Lesson 6: A Structured Decision Process

An Overview

60 minutes

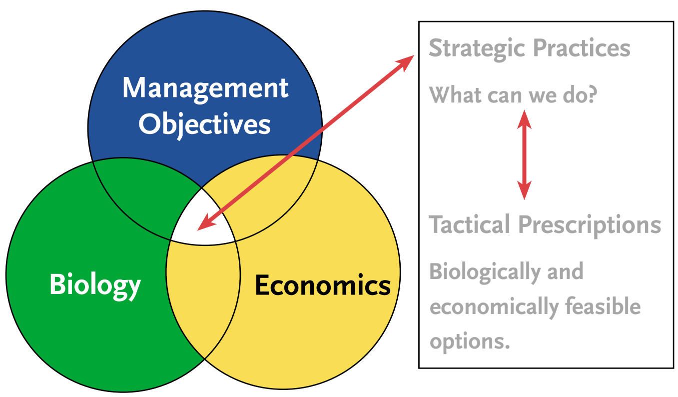
Lesson Objectives

- ▲ To introduce the participants to the main components of the a structured decision process for making density management decisions.
- ▲ To emphasize the need for feedback and reevaluation.

Method: Introduce the Guidelines – Lecturette

- ▲ Go over the main sections of the structured decision process,
- ▲ Provide a real life example

Structured Decision Process



Decision Process – Management Objectives

Some possible sources for guidance:

- ▲ **Timber Investment Steering Committee**
- ▲ **Innovative Forest Practice Agreements**
- ▲ **TFL management plans**
- ▲ **TSA Timber Supply Review**

A Structured Decision Process – Management Objectives

The knowledge required to make density management decisions is similar to that required for other silviculture decisions. For example,

- a silviculture planner must understand the requirements and objectives of the forest owner,
- the characteristics of the forest and
- the response potential of individual stands within the forest to specific management interventions

The decision framework consists of three major components.
First and foremost:

- Management objectives
- Management objectives define the current and future quantity and quality of timber and non-timber resources desired from the forest. For instance, management objectives should specify:
  - the silvicultural system(s) to be employed,
  - the periodic rate of timber harvest, the species to be managed,
  - the standards defining current and future harvesting operability, and
  - current and future product objectives.
- Non-timber resource objectives require similar detail. For instance, biodiversity, habitat, recreation and visual management objectives should be defined in space and time parameters, including specified areas, specific locations, management periods and standards defining the kinds of management interventions permitted.
- Defining management objectives for public forest resources is a complex process. Factors such as the nature and extent of the forest resources available, the goals of each resource user, and the resource management rules imposed by governments must be harmonized into a single, acceptable forest management plan. The process of defining forest management objectives is beyond the scope of this document.

Some possible sources for guidance:

- Timber Investment Steering Committee
- Innovative Forest Practice Agreements (Lignum Merritt)
- TFL management plans
- TSA Timber Supply Review

A Structured Decision Process

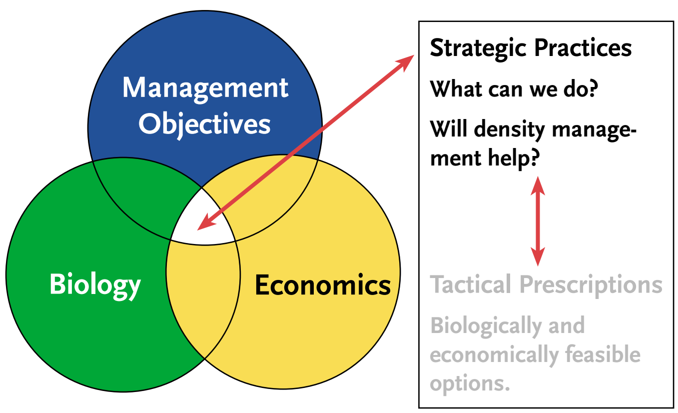
Strategic Practices

Management plan objectives and the structural and productivity characteristics of the forest estate will determine which silviculture strategy (forest practice) to pursue.

Thus to identify strategic practices one must first describe the forest estate. Once the forest estate has been described, for example by species, age and productivity it can be analyzed to determine what if any strategic practices could be used to assist achieving the objectives for the unit.

