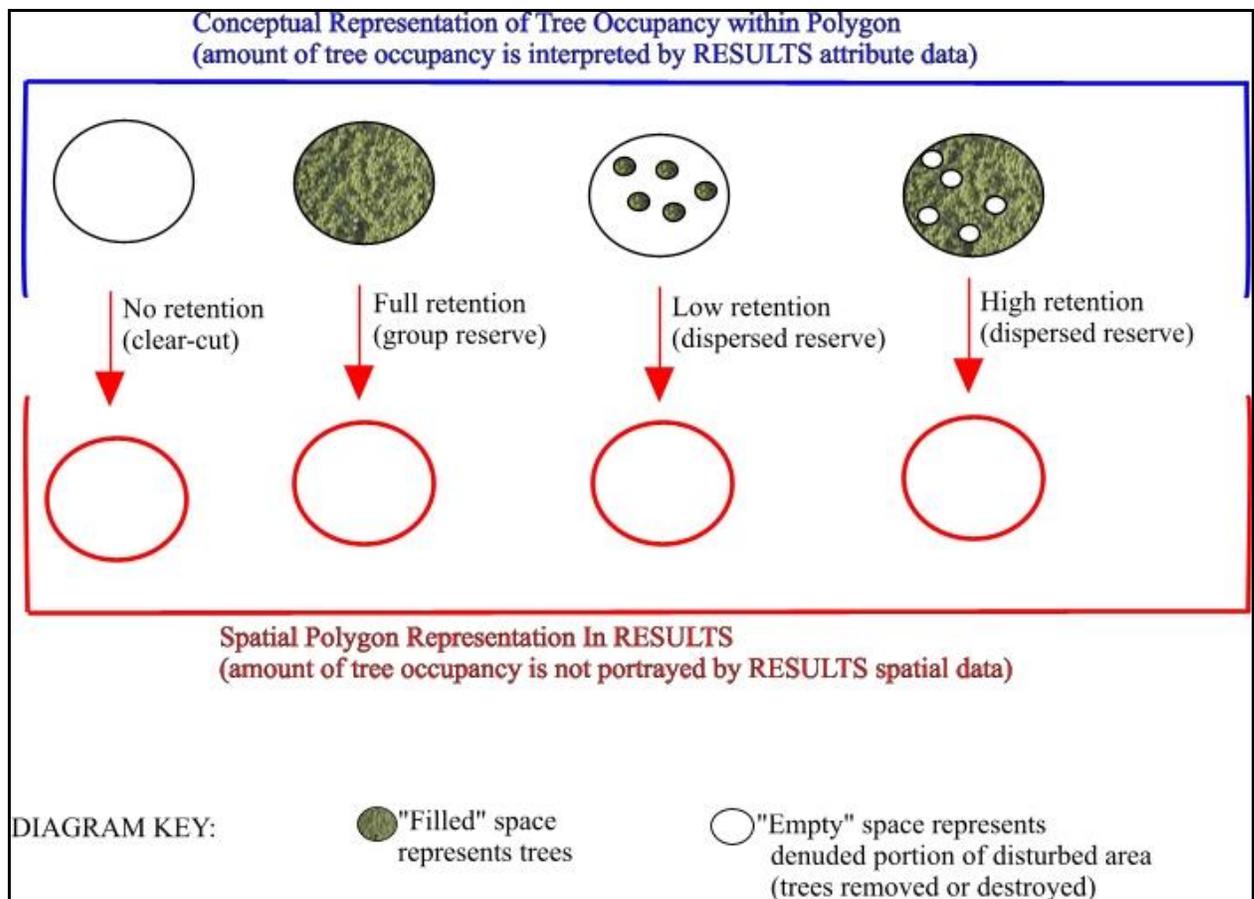


Figure 1 How to interpret diagrams in this guide

In RESULTS all spatial polygons are represented the same way, by lines defining the polygon boundaries. These lines are not used to interpret tree coverage within any area. The attribute data are used to interpret amount of tree coverage within any polygon, whether that consists of no trees (clearcut); full retention (group reserve), low or high retention (dispersed reserve). The spatial polygons in RESULTS define the locations of the areas described by the attribute data.

4. Examples

The range of unique silvicultural systems and harvest practices managed in BC exceeds the examples in this document. This document serves as a *guideline* to demonstrate how forest cover data for a submission may be organised given the objectives and type of silvicultural practice is applied. Submitters should use the basic guidelines in the RISS-ls to classify the components of the submission.

Note on Average Basal Area/hectare

Many silvicultural systems and harvest practices being prescribed have a specified target BA/hectare retention level (usually as a percentage of pre-harvest BA/hectare) as part of the stocking standard specified in the Forest Stewardship Plan (FSP), Woodlot Licence Plan (WLP), a Forest Development Plan (FDP)²⁰ for a site plan prepared prior to the enactment of the *Forests and Range Practices Act* (FRPA), a silviculture prescription prepared prior to the enactment of FRPA, or a government-funded project. In these cases, retained BA/hectare is included in the *inventory* and *silviculture components* of forest cover submissions.²¹

²⁰ Under the transition Code (post December 17, 2002) stocking standards were included as part of the FDP.

²¹ In cases where BA was not included in a stocking standard, and where forest cover associated with retention is reported, inclusion of BA in the inventory component of the forest cover submission is a good practice because of its utility in reforestation planning and assessment and timber supply review.

4.1. Long Term Retention (Reserves)

4.1.1. Group

In a **Group Reserve**, a group of trees is mapped and associated with a polygon (but generally not an SU²²), and their forest cover characteristics are tracked in the RESULTS with polygon component, if an inventory component is provided, then inventory is submitted as forest cover multi-layer fields commonly as Layer 1 (mature).

Example (Figure 2): A 5.45 ha opening has been harvested, within which a 0.45 ha group of mature trees (BA=35m²/ha) is retained for the purpose of providing wildlife habitat. No harvest entries are planned; hence no SU is associated with the wildlife tree retention area. Two polygons are mapped: **A** (representing the denuded portion, associated with SU 1); and **B** (representing the wildlife tree retention area).

