Silviculture For Landowners

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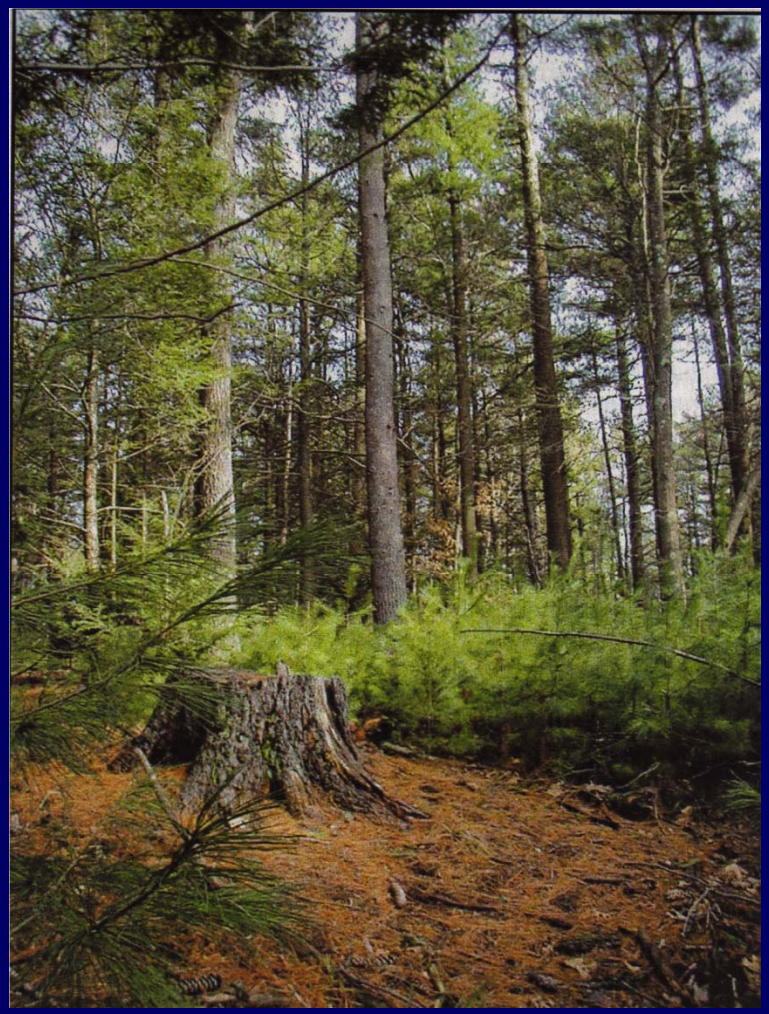
RIFCO Woodlands Owners Workshop

-

February 4, 2012



Natural Resources Conservation Service

With Thanks To…

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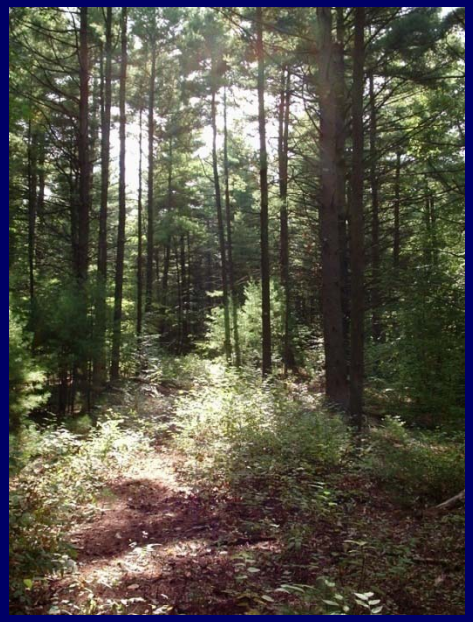
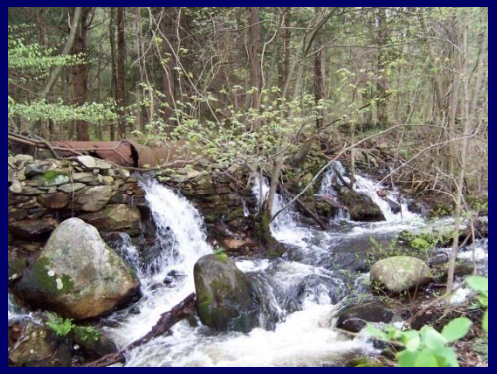
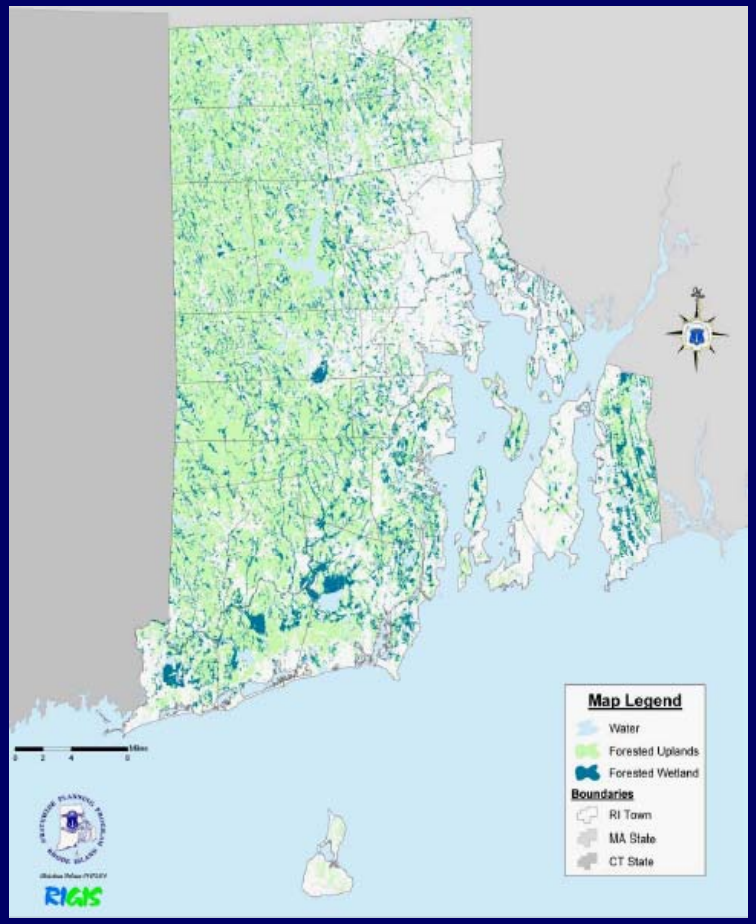
Outline

- A Short Account of a Long (Forest) History
- Some Forest Ecology Basics
- What is silviculture?
- Applying silviculture on your property
  - The landowner's objective
  - The landowner's responsibility
- Examples of silvicultural practices
- What silviculture is not
- Coping with Deer
- Alien (Non-native) Invasive Species

Rhode Island's Working Forestland

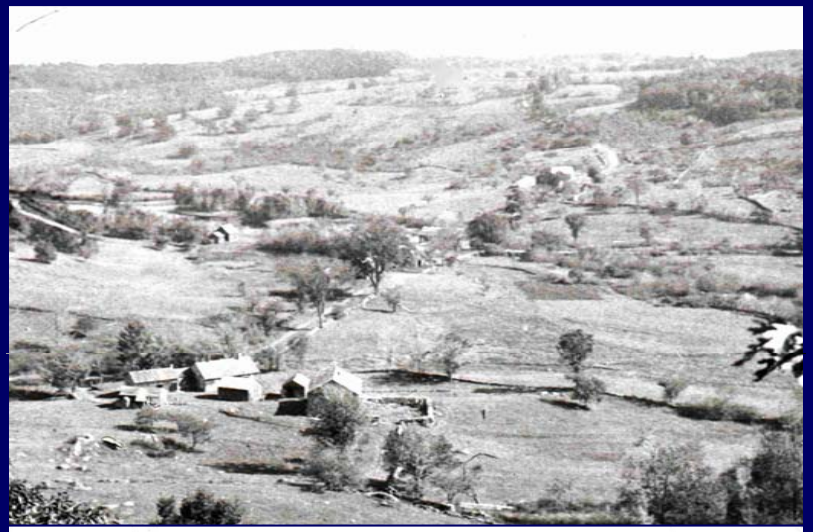






A 373 YEAR HISTORY:

From 98% to 25% to 55%:



LOTS OF PEOPLE; LOTS OF FOREST

- 365,000 acres:
  55% of state' land
- 1 million people on 669,000 acres

WE ARE:

- The 2nd Most Densely Populated State
- 14th in Percent of Forest Cover

55% by individuals & families

- 28% by non-forest corporations

Introduction to Forest Ecology

Some Basics

Ecology

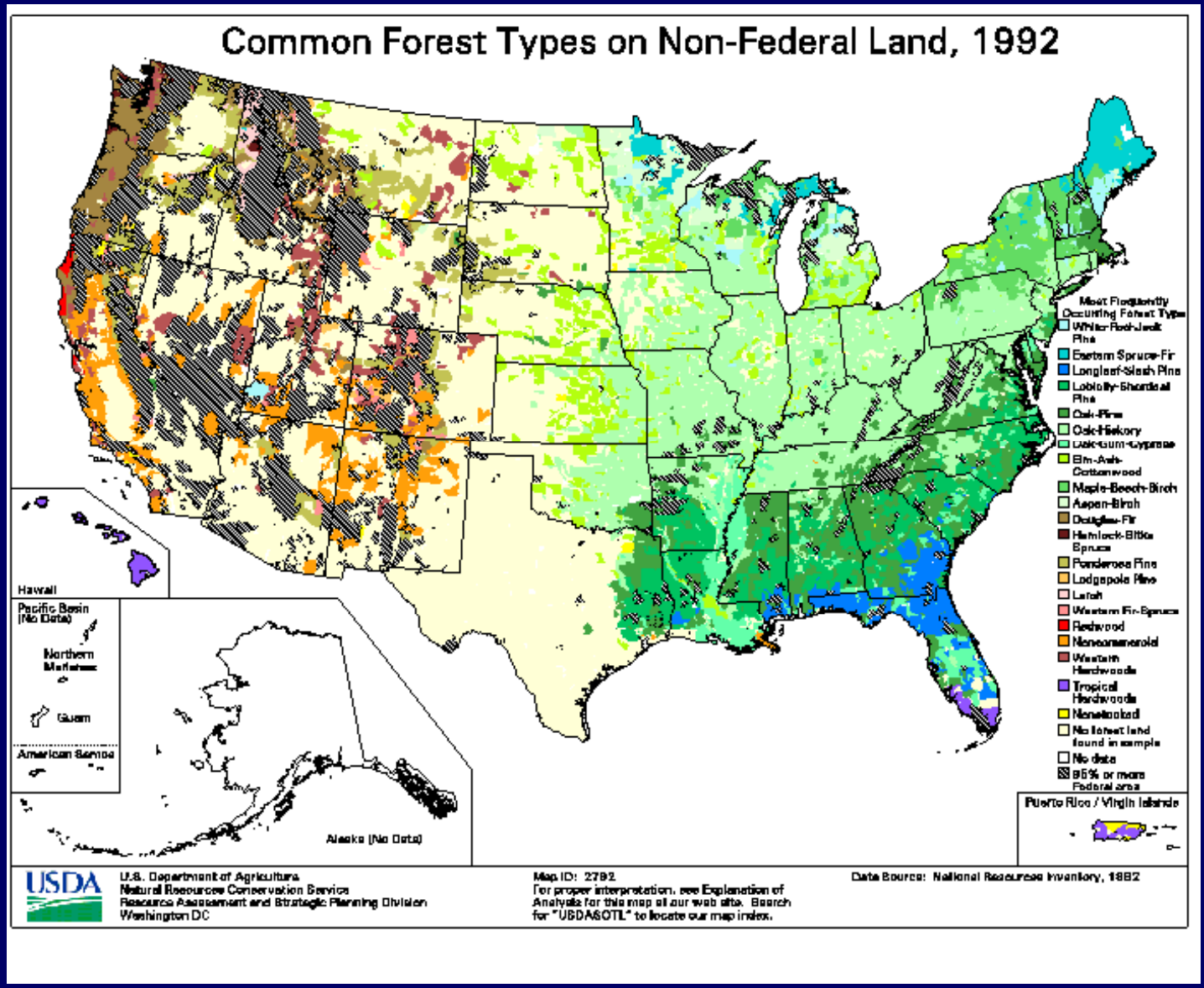
The ***science*** which deals with the ***interrelation of plants and animals*** to their ***environment*** and to site factors that operate in controlling their distribution and growth or more simply… the study of ecosystems (or more broadly, the study of nature). (Perry, 1994)

Forest Ecology

A ***forest ecosystem*** includes living organisms from the ***top of the canopy to the lowest layers*** affected by both ***Biotic and abiotic processes***

