Restoring and Regenerating High Graded Forests

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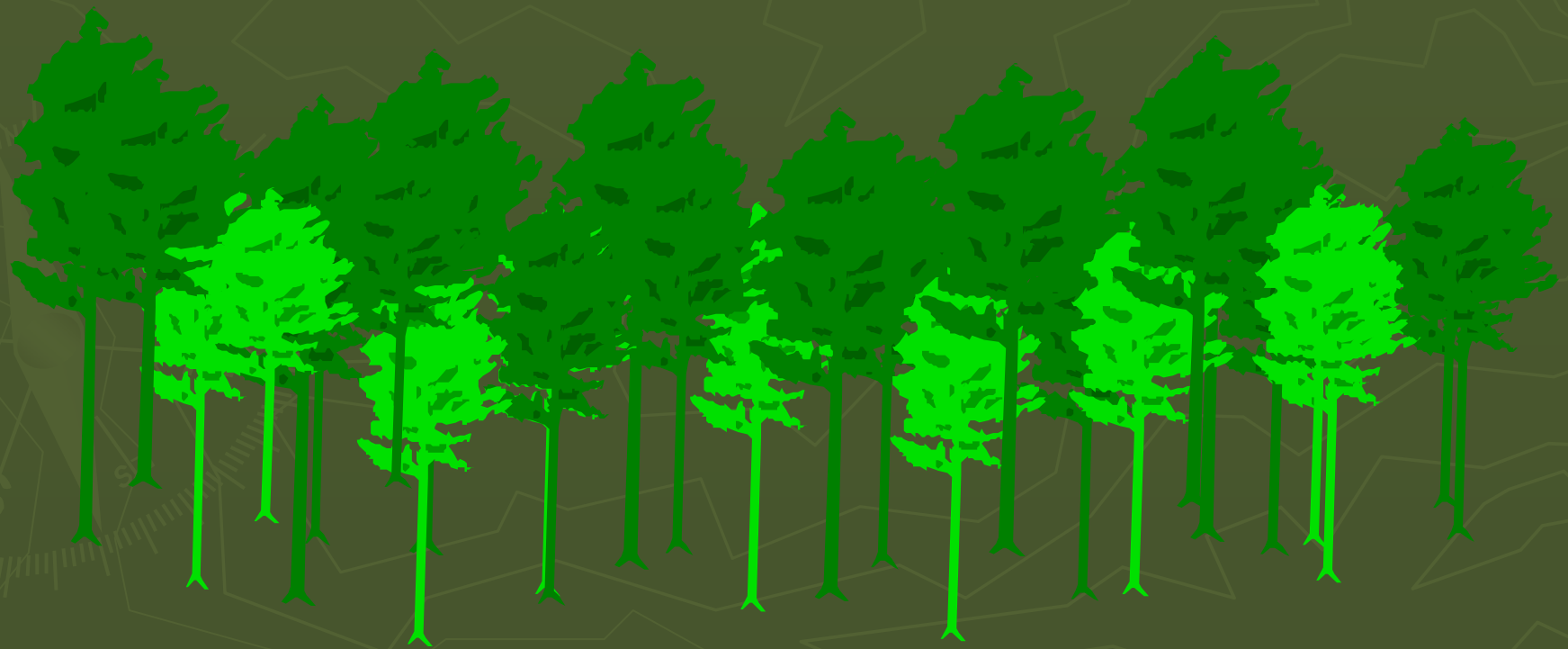
Silviculture

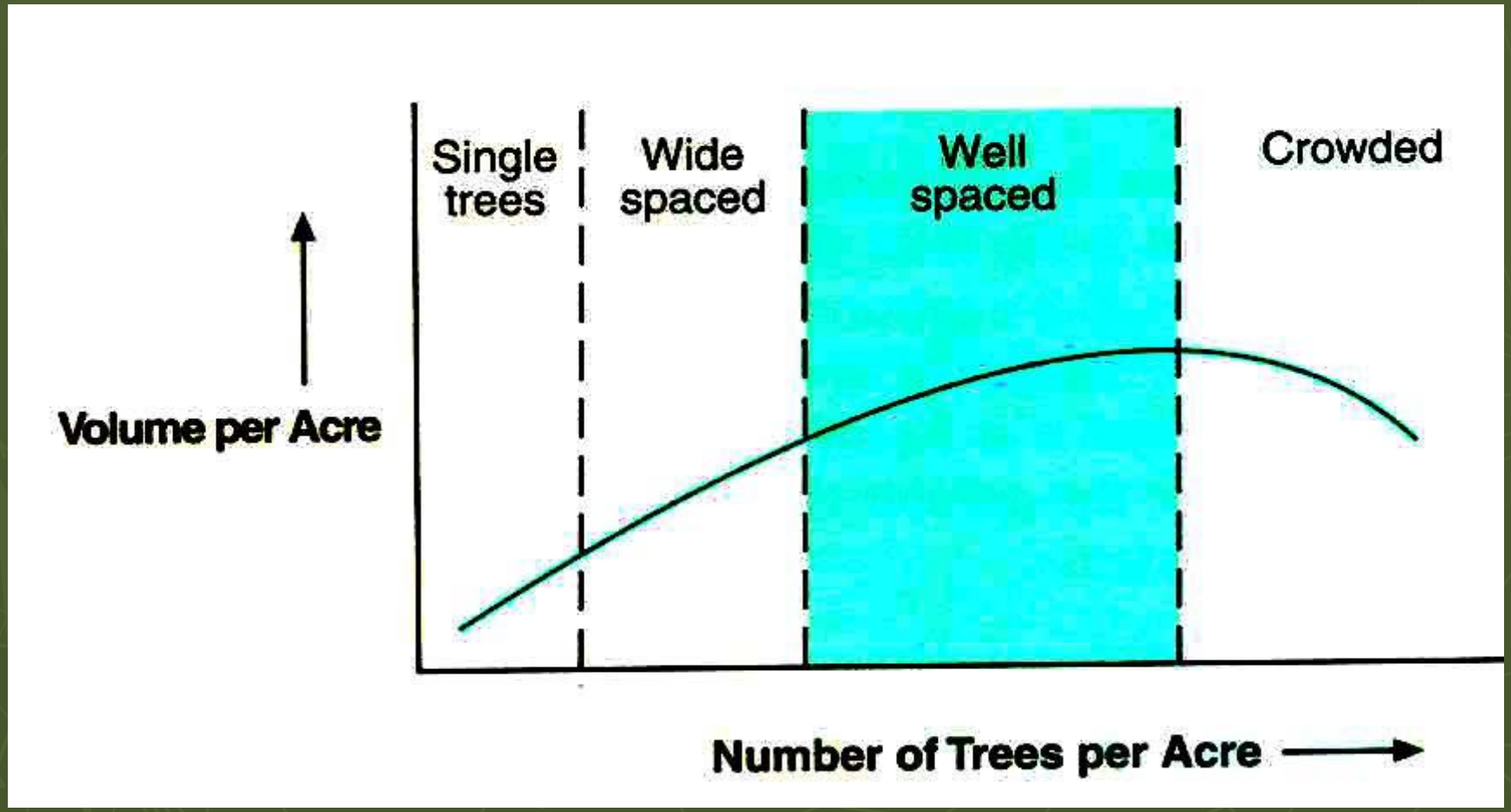
The theory (science) and practice (art) of controlling forest establishment, composition, structure, and growth



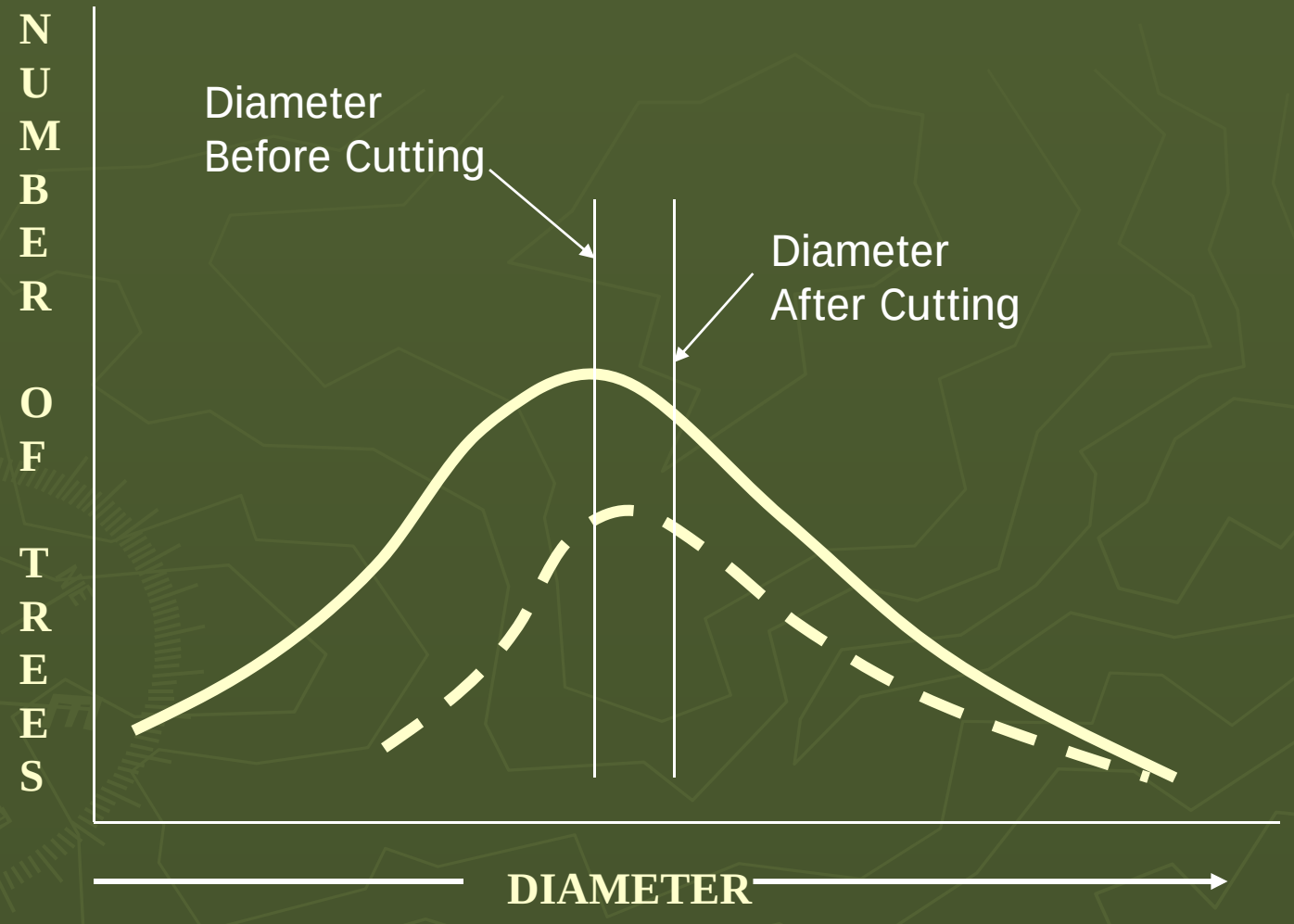
Silvicultural Harvests Focus on:

- Residual Trees
- Regeneration

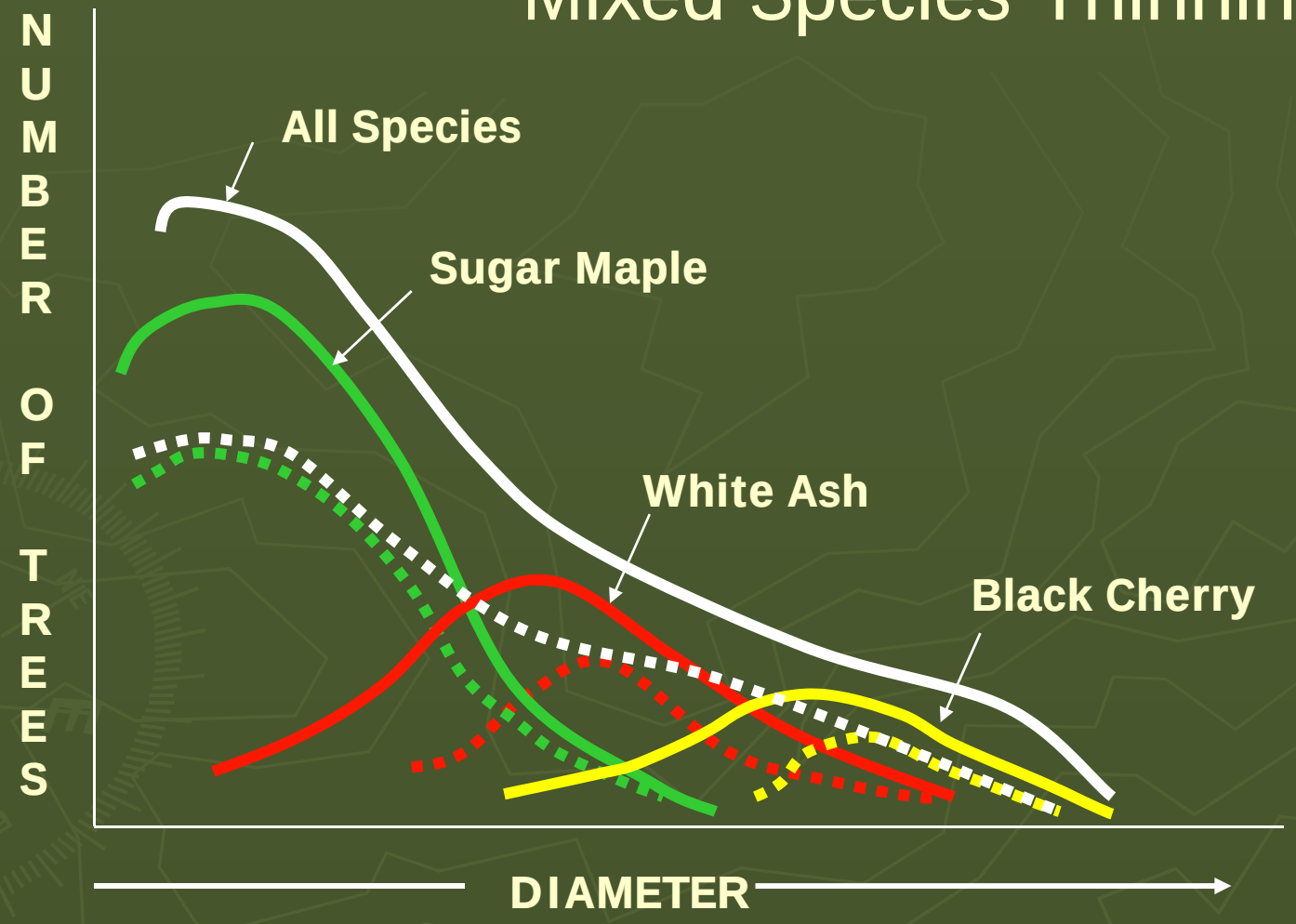
Langsteader's Curve



Single Species Thinning



Mixed Species Thinning



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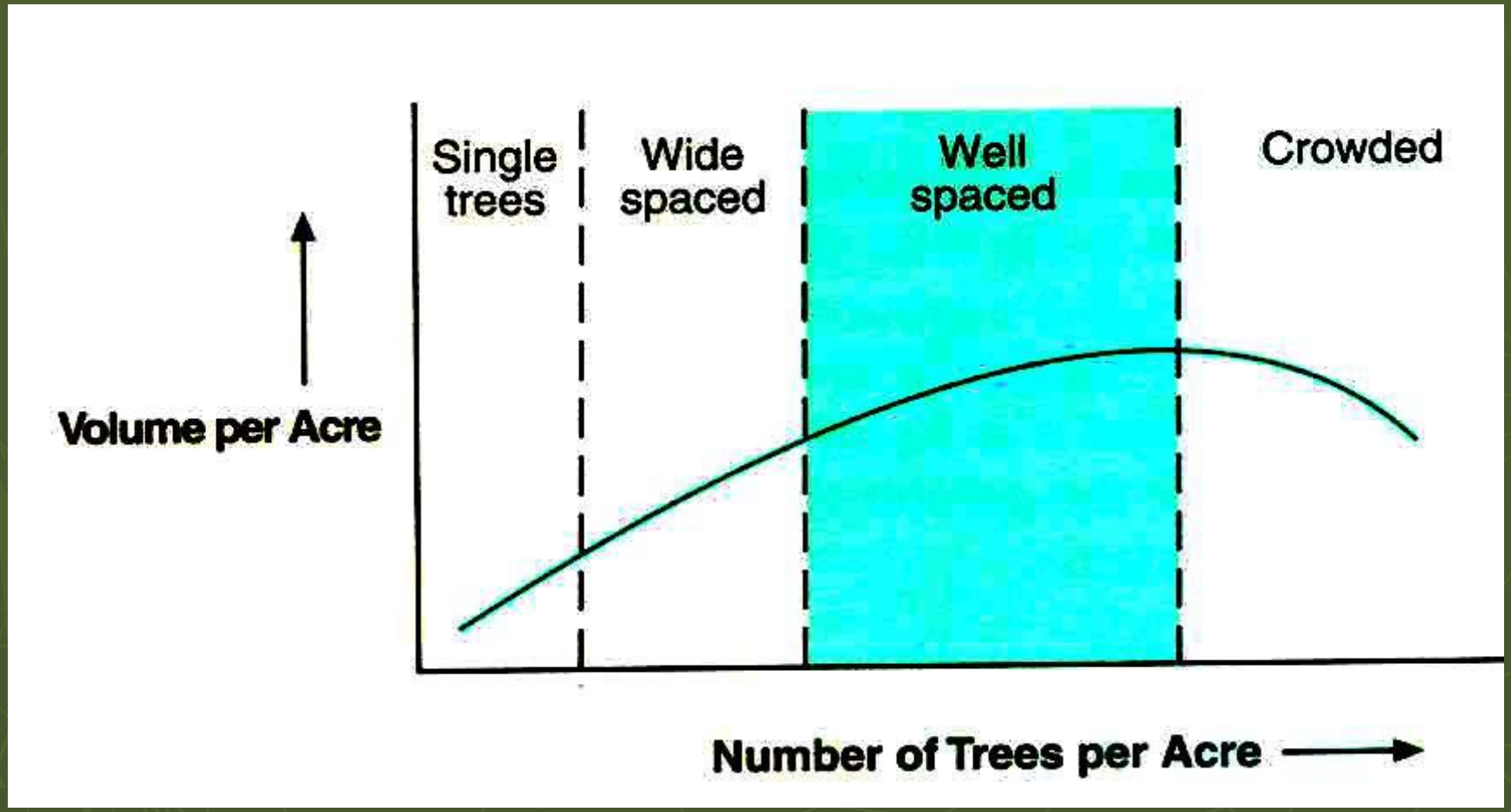
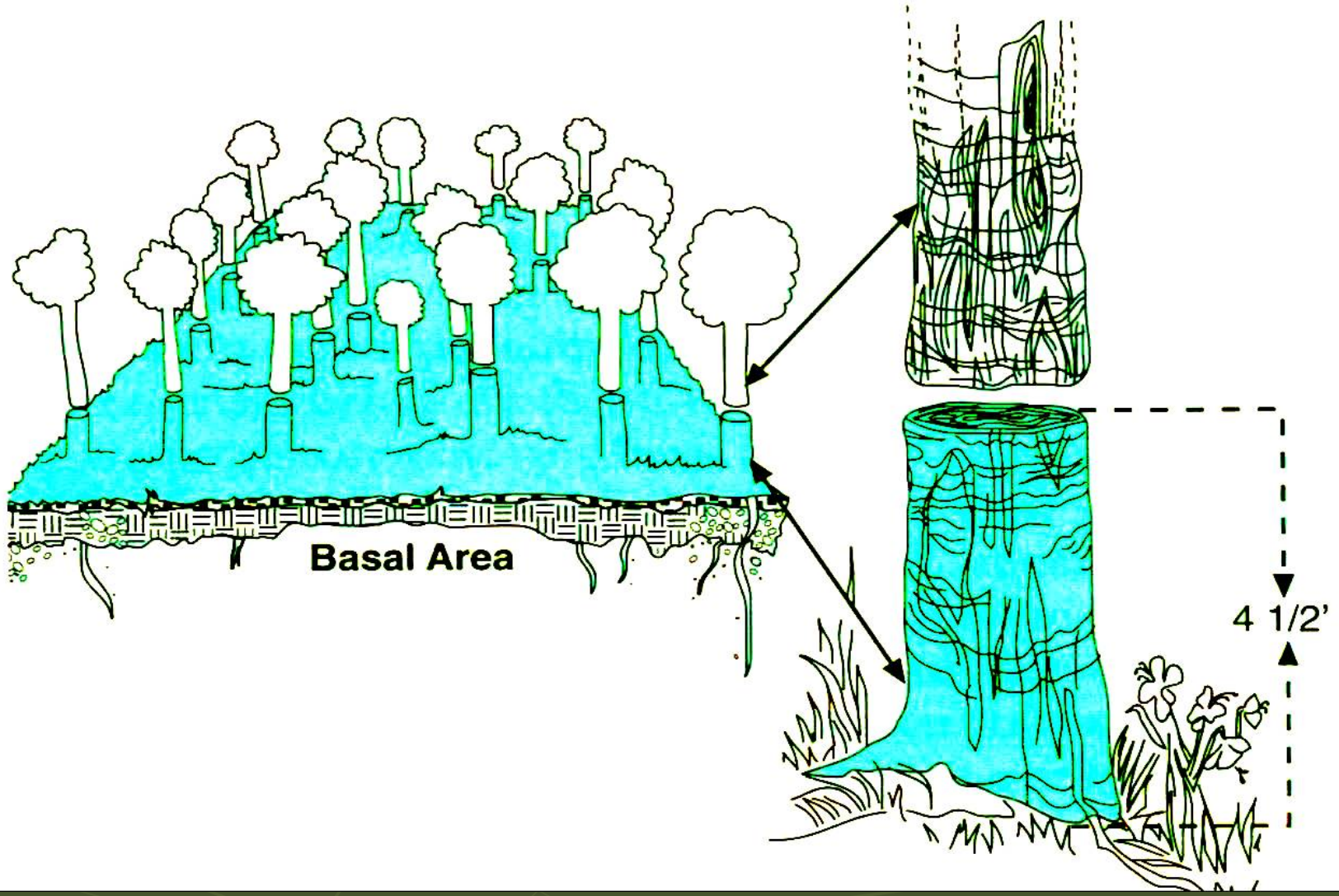
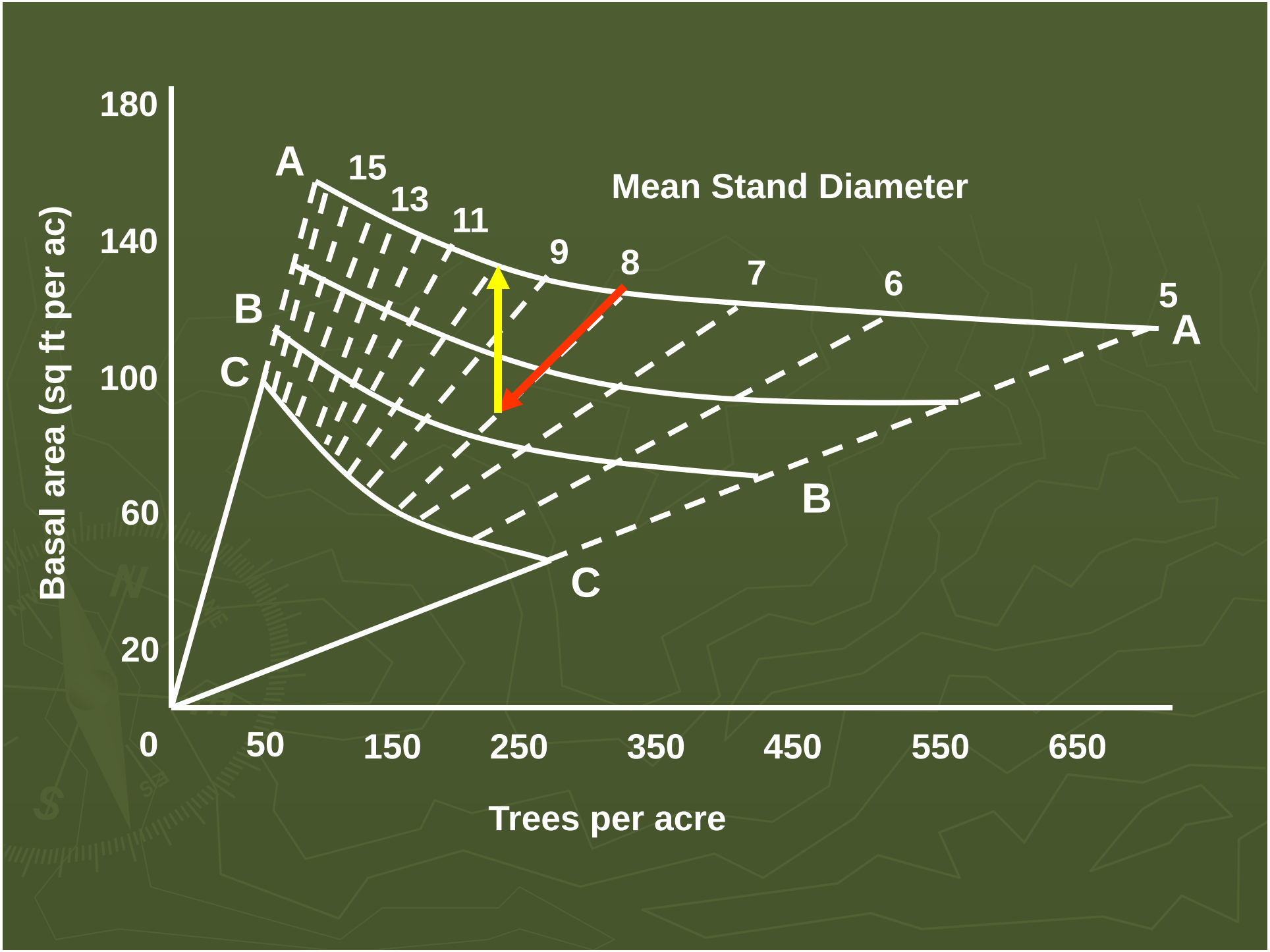
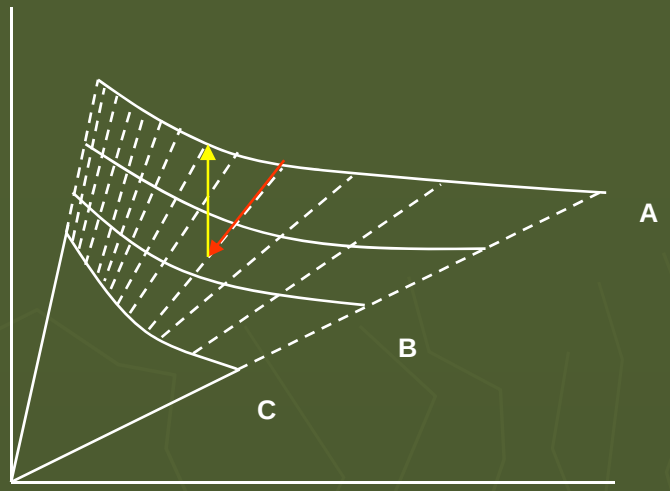


