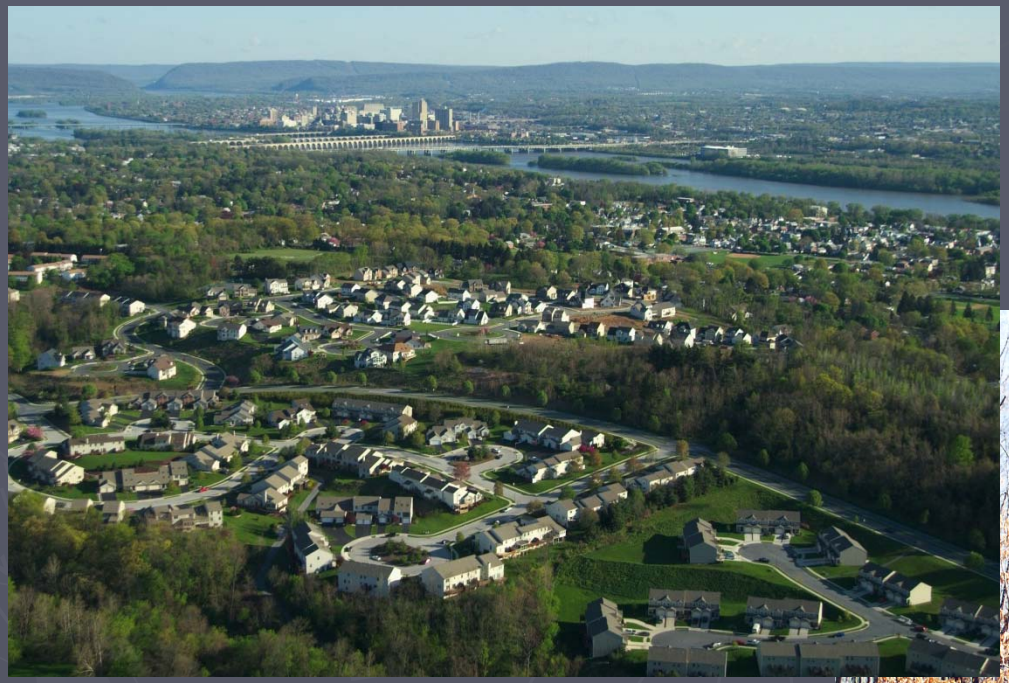

Forest Ecology
Jim Finley
PENNSTATE
1855
Cooperative Extension
College of Agricultural Sciences

# What We'll Cover

- Ecology
- Site Factors
  - Abiotic
  - Biotic
- Tolerance
- Succession
- Stand Development

# Ecology = Studying the Home



# Forest Ecology

## The study of the Forest Environment

# Where Do We Start?

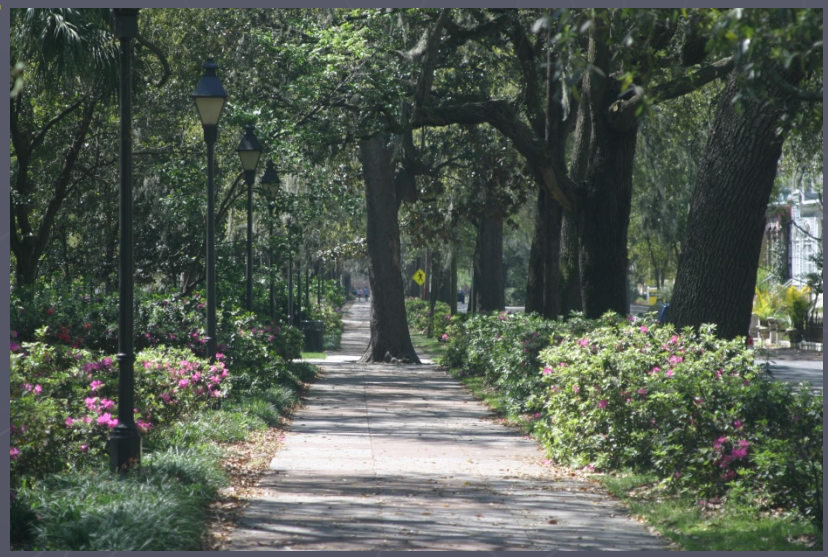
## Think Like a Plant

# Thinking and Acting Like a Plant

- What is your favorite plant?
- Where does it grow?
- How do you describe that place?
- What is important?

# An Understanding of the Forest Environment

- Why is this important?
- Helps us manage:
  - Plants (trees)
  - Wildlife
  - Water



Guides our actions / Predict our impacts

# ABCs of Forest Ecology

- Abiotic (non-living)
- Biotic (living)
- Cultural (human made)

Roles, Relationships, and Interactions

# Abiotic = Site Factors

## Site

- The environment.
- The system supporting a forest.
- Influences trees and plants

# Site Factors

- **Climate**
- **Soil**
- **Topography**

What trees and plants grow there and how well they grow.

# Site Is More Important Than Vegetation

- It is more fixed
- It is more stable
- It is more easily defined
- Reflects disturbance
  - Strip mine (extreme)
  - Pasture (subtle)

# Climate

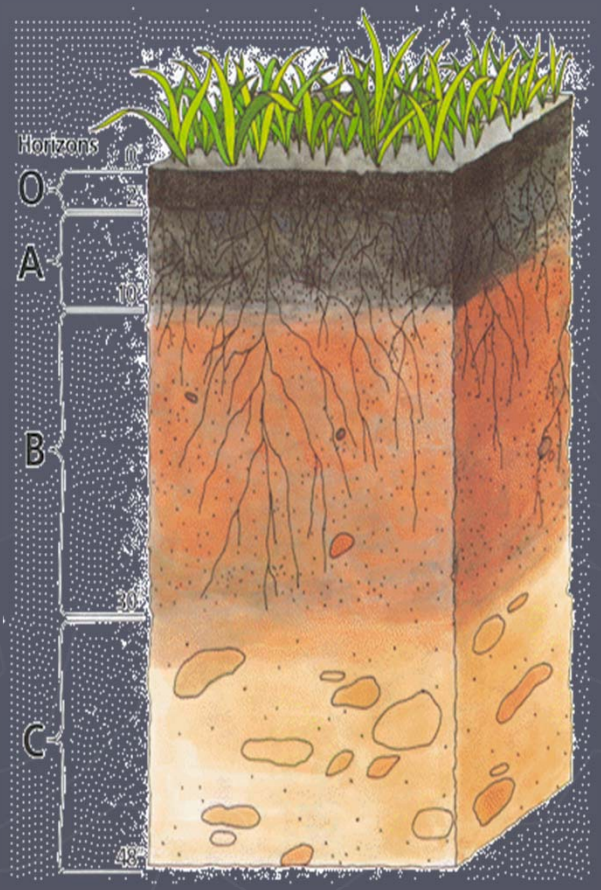
- Temperature
- Precipitation
- Humidity
- Wind

# Weather

- Latitude
- Terrain
- Elevation
- Nearby Water Bodies

# Soil

- Supports forest life.
  - Holds nutrients, water, and oxygen
  - Provides anchorage
- Soil Texture
  - Sand, Silt, and Clay particles
  - Loam = a mix of all three



