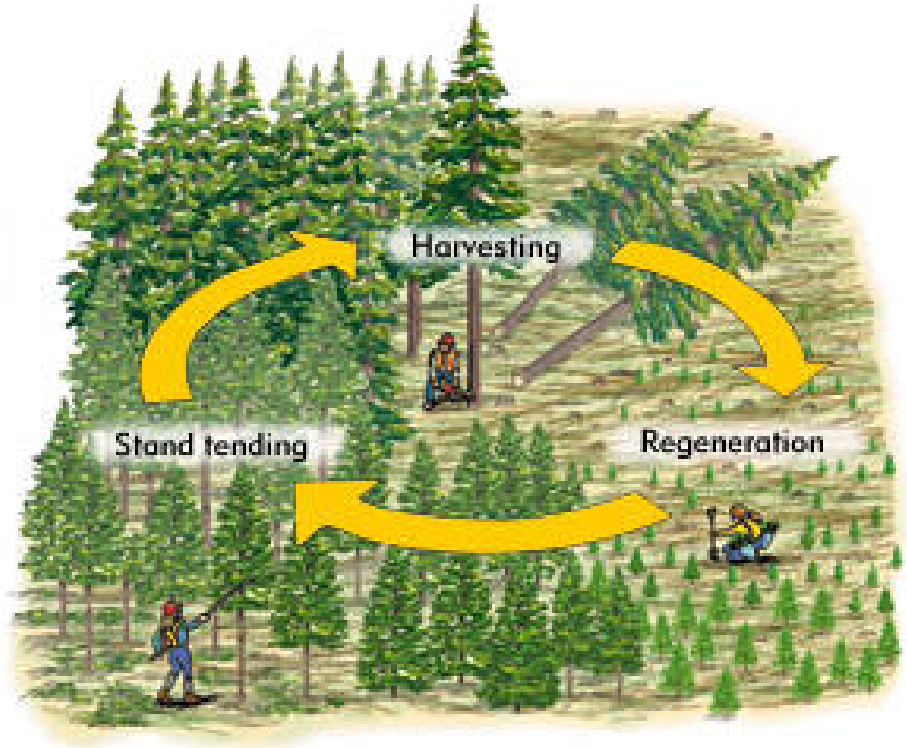
# Introduction to Silviculture

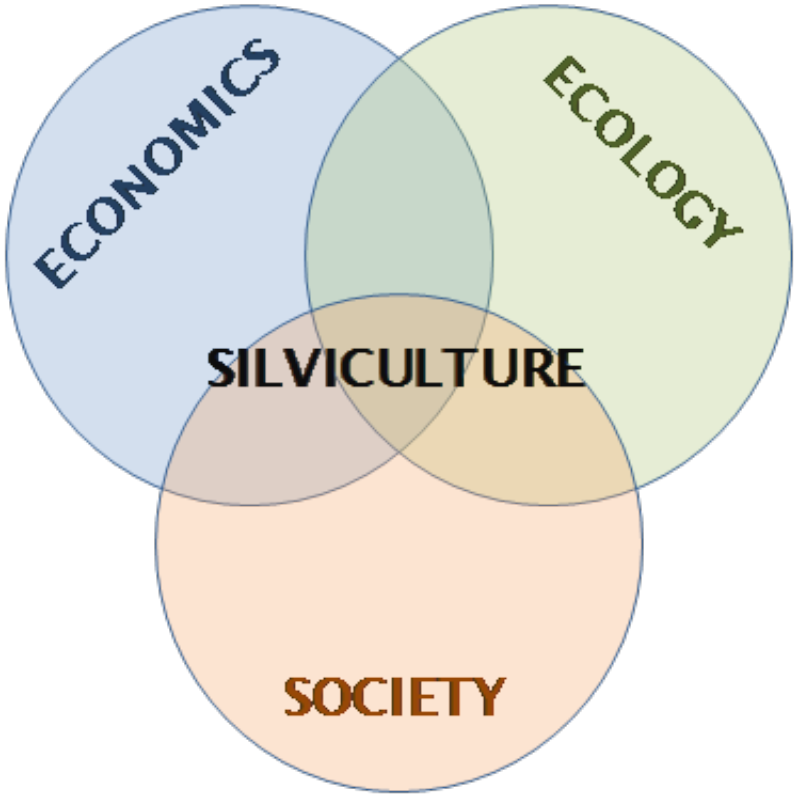
- Objectives
  - Overview of silviculture
  - Structural measures used to characterize forest stands and resources
  - **First:** questions, take-home points, things you learned, etc. from reading assignment

*Silviculture is to forestry as agronomy is to agriculture in that it is concerned with the technology* [i.e., science] *of growing vegetation. Like the rest of forestry itself, silviculture is an applied science that rests on the more fundamental natural and social sciences.*