Basal Area




Basal area (sq ft per ac)
180
140
100
60
20
0
50
150
250
350
450
550
650
Trees per acre
Mean Stand Diameter
A
B
C
15
13
11
9
8
7
6
5
A
B
C

Stocking Chart Interpretation

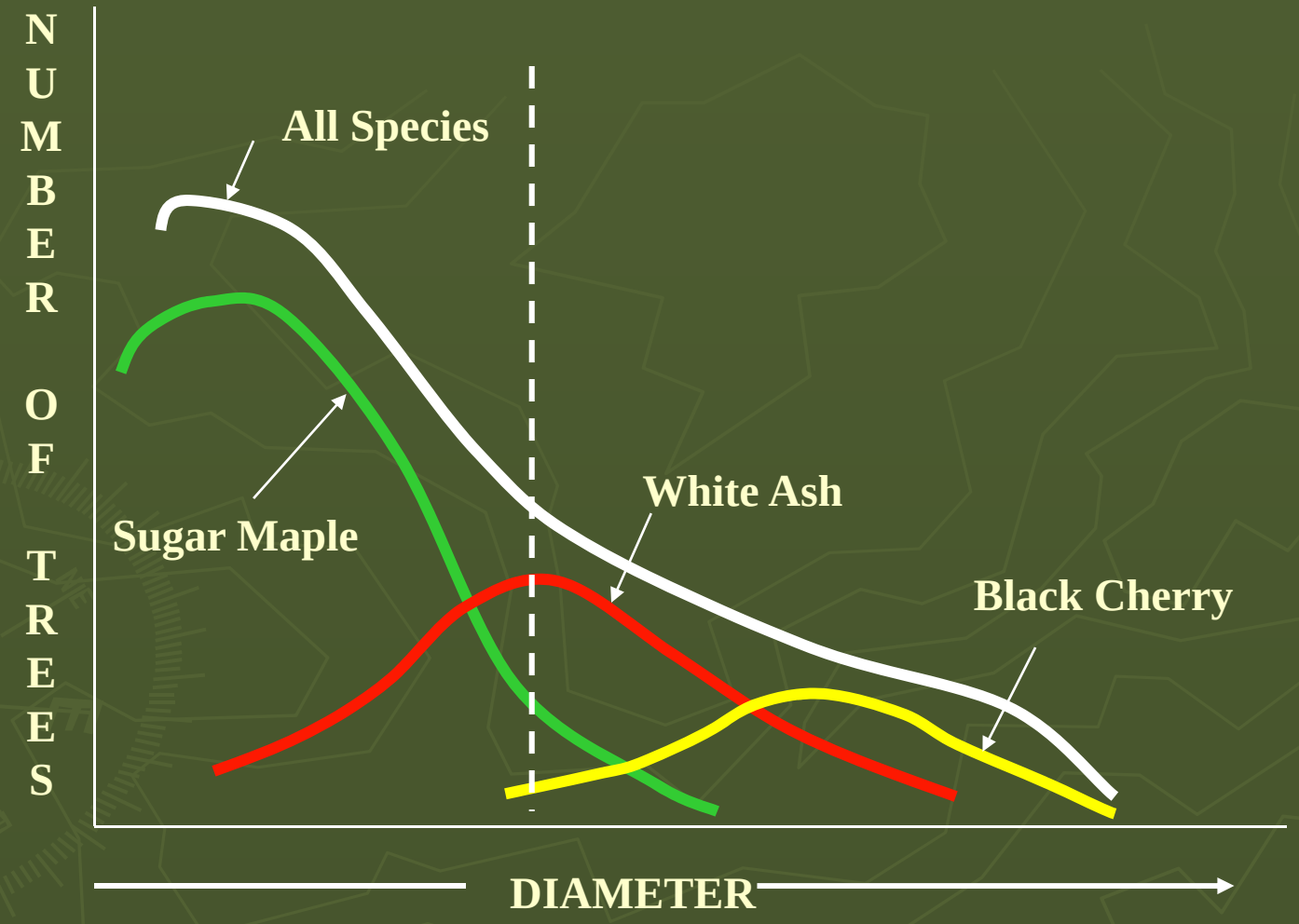


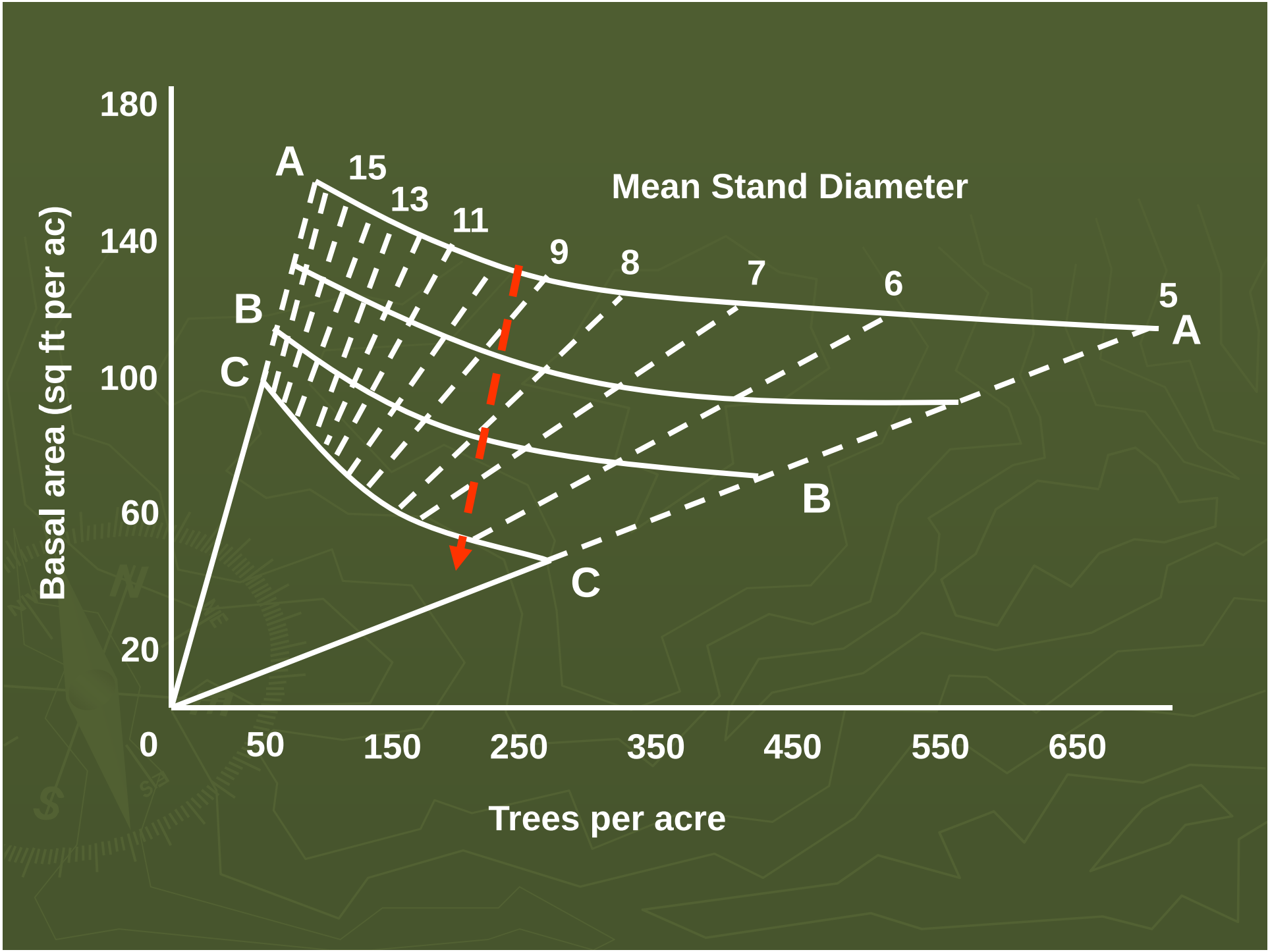
- A-LINE
  - 100% stocked; maximum crowding
- B-LINE
  - Generally 60% stocked; site fully occupied, trees relatively free of competition
- C-LINE
  - Generally 45% stocked (30 to 60% depending on stand age); stand will gain B-line stocking within 10 years

Acceptable Growing Stock

- Merchantable tress not large enough to be mature, but are desirable species, form, and quality
- Satisfactory as crop trees in a final stand on the site
- Have potential to be part of a future intermediate cut

Diameter Cut

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Trees per acre
Mean Stand Diameter
A
B
C
15
13
11
9
8
7
6
5
A
B
C

Diameter-limit Cutting or High Grading

- Removes high-value trees
- Reduces diversity and options
- Removes seed source
- Concentrates growth on low-value trees
- No control over stand density and spacing
- Maximizes immediate income yield

If lucky, regen there, but light may not be.

Extent of high-grading?