REPORTING STRUCTURE

Polygon A (denuded portion)

Associated with SU 1. Forest cover attributes submitted for the Polygon Component; and Inventory and Silviculture Component Layers I and S respectively.

Polygon B (residuals)

Reserve Type = Group. Reserve Objective = WTR. Not associated with an SU.

Forest cover attributes submitted for the Polygon component; and Inventory Component Layer I (Mature). Tree cover pattern is 9, indicating that the residuals occupy a large proportion of the polygon area.

NOTE: It is recommended to use the best available forest cover information available – a recent survey or cruise summary report. Where an inventory component is not submitted, the underlying Vegetation Resources Inventory (VRI) label is maintained. However it is recommended to submit an updated inventory component where the underlying VRI attributes (species, age, height, crown closure, density) previous to the disturbance are no longer representative of the new polygon (i.e. MPB kill scenario).

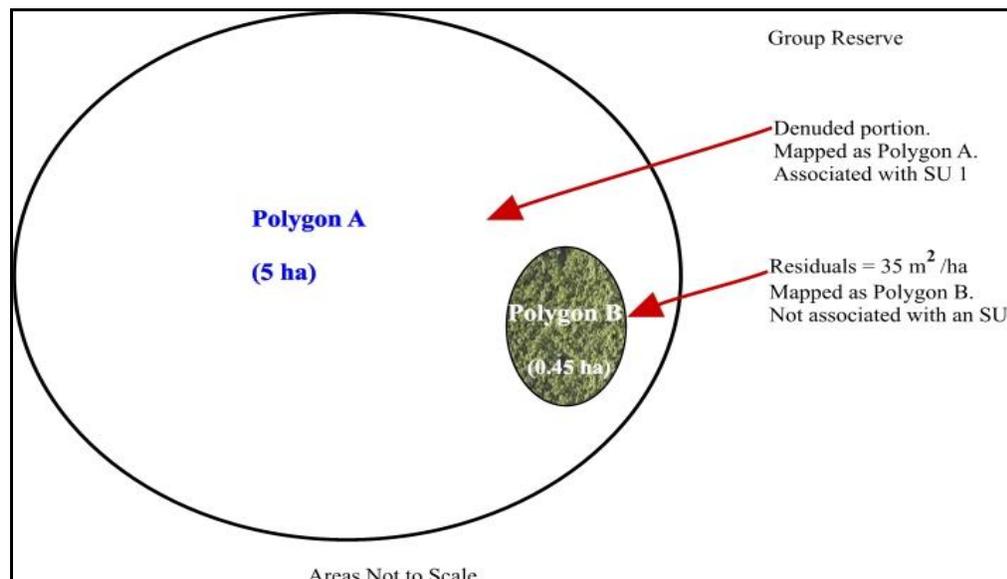


Figure 2 Group Reserve

Polygon A is associated with SU 1. Polygon B (the location of a group of residuals) is not associated with an SU, because it is not subject to current or future harvest entries.

²² Exceptions: Short term retention for Group selection, with Reserve Objective = TIM. See examples in Sections 4.2.2.

4.1.2. Dispersed

In a *Dispersed Reserve* residual trees are not mapped individually, but their forest cover attributes are tracked in the RESULTS forest cover inventory component multi-layer fields.

Example (Figure 3): A 5 ha opening has been harvested, and some culturally modified trees (CMTs) have been left standing throughout the opening ($> 5 \text{ m}^2 / \text{ha}$), and are not planned to be removed as part of future harvest entry (For this example, these could be just Layer 1 stems left for other planned reasons as well). They are not individually mapped but are tracked as part of Polygon A, which is associated with an SU of which the even-aged stocking standards relate to managing the denuded portion (Regen layer) of the polygon. The CMTs do not contribute to stocking.

REPORTING STRUCTURE

Polygon A (residuals are dispersed throughout the denuded area)

Reserve Type = Dispersed. Reserve Objective = CHR (cultural heritage resource).

Associated with SU 1. Forest cover attributes submitted for Polygon Component; Inventory Component Layer 1²³ (Mature); and Inventory and Silviculture Components Layers 4 and 4S (Regen). Use best available forest cover information for Layer 1 if recent survey is not available (e.g., last forest cover map or cruise summary report). Tree cover pattern is 1 indicating sparse distribution of the CMTs.