The strategic value of reforestation, density management, fertilization and pest management can be determined through analysis, usually involving forest estate modeling. There is a list of commonly available decision support and forest estate models provided in the guidelines, (pp 49–53). To use the tools effectively requires someone who knows what they are doing.

Structured Decision Process



Decision Process

Prerequisites for a forest-level strategic analysis are:

1. Clear and specific forest management objectives
2. Accurate information on the growing stock of the forest
3. Knowledge of the potential benefits of the potential treatments

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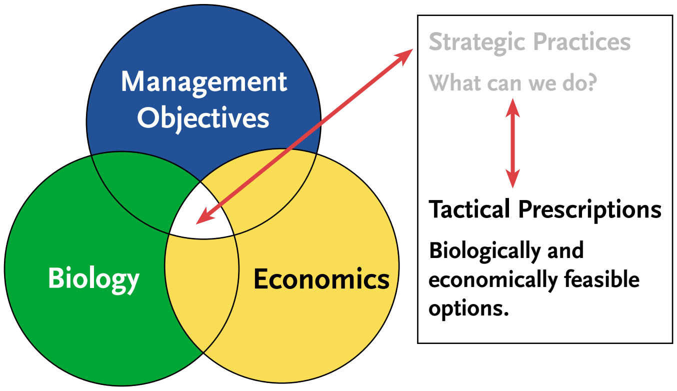
More than one strategy may be necessary to accomplish management objectives. A thorough analysis will indicate relative strategic values, (e.g., brushing vs thinning), as well as the scale of silviculture activity necessary.

We will go over an example once we have covered the third component of the decision framework.

Structured Decision Process



Decision Process

Tactical prescription to create premium logs (Fd SI32)

- ▲ Space to 600 sph at 4 metres average height
- ▲ Prune one lift when dbh is between 5 and 8 cm (5–7 m tall)
- ▲ Prune second lift when height is betwen 9–12 m
- ▲ Harvest at 80 years

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A Structured Decision Process

Tactical Prescriptions

Stand-specific silviculture treatments are tactical decisions. Stand-level tactics (silviculture prescriptions, stand management prescriptions) should support silviculture strategies. Prescription design and treatment effectiveness must be viewed within the context of the strategic plan.

The key point here is that stand density prescriptions must be made within the context of a broader silviculture regime, and a silvicultural regime must be guided by the strategic objectives for the management unit.

A definition:

Silvicultural Regime – A series of carefully sequenced and implemented activities at specific time periods and intensities to achieve desired objectives.

For example, to create premium sawlogs on good sites.

Here is an hypothetical tactical prescription:

- ▲ Space to 600 sph at 4 m
- ▲ Prune one lift when dbh is between 5 and 8 cm (5–7 m tall)
- ▲ Prune second lift when height is between 9–12 m

Harvest at 80 years.

Key points:

Tactical prescriptions must be in line with the strategic objectives of the management unit.

There must be sufficient stands to make it worthwhile at the forest level.

Treatment regimes must be either suitable or provisional, based on the project planning matrix.

Project Planning

Some examples using the three levels of feasibility

Decision criteria	Expected outcome of forest and stand analysis				
Biological feasibility	+	+	+	+	+
Economic feasibility	+	+	+	–	–
Forest-level feasibility	–	/	+	+	/
Stand-level treatment decision	Unsuit-able	Prov.	Suitable	Prov.	Unsuit-able

A Structured Decision Process

Project Planning

Three decision criteria must be considered: biological feasibility, economic feasibility and forest-level considerations. Biological and economic feasibility are based on a timber production perspective. Forest-level feasibility is a test of whether the treatment or project contributes to forest-level considerations, including both timber and non-timber objectives.

The test of biological feasibility is the most important of the three feasibility tests. Any treatment objective which is biologically infeasible for any reason must not be considered further. Forest resource stewardship also demands that silviculture practices should not compromise the structural integrity or long-term production potential of a stand.

Suitable, unsuitable and provisional are relative measures of how closely a project meets the test of all three criteria. The last row in the matrix indicates the project suitability decision, and provides either a justification or recommends a subsequent procedure.

