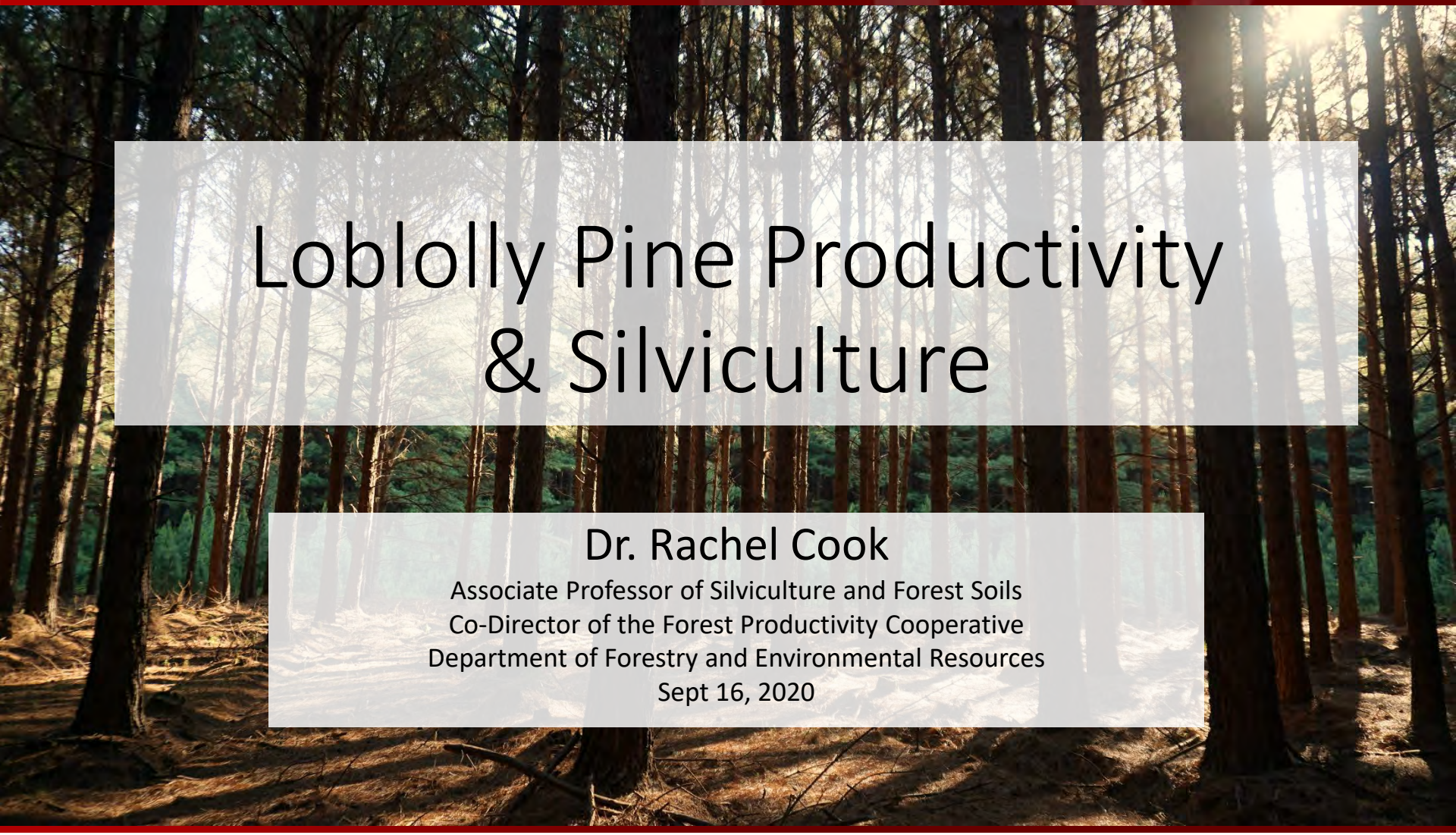


Loblolly Pine Productivity & Silviculture

Dr. Rachel Cook
Associate Professor of Silviculture and Forest Soils
Co-Director of the Forest Productivity Cooperative
Department of Forestry and Environmental Resources
Sept 16, 2020

NC STATE UNIVERSITY
VIRGINIA TECH
Universidad de Concepción
UFLA UNIVERSIDADE FEDERAL DE LAVRAS

Outline

- Light Interception and Growth
- Soil Supply and Tree Demand
- Planting Time Decisions
  - Site Prep
  - Spacing/Density
  - Fertilization
  - Weed Control

Time for some heavy lifting!

