



Forest-level Benefits of Stand Density Management

Jordan S. Tanz, RPF
Cortex Consultants Inc.

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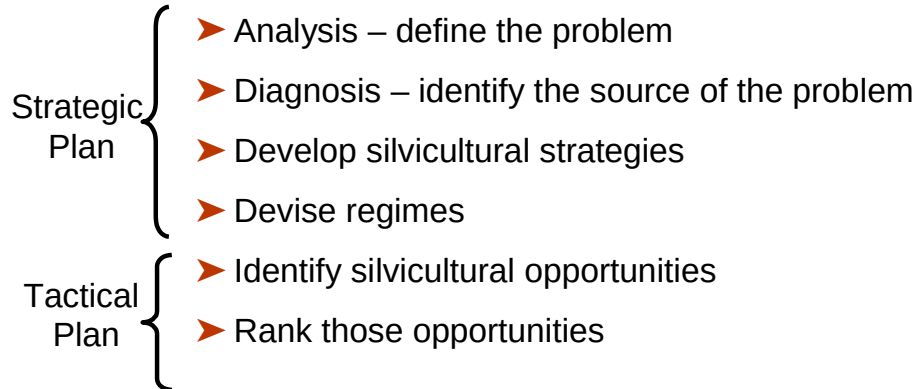
TSR has changed the way we think about forest management and planning in three ways:

- It has given us a standardized view of the status of each management unit in the province, so that we now have a baseline for the whole province.
- It has standardized the method for quantifying timber supply.
- Because of this, TSR estimates of timber supply are now used as the baseline against which all “incremental” investments are measured and evaluated.

As a result, we can estimate the forest-level effects of stand treatments by projecting them in a forest-level model. And this means that evaluating benefits of stand density treatments requires incorporating them in a forest-level model.



Strategic and tactical silviculture planning process



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The silviculture planning process that has evolved over the last few years starts by identifying problems or issues at the forest level, and works through identifying objectives, strategies, regimes, and activities that could address the forest-level problems or issues.

Then we try to find opportunities on the ground to apply the treatments. It's not enough to know that a specific type of treatment applied to particular stand types will provide some amount of timber supply benefit. To realize the benefit, we have to be able to find hectares on the ground that are in a condition that is suitable for treatment.

Finally, we rank these opportunities.



Key ideas

1. Timber supply is driven and controlled by much more than stand growth.
2. Stand treatments affect timber supply via specific, understandable mechanisms.
3. If stand treatments are to have a recognized effect on forest-level values, they have to be incorporated into a forest-level analysis.
4. Planning silviculture activities should not be based on stand-level objectives alone.

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Understanding the link between silvicultural activities and timber supply requires understanding these effects in a general sense to guide development of regimes and options.

Then we can use an objective analytical approach to strategic silvicultural planning.



Stand-level effects of silviculture activities

Silviculture actions	accelerated availability	mean growth	accumulated yield	productivity	average diameter	quality	biological diversity
Basic silvic.	+	+	+	+	+	+	+/-
Spacing	++	+	-	+/-	+	+/-	+/-
CT	+	0	-	+	+	-	+
Fertilization	+	+	+	+	+	+	0
Pruning	0	0	0	0	0	++	0
Tree improv.	+	+	+	+	+	+	+/-

