

# **IMPACT OF SILVICLUTURAL PRACTICES ON WOOD QUALTIY OF SOUTHERN PINE**

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**FERTILIZATION AND WEED  
CONTROL AT PLANTING**

**MID-ROTATION  
FERTILIZATION**

**PLANTING DENSITY**

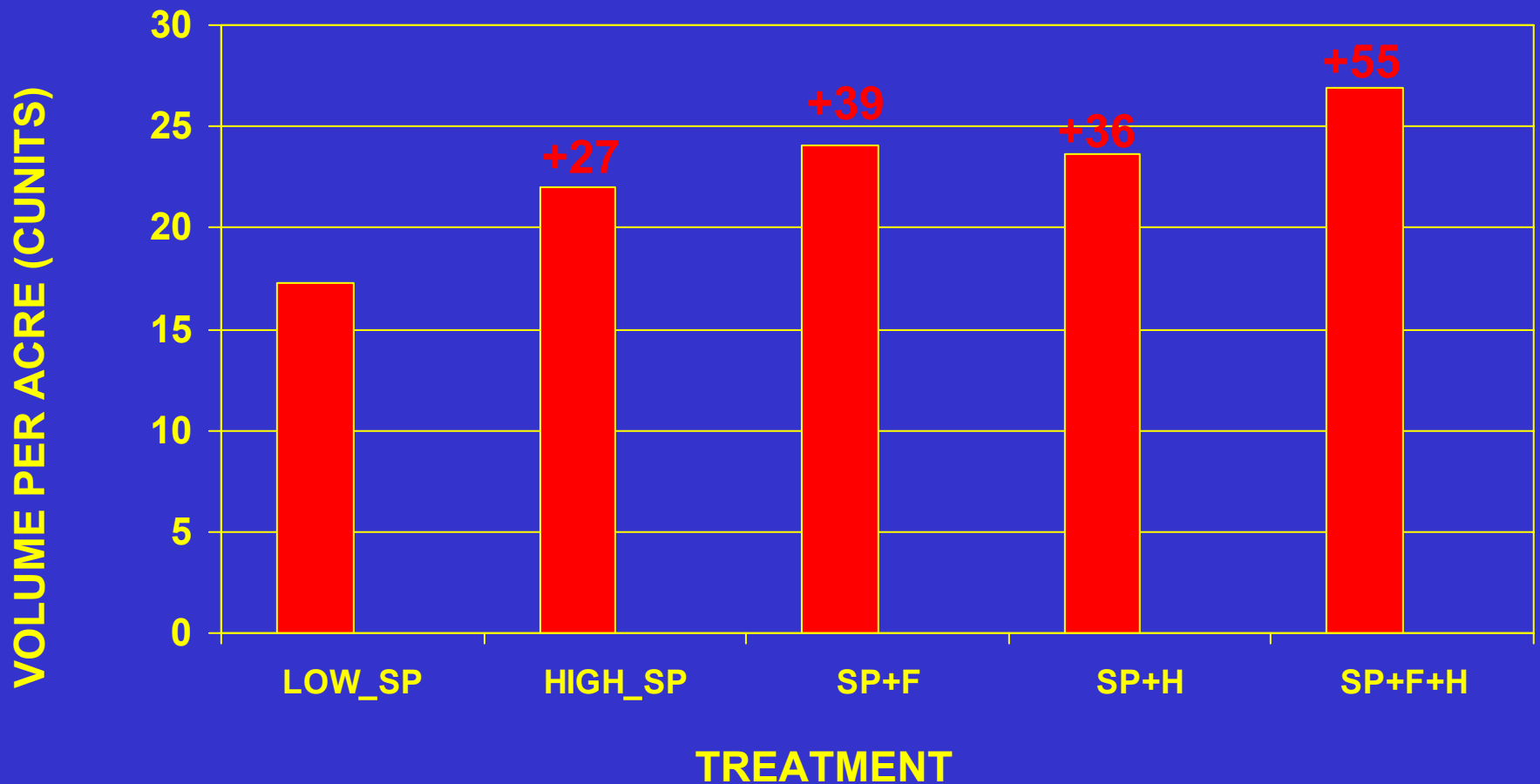
**RATE OF GROWTH,  
ROTATION AGE AND  
GEOGRAPHIC LOCATION**