In recently assessed timber harvests, high quality sawtimber production was sustained in:

Pennsylvania	–	38% of the time
West Virginia	–	27% of the time
New York	–	38% of the time

(Finley et al. 1997; Fajvan et al. 1998; Nyland pers. comm)

“The Green Lie”

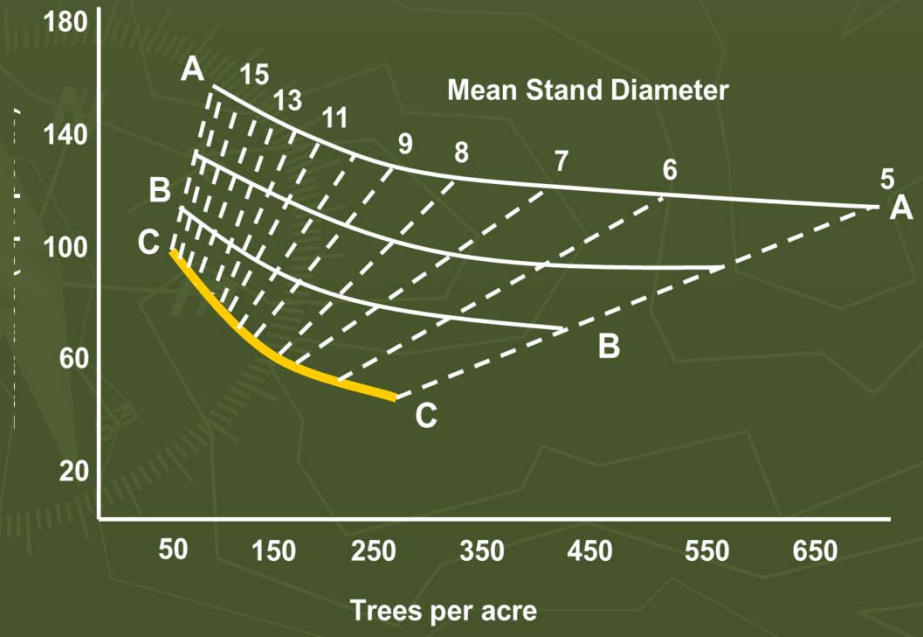
Apparently, many, if not most, hardwood stands have been high-graded over the recent and distant past.

(Nyland)

What about That C-Line?

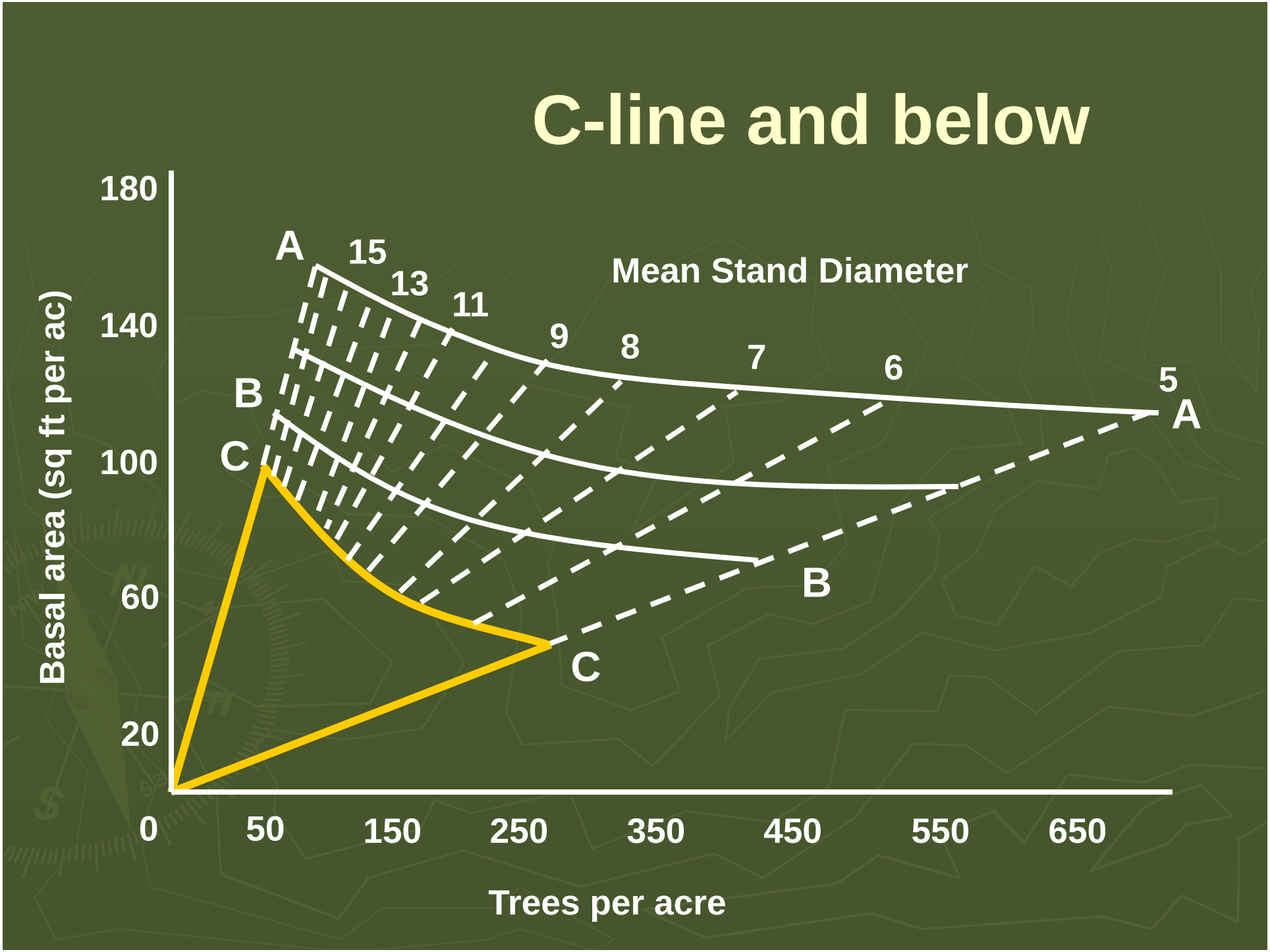
"If the AGS basal area is approximately equal to or greater than the C-level requirements, the stand is worth saving and managing."

"But when the number of AGS is below the C-level, seriously consider regenerating the stand."

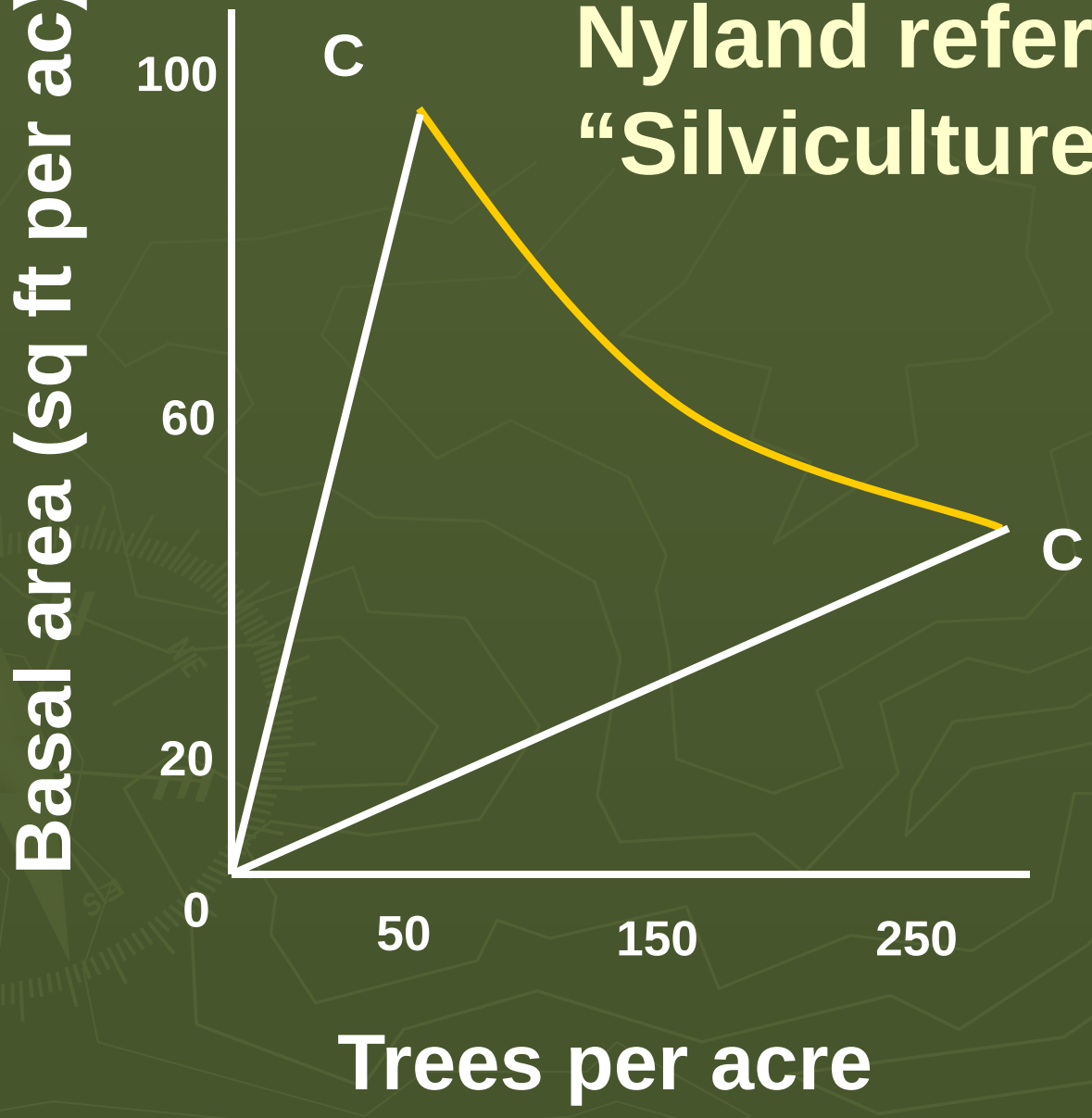


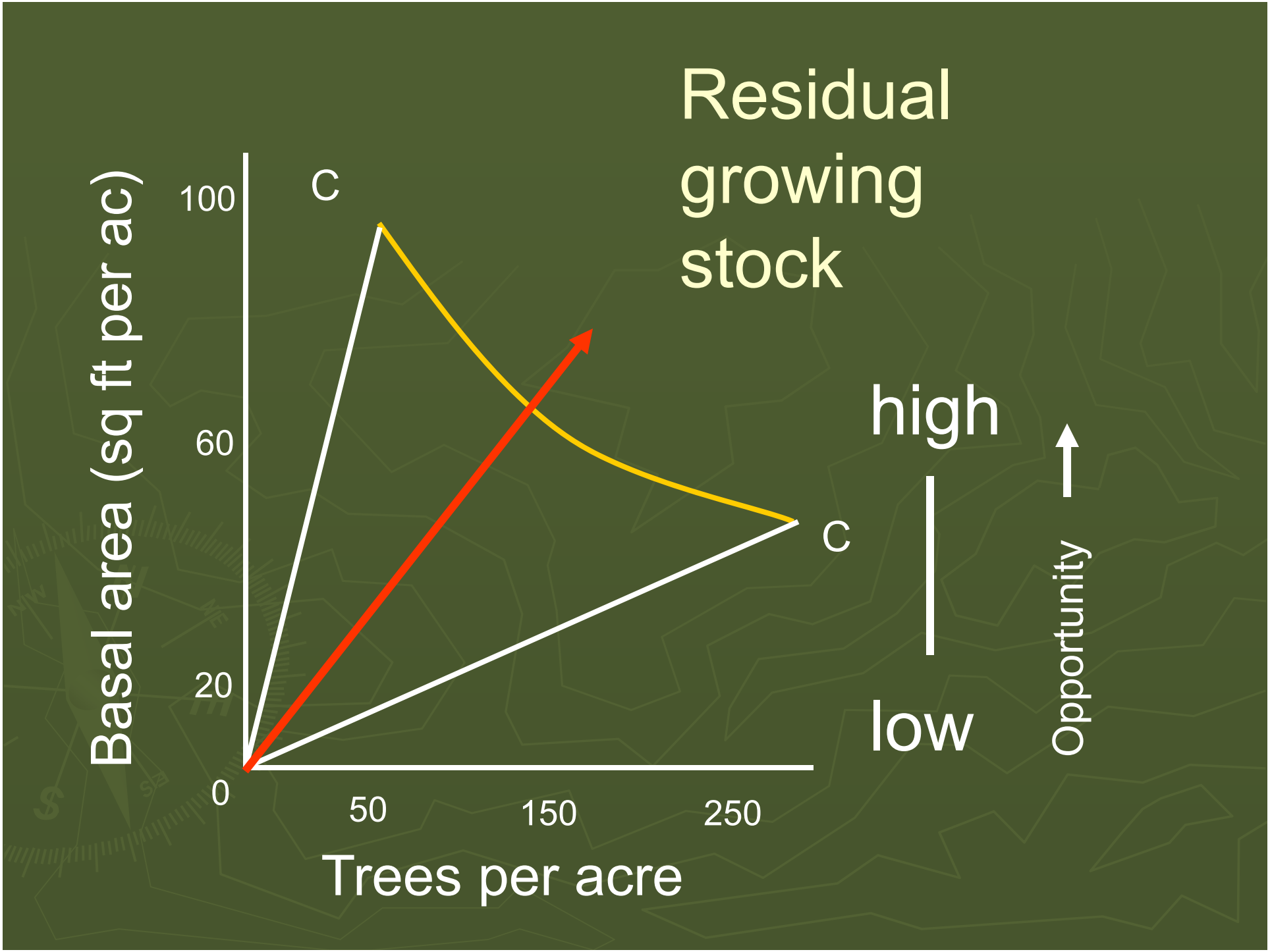
(Roach and Gingrich 1968)