# Introduction to Silviculture

- Silviculture - Applied Forest Ecology



# Introduction to Silviculture

- Silviculture - Applied Forest Ecology
  - Ecological forestry (Franklin et al. 2007)
    - Emulation of natural disturbances and resulting stand development processes as a model for silvicultural practices
    - 3-legged stool of ecological forestry
      - Retention of biological legacies at harvest
      - Intermediate treatments to enhance stand heterogeneity (structural & compositional)
      - Allowance of appropriate recovery periods between harvests

# Introduction to Silviculture

- Silviculture - Applied Forest Ecology
  - Ecological forestry (Franklin et al. 2007)

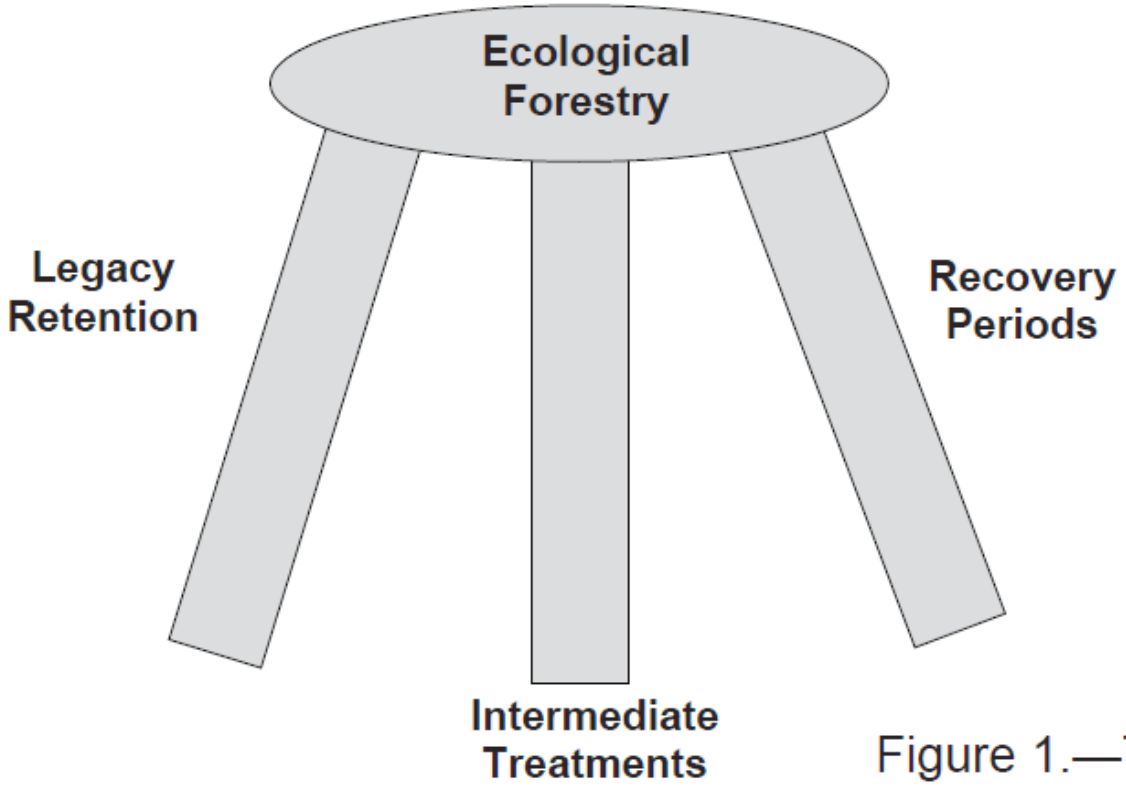
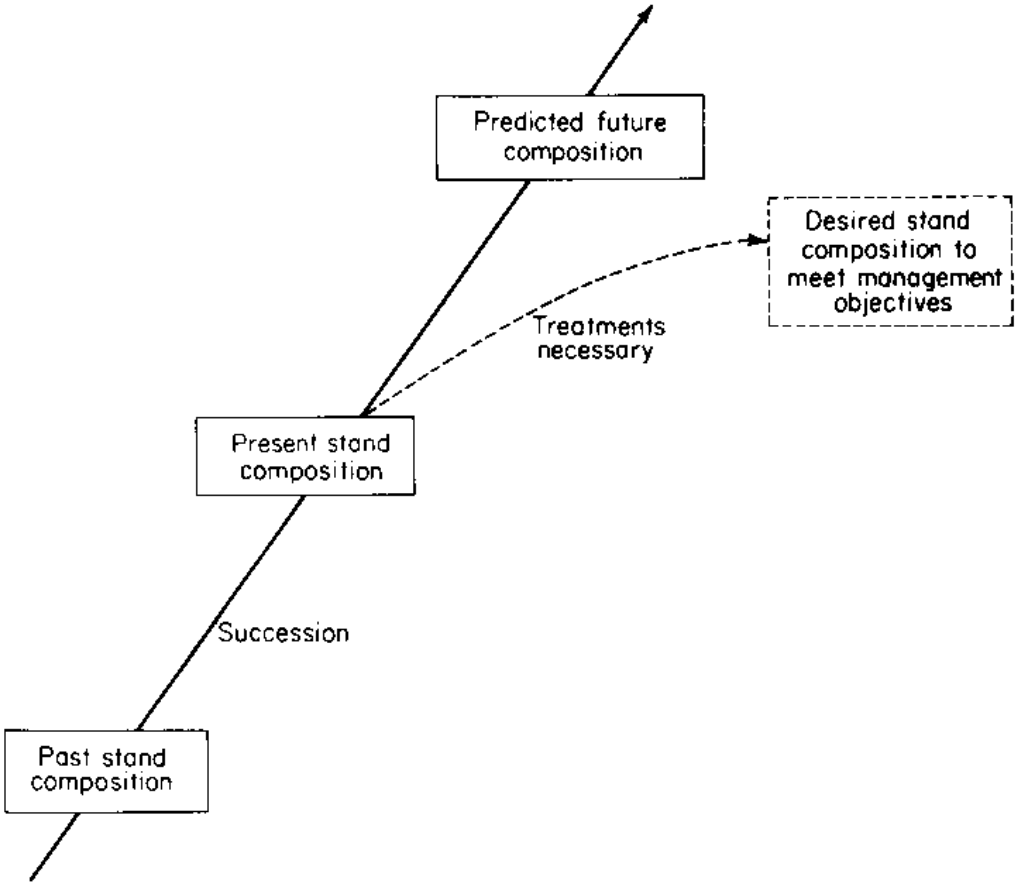