FPC Co-Directors

Rafael Rubilar

Rachel Cook

Dave Carter

Otavio Campoe

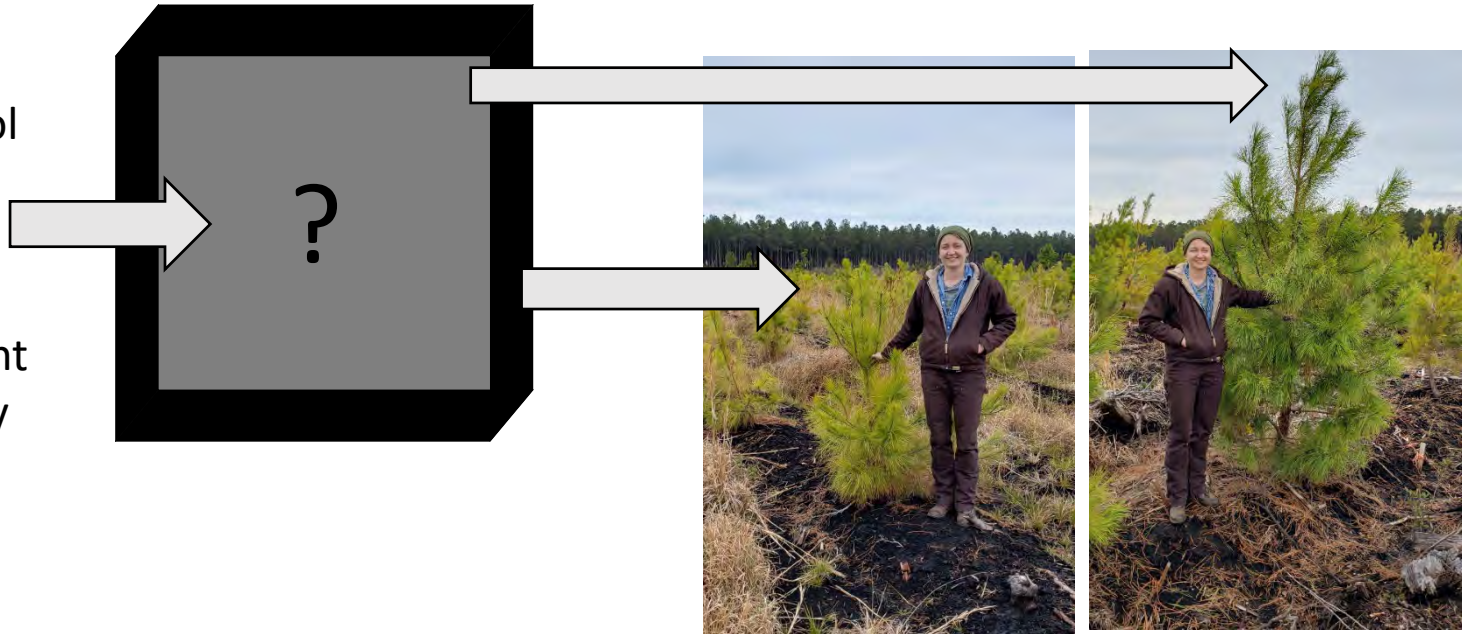
FPC Team

The **Mission** of the Forest Productivity Cooperative
is to create innovative solutions
to enhance forest productivity and value
through sustainable management of site resources.

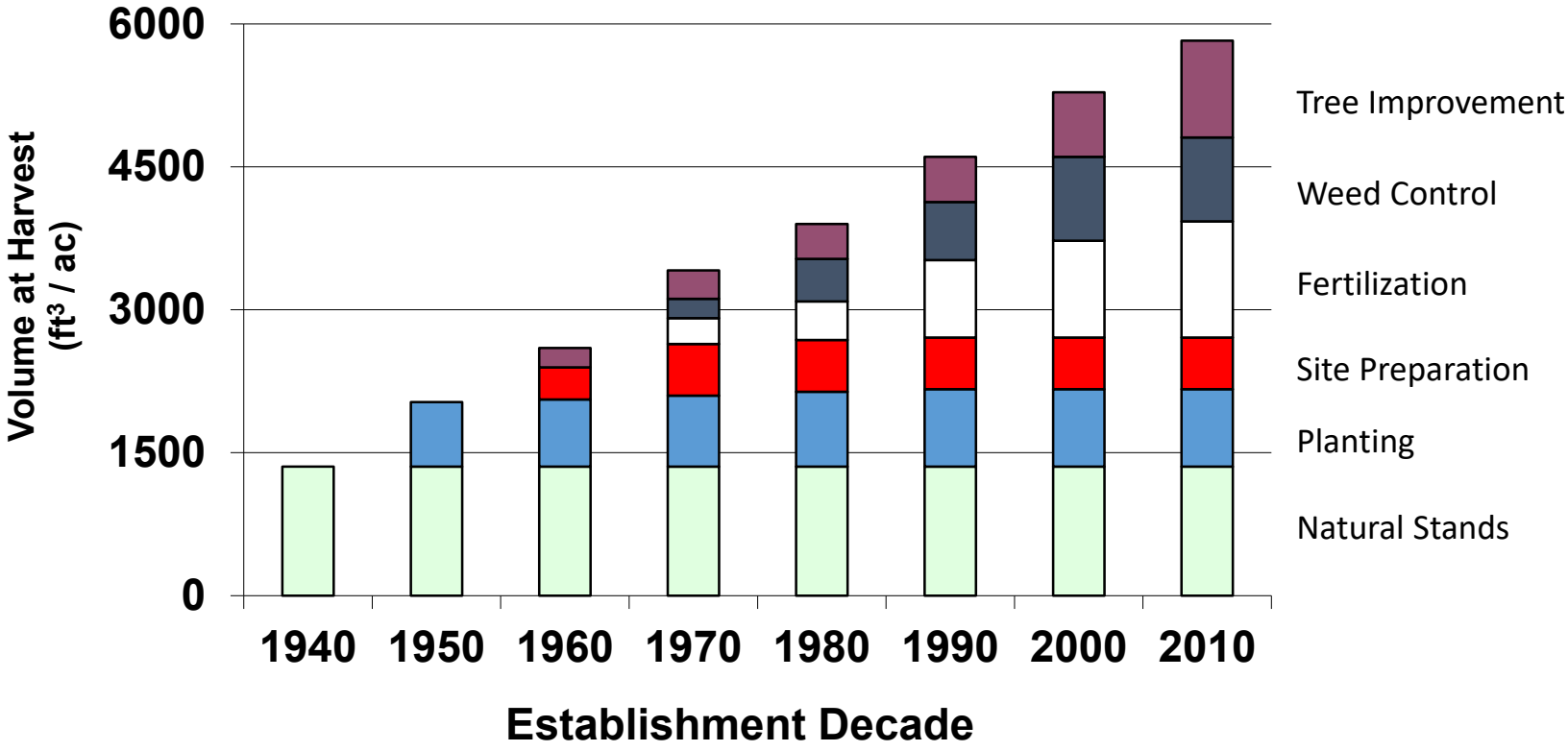
Forest Productivity

Enhancing site resource availability and utilization through silvicultural management