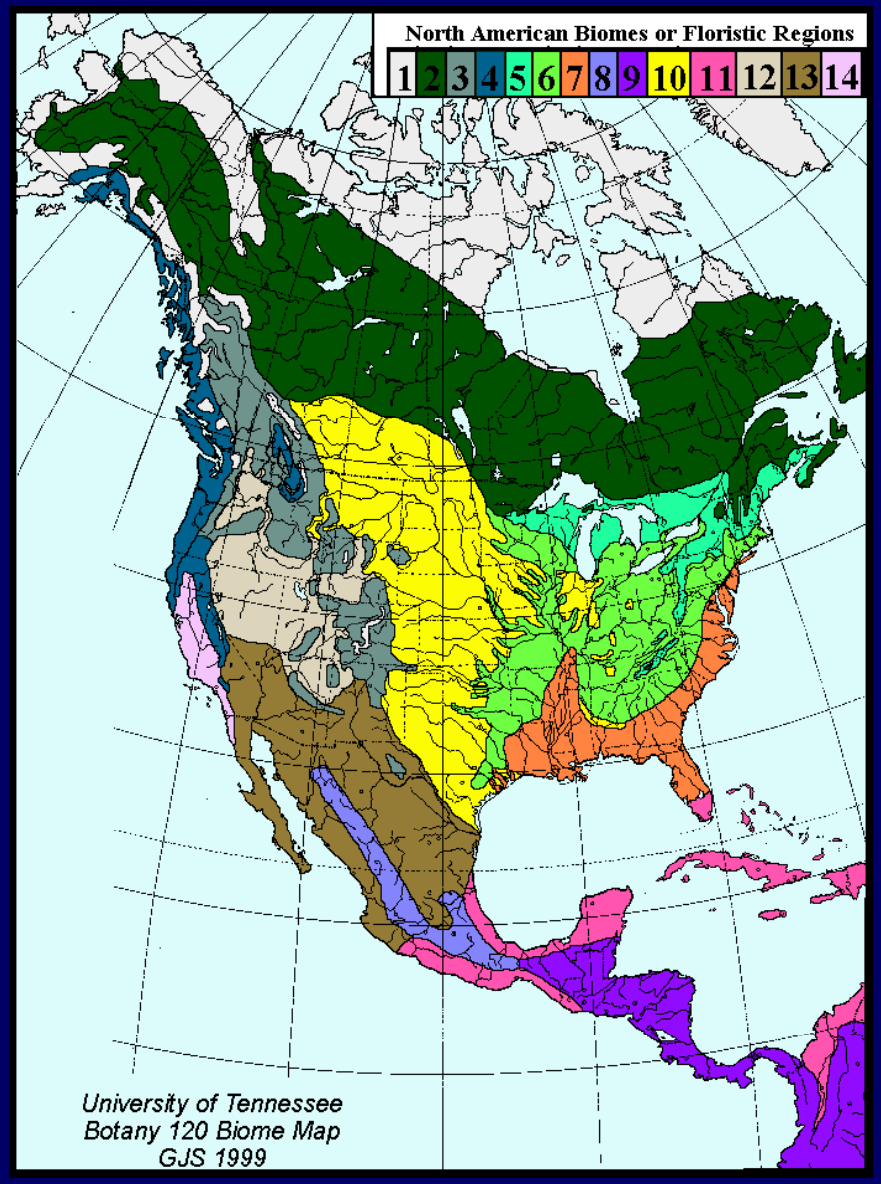
Some Forest Truisms

- ***Forests are dynamic;***
- ***Seedlings germinate, grow, compete with each other and with larger trees. Some survive for hundreds of years;***
- ***Change will happen;***
- ***Which species will be predominant in the future forest depends not only on climate and soils; but also on***
  - ***Management decisions made today;***
  - ***Changes in forest composition will affect the quality and variety of forest resources available to future generations and wildlife***

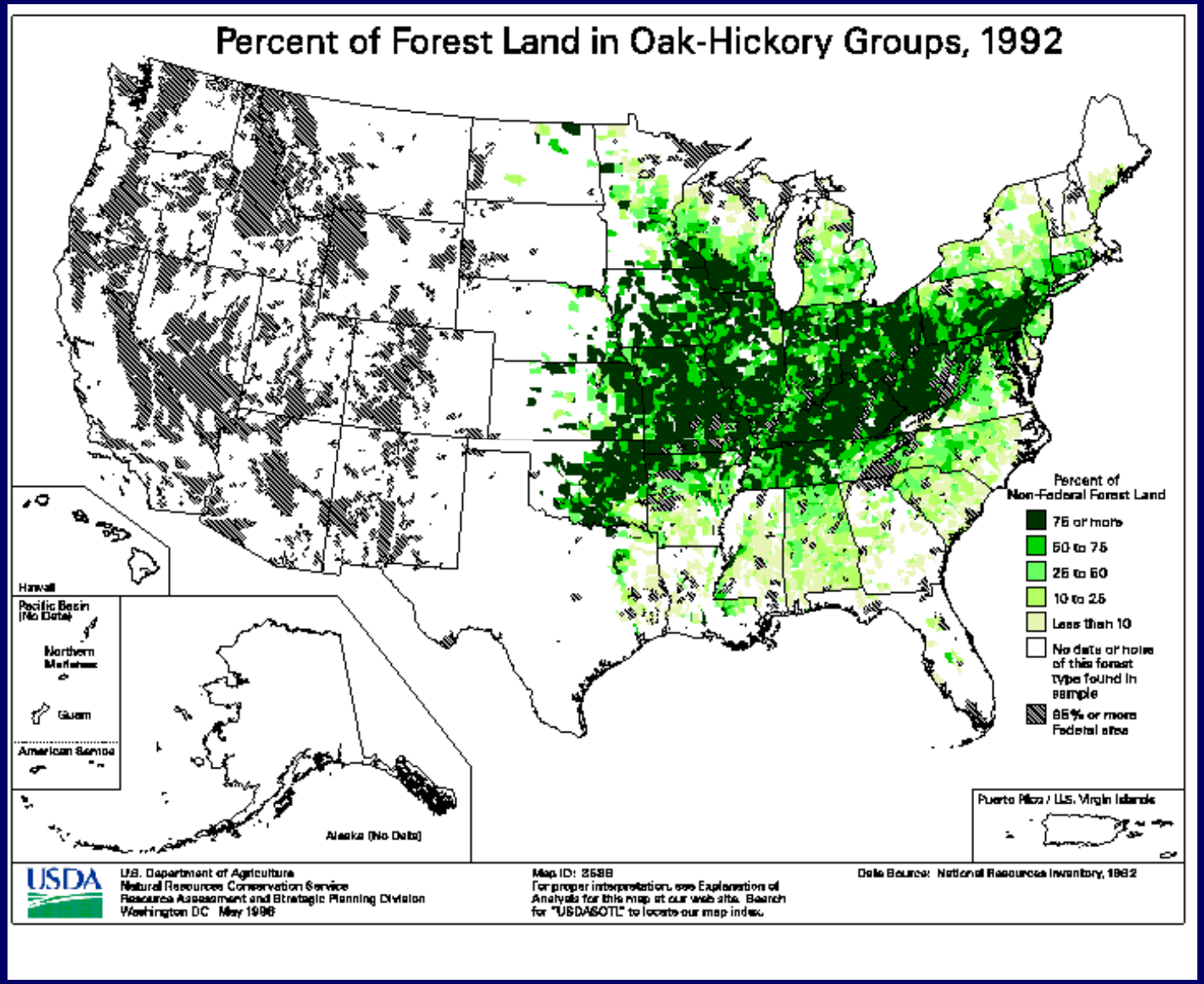


Common Forest North American Forest Types

North American Forest Biomes

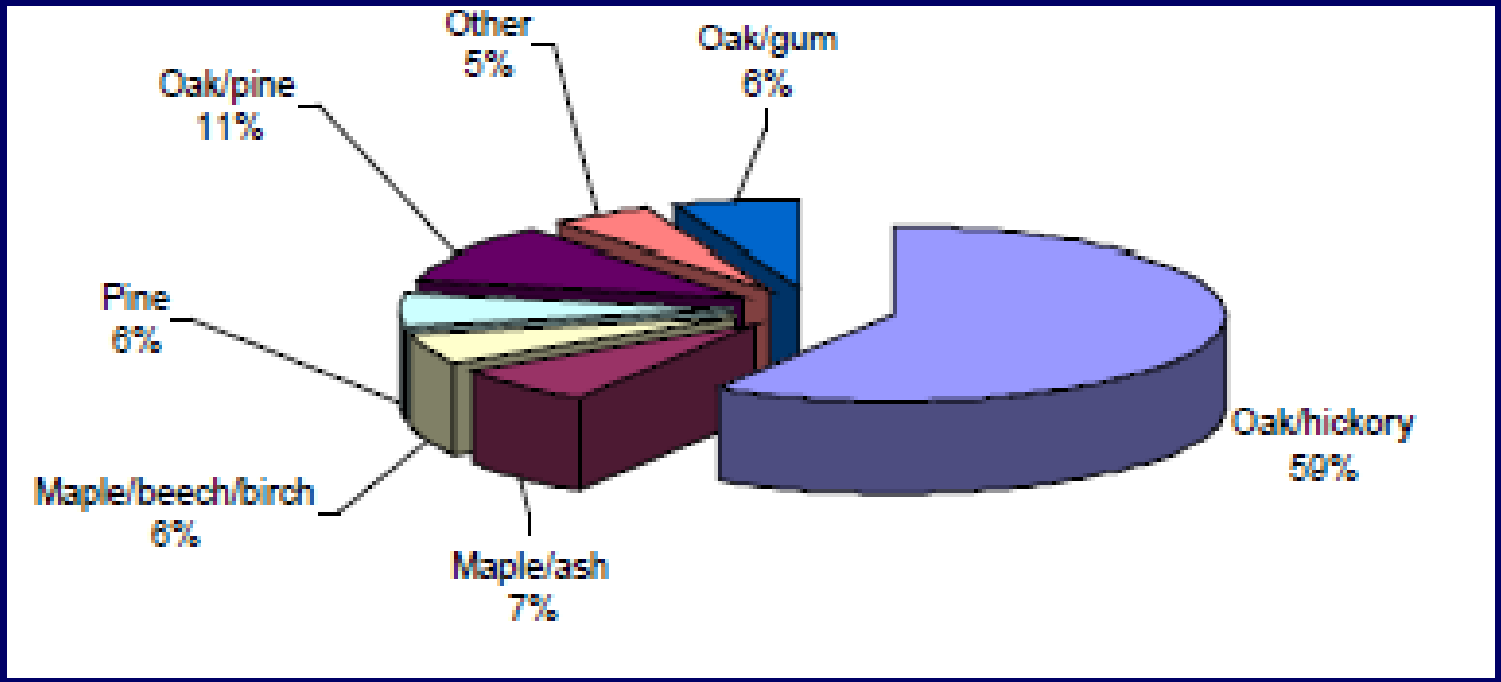


1- Tundra
2- Boreal
3- Rocky Mtn. Evergreen
4 - Pacific Coast Evergreen
5 - Northern Mixed
6 - Eastern Deciduous
7 - Coastal Plain Mixed Evergreen
8 - Mexican Montane
9 - Central American Rain
10 - Great Plains Grasslands
11 - Tropical Savanna
12 - Cool Desert
13 - Hot Desert
14 - Mediterranean Shrub



Oak-Hickory Forest Type

White Pine/Red Pine
Oak/Pine
Oak/Hickory
Elm/Ash/Red maple
Oak/Gum/Atlantic White Cedar



Common RI Forest Types

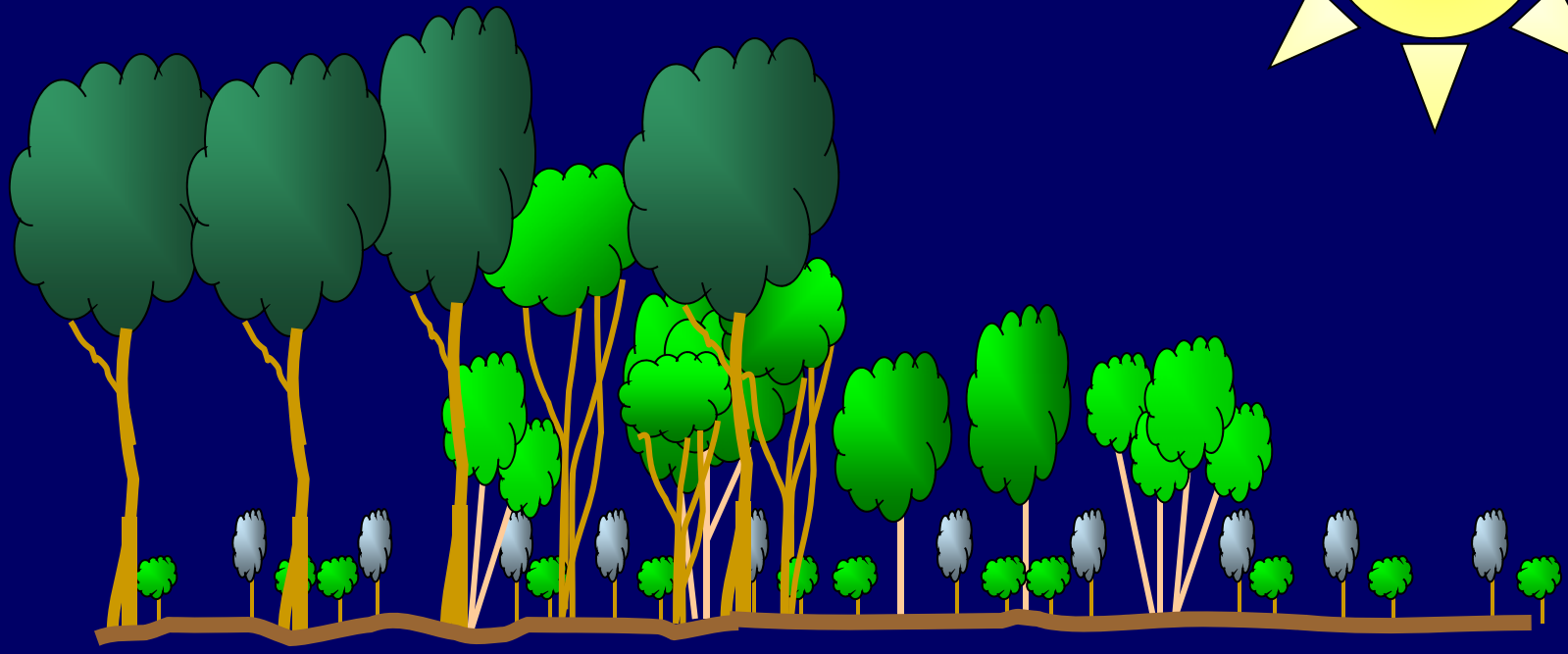
FOREST ECOSYSTEM FUNCTION

Limiting Factors

Environmental factors:

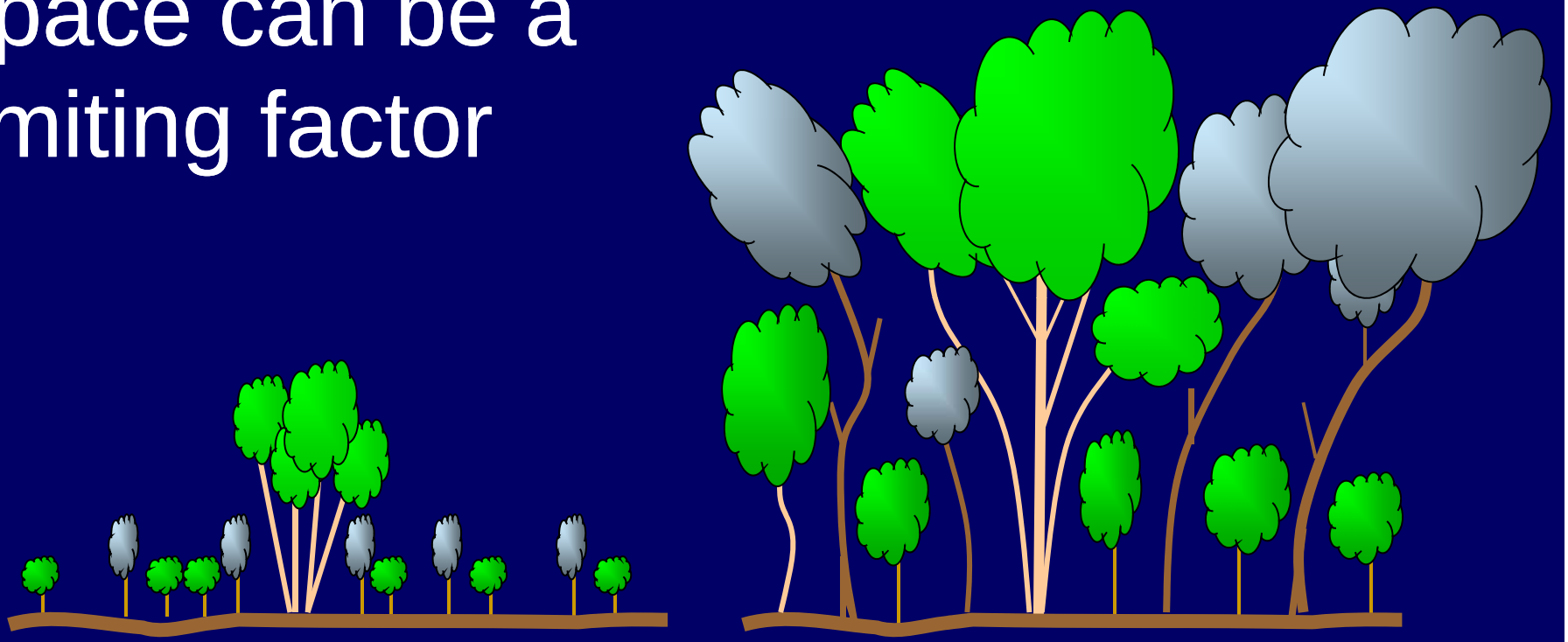
- **Abiotic**
  - **Light & space**
  - **Moisture**
  - **Soil**
- **Biotic**
  - **Competition**
  - **Browsing**
  - **Insects & diseases**

Sunlight as a Site Factor



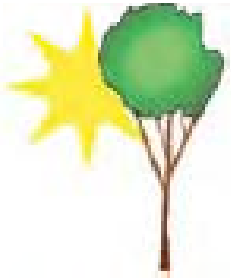
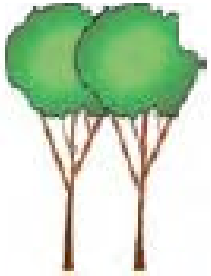
Each layer of the forest canopy intercepts light

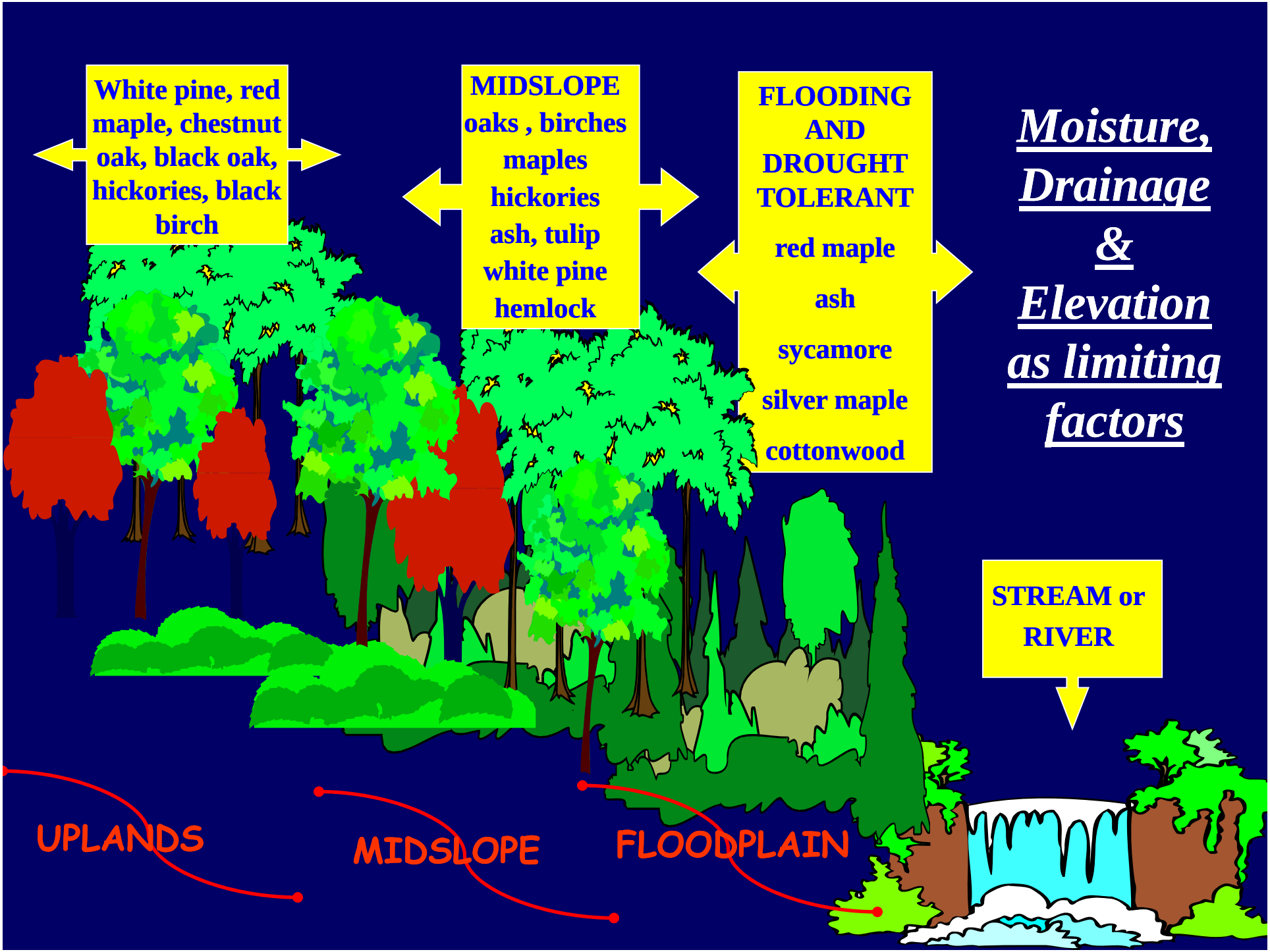
Lack of light and space can be a limiting factor



Taller competing stems can lead to sweep and crooks in other stems during stand development

Shade Tolerance

Intolerant	Midtolerant	Tolerant
		
Needs full sunlight	Grows in partial sunlight	Endures forest shade
Common Tree Species		
Tulip poplar	Red, black, and scarlet oak	Hemlock
Paper and gray birch	Shagbark hickory	Sugar, red, and striped maple
Bitternut and mockernut hickory	White and chestnut oak	Beech
Aspen	Eastern white pine	Basswood
Ash	Black and yellow birch	
Pin cherry	Pepperidge	
Species Characteristics Analogy		
High stakes gambler	*Investor*	*Miser*
Fast growth rate	Moderate growth	Slow growth rate
Few reserves	Some reserves	Large reserves
Short lifespan	Medium lifespan	Long lifespan
High mortality	Moderate mortality	Low mortality


White pine, red maple, chestnut oak, black oak, hickories, black birch
MIDSLOPE
oaks , birches
maples
hickories
ash, tulip
white pine
hemlock
FLOODING AND DROUGHT TOLERANT
red maple
ash
sycamore
silver maple
cottonwood
Moisture, Drainage & Elevation as limiting factors
STREAM or RIVER
UPLANDS
MIDSLOPE
FLOODPLAIN

Putting It All Together
SITE: Soil, Moisture, Elevation, Aspect, Slope, etc.

Putting It All Together

SITE: Soil, Moisture, Elevation, Aspect, Slope, etc.

Site Quality and Topographic Position

Poor sites have low fertility and dry soils. They are commonly found on ridgetops, swamps, and where soils are very sandy.

Average sites have intermediate soil moisture and fertility. They are commonly found on hillsides.

Good sites have high fertility and abundant soil moisture. They are commonly found in valleys and lower slopes or benches on hillsides.

FORESTS…*and how we "see" them*

FORESTS are comprised of STANDS

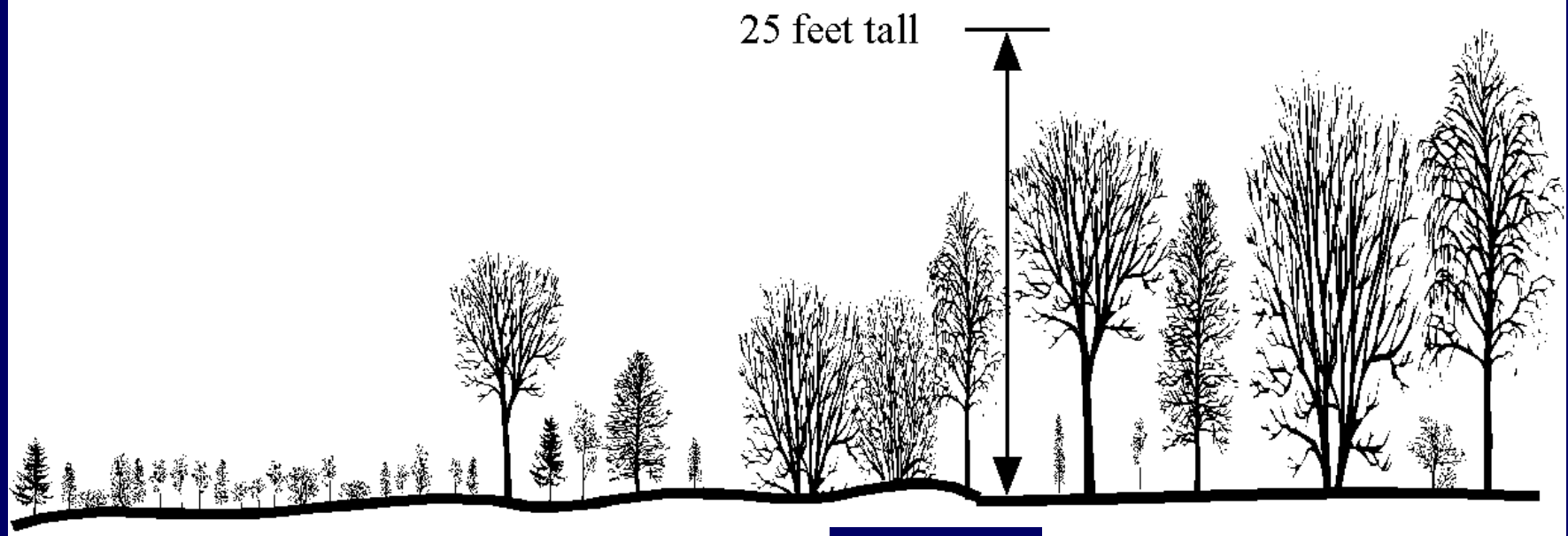
STANDS are comprised of TREES,
and other components.

A STAND is the essential unit of silviculture,

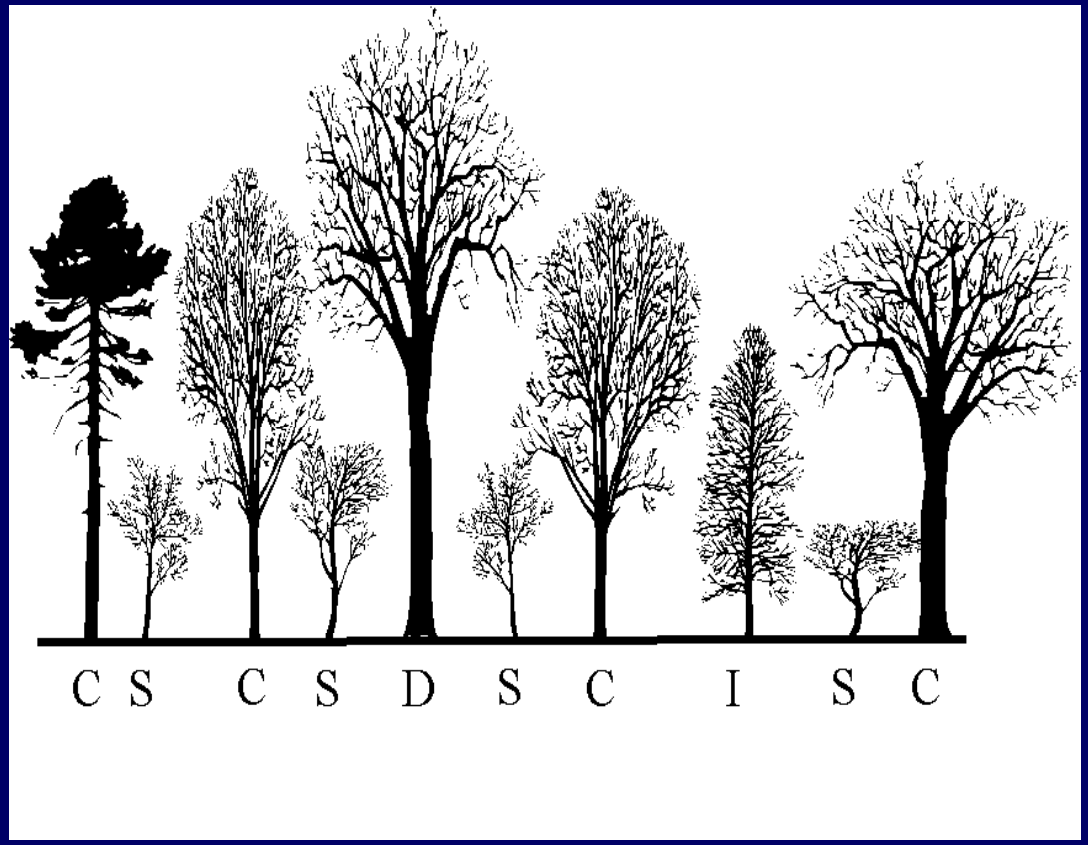
"a contiguous group of trees sufficiently uniform in species composition, age class arrangement, and condition so as to be a homogeneous and distinguishable unit".

A forest is essentially a collection of stands.

Early stand development



Crown classes – canopy position



- **Upper canopy**
  - D (dominant)
  - C (codominant)
- **Lower canopy**
  - I (intermediate)
  - S (suppressed)

SUCCESSION - What a Concept!

Depends on the history of disturbance,

and

the source or origin of new growth.