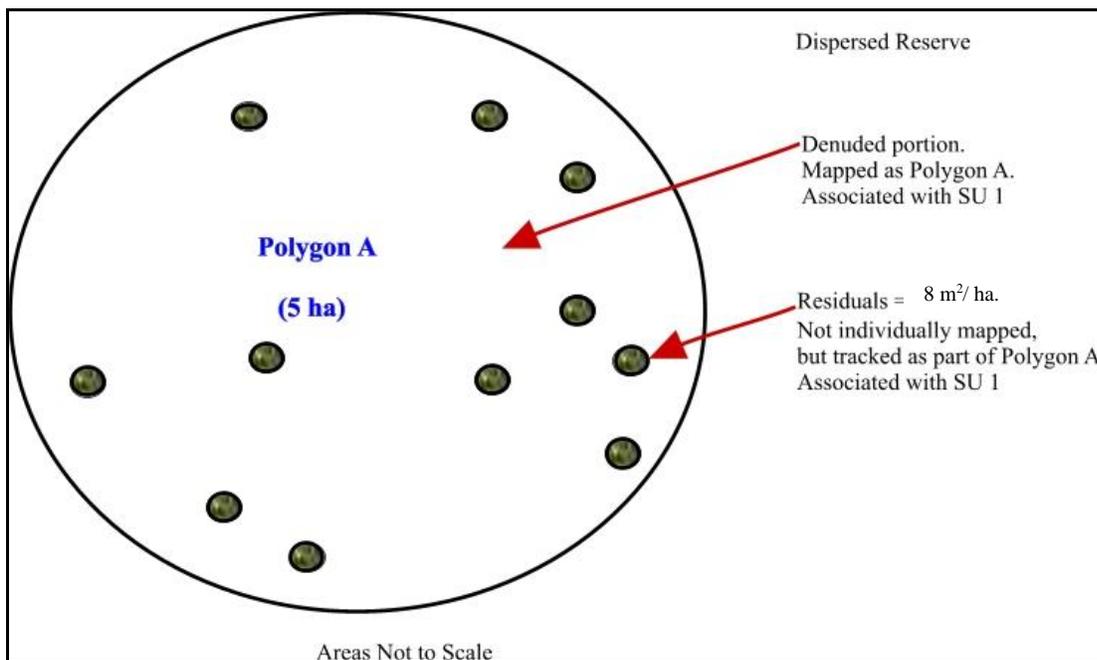


Figure 3 Dispersed Reserve

The specific locations of the residuals are not mapped, but the stand profiles are represented in the multi-layer forest cover attribute reports. (Layer 1 represents the mature residuals for the inventory component; Layers 4 and 4S represent the Regen portions of the inventory and silviculture components). The stocking standards that apply to SU 1 require establishing free to grow young trees in the denuded area, so silvicultural obligations apply to Layer 4 only, and Silviculture information is reported for Layer 4S only.

²³ CMTs are in Layer 1 (inventory component) only.

4.1.3. Retention (long term) silvicultural system

A *retention system* features individual or small groups of trees distributed over the entire cutblock, with an edge effect influence covering at least 50% of the cutblock.

Example (Figure 4): Forest cover data is submitted to describe a 4.25 ha area in which light harvest occurred, leaving mature trees (e.g., 20 m² /ha residual BA) retained as small aggregates (each <0.25 ha) distributed throughout the polygon. No future harvest is planned for the area²⁴. The retained trees are not mapped in this example, but because harvesting has occurred throughout the cutblock, the area is associated with an SU. Only one Polygon is delineated because the forest cover in both layers (Mature and Regen) is relatively uniform throughout the area. The stocking standard²⁵ specifies a management strategy to ensure the retained stems remain intact with a target BA. The primary purpose for leaving the trees is to meet high sensitivity visual quality objectives, with a secondary purpose of wildlife tree retention goals. Because RESULTS has only one reserve objective field, the visual quality objective is entered into the field²⁶.

REPORTING STRUCTURE

Polygon A (the residuals are dispersed throughout the denuded portions)

Reserve Type = Dispersed. Reserve Objective = VIS. Associated with SU 1.

Forest cover attributes are submitted for Polygon Component; and Inventory and Silviculture Components Layers 1 and 1S (Mature) and Layers 4 and 4S (Regen). Forest cover information for Layers 1 and 1S is based on a survey in which BA of residuals is collected (because the residuals comprise part of a stocking standard specified in an FSP). Tree cover pattern is 3, indicating several sporadic occurrences of trees throughout the polygon.

²⁴ If a future harvest were planned or occurs for the dispersed residuals either: 1) during the rotational planning cycle (short term retention); or, 2) at the end of the scheduled rotational cycle (long term retention); the reserve objective would be classified as "timber management" (TIM).

²⁵ The stocking standards applied to this type of retention system may include multi-story stocking standards, DFP stocking standards, or newly proposed standards (e.g., SEDRSS)

²⁶ If wildlife tree retention were the primary objective for leaving the reserve trees, then WTR would be coded in the reserve objective field. In that case, wildlife tree goals would count towards meeting FPPR s.66 requirements for wildlife tree retention, and would be accounted for in RESULTS.

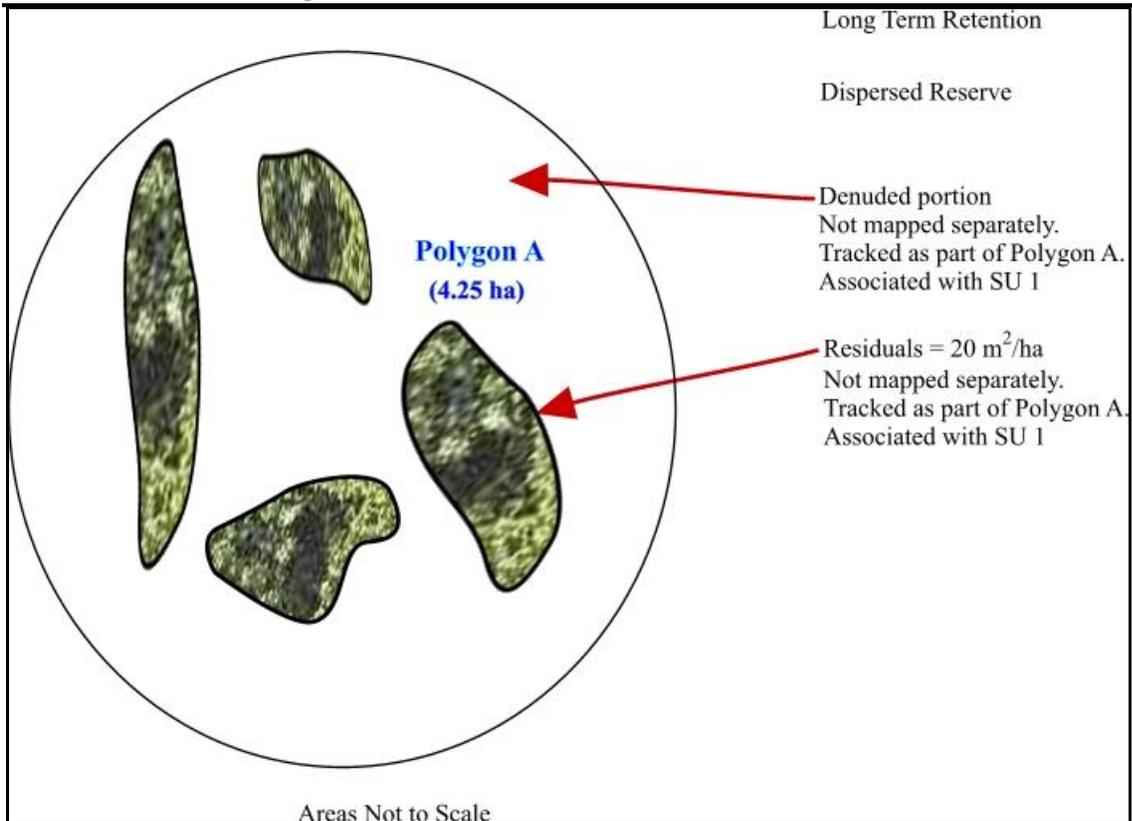


Figure 4 Retention System

In this example, the specific locations of the residuals and denuded portions of the disturbance area are not mapped²⁷. The stand profiles are represented in the multi-layer forest cover attribute reports. (Layers 1 and 1S represent the mature residuals; Layers 4 and 4S represent the Regen portion).

