




Silviculture

FORS 3347

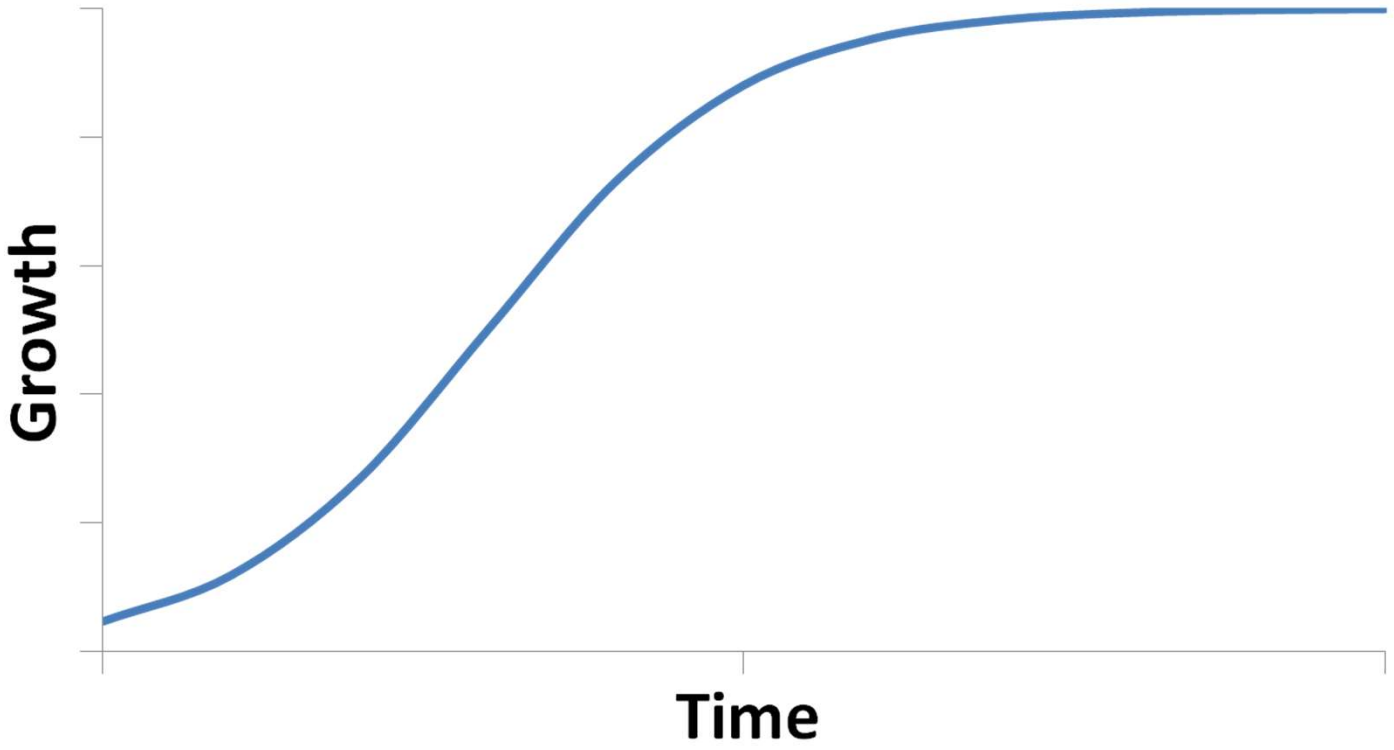
Instructor: Dr. Jeremy Stovall

Quantifying Growth - Increment

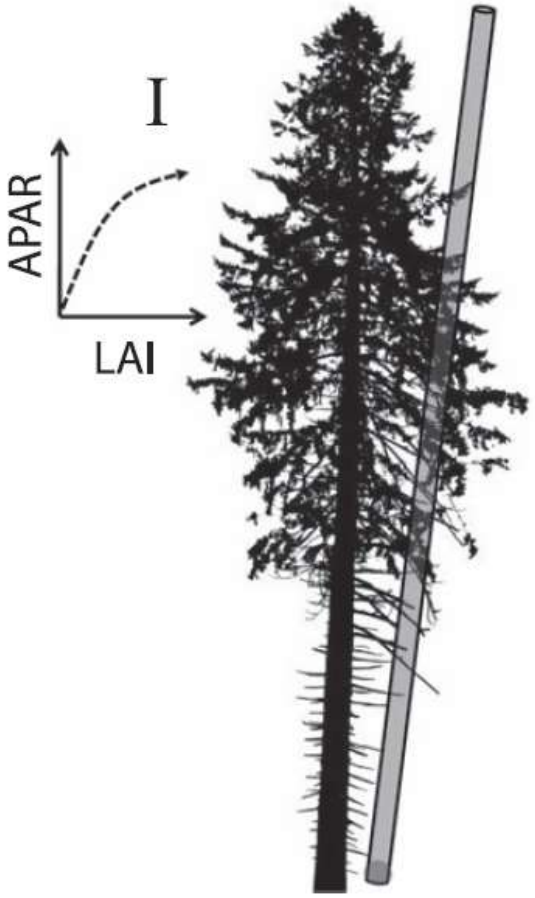





Carbon Balance & Growth



Canopy Depth



Binkley, D., et al. Light absorption and use efficiency in forests: Why patterns differ for trees and stands. Forest Ecol. Manage. (2011), doi:10.1016/j.foreco.2011.11.002