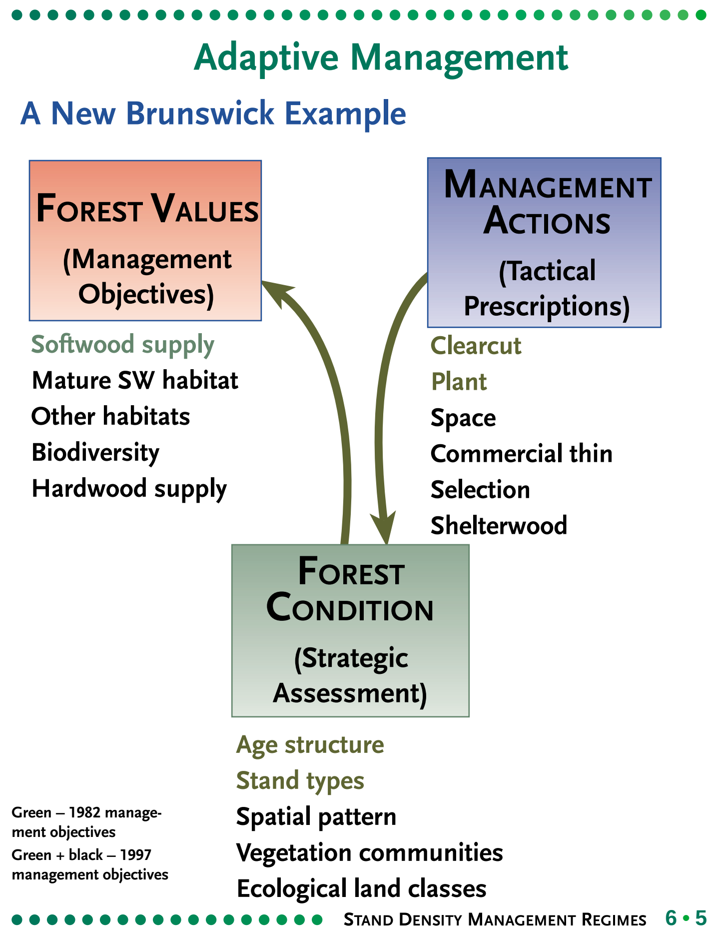
In the first decision scenario (column 2) the proposed density management project is expected to produce a positive biological response, generate a positive stand-level economic outcome, yet result in a negative forest-level effect. The appropriate decision in this case is that the project is unsuitable because it confounds achievement of forest-level objectives.

The second scenario (column 3) is similar to the first, except the expected impact of the project at the forest level is neutral, instead of negative. This changes the decision to **provisional**, and a recommendation to proceed with the project depends on the availability of silviculture funds and the inclination of those managing the forest estate.

The third scenario (column 4) represents the most favorable measure of project suitability. Positive results were measured for all criteria. The resulting decision makes the project **suitable** since it contributes positively to management objectives, and is biologically and economically feasible.

The positive (biological), negative (stand-level economic), and positive (forest level) combination in ***scenario four*** (column 5) results in a **provisional** decision, and a recommendation for minimum cost ranking. This means that the proposed project could be undertaken because of its capacity to yield a positive contribution to forest management objectives. However, there may be other projects also meeting objectives but capable of generating a more favorable (or less costly) economic outcome. Where funding is available, all stand density management activities would be ranked in order from least to most costly. Stand density management projects would be undertaken in this order to a point where total density management program costs equaled available funds.

In the ***fifth scenario*** (column 6) the density management project is expected to yield a positive biological response, a negative stand-level economic response, and a neutral forest-level response. T**he project, in this instance, is unsuitable.** If a project has a positive biological impact, neither contributes to nor detracts from achievement of forest-level objectives, yet provides no net economic gain at the stand level, it would be difficult to justify the expenditure of silviculture funds. Practitioners should instead consider alternative projects or investments that provide greater returns and/or contribute more to achieving forest estate management objectives.



Adaptive Management
A New Brunswick Example
FOREST VALUES
(Management Objectives)
Softwood supply
Mature SW habitat
Other habitats
Biodiversity
Hardwood supply
MANAGEMENT ACTIONS
(Tactical Prescriptions)
Clearcut
Plant
Space
Commercial thin
Selection
Shelterwood
FOREST CONDITION
(Strategic Assessment)
Age structure
Stand types
Spatial pattern
Vegetation communities
Ecological land classes
Green – 1982 management objectives
Green + black – 1997 management objectives
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A Structured Decision Process

Feedback is an essential part of any ongoing management regime.

