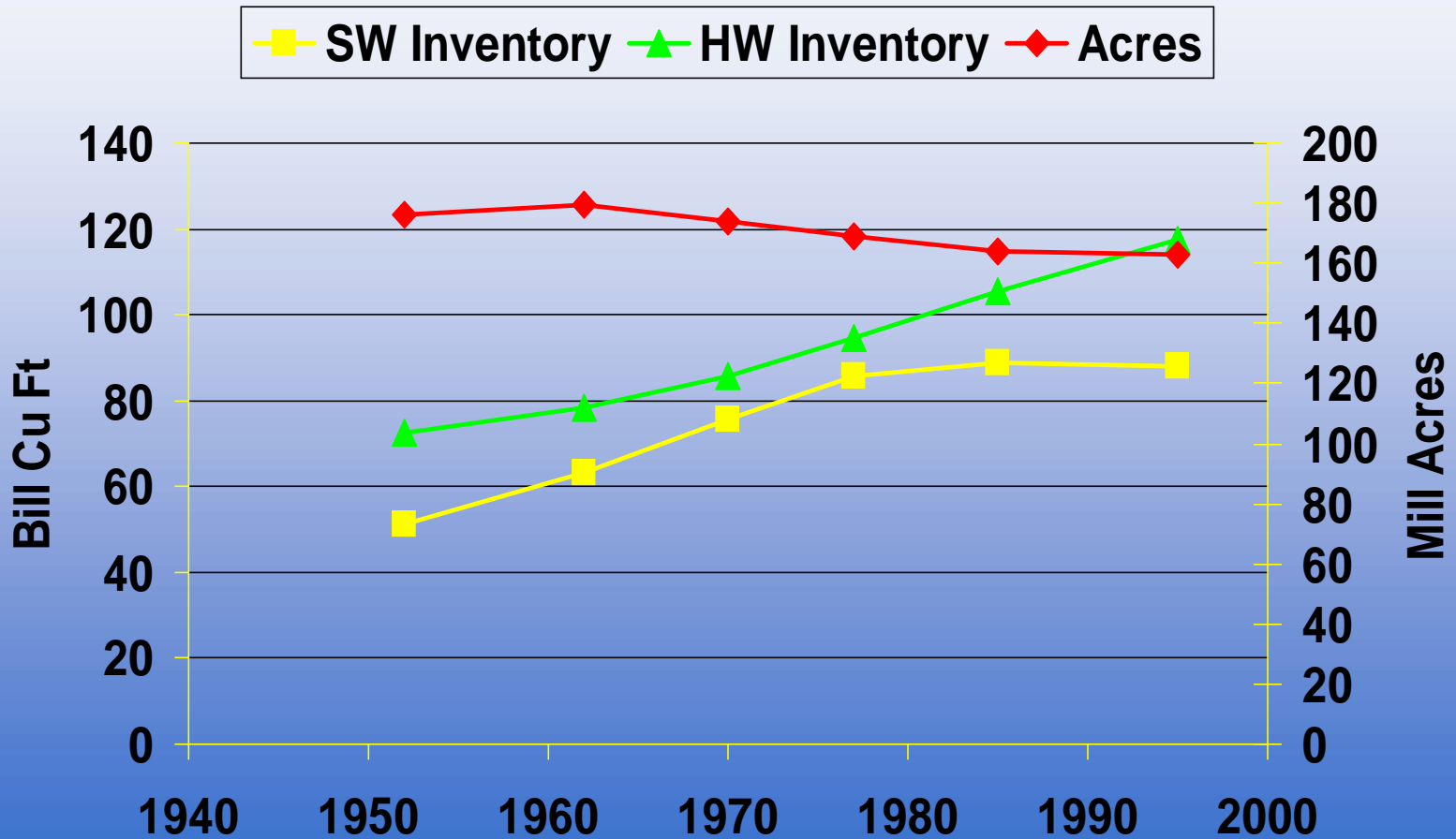


Modeling Changes in Forest Capital

- *Intensive Margin*: Intensity with which forests are managed for timber production
 - Plantation intensity
 - Input intensity
- *Extensive Margin*: Amount of land allocated to forests
- *Why Important?*
 - Sectoral response to timber scarcity
 - Affects all ecosystem services provided by land, forests

Southern Timberland Acreage and Growing Stock Trends



Research and Policy Questions

- How much forest will be lost to development pressures and where?
- Will rising timber prices offset some of these forest losses by re-allocating land from other uses?
- Can scarcities be mitigated by intensified forest management ?
- How is forest structure altered by changes in management and how does this affect the mix of timber and non-timber outputs.

Modeling Management Intensity

- Economic Factors
- Evidence/Trends
- Research Tasks

Economics of Management Intensity

- Intensity with respect to plantations
 - Establishment
 - Post-establishment activities
- Intensive management drivers
 - Timber prices, management costs
 - Available technology
 - Public Policies (+ and -)
- Management tendencies differ across owners, physiographic conditions