²⁷ RESULTS can accommodate mappable units of 0.1 ha. Licensees may choose to map to this level of detail if desired to achieve a specific or sensitive management objectives.

4.2. Short Term Retention (as part of a silvicultural system)

Uneven-aged

4.2.1. Single Tree Selection

A *single tree selection* system is an uneven-aged system and consists of regular harvest entries of individual or small groups of trees until the end of the rotational planning cycle. The locations of the individual trees are not mapped; rather it is the polygons within the SUs from which the trees are harvested that are mapped. The forest cover for the residuals may remain similar to the original cover after the first harvest entry, taking into account any changes to the species, height, BA, or age structure as a result of the first entry.

Example (Figure 5): A 5.1 ha opening, in a stand with a pre-harvest BA of 80 m² per ha., has had a first harvest entry remove 30 m²/ha of basal area - cutting individuals and small groups of trees in various age classes. The residual stems are uniformly distributed throughout the opening. A second harvest entry is planned in 10 years. The applicable stocking standard specifies post-harvest target stand structure and percentage of pre-harvest BA to be removed (specifying a range between high and low values).

REPORTING STRUCTURE

Polygon A (the denuded portions are dispersed throughout the retained residuals)

Reserve Type = Dispersed. Reserve Objective = TIM. Associated with SU 1.

Forest cover attributes are submitted for Polygon Component; and Inventory and Silviculture Components Layers 1, 1S, 2, 2S, 3, and 3S (Mature, Pole and Sapling residuals) and Layers 4, and 4S (Regen), as applicable. Forest cover information is based on recent multi-story survey in which BA of remaining residuals is collected because a residual basal area target is specified by the applicable stocking standard from the FSP or WLP. Tree cover pattern is 8, signifying continuous occurrence of residuals with several small denuded patches. Re-entry year is 2019.

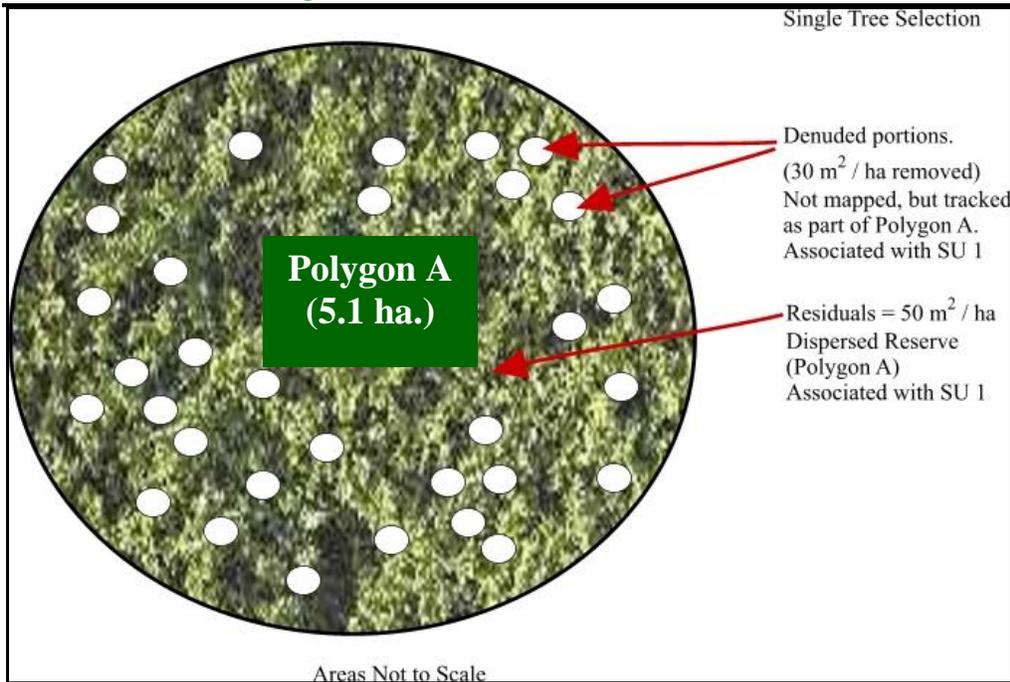


Figure 5 Single Tree Selection System

The specific locations of residuals and denuded portions of the disturbance area are not mapped. The stand profiles are represented in the multi-layer forest cover attribute reports. (Layers 1, 1S, 2, 2S, and/or 3 and 3S represent the Mature, Pole and Sapling residuals; Layers 4 and 4S represent the Regen layer in the denuded portions).

4.2.2 Group Selection

A group tree selection system is an uneven-aged system that promotes small even-aged groups of trees distributed across the stand. It consists of regular harvest entries of small groups of trees until the end of the rotational planning cycle. The locations of the small openings are tracked, either as mappable units (if they exceed 0.25 ha²⁸) or as unmappable forest cover attributes. The small openings are created at relatively short intervals to develop a mosaic of at least 3 or more age classes throughout the stand.

Unlike the single tree selection silvicultural system, the even-aged groups within a group selection system are generally large enough to accommodate a component of shade intolerant species (i.e., openings that are usually equal to or greater than, one or two tree lengths in size [e.g., 30-80 m wide]).

Group selection is easier to administer than single tree selection and does not require multi-story stocking standards or survey methods.

Example (Figure 6): A 40 ha area will be managed under a 4 pass group selection silvicultural system over a 80 year rotational cycle. The first pass removed a total of 10 ha in 22 groups ranging from 0.3 to 0.5 ha distributed throughout the cut-block. Each group is part of the net area to be reforested (NAR) and managed using even-aged standards. The residual trees (Polygon A) have a timber management objective with a re-entry year scheduled, and are subject to intermediate cut stocking standards (SU 3). An additional 10 ha is planned for harvest every 20 years resulting in 4 distinct age classes at age 80.

