Climatological relationships of Atlantic White Cedar, *Chamaecyparis thyoides,* (AWC):

precipitation, temperature, and drought intensity relationships through tree ring analysis

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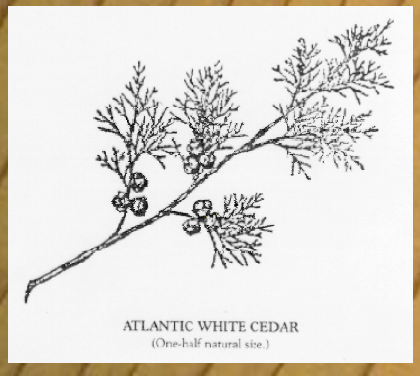
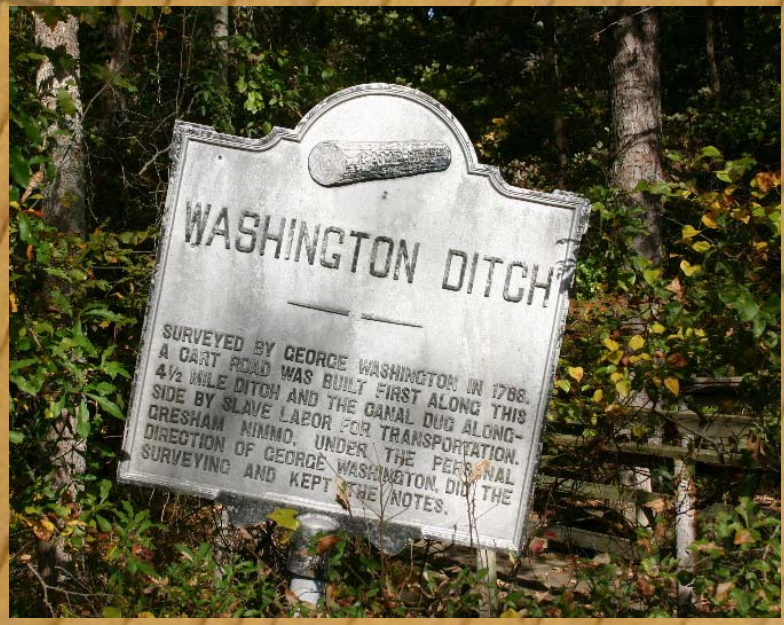


AWC Swamps as an endangered ecosystem

- Overharvesting recorded as far back as 1748
  - Roofing, housing, fencing, Pleasant aroma (Atkinson et al)
- Ditching began by George Washington in 1770's
- Successful drainage of Great Dismal Swamp (GDS) in 1812
  - GDS Canal and its Feeder Ditch
- Over 90% of AWC has disappeared (Noss et al. 1995)
- GDS National Wildlife Refuge
  - Established 1974
- 1995 Laboratory Research



Known AWC growth factors

Precipitation	•Obligate wetland species •Balance with evapotranspiration
Drought (PDSI)	•Stress for trees, markers for crossdating
Water table levels (Lake Drummond)	•Root zone conditions •Peat accumulation •GDS non-riverine
Temperature	•Increased Metabolism •Higher oxygen demand in warmer temperatures