Southern Acres Planted

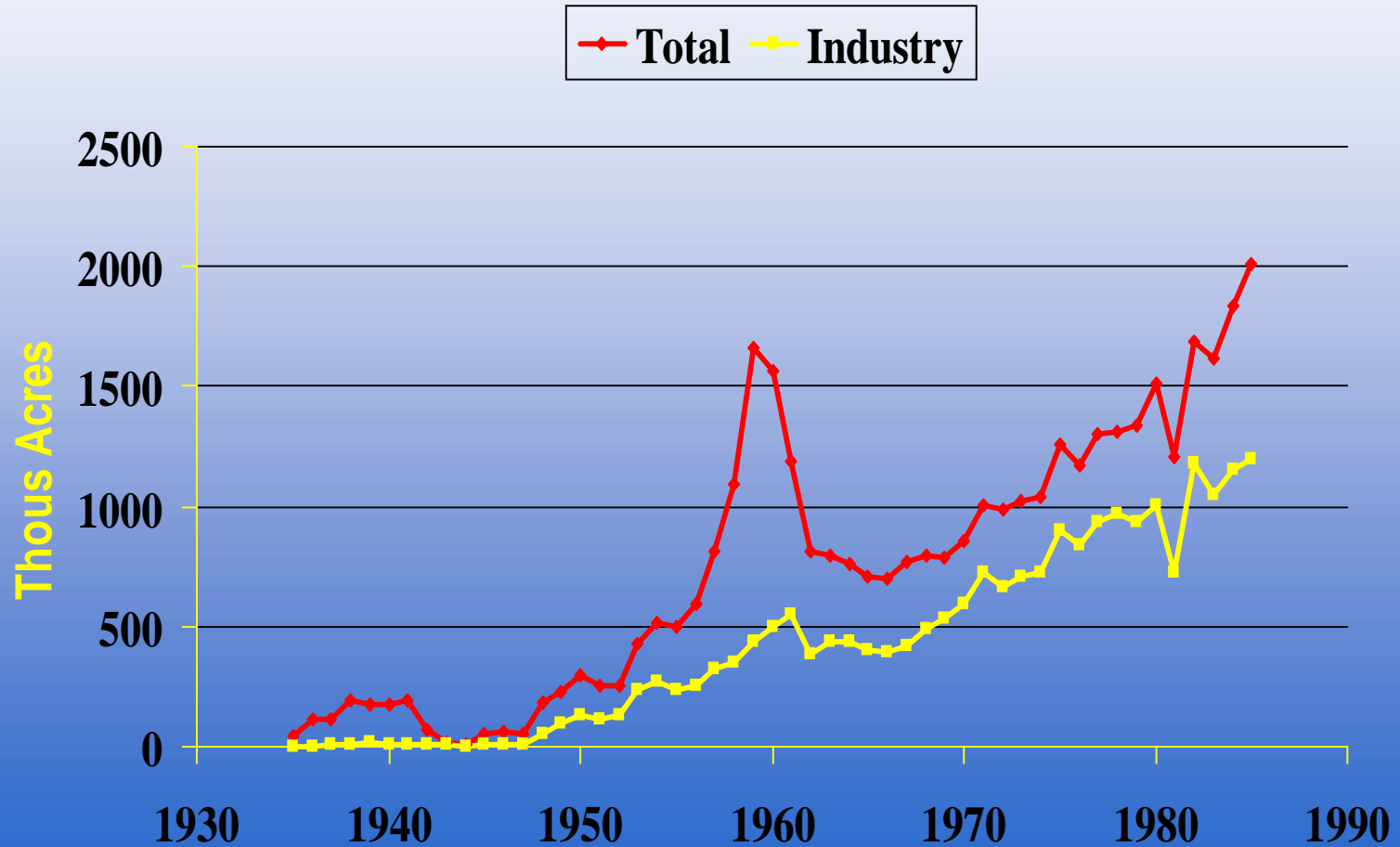
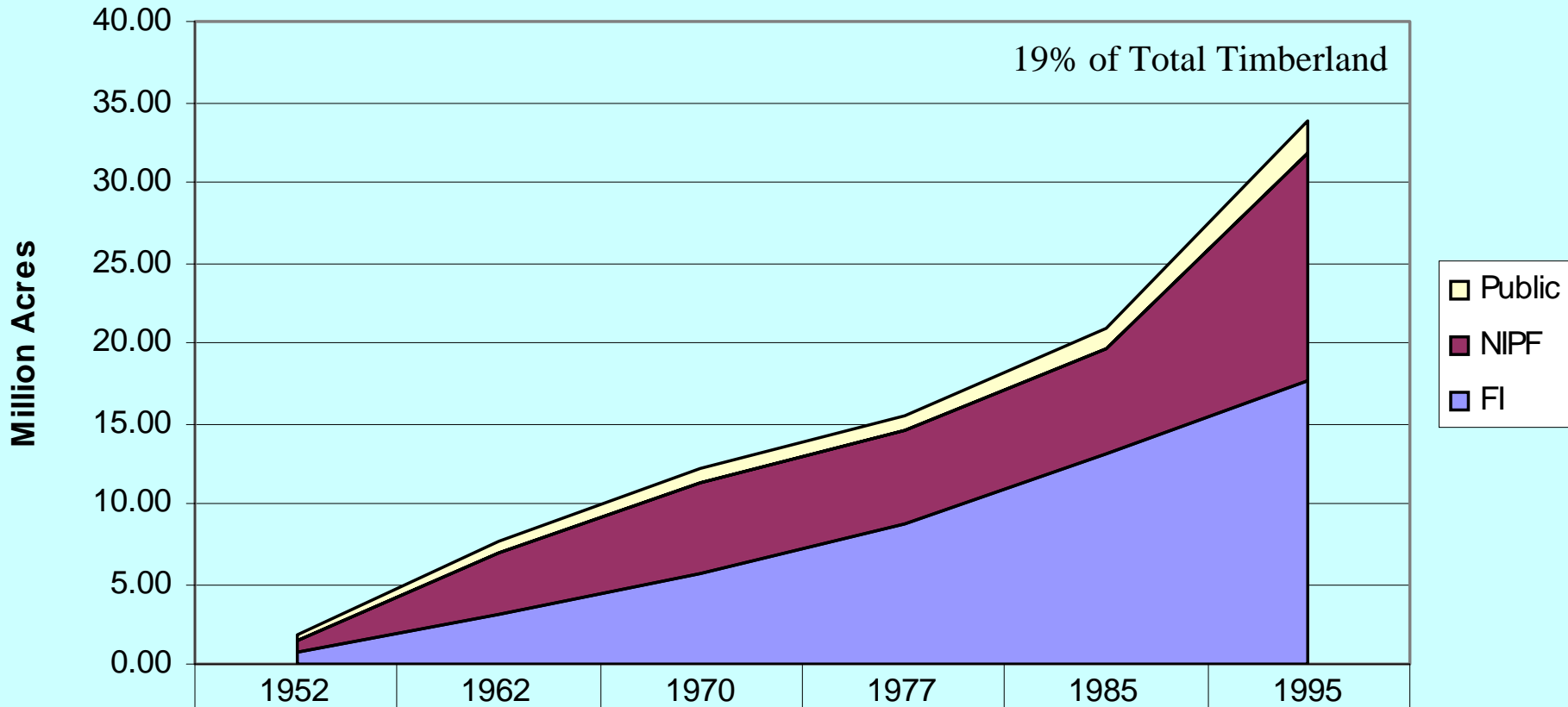


Figure 1. Southern U.S. Plantation Acres By Owner



	1952	1962	1970	1977	1985	1995
Public	336	720	814	857	1163	1979
NIPF	850	3740	5616	5843	6568	14200
FI	660	3127	5714	8723	13153	17700

Figure 2. Southern U.S. Softwood Growing Stock Volume

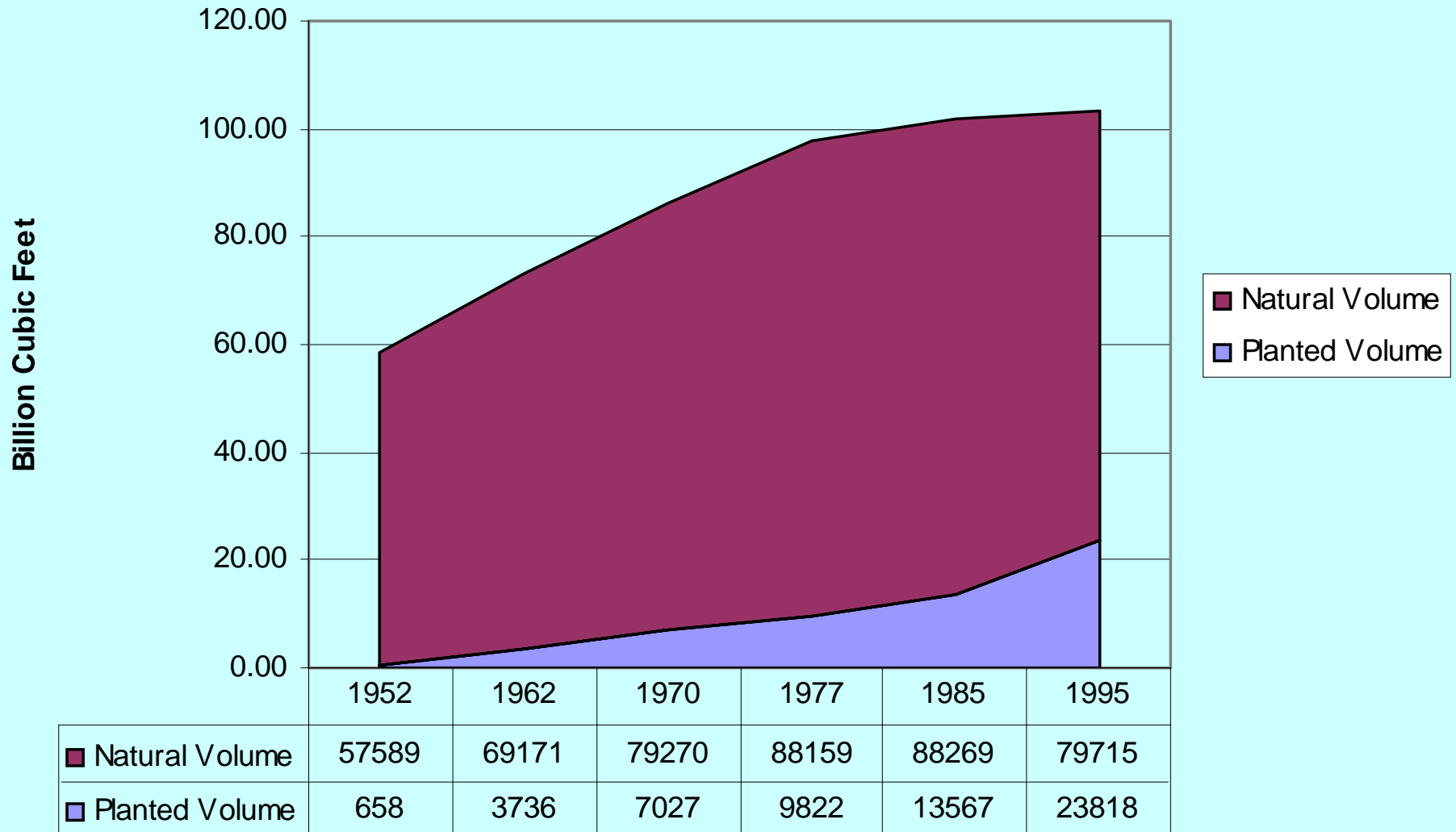


Figure 3. Plantation Ownership

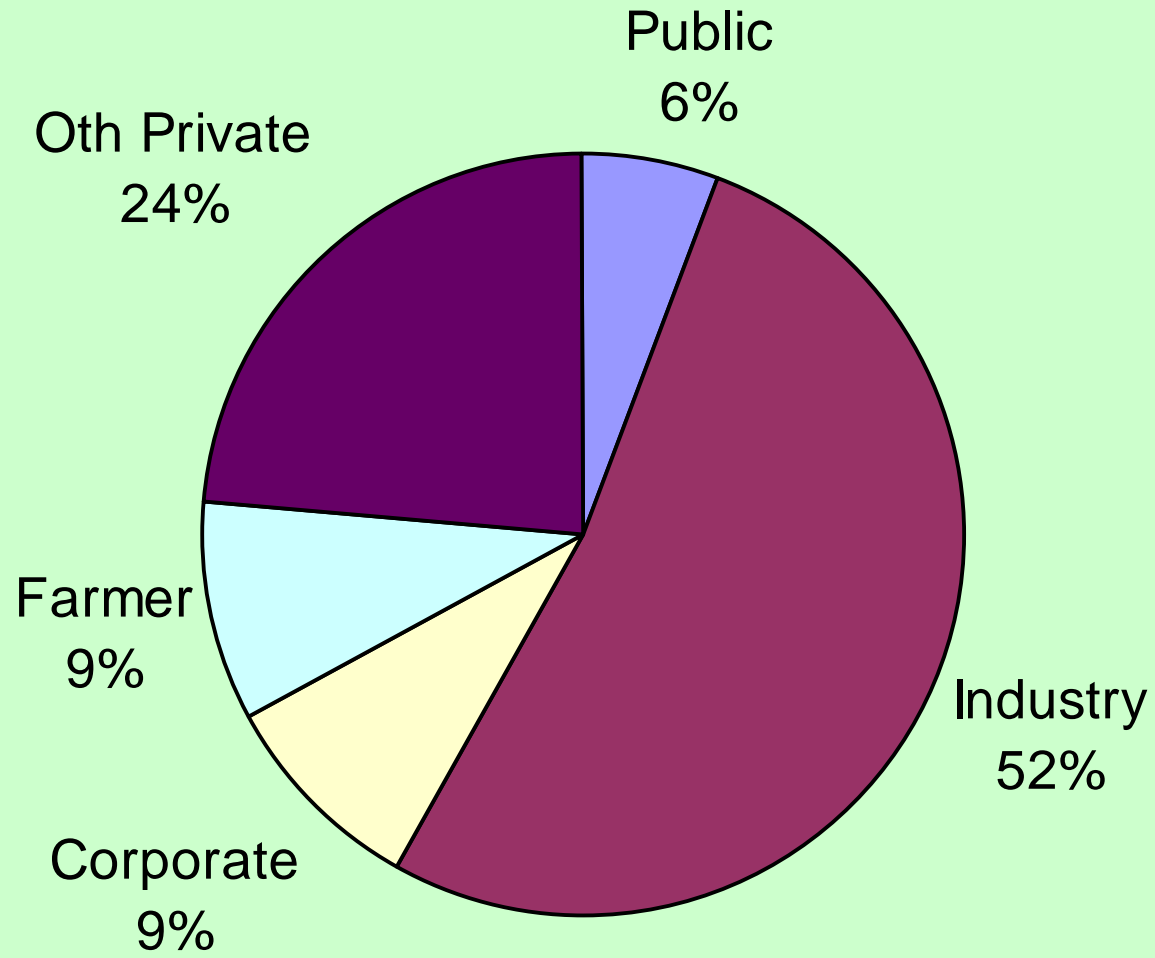


Figure 4. Pine Growth Rates

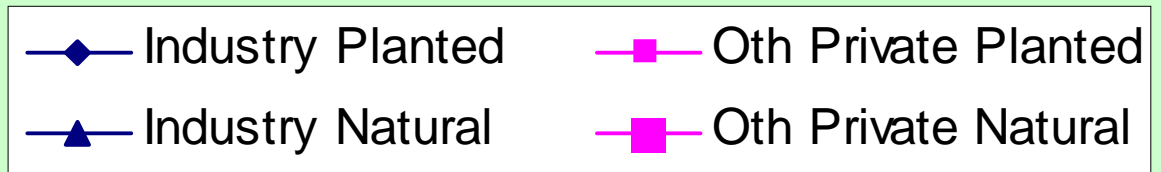
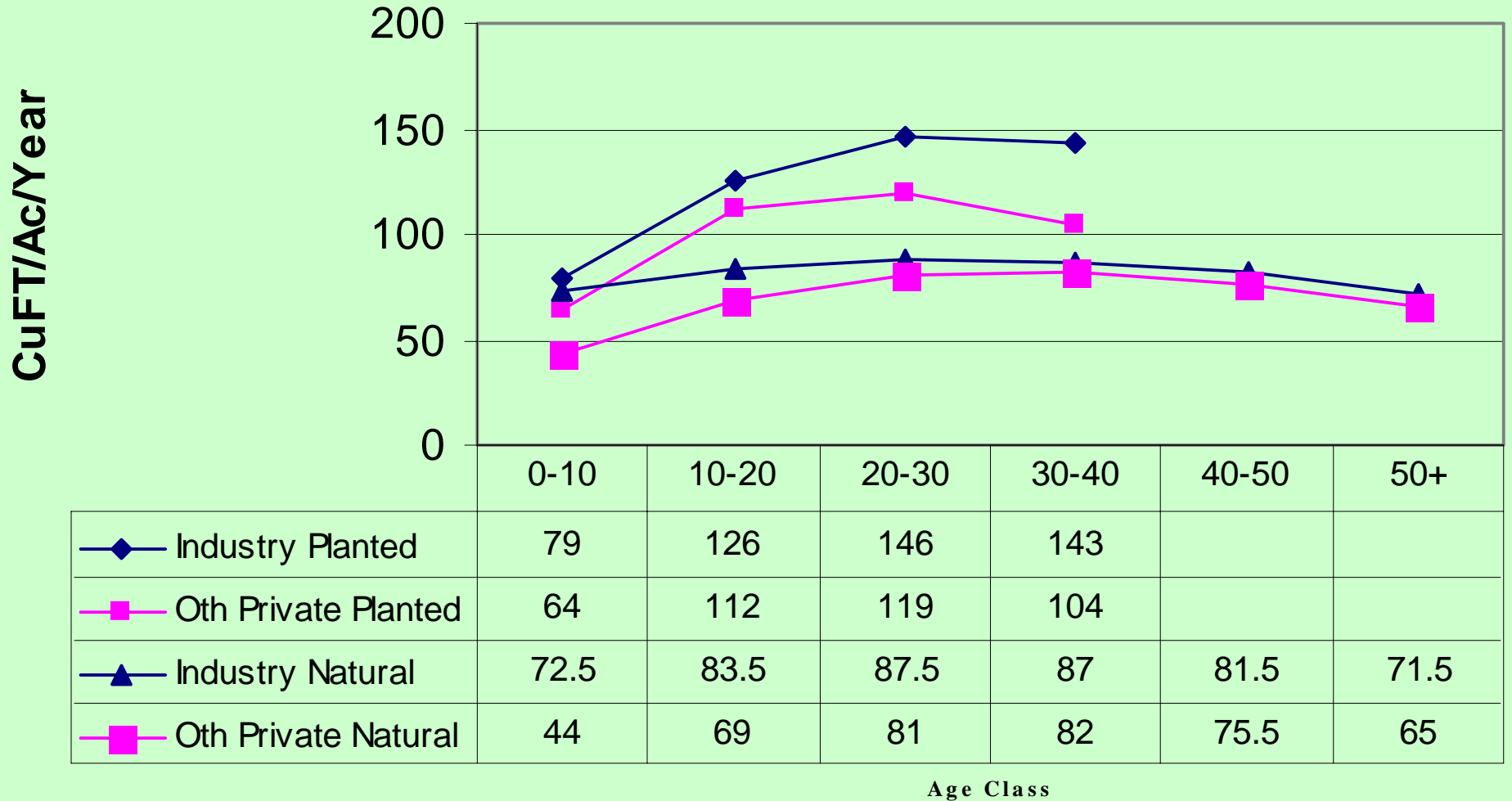
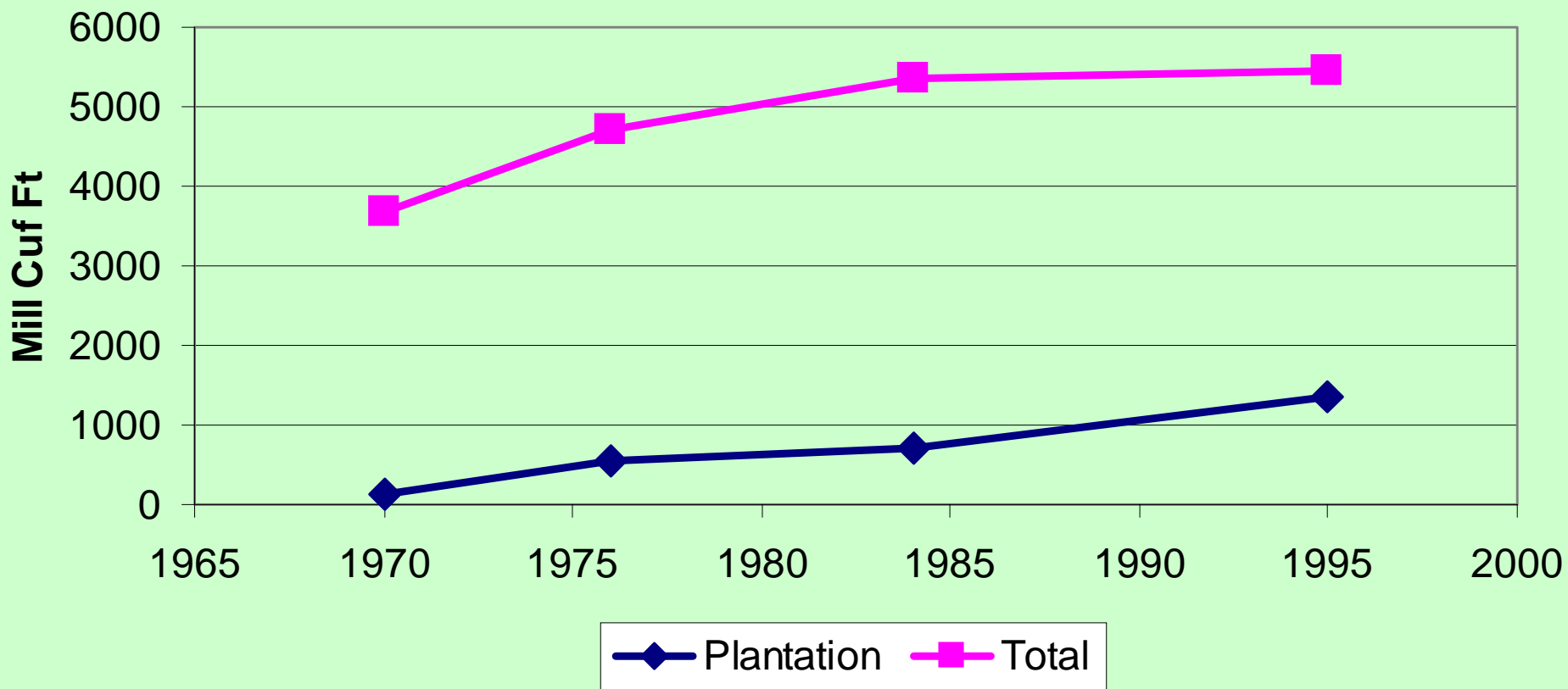