Figure 1.—The three-legged stool of ecological forestry.

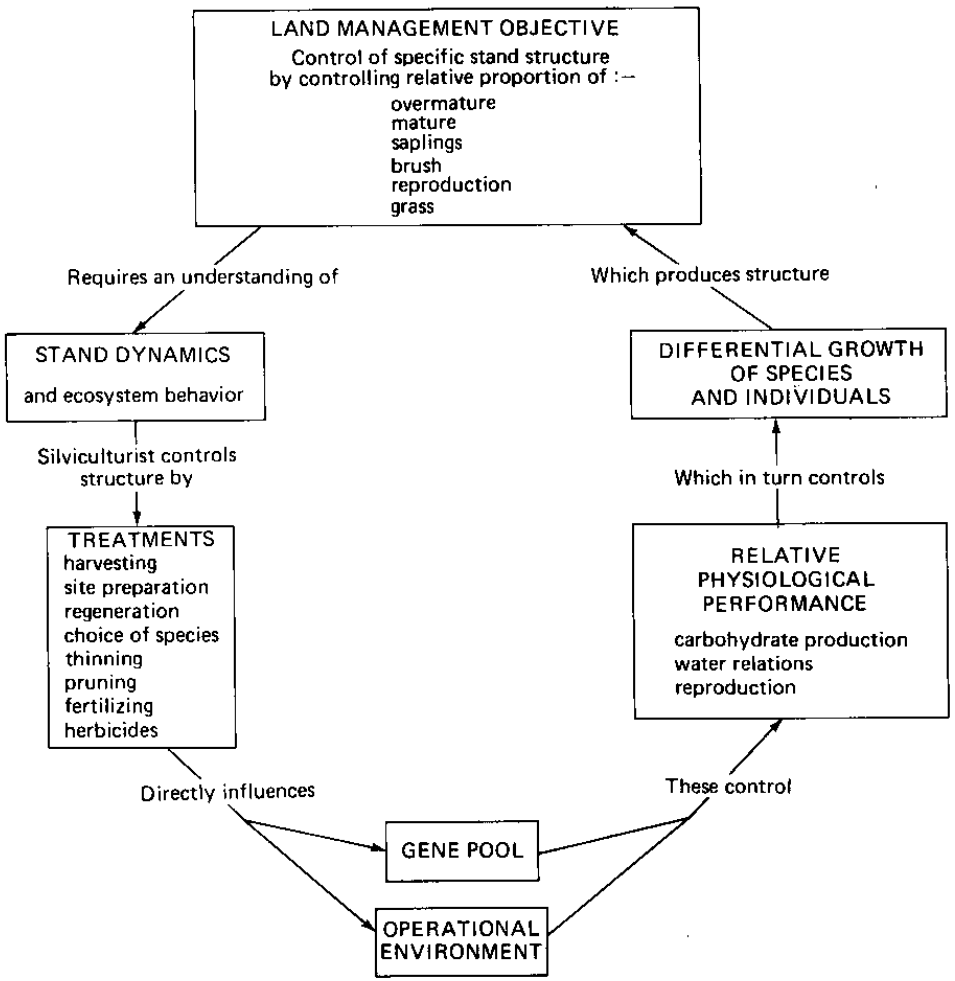
# Introduction to Silviculture

- Silviculture - Applied Forest Ecology



# Introduction to Silviculture

- Silviculture - Applied Forest Ecology



# Introduction to Silviculture

- Silviculture - Applied Forest Ecology
  - Silvicultural practices / treatments

Thinning

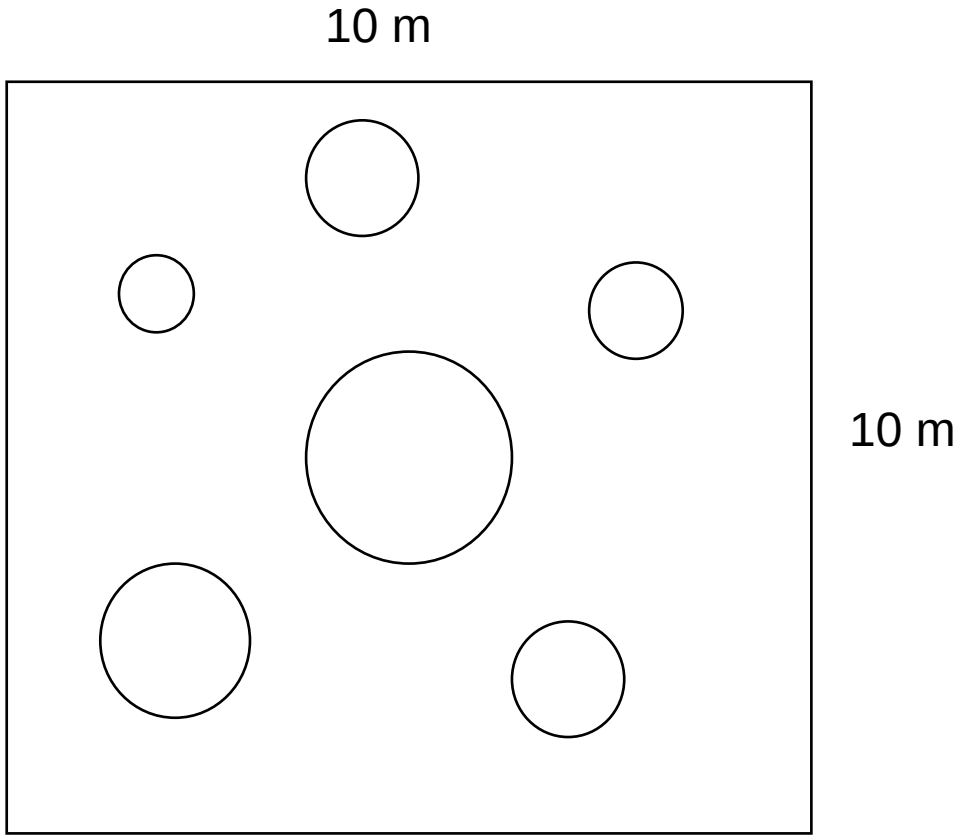
Pruning

# Introduction to Silviculture

- Silviculture - Applied Forest Ecology
  - Silvicultural practices
    - Control of stand structure & processes
    - Control of composition
    - Control of stand density
    - Control of rotation length
    - Facilitating harvest
    - Restocking/renewing next cohort
    - Protection
    - Conservation of site productivity