The stand density management decision support process relies on:

- up-to-date knowledge regarding the biology of timber production, and current information regarding the people
- values and needs reflected in forest management plans
- scientific knowledge is continually updated through empirical observation and new discoveries
- forest management plans change with the participants, the economy and the times.

Thom Erdle in his paper *Progress toward sustainable forest management: Insight from the New Brunswick experience* (1998). Provides an example of the feedback loop described in the guidelines.

- The paper deals with shifting concept of sustainability.
- The example shows how all three parts of the decision process can change over time.
- The forest values (management objectives – as per the guidelines) have increased from only softwood supply in 1982 to incorporating supply along with mature shelterwood habitat, other habitats, biodiversity and hardwood supply.
- Forest condition is now assessed for age structure, stand types as it was in 1982, but now spatial patterns, vegetation communities and ecological landclasses are measured.
- Management actions have expanded to meet the increased level of stewardship to include spacing, commercial thinning, selection and shelterwood systems, from the former clearcut and plant of 1982.

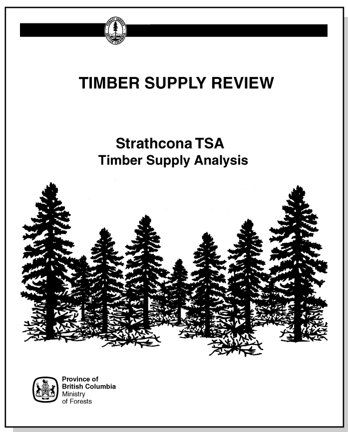
A BC example is next.

Real Life Example Strategy

Strathcona Timber Supply Area

Strategy at a glance

- ▲ General Strategy
- ▲ Working Targets
- ▲ Product Objectives
- ▲ Major Silviculture Strategies
- ▲ Incremental Silviculture Program



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Real Life Example Strategy

Read over the topic areas.

- ▲ Spend 5–10 minutes looking at the strategy at a glance.
- ▲ Talk to your neighbour if you wish.

We will discuss the strategy once you have had a chance to look it over.

Strategy at a Glance[1]

General Strategy The focus of the silviculture strategy in the Strathcona TSA is to aid the redistribution of harvest between supply blocks, increase the supply of sawlogs during the mid-term period, diversify the age class structure, assist in managing for aesthetic and wildlife values, and increase the future supply of premium logs.

Working Targets

Quantity: Manage mid-term timber supplies to yield a harvest of approximately 1.10 million m^3/yr and long-term supplies to yield 1.25 million m^3/yr.

Quality: Manage regenerated stands to yield at least 6% premium logs by volume, with the majority of the remainder being of sawlog quality.

Product Objectives The following are product objectives at the log level for the Strathcona TSA.

Quality Class	Species	Characteristics
Premium Log:	Douglas-fir, clear, pruned	45+ cm min DBH, pruned, min 5 m log.
	Douglas-fir, large timber	55+ cm min DBH, unpruned.
	Douglas-fir, clear, unpruned	long rotation.
	Hemlock, large timber	55+ cm min DBH, unpruned.
	Hemlock, clear, unpruned	long rotation.
	Cedar, large timber	55+ cm min DBH, unpruned.
	Cedar, clear, unpruned	2 rotations in stand.
Sawlog:	Minimum average stand DBH of 45 cm and min. stand vol. of 350 m^3/ha.	

Continued on next page

[1] *From Strathcona Timber Supply Area, Incremental Silviculture Strategy* (Interim) Version 1.0 – August 31, 1998.

Major Silvicultural Strategies

Quantity *(Some of the following are not within the traditional scope of incremental silviculture but are included here for completeness.)*

1. In the Sayward and Kyuquot SBs achieve a 3–5 year earlier green-up of regenerated stands through a variety of silvicultural practices.
2. In the Sayward, increase existing stand volumes 10% and diversify the age class structure by spacing 300 ha/yr, fertilizing1 500 ha/yr and commercial thinning 400 ha/yr.
3. In the Kyuquot and Loughborough SBs, move age class 1 & 2 stands ahead for earlier harvest and diversify the age class structure by spacing 1100 ha/yr and fertilizing 200 ha/yr.
4. Increase regenerated stand volumes 20% (tree improvement is critical to success).

Quality

1. Prune 250 ha/yr to increase the future supply of premium logs by 2%.
2. Manage selected stands for large dimension timbers.
3. Manage for clear timber through long rotations of selected stands.

Habitat

1. In the Sayward, create old forest characteristics as early as possible.
2. Space 50 ha/yr to [what density?] for [what purpose?].

Incremental Silviculture Program (ha)

Year	Surveys	Backlog Brushing	Space	Prune	Fertilize	Total
1	7,000	100	1,550	250	1,500	3,400
2	7,000	100	1,550	250	1,500	3,400
3	7,000	100	1,550	250	1,500	3,400
4	7,000	-	1,550	250	1,500	3,300
5	7,000	-	1,550	250	1,500	3,300
Subtot Yr 1 - 5	35,000	300	7,750	1,250	7,500	51,800
6 - 10	35,000	-	7,750	1,250	7,500	51,500
Total Yr 1 - 10	70,000	300	15,500	2,500	15,000	103,300

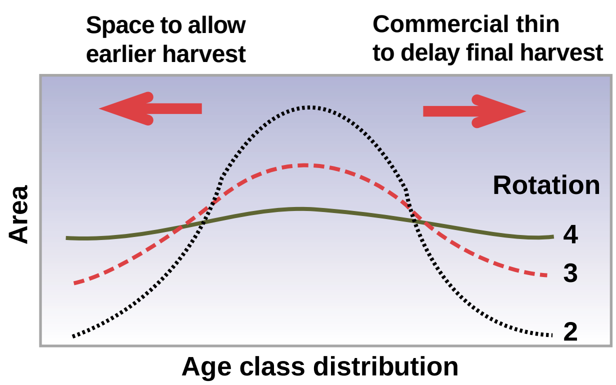
A Strategic Objective and a Tactical Response

Strategic Objective:

- Break up the concentration of ages into a normal forest

Tactical Response

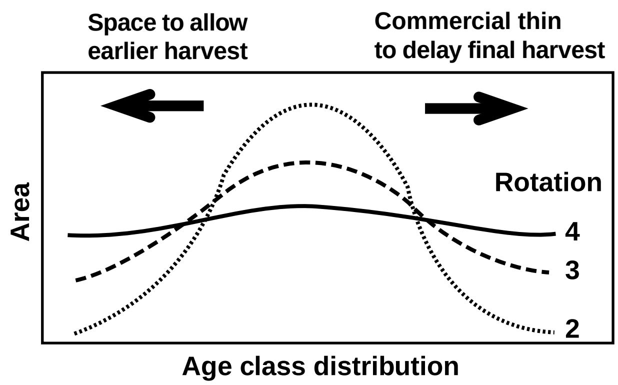
- spacing some stands to bring them to harvestable size earlier and move them forward in the harvest queue;
- spacing some stands to set up for CT; and
- CT some stands to delay final harvest by 1 age class.



A Strategic Objective and a Tactical Response

You will not there are two strategic objectives provided below. These offer different tactical responses. Note also that to determine their value for the strategy, further assessment is required

Strategic Objective	Discussion – Current Status	Anticipated Result
Break up the concentration of ages into a normal forest by:	1. The diagram below shows how over several harvest rotations, the strategy will redistribute the age classes into a more even distribution.	1. Effect unknown – requires modelling. Ultimately beneficial in meeting adjacency/ green-up requirements. Allows for the Sayward to be potentially managed as an independent management unit at some future time.



Tactical Options

a) spacing some stands to bring them to harvestable size earlier and move them forward in the harvest queue;

b) spacing some stands to set up for CT; and

c) CT some stands to delay final harvest by 1 age class.

The district expects to soon assign to every stand a target harvest age within 5 year age groupings.

a) Current program is to **space 200 ha/yr for bringing harvest ages forward**

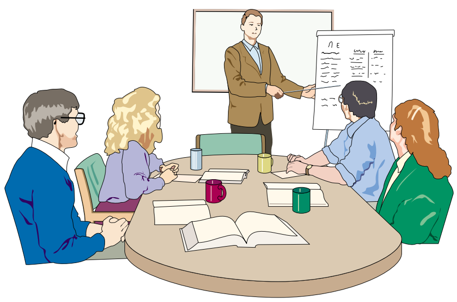
b) Current program is to **space 100 ha/yr for setting up for CT**.

c) Current program is to **CT 400 ha/yr** for the dual purpose of delaying final harvest ages as well as overcoming adjacency constraints.

