




INFLUENCES OF CLIMATE ON PLANTATION LOBLOLLY PINE (*PINUS TAEDA*) GROWTH RESPONSES



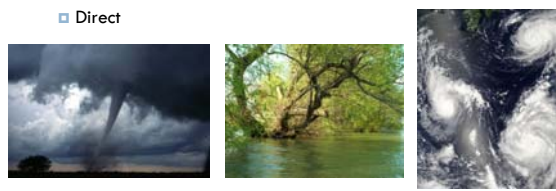
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Influences of Climate on Forests

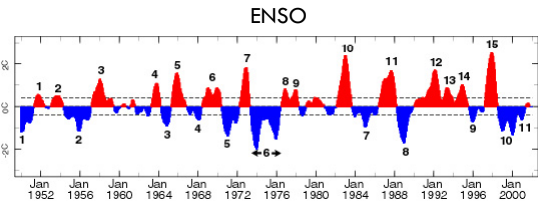
- Climate
 - ▣ Average weather over long period of time
- Impacts on ecosystems
 - ▣ Direct



Influences of Climate on Forests



- Impacts on ecosystems
 - ▣ Indirect

ENSO

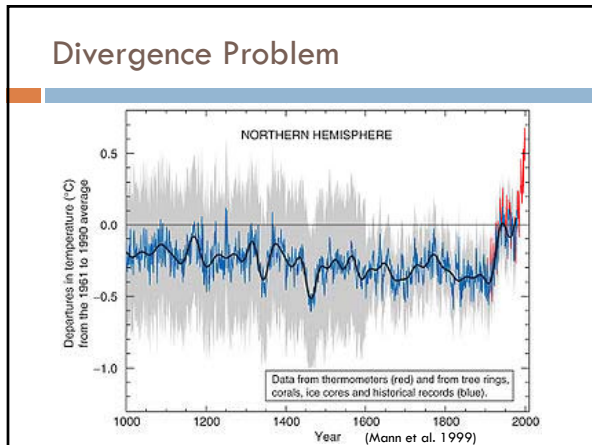


Dendroclimatology

- Dendro = tree
Climatology = study of climate
- Climate reconstructions or growth responses

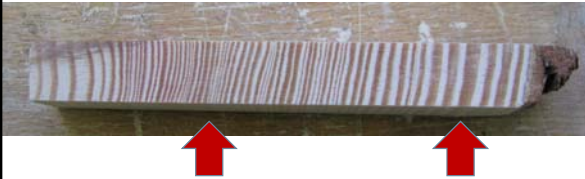


- Temperature vs. moisture sensitive



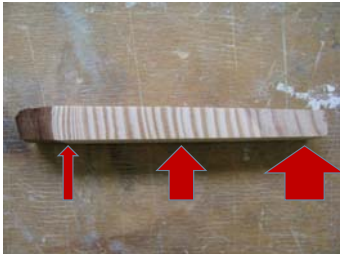
Identifying Climate Signal in Trees

- Variation in annual growth rings
- Cross-date
- Master chronology
- Statistical techniques to remove autocorrelation and age-dependent growth trends



Growth Trends

- Autocorrelation
 - ▣ Lag effect
- Age-dependent growth related trends

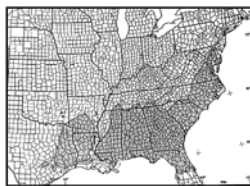


Research Objectives

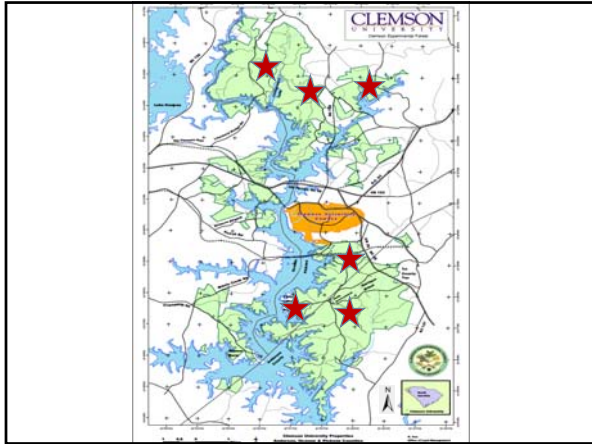
- **Goal:** Determine the influences of climate on plantation loblolly pine (*Pinus taeda*) growth responses
- **Objectives:**
 - ▣ 1) Cross-date plantation loblolly pine
 - ▣ 2) Determine growth response(s) to climatic driver(s)

Loblolly Pine (*Pinus Taeda*)

- Most intensively managed in Southeast
- Range of sites
- Aggressive pioneer
- Responds well to silvicultural treatments



(Little 1971)



Study Sites - North



Waldrop Stone




East Dam




Holly Springs


Study Sites - South



Swine Center



Watershed



Outdoor Lab

Sample Selection and Collection



- 10 cores per stand
- ~30 cm from RCD



- 3 cross-sections per stand
- Subjective without preconceived bias approach (Mueller-Dombois and Ellenburg 1974)

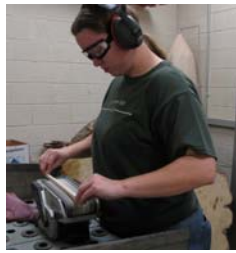
Sample Preparation

- Mount cores



- Sand cores

- ANSI 220, 320, 400 grit

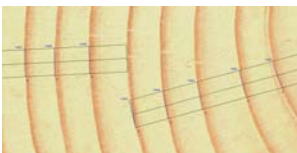
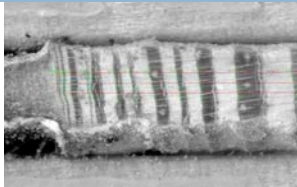


(Orvis and Grissino-Mayer 2002)

Methodology

1) Cross-date plantation loblolly pine

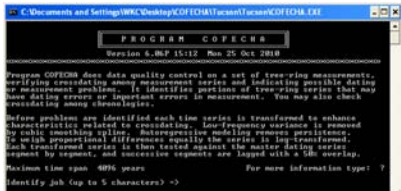
- Windendro



Methodology

1) Cross-date plantation loblolly pine

- COFECHA 6.06
 - ▣ Assess quality of cross-dating
 - ▣ Time-series correlation techniques
 - ▣ Account for autocorrelation and age-growth related trends

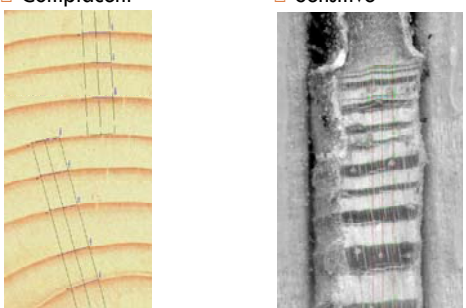


(Holmes 1983, Grissino-Mayer 2001, Stokes and Smiley 1996)

Methodology

1) Cross-date plantation loblolly pine

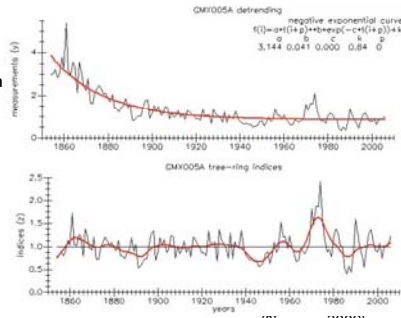
- Complacent
- Sensitive



Methodology

2) Determine growth response(s) to climatic driver(s)

- ARSTAN (Cook 1985)
 - ▣ Removes autocorrelation and age-dependent growth trends
 - ▣ Autoregressive standardization
 - ▣ Unit-less indices indicating size of growth-ring



(Biermann 2009)

Methodology

2) Determine growth response(s) to climatic driver(s)

- DendroClim 2002
- NCDC and climate indices
- Moving correlation function analyses

(Biermann 2009)

Acknowledgements

My Committee
US Forest Service
Clemson University
University of Tennessee – Knoxville
Department of Forestry, Wildlife and Fisheries

Questions?