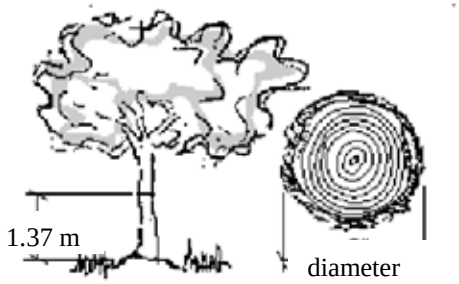
# Introduction to Silviculture

- Forest Structure - Stand Density

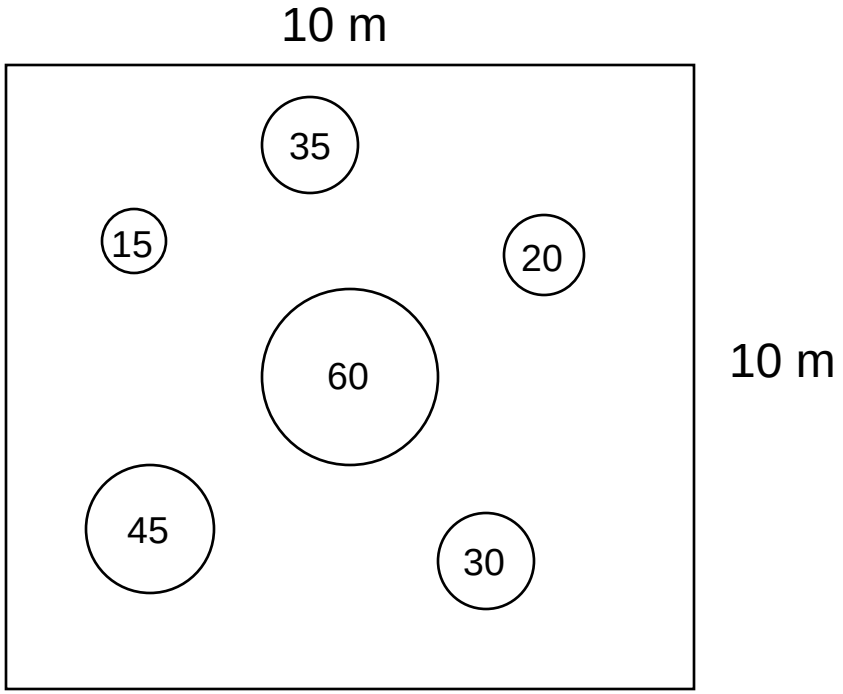


# Introduction to Silviculture

- Forest Structure - DBH

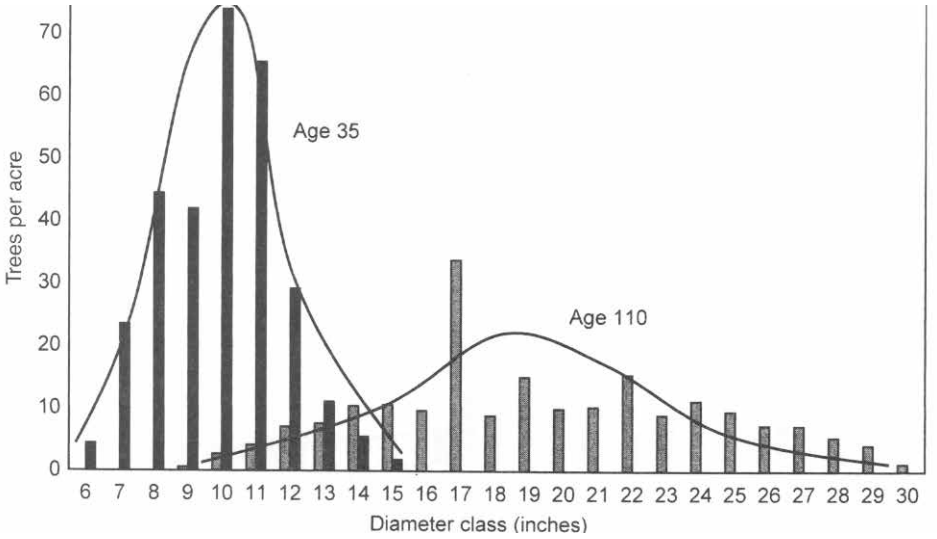


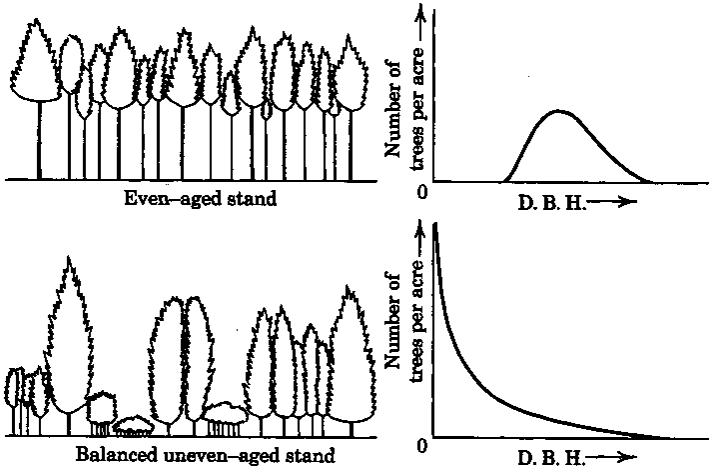

# inside circle is DBH (cm)



# Introduction to Silviculture

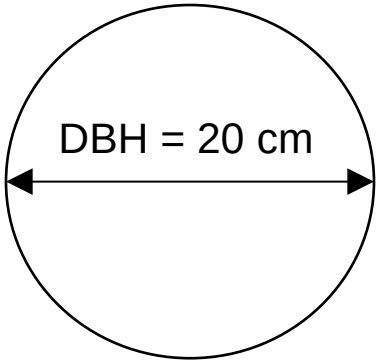
- Forest Structure – Diameter Distribution