Figure 5. Southern Softwood Removals By Type



Research Tasks

- Task 1: Define Scope of Management Intensity to be Modeled
- Task 2: Establish the Empirical Relationship Between Timber Prices and Management Intensity
- Task 3: Construct Module that Relates Timber Prices to Management Intensity

Task 1: Define Scope of Management Intensity to be Modeled

- Candidate activities:
 - Planting
 - Post-establishment management intensity classes
 - Intensive (chemicals, prescribed burn, PCT,...)
 - Passive
 - Intermediate classes

Task 1: Define Scope of Management Intensity to be Modeled (cont'd)

- Assess data availability
 - Reforestation
 - Area (by owner): very good
 - Establishment costs:
 - Temporal: good
 - Spatial: fair
 - Cost share data
 - FIP
 - CRP
 - Data on adoption of other management activities is limited

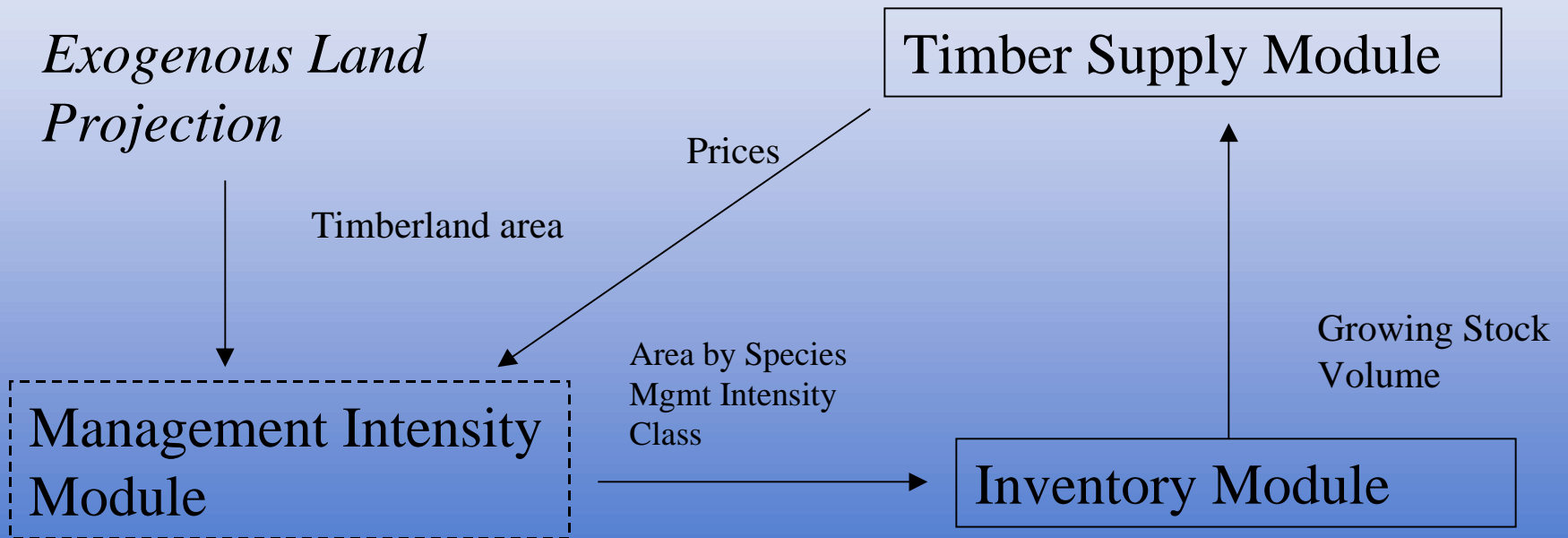
Task 2: Empirical Relationship: Timber Prices and Management Intensity

- Reforestation investments
 - Data can support econometric estimation
 - Current studies: Royer (1987); Lee and Murray (1990); Lee, Kaiser, & Alig (1992)
 - Propose new estimation using updated FIA data, controls for land quality, and joint estimation with land use

Task 2: Empirical Relationship: Timber Prices and Management Intensity (contd)

- Post-establishment investments
 - Data do not directly reveal activity adoption
 - Constrained optimization/hybrid approach likely

Task 3: Construct Management Intensity Module



Management Intensity: Summary Points

- Variations in management intensity can have a large effect on inventories, timber supply
- Reforestation easier to model than post-establishment activities
- Advantages of econometric approach: revealed behavior reflects non-economic factors
- Lack of data for estimation may call for some normative modeling, s.t. constraints

Modeling Land Use

- Economic Factors
- Evidence/Trends
- Research Tasks

Economics of Land Use

- Market factors
 - Developed use demands (population, income)
 - Agricultural returns
 - Forest returns
- Non-market factors
- Public Policies (+ and -)
 - Cost-sharing programs
 - Taxation
 - Local land use regulations