# Soil Texture

Tree Height

Moisture/Aeration

Moisture/Aeration

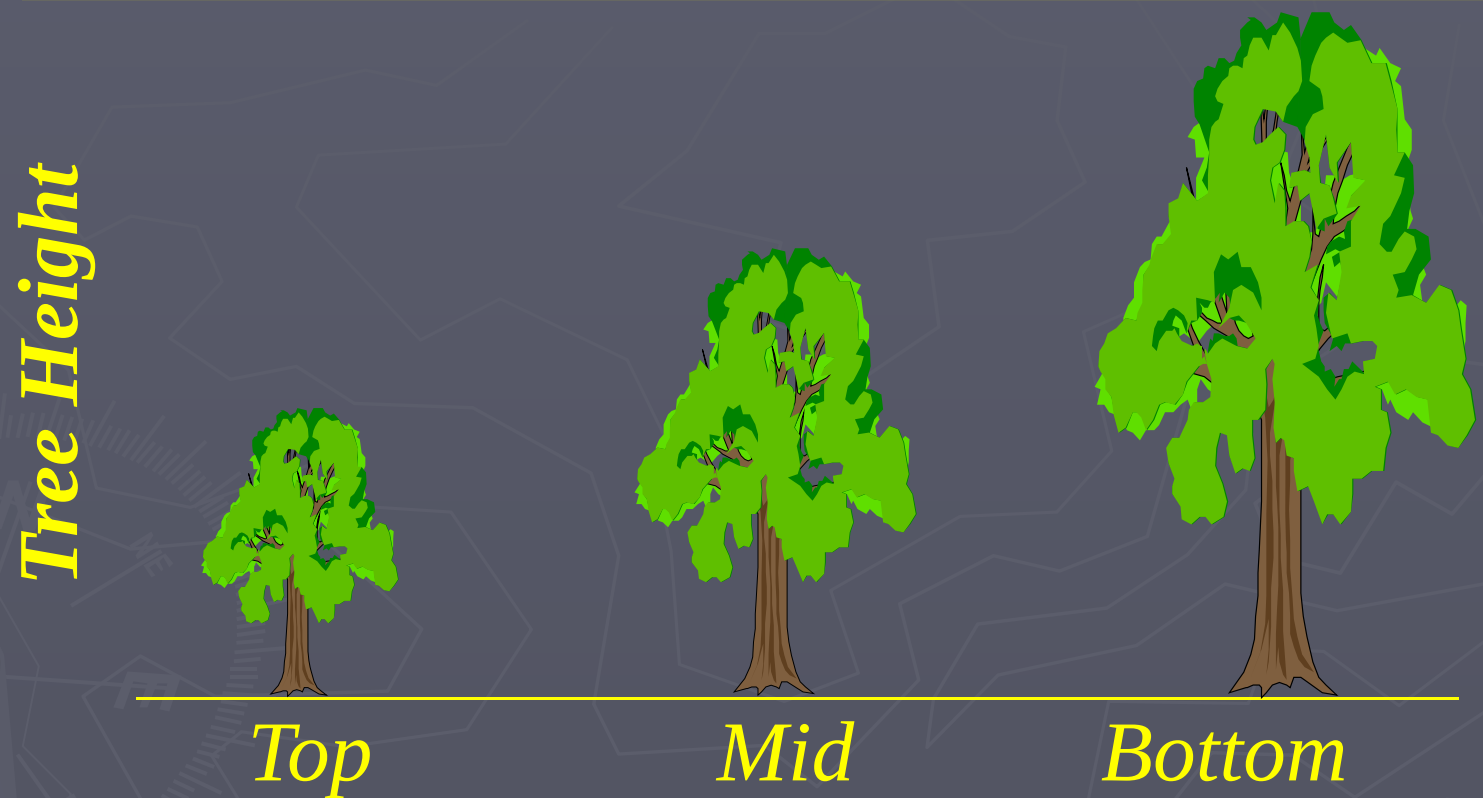
*Sand* *Loam* *Clay*

# Topography - Slope

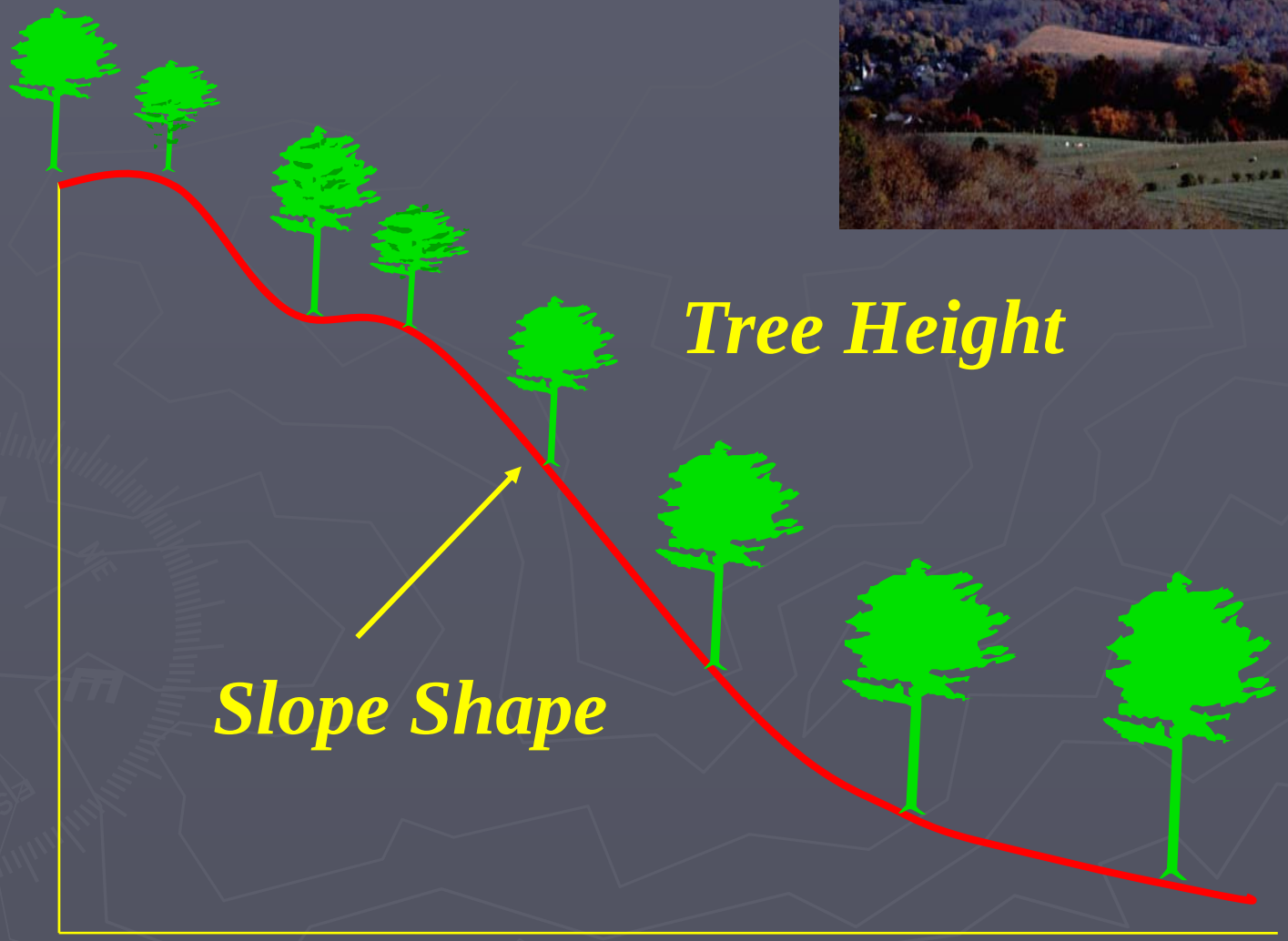
- Slope – steepness of the ground
- Influences . . .
  - Water run off
  - Soil erosion
  - Nutrient loss
- Steeper sites = shallower soil

# Soil Depth and Slope Position

# Tree Height and Slope Position



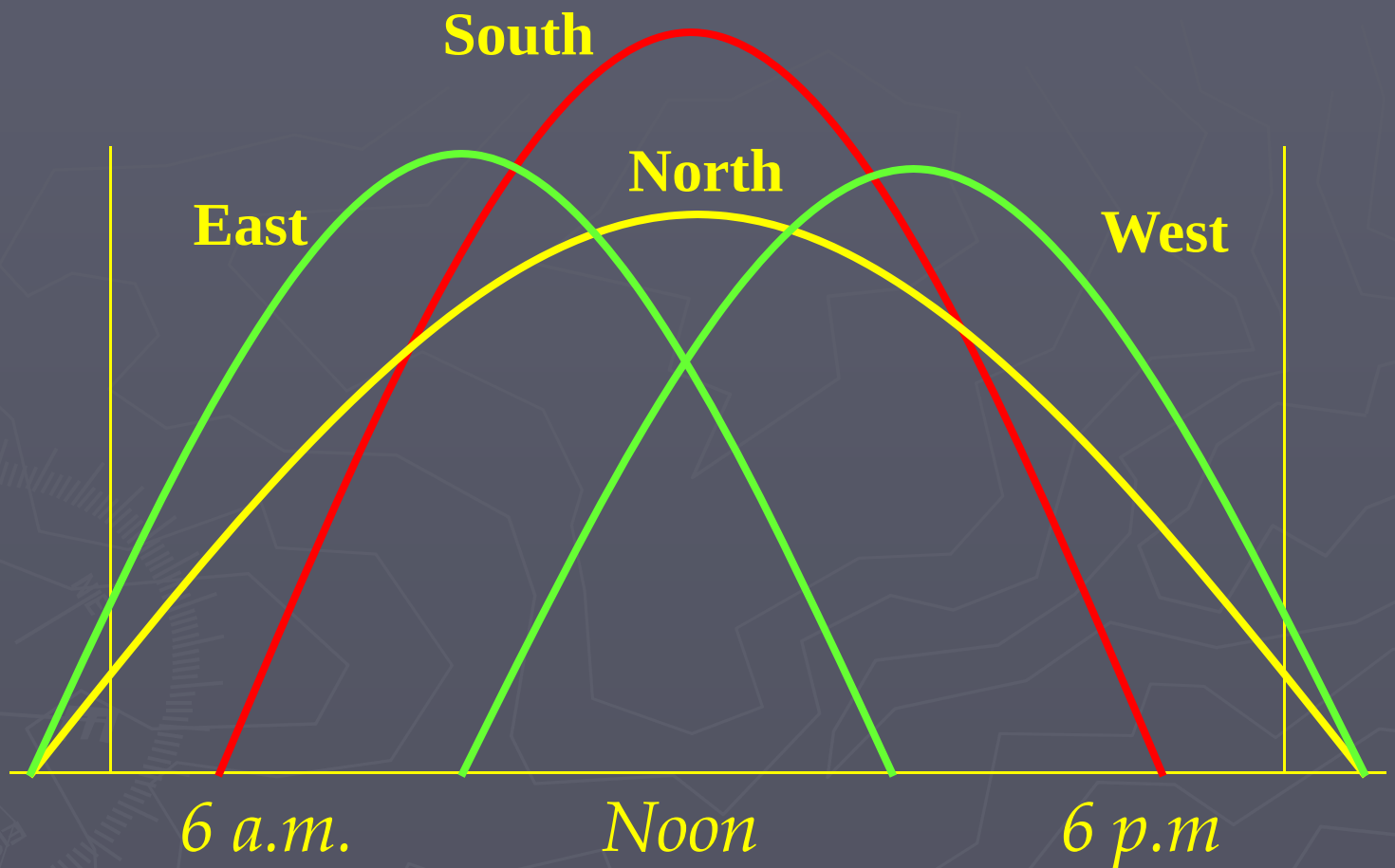
# Slope Shape and Position



# Topography - Aspect

- The compass direction a slope faces
- Influences
  - Sunlight
  - Heat
  - Wind
  - Water

