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Is...

- Diameter growth and
- Height growth

of loblolly pine plantations in East Texas affected by...

- Temperature,
- Precipitation and
- Number of Raindays?
Growth of loblolly pine (Pinus taeda L.) plantations in East Texas is influenced by many factors - soil, genetics, insects, diseases, associated vegetation and climate - to list a few items. Insights into the role that these factors contribute to the production of wood might assist East Texas plantation managers in establishing, growing and harvesting planted trees.

Recent work by Brown (1994) has provided information on the impact of climatic factors on tree growth. Two of the research questions that Brown asked were:

- Are there differences in diameter growth between different levels of climatic factors?
- Are there differences in height growth between different levels of climatic factors?

This paper presents answers to these two questions.

Planted loblolly pine diameter and height growth data were obtained from the East Texas Pine Plantation Research Project (ETPPRP). The ETPPRP is a long-term on-going study tracking the development of pine plantations in East Texas. Data collection started in 1982 from an array of permanent plots located throughout the forested region of East Texas. Diameter and height growth values were tabulated by analyzing sequential measurements of the permanent plots.

Weather data was obtained from National weather Service stations situated within East Texas. Stations with relatively complete temperature and precipitation data were utilized.

Each ETPPRP permanent plot was matched with a nearby weather station. If a station was not nearby, weather values were averaged from the closest two or three stations.

Weather information was summarized into fifteen weather factors (listed in the blocks on this page). For each factor, several levels were established across the observed range of values.

An one-way analysis of covariance (with plantation age and number of trees per acre as covariates) was calculated for each climatic factor. Results are presented on the next three pages.
Effect of Climatic Factors

Diameter Growth

Of the 15 climatic variables, statistical distinctions ($P \leq 0.05$) in observed average annual diameter growth rates were detected between different levels of:

**Annual Maximum Temperature**
Regions in East Texas with lower average maximum temperatures (72-73°F) tended to depict higher growth rates (0.7" per year) than the growth rates (0.3" per year) observed in regions of higher temperatures (78-80°F).

**Annual Minimum Temperature**
Regions in East Texas with lower minimum temperatures (53-54°F) tended to depict higher growth rates (0.6" per year) than the growth rates (0.5" per year) observed in regions of higher temperatures (59-60°F).

**Spring Maximum Temperature**
Regions in East Texas with lower average maximum temperatures (74°F) tended to depict higher growth rates (0.7" per year) than the growth rates (0.5" per year) observed in regions of higher temperatures (79-81°F).

**Summer Minimum Temperature**
No particular trends were evident. Growth rates varied between 0.5" - 0.6" across a temperature range of 66" - 71°F.

**Spring Raindays**
Regions in East Texas with more spring raindays (23 days) tended to depict higher growth rates (0.7" per year) than the growth rates (0.5" per year) observed in regions of fewer rain days (10 days).

**Summer Raindays**
No particular trends were evident. Growth rates were about 0.5" across a range of 7 - 20 summer raindays.

No statistical differences in diameter growth were seen between different levels of the other 9 climatic factors.

These growth rates are consistent with values computed by Ross and Lenhart (1994) in a comprehensive study of East Texas pine plantation growth values.
Height Growth

Of the 15 climatic variables, statistical distinctions (P≤0.05) in observed average annual height growth rates were detected between different levels of:

**Spring Minimum Temperature**
Regions in East Texas with higher average minimum spring temperatures (56-59°) tended to display higher growth rates (4' per year) than the growth rates (3.3' per year) observed in regions of lower temperatures (47-48°).

**Summer Maximum Temperature**
Regions in East Texas with lower average maximum summer temperatures (89-90°) tended to display higher growth rates (4' per year) than the growth rates (3.3' per year) observed in regions of higher temperatures (93-94°).

**Spring Temperature Range**
Regions in East Texas with shorter average spring temperature ranges (18-20°) tended to display higher growth rates (4' per year) than the growth rates (3.3' per year) observed in regions of longer temperature ranges (26-28°).

**Summer Temperature Range**
Regions in East Texas with shorter average summer temperature ranges (18-20°) tended to display higher growth rates (4' per year) than the growth rates (3.3' per year) observed in regions of longer temperature ranges (26-28°).

**Annual Precipitation**
Regions in East Texas with more average annual rain (60" per year) tended to display higher height growth rates (5' per year) than the growth rates (3.3' per year) observed in regions of less annual rain (40" per year).

**Spring Precipitation**
Regions in East Texas with more average spring rain (6-8" per year) tended to display higher height growth rates (4.3' per year) than the growth rates (3.7' per year) observed in regions of less spring rain (3-4" per year).

**Summer Precipitation**
Regions in East Texas with more average summer rain (5' per year) tended to display higher height growth rates (4' per year) than the growth rates (3' per year) observed in regions of less summer rain (3" per year).

**Annual Raindays**
Regions in East Texas with more annual rain days (75-80 days) tended to display higher height growth rates (5.3" per year) than the growth rates (3.3' per year) observed in regions of less rain days (45-50 days).
Spring Raindays

Regions in East Texas with more spring rain days (20-25 days) tended to display higher height growth rates (5' per year) than the growth rates (3.3' per year) observed in regions of less rain days (10-15 days).

No statistical differences in height growth were seen between different levels of the other 6 climatic factors.

These growth rates are consistent with values computed by Ross and Lenhart (1994).

Literature Cited