Fertilization
Vegetation control
Tillage
Thinning
Burning
Slash management
Spacing & Density
Genetics



Productivity Improvements in the South

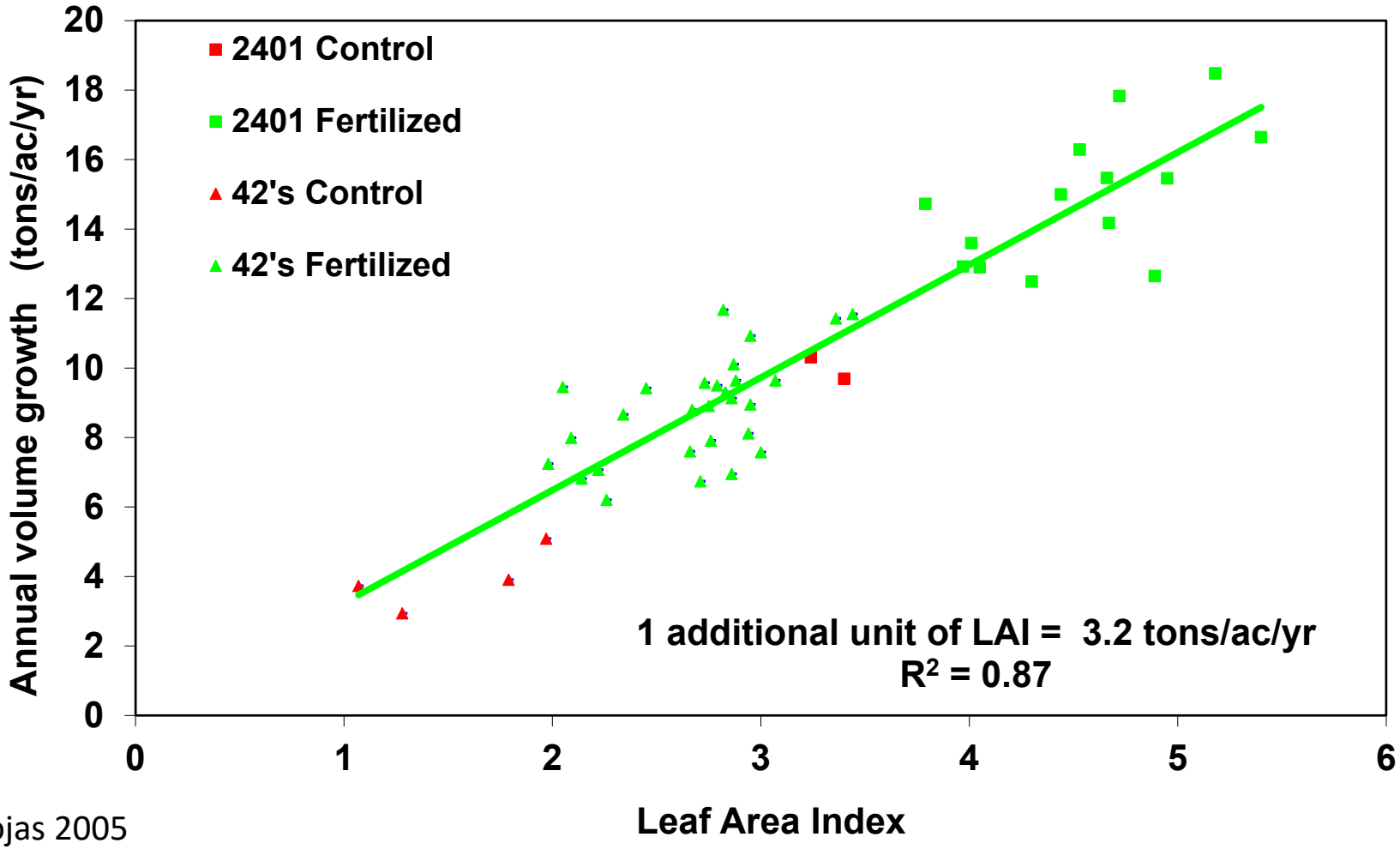


Fox et al. 2007

Poor Growth
In Stands with
Low Leaf Area

Good Growth
in Stands with
High Leaf Area

Annual Volume Growth Increases with Leaf Area

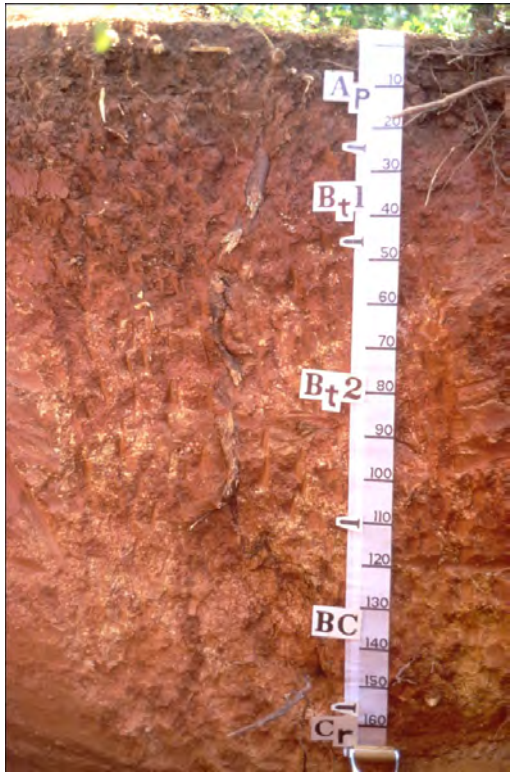


Rojas 2005

30 lbs N to produce 1 unit of Leaf Area

