

Agri-Science 801A

Forest Management Principles



Forest Management Concepts



Forest Management Concepts

- Forest Management is a planned process or system used to tend an **entire forest area** or an **individual forest stand** for a particular goal or set of goals such as:
 - Timber products
 - Pulp, lumber, fuel, veneer, etc
 - Non-timber products
 - Nuts, berries, medicinals, etc
 - Wildlife
 - Recreation
 - And more.



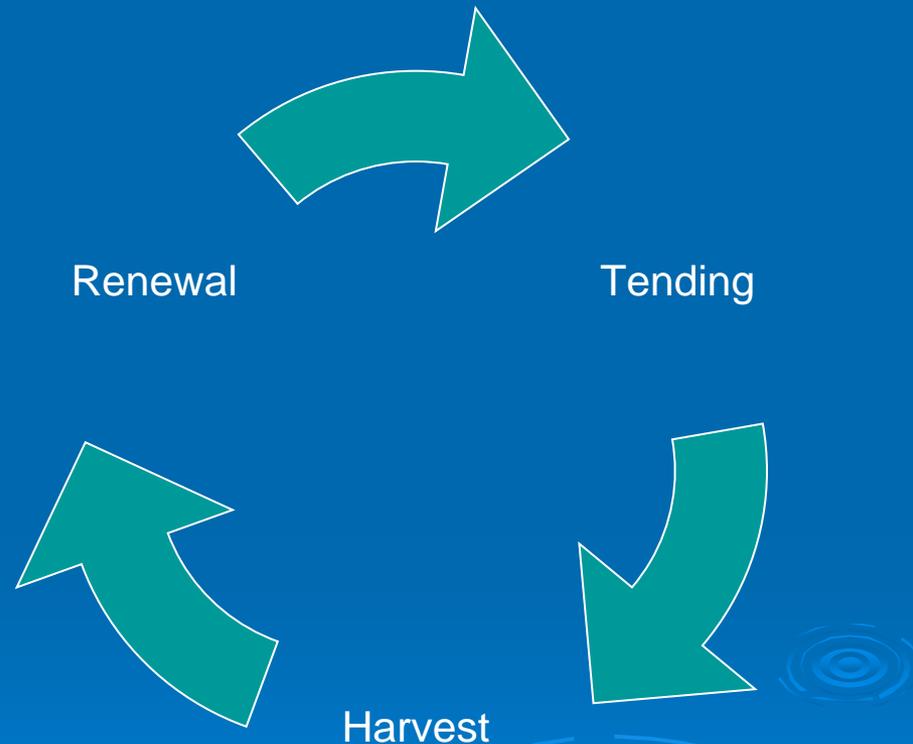
Forest Management Plans

- The process should begin with the development of a forest management plan.
- The plan helps the owner to manage the land by providing information such as:
 - A property map with tree species and outlines of individual stands.
 - An assessment of the capabilities of the forest & soils.
 - Product options and ideas.
 - Treatment recommendations such as harvest options, planting recommendations, trail layout, costs, etc.
 - Implementation timeframes.
- In order to be successful, the plan must match the capabilities of the forest with the land owners' objectives and goals.



