THE SILVICULTURAL SYSTEM

Ralph D. Nyland

Distinguished Service Professor - Silviculture

Department of Forest and Natural Resources Management
SUNY College of Environmental Science and Forestry
Syracuse, NY 13210

SILVICULTURE ...

... the methods for establishing and maintaining healthy communities of trees and other vegetation

.... that have value to people
What silviculturists do ...

**CONTROL** – establishment, composition, structure, and growth

**FACILITATE** – harvesting, management, and use

**PROTECT** – sites and trees

**SALVAGE** – dead and diseased trees, and potential mortality
... controlling natural patterns of stand development to favor a landowner

SILVICULTURE
works with stands

STAND

A community of trees sufficiently uniform in
composition, constitution, age, spatial arrangement
site quality, or other conditions that distinguish it ...

... so forming a silvicultural or management entity

After Ford-Robertson 1971, Helms 1998
So silviculture deals with stands …

… homogeneous in some condition or characteristic

Treating one stand at a time …

… the silviculture
Easily identified on the ground …

… managed as individual units to enhance the desired values
FOREST MANAGEMENT …

… deals with the collection of stands that comprise a forest

… or some other management unit
To make the whole forest more useful …

Integrating silviculture across an entire forest …

… the forest management
Forest management ...

Like this ... ... across time and space

... to serve the interests of people
But always keep Einstein’s observation in mind …

“… if we are to solve problems that plague us, our thinking must evolve beyond the level where when we created those problems in the first place.”

(from McDonough and Braungan. 2002. Page 165)

Thus when planning silviculture and forest management …

Consider the ecologic and economic factors

After Urban et al. 1987
... integrated across a compartment

Consider the ecologic and economic factors at least one level beyond the scale of immediate interest

After Urban et al. 1987

... and throughout a forest

Consider the ecologic and economic factors at least one level beyond the scale of immediate interest

After Urban et al. 1987
always thinking about the landscape

Consider the ecologic and economic factors at least one level beyond the scale of immediate interest

After Urban et al. 1987

with important influences coming from outside to affect our options for managing stands and forests
... and others of the stand and forest dictating what we can contribute to the larger area

Remember ...

Hummel (2006) calls this ...

... **LANDSCAPE SILVICULTURE**

... developing prescriptions for individual stands, but evaluating them collectively based on objectives for the landscape as a whole
How to do this ...

... the silviculture

THE SILVICULTURAL SYSTEM ...

... the plan for managing a stand over the long run

... the way we control, facilitate, protect, and salvage in a stand

To control conditions and enhance the desired values …
THE SILVICULTURAL PLAN …

… the end point of a deliberate problem solving process

… that starts with the objectives for management

THE PROBLEM SOLVING PROCESS:

1. *Determine the landowner’s objectives*
2. Evaluate existing stand conditions
3. Identify the options
4. Quantify the likely outcome of each one
5. Drop unsuitable options
6. Explain the viable alternatives
7. Help the landowner decide
8. Implement the prescription
9. Evaluate the results
REMEMBER -

Learn the objectives …

… the rest will follow from your thoughtfulness and creativity

… for a desirable outcome
So what does a system involve?

ALL SYSTEMS HAVE THREE COMPONENTS

after Nyland et al. 1983

Components of silvicultural systems for sustained management

1. Regeneration
   - Natural
   - Artificial - seeding
   - Planting
   - Release treatments
   - Pruning
   - Thinning
   - Intermediate treatments
   - Clearcutting method
   - Shelterwood method
   - Seed-tree method
   - Selection method
   - Other partial cuts
   - Two-aged methods

2. Tending

3. Harvest
   - Harvest... a means to

ALL SYSTEMS HAVE THREE COMPONENTS

after Nyland et al. 1983
SILVICULTURE SEPARATES FORESTRY FROM EXPLOITATION

Continuity over time  Sustained values

The systems differ for three broad groups of stands …
EVEN-AGED

A community of trees having no or only small differences in ages …

… by convention with a spread of ages not exceeding 20% of the rotation length

ROTATION …

… the planned number of years between formation of a stand (even-aged) and its final cutting (regeneration) at a specified degree of maturity
Starting with young ones …

… getting older
... and finally mature

... within a single stand

... with a clear pattern of development through time

... within a single stand
... and in each even-aged stand across a forest

So ...