Purpose

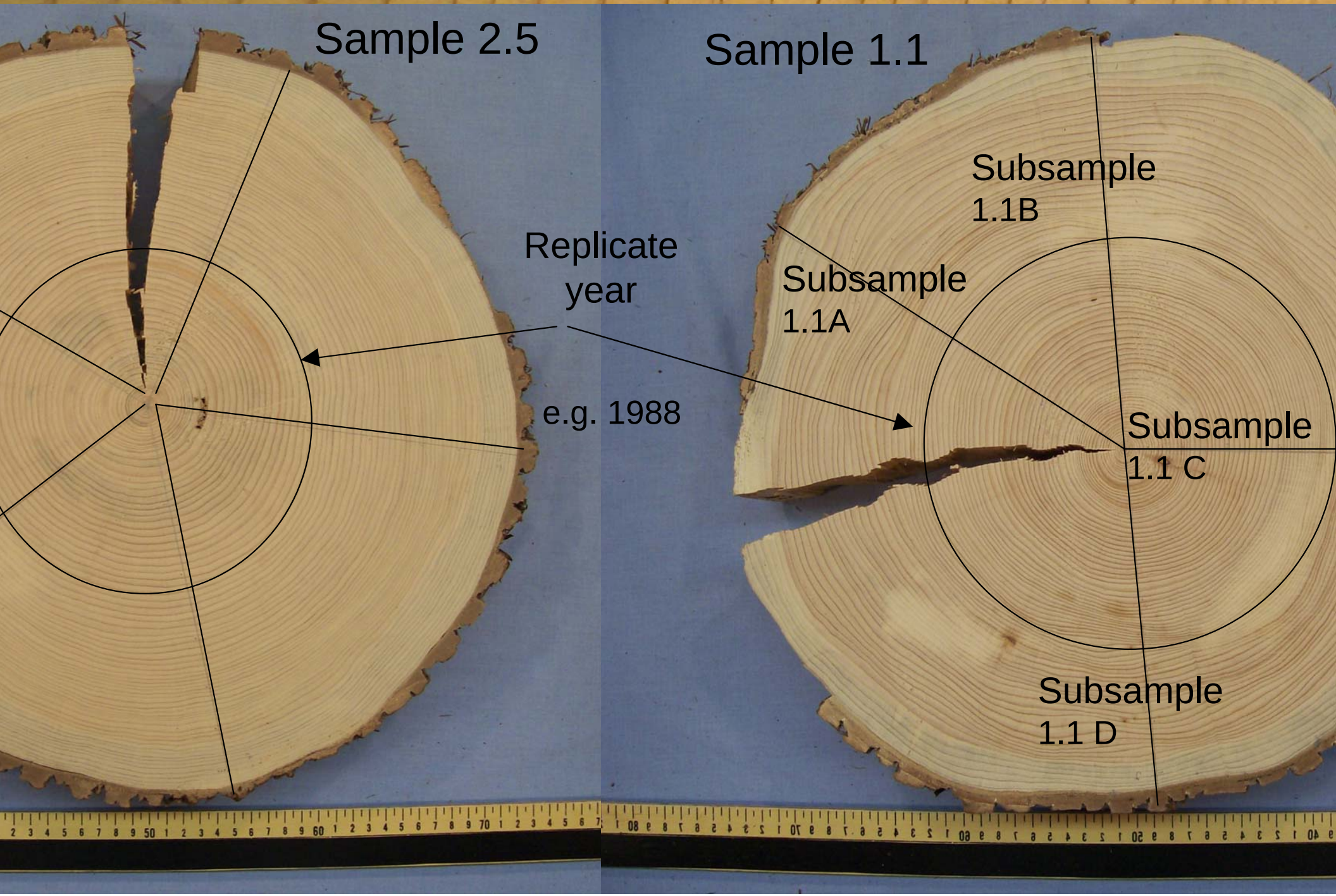
- The purpose of this study was to use tree ring chronology from 1919-2003 to study the extent of climatological effects on growth and understand potential management implications.