Natural:	**Human:**
wind	**harvest**
fire	**clearing**
disease/insect	**conversion**

Seed or Sprout

In General:

Shade intolerant
Short life span

Shade tolerant
Longer life span

Gray birch	**Tulip, Ash**	**White pine**	**Black birch**	**Hemlock**
Cherry sp.	**Red Oaks**	**White oaks**	**Sugar Maple**	**American Beech**
Cedar (juniper)	**Hickory**	**Red maple**	**Yellow Birch**	**Ironwood**

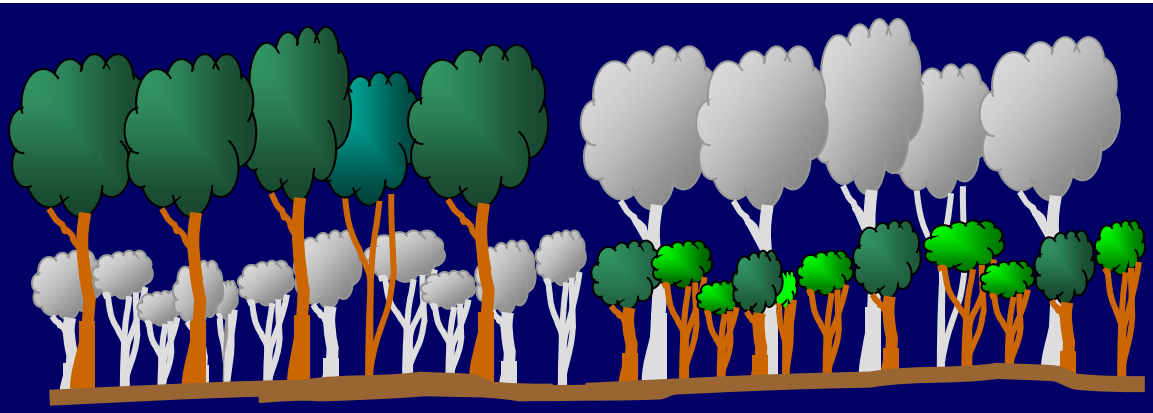
Forestry ***practically affects*** succession by any treatment within the forest

1. ***Planting will speed-up or reverse succession*** by establishing species that are characteristic of earlier or later stages of succession.
2. ***Improvement cut will speed-up or set-back*** succession depending on whether early or late succession species are favored.
3. ***Selection harvest can maintain*** a mature stand structure and composition without allowing succession to proceed to an over mature or climax situation

Disturbance: The Agent of Change

~ Type, Intensity and Frequency ~

Type:

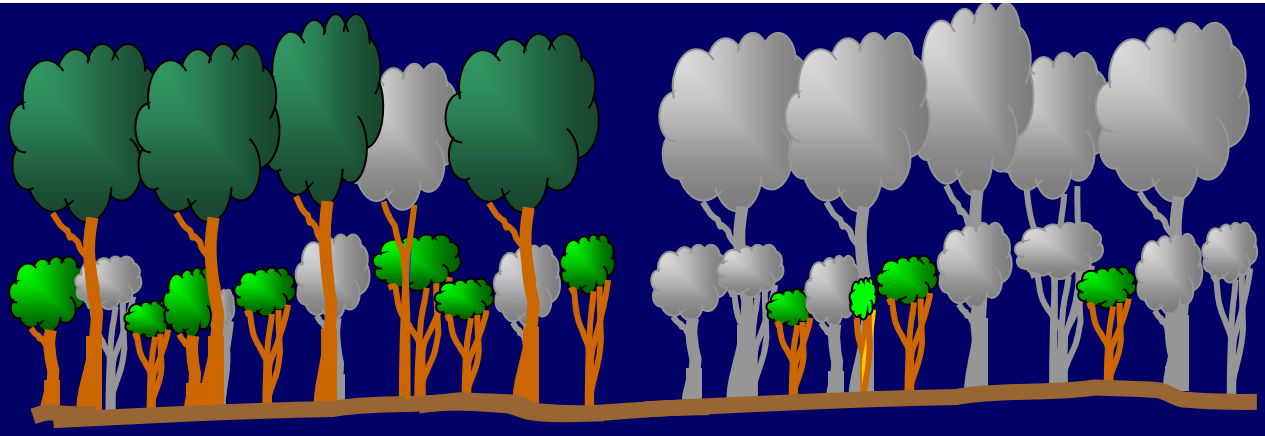


Low (understory) disturbance

High (overstory) disturbance

Disturbance types vary from those that remove the smallest trees in the understory (grazed forest at top) to those that predominantly remove the largest trees (microburst at bottom).

Intensity:



Single tree mortality

Stand replacement

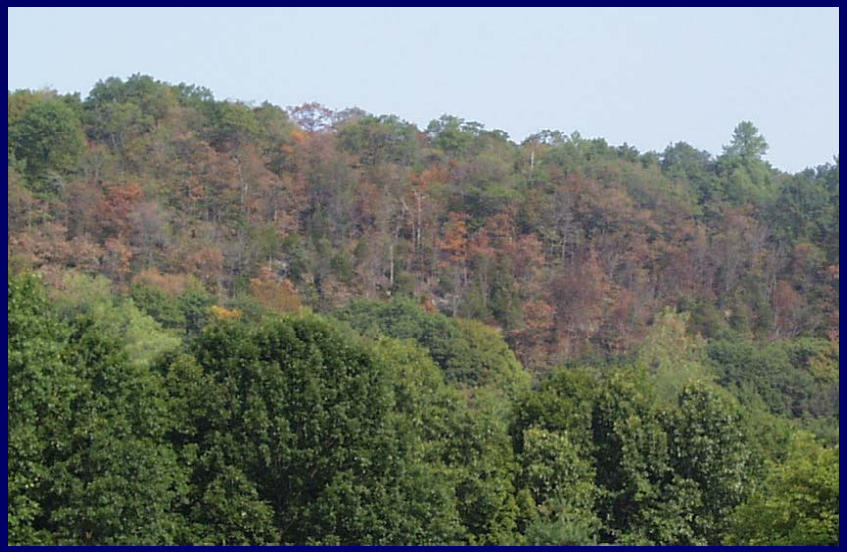
Single tree mortality

Small windthrown groups

Complete stand removal

Frequency:

Forest fire suppression in the early 1900s.



Drought effects

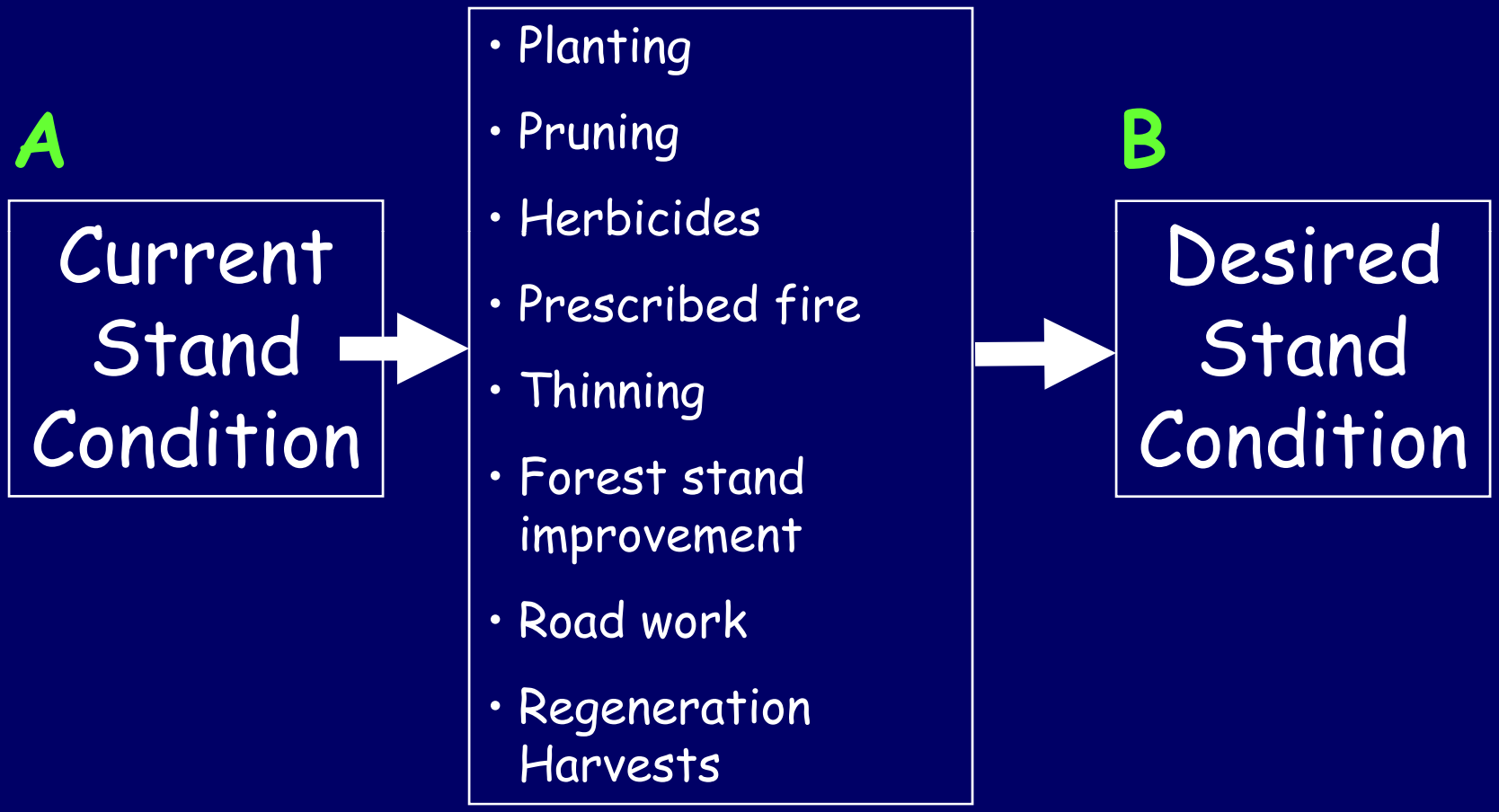
Ice storms periodically open forest canopies

Major hurricane strikes RI about every 100

What is Silviculture?

- A means to an end
- Tool to “control” forest vegetation

Getting from Point A to Point B



Ecological Forestry

"Using knowledge of natural disturbance regimes and ecological processes *to make management decisions about* …"

- Stand structure (vertical and horizontal)
- Rotations and cutting cycles
- Species composition
- Regeneration methods
- Other biodiversity issues

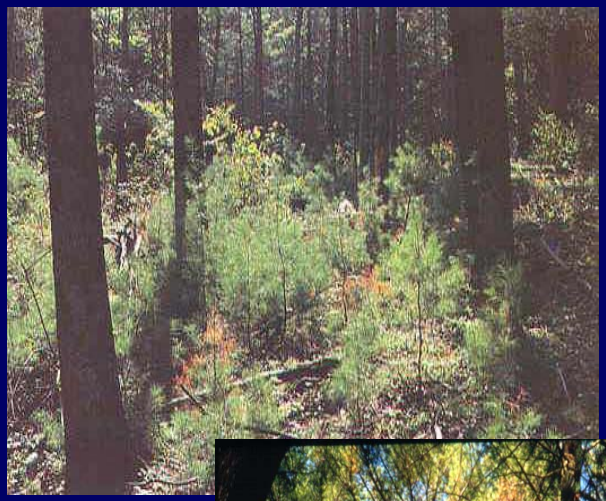
Mimicking Forest Disturbance to Influence Forest Composition

Thinning a stand by removing the smaller trees (right) will mimic some conditions created by a wildfire the kills all but the largest trees (left).

Clearcutting (right) mimic natural process such as a hurricane (left).

SILVICULTURAL CYCLE

- **Establish Stand of Desired Trees**
- **Weeding**
- **Intermediate Thinnings**
- **Promote Growth of Crop Trees**
- **Establish and Release Regeneration**



Silviculture = Applied Forest Ecology

- Silvi = Culture =

- **The (art and) science of controlling the Establishment, Composition, Growth, and Quality of forest stands to achieve the objectives of ownership.**

Application of Silviculture (3 parts)

- Methods of Regeneration
  - Act of replacing old trees artificially or naturally over a time period ranging from 1 year to 50 years or more.
- Intermediate Cuttings
  - Treatment (cutting) during a portion of rotation not included in the regeneration period
- Protection

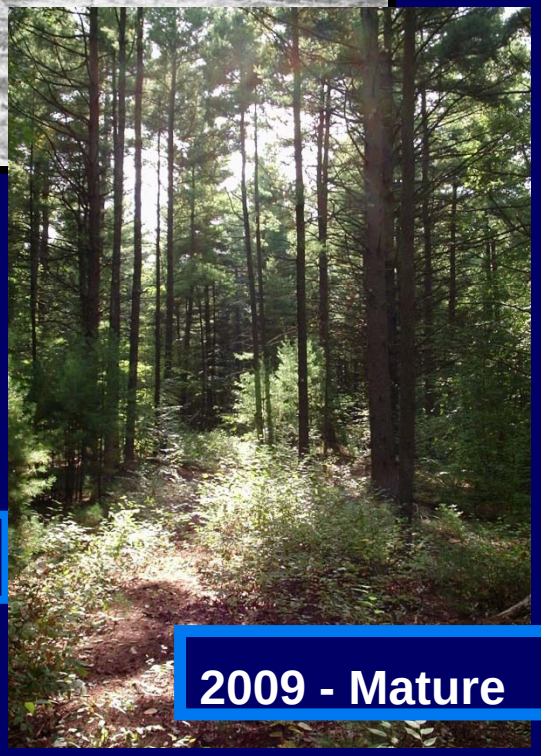
Eastern White Pine Management over 70 Years

1930 - planting

1950 - pruning

1940 - brush cutting

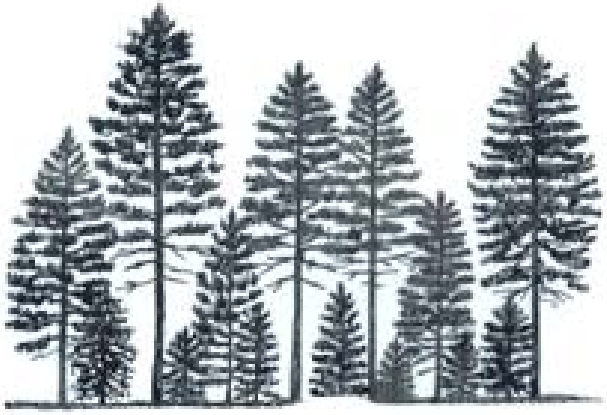
1970 - thinning



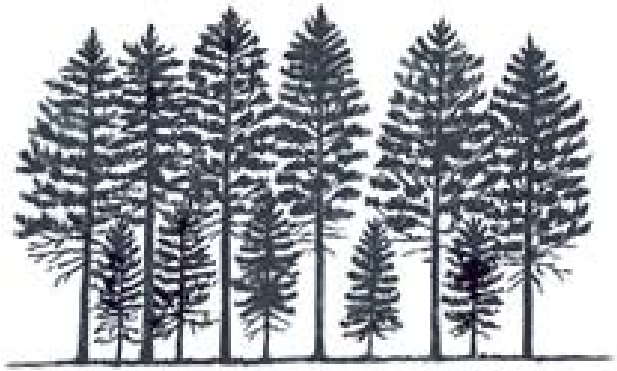
2009 - Mature

Silviculture

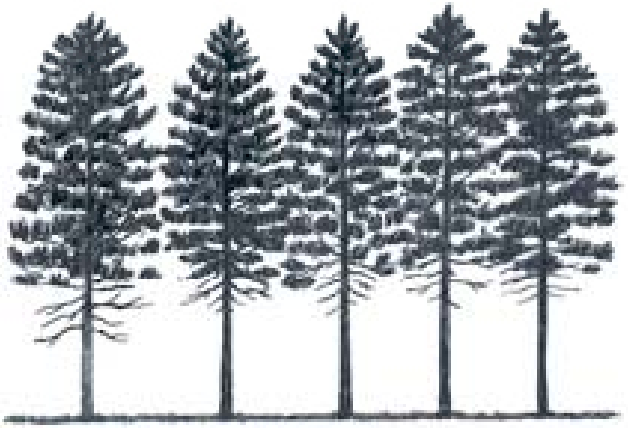
- **Silviculture is a broad set of practices used to achieve a desired future condition**
- **Silviculture is often divided into two categories:**
  - **even-aged and**
  - **uneven-aged management**



Uneven-aged: a stand with trees of three or more distinct age classes, either intimately mixed or in small groups.