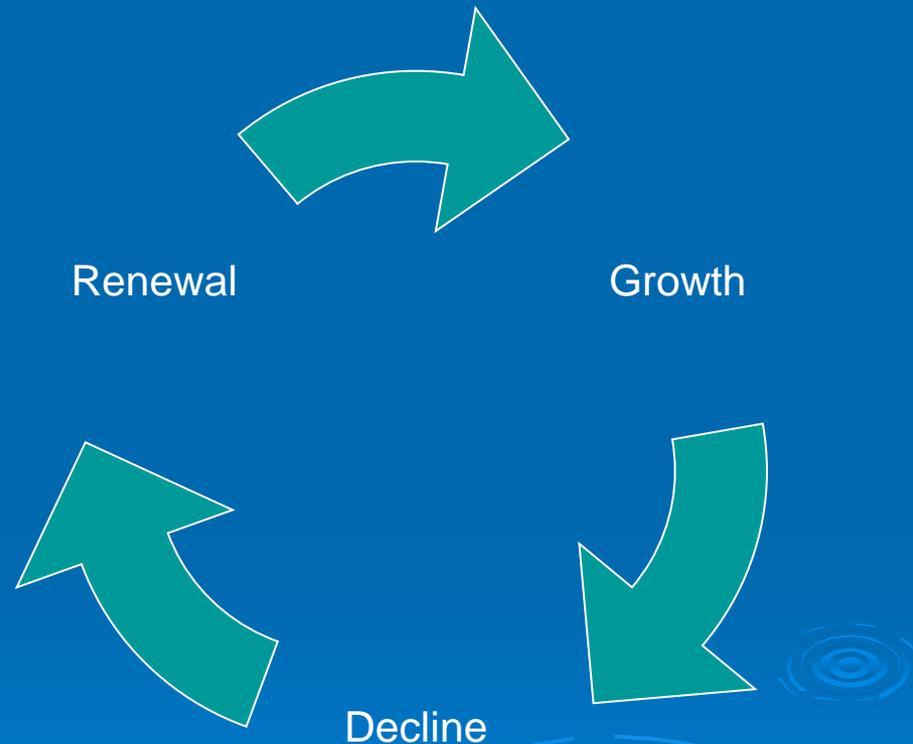
Forest Management Concepts

- **Forest Management is a cycle** of with several broad operational categories:
 - Establishment/renewal
 - Planting & Natural Renewal
 - Stand tending
 - Harvest systems
 - Roads & Trails
 - Forest Management Plans
- It can also include factors such as boundaries lines, insect and disease control, and much more.
- **The forest management cycle can start at any point** depending on the current condition of the stand or forest being managed.



Forest Management Concepts

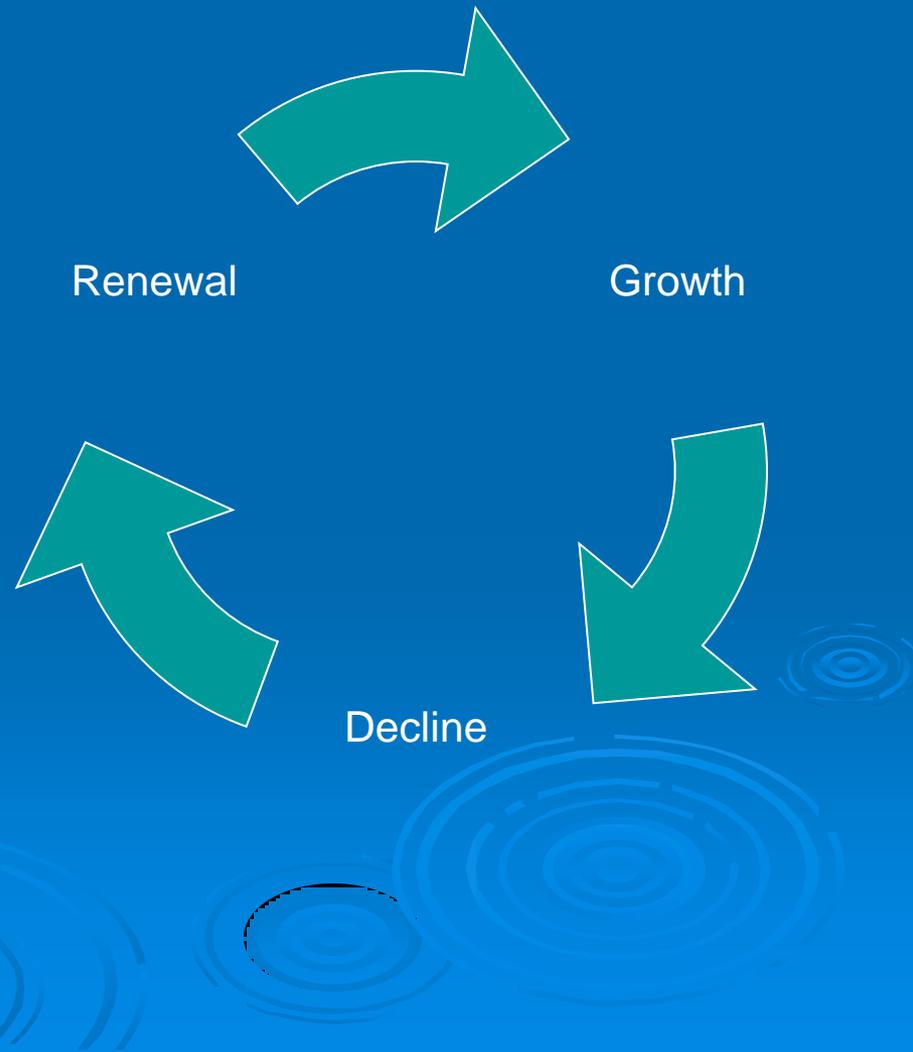
- The Management cycle reflects the way forest ecosystems function.
 - Young trees become established on forest sites suited to their needs.
 - As they grow, the trees compete against one another for growing space, nutrients, sunlight, and water.
 - Trees mature and begin to produce seed.
 - Trees reach old age or die from fire, disease and insects creating conditions for the establishment of a new forest.