Leaves grow Trees
Resources grow Leaves

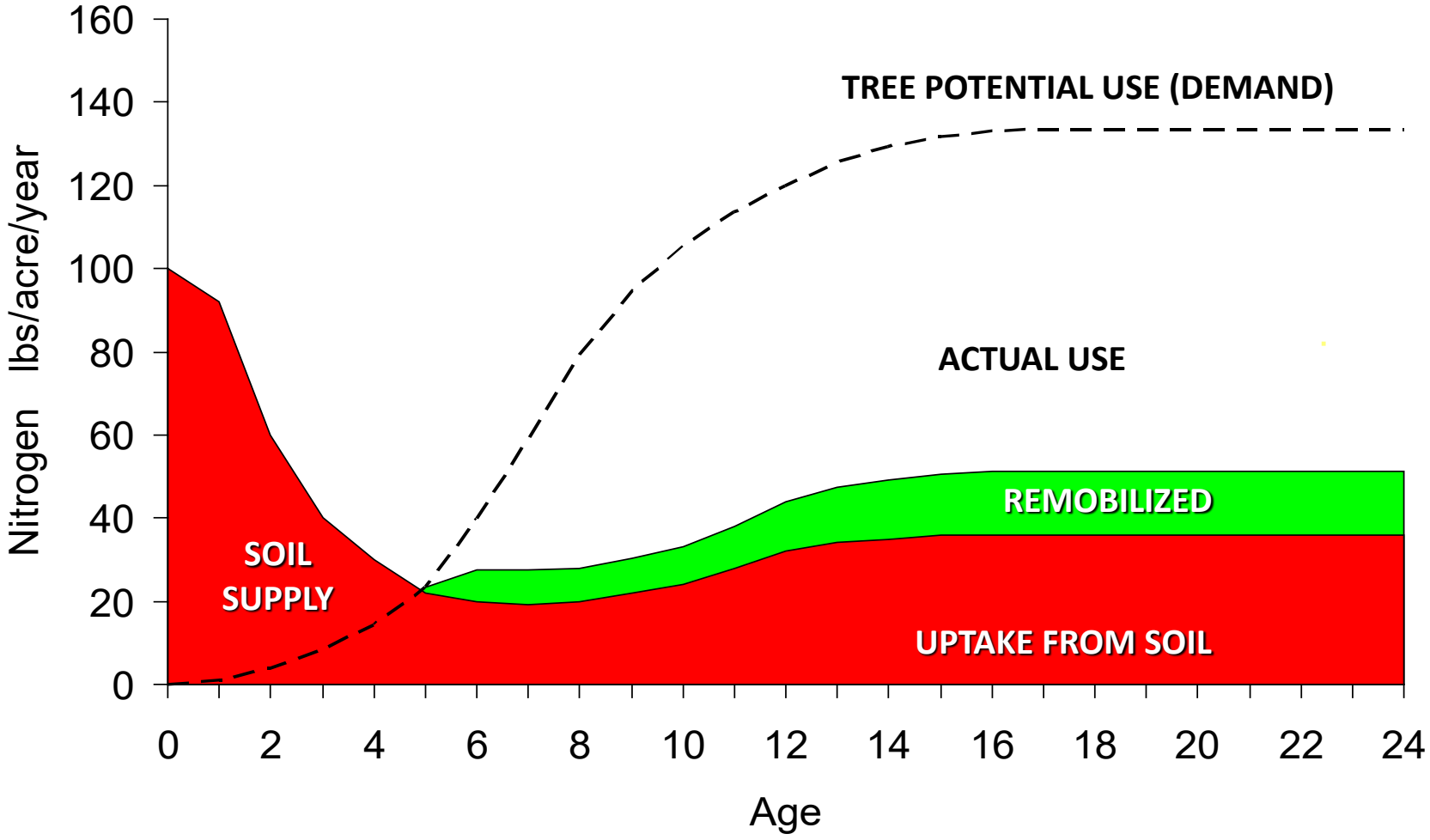
Inherent Nutrient Availability Depends on Soil Properties



What do soil properties tell you?

- Supply
  - Rooting volume that will provide:
    - Aeration
    - Water holding capacity
    - Soil nutrient supply
- Will it meet Demand?
  - Increased by:
    - More potentially productive trees
    - More trees per acre