Private Timberland in the U.S. South

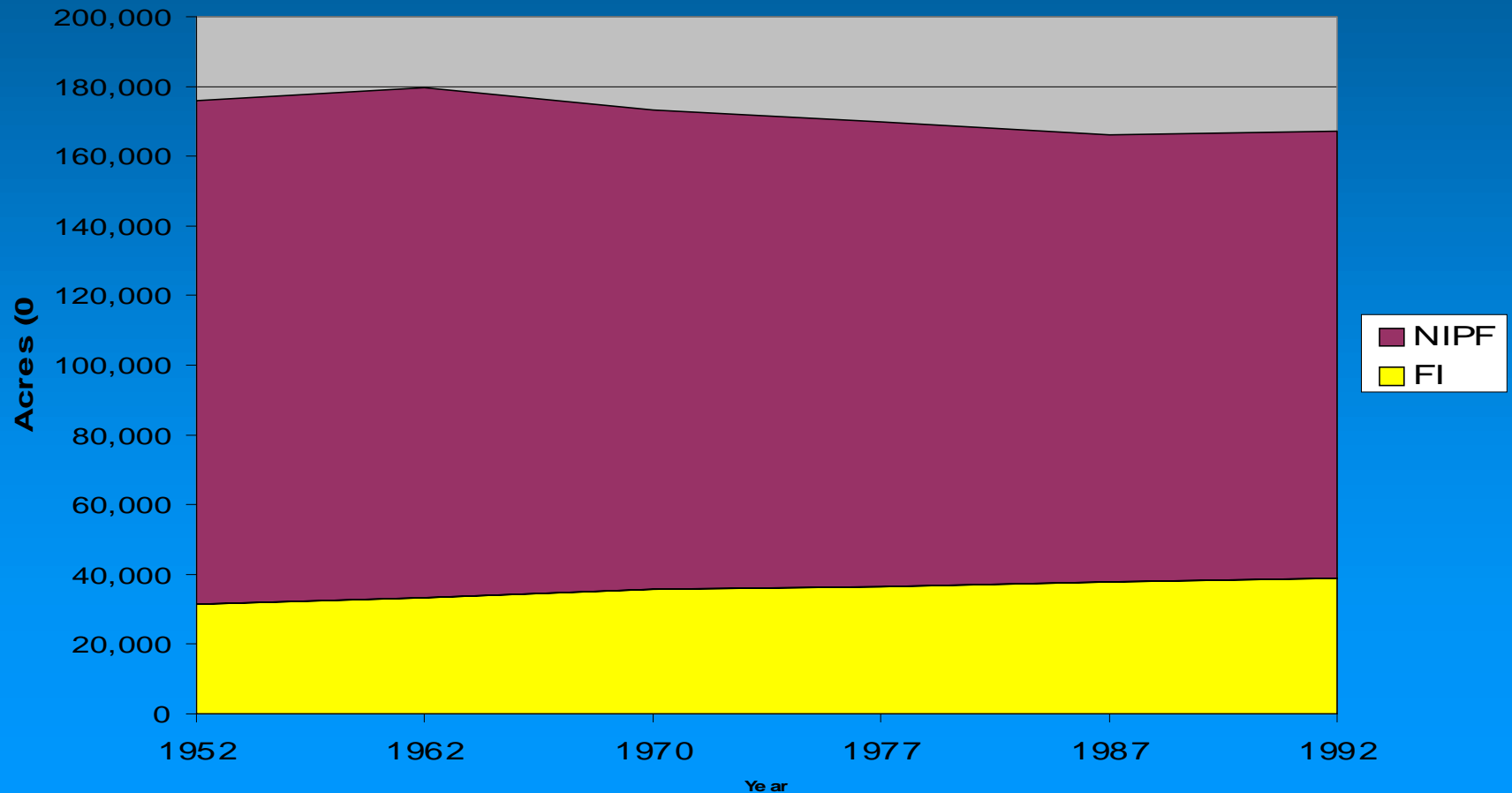
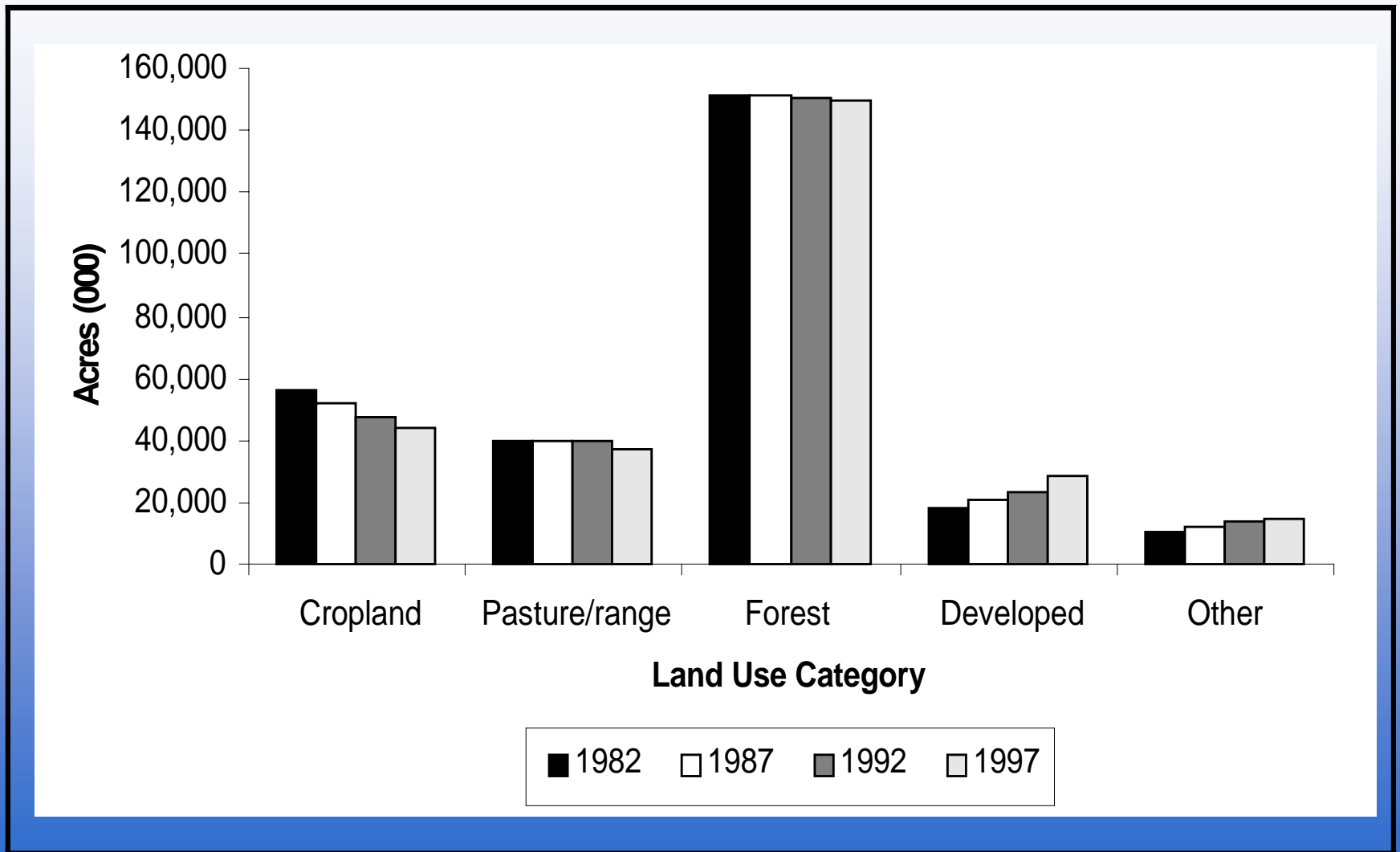
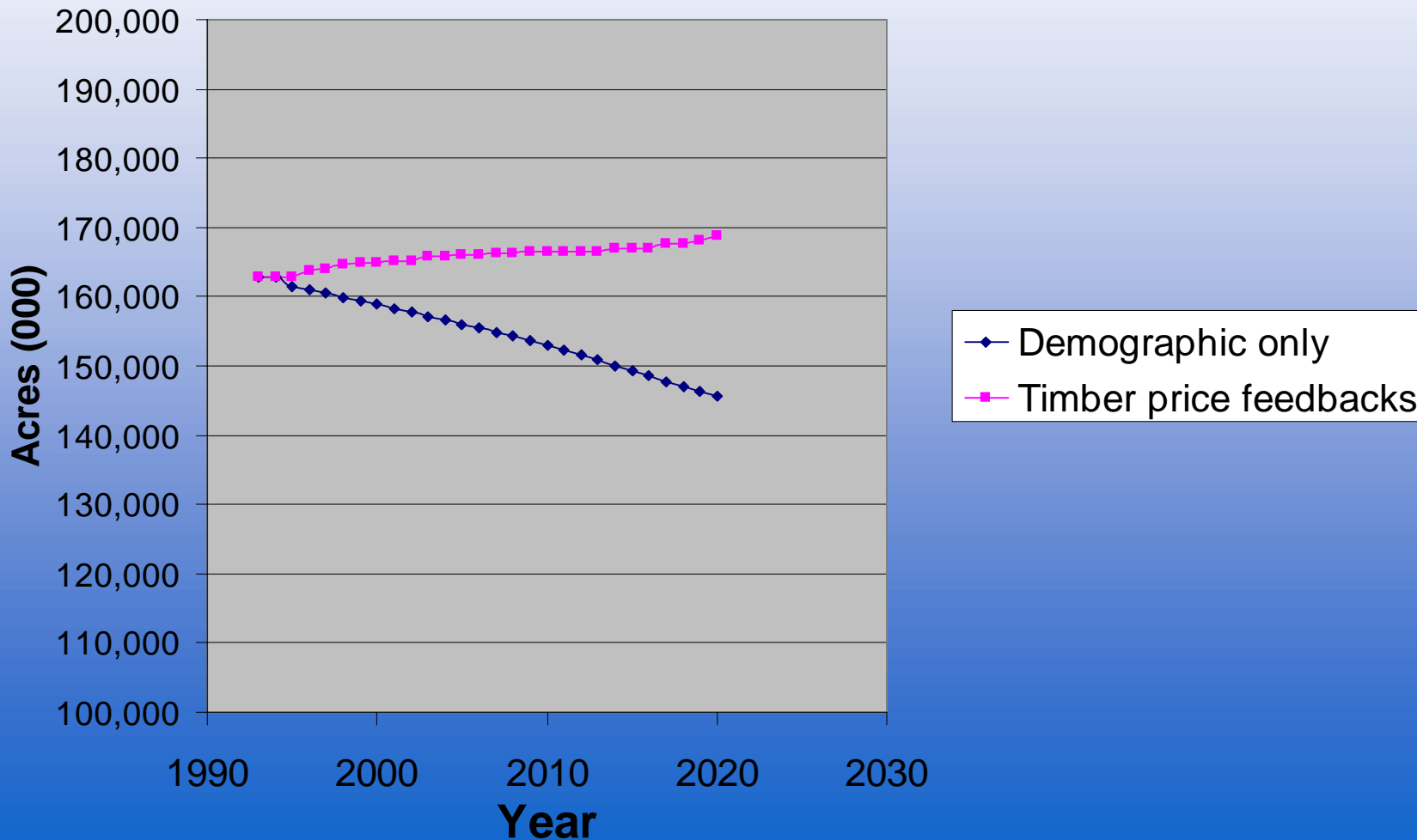


