ENVIROTHON FORESTRY TRAINING

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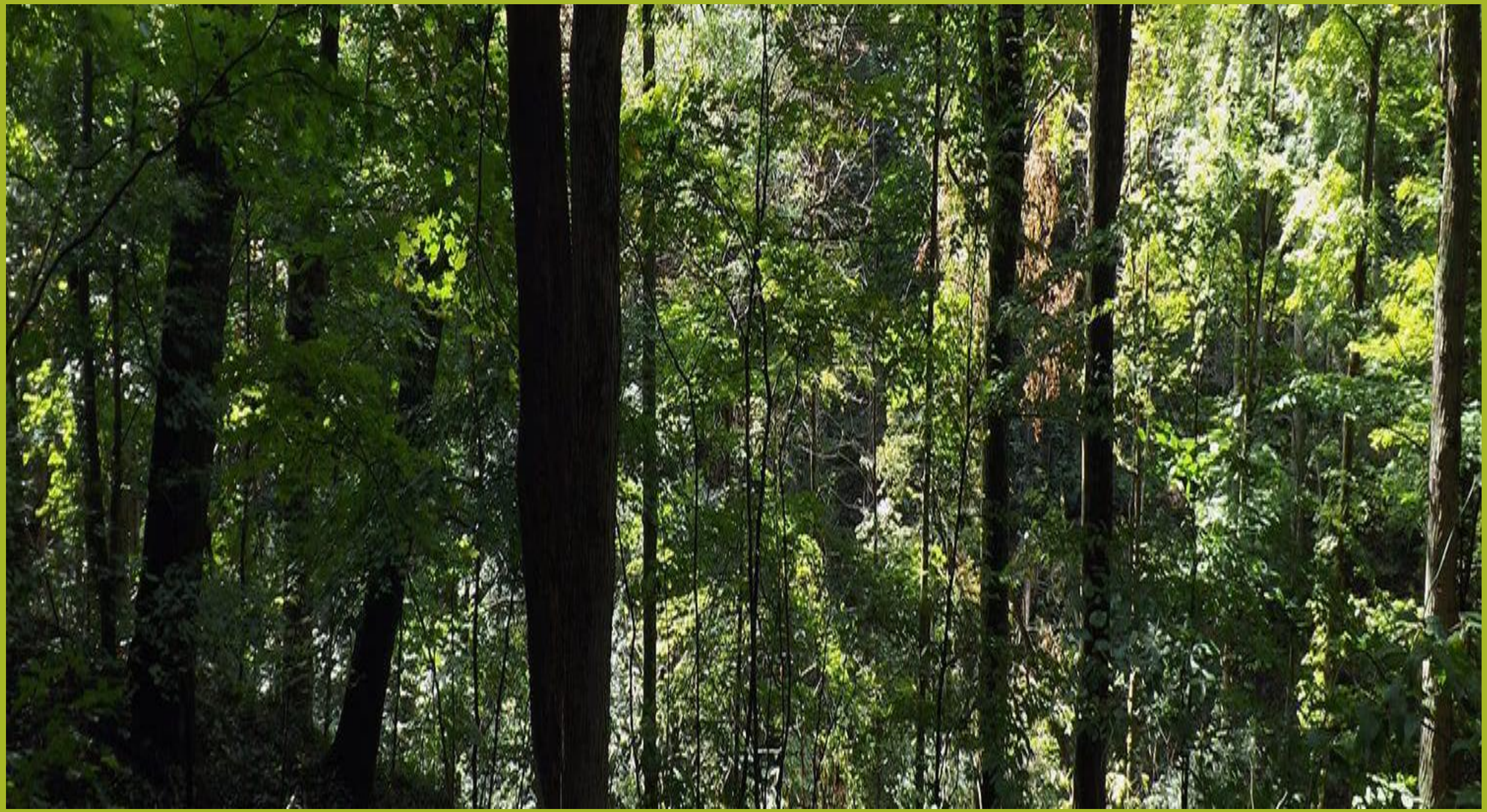
Forestry Topic Overview

- Forestry Fundamentals
- Management & Community Ecosystems
- Biodiversity
- Tree Tolerance & Silvicultural Practices