Two-aged: a stand with trees of two distinct age classes separated in age by more than plus or minus 20% of the rotation age.



Even-aged: a stand composed of a single age class of trees in which the range of tree ages is usually plus or minus 20% of the rotation age.

Even-Aged Systems

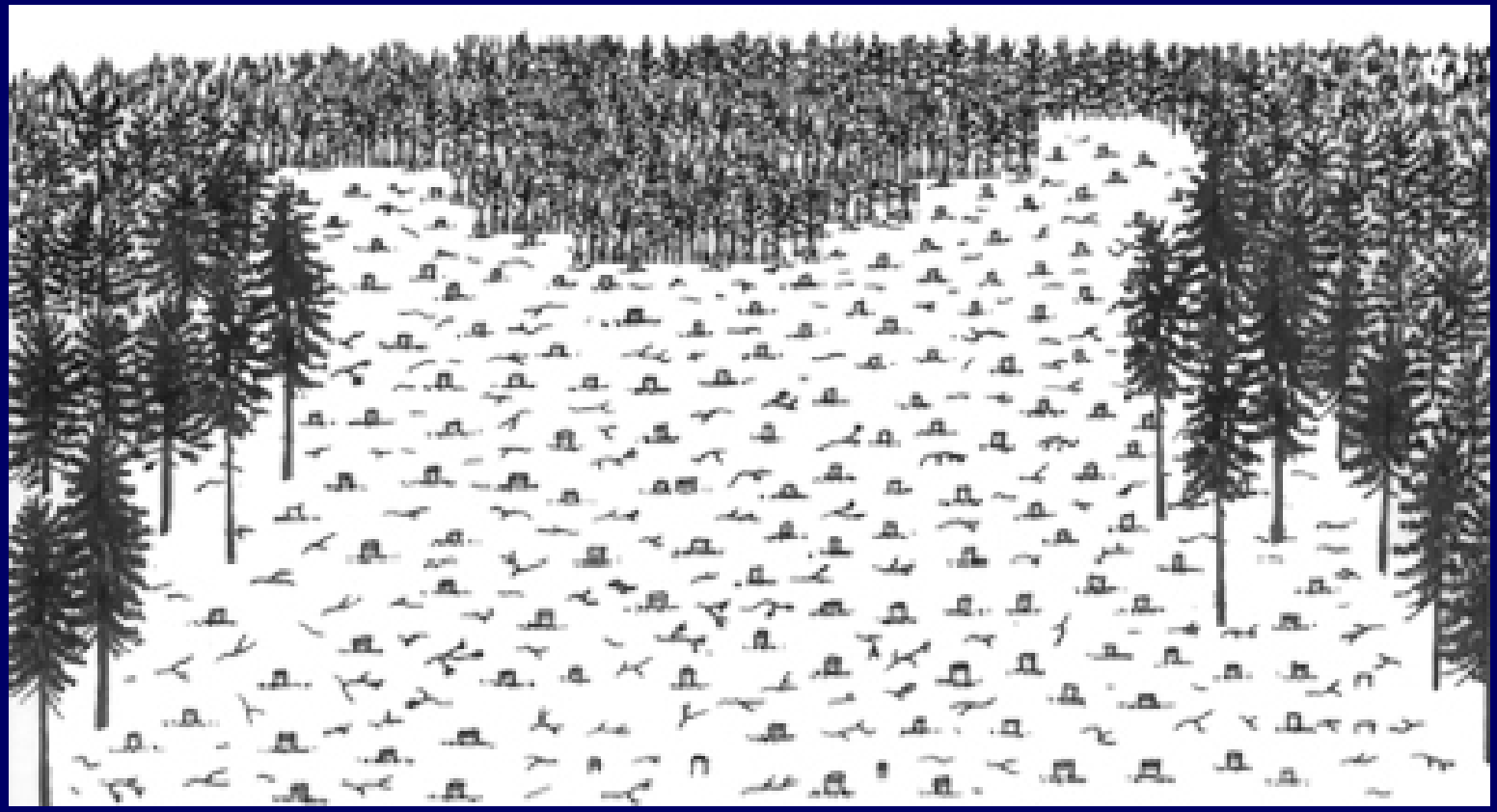
- Even-aged stands in which all of the trees are approximately the same age, are generated in response to natural or human-caused disturbance that suddenly removed the previous stand.
- Essential for shade-intolerant species
- Four Regeneration Systems
  - Clear Cutting
  - Seed Tree
  - Shelterwood
  - Coppice

Clearcutting

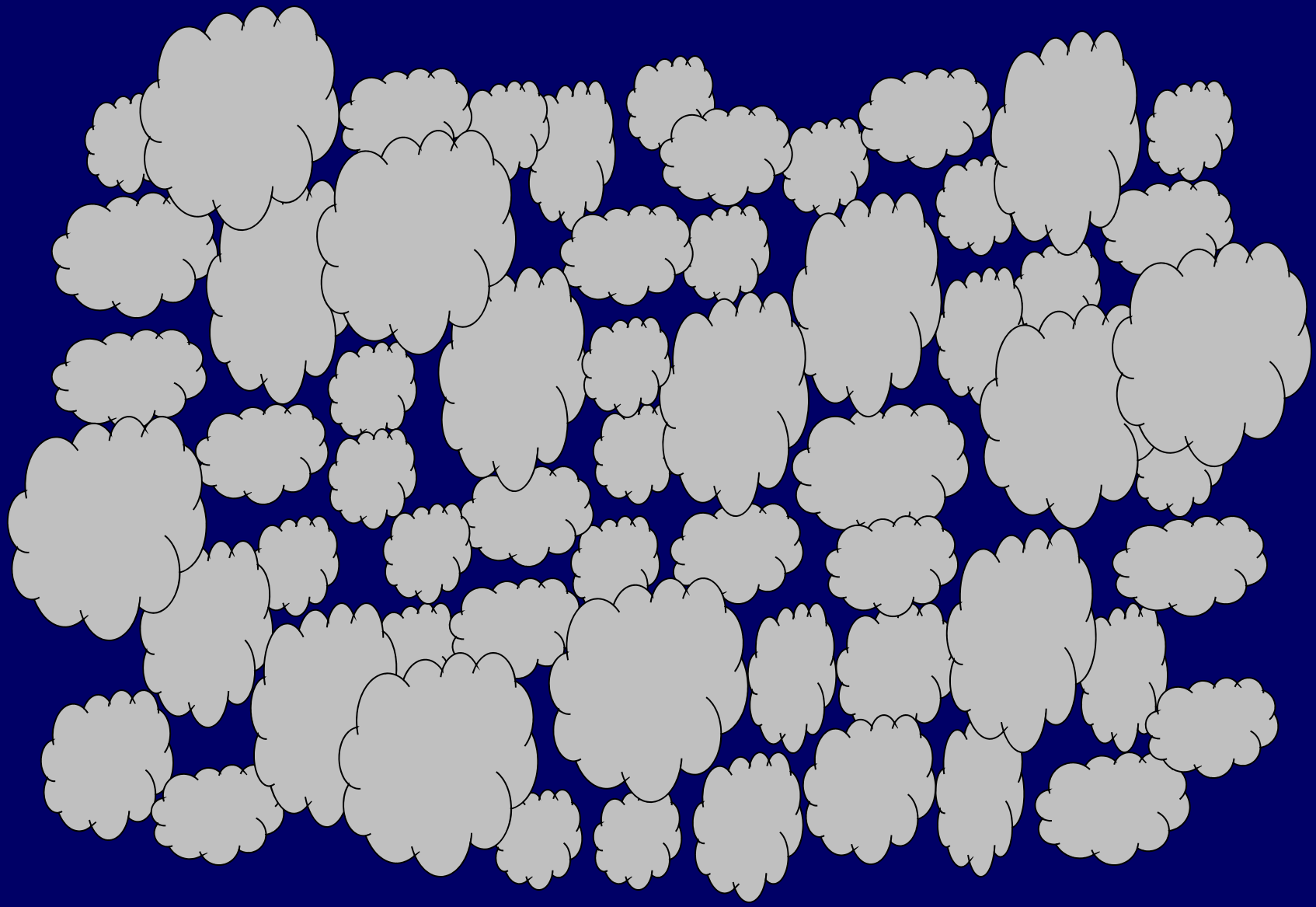
- In clearcutting, all trees on the harvest unit are felled. Clearcutting can be appropriate in forest types in which the dominant species are intolerant of shade and dependent upon severe disturbances such as forest fires for their perpetuation.