**ON WOOD PROPERTIES AND  
LUMBER YIELD**

**Effect of Competition  
Control Plus Fertilization  
at Planting on Wood  
Properties**

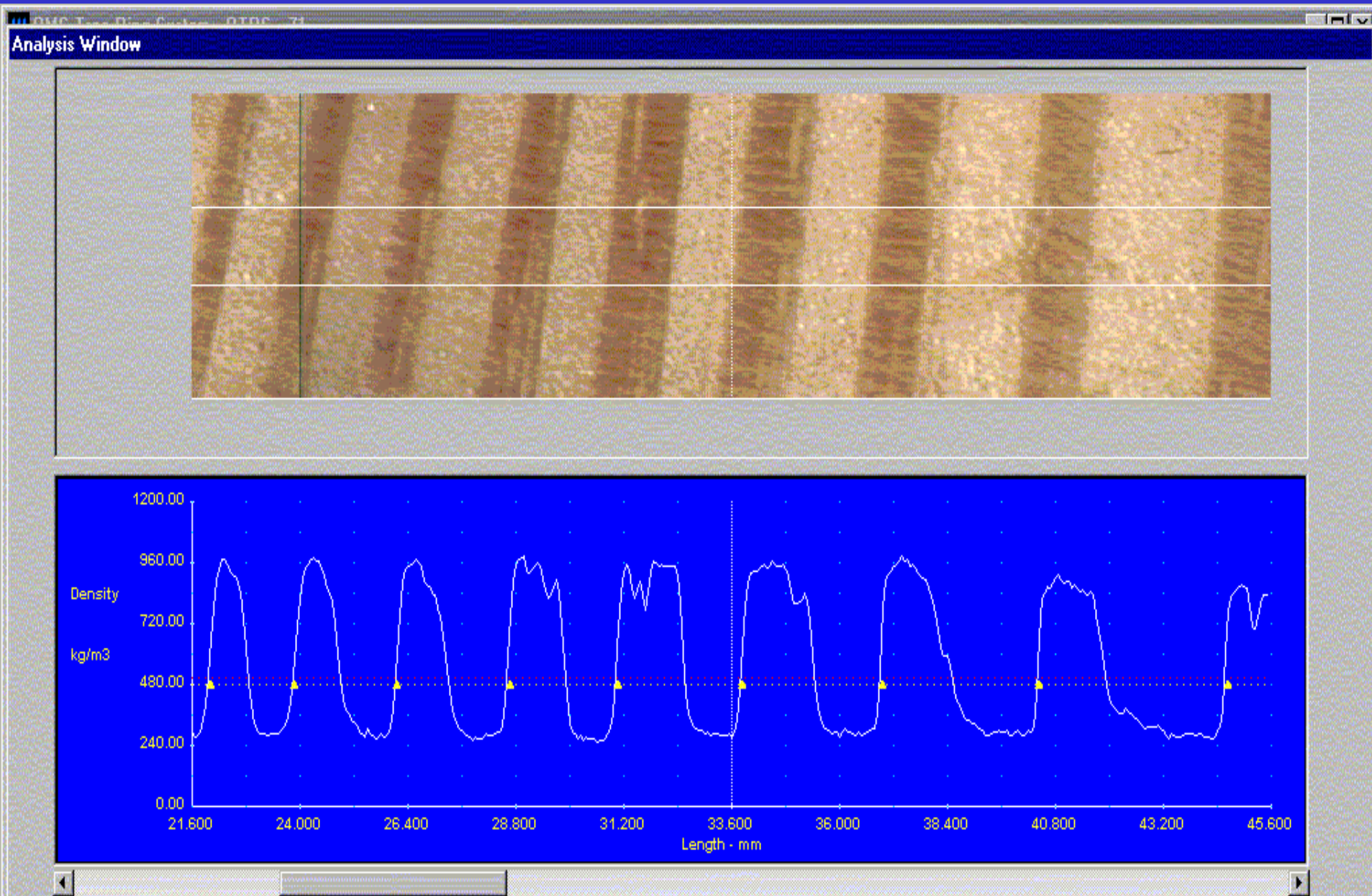
**(NCSU RW-7)**

**AVERAGE STEM VOLUME PER ACRE AT AGE 14  
FOR NCSU RW-7 LOBLOLLY PINE BY TREATMENT  
(AVERAGE FOR 4 LOCATIONS)  
(DIFFERENCE FROM LOW\_SP IN %)**