Forest Management Concepts

➤ As each stage occurs, different types of forest plants and animals use the area and then as conditions change, they move on.

- There is no single type of forest which will support all species of wildlife.
- Most species use different forest types for different habitat requirements.
 - Nesting
 - Large live or dead trees
 - Food
 - Small seed bearing shrubs
 - Cover
 - Large branches or dense young trees



Establishment

- Planting trees is a form of establishment or **forest renewal**.
- Planting programs are often a key component of forest management programs.
- People plant trees:
 - To re-establish forest cover
 - Field, cutovers, forest fire, stream banks, etc.
 - For economic reasons
 - Produce a forest crop
 - To provide habitat requirements
 - Introduce species which are missing from the site or more suited to predicted climate changes.



Establishment.

Pre-harvest Survey

- A pre-harvest survey is done to determine the quantity and composition of any advance natural regeneration, and identify any gaps.
- Sites with adequate advance regeneration need to be harvested in a manner which protects the young trees and supports their development.
- If this survey identifies any deficiencies, trees are planted on sites to:
 - Ensure a prompt return to forest cover
 - Ensure the right combination of species
 - Fill gaps in the existing regeneration
 - OR a combination of these goals.



Establishment. Site Preparation

➤ Site Preparation

- Once the harvest has been completed, the site is prepared for planting.
 - about 6 months in advance of planting.
- This is done to:
 - Expose mineral soil & create planting sites.
 - Reduce slash (tree branches and tops).
 - Increases the composting rate of woody debris
 - Reduce insect problems.



Establishment.

Seedling Specifications

- Seedlings are matched to:
- Site conditions
 - Dry vs wet
 - Exposed vs sheltered
 - Grasses vs forest floor
 - Soil type
- Goals for the site
 - Economic
 - Habitat
 - Environmental protection
 - Probably a combination
- Existing Regeneration
 - Do the quality and quantity of existing species meet the land owner's goals?
 - Are additional species required?



Establishment.

Planting Specifications

- Planting density (trees/ha)
 - Forces the tree to grow straight up.
 - Reduces side-branching (fewer and smaller knots)
 - Reduces competition from unwanted plants.
 - Average of 2200-2500 trees planted/ha.
 - Trees are usually planted in rows and blocks of one or two species*.



* Different tree species grow at different rates, particularly during their first few decades – therefore, interplanting different species may not work.

Stand Tending. Year 0 – Year 10

- **Maintenance** (*sometimes called cleaning*) involves removing unwanted vegetation in young plantations or natural renewal sites to:
 - Select the desired tree species (planted or natural).
 - Provide the proper spacing (growing room) between trees.
 - Prevent shading from above.
- **Manual Maintenance**
 - Use of a brush saw to cut down unwanted trees and shrubs.
- **Chemical Maintenance**
 - Use of a herbicide to suppress unwanted vegetation until desired trees are free-to-grow.



Stand Tending. Year 10 - Year 25

- Pre-commercial Thinning (PCT) is a treatment designed to ensure that the desired trees maintain their growth rate and growth characteristics.
- The trees are usually too small to produce commercial products.
 - Direct cost to the owner
- PCT involves:
 - Selecting the desired tree species (planted or natural).
 - Providing the proper spacing (growing room) between trees.
 - Unwanted trees are usually dropped and left on the ground to decay.
- Manual PCT
 - Use of a chainsaw to cut down unwanted trees and shrubs.
 - Care must be taken to avoid damaging residual (standing) trees.



Stand Tending. Year 25+

- Commercial Thinning is a treatment designed to maintain growth rates **AND** generate an economic return for the land owner.
- Commercial thinning involves:
 - Selecting the desired tree species (planted or natural).
 - Providing the proper spacing (growing room) between trees.
 - Designing proper access routes through the stand to fell and remove trees safely and effectively
- May be done manually (chainsaw) or mechanically (harvester)
 - Care must be taken to avoid damaging residual (standing) trees.
- Reduces number of trees by 30 – 40% in each thinning
- Continues every 10 – 20 years depending on growth rates and markets.
- At Year 50, the owner should look to start new crop in understory by natural seeding/renewal.



Maturing Stands Year 50+

- At Year 50, the owner will begin to plan for the establishment of a new crop in the understory.
- Increase in sunlight from thinnings will create opportunities for natural renewal from the seed of the mature trees.
 - Species such as larch and red pine cannot renew themselves in their own shade.
- Encourages shade tolerant species.
 - May underplant if more shade tolerant species as required.