Clearcutting

Even-aged Management System



Silvicultural Clearcut

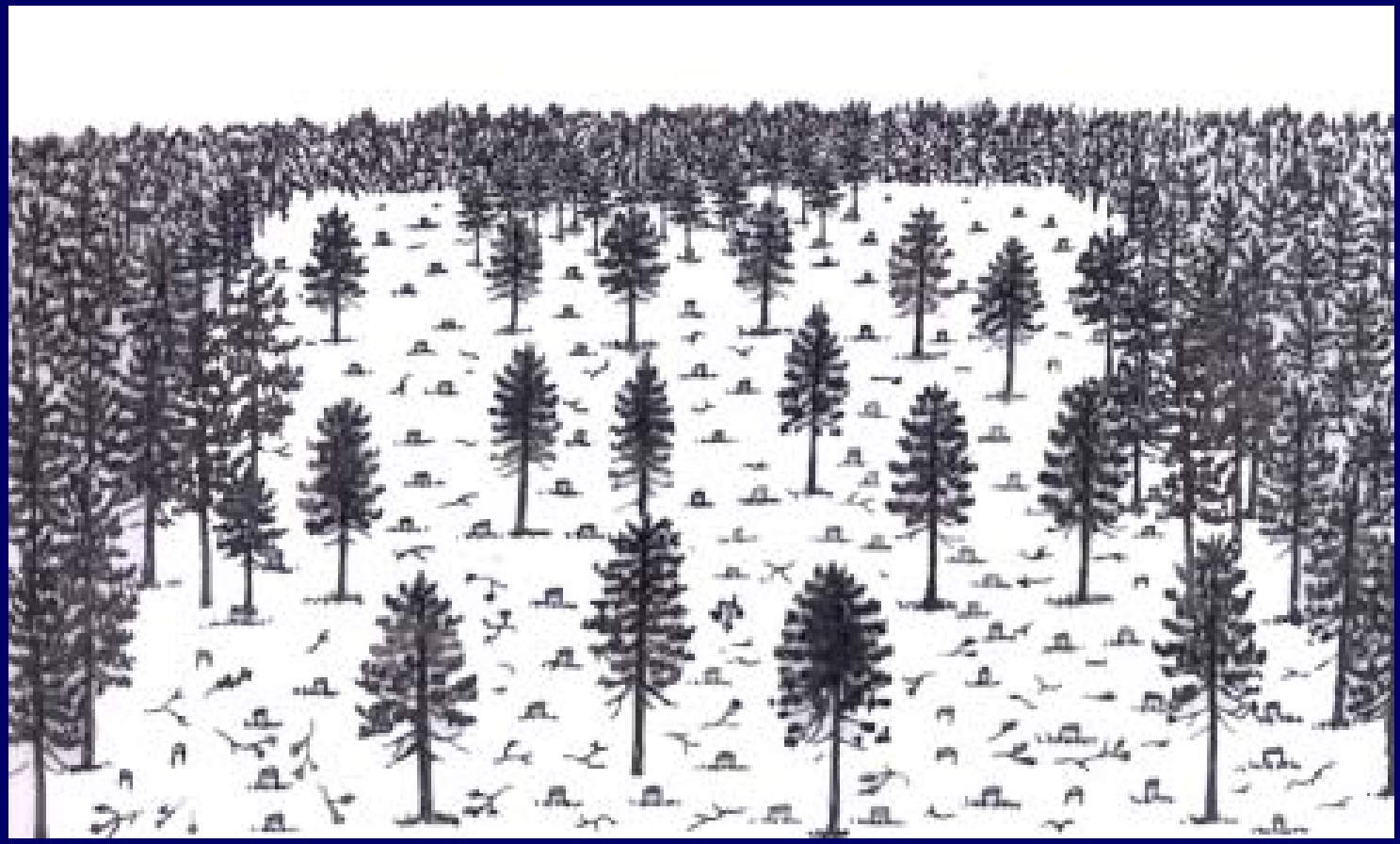


Silvicultural Clearcut

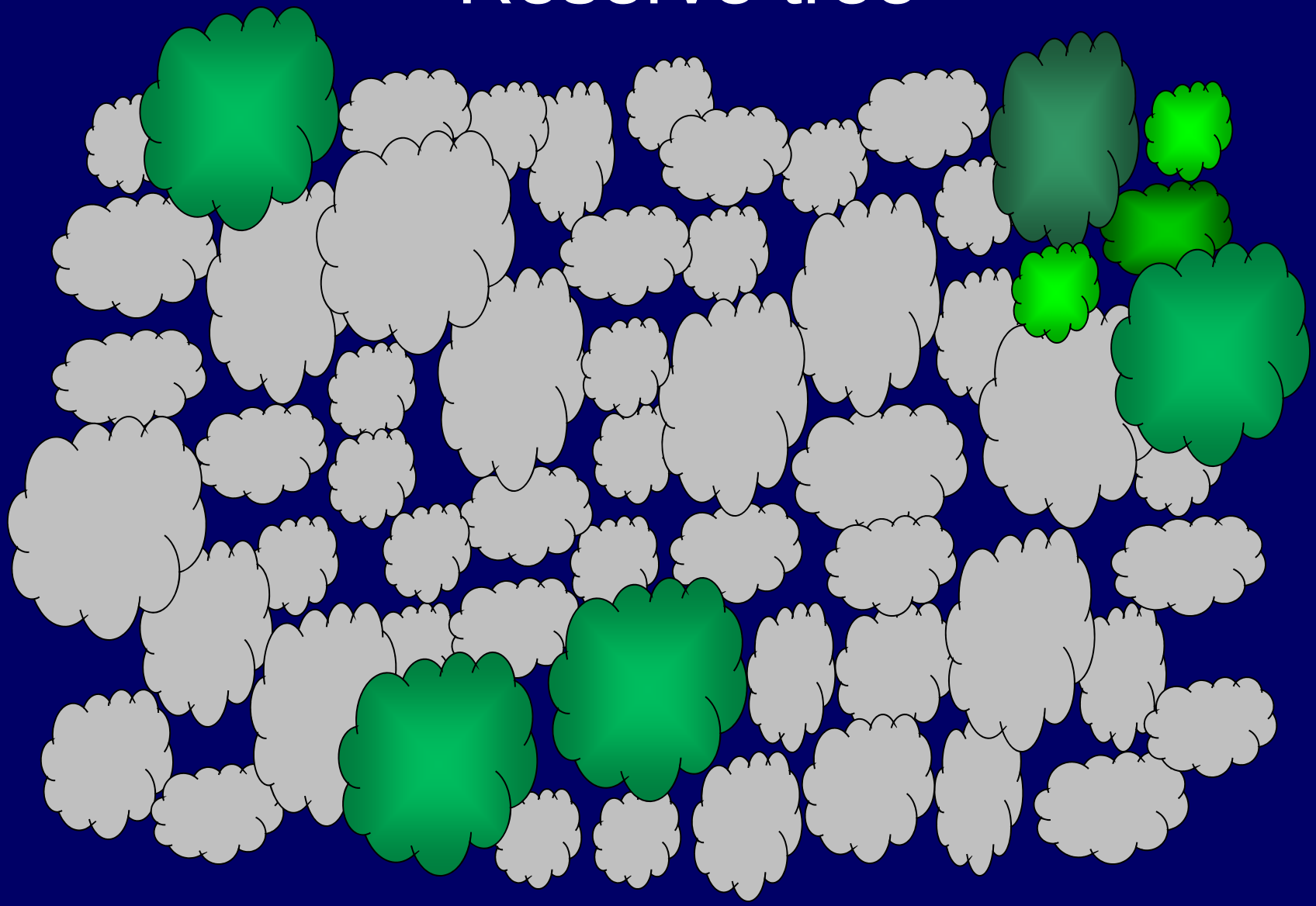
Seed/Reserve Tree Silvicultural System

- In a Seed-tree silvicultural system, selected, scattered mature and high quality trees are left on the site to serve as a seed source for the new stand and to provide a uniform dispersal of seed. This method is not a good choice for trees that lack a sufficient tap root. Competing brush can interfere with regeneration.

Seed Tree Silvicultural System



Reserve tree



Even-aged: Seed tree

Seed Tree

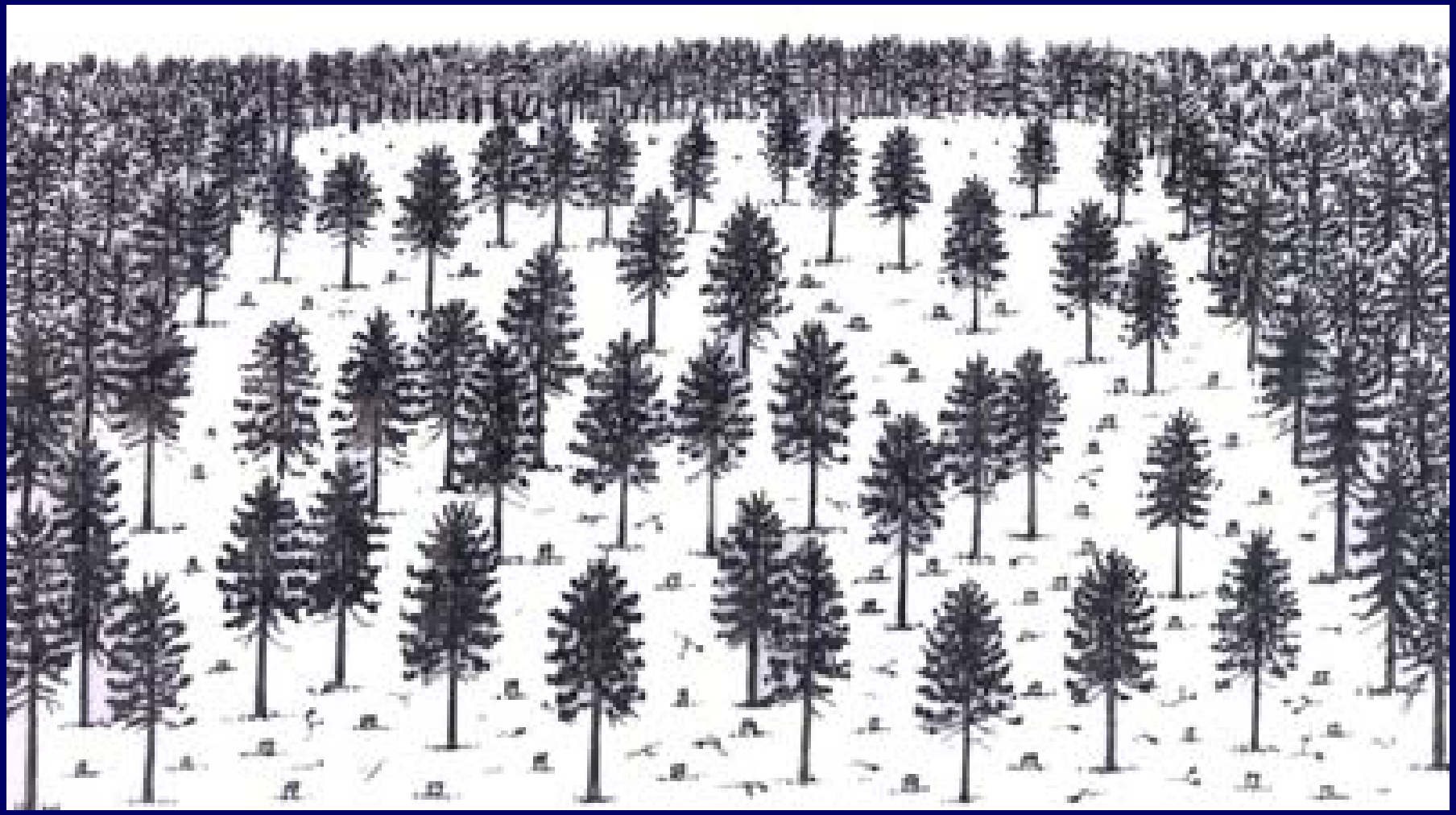
System

White Pine

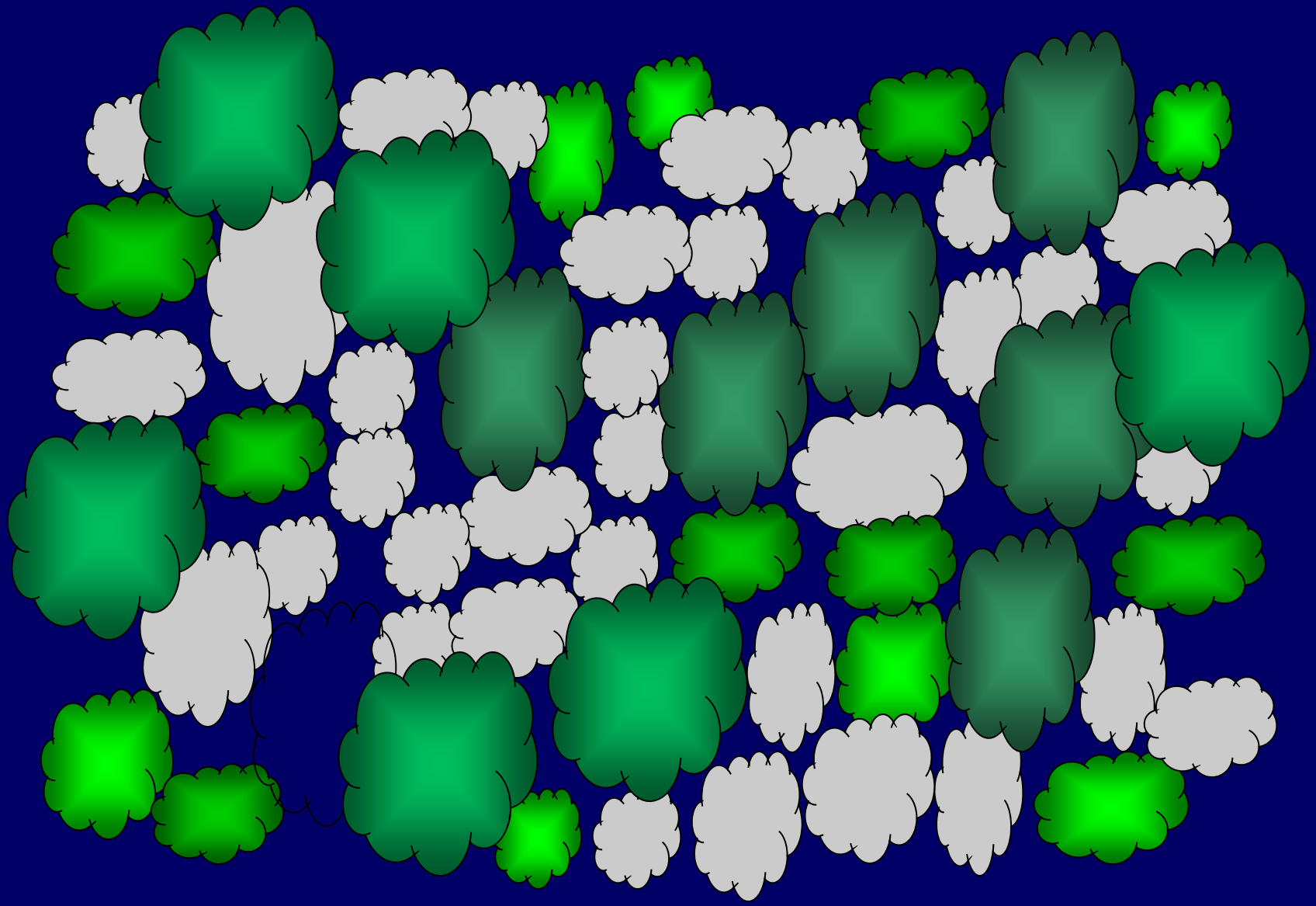
Shelterwood Silviculture

- A shelterwood is a two-aged silvicultural system designed to allow for reproduction and provide partial shade to newly germinating seedlings. After the younger trees reach an appropriate height, the older trees are removed, thus establishing an even-aged stand. The next harvest can then repeat the process.

Shelterwood Silvicultural System



Shelterwood



Shelterwood (oak-pine) MDC Lands (Massachusetts)

Shelterwood cutting on Massachusetts Wildlife Lands

Coppice Regeneration

- Coppice regeneration depends upon vegetative regeneration by the stump sprouts or root sprouts instead of development of the stand from seed. Coppice regeneration is usually an even-aged reproductive method. Oak and Aspen regeneration is a good example of this practice.