²⁸ RESULTS can accept spatial polygons to a resolution of 0.1 ha. Licensees who wish to track units to accommodate unique or sensitive management goals may submit to that level of resolution.

In this example, two distinct SUs are delineated to distinguish the NAR from an upland and lowland ecosystem with different stocking standards. The groups are managed as mappable multi-part polygons associated with each SU.

The post-harvest opening consists of 22 mappable denuded polygons. The mappable denuded areas are tracked as individual multi-part polygons given similar groupings of forest cover within a given SU. The stocking standards associated with Polygons B versus C/D are different; hence they are associated with two different SUs, 1 and 2, respectively. The multi-part Polygon D, while associated with the same stocking standards as Polygon C (SU 2), has a significantly different forest cover profile (e.g., very low stocking compared with Polygon C) and is therefore labelled separately from Polygon C.

REPORTING STRUCTURE

Polygon A (residuals)

Reserve Type = Group. Reserve Objective = TIM. Associated with SU 3.

Forest cover attributes submitted for the Polygon component; Inventory Component Layer I²⁹ (mature stems), and Silviculture Component Layer S³⁰ (mature stems). Use best available forest cover information if recent survey is not available (e.g., last forest cover map or cruise summary report). Tree cover pattern is 9, indicating that the residuals occupy a large proportion of the polygon area. *Note: the tree cover pattern refers only to Polygon A, not to the entire opening.* Re-entry year is 2029.

Polygon B (denuded portion, multi-part polygon)

Associated with SU 1. Forest cover attributes submitted for Polygon Component; and Inventory and Silviculture Components Layers I and S, respectively.

Polygon C (denuded portion, multi-part polygon, different SU from Polygon B)

Associated with SU 2. Forest cover attributes submitted for Polygon Component; and Inventory and Silviculture Components Layers I and S, respectively.

Polygon D (denuded portion, multi-part polygon, same SU as, but dissimilar forest cover from, Polygon C)

Associated with SU 2. Forest cover attributes submitted for Polygon Component; and Inventory and Silviculture Components Layers I and S, respectively.

²⁹ Or other applicable layer(s) that may pertain to skid trails, landings, etc.

³⁰ Or other applicable layer(s) that may pertain to skid trails, landings, etc.

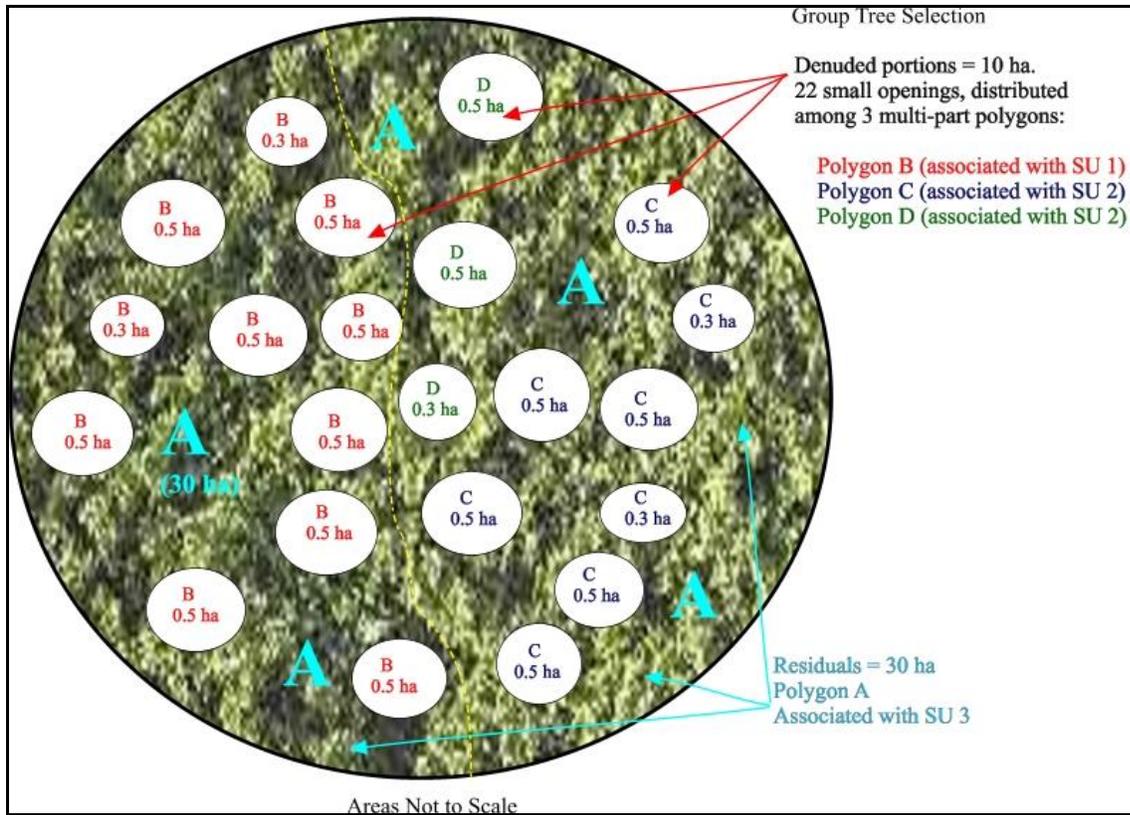


Figure 6 Group Tree Selection System

The residuals are mapped and described as Polygon A (SU 3 – standards to preserve the residuals intact). The small group openings are mapped as 22 distinct units among 3 multi-part polygons (B – SU1; C and D – SU 2). Polygon B (SU 1) is represented as a multi-part polygon (11 mappable openings) because the stand conditions for the forest cover attributes are similar among the 11 openings. Polygons C and D (SU 2) are not part of the Polygon B grouping because they are associated with a different SU 2. Within SU 2, the 11 openings are separated among multi-part Polygons C (8 openings) and D (3 openings), given that the openings within Polygon D have a significantly different forest cover profile (e.g., lower stocking) than the openings within Polygon C.