C-line and below



This uncharted triangle Nyland refers to as … "Silviculture purgatory"

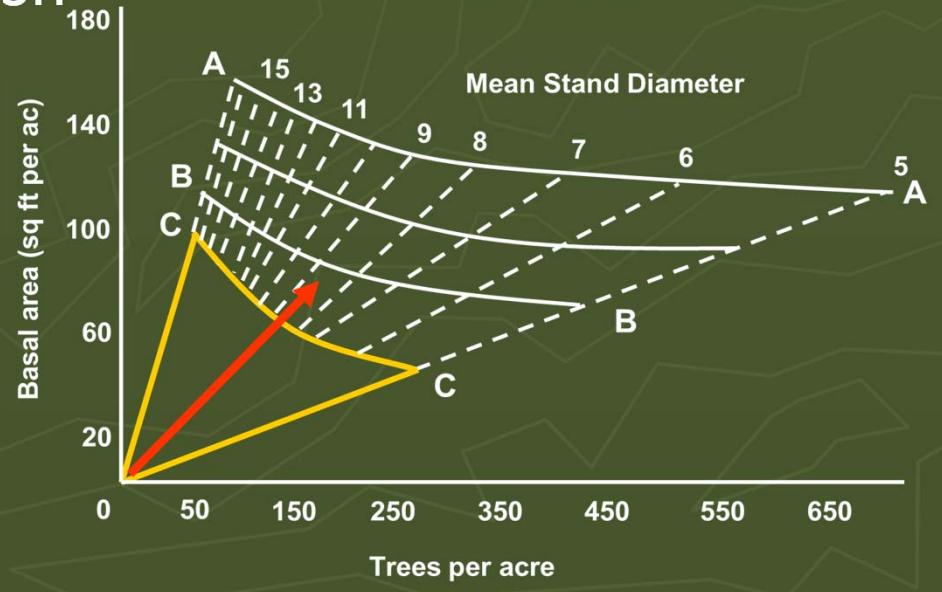



Residual growing stock
Basal area (sq ft per ac)
100
60
20
0
C
C
50
150
250
Trees per acre
high
low
Opportunity

Goal: Build Future Stand Options

- Short-term objective
  - Conserve options
  - Create conditions for recovery/restoration
- Long-term objective
  - Restore stand health
  - Restore species composition
  - Restore AGS

C-line and below



Restoration Strategies

- Have Silviculturally sound goals
- Determine
  - Growing Stock – AGS/UGS
  - Species composition
  - Seed source
  - Regeneration condition
  - Competition
  - Age classes
  - Impediments

Challenges

- Degraded stands may require more than one treatment
- Markets and conditions constrain options
- Consider any forward movement a success
- Unequal treatments across and within stands:
  - Some treated,
  - some avoided, and
  - some liquidated

Harvesting Constraints

- Low or No Commercial Volume
  - Difficult to do a commercial treatment
  - When there is little – Difficult to retain any
  - All desirable seed sources critical
    - Small
    - Poor
    - Culls

Prescription Evaluation

- Good Outcomes
  - Treatment leaves the stand in even marginally better condition
- Better Outcomes
  - Future management options retained
  - Future management options enhanced

Current Stand Options

- Poles – Intermediate treatment (<12” DBH)
- Sawlogs – Intermediate treatment or Commercial harvest
  - Reduce UGS – favor AGS
  - Create capital for regeneration treatments
    - Competition
    - Deer
    - Light
- Residual culls – Release
- Advanced regeneration – Release/Daylight
  - Combine Regeneration and Rehabilitation treatments

Exercising Options
Species Retention

- Retain commercial/Important species
- Remember markets may change
- Phenotypes - outward, physical manifestation
- Genotypes - internally coded, inheritable information

Exercising Options
Residual Tree Priorities

- Retain species
- Improve residual tree vigor
  - Protect or Open
- Improve quality (Increase AGS to UGS ratio)
  - Stem
  - Crown
- Control competition
- Prepare seedbeds around retained trees

How Many Saw-size* AGS?

- Less than 30 – Consider stand regeneration
- More than 30 – Consider stand continuation or use them as a means to regenerate

Result:
Two age silviculture

* 12 inches and larger DBH

Silvicultural Harvests Focus on:

- Residual Trees
- Regeneration

Regeneration Sources (Options)

- Advanced regeneration
- Banked seeds
- Retained seed sources
  - Culls
  - Smaller trees
- Stump sprouts

Future Stand Challenges

- Interfering Plants

Future Stand Challenges

- Interfering Plants
- Overstory Density

Future Stand Challenges

- Interfering Plants
- Overstory Density
- Seed source

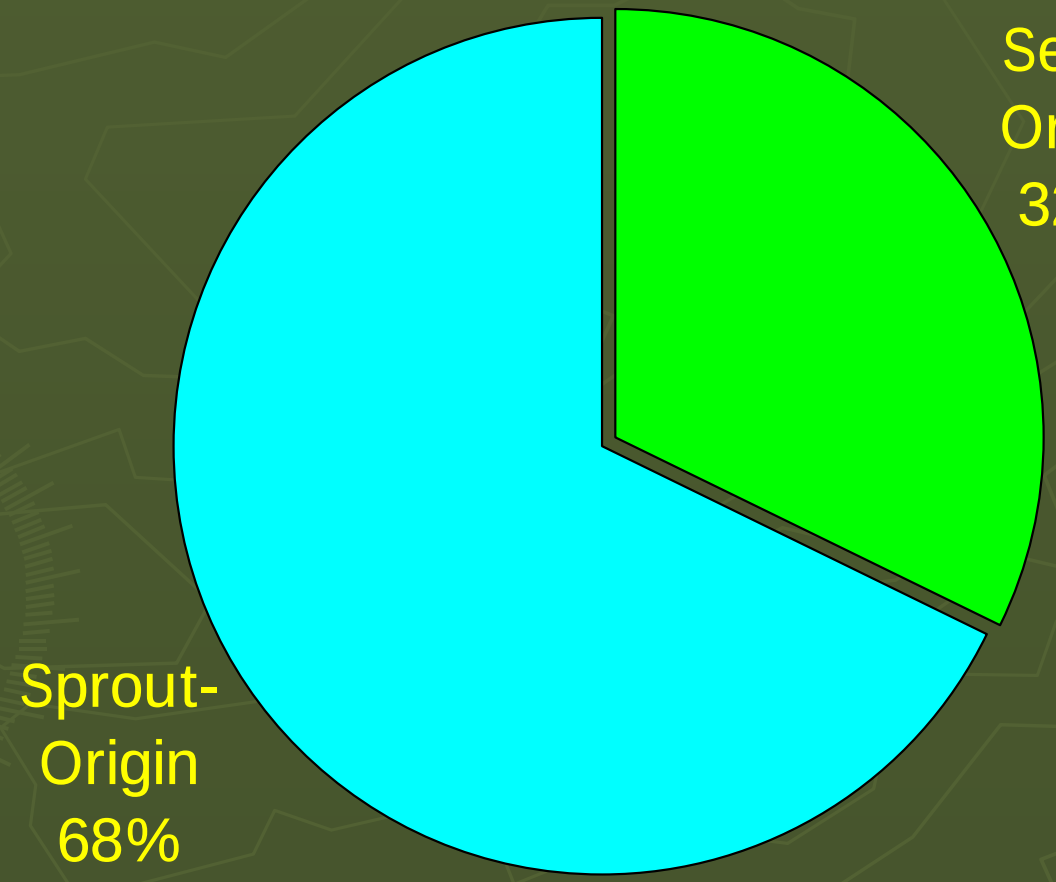
Future Stand Challenges

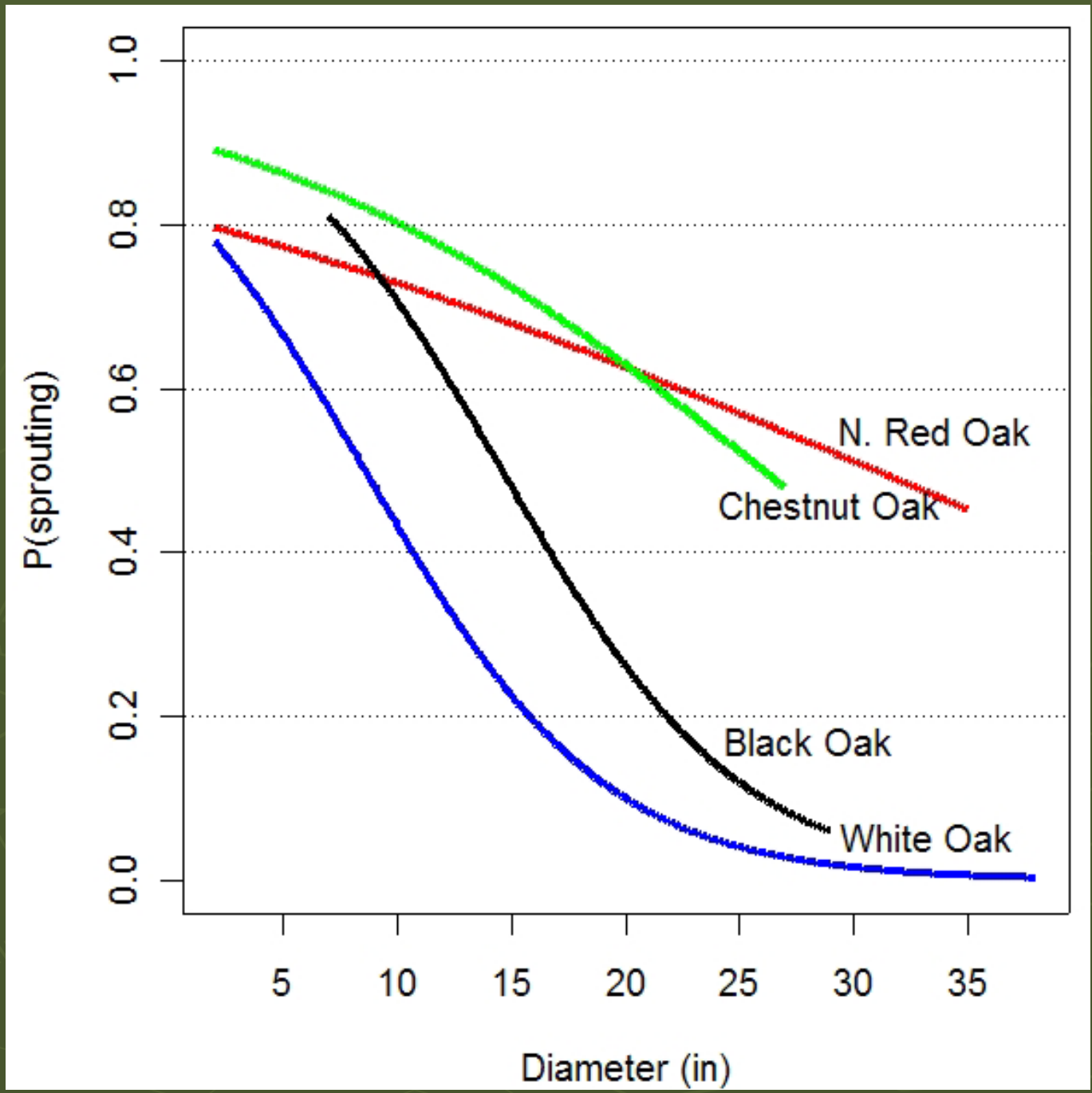
- Interfering Plants
- Overstory Density
- Seed source
- Deer

Future Stand Challenges

- Interfering Plants
- Overstory Density
- Seed source
- Deer
- Number, Condition, Type, and Potential of Advanced Regeneration