Live Tissue

FOLIAGE

+

FINE ROOTS

+

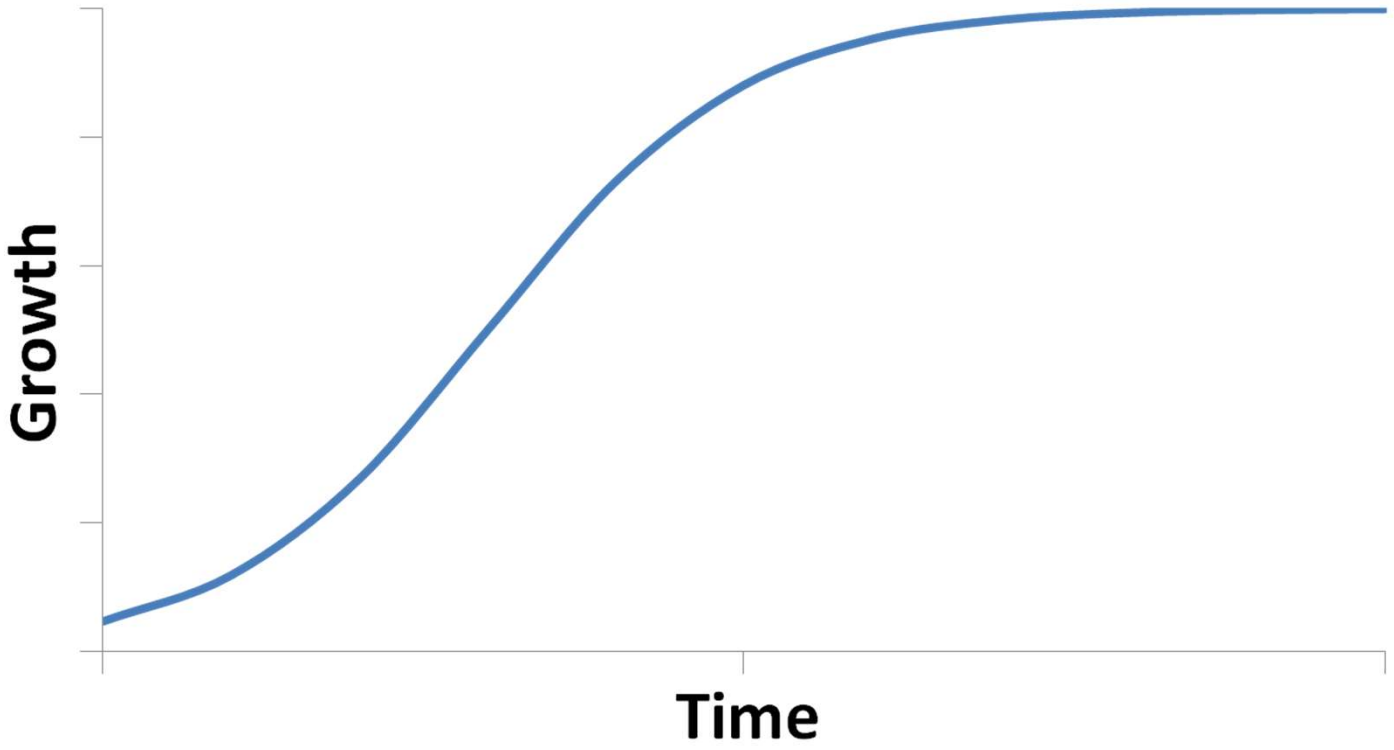
CAMBIUM & PHLOEM

Canopy Versus Live Tissue

$$\frac{\text{Canopy} = \text{Photosynthesis} = \textbf{Carbon Gained}}{\text{Live Tissue} = \text{Respiration} = \textbf{Carbon Lost}}$$

$$\text{IF} \quad \frac{\text{Carbon Gained}}{\text{Carbon Lost}} = 1 \qquad \textbf{Growth = 0}$$

Carbon Balance & Growth



Different Types of Increments

- Current Annual Increment
  - What grew last year?
- Periodic Annual Increment
  - What grew over the past 5 or 10 years?
- Mean Annual Increment
  - What has grown over the life of this even-aged stand?

Mean Annual Increment

- Merchantable or Total?

How Do We Quantify Growth?

Weight

- Tons (short ton = 2000 pounds)
- Metric Tons (1,000,000 grams)

Area

- Acre (43,560 square feet)
- Hectare (2.47 acres)

Volume

- Cubic Feet
- Cunit (100 cubic feet)
- Cord (128 cubic feet stacked)
- Board Feet (144 cubic inches)
- MBF (1000 board feet)
- Cubic Meters

How Do We Quantify Growth?

3 tons = 100 cubic feet = 1 cunit

2.7 tons = 1 cord

7.1 tons = 1 MBF

1 ton = 1 cubic meter