# Solar Insolence

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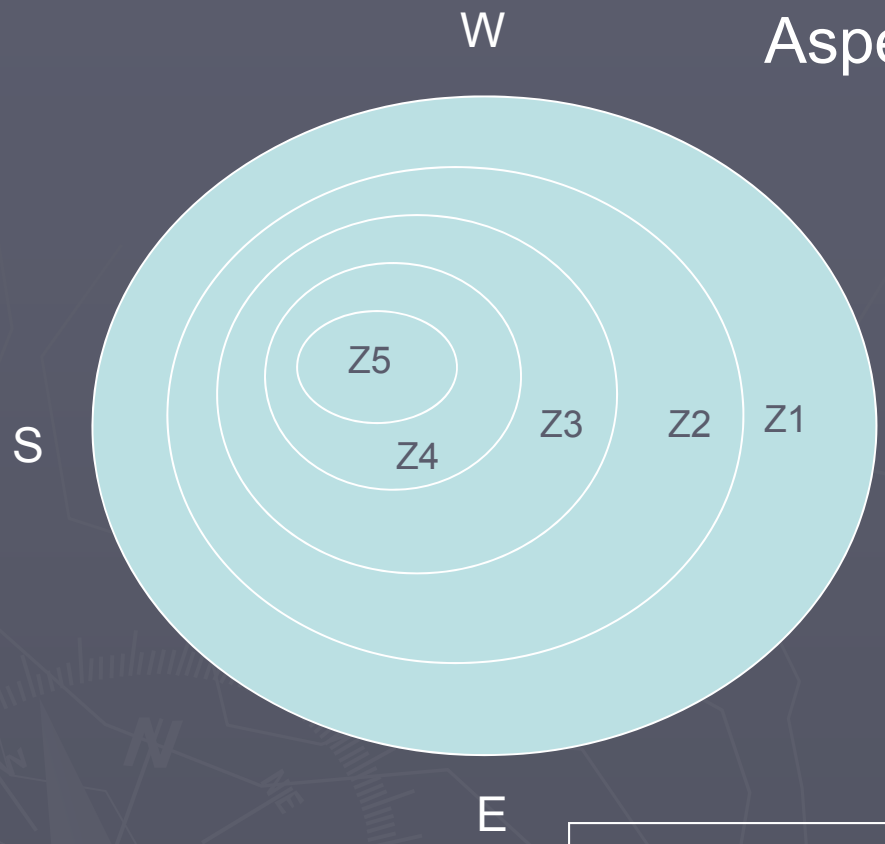
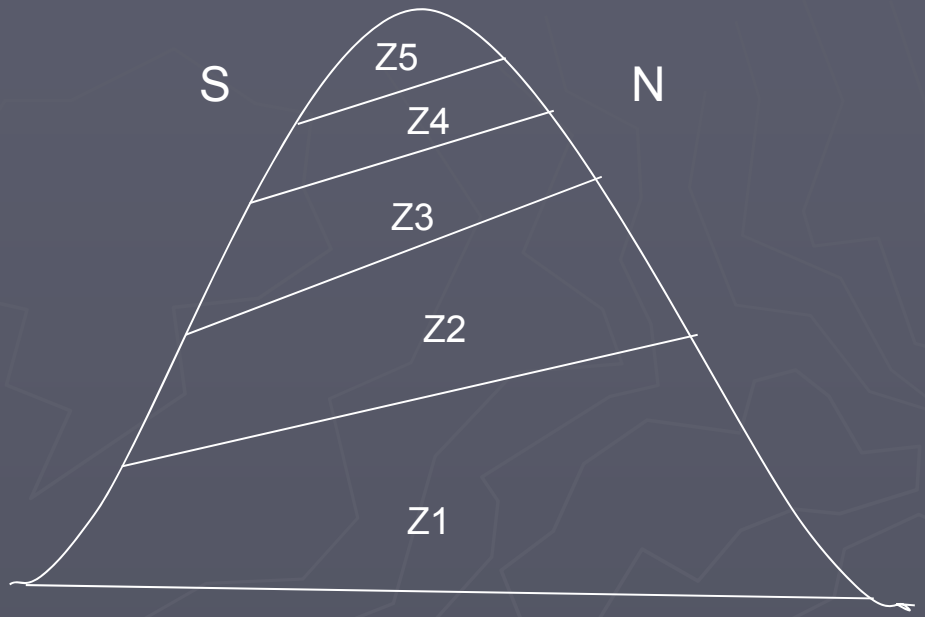
# Aspect