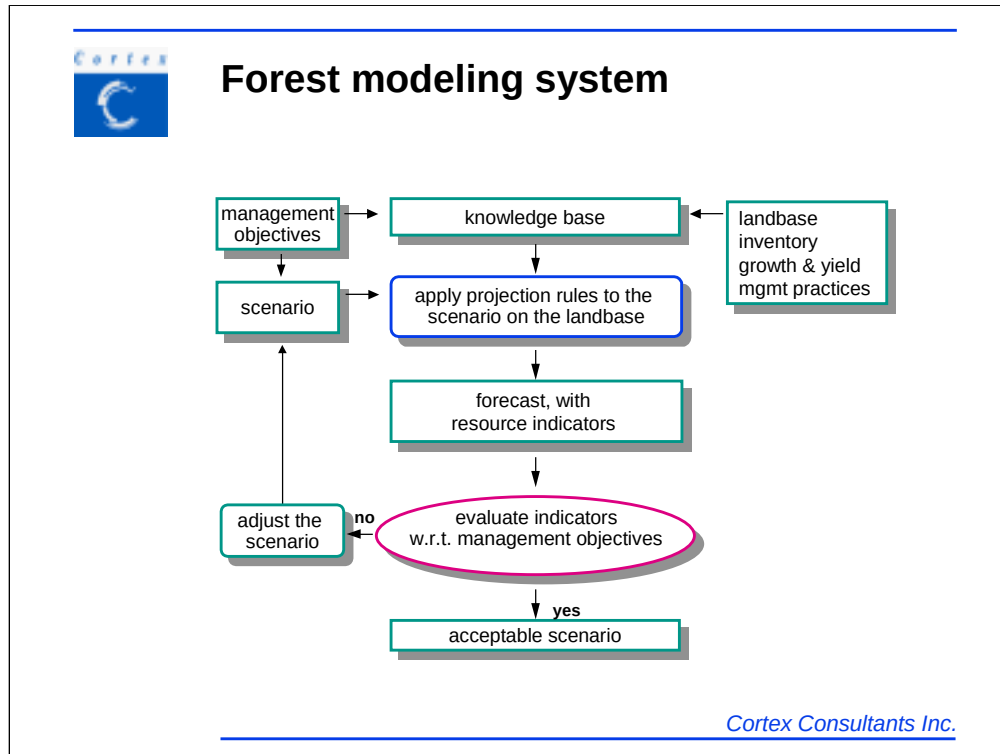
Source: Adapted from G. Weetman, SIBC 1992

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This slide was adapted from a table produced by Gordon Weetman in an SIBC workshop in 1992 and it illustrates the stand-level effects of silvicultural activities.

This is a simplified list of silviculture actions, but the idea is that the relative impact of each action on the stand-level state variable or indicator is given by the sign and the weight of the sign.

These activities act through three factors -- they change growth and yield, change the landbase, or offset constraining policy.



Forest modeling system

This is a flow chart of a typical forest model:

Knowledge base:

- timber harvesting landbase (THLB)
- forest inventory
- age-class structure
- growth and yield information
- current state of the forest

Management scenario:

- some management decisions are set elsewhere (e.g., by an LRMP process), including the management objectives for the forest
- what management decisions are you free to adjust?—typically harvest schedule options and their accompanying management assumptions

Forest state is projected into the future, using information in the knowledge base, and projection rules embedded in the model. Indicators of the state of the forest are produced (e.g., age-class distribution) and evaluated.



Mechanics of stand-forest links

Silvicultural activities affect timber supply through:

- landbase effects
- growth and yield effects
- policy effects

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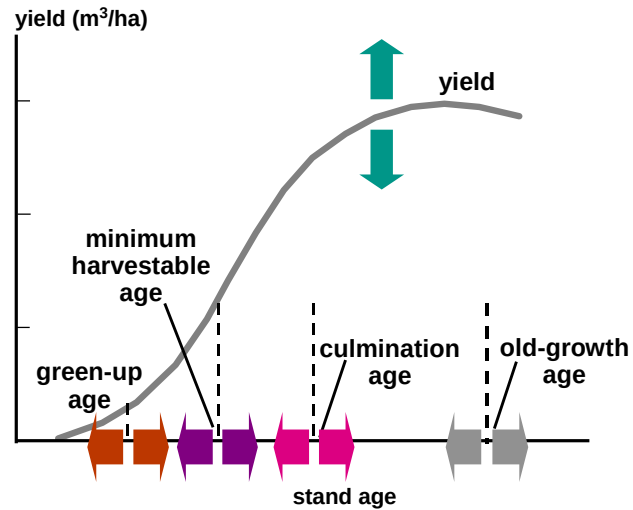
Stand-forest links– landbase effects

- allow some harvesting where it would not otherwise be allowed (commercial thinning)
- change the order in which stands become available for harvesting by reducing minimum harvest age
- add or remove landbase area (in the net-down process: low site, PFT)

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Stand-forest links – growth and yield effects



