



Role of Silviculture in Forest Management

ESRM 323 – Practical Silviculture

Chapter 17 in Smith, *et al.*

Silviculture in Forest Management

A forester is an ecologist, a silviculturist, a manager of resources and people, and is business savvy; alert to the needs of markets

- Three primary tasks of forest managers:
 1. Determine the potential of a tract of land to produce desired benefits, products, and environmental services (as defined in goals), identify constraints on forestry practice;
 2. Plan how to achieve desired goals;
 3. Conduct the enterprise so that work and labor are in balance and financial targets are met.

Three Primary Tasks Detail ...

1. Determine potential of land ... This defines and prioritizes 3 forest functions as mgt. objectives
 - Productive functions
 - Wood products will remain the dominant income source
 - Secondary products: mushrooms, salal & ferns, wildlife
 - Protective functions
 - Control soil erosion, landslips, and avalanches, protect water supplies, provide habitat for plants and animals
 - Social functions
 - Employment, field sports, recreation

Three Primary Tasks Detail ...

2. Plan how to achieve desired goals

i. Choose silvicultural system(s)

- Pure, single or double cohort; pure, multi-cohort; mixed, single cohort; mixed, multi-cohort; coppice
- Silvicultural system embodies: method of regeneration, form of crop produced, orderly arrangement of crops over forest

2. (cont'd) Plan how to achieve goals

ii. Decide how to divide up forest for silvicultural purposes

- Working plan area is divided into compartments
 - Clearly recognizable on ground, marked on maps; follow road-lines, ridges, streams, etc.
 - Consist of single or several stands
 - Stand descriptions consist of soil & vegetation types, age class(es), species composition, structure, stage of development, site quality, area, access, windthrow hazard, health & quality
 - Stands are allocated to working circles, formed to satisfy a particular object of management – concentrated or dispersed

2. (cont'd) Plan how to achieve goals

iii. Decide how yields are to be sustained and regulated

- Sustained yield: regular and continuing supply of the desired benefits, products, environmental services to the full capacity of the forest w/out degrading the site. Requirements:
 - Soil and growing stock must be kept healthy and productive
 - Composition, structure, stocking of stands must match objectives and site capability
 - Arrange individual stands so tending / harvesting is efficient
 - Each working circle must have growing stock appropriately distributed over sizes and ages from youth to maturity
 - Reserves must be created as security against catastrophe

2. (cont'd) Plan how to achieve goals

iii. (cont'd) Sustain & regulate yields ...

- Area method of yield regulation
 - Divides total forest area into as many equally productive units as there are years in the planned rotation
 - Imitates agriculture – coppice, even-aged systems
- Volume method of yield regulation
 - “Allowable annual (or periodic) cut” is determined with due regard for rate of growth (current and potential) and for volume of growing stock, existing and desired
 - Depends on regulating diameter distributions – need sizes and kinds of trees desired for objectives
 - Given appropriate growing stock made up of proper size and kind of trees – obviates need for knowing rotation length and amount of area exposed to cutting

2. (cont'd) Plan how to achieve goals

iv. Decide how to harvest, process, market timber

- Harvesting system: combination of methods to fell trees, extract logs to roadside & hauling as constrained by climate, soil, terrain & timber markets,
 - Felling & extraction
 - Stump to road most costly: skidding, forwarding, cable systems
 - Road networks designed to meet harvesting needs usually satisfy other needs: people, animals, regeneration, tending, fire-fighting, other protective functions
 - Methods of extraction, road standards, and volume produced influence selection of road spacing; limits on # of stream crossings
 - Actual road length required to serve an area often exceed that which spacing dictates by 25 to 45%

2. (cont'd) Plan how to achieve goals

- iv. (cont'd) Decide how to harvest, process, market timber
 - Market values influence silvicultural treatments
 - Wood 'quality': fitness for a particular use
 - Timber 'quality': closeness to market specifications
 - Ideally, choose the harvesting system with lowest cost per unit volume delivered to market with least damage to site, residual stand