All trees in a stand regenerated at the same time ...  
... all developing to maturity together  
... all coming of age at the same time
The silvicultural system for even-aged stands
With even-aged stands …

... tend when immature

... reducing the crowding

Thinning …

... favors the biggest and best trees to promote their growth
... with tending (e.g., thinning) to influence stand development

With even-aged stands ...

... tend when immature

... regenerate when mature

... replacing the entire stand
... like the shelterwood method

... when an even-aged stand matures

One kind of even-aged reproduction method
... giving rise to a new even-aged community

NEVER do all three at the same time

... for EVEN-aged silviculture
UNEVEN-AGED

A community with trees that differ markedly in their ages …

… by convention the spread of ages exceeds 25% of the planned lifespan for an age class

… each stand having trees of different ages

… including young trees
… intermixed with an older one

… and another
... and even another

... and often more

... all growing together in the same stand
... but only one reaching maturity at a time

... with ages and sizes interspersed across a stand
... and in uneven-aged stands across a forest

So ...

Parts regenerated at different times …
… young, middle-aged, and old all present
... each comes of age at a different time
Uneven-aged lodgepole pine

The silvicultural system for uneven-aged stands
With uneven-aged stands …

… both tend and regenerate each time

Periodically …

… regenerating the mature trees

… thinning the younger age classes
SELECTION METHOD

... the uneven-aged reproduction method

... coupled with tending of the three or more age classes within a stand
**ALWAYS** do all three things with EACH entry

... for UNEVEN-aged silviculture

... *concurrent treatments*

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**TWO-AGED**

A community with trees of two distinct age classes

... 

... separated in age by *more than 20% of* the life span for each one
A young age class beneath older trees …

… through time the younger trees develop
... getting bigger and bigger

... we eventually remove the old trees and thin the remaining age class
... to regenerate a new one
... and start again
Two distinct age classes present …
… great difference in age between the two
… each comes of age at a different time
Two-aged lodgepole pine

Components of silvicultural systems for sustained management

Phase
- Regeneration

Component treatments
- Natural
- Artificial - seeding
- planting

Release treatments
- Pruning
- Thinning
- Intermediate treatments

Clearcutting method
- Shelterwood method
- Seed-tree method
- Selection method
- Other partial cuts
- Two-aged methods

The silvicultural system for **two-aged** stands
REGENERATE a new age class ...

... while TENDING the other

... but may TEND separately at intermediate stages

At maturity ...

... remove the old trees ... and thin the younger ones
1. We apply different **KINDS** of treatments or interventions at different stages of stand or age class development…

   … and these occur in a logical **SEQUENCE**

Conceptually, these designations imply at least two important concepts:
2. To adequately control stand establishment, composition, and development (growth) …

… we must also plan for the proper TIMING of the treatments

… to insure the sought-after effects

TIMING and SEQUENCE

as well as KIND …

We do this through the SILVICULTURAL SYSTEM
Pursuing the options …

… through silviculture

But what about intensity?

Financial factors often control intensity …

… the inputs of money, people, and other resources
... even when using efficient methods to implement the treatments

With intensity reflecting the inputs of funds, resources, and technology ...

Types of possible management policies

<table>
<thead>
<tr>
<th>Non-declining even flow</th>
<th>Even flow</th>
<th>Balanced structure</th>
<th>Trees after trees</th>
<th>Exploitation</th>
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Increased intensity of silviculture and management control

Appreciable inputs

Few inputs

(after D. Kotan, SUNY-ESF, 1984)
And remember Stone’s advice...

Each site can repay only certain levels of investments ...
The better sites support a higher intensity of use … 
... and repay with higher returns

Careful planning can integrate

economic

and

ecologic factors

Look at one model …

... to highlight the challenges …

... and the concerns
THE SILVICULTURE SURFACE
... a concept for management

Figure 2-7, in Nyland 2002

After Nowak, Briggs, Germain, and Nyland 2000

But the concept basis likely diminishes like this …

After Nowak, Briggs, Germain, and Nyland 2000
THE OBJECTIVE …

… to satisfy the economic benefits

but

… in an ecologically acceptable way
Yet economic constraints may limit actions …

... keeping you in a limited box

So move as high on the silviculture surface

as financial and other institutional constraints

allow at the moment
But keep things off the slope …

Exploitation often pushes stands over the edge …

After Nowak, Briggs, Germain, and Nyland 2000
Take care to cause no irreversible ecologic change …

insuring …

- trees after trees
- stable soils
- protected landforms

(e.g., intact drainages)

Silviculture makes the difference …
Background reading:


Sources cited:


