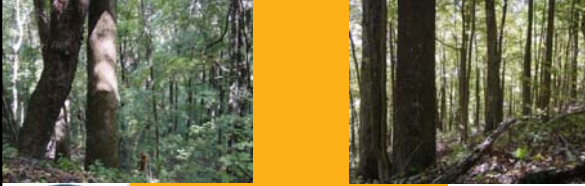
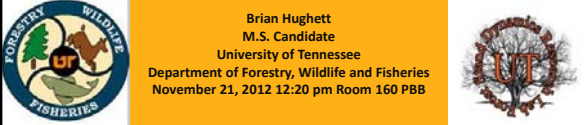


Stratification of forest community classifications to increase the accuracy of forest growth and yield models



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November 21, 2012 12:20 pm Room 160 PBB



Outline

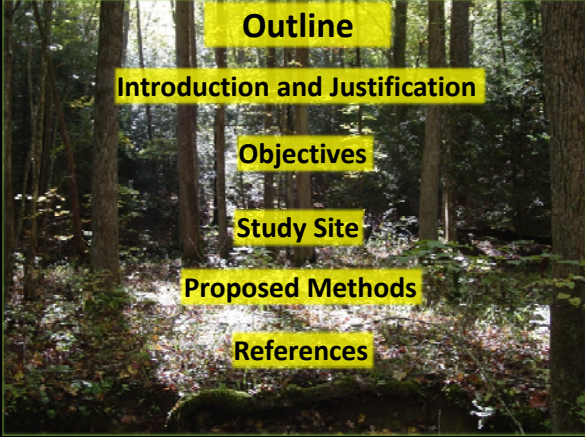
Introduction and Justification

Objectives

Study Site


Proposed Methods

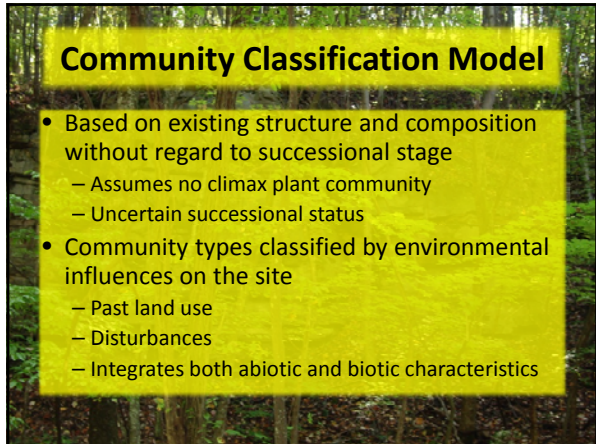
References



Forest Classification

- Means of describing and segregating forest management units
 - Based on
 - Biotic (vegetation characteristics)
 - Abiotic (site characteristics)
 - Both
- Differ due to
 - Scale, purpose, and heterogeneity of the physical setting





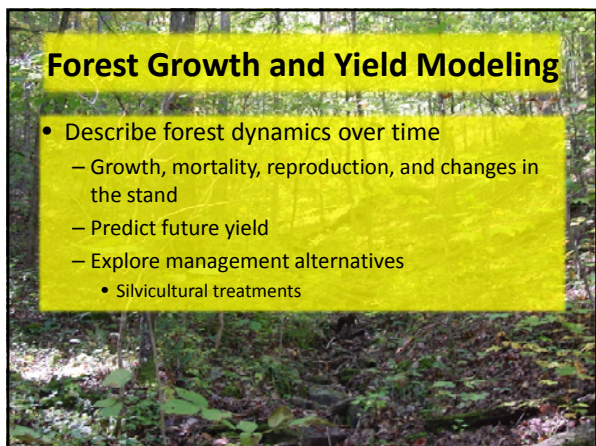
Community Classification Model

- Based on existing structure and composition without regard to successional stage
 - Assumes no climax plant community
 - Uncertain successional status
- Community types classified by environmental influences on the site
 - Past land use
 - Disturbances
 - Integrates both abiotic and biotic characteristics