Consequences – If the strategy is not followed, given the dynamics of the TSA with 3 supply blocks, the cut would rotate heavily from supply block to supply block – coming in, maxing out to the limits of forest cover constraints, and then rotating to the next supply block and doing the same thing. This would reduce flexibility and potentially result in additional public derived constraints.

Strategic objectives		
Create old forest characteristics as early as possible Tactical option through a regime of spacing/fertilization/CT/ ertilization.	2. The Sayward has few older forests. Anticipated as a future issue – TSR 1 did not include an older forest requirement in base case. Forest structure can be advanced similar to that of older forests through this strategy. Existing programs will accomplish this.	2. Effect unknown. No TSR 1 sensitivity test. Requires modelling.

Strategic Objective



A suggested approach...

- ▲ **Someone needs to do advance preparation**
- ▲ **Use a workshop to go over the options**
- ▲ **Be sure you have the "right" participants and that they are welll prepared**

An Approach That Has Been Used In Several BC TSAs[2]

Advance preparation of between 7 to 10 days is needed to go over the Timber Supply Review and prepare potential strategies. This must be done by someone who is familiar with the inner workings of the timber supply. When working with the timber supply you have to separate modeling phenomenon from true timber supply effects. You also have to speculate on what a potential harvest forecast might look like without the shackles placed on the TSR analysis. TSR is about the present – silviculture strategy is about creating a future.

A strategy is only good to the degree that it **proves appropriate and is achieved.** For example, the Fraser TSR basecase took a steep dive and then leveled out at the LTHL. A hypothesized new forecast created a 40% increase at year 50! You can imagine the difference in strategies that that generates.

You also need to look at not only opportunities to increase timber supply, but also where silvicultural interventions may protect against risks to timber supply. A good example here is when sensitivity analysis shows a relatively small increase in forest cover constraints over the current practice would result in an inability to maintain the current harvest level. Here, perhaps increasing the use of partial harvesting or CT might be a good preventative measure. Better yet, is when doing so would actually free up timber supply that is otherwise unavailable. Sometimes these become no-brainers as a first choice strategy; if constraints do become tighter, you've helped offset the impact and if they don't become tighter, you get a gain in timber supply over the base case.

Part of the process, too, is a gap analysis. What additional information do we need to know? For example, in Kootenay Lake, the easiest increase in timber supply could come from sites classified as low but that are actually poor. If low, they're outside the THLB, if poor, they're in. The solution was go out and re-assess/re-classify the low sites. Once they have a handle on it, they can then see if there's any opportunity for silviculture (e.g., rehab, fertilization) to bring any of the residual low-site area into the THLB. Another example, no one knows what their local OAF1 is, yet there are survey methods now available.

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2 Outlined by Larry Atherton who has been involved in a number of TSA Incremental Strategies under contract to the Ministry of Forests, funded by FRBC.

As can be seen numerous options exist and will vary by TSR and TFL. To make the plan specific to a TSA the following should attend a facilitated workshop to develop a silviculture strategy.

NOTE: ***A central aspect of the workshop is that you must have the people with the essential local knowledge in the room. This is THEIR plan, not the people who facilitate it. These people are:***

- district silviculture planners
- a senior district management person
- the timber supply analyst – either the regional or district person
- a regional silviculture specialist or two (no more)
- MOELP rep
- each major licensee
- First Nations, if appropriate.

What should they bring?

- knowledge of current silv practices and opportunities (e.g., fert is a great idea, but if there are no suitable candidate stands…)
- program level in the management unit
- local stand treatment priorities, if any
- local financial analysis of silviculture investments, if any
- local timber product objectives, if any
- local habitat objectives
- species trends in reforestation (e.g., spruce going down,pine going up)
- status of tree improvement program for local species
- latest timber supply analysis report and AAC rationale
- timber supply analysis detail, if available (analyst to bring)

See the *Strathcona Timber Supply Area Incremental Silviculture Strategy* (Interim) Version 1.0 in your appendix for further detail. See also the chief forester's policy for additional guidance.