Post Hurricane Isabel

Methods

- 11 plots
- 105 samples
  - Great Dismal Swamp National Wildlife Refuge

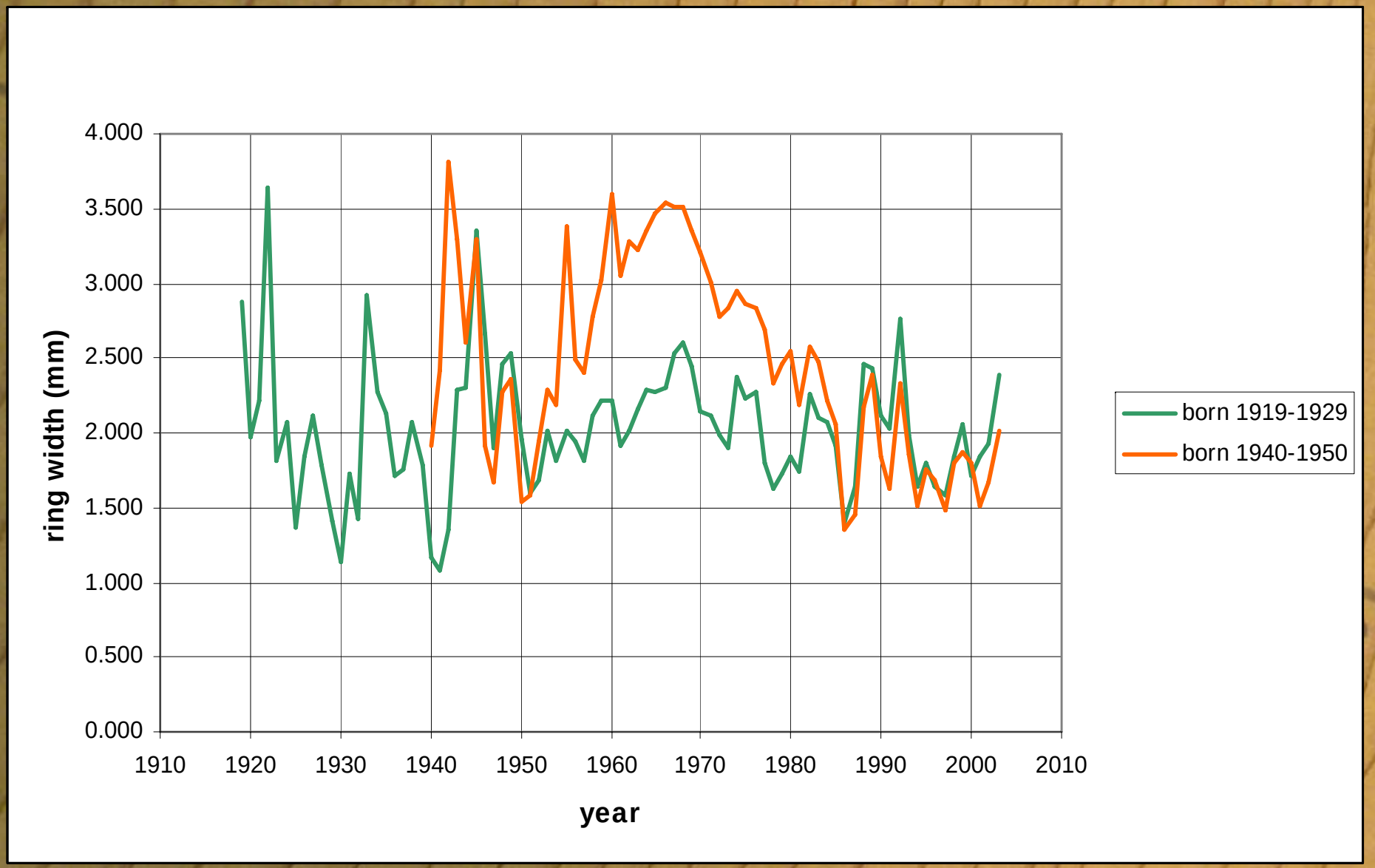
Sampling Technique



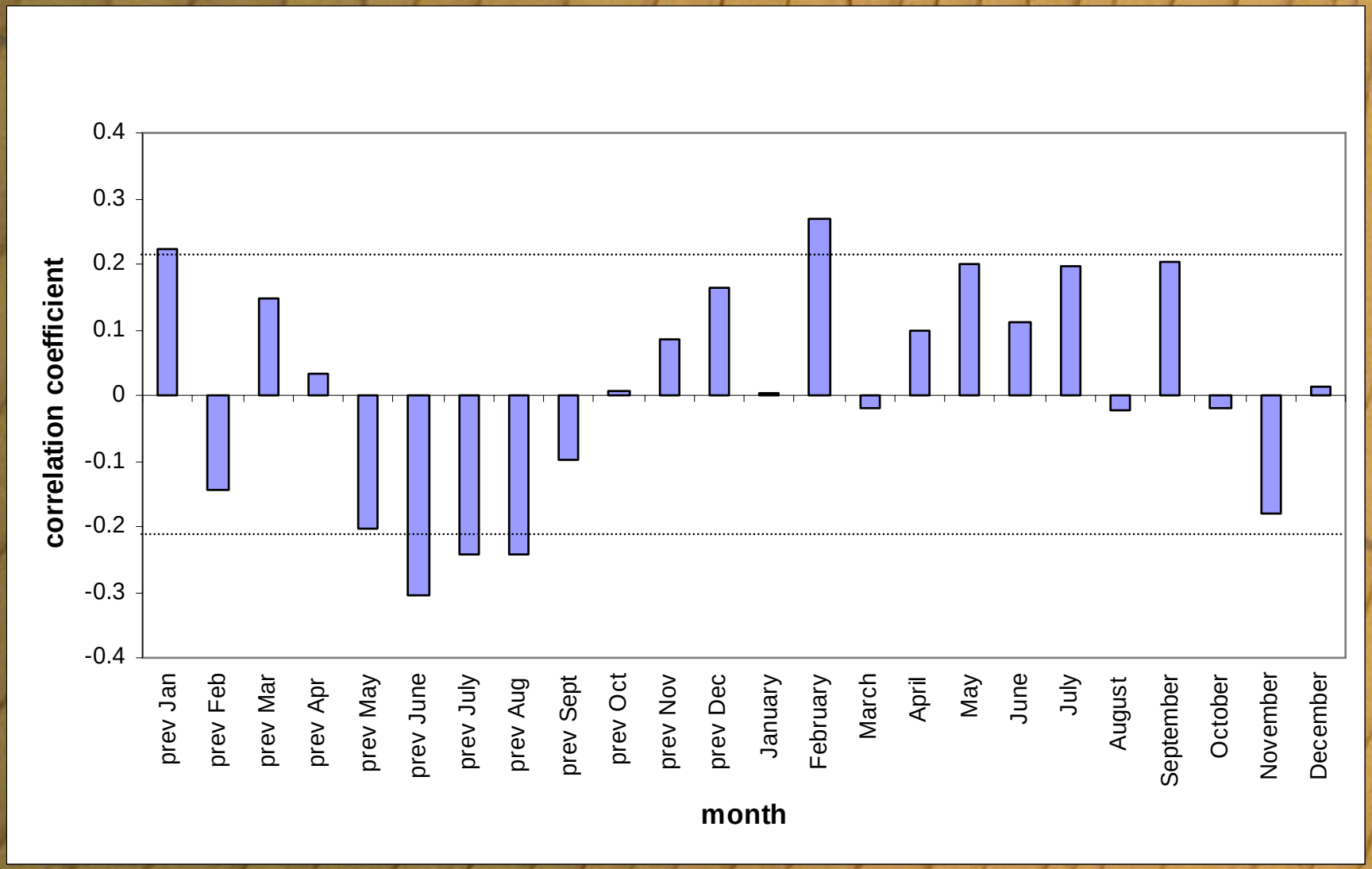
Methods Continued

- Crossdating based on marker years (COFECHA)
- Three Chronologies calculated (ARTISAN)
  - Residual Chronology
- Correlation coefficients of each month presented for each climatic variable on a 20 month growing season

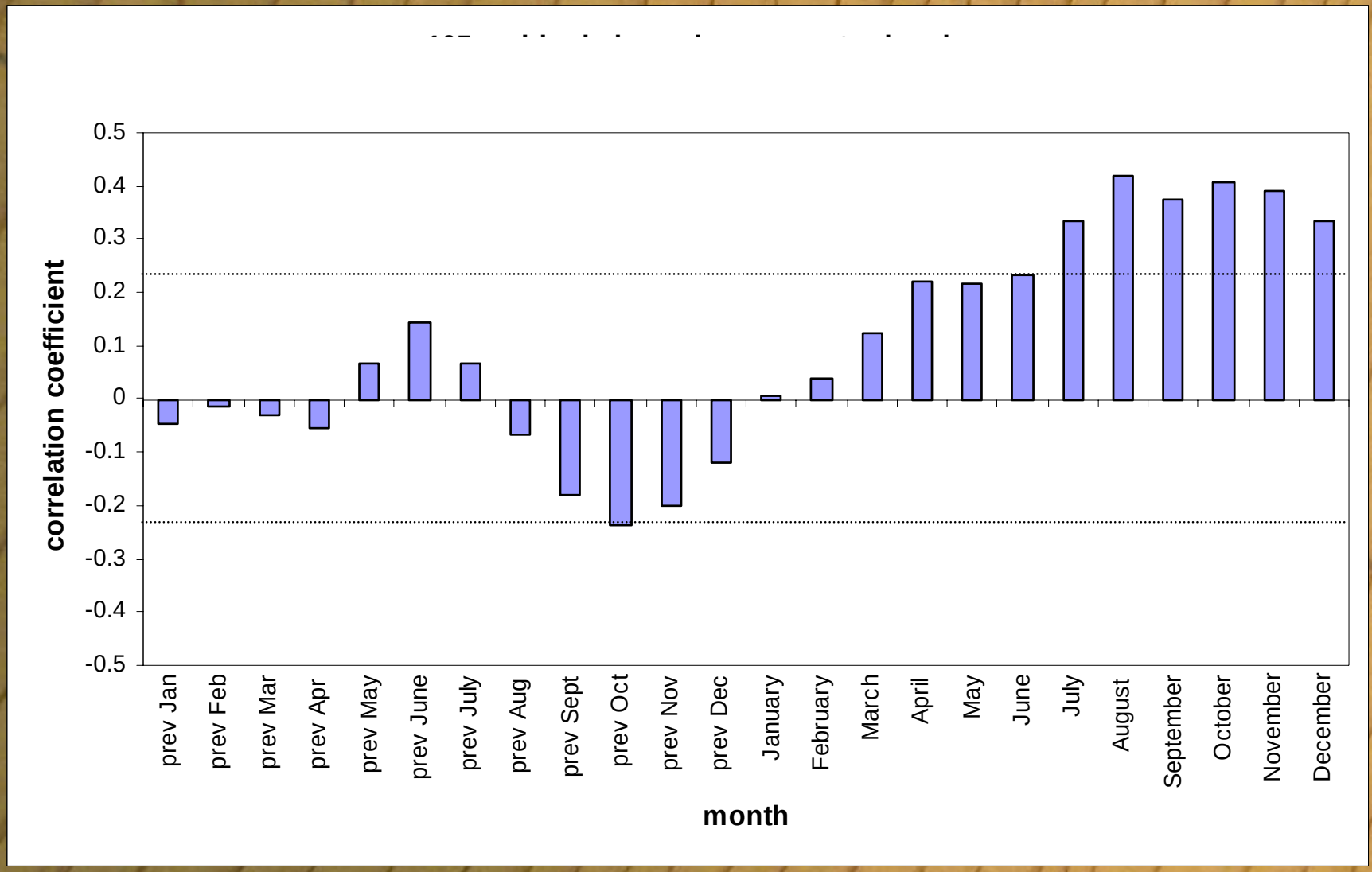
Comparison of average raw ring widths for two AWC age-classes