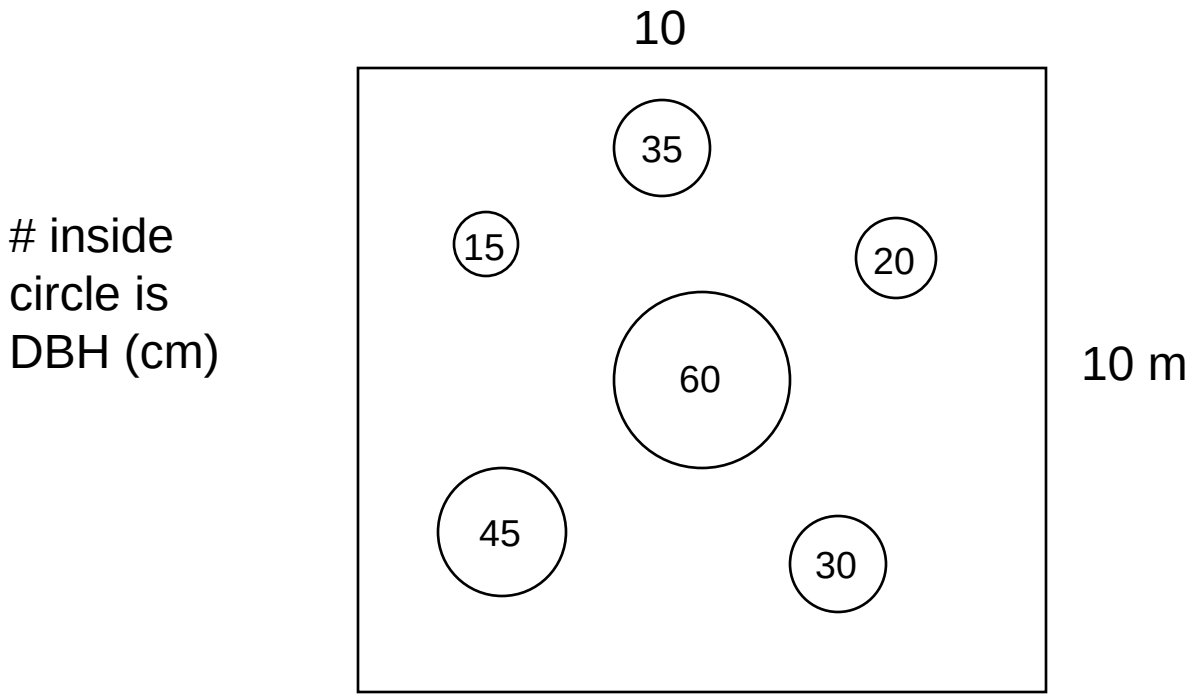
# Introduction to Silviculture

- Forest Structure - Basal Area (Ind. Tree)
  - Cross-sectional area of an individual tree at breast height ($cm^2$ or $m^2$)
  - $BA = (\pi * dbh^2) / 4$
    - For dbh in cm and BA in $cm^2$
  - $BA = (\pi * dbh^2) / (4 * 10{,}000)$
    - For dbh in cm and BA in $m^2$



# Introduction to Silviculture

- Forest Structure - Basal Area (Stand)
  - Typically expressed as square units of BA ($m^2$) per unit of land area (ha); $m^2$/ha (or $cm^2/m^2$)



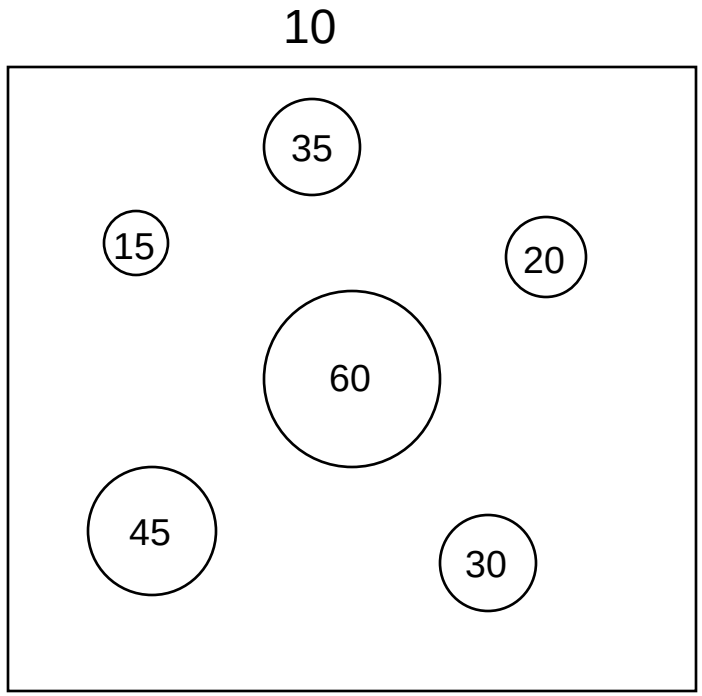
# Introduction to Silviculture

- Forest Structure - Quadratic Mean Diameter

$$QMD(cm) = \sqrt{(MeanBA / 0.0000785)}$$

  – For QMD (cm) from Mean BA ($m^2$)