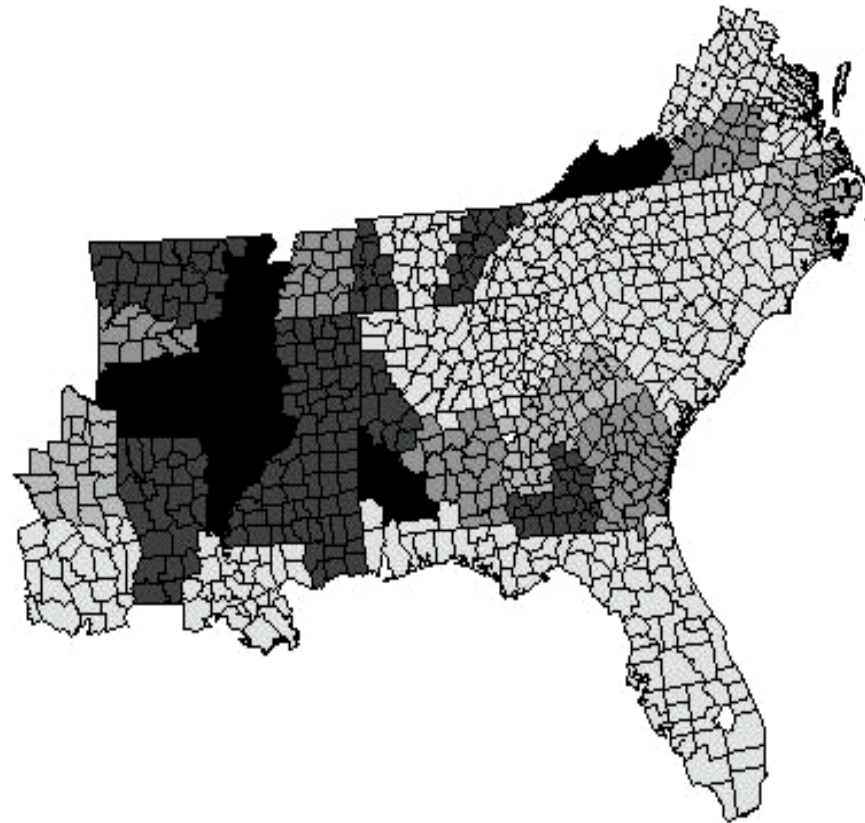
Figure 1. Major Uses of Non-federal Land in the 10 Southeastern States: 1982–1997^a