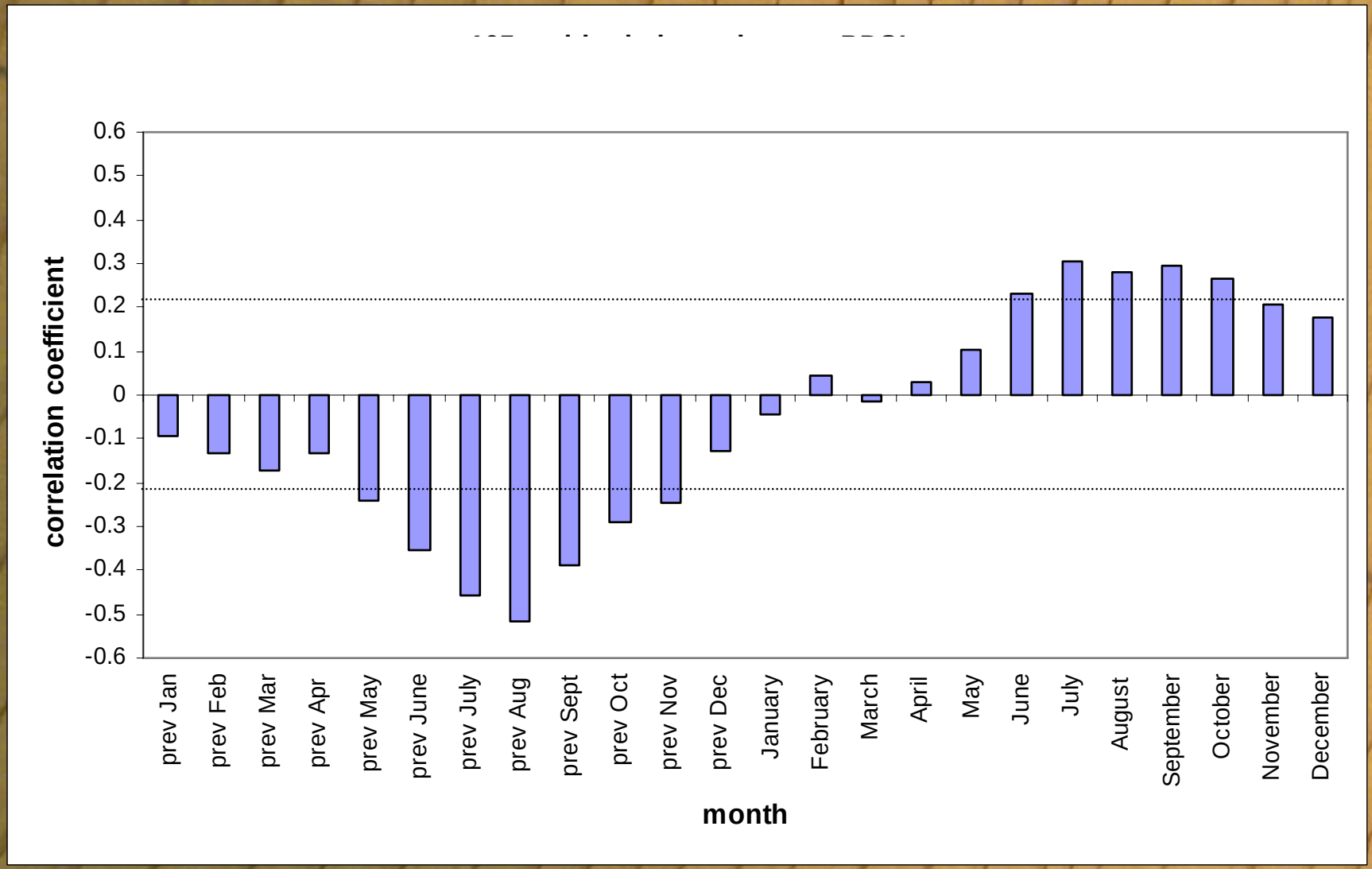
Correlation coefficients for residual chronology ring widths and total monthly precipitation



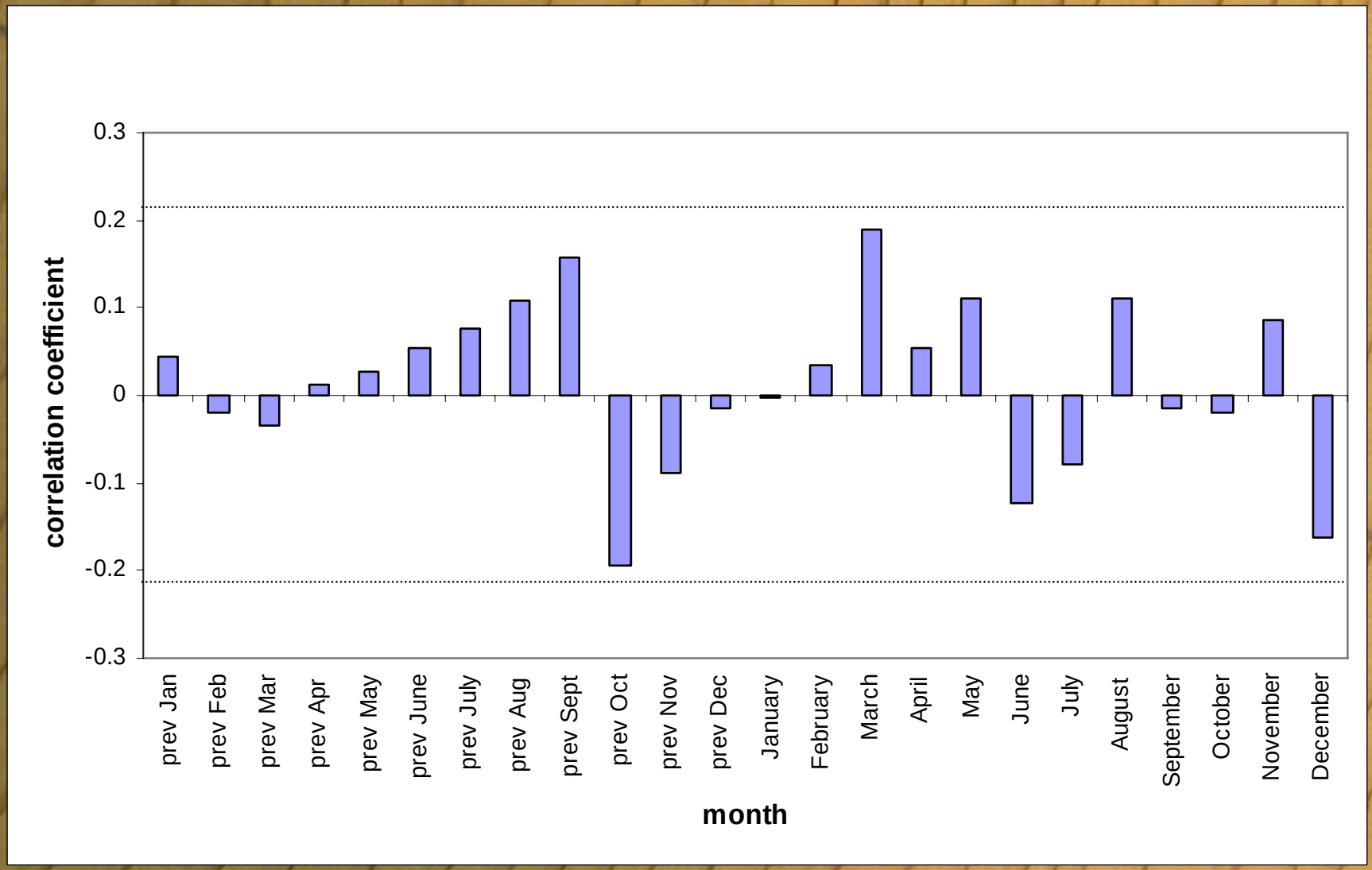
Correlation coefficients for residual chronology ring widths and Lake Drummond average monthly water levels



Correlation coefficients for residual chronology ring widths and monthly Palmer Drought Severity Index (PDSI)



Correlation coefficients for residual chronology ring widths and average monthly temperature



Results Summary

- PDSI was the strongest predictor
- Drought corresponded with both the previous year's and current year's drought.
  - Decreased growth in current year
  - Increased growth in the following year
- Increased water table related with increased growth in current year

Discussion

- Hydrology: wetland structure and function
- Changes in hydrology can cause changes
  - species composition
  - richness
  - nutrient cycling
  - ecosystem productivity
  - organic accumulation

(Mitsch and Gosselink 2000)

Restoration and Management Implications

- Bulk Yield Increase
  - Fluctuating water table
  - Potential peat oxidation for release (NWR 2006)
    - Oligotrophic ecosystem (Natural Heritage 2006)
- Restoration ecology
  - Higher water table
    - Seed bank protection
    - Peat accumulation
      - Decreased levels of oxidation

Future Study

- Restoration modeling
- 80 year chronology
  - Impacted

Great Dismal Swamp National Wildlife Refuge

  - Buried logs
  - Extended chronology

http://media.hamptonroads.com/cache/files/images/113771.jpg

Works cited

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Noss et al. 1995, Atkinson et al, Mitsch and Gosselink 2000


Thank you!