Even-aged

4.2.3 Intermediate Cuts or Commercial Thinning - No regeneration objectives

Stands harvested under the provisions of FPPR 44(4) or WLPPR 34 (3), where an **intermediate harvest** occurs (such as for a commercial thinning entry, or single tree removal), are differentiated from stands prescribed for uneven-aged single tree selection silvicultural systems. These uneven-aged single tree systems generally have stocking standards and obligations for all applicable layers.

In contrast, the setting up of a Standards Unit³¹ for these kind of non-regeneration obligation stands that have been harvested as intermediate cuts, requires that an obligation of maintaining a desired stand structure of only the Layer 1 residuals be intact. The resulting obligation is based solely on the residual stand structural characteristics and not regeneration. Note that an intermediate cut harvest requires a stocking standard specifically for intermediate cut to be approved in FSP or WLP.

Forest cover is reported to track how the desired stand structure has been managed. Re-entry year of commercial thinning and types of intermediate harvest with a final entry is differentiated from that of a single entry harvest with no re-entry year.

Example (Figure 7): A 5 ha second growth coastal Douglas fir stand has been commercially thinned 20 years prior to final harvest (15 m²/ha removed³²), by way of an intermediate cut harvest, leaving a residual BA of 45 m²/ha uniformly dispersed throughout the polygon. Although this even aged stand does not have regeneration objectives pertaining to the denuded portions, it is nevertheless subject to standards that specify the characteristics of the desired profile of the residuals.

³¹ In this case the "No-regen Obligations" indicator is set in RESULTS.

³² Disturbance created by in block skid trails are part of the denuded portion and are addressed by the intermediate cut stocking standards.

REPORTING STRUCTURE

Polygon A (denuded portions are dispersed throughout the retained residuals)

Reserve Type = Dispersed. Reserve Objective = TIM. Associated with SU 1.

Forest cover attributes are submitted for Polygon Component; and Inventory and Silviculture Components for Layers I and S, respectively (Mature even-aged residuals only). Forest cover information is based on a recent survey in which BA and/or density of remaining residuals is collected (because the residuals comprise the stocking standard specified in an FSP). Tree cover pattern is 9 to signify a continuous occurrence of residuals with limited small openings. Re-entry year is 2029.

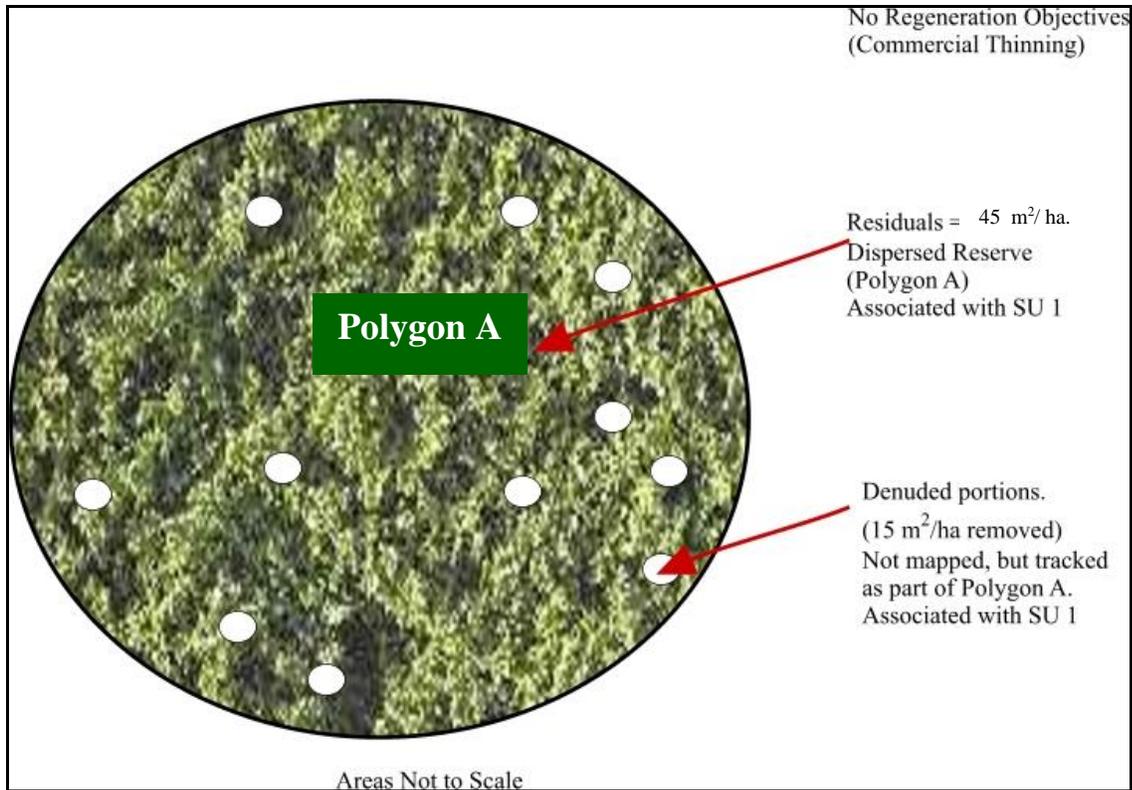


Figure 7 Commercial Thinning

The specific locations of the residuals and small denuded portions are not mapped, but the stand profiles are represented in the even-aged forest cover attribute reports. (Layers I and S represents the even-aged Mature residuals in layer 1). Although no regeneration objectives apply to this stand, the standards associated with SU 1 pertain to the required characteristics for preserving the residuals.

4.2.4 Unharvested Stems (may or may not contribute to stocking)

Merchantable (unreserved) stems and/or residual timber volumes that were left in excess of prescribed retention volumes are assessed as waste in accordance with the *Provincial Logging Residue and Waste Measurement Procedures Manual*³³. In RESULTS, these excess stems are reported as a dispersed reserve type with a timber management objective. They are tracked in RESULTS because they contribute to future timber supply estimates, as well as potentially impact growth and yield of the regenerating stand. These residuals could be made available for a subsequent harvest in the rotational cutting cycle but do not contribute to current stocking³⁴.