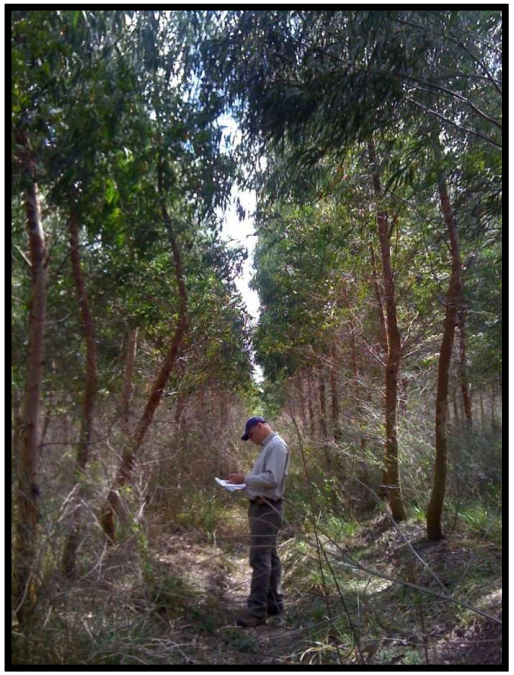
1 ton/acre = 2.5 cubic meters per hectare

1 ton = 0.9 metric tons

1 ton/acre = 2.2 metric tons per hectare

Interpreting Mean Annual Increment

- Eucalyptus: 2-16 tons/acre/year
- Radiata Pine: 5-13 tons/acre/year
- Hybrid Poplars: 4-15 tons/acre/year
- Douglas-Fir: 4-6 tons/acre/year
- Norway Spruce: 1-3 tons/acre/year
- White Spruce: 1-3 tons/acre/year
- Natural Forests: 0.3-1 tons/acre/year



Interpreting Mean Annual Increment

- For Loblolly Pine in the US South
  - **3** tons/acre/year – low quality site, low intensity silviculture
    - 2.6 truck-loads per acre per 25 year rotation
  - **6** tons/acre/year – average quality site, operational silviculture
    - 5.2 truck-loads per acre per 25 year rotation
  - **9** tons/acre/year – high quality site, very intensive silviculture
    - 7.9 truck-loads per acre per 25 year rotation
  - **12** tons/acre/year – goal for future tree improvement and silviculture
    - 10.5 truck-loads per acre per 25 year rotation

Take-Home

- Mean Annual Increment is useful in silviculture
- Units can cause confusion
- Keep bench-marks in mind for reference