Nutrient Supply and Demand



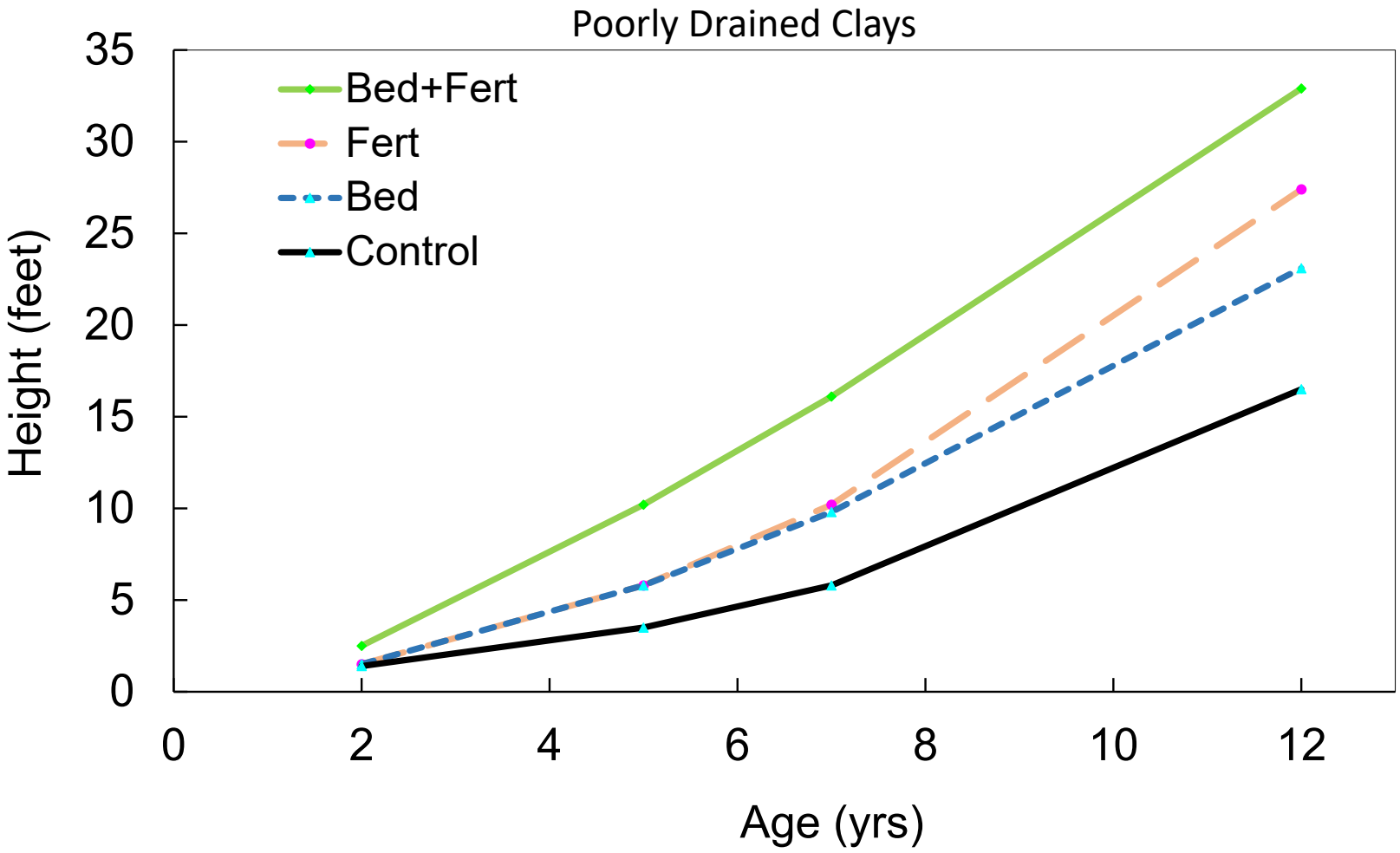
Planting Time Decisions

- Genetics
  - Open pollinated vs Controlled pollinated
  - Coastal or Piedmont
- Spacing & Stand Density
- Bareroot vs Containerized
- Site Preparation
- Fertilization
- Vegetation control
- Tip moth

Site Preparation

- Site Preparation creates environmental conditions suitable for the species that a landowner desires
  - Controls vegetation
  - Promotes slash decomposition
  - Bedding recommended on somewhat poorly drained soils and wetter
    - LOOK AT SOIL MAPS FOR DRAINAGE CLASS

Some Sites Need Multiple Treatments



Wet sites, get additive effect of bedding and fertilization – doubling production

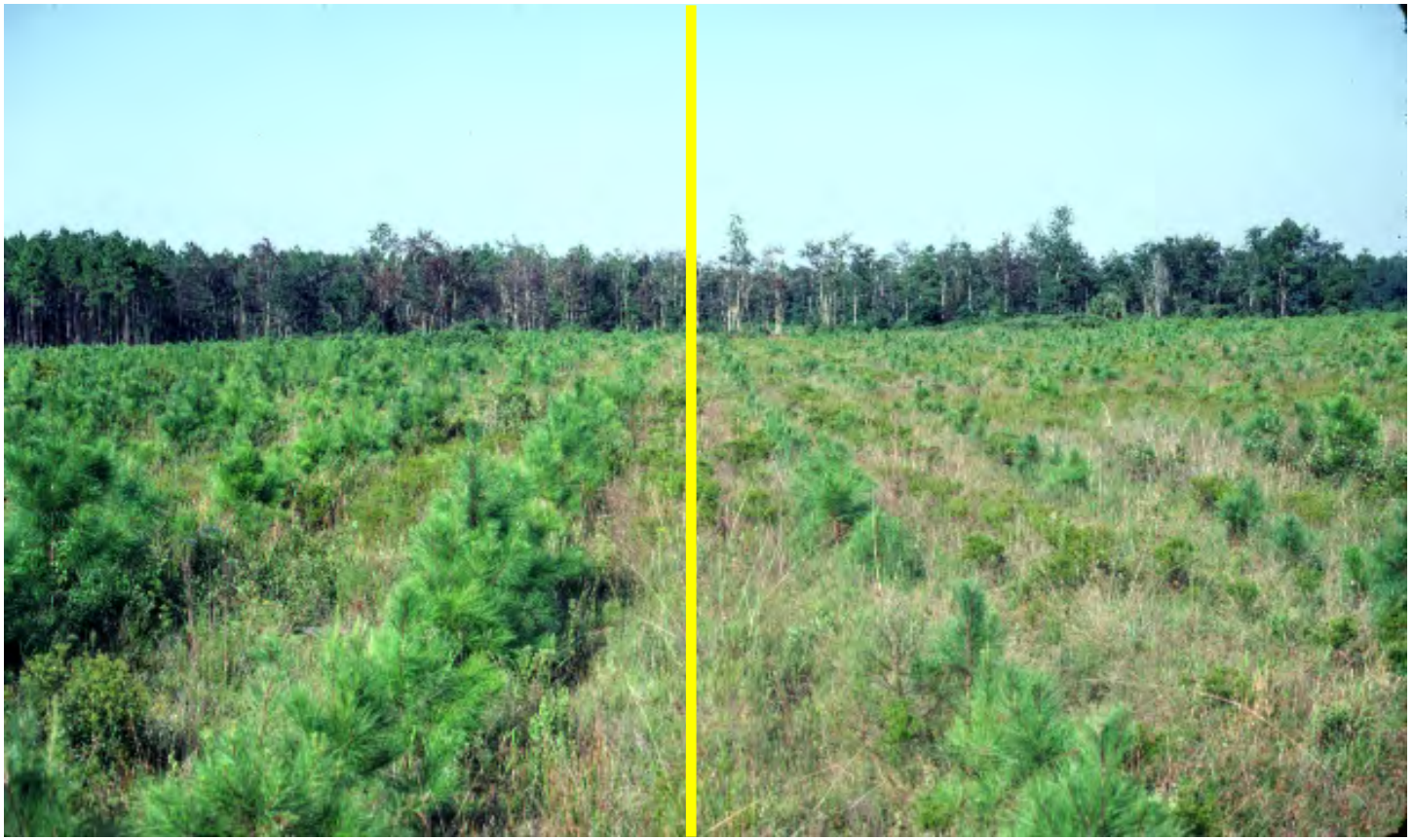
Gent et al. 1986

Spacing and Stand Density

- Most stands planted at
  - 12 x 8 ft to 16 x 6 ft spacing
  - ~450 trees per acre
- New genetics
  - Better stem form
  - Fewer branches (angle and diameter, self pruning)

- 450 TPA give more time before a thin
  - Better genetics + better silviculture = faster growth -> need to thin sooner

Fertilization



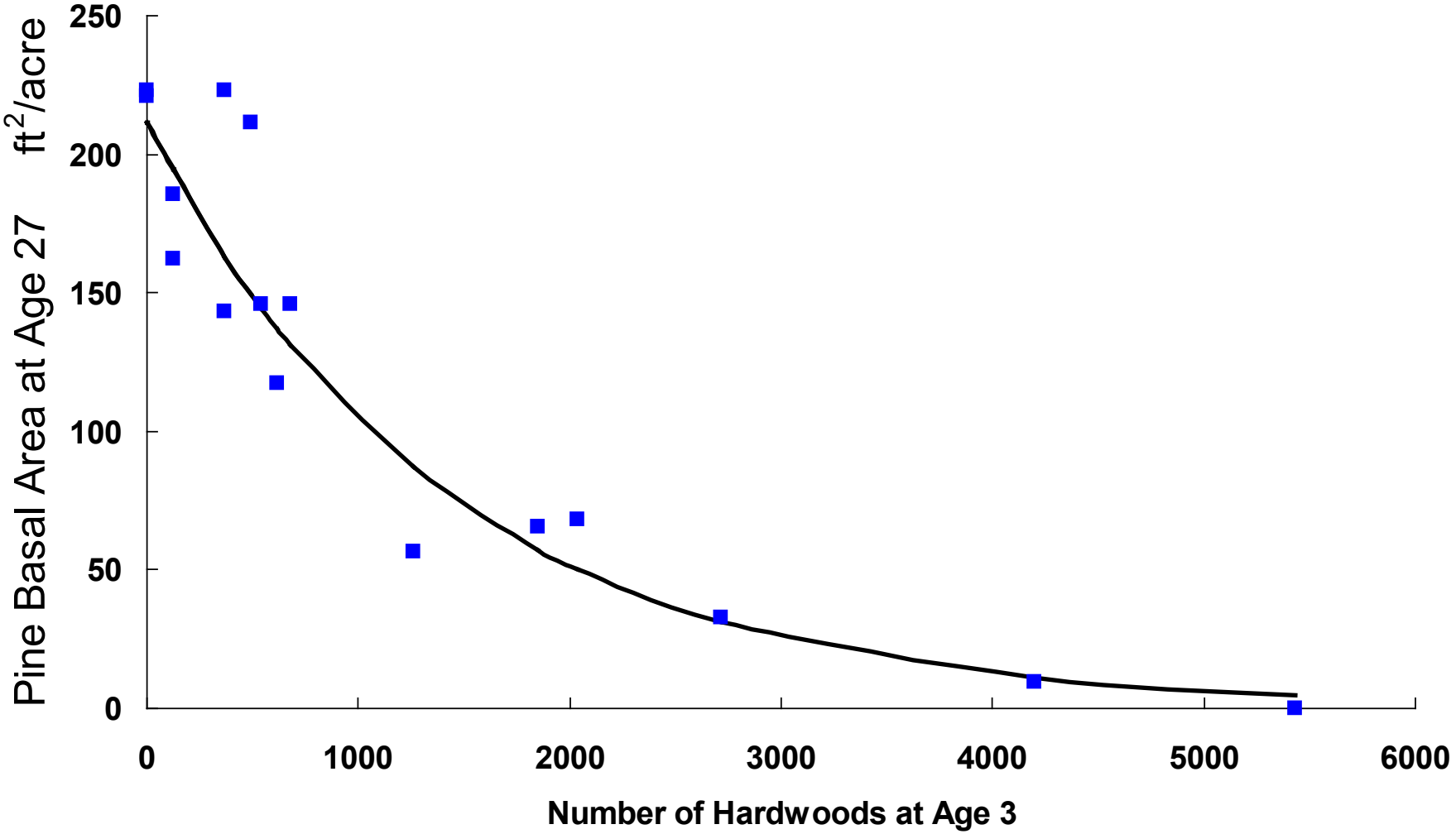
P Fert No P Fert

Operational Plantation – Second growing season

At Planting fertilizer recommendations

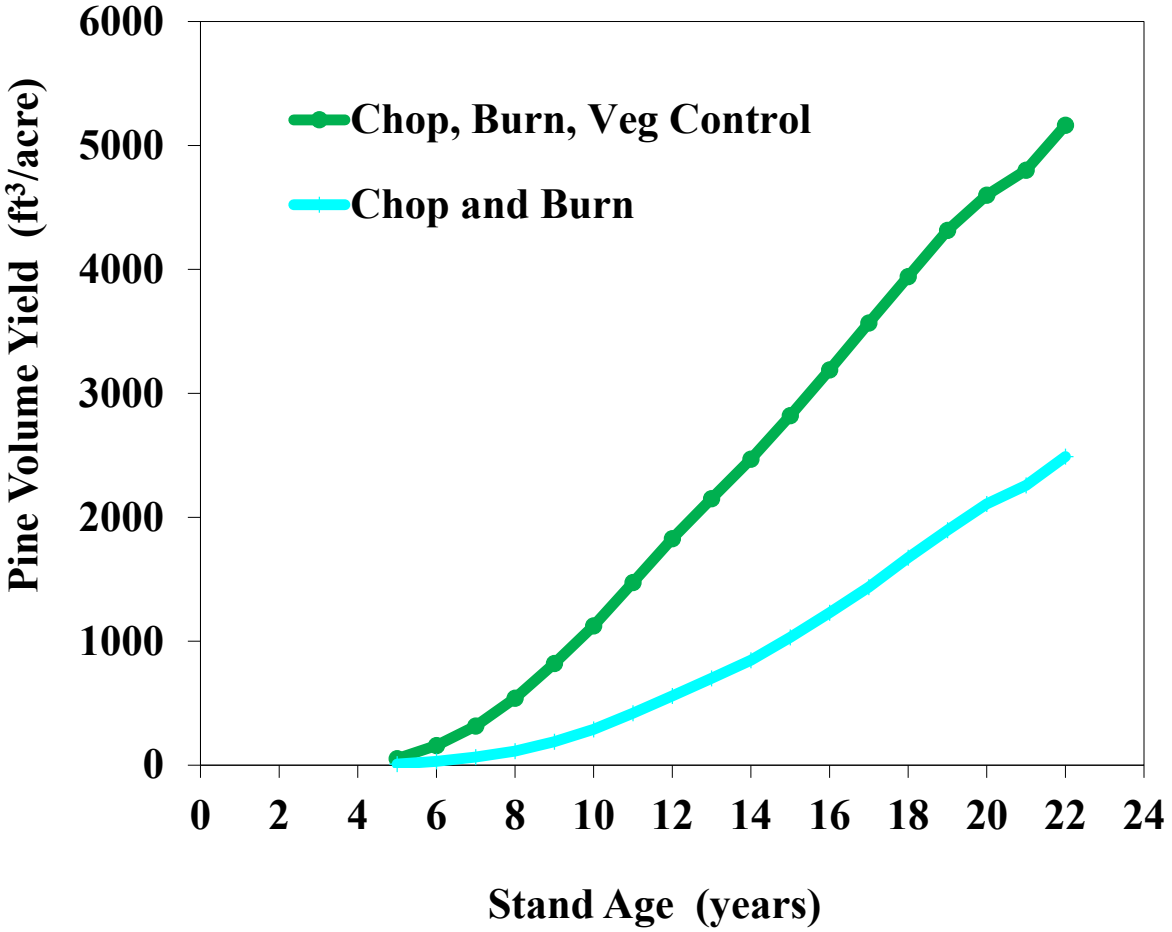
- Soil sampling 6-8 inch sample with at least 10 points per site
    - Mehlich 1 Soil P
        - < 5 ppm – 40 lb elemental P/acre
        - 5-10 ppm – 20 lb elemental P/acre
        - > 10 ppm – 10 lb elemental P/acre to be safe
        - Note double all ppm critical values for Mehlich III extraction
- Use Soil P values!
    - 100 lb/ac DAP (18N+20P) to 200 lb/ac DAP 36N+40P)
    - Triple Super Phosphate (TSP) in highly organic soils
    - TSP and DAP both contain 20% elemental P

Hardwoods exponentially decrease pine growth



Glover and Zutter 1993

Vegetation Control is Critical



Fertilized and drum chopped
No veg control

Herbicide recommendations

- Reduce hardwoods to very low levels (100 TPA)
- Control shrubs aggressively
- 1st year weed control – spot or band apply

- Need to pay attention to:
  - Timing
  - Chemical selection
  - Chemical rate
  - Planting time