2. (cont'd) Plan how to achieve goals

- v. Decide how to design the forest for efficient functioning, sacrificing aesthetics as little as possible
 - Design: visual expression of ideas that give purpose and direction to a forest enterprise
 - Components of forest design:
 - Geology and surface features characterizing the landscape
 - Silvicultural system itself
 - Road network
 - External and internal boundaries and their treatment to protect growing stock from damage, maintain flora & fauna, enhance amenity

2. (cont'd) Plan how to achieve goals

- vi. Decide how forest enterprise will be organized for best use of land, labor and capital – including social functions
 - Recreation potential
 - Most popular and compatible forms of rec. are informal
 - Mixed stands, irregular structure, long rotations, open spaces, esp. in vicinity of towns, cities
 - Careful design of recreation sites needed to avoid degradation
 - Rights of user – e.g., grazing
 - Agro-forestry
 - Land use systems and practices in which trees & shrubs are grown together with agricultural crops & domestic animals

Three Primary Tasks Detail ...

3. Conduct the enterprise so that work and labor are in balance and financial targets are met (so that progress can be compared with the working plan)
 - i. Financial considerations
 - Net Present Value (NPV) – uses a set interest rate
 - All costs and revenues are discounted to the present
 - Used to choose between two courses of action
 - Regeneration technique, rotation length, thinning programs, logging methods
 - Always favors securing early returns & postponing costs, all the more so when interest rates are high

3. (cont'd) Balance work & labor ...

i. (cont'd) Financial considerations

- Internal Rate of Return (IRR)
 - Most often used to compare land uses
 - Looks at interest rate generated by project itself
 - IRR is break even interest rate where discounted revenues exactly equal discounted costs ($NPV = 0$)
- Financial maturity analysis
 - Considers the interest that growing trees are earning on their own value
 - Realizable value of a stand at any time is treated as an investment, rotation is ended when increase in value ceases to exceed a desired interest rate

3. (cont'd) Balance work & labor ...

i. (cont'd) Financial considerations

- Rotation length
 - Physical – aimed at maximizing yield presuming sustained yield in the long run in terms of mensurational units of yield
 - Fits best when need to guarantee a perpetual supply of timber to some local / regional forest industry when land is limiting factor
 - Financial – aimed at optimizing money returned on capital
 - Fits best when available capital for long-term silvicultural investment is major limiting factor

3. (cont'd) Balance work & labor ...

ii. Control of operations

- Cutting is the chief tool by which the forest is controlled
- Trees or stands to be cut, left or otherwise treated in any silvicultural operation can be designated by:
 - Specification in words
 - Use when unnecessary or economically infeasible to make sophisticated distinctions between trees
 - Avoid simple diameter limit, species specifications
 - Often requires careful compliance monitoring
 - Lay out small plots to demonstrate desired cutting

3. (cont'd) Balance work & labor ...

ii. (cont'd) Control of operations

- Physical marking
 - Less dependent on inspections
 - Can be figured as a per unit charge of product designated for harvest
 - Most silvicultural benefits come from increases in future production – more logically handled as per acre cost and the future yield thereof
- Some combination of “words” & “marking”
 - E.g., reserve all trees below certain merchantability limit (or a particular species) and specifically mark those above stated limit
 - Avoid confusion

3. (cont'd) Balance work & labor ...

iii. Contracts

- Parties
- Purpose
- Term
- Work description
- Liabilities & Penalties
- Payments & Considerations
- Execution

Summary Points

- A forester is an ecologist, a silviculturist, a manager of resources and people, and is business savvy; alert to the needs of the land and the status of markets
- Three primary tasks of the forest manager
 - Determine potential of land to produce desired benefits
 - Protective functions, productive functions, social functions
 - Plan how to achieve goals
 - Silvicultural system, working plan areas, sustained yield, harvesting operations, forest design
 - Balance work & labor meeting financial targets
 - Financials (NPV, IRR, FMA, Rot. Length), control operations