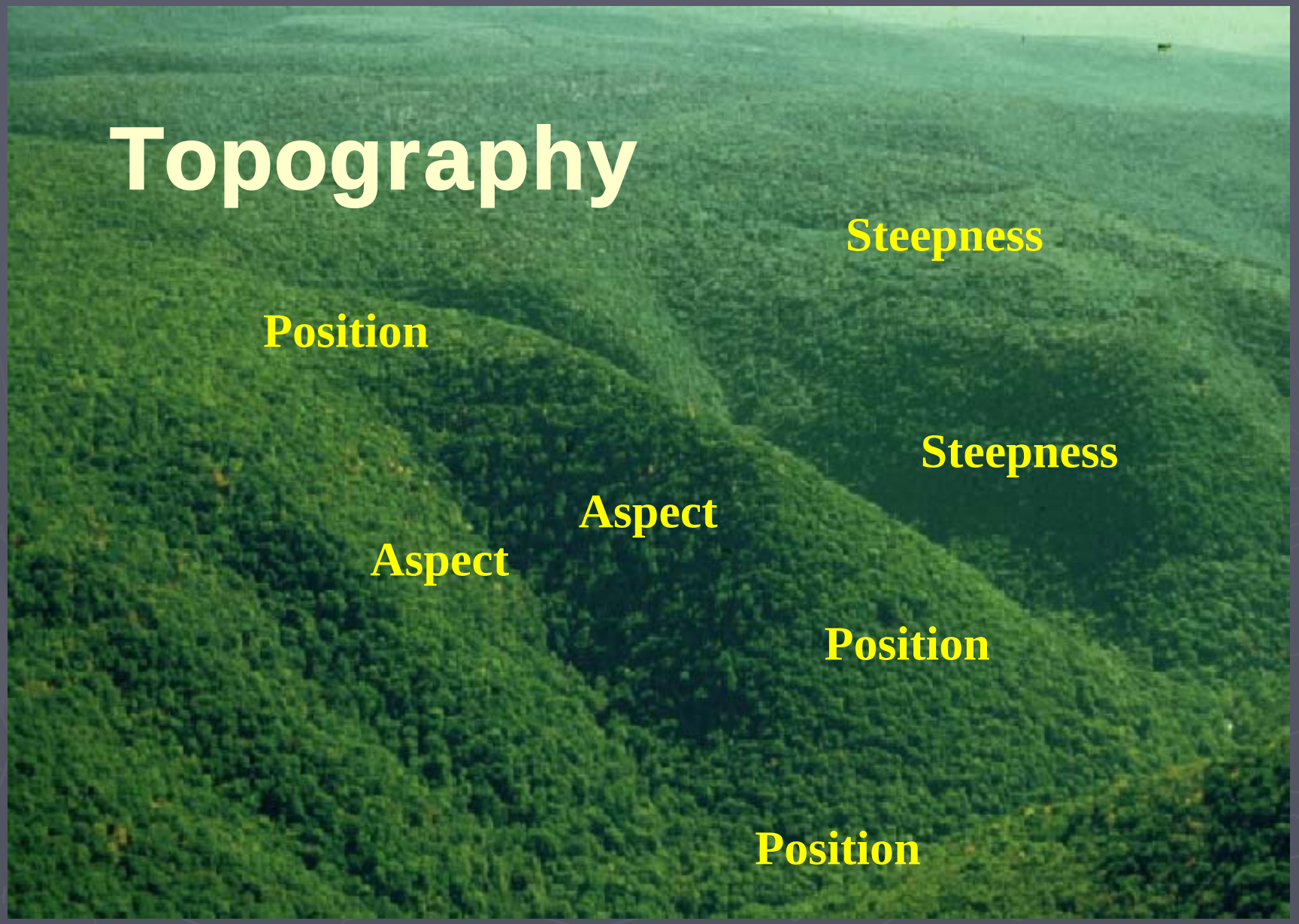
# Aspect and Speciation Interaction




## Species by Zones

| | |
|---|---|
| Zone 1 | He, YP, SM, Cu, YB |
| Zone 2 | WP, SM, HI, RO |
| Zone 3 | WO, CO |
| Zone 4 | CO, BG |
| Zone 5 | CO, MtnL, BIB |


Topography
Steepness
Position
Steepness
Aspect
Aspect
Position
Position

# Biotic = Forest Life

- Includes:
  - Plants
  - Animals
    - Insects
  - Fungi
  - Bacteria
- Abiotic factors influence forest found

# We'll Focus On:

- Tree Growth
- Succession

# Tree growth affected by:

- Light
- Water
- Nutrients
- Space

As well as biotic factors

# Law of Minimums

Whenever a factor approaches a minimum, its relative effect becomes increasingly great.