Common Site Prep Treatments for Pines

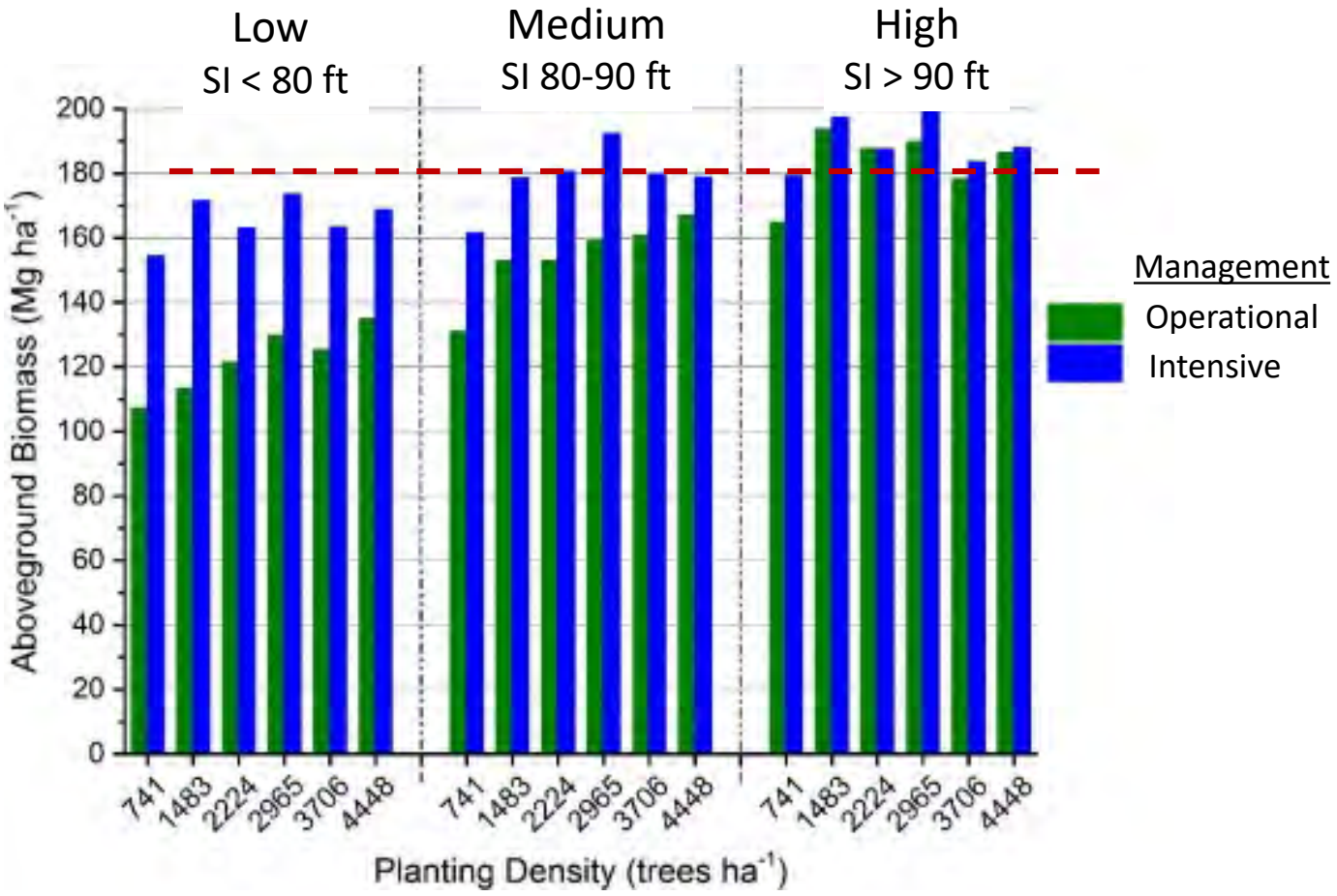
- Upland Sites (Oak, hickory, sweetgum, maple, etc)
  - 40-48 oz Chopper Gen2 (Imazapyr) + 2-3 qts Accord XRT II (Glyphosate)
- Waxy leafed species (Gallberry, Yaupon, Lyonia, Waxmyrtle, TiTi, etc)
  - 40-48 oz Chopper Gen 2 (Imazapyr) + 1-2 qts Garlon 4 Ultra (Triclopyr)
- Saw Palmetto
  - 40-48 oz Chopper Gen 2 (Imazapyr) + 3-4 oz Escort XP (Metsulfuron)
- ADD 1-5% Methylated Seed Oil (MSO) to improve absorption into the plant

*32 oz in a quart

Herbaceous Weed Control in Loblolly Pine

- Spring application (Feb-April)
  - 2 oz Oust XP (Sulfometuron) + **4-6 oz** Arsenal AC (Imazapyr)
  - 2 oz Oust XP + 24 oz Velpar L
  - Loblolly is most tolerant pine to Arsenal among Southern Pines

More Response on Lower Quality Sites BUT Lower Max Potential



Culture x Density Trial age 15

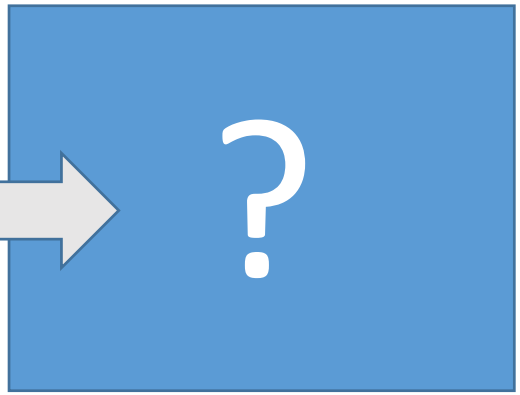
Zhao et al., 2016

How far can we push productivity?

Depends on what will pay $$

Single Bed & One Midrotation Fertilization
Age 23 Yield = 71 tons/acre

Double Bed, Competition Control, & Three Fertilizations
Age 17 Yield = 125 tons/acre



Thanks for your attention!

rachel_cook@ncsu.edu

Based on recommendations of: Pat Minogue, University of Florida, North Florida Research and Education Center & John Johnson, MeadWestvaco, Summerville, SC

August 2015 Registrations

Common Site Prep Herbicides- Pines

Herbicide Common Name	Trade Name (Many other generics)	Loblolly	Slash	Longleaf
		Product Rates Applied per Acre		
Glyphosate	**Accord® XRT II** **Accord® XRT**	4-8 quarts 1.5-8 quarts	4-8 quarts 1.5-8 quarts	4-8 quarts 1.5-8 quarts
Triclopyr	**Garlon® 4 Ultra**	4-6 quarts	4-6 quarts	4-6 quarts
***Hexazinone**	**Velpar® L** **Velpar® DF**	2-6 quarts 1.3-4 lb	2-6 quarts 1.3-4 lb	2-6 quarts 1.3-4 lb
***Imazapyr**	**Chopper® Gen2** **Arsenal® AC**	32-64 oz 24-40 oz	32-64 oz 20-32 oz	32-64 oz 24-40 oz
***Sulfometuron**	**Oust® XP**	2-8 oz	2-8 oz	2-8 oz
***Metsulfuron**	**Escort® XP**	4 oz Maximum	4 oz Maximum	**NOT LABELED**

****Persistent soil active herbicides shown in bold.***

August 2015

Herbaceous Weed Control Herbicides -Pines

Common Name	Trade Name (Many generics)	Product Rates/Acre
Hexazinone	**Velpar®** L **Velpar®** DF	4-8 pts 1.3-1.8 lb
Imazapyr	**Arsenal®** AC	4-6 oz (6-10 Lob.)
Metsulfuron	**Escort®** XP	0.5-1 oz Lob, Slash
Sulfometuron	**Oust®** XP	2-8 oz
Sulfometuron (12%) + Hexazinone (63%)	**Oustar®**	10-19 oz
Clopyralid	**Transline®**	0.25-1.3 pts