Harvest Systems

Clearcut

- Clearcutting is most common harvest methods used on PEI.
- Clearcutting is suited to:
 - Shallow rooted species such as spruce, fir and larch.
 - Overmature stands, or stands which have insect or disease problems.
 - Stands where worker safety is a concern.
 - Dead or dying trees
 - Sites suited to the renewal of shade intolerant or moderately tolerant species.
 - Sites which need full planting due to the lack of advance regeneration or the poor quality of the mature trees.
 - Old field sites.



Advantages: large, one-time economic return, safety, easy to plant, reduced fire potential, fewer roads/trails.

Disadvantage: no income next 40+yrs, sudden habitat and landscape change .

Harvest Systems

Clearcut

- Clearcuts can be designed to mimic common Acadian Forest disturbances such as fire and insect damage by.
 - Retaining cover patches with trees of different ages, species and heights.
 - Retaining travel corridors to permit wildlife to travel safely from forest block to forest block.
 - Conserving snags (dead standing trees) for cavity nesters.
 - Providing buffers around nesting sites and dens (*usually 100m buffer recommended*), and along streams, rivers and wetlands (*minimum 20 m buffer*).
 - Maintaining seed trees to provide seed for the next forest.



Harvest Systems

Strip and Patch Cuts

- Strip and Patch cuts are modifications of the clearcut system.
- Strip cuts:
- The owner marks off the stand in strips prior to harvest.
 - Strip width is usually 1.5 – 2 times the height of surrounding trees.
 - Narrow strips = long lived shade tolerant species.
 - Wider strips = more shade intolerant species.
- The strips renew themselves naturally, and then additional strips are harvested over the next 40 – 60 years.
 - Renewed strips are treated as young stands.



Advantages: less impact and habitat change, income spread out over longer period
Disadvantages: more reliance on natural renewal, timber price fluctuations.

Harvest Systems

Strip and Patch Cuts

- Patch cuts:
- The owner marks off patches in the stand prior to harvest.
 - Patch diameter is usually 1.5 – 2 times the height of surrounding trees.
 - Suited to longer lived shade tolerant species.
 - Bigger patches encourage more shade intolerant species.
- Patches renew themselves naturally and then more patches are harvested over the next 40 – 60 years.
 - Irregular cut edges create a more natural landscape.
 - Renewed areas are treated as young stands.



Advantages: less visual impact and habitat change, income spread out over longer period

Disadvantages: more reliance on natural renewal, larger road/trail network, harvest equipment on site more often over the next 60 years, worker safety.

Harvest Systems

Selection Harvest

- Selection harvest systems focus on individual trees or group of trees over a period of 60 – 100 years.
- The harvest is designed to ensure constant shade on the forest floor, so the canopy should have a high percentage of shade tolerant species.
 - White pine, red spruce, beech, yellow birch, sugar maple, etc.
- All trees are marked for either harvest or retention based on the long term goals for the stand.
 - Residual trees will provide seed for natural renewal.
 - Residual trees are to provide the best economic returns for the owner in years to come.



Harvest Systems

Selection Harvest

- Selection harvesting is designed to create and multi-aged forest over a period of several decades.
- The focus is create a more natural appearing forest, develop large diameter, high value logs, and reforest the site naturally.



Advantages: less landscape/habitat disruption, emphasis on small volume but high value forest products, spreads income out indefinitely, no need to plant.

Disadvantages: Costly and requires skilled workers and the right equipment, difficult to avoid hy-grading (*take the best & leave the rest*), as young trees grow, it becomes difficult to avoid damaging them during harvest or extraction operations, worker safety when felling among large standing trees.

Harvest Systems

Road and Trail systems

- In order to manage any forest, the owner must establish roads and trails suited to their harvest and management needs and which meet a variety of environmental standards.
- Roads and trails allow for:
 - Site access
 - Hauling routes
 - Fire control
 - Recreation
 - Wildlife viewing, and more.
- They are expensive to build and maintain, particularly bridges and culverts.



Forest Management Cycle Conclusion.

- As we have learned, Forest Management is a planned process or system used to tend an **entire forest area** or an **individual forest stand** for a particular goal or set of goals such as:
- Forest managers may be:
 - Individuals who own small parcels of land
 - Large forest companies
 - Government (crown or public lands)
 - Communities
 - Aboriginal groups
 - Or any combination.
- Planned forest management the conserves water, wildlife, recreation, aesthetics, wood and other values.
- Managed forests are:
 - renewable
 - accessible
 - and provide the basics of everyday life.