For oak stump and seedling sprouts more important than seedlings

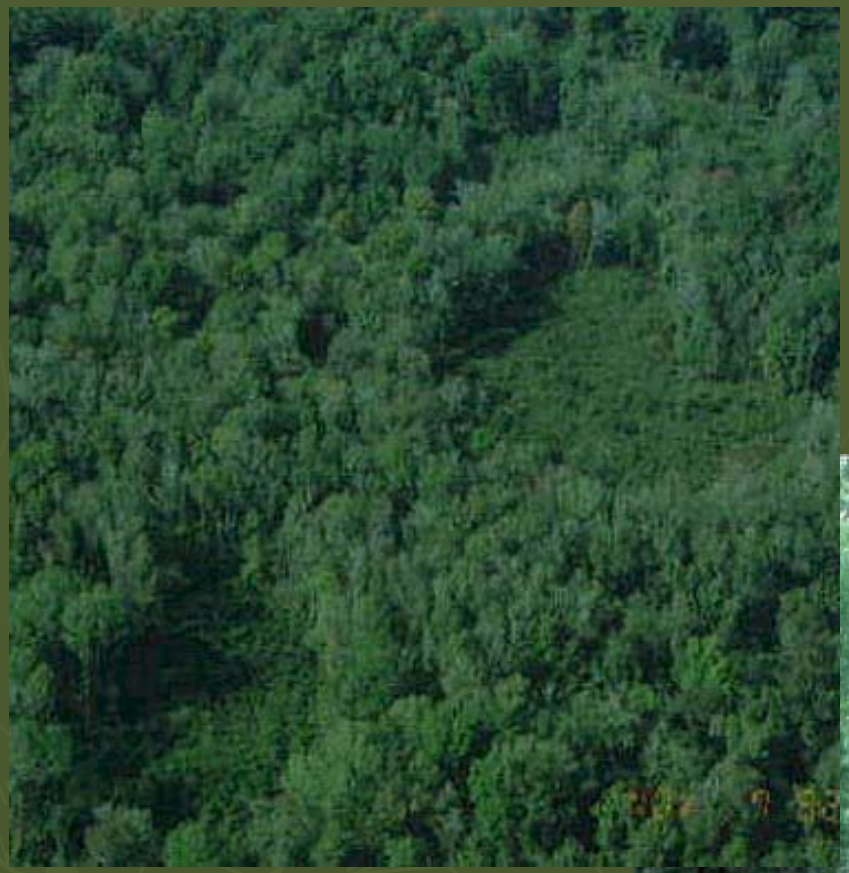



P(sprouting)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
25
30
35
Diameter (in)
N. Red Oak
Chestnut Oak
Black Oak
White Oak

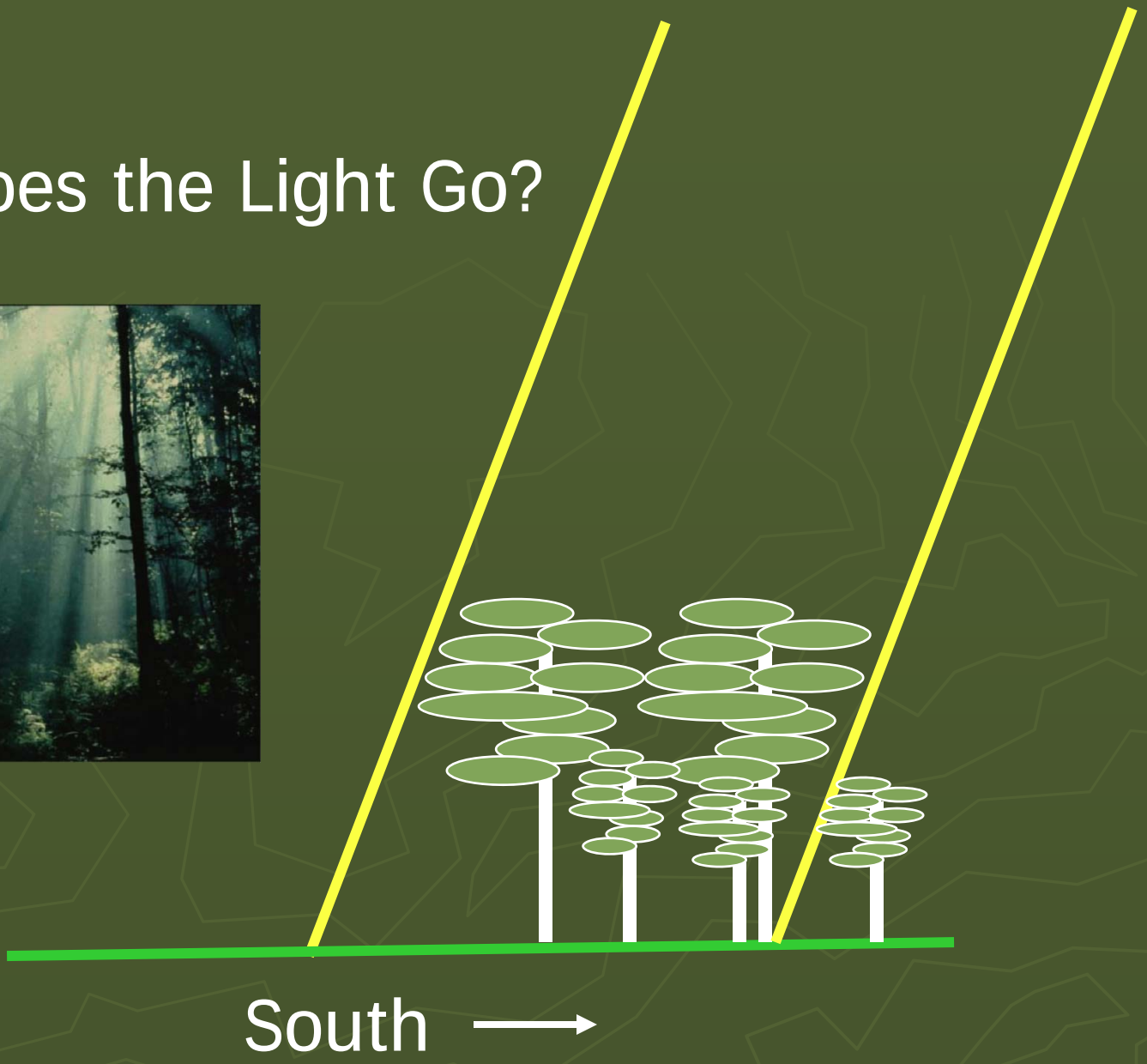
Regeneration Considerations

- Residual AGS
  - Species
- Seed source
- Seed supply
- Interfering plants
- Advance regeneration
- Operability
  - Volume
  - Site

Gap Considerations

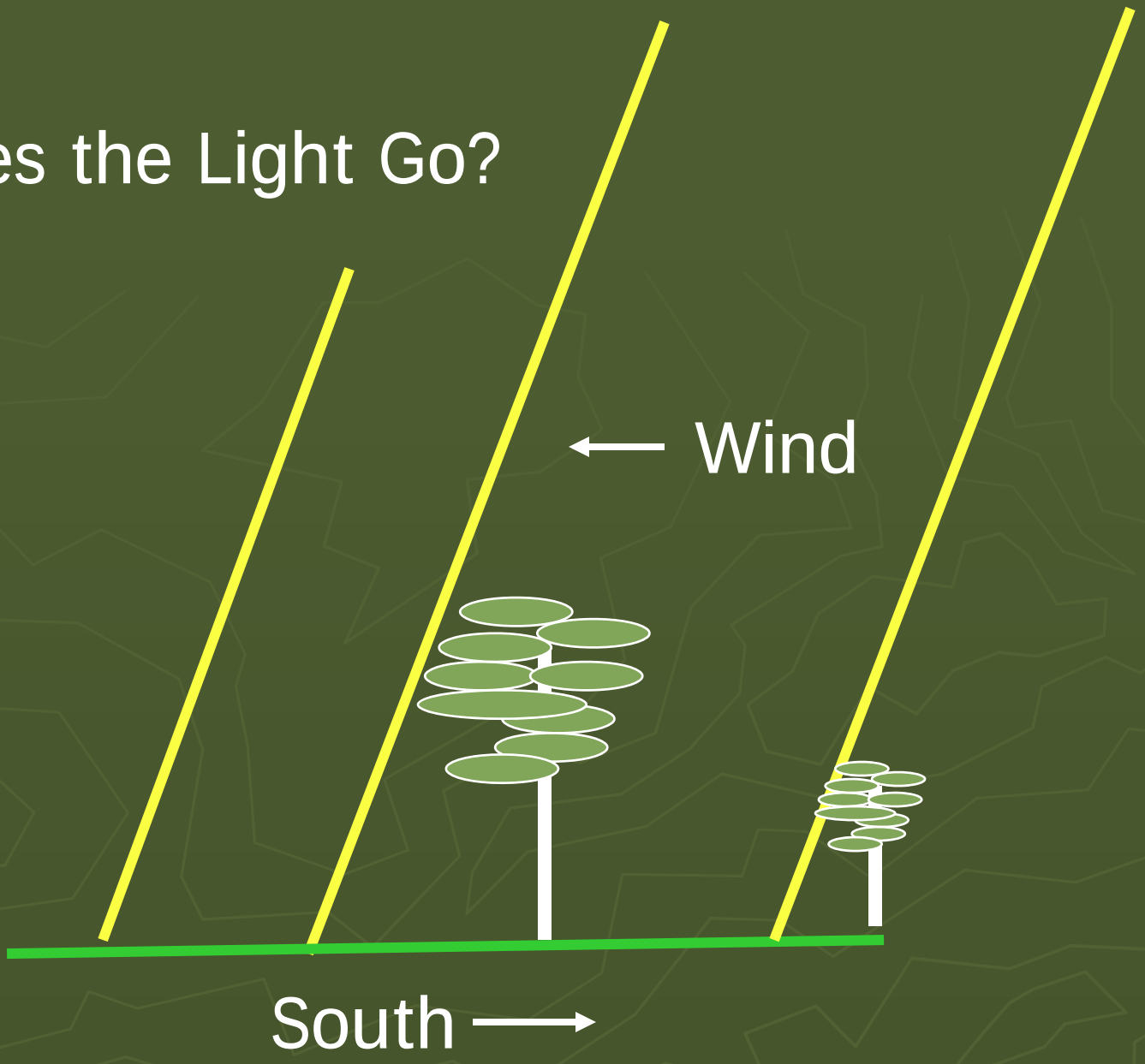


Where Does the Light Go?



June 21, max angle 78

Where Does the Light Go?