# Example of x-ray densitometer simultaneous video and x-ray



Scan Time and Date: 28-Aug-2002 04:17:59

Operator: EE

**EFFECT OF COMPETITION CONTROL PLUS  
FERTILIZATION AT PLANTING ON EARLYWOOD,  
LATEWOOD AND RING WEIGHTED SPECIFIC GRAVITY  
FOR NCSU RW-7 LOBLOLLY PINE AT AGE 22  
(AVERAGE FOR 4 LOCATIONS)**

| <b>TREATMENT</b>  | <b>EARLY<br/>WOOD<br/>SP. GR.</b> | <b>LATE<br/>WOOD<br/>SP. GR.</b> | <b>RING<br/>WOOD<br/>SP. GR.</b> |
|-------------------|-----------------------------------|----------------------------------|----------------------------------|
| <b>LOW SP</b>     | <b>.321</b>                       | <b>.678</b>                      | <b>.484</b>                      |
| <b>HIGH SP</b>    | <b>.315</b>                       | <b>.694</b>                      | <b>.485</b>                      |
| <b>SP + F</b>     | <b>.315</b>                       | <b>.681</b>                      | <b>.479</b>                      |
| <b>SP+ H</b>      | <b>.318</b>                       | <b>.693</b>                      | <b>.488</b>                      |
| <b>SP + F + H</b> | <b>.317</b>                       | <b>.688</b>                      | <b>.484</b>                      |



**EFFECT OF COMPETITION CONTROL PLUS  
FERTILIZATION ON DIAMETER OF JUVENILE WOOD CORE  
AND PROPORTION OF BASAL AREA IN JUVENILE WOOD  
FOR NCSU RW-7 LOBLOLLY PINE AT AGE 22  
(AVERAGE FOR 4 LOCATIONS)**

| TREATMENT  | DIB              | DIFF            | DIB       | PERCENT           |
|------------|------------------|-----------------|-----------|-------------------|
|            | JUVENILE<br>WOOD | FROM<br>NO CONT | AT<br>DBH | BA IN<br>JUVENILE |
|            | IN               | %               | IN        | %                 |
| LOW SP     | 6.3              |                 | 8.0       | 62                |
| HIGH SP    | 6.3              | 0               | 7.9       | 63                |
| SP + F     | 6.6              | +5              | 8.6       | 59                |
| SP+ H      | 6.6              | +5              | 8.5       | 61                |
| SP + F + H | 6.9              | +10             | 8.8       | 61                |





# AVERAGE MOE, MOR AND SPECIFIC GRAVITY FOR JUVENILE AND MATURE WOOD STATIC BENDING SAMPLES FOR NCSV REGION WIDE 7 LOBLOLLY PINE BY TREATMENT AVERAGED ACROSS LOCATIONS

| TREATMENT     | JUVENILE WOOD |         |        | MATURE WOOD |          |        |
|---------------|---------------|---------|--------|-------------|----------|--------|
|               | MOE           | MOR     | SP.GR. | MOE         | MOR      | SP.GR. |
|               | (MILL PSI)    | (PSI)   |        | (MILL PSI)  | (PSI)    |        |
| <b>C</b>      | 0.75 a        | 7,891 a | .422 a | 1.24 a      | 12,070 a | .530 a |
| <b>SP</b>     | 0.73 a        | 7,663 a | .394 a | 1.33 a      | 11,933 a | .521 a |
| <b>SP+H</b>   | 0.69 a        | 7,652 a | .397 a | 1.34 a      | 12,361 a | .538 a |
| <b>SP