Example (Figure 6): A 5.5 ha cutblock, with a pre-harvest average BA of 100m²/ha, that was planned (in the FSP and site plan) to be harvested under a clear-cut silvicultural system, has instead been harvested leaving 20 m²/ha of merchantable residuals standing. The residuals are assessed as waste in accordance with the *Provincial Logging Residue and Waste Measurement Procedures Manual*.

³³ At <http://www.for.gov.bc.ca/hva/manuals/rwprocedures.htm>

³⁴ In some cases (e.g., for some DFP stocking standards), these trees may contribute towards stocking if they meet the identified leave tree criteria. Unharvested stems that are of poor quality and vigour, or that have been damaged, would not meet the identified leave tree criteria.

REPORTING STRUCTURE

Polygon A (the merchantable residuals are dispersed throughout the denuded portion)

Reserve Type = Dispersed. Reserve Objective = TIM. Associated with SU 1.

Forest cover attributes are submitted for Polygon Component; Inventory and Silviculture Components Layers 4 and 4S (Regen); Inventory Component Layer 1 (Mature), and any other applicable layers. Forest cover information for Layer 1 residuals is based on recent cruise information in which BA of remaining residuals is collected for stumpage waste billing purposes. Tree cover pattern is 5³⁵ to indicate significant amount of standing mature trees dispersed throughout the opening.

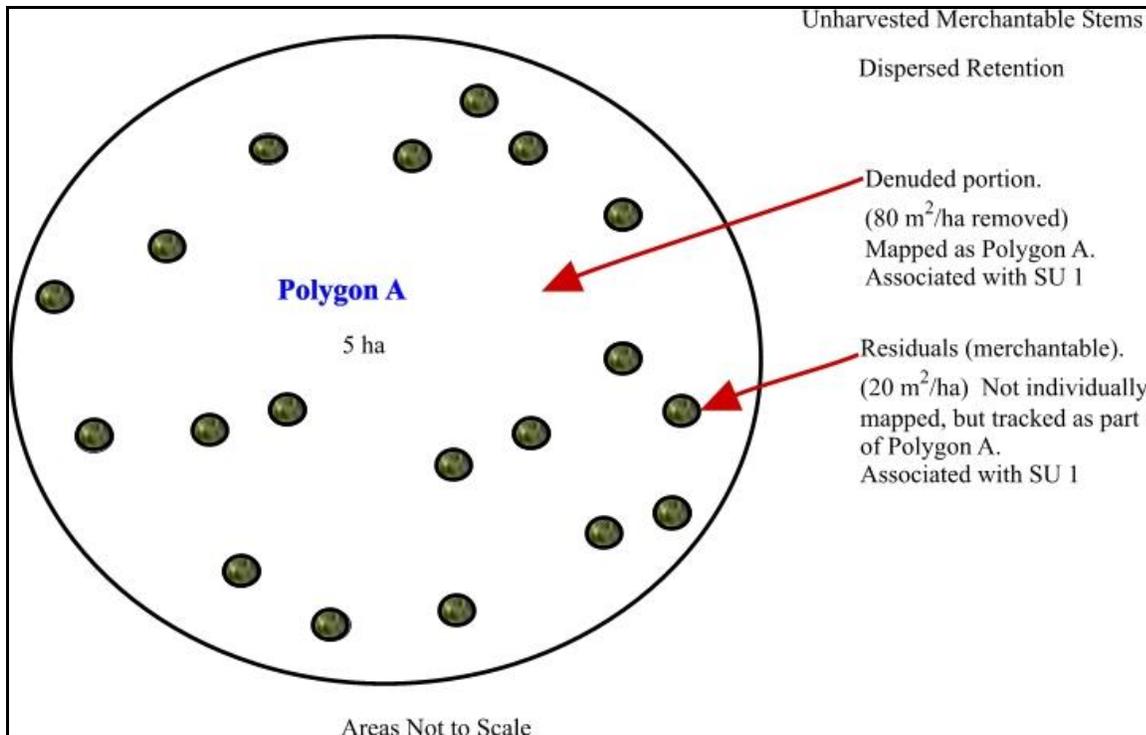


Figure 6 Unharvested Merchantable Stems – Dispersed Residuals

The specific locations of the residuals are not mapped as single trees and areas < 0.25 ha, but the stand profiles are represented in the multi-layer forest cover attribute reports. (In this example, Layer 1 represents the Mature residuals for the inventory component; Layers 4 and 4S (Regen) represents the denuded portion of the polygon for both inventory and silviculture components). Because the stocking standards associated with SU 1 pertain to reforesting the denuded portion of the polygon only, the silviculture component contains information specific to Layer 4S. However, if a DFP or SEDRSS standard is being used for an obligation, the Layer 1S could also be used for the mature trees in the silviculture label.

³⁵ These kinds of situations have resulted in stands with tree cover patterns ranging from 1 – 5.