Sun Penetration June 21

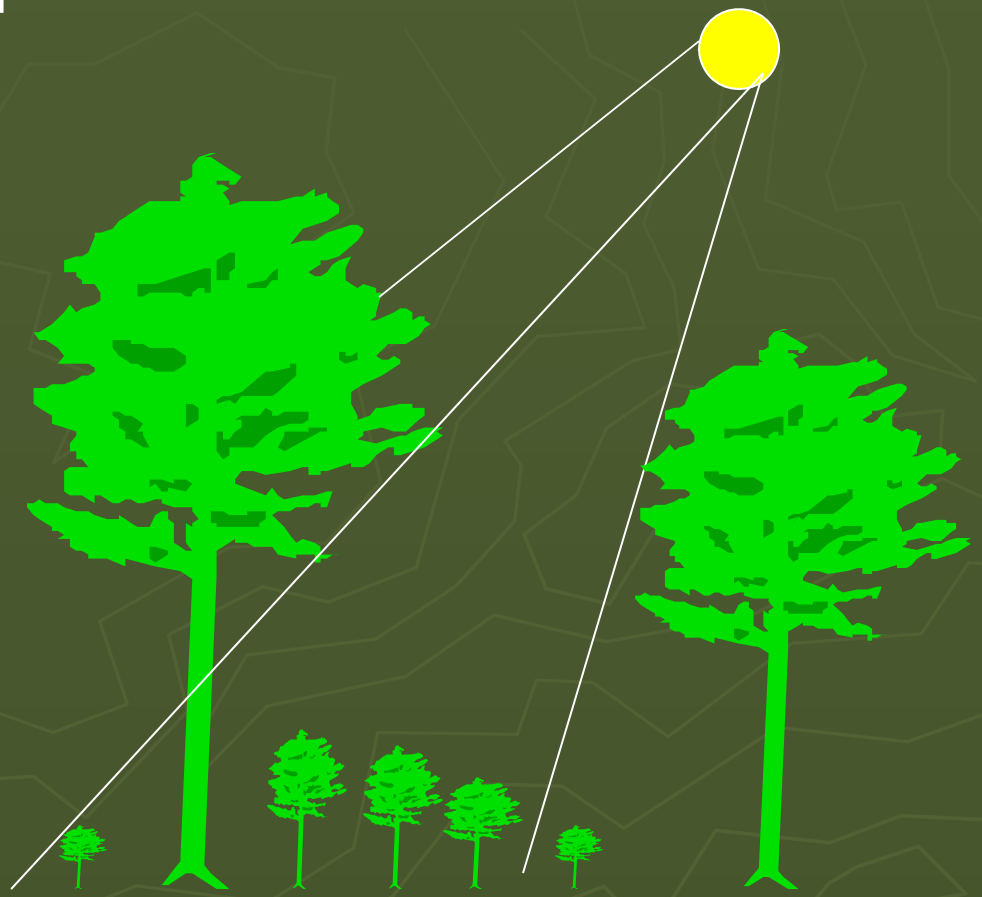
East

West

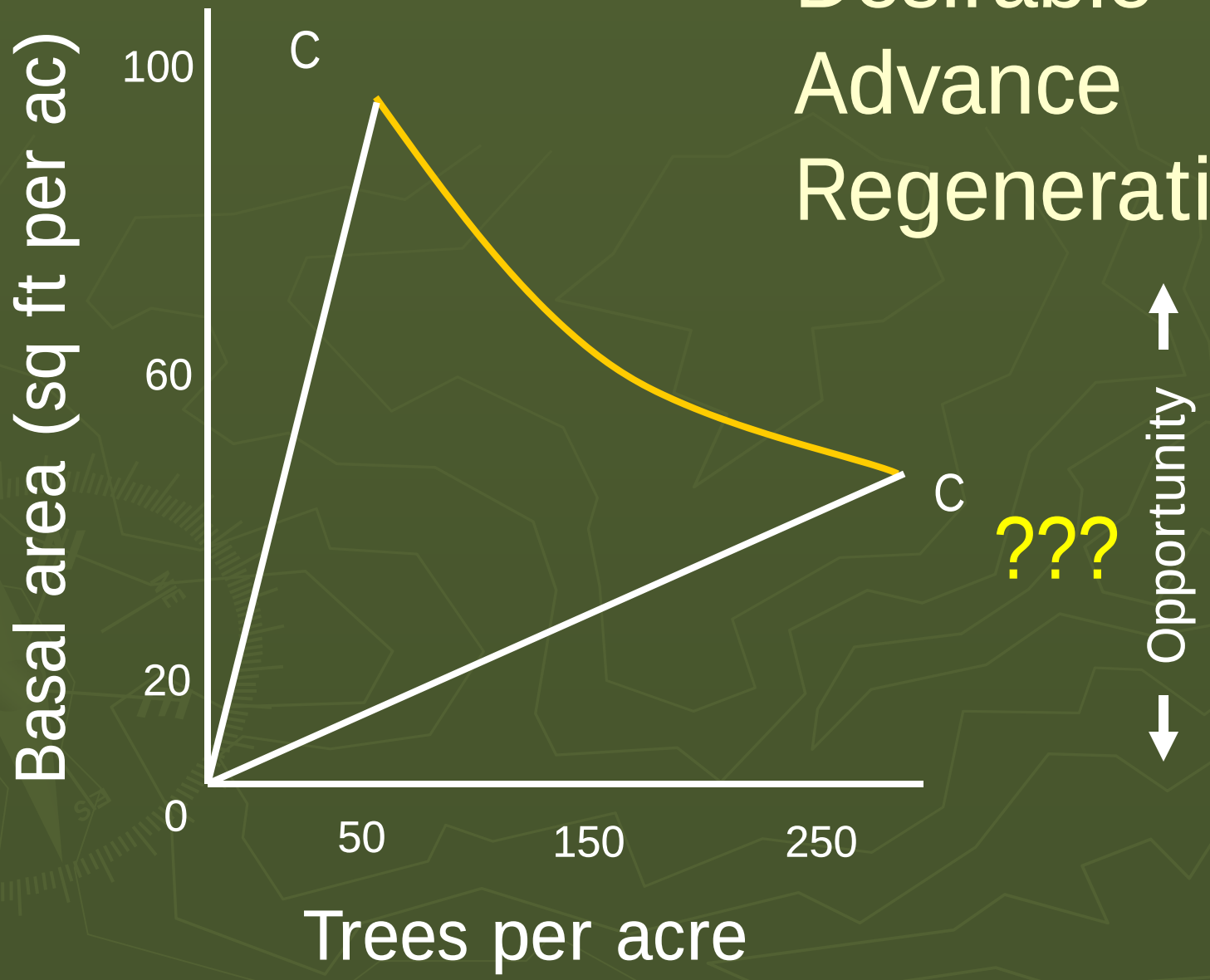
South

Prepare Seedbeds

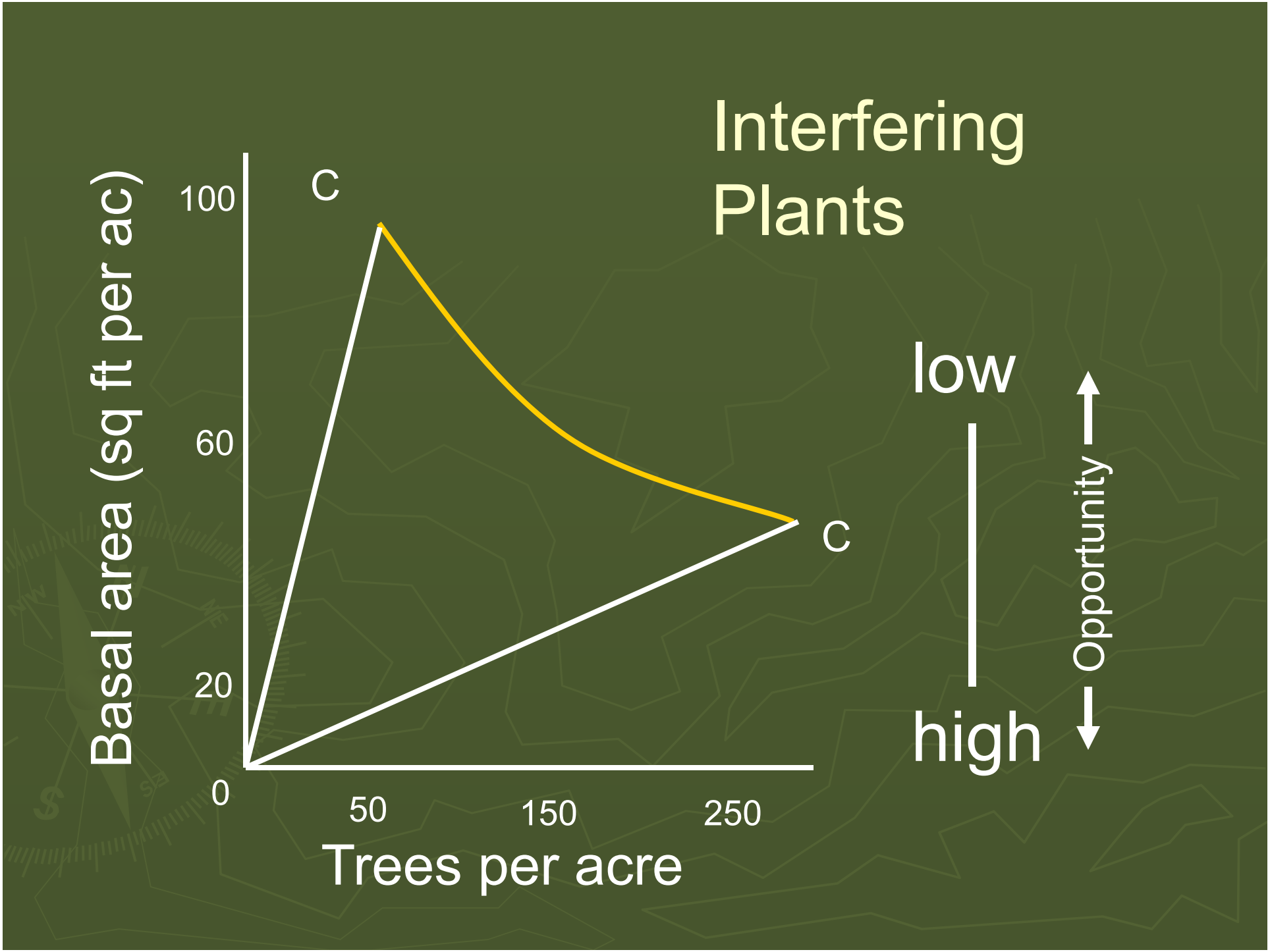
- Reduce competition
- Fence
- Disturb litter
- Timing
  - Seed years
  - Season
- Light placement