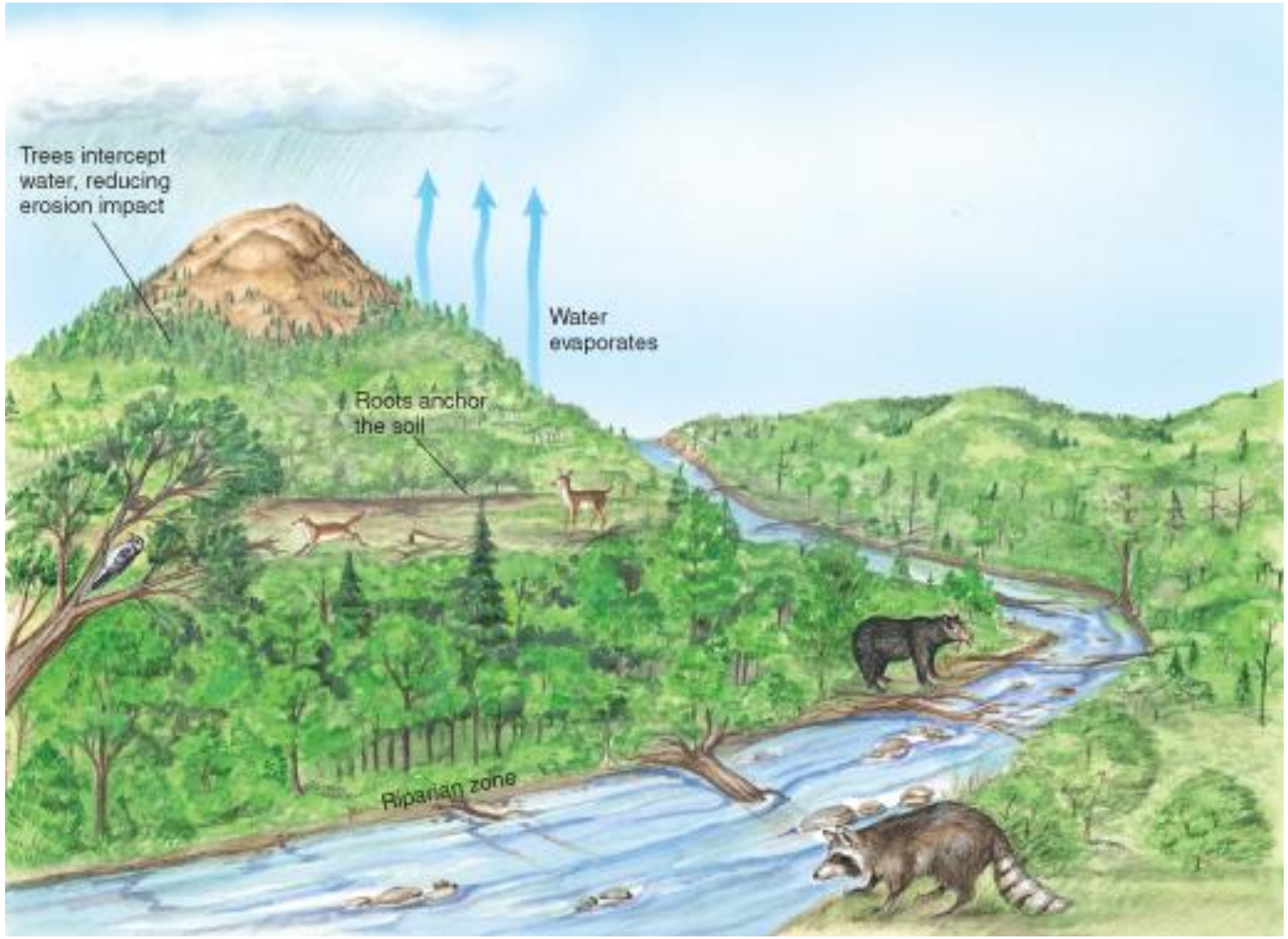
FORESTRY FUNDAMENTALS



Eco-Services

Eco-Services are the outputs, conditions, or processes of natural systems that directly or indirectly benefit humans or enhance social welfare.

Ecosystem services can benefit people in many ways, either directly or as inputs into the production of other goods and services.



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Major Forestry Issues

- Sustainability
- Clear-cutting
- Old-growth forests
- Plantations
- Stream-protection zones
- National forests
- Forest fires
- Certification
- Scale of management
- People's role

Modern Conflicts over Forestland and Forest Resources

A Global Dilemma

- Deforestation is estimated to have increased erosion and caused the loss of 562 million hectares (1.4 billion acres) of soil worldwide, and the estimated annual loss is 5–6 million hectares or 12,320,000-14,820,000 million acres.

Forest Health

"the perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects or disease, and resilience to disturbance" and it properly recognizes that **"perception and interpretation of forest health are influenced by individual and cultural viewpoints, land management objectives, spatial and temporal scales, the relative health of the stands that comprise the forest, and the appearance of the forest at a point in time"** (ref., The Dictionary of Forestry edited by J. A. Helms, 1998).

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Is this a Healthy Forest Ecosystem?

- Lacks trees
- Eco-services are disrupted
- Fails to provide any ecological benefits

How Can Things Change?

Change in Times

- Many forests are in the tropics, mountain regions, or high latitudes, places were difficult to exploit before the advent of modern transportation and machines.

Balance of Nature

- Nature undisturbed achieves a permanency of form and structure that persists indefinitely.
- If it is disturbed and the disturbing force is removed, nature returns to exactly the same permanent state.
- permanent state of nature, there is a “great chain of being” with a place for each creature (a habitat and a niche) and each creature in its appropriate place.

MANAGEMENT & COMMUNITY ECOSYSTEMS

Ecosystem Management

- **Definition:**

  management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem composition, structure, and function.

  Sustainability must be the primary objective, and levels of commodity and amenity provisions adjusted to meet that goal.

Community Ecosystems

- Ecosystem born in 1935, British ecologist Arthur Tansley **"the whole system including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome**

  refers to all organisms in a given place (including people) and their interactions with each other and the environment.

Community Ecosystems

- **Conservation**:

  using natural resources to meet the needs of people without degrading the ecosystem

- **Sustainability:**

  managing, protecting, and restoring natural resources to maintain their health and viability in perpetuity.

Community Ecosystems

- **Connectivity:**

  maintaining or creating interconnected habitats and people working towards common goals

- **Diversity:**

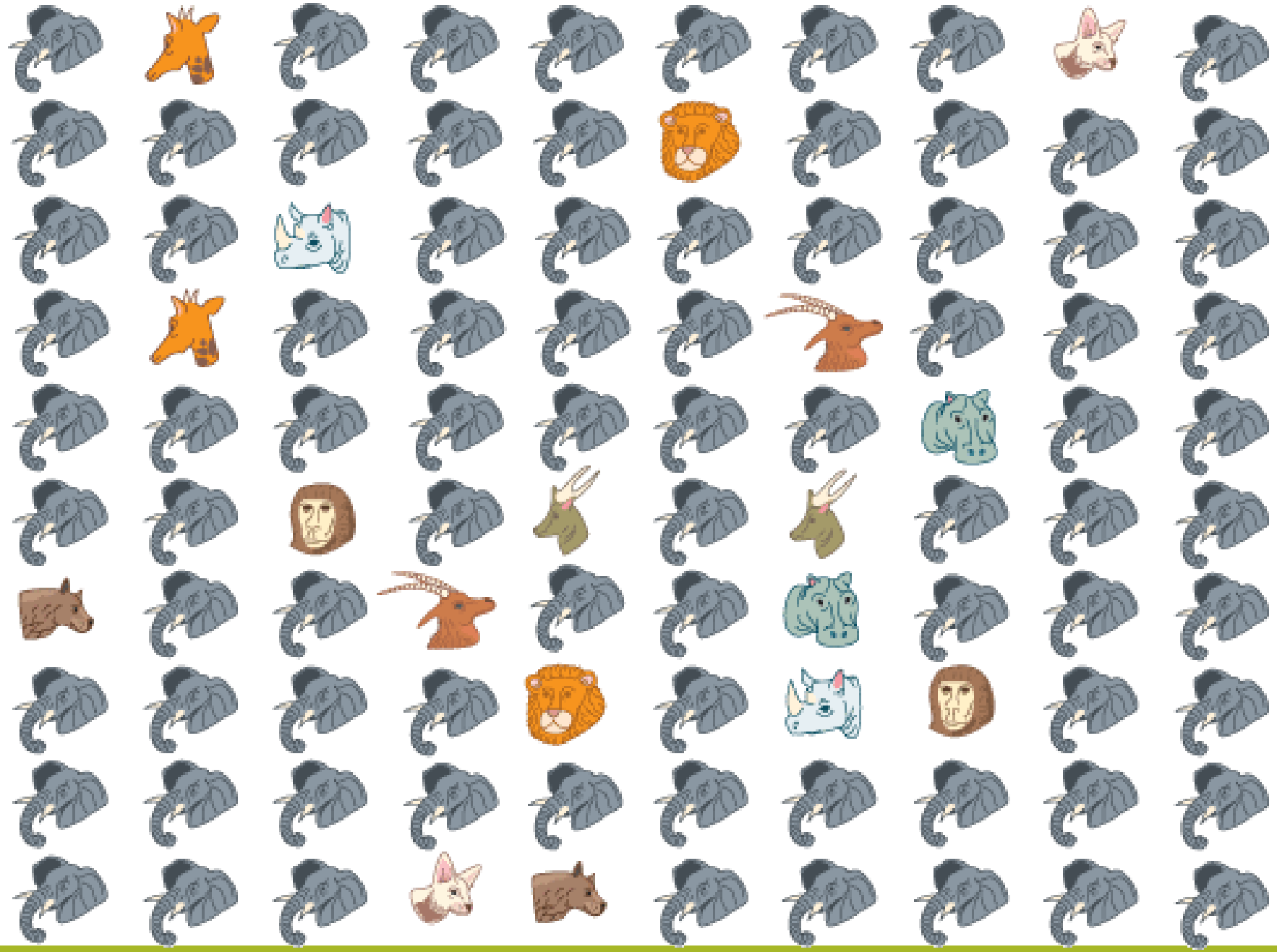
  managing a wide variety of flora and fauna and involving a broad range of people and interest groups.

BIODIVERSITY

Why Do People Value Biodiversity?

There are nine primary reasons:

- Utilitarian
- Public-service
  - Eco-services
- Ecological
- Moral
- Theological
- Aesthetic
- Recreational
- Spiritual
- Creative



(a)

(b)

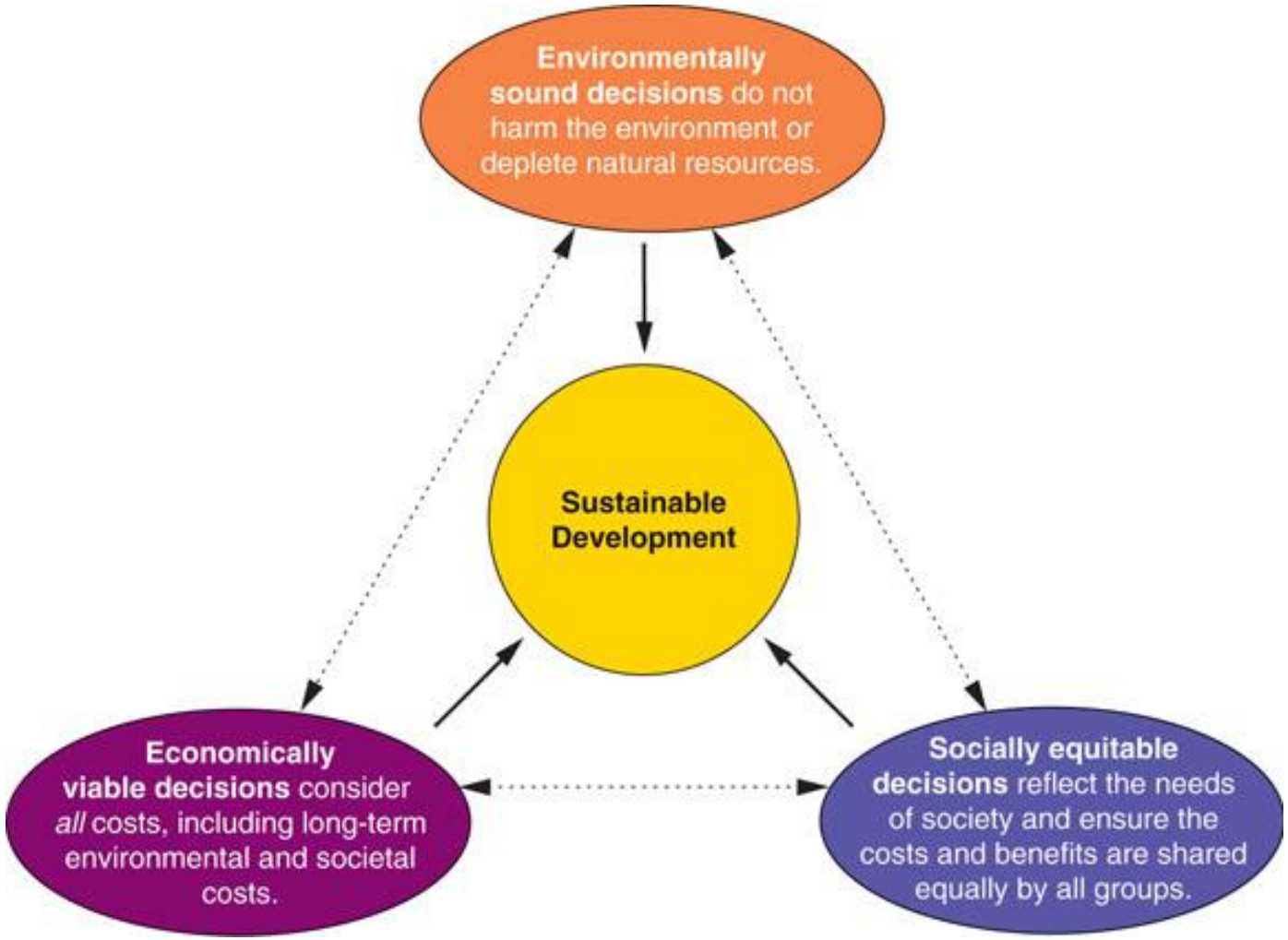
- **Species Richness**
- Species richness is the number of species present in the forest. For small datasets it can be calculated by counting the number of species in your forest manually.
- **Species Evenness**
- Species evenness describes the relative abundance of each species. Once you have measured the area of each species in your forest you can see how evenly they are distributed. The percentage area of the most dominant species can be helpful in understanding evenness

MANAGEMENT & COMMUNITY ECOSYSTEMS

Community Ecosystems

- The principle goals in conserving and managing community trees and other natural resources.

Health and sustainability of an ecosystem



Sustainable development

Three factors—environmentally sound decisions, economically viable decisions, and socially equitable decisions—interact to promote sustainable development

Ecosystem Management

- Sustained Yield vs. Sustainability

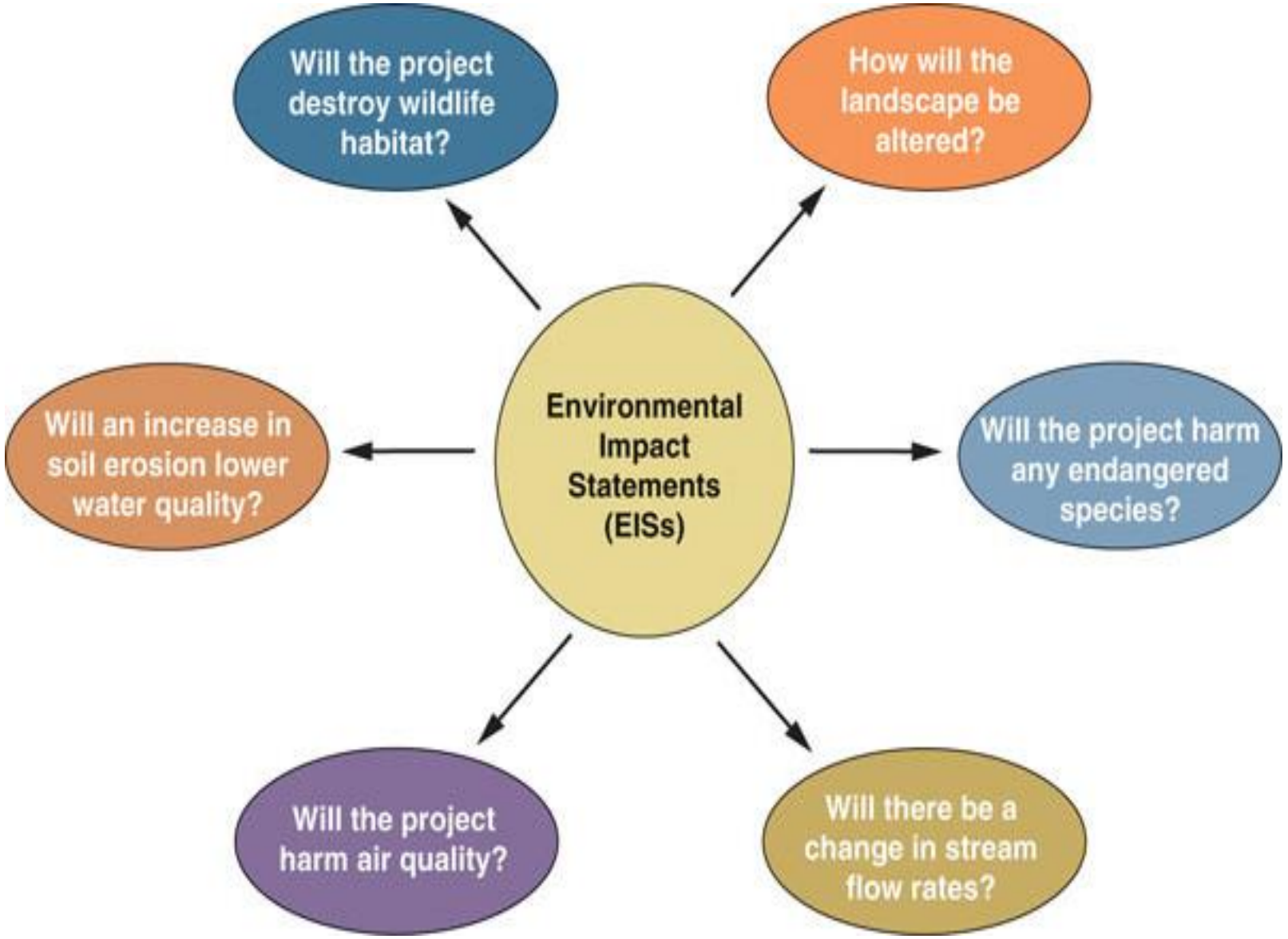
  Sustained yield focused on outputs and views resource conditions as constraints on maximum production

  Sustainability makes resource conditions the goal and a precondition for meeting human needs over time; focus shift in 1980's

Ecosystem Management

- Principles of Ecosystem management:

1. Socially defined goals and objectives
2. Holistic integrated science
3. Adaptable institutions
4. Collaborative decision making


Will the project destroy wildlife habitat?
How will the landscape be altered?
Will an increase in soil erosion lower water quality?
Environmental Impact Statements (EISs)
Will the project harm any endangered species?
Will the project harm air quality?
Will there be a change in stream flow rates?

Western worldview

A Logging operations in 1884. This huge logjam occurred on the St. Croix River near Taylors Falls, Minnesota. B The Western worldview in action today. A logging company road cuts through an Indonesian forest, making the region's hardwoods available for logging.

TREE TOLERANCE & SILVICULTURAL PRACTICES

What is Silviculture?

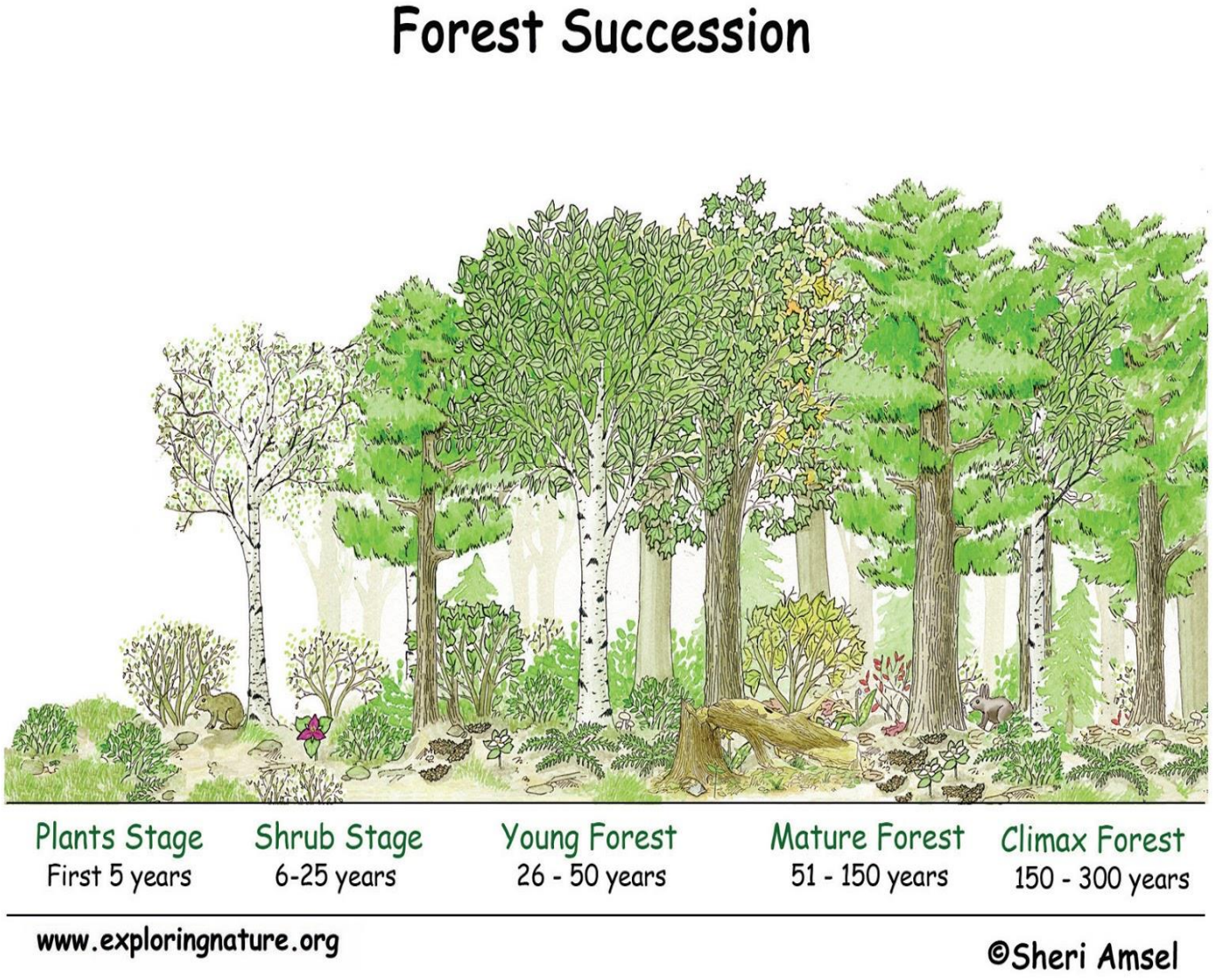
- Silviculture is the application of the principles of forest ecology to a stand of trees to help meet specified objectives.

- Objectives can include:
  - Income
  - Wildlife habitat
  - Water quality
  - Recreation
  - Any other values a forest is capable of providing.

The Big Picture

- If you understand one basic idea, you can understand almost everything else in forestry.

- This idea is ***shade tolerance*** as it pertains to ***forest succession***!



Tolerance

- ***Different species of trees have differing abilities to tolerate extended periods under a closed canopy.***

- Species are generally divided into tolerant, intolerant, and intermediate categories.

Intolerant Species

- Intolerant species are generally the first in" after an event such as a clear-cut or a major fire that substantially opens the canopy.
- These trees are often called ***pioneer species***.
    - These trees tend to:
    - - be fast growing
    - - be short-lived
    - - have light seeds


Sweetgum leaf

Tolerant Species

- These trees normally are not the first to colonize open areas. Instead, they grow up into an existing canopy.

- Usually, these trees are found in the "climax community."

- These trees tend to:
- - live a long time
- - grow slowly
- - have heavier seeds

Intermediate Species

As the name implies, these trees have characteristics that are “**in between**” the tolerants and the intolerants.

Intolerant Pioneers

- Red Maple
- Yellow-Poplar
- Sweetgum
- Loblolly Pine

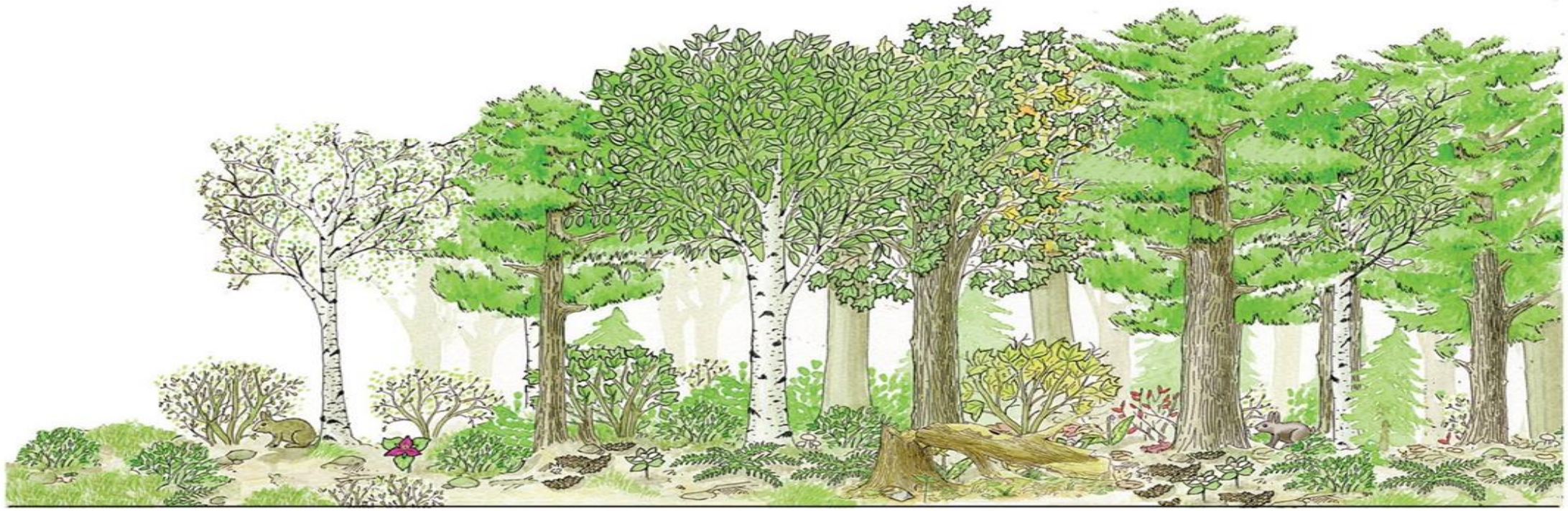
Tolerant Climax Community

- American Beech
- Some Oaks

Succession

- The change in species composition that occurs in a stand over time.
- An area is colonized by intolerant, fast-growing species. Eventually, tolerant trees become established in the understory and start growing into the canopy.
- One of two things then happens. Either (1) the intolerants die naturally and are replaced by the tolerants that have been present in the understory for some time, or (2) the tolerant trees finally overtop the intolerants and shade them out, causing them to die.

Forest Succession



Plants Stage	Shrub Stage	Young Forest	Mature Forest	Climax Forest
First 5 years	6-25 years	26 - 50 years	51 - 150 years	150 - 300 years

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Disturbance

- Events such as landslides, fires, clear-cuts, floods, etc. that clear an area of vegetation, allowing light to reach the ground.
- Can be natural or man-made
- A disturbance can re-start forest succession from scratch.

Even-aged vs. Uneven-aged Management

- Your management goals and the shade tolerances of the species involved will determine whether to manage on an even-aged or uneven-aged basis.

- A Rule of Thumb:

  → For intolerant species, even-aged management is best.

  → Use uneven-aged management for tolerant species.

Even-aged Management – Shade Intolerant Species

Even-aged systems

→ The goal here is to remove enough of the canopy to allow intolerant species to regenerate.

→ Used for intolerant species only.

→ All trees in the stand are the same age.

Even-aged Management

- The age at which a stand is harvested is called the ***rotation age***.

Normally, standing trees are converted into logs.

The site is *regenerated* with the next crop of trees.

Even-aged Management – Shade Intolerant Species

Even-aged management options include:

1. Clear-cutting: Remove all trees
2. Seed tree systems: leave just a few trees per acre
3. Shelterwood systems: leave 20+ trees per acre

Even-aged Management:
Clear-cutting

Even-aged Management:
Clear-cutting

Even-aged Management:
Seed Tree

The seed tree harvest unit acts as a clearcut, but with natural regeneration from trees in the original stand.

Even-aged Management:
Shelterwood

20 or more trees per acre are left on site to provide some shelter for seedlings for the first few years.

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Even-aged Management: *Shelterwood*

This stand has been opened up sufficiently for sunlight to reach the forest floor for the entire day.

Uneven-aged Management – Shade Tolerant Species

Uneven-aged systems

→ The goal is to remove only enough of the canopy to allow shade-tolerant species to regenerate.

→ Used for shade tolerant species only.

→ Multiple age classes.

Uneven-aged Management – Shade Tolerant Species

Uneven-aged management options include:

1. Group selection systems: small areas are harvested.
2. Single tree selection systems: individual trees are harvested.

Uneven-aged Management:
Group Selection

Group selection harvests are basically small clear-cuts, with the diameter of the opening less than twice the height of dominant trees in the adjacent stand.

Uneven-aged Management:
Group Selection

As the day progresses, different portions of the harvest unit receive sun and shade.

Uneven-aged Management:
Single Tree Selection

As the name implies, single trees are removed. This creates only small gaps with minimal additional light reaching ground level.

This technique favors the very shade-tolerant species.

Note how the understory remains dark even after the harvest.

TYPES OF HARVEST

CLEARCUTTING

PATCHCUT

SEED TREE

GROUP SELECTION

SHELTERWOOD

SINGLE TREE SELECTION

How do we ***DO*** silviculture?

1. Determine your goals for your forest.
2. Evaluate existing conditions in the forest.
3. Decide what *treatments*, if any, can help you reach your goals.
4. Implement treatments at the right time.

Treatments - Planting

Genetically superior tree seedlings are available from commercial nurseries for most commercial and wildlife species.

Treatments - Thinning

- Why thin?

- Thinning opens a dense stand, resulting in larger crowns (more leaves).
- This translates to greater diameter growth and earlier marketability.
- Thinning can also improve forest health and reduce fire hazards.

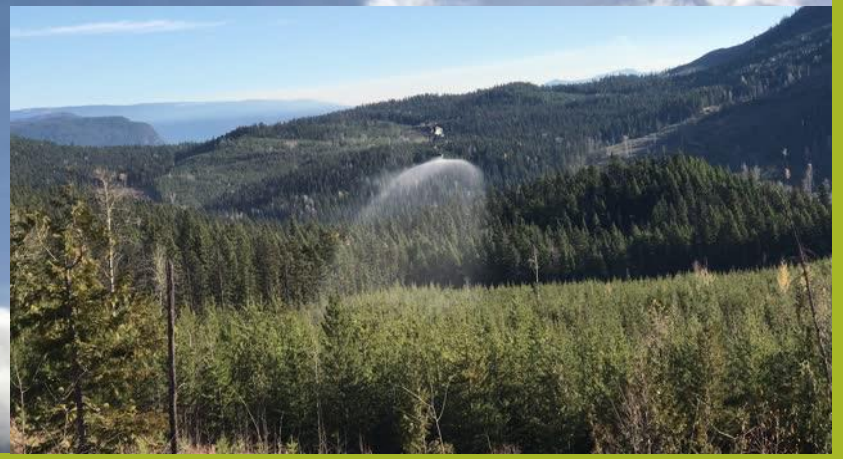
Treatments - Pruning

- Pruning is done primarily with pines and other conifers. It creates a high-quality, knot-free butt log with minimal taper.

Treatments - Burning

Burning periodically can reduce unwanted competition in some places.

Treatments - Fertilization



A Question for Future Foresters

- Most of the wood and paper we use in this country come from loblolly pine and Douglas-fir. These two species are intolerant of shade.
- What does this imply in terms of how we manage for these two species?