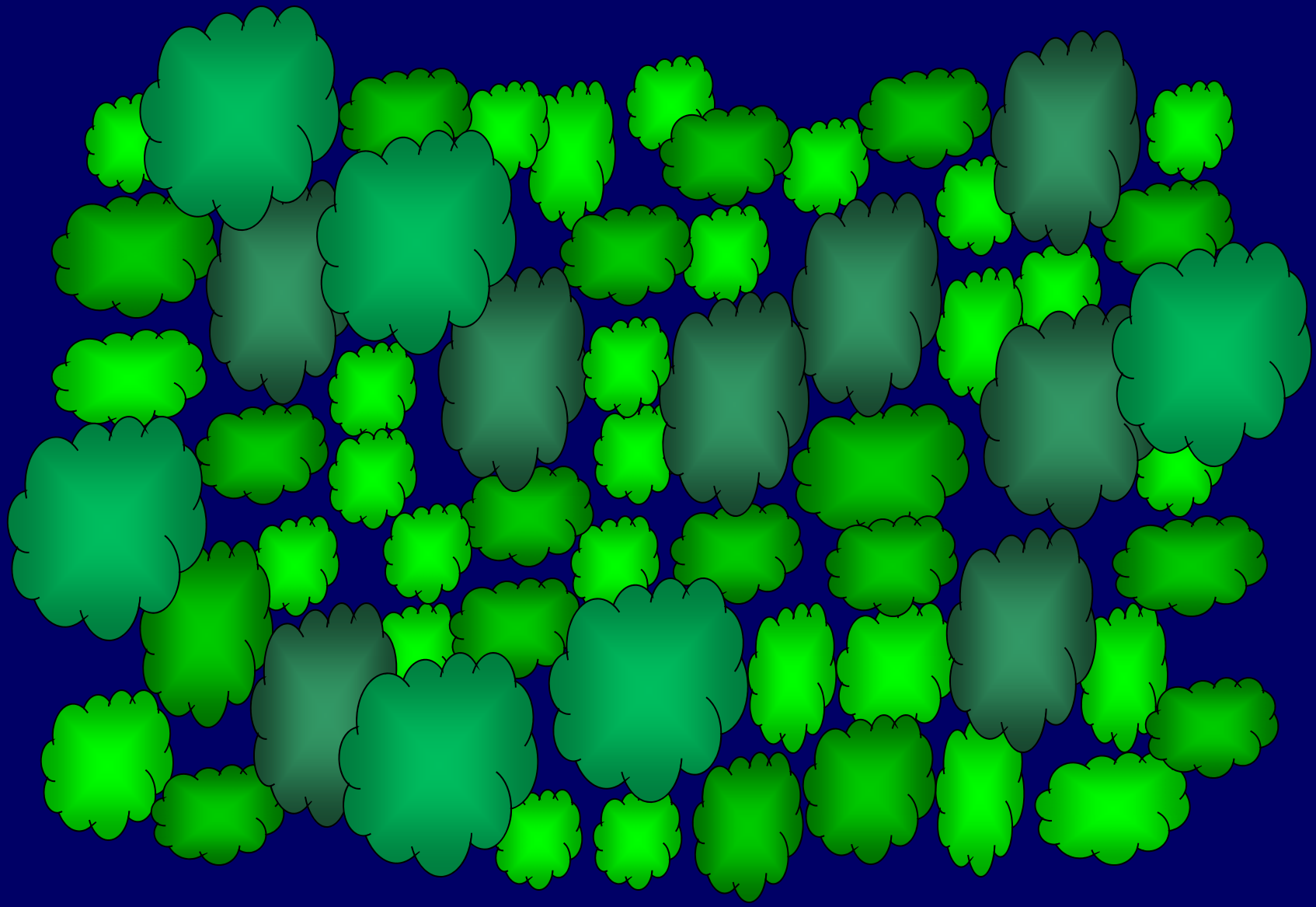
Uneven Aged Systems

- Uneven-aged stands are usually defined as stands in which at least three age classes are intermixed in equal proportion within the stand.
- Three Systems
  - Preserve
  - Selection Method" of harvesting
    - Individual tree selection – remove scattered individuals
    - Group selection – remove scattered groups
  - "Diameter Limit – "High Grading"

Uneven-aged Management

- Uneven-aged management is accomplished by the selection method of thinning/harvesting. Scattered trees or small groups of trees are harvested at 10-20 year intervals. This diffuse pattern of tree removal allows for a matrix of age classes within the stand. This will lead the stand to a climax condition.

Forest Preserve/Unmanaged forest

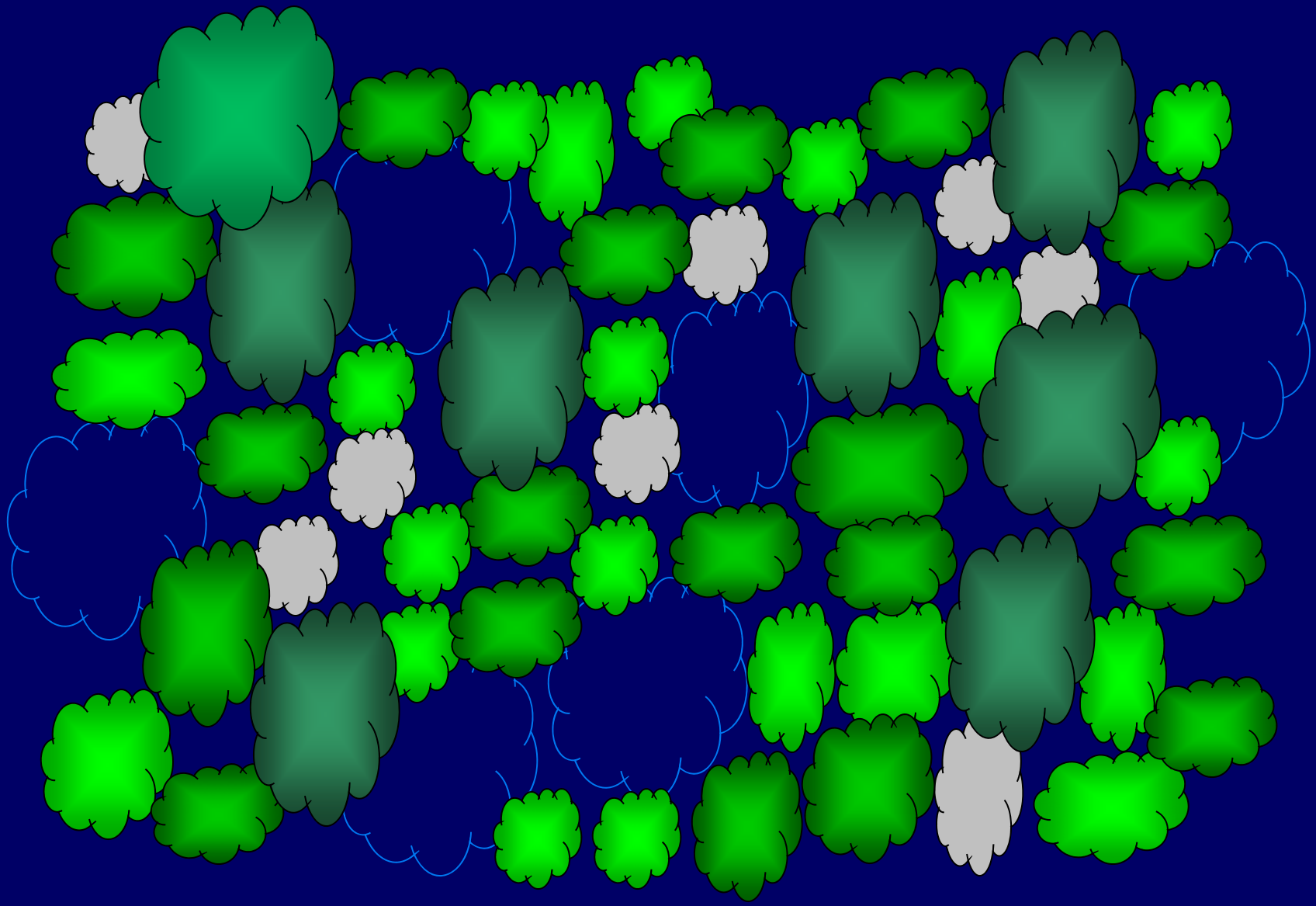


Forest Preserve/Unmanaged forest

Selection Methods of Thinning

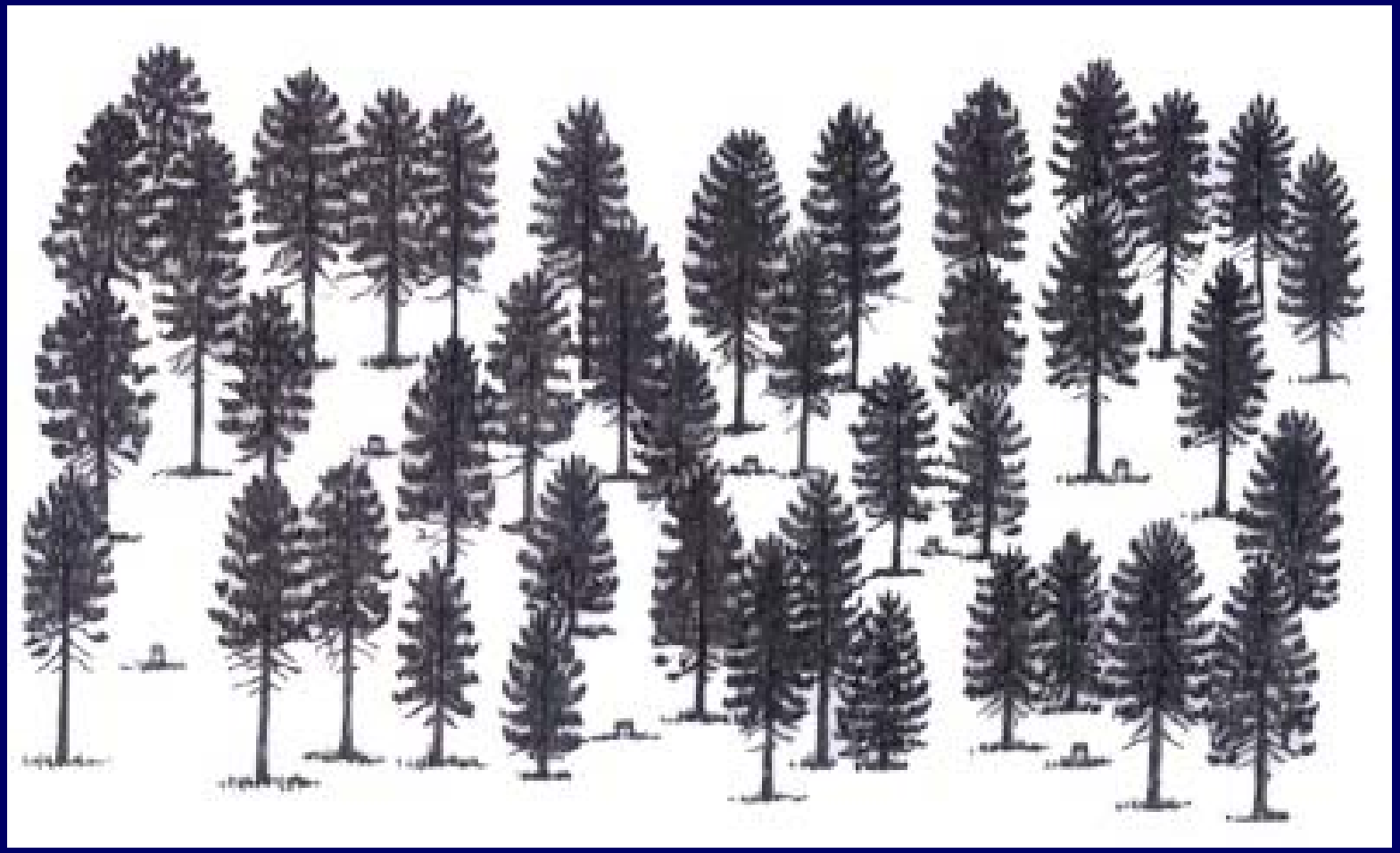
- Low Thinning
- Crown Thinning
- Selection Thinning
- Mechanical Thinning
- Single Tree Selection