# inside circle is DBH (cm)

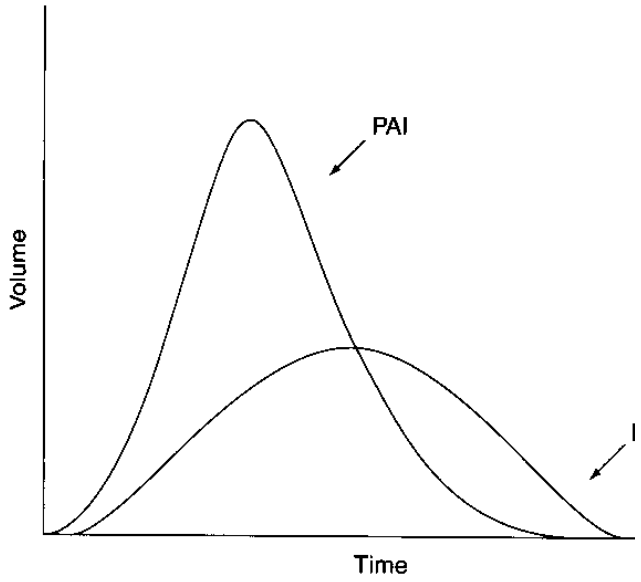


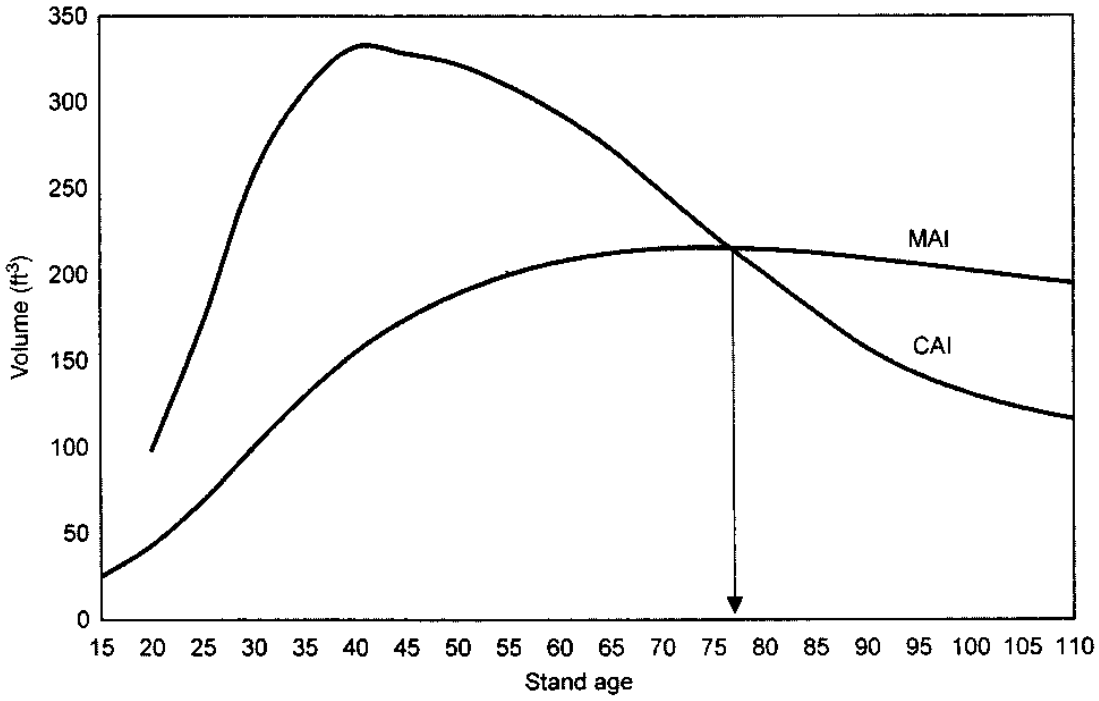
# Introduction to Silviculture

- Forest Structure - Annual Increment
  - MAI = Mean Annual Increment
    - Volume or mass per unit area / Age
  - CAI = Current Annual Increment
    - Volume or mass at the end of the current year - Volume or mass at the beginning of the current year
  - PAI = Periodic Annual Increment
    - (Volume or mass at the end of a period - Volume or mass at the beginning of the period) / length of the period
    - If length of the period is 1 year, then PAI = CAI