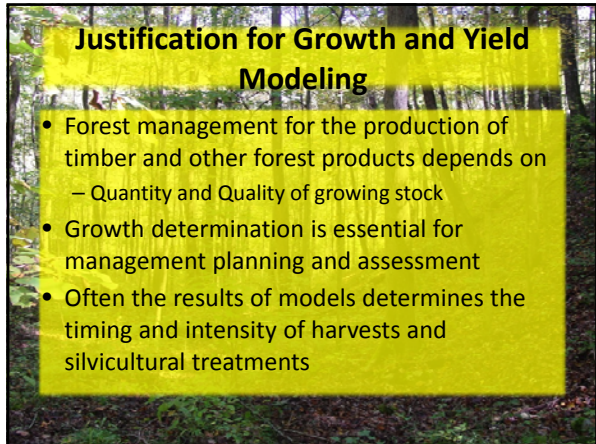
Justification for Community Classification

- Eastern U.S. forests
 - Lack climax vegetation
 - Subject to frequent disturbance
 - Have uncertain successional status
 - Managed for desirable preclimax vegetation
- Objective and subjective multivariate procedures
 - Able to identify and describe communities grouped by unquantifiable variables that are implicit in the data structure
 - Ex. Disturbance, succession, past land use



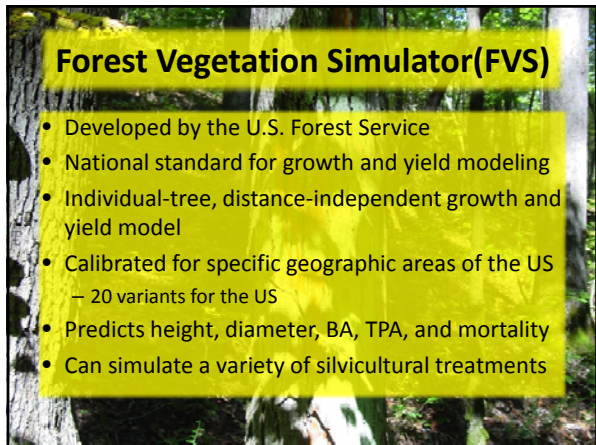
Forest Growth and Yield Modeling

- Describe forest dynamics over time
 - Growth, mortality, reproduction, and changes in the stand
 - Predict future yield
 - Explore management alternatives
 - Silvicultural treatments



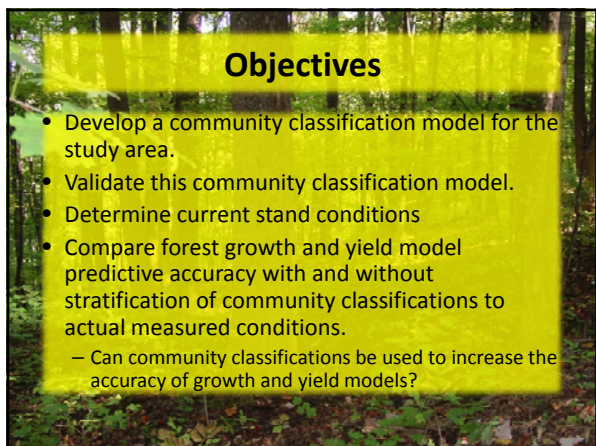
Justification for Growth and Yield Modeling

- Forest management for the production of timber and other forest products depends on
 - Quantity and Quality of growing stock
- Growth determination is essential for management planning and assessment
- Often the results of models determines the timing and intensity of harvests and silvicultural treatments