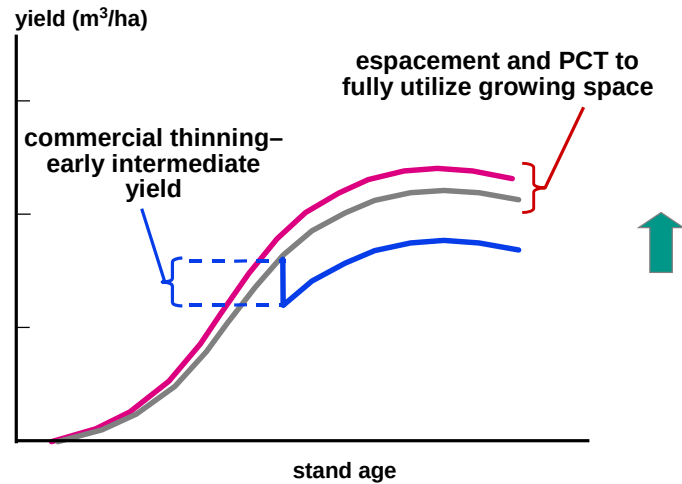
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There are various milestones in the life of a stand that are important in timber supply analysis. We may be able to influence timber supply by applying treatments that affect when a stand reaches these milestones.

These points are green up age, minimum harvest age, culmination age and old-growth age.



Stand-forest links– growth and yield effects



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Growth and yield effects - Prompt and proper espacement and pre-commercial thinning can be used to increase merchantable yield. Commercial thinning can be used to produce intermediate yields in stands that would otherwise be excluded from harvesting until they reach minimum harvestable age.



Stand-forest links – policy effects

- Density management to control structural development of stands, creating non-timber values: e.g.,
- wildlife habitat
- visual values
- hydrological attributes

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Policy effects - spacing, pruning and fertilization can be used to create desired non-timber values. These activities can maintain early seral stages for longer periods of time providing valuable understory vegetation and habitat for wildlife.



Direct effects of stand-level treatments

- Direct effects
 - increase productivity
 - increase THLB
 - offset administrative constraints
- Indirect effects
 - interactions of direct effects

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Landbase effect means doing something to stands to increase the size of the timber harvesting landbase.



Direct effects – Increase timber harvesting landbase

- allow some harvesting where it would not otherwise be allowed (e.g., commercial thinning of Preservation VQO areas)
- expand the THLB (e.g., rehab backlog NSR, convert to conifers)

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We may be able to increase the size of the timber harvesting landbase by using silviculture to reduce the effect of certain constraints (e.g. visual quality, community watersheds, etc.).

We might also be able to expand the THLB by treating area that was previously excluded from the THLB.



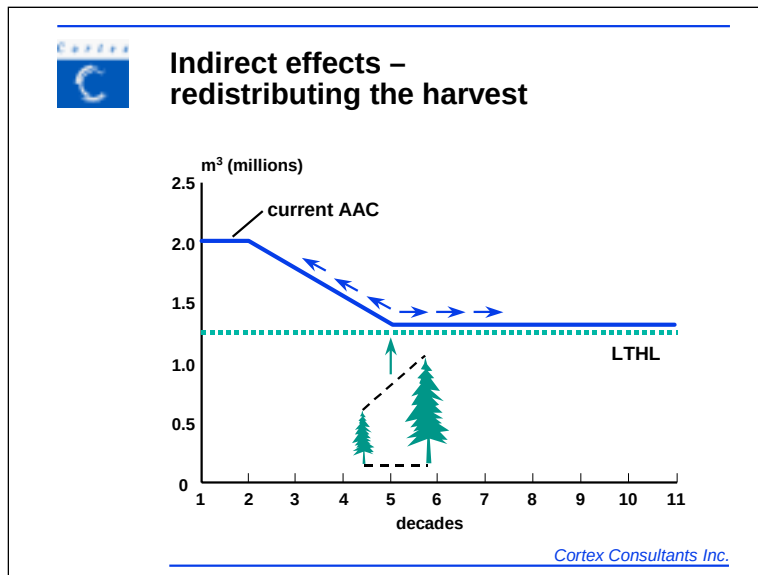
Direct effects – Offset administrative constraints

- e.g., density management to control structural development of stands
- creating non-timber values
 - wildlife habitat
 - visual values
 - hydrological attributes
- offset late seral stage retention requirements

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Determining/forecasting forest-level effects of silvicultural actions requires understanding the direct and indirect (policy interactions) effects.

Policy effects means doing things that control development of stands so we get an interaction with policy that makes more timber available.



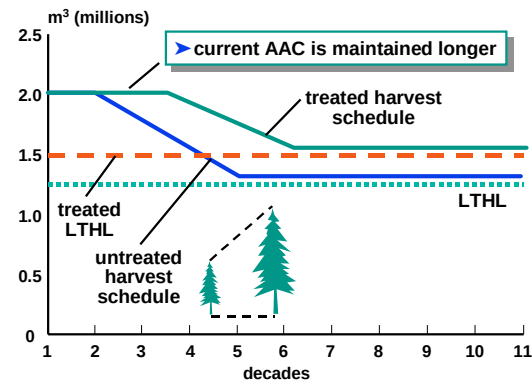
Incremental volume production in decade 5 will allow stands to be rescheduled to more productive ages for harvesting

- may release older stands to be harvested sooner, converting them to higher yield managed stands sooner
- may allow hectares to be held longer, increasing yields

Any silviculture regime that increases volume production in decade 5 or 6 will have a high shadow price (i.e., will contribute to the objective-- producing volume)



Direct and indirect effects— increasing the rate of harvest



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The harvest schedule and LTHL may increase with treatments



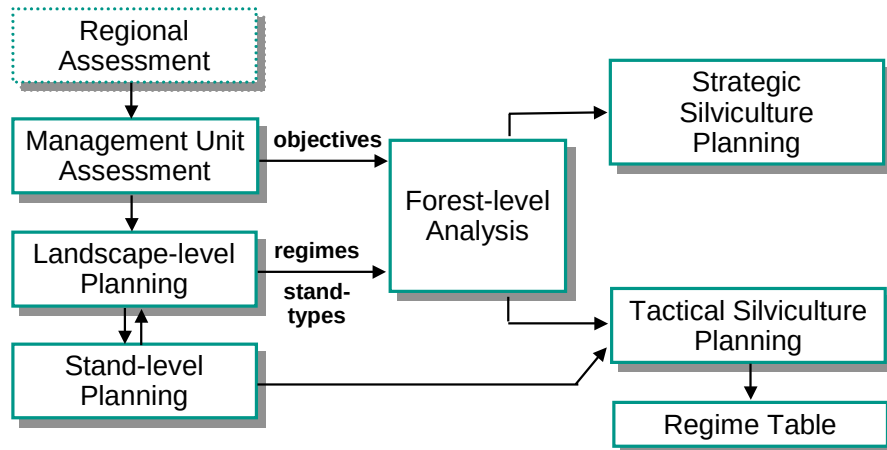
Analysis-based strategy development

- regime options
- treatment areas
- forest-level objectives:
 - timber supply
 - product targets
 - employment targets