# Introduction to Silviculture

- Forest Structure - Annual Increment

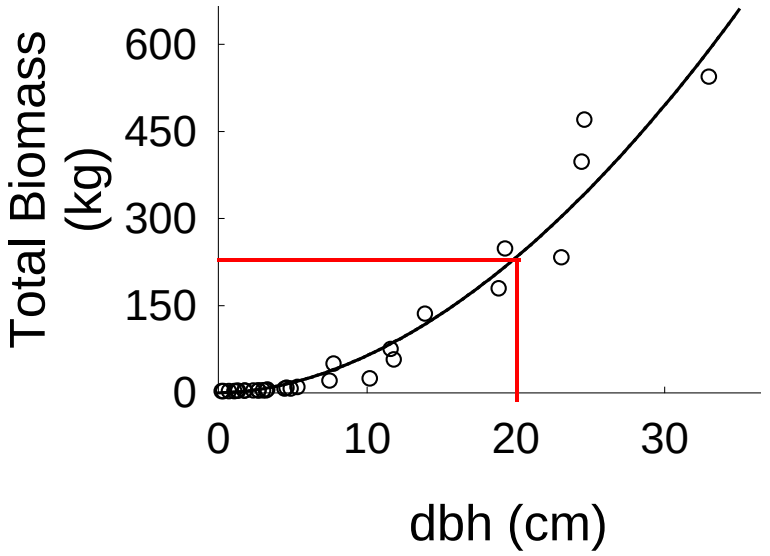


# Introduction to Silviculture

- Forest Structure - Allometry
- Biomass
  - $Y = aX^b$
  - $Y = 0.88*X^{1.86}$

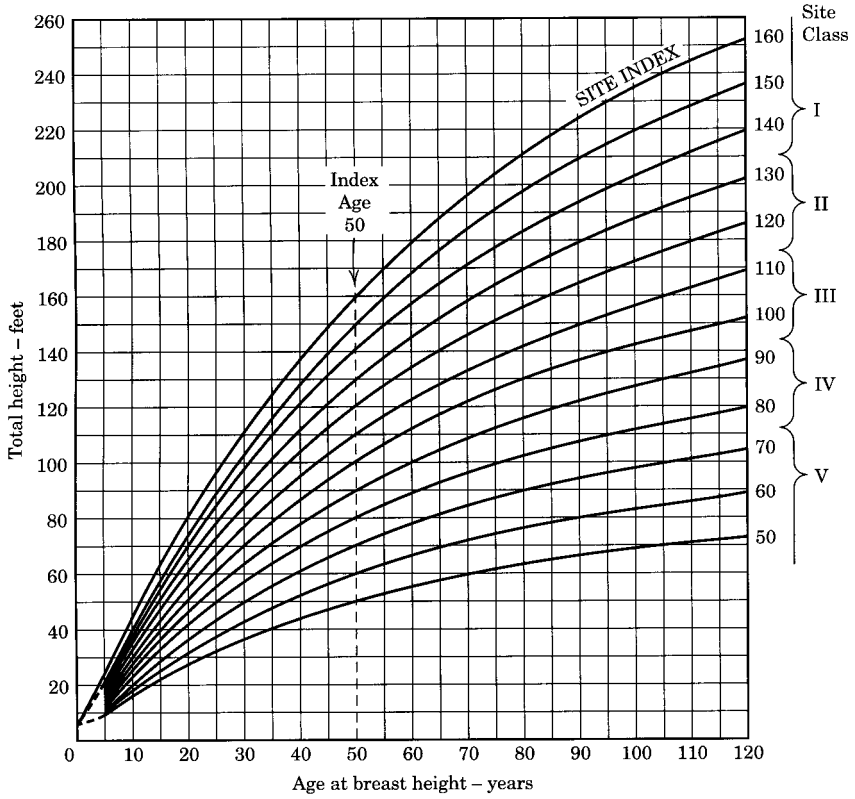
*Metrosideros polymorpha*




Litton & Kauffman (2008)

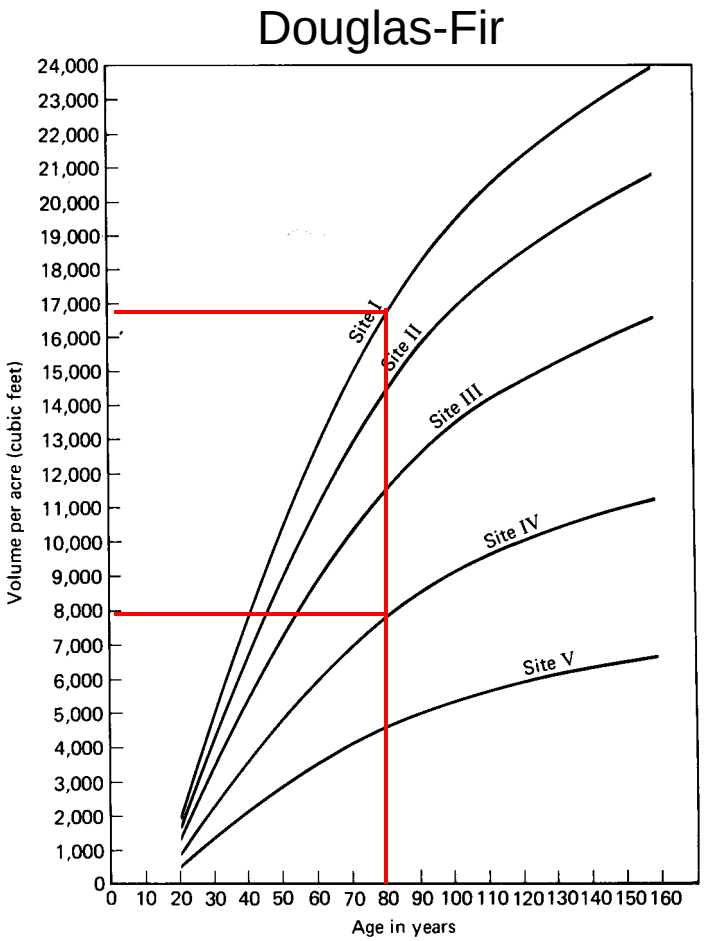
# Introduction to Silviculture

- Forest Structure – Site Index



# Introduction to Silviculture

- Forest Structure – Site Index & Volume



# Introduction to Silviculture

- Forest Characterization Exercise
  - **Purpose**: (a) experience calculating some of the more commonly used metrics of forest resources; and (b) to prep you for Mid-term II
  - Assigned 3/7/16 via email
  - Due 3/17/16 in class via hardcopy print