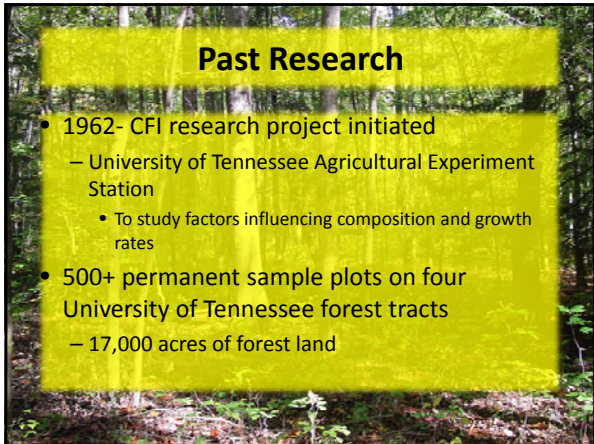
Forest Vegetation Simulator(FVS)

- Developed by the U.S. Forest Service
- National standard for growth and yield modeling
- Individual-tree, distance-independent growth and yield model
- Calibrated for specific geographic areas of the US
 - 20 variants for the US
- Predicts height, diameter, BA, TPA, and mortality
- Can simulate a variety of silvicultural treatments



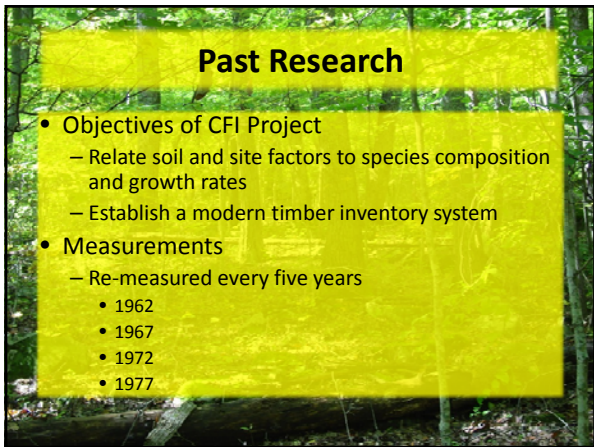
Objectives

- Develop a community classification model for the study area.
- Validate this community classification model.
- Determine current stand conditions
- Compare forest growth and yield model predictive accuracy with and without stratification of community classifications to actual measured conditions.
 - Can community classifications be used to increase the accuracy of growth and yield models?



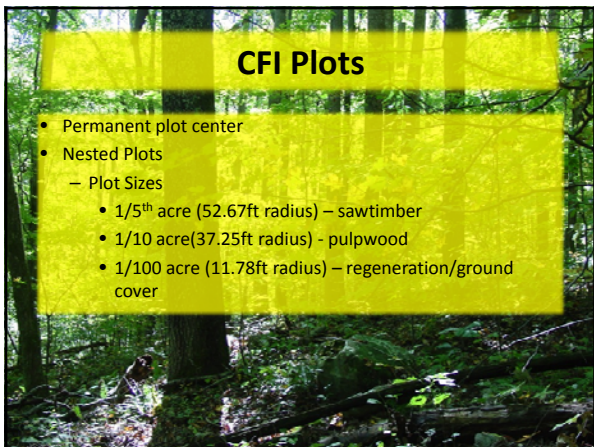
Past Research

- 1962- CFI research project initiated
 - University of Tennessee Agricultural Experiment Station
 - To study factors influencing composition and growth rates
- 500+ permanent sample plots on four University of Tennessee forest tracts
 - 17,000 acres of forest land



Past Research

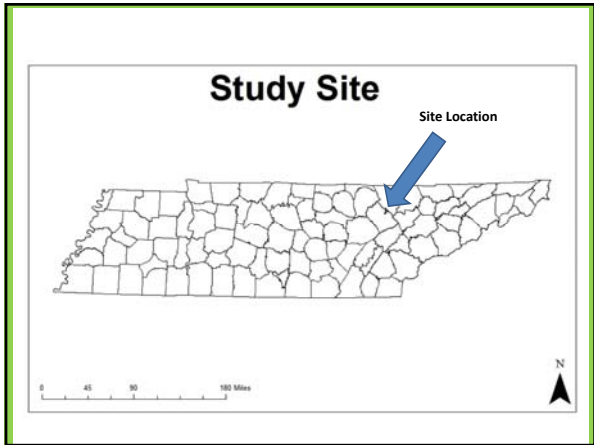
- Objectives of CFI Project
 - Relate soil and site factors to species composition and growth rates
 - Establish a modern timber inventory system
- Measurements
 - Re-measured every five years
 - 1962
 - 1967
 - 1972
 - 1977