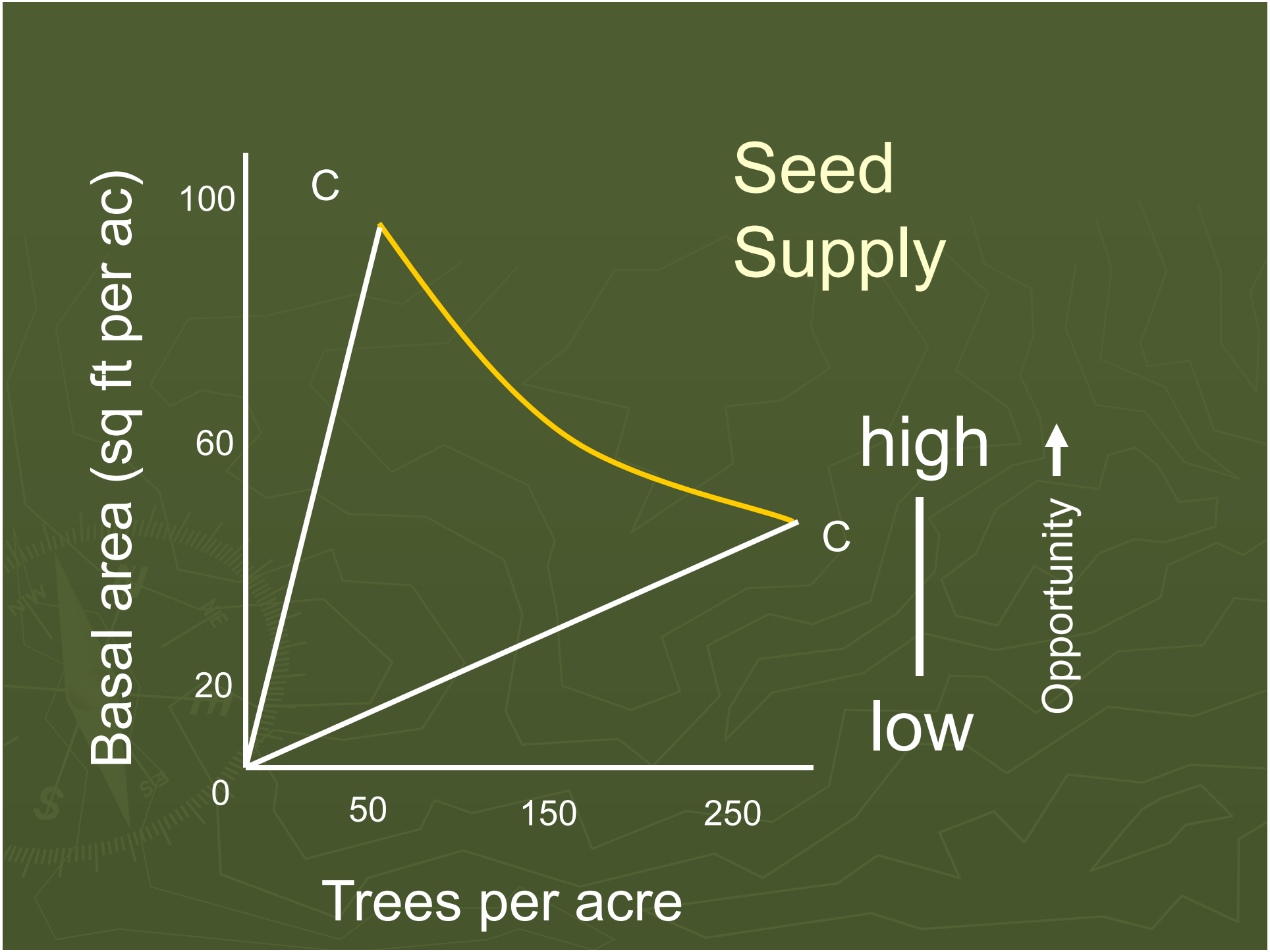


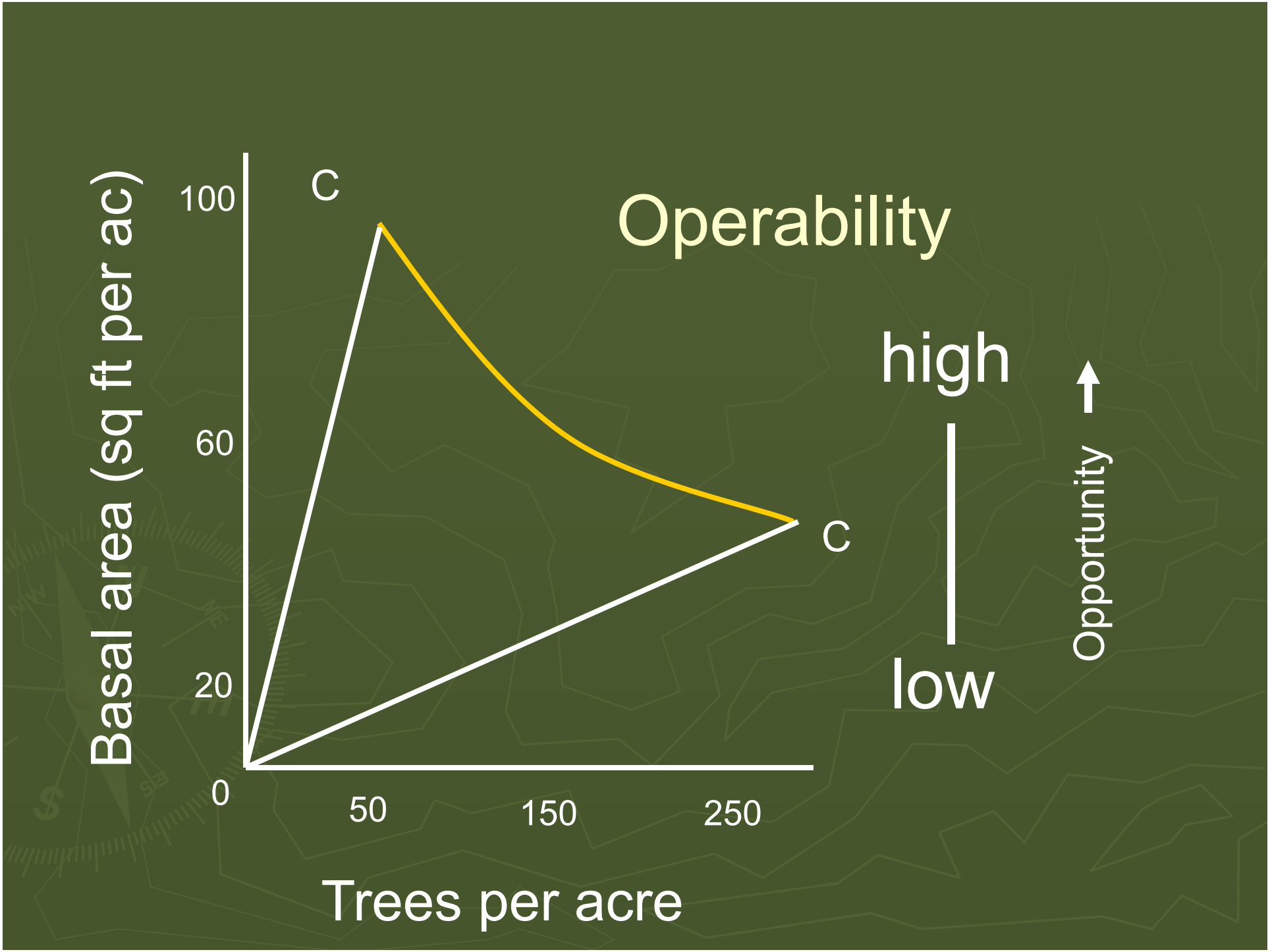
Desirable Advance Regeneration




(Photo from R. Nyland)

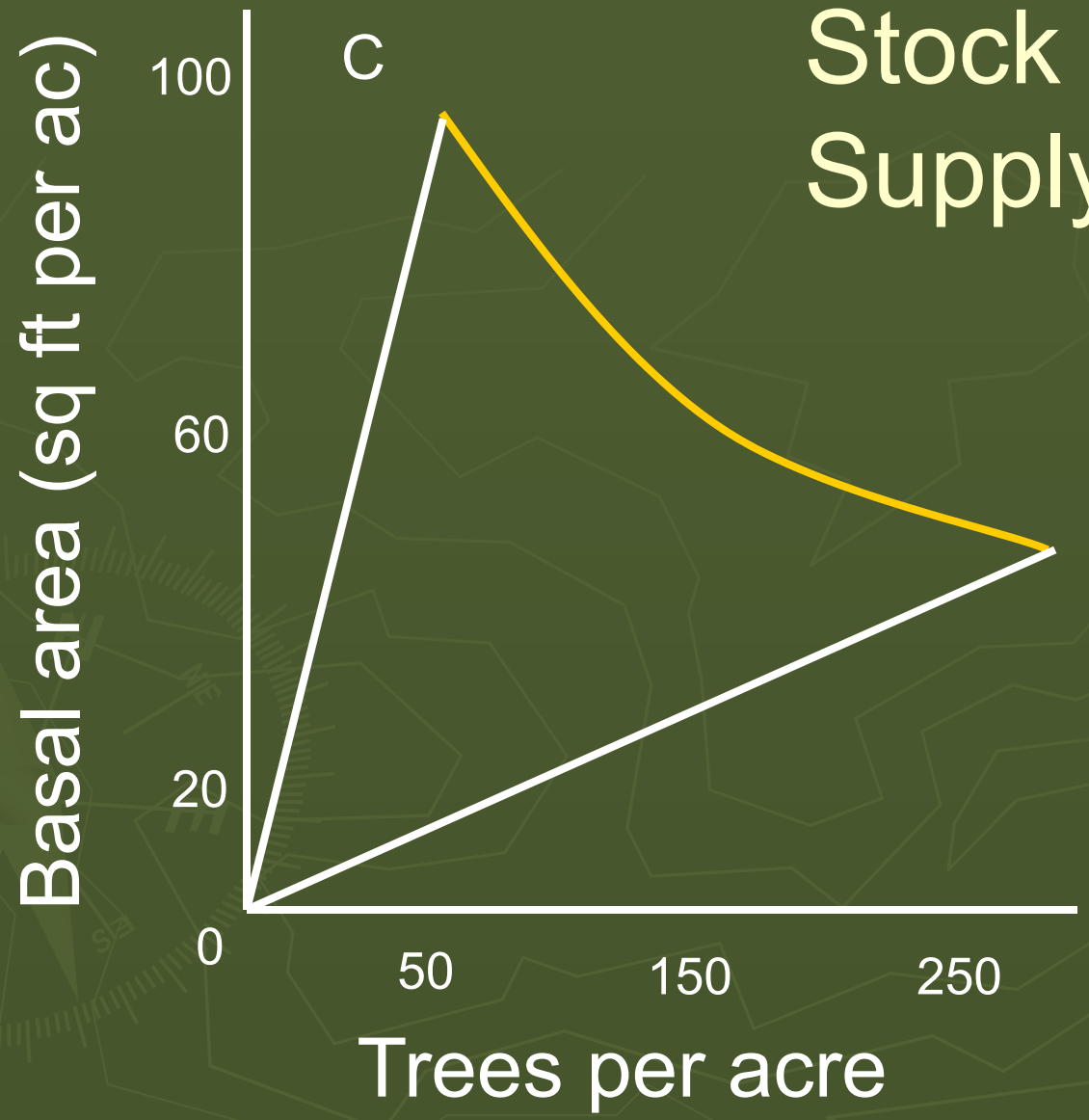

Interfering Plants
Basal area (sq ft per ac)
100
60
20
0
C
C
50
150
250
Trees per acre
low
high
Opportunity


Seed
Supply
Basal area (sq ft per ac)
100
60
20
0
C
C
50
150
250
Trees per acre
high
low
Opportunity


Operability
Basal area (sq ft per ac)
100
60
20
0
C
C
50
150
250
Trees per acre
high
low
Opportunity

Operability

Residual Growing Stock and Seed Supply



high

low

Opportunity


(Photo from P. McGlew and R. Germain)

Guidelines

In hardwood stands, we often need ...

a few to 30

... seed bearing trees per acre

Residual Growing Stock

- Is there a seed source?
  - Sum of 30
    - 15 Large sawtimber trees (2x)
    - 30 Small sawtimber trees (1x)
- IF more then 30 AGS, this may be the revenue source for stand investment.

Advanced Regeneration SILVAH-based

- Size and Species
- White-tailed Deer
- Weighted Counts

Weight 1	2” to 1’
Weight 2	1’ to 3’
Weight 20	3’ to 5’
Weight 50	> 5’

Plot 6 ft. radius

Rule

- Sum 50 on 70 % with High Deer
- Sum 15 on 70% with Low Deer

ORSPA Guidelines – Oak

- Size and Species
- Total Seedling Height
- Competing Plants
  - Blueberry
  - Percent cover
- Sprout Contribution

70% of plots meet desired stocking

Plot 3.72 ft. radius

Total Height	% Oak Prediction
7 feet	50%
11 feet	66%
> 14 feet	75%

Summary / Conclusions

- Cut the UGS (“Get the green junk out”)
  - Unless you need the seed source
- Favor the best of what you have
- Conserve seed supply and advance reproduction (sapling sprouts)
- Interfering plants — kill them
- Watch the “sweeteners” — Operability

A final word from Roach and Gingrich

"... sooner or later the cost of past maltreatment must be paid whether as an outlay for silvicultural improvement or as sacrifice of productivity for many more years while nature does the improvement."

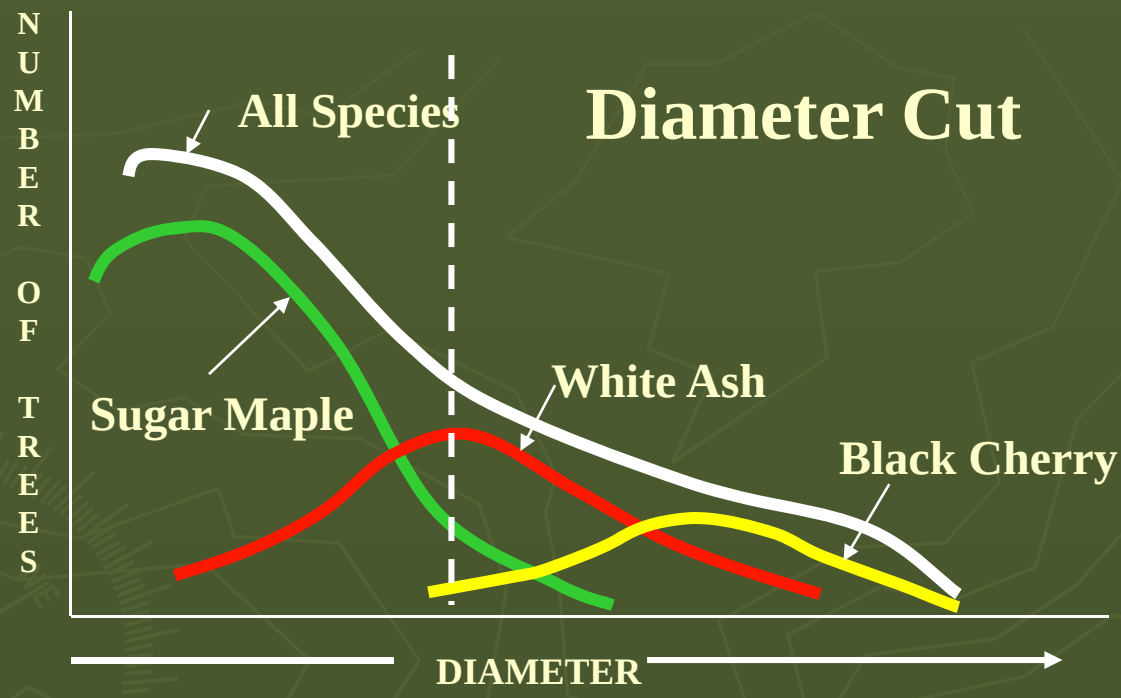
(Roach and Gingrich 1968)

Your woodlot is in fact, a historical document which faithfully records your personal philosophy. Let it tell a story of tolerance toward living things, and of skill in the greatest arts: how to use the earth without making it ugly.

Aldo Leopold

A Fierce Green

Questions



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