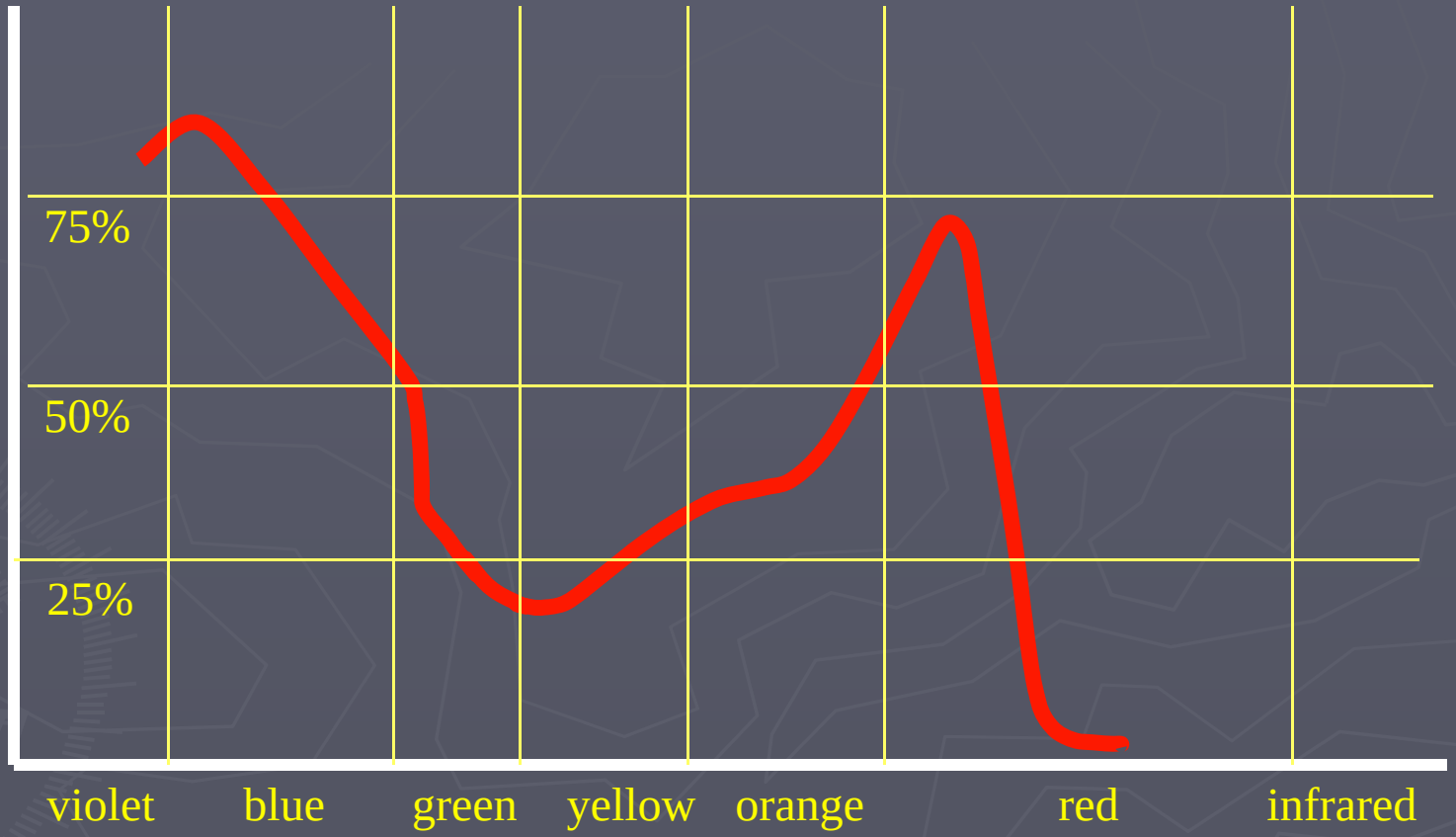
Corollary:

A Law of Maximums

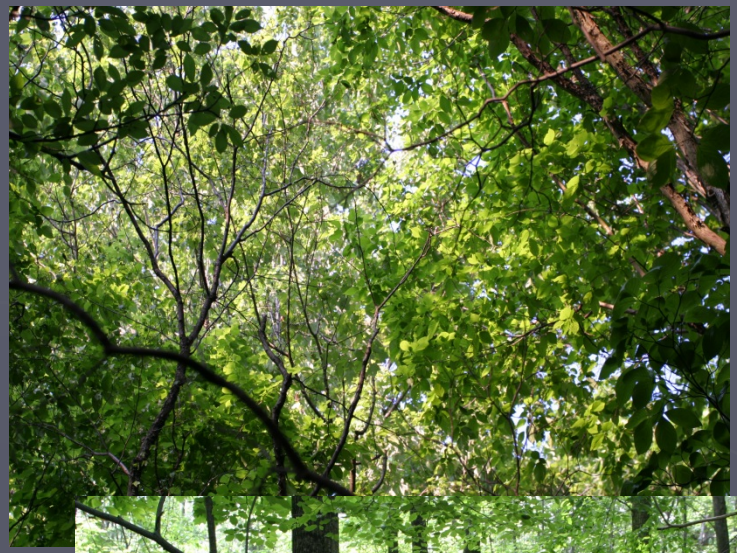
# Tolerance

- Temperature
- Soil Conditions
  - Water
  - Nutrients
  - Compaction
- Browsing
- *Shade*

# Light Wave Length Affecting Plant Growth




Source: http://www.ext.colostate.edu/pubs/garden/07711.html



# Shade Tolerance

Describes the level of light at which a species is best able to germinate, grow, and develop.