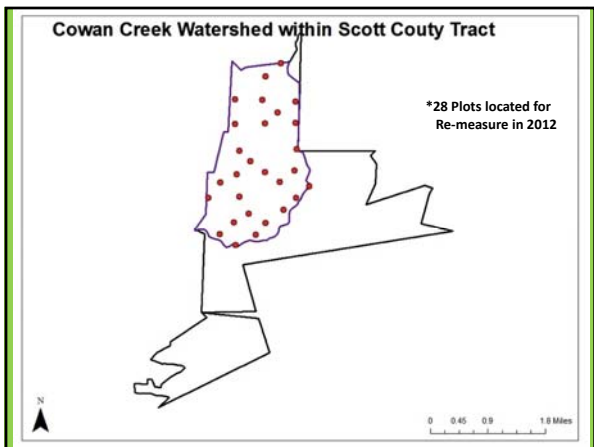


CFI Plots

- Permanent plot center
- Nested Plots
 - Plot Sizes
 - 1/5th acre (52.67ft radius) – sawtimber
 - 1/10 acre(37.25ft radius) - pulpwood
 - 1/100 acre (11.78ft radius) – regeneration/ground cover









Data Collected

- Slope direction
- Slope %
- Position
- Slope form
- Soil characteristics/productivity measures (assumed constant)
- Canopy cover
- Shrub cover
- Importance values
- Disease incidence
- Mortality/ingrowth
- Reproduction stocking/composition
- Sawtinmber/pulp class

Data Collected

- DBH
- Species
- Total height
- Merchantable Height
- Grade
- Vigor

Methods: Classification Model

- Principal components analysis
- Attempt at explaining the total variation
 - Variable reduction
 - Determine number of PC to retain (eigenvalues/screeplots)
 - factor loadings -determine variables to be retained
 - View plotted pc scores for outlier detection

Methods: Classification Model

- Factor Analysis
- Join correlated variables into common factors to objectively define communities
 - Interpretation of communities from factor loadings
 - Eliminate variables causing salient loadings

Methods: Classification Model

- Cluster analysis
 - group communities based on similarities and dissimilarities
- Corroborate the results of the factor analysis
- Proc means to obtain cluster profile
 - Determine variables responsible for cluster formation

Methods: Model Validation

- Discriminant analysis
- Evaluates predictive performance of model between the community types(clusters).
- Variable selection for LDA (proc stepdisc)
- Analyze classification matrix for external dataset, holdout sample, jackknife, and resubstitution.

Methods: Growth and Yield Models

- Run FVS
 - Unaltered inventory data
 - Inventory data stratified by community classification
- Operational validation
 - Test whether predictions agree with actual measured conditions
 - Control charts (evaluate model accuracy over time)

Literature Cited

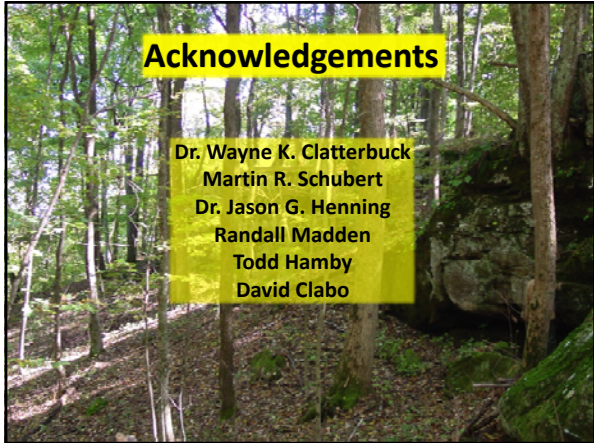
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Questions?