Net Change in Timberland with Timber and Land Markets Jointly Modeled



Projected Timberland Loss: Demographic Factors Only



Timberland Loss



>10%

2.5%-5%



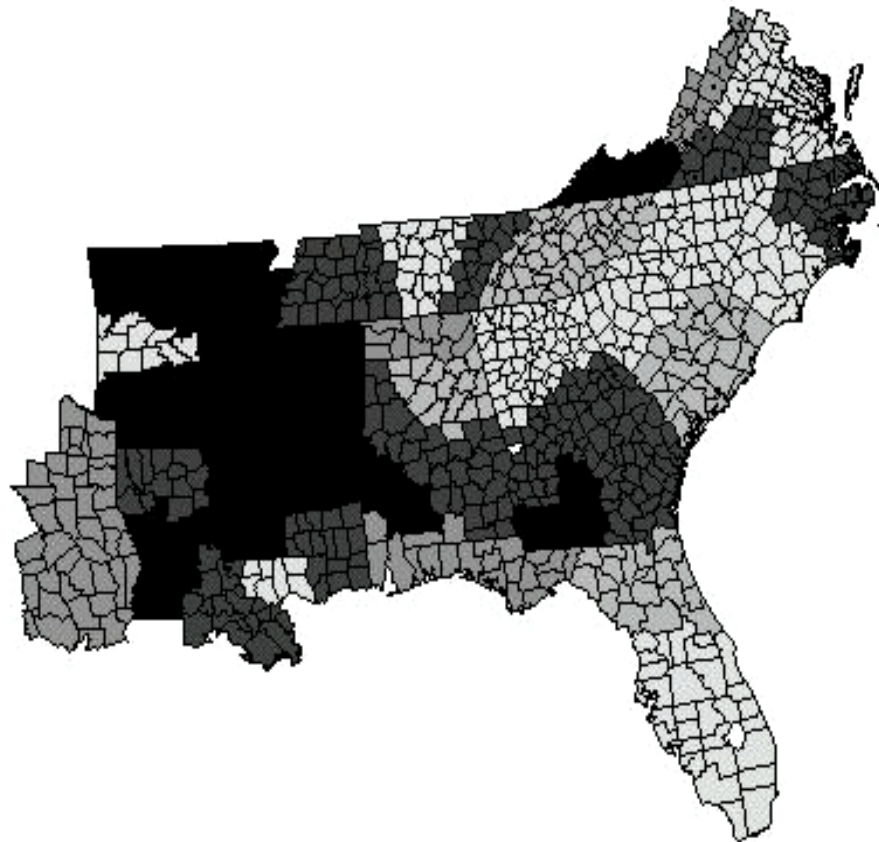
7.5%-10%

< 2.5%



5%-7.5%

Timberland Change by Sub-region: Timber and Land Markets Jointly Modeled



LANDLUL



< -10%

0% - 5%



-10% - -5%

> 5%



-5% - 0%

Research Tasks

- Task 1: Establish the Empirical Relationship Between Timber Prices and Land Allocation
- Task 2: Obtain Data for Exogenous Data Variables
- Task 3: Construct Module that Relates Timber Prices to Land allocation

Task 1: Empirical Relationship: Timber Prices and Land Use

- Econometric Land Use/Forest Area Studies
 - *South*: Alig (1986); Alig, White, Murray (1988); Hardie, Parks, Gottlieb, Wear (2000)
 - *Elsewhere in US*: Parks & Murray (1994)
 - *Results*: Timber prices affect private forest area, but response is inelastic (0.3-0.5)

Task 1: Empirical Relationship: Timber Prices and Land Use (cont'd)

- Optimization approach: land is explicitly allocated to use with highest market return
 - e.g, FASOM (Adams, Alig, McCarl et al 1995)
 - Advantage: theoretical consistency and tractability
 - Disadvantage: can be empirically inconsistent, especially in the short-run
- Proposed approach: Econometric

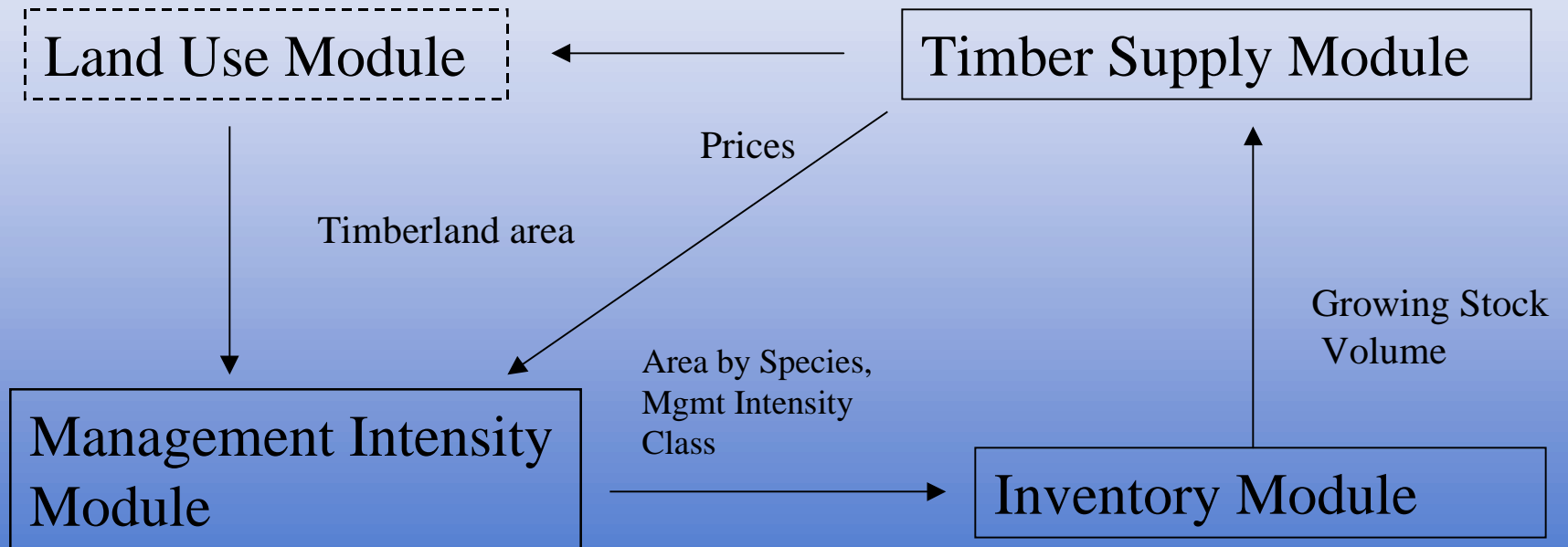
Task 1: Empirical Relationship: Timber Prices and Land Use (cont'd)

- Point of departure: Econometric model of Hardie, Parks, Gottlieb, Wear (2000)
 - Variables: Timber prices and costs, agricultural revenues and costs, demographics
 - Key advantages: timeliness, geog. coverage
 - Shortcomings: specification requires modification to work with SRTS and/or incorporate ag. models
- Estimate new model
 - Test alternative model specifications
 - Joint est'm with management intensity

Task 2: Obtain Data for Exogenous Data Variables

- Demographic variables
- Agricultural revenues and costs
- Other variables specified in new models

Task 3: Construct Land Use Module



Land Use: Summary Points

- Land allocation in South is largely determined in competitive market setting. Competition between forests and agriculture has always been keen.
- Developed uses (small, growing) continues to take land from both forests and agriculture
- Ignoring feedbacks between timber and land markets can lead to gross mis-estimation of forest area trends and timber production capacity
- Econometric approach: same advantages as with management intensity