Single-tree selection



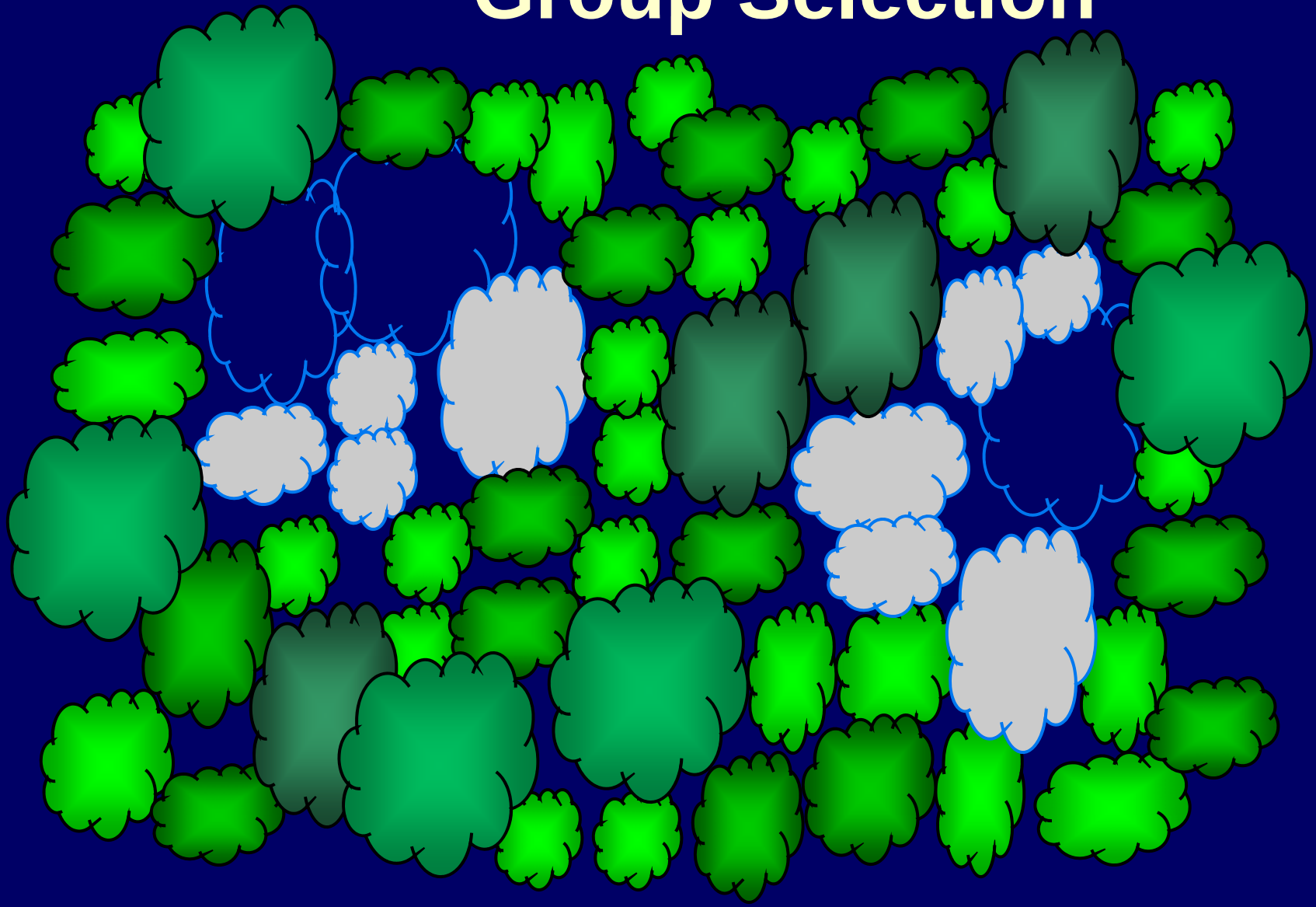
Individual Tree Selection

Uneven-aged Management



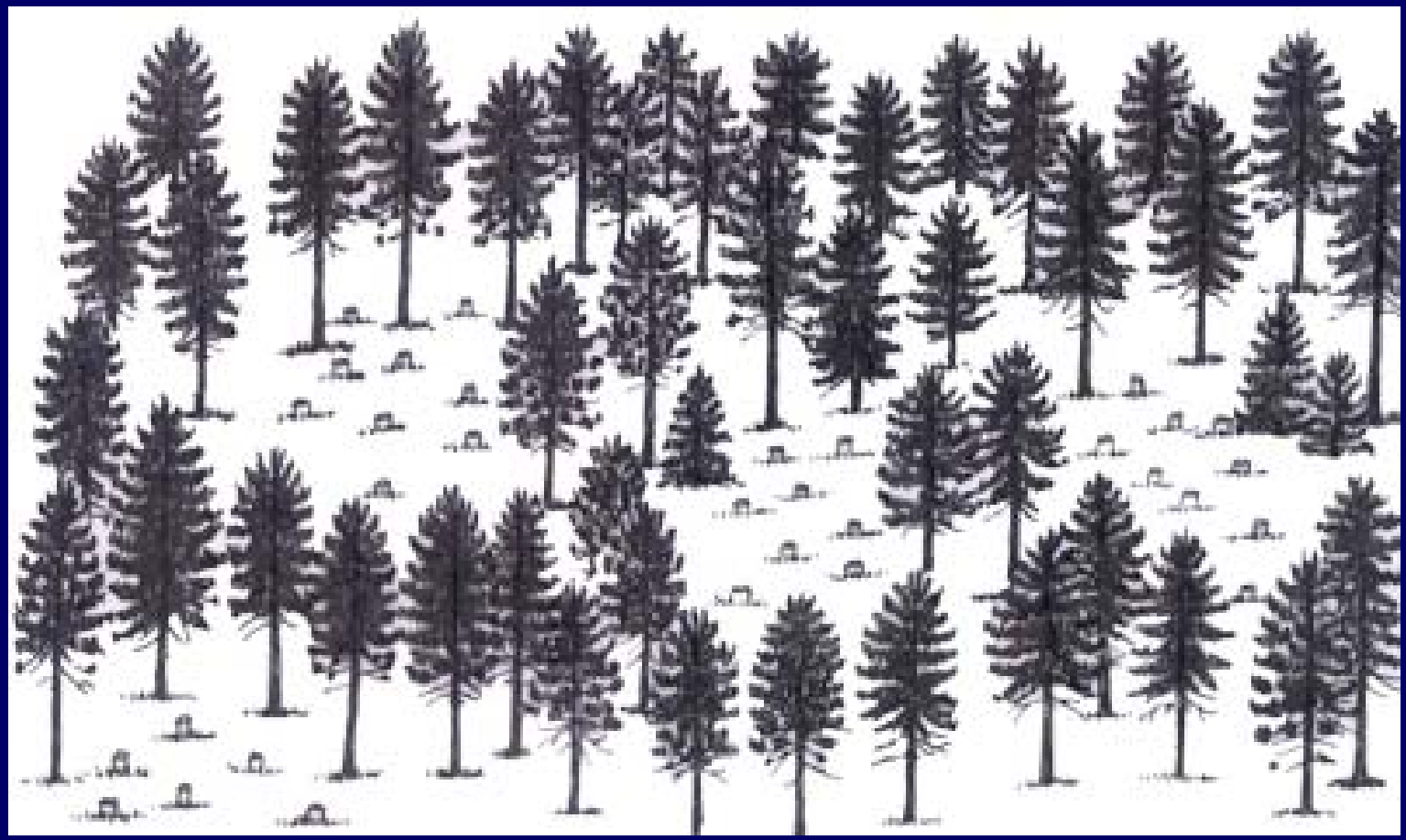
Single-tree selection

Group Selection



Group Selection Silviculture

Uneven-aged Management



Uneven-aged: group selection

Group Selection

Intermediate Treatments

- Treatments that occur between the time of stand establishment and the time of regeneration harvest
- Objectives
  - Improve stand quality
  - Protection and control of mortality
  - Shorten rotation

Intermediate Treatment Types

- Release Cuttings
- Improvement Cuttings
- Thinning

Treatments to Improve an Existing Stand

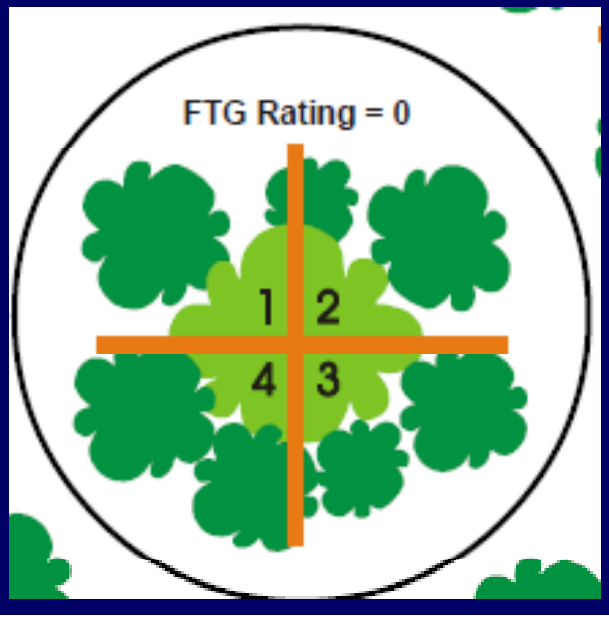
- Release Treatments
  - Release treatments are best performed when the favored species are very young. Release treatments are done to free desirable seedlings and saplings from overstory competition.
  - White pine release is a good local example.
  - Low commercial value

Improvement Cuts

- Improvement cuts are treatments in pole or mature timber stands that target diseased and poorly formed trees or other trees of low value. Removal of poor quality trees frees up growing space and nutrients for the higher quality trees.

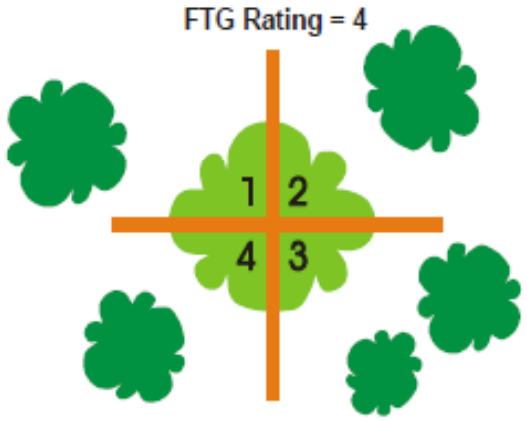
Crop Tree Management/Release

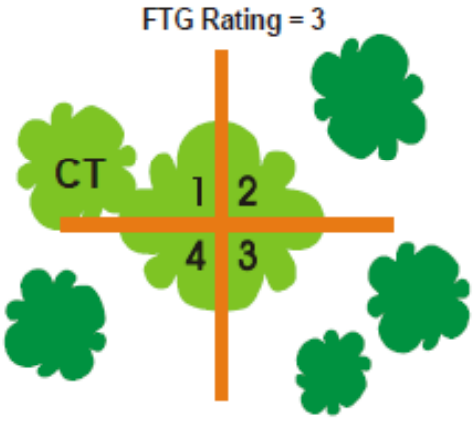
- Crop Tree Management focuses on selecting and releasing crop trees that meet criteria based on the landowner's goals and objectives for the property.
- To do this, a crown-touching release must be applied to each of the timber and most of the wildlife and aesthetic crop trees selected to produce the identified benefits.



FOR OPTIMUM GROWTH
A 4-SIDED RELEASE IS REQUIRED

the only exception is . . .





Methods of Thinning

- Low Thinning
- Crown Thinning
- Selection Thinning
- Single Tree Selection
- Diameter Limit – “High Grading”

Low Thinning

- Thinning from below
  - Usually only overtopped trees are removed
  - Intermediates can be taken
  - Dominant and codominants are left alone
  - Low commercial value

Crown Thinning

- Trees are removed from the middle and upper portion of the range of crown and diameter classes rather than from the lower end.
  - Overtopped trees and intermediates that do not interfere with crop trees are not cut in crown thinning.
  - Higher commercial value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Selection Thinning/Harvesting

- In selection thinning, dominant trees are removed in order to stimulate the growth of trees in the lower crown classes.
  - The same kind of vigorous trees that are favored in crown and low thinning are the very ones that are likely to be cut in selection thinning
  - Selection thinning can degenerate into “high-grading” if not carefully applied.
  - Higher commercial value

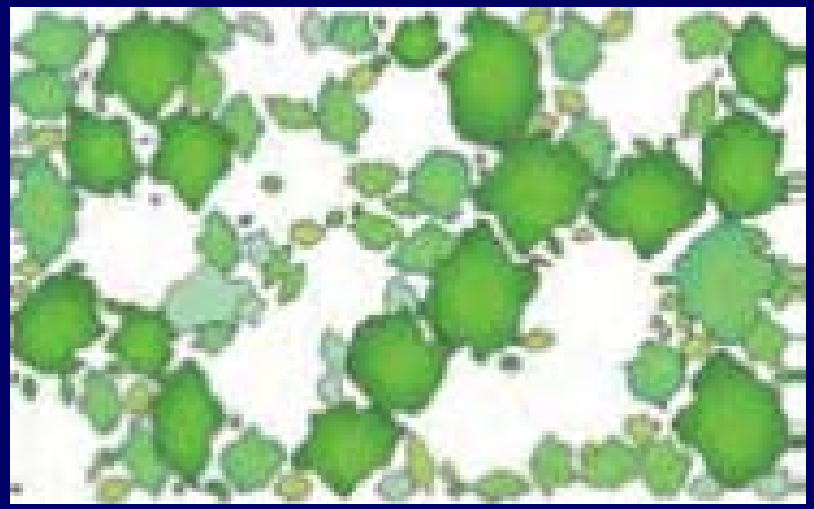
Single Tree Selection Thinning

With Single tree selection thinning, combinations of crown thinning, low thinning and selection thinning occur during the same cutting cycle. This is the best means of maintaining an unevenaged silvicultural system and avoiding the practice of “high grading”.

(Selection System)

Diameter Limit Cutting/High Grading

"Cut the Best & Leave the Rest"



Beware!

Diameter Limit Cutting/High Grading

"Cut the Best & Leave the Rest"

- A high-impact cut in which the most profitable trees are removed with little or no consideration for future conditions.

- Often disguised as a "selection" harvest or "selective cutting"

- Has a negative long-term impact on both economic value and on forest health because no effort is made to ensure the establishment of desirable regeneration.

- Diameter-limit cutting may appear to cut only the largest trees to release smaller, younger trees. In fact, smaller trees in even-aged stands typical of this region are just slower growing trees of the same age as those targeted for removal.

Negative Consequences to the Ecosystem

- Reduced diversity
- Reduced food sources
- Reduced $ value per acre
- Increased disease & insect, risk to storm damage
- Reduced volume, stocking, and quality
- Slower growth
- Extended time to next harvest of equal volume
- Future options constrained

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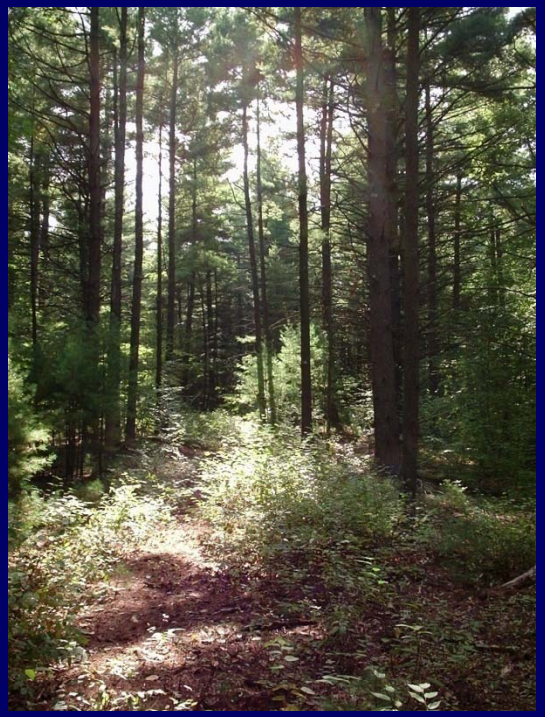
Opportunities for Forestry-related Conservation Assistance to Private Landowners



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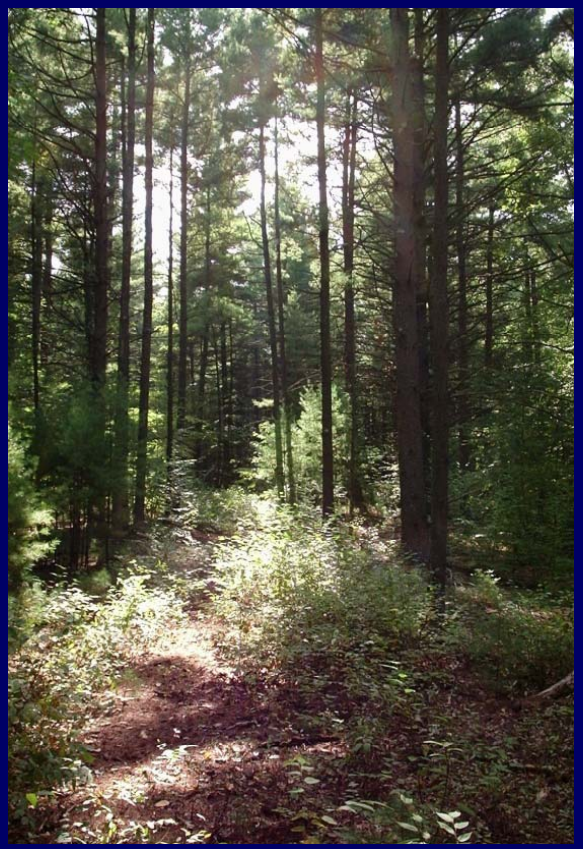
Forest Management Plan (CAP)

Definition

A forest management plan is a site specific plan developed for a client, which addresses one or more resource concerns on land where forestry-related conservation activities or practices will be planned and applied



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Common RI NRCS Forestry Practices

- **Forest Management Plan (CAP)**
  - **Access Control**
  - **Brush Management**
  - **Early Successional Habitat Development & Management**
  - **Forest Stand Improvement**
  - **Invasive Species Control**
  - **Forest Trails and Landings**
- **Prescribed Burning**
- **Riparian Forest Buffer**
- **Silvopasture Establishment**
- **Tree/Shrub**
- **Site Preparation**
- **Tree/Shrub Establishment**
- **Tree/Shrub Pruning (660)**
- **Upland Wildlife Habitat Management**
- **Stream Crossing**

Your Next Steps ?

- Have a Plan
- Review your objectives
- Join a forest land owner association
- Continue to educate yourself
- Attend woods walks
- Walk and talk with your forester
- Others ?????

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Thank You

Healthy Environment

Productive Lands