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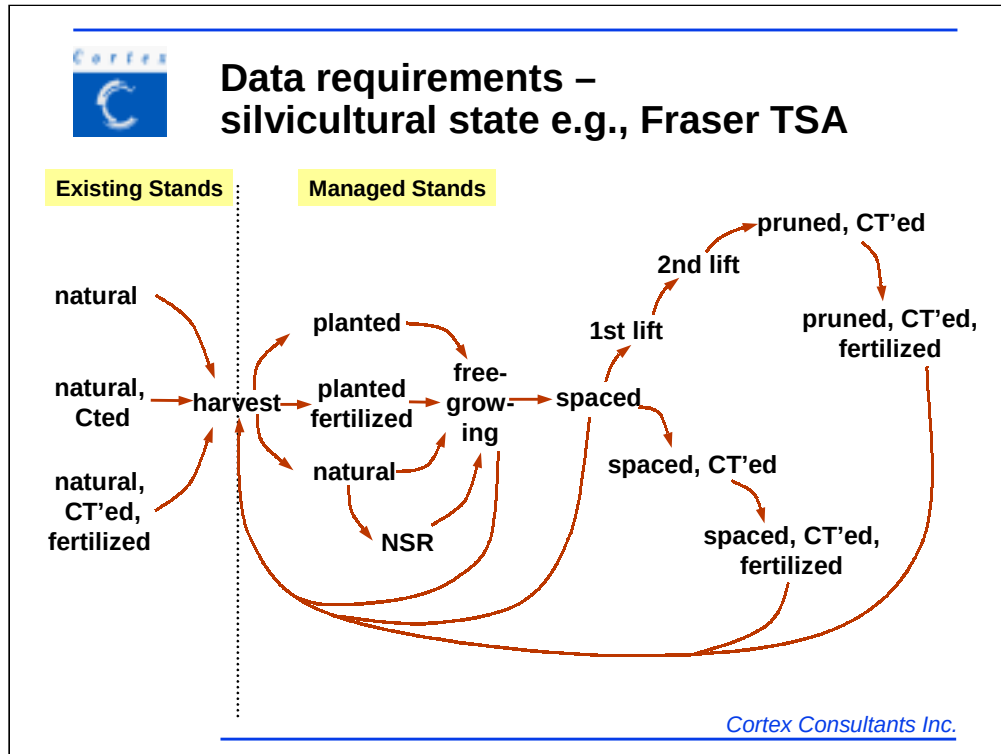


Silviculture Planning Framework



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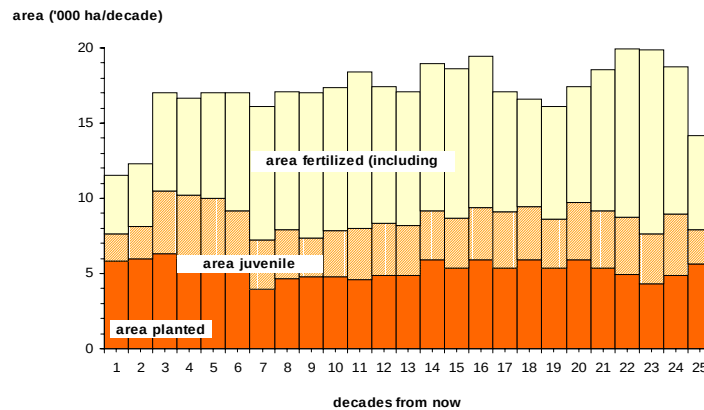
regional assessment includes all the higher-level plans and objectives that affect planning and have to be considered somehow in the silvicultural analysis



All potential scenarios must be mapped out to ensure none are missed. Harvest and spacing are two key points where all activities are keyed through. That is why spacing is a valuable key to achieving forest level management objectives.



Area treated – Arrowsmith TSA Silviculture Strategy

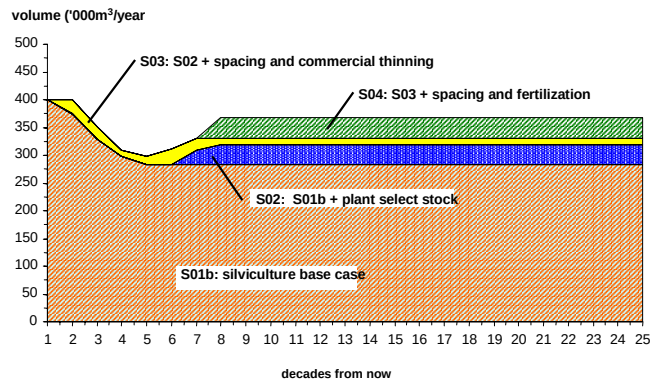


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This graph shows the silviculture strategy for the Arrowsmith TSA. All hectares of planting, spacing and fertilization are depicted over 25 decades.



Impact of planting “select” stock, CT, spacing and fertilization on the harvest forecast, Arrowsmith Silviculture Strategy



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This figure shows the cumulative effects of silviculture at the forest level. Regime S03 (planting, spacing and CT) has an immediate effect on reducing the amount of falldown in the first 7 decades.