APPENDIX A: Tree Cover Pattern

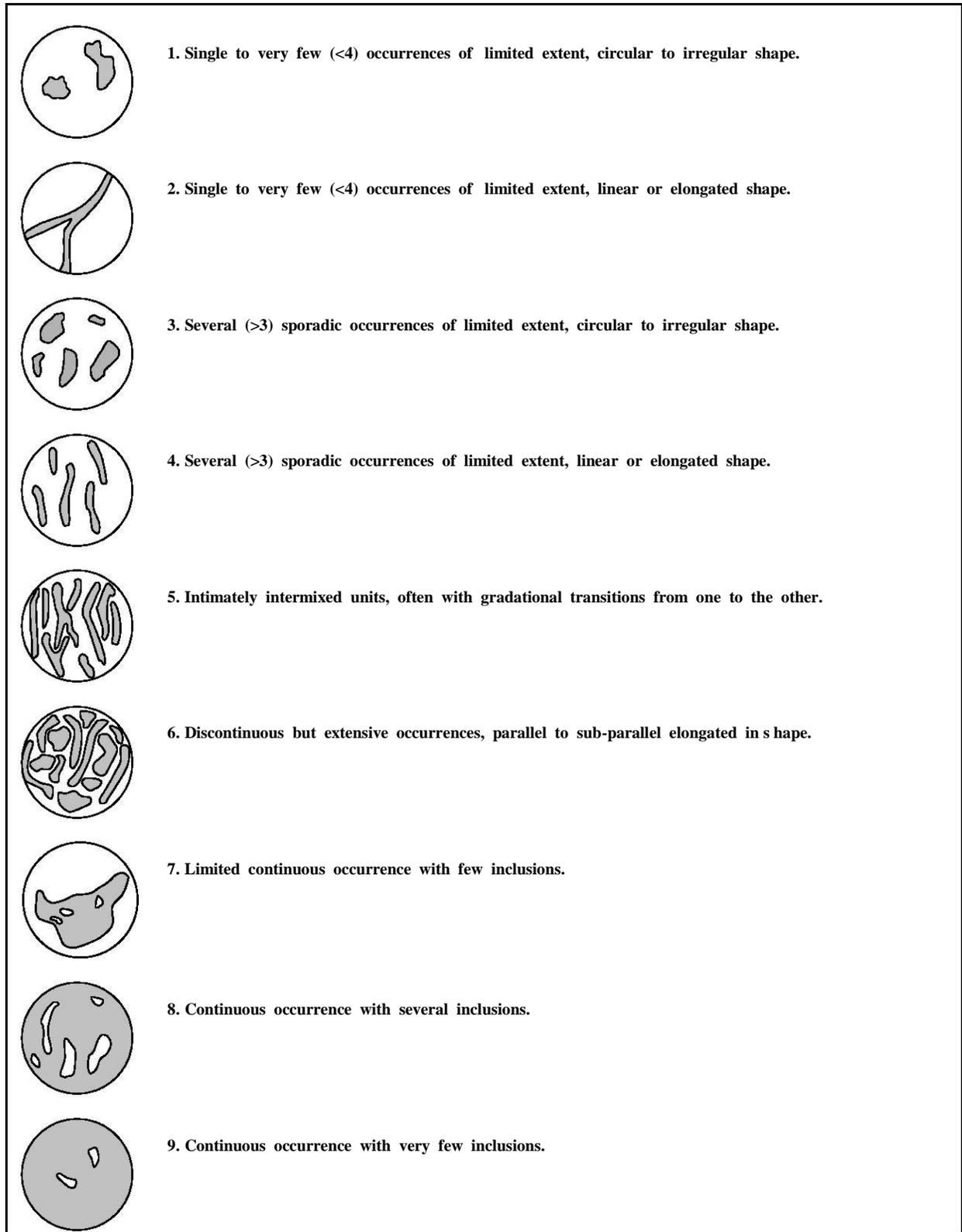


Figure 7 Tree Cover Pattern³⁶

³⁶ From page 61 in the *Vegetation Resource Inventory Photo Interpretation Procedures* at http://ilmbwww.gov.bc.ca/risc/pubs/teveg/vri-photointerp2k2/photo_interp2k2.pdf

APPENDIX B: Crown Closure

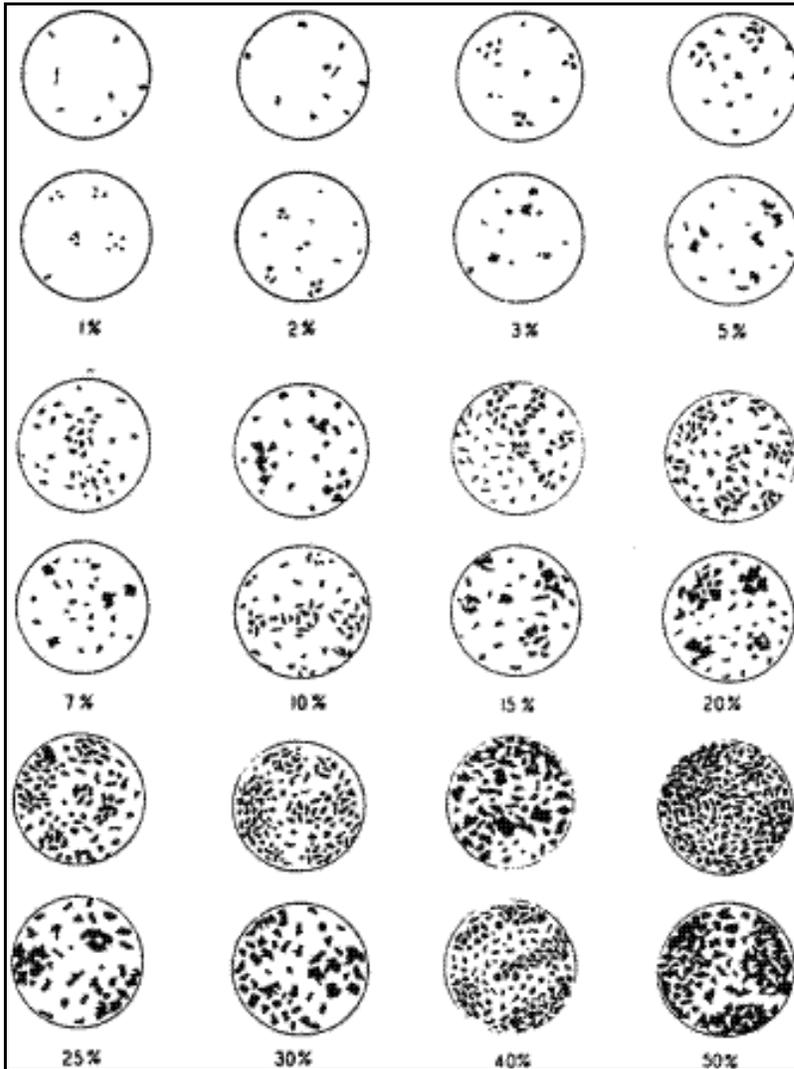


Figure 8 Crown Closure³⁷

³⁷ From page 21 of *FS660 Silviculture Survey Reference* at <http://www.for.gov.bc.ca/isb/forms/lib/FS660.PDF>