- Tolerant
- Intermediate
- Intolerant

# Shade Tolerant Species

- Grow in shade
- Long-lived
- Slow growth rate
- Competitive Strategy
- Species
  - Beech
  - Sugar Maple
  - Hemlock
  - Red Maple
  - Black Gum

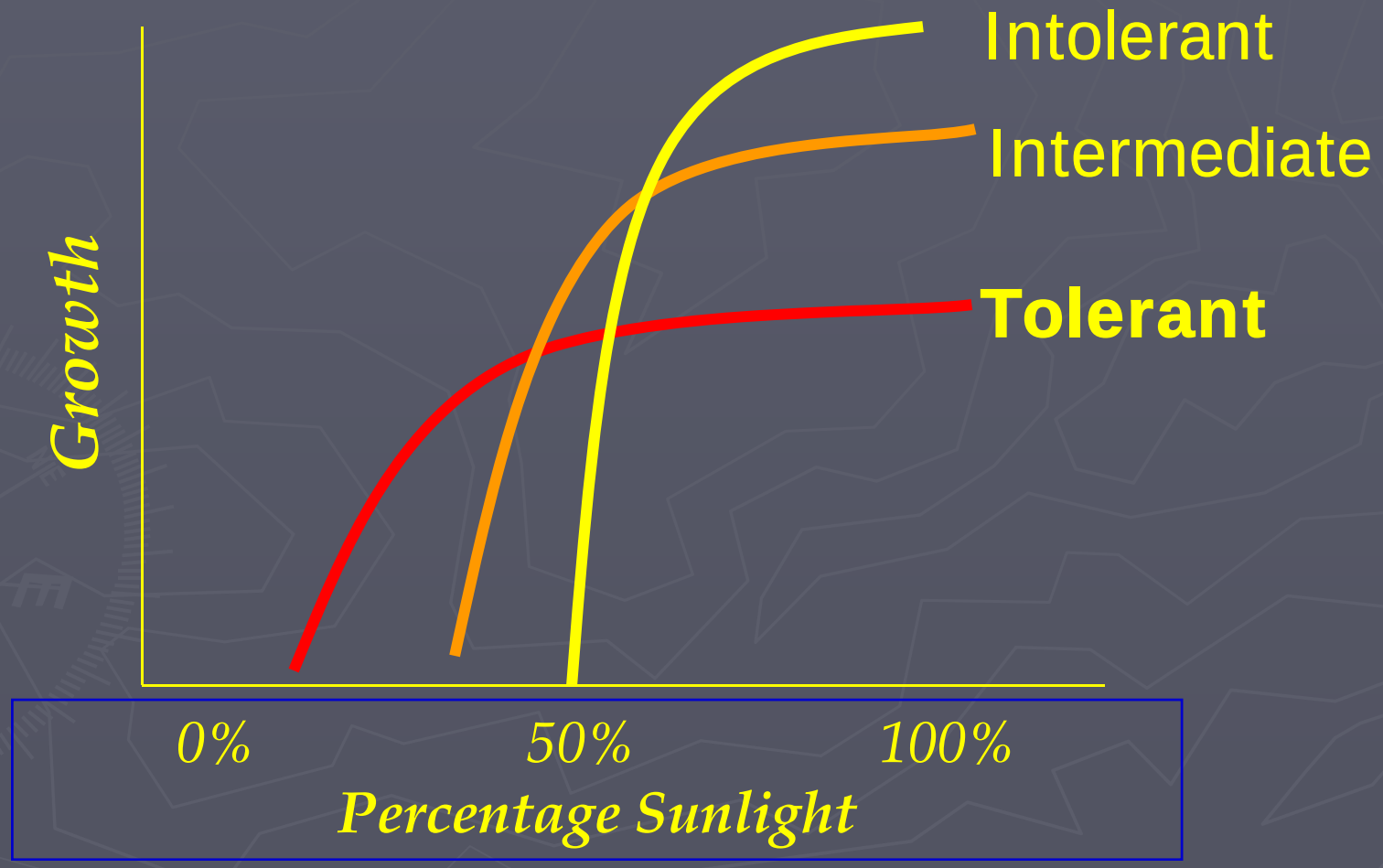
# Intermediate Species

- Need moderate light to germinate and grow
- Competitive strategy
- Are long-lived
- Species
  - Red Oak
  - White Oak
  - Hickory
  - White Pine

# Intolerant Species

- Need nearly **full** sunlight to germinate and grow
- Competitive strategy
- Species
  - Aspen
  - Black Cherry
  - Yellow Poplar
  - White Ash
  - Birch

# Tolerance, Sunlight, Growth



# Succession

The natural progression from one predominant vegetative type to another, over time, in the absence of disturbance

| Forbs & Grasses | Mixed Herbaceous | Shrubs | Trees |
|---|---|---|---|
| Pioneers | Transition | | Late |


Old Field Succession

# Forest Succession

# Stand Development


1927


1928


1937 – 10 years


1947 – 20 Years


1958 – 30 Years


1968 – 40 Years


1978 – 50 Years


1988 – 60 Years


1998 – 70 Years


2008 – 80 Years

# Benefits of Understanding Forest Ecology?

- Helps us better manage the forest
- Knowledge of how species grow
- Knowledge of what species will regenerate after a cut or disturbance
- Knowledge of optimum time for harvesting
- Knowledge of how site influences what species will grow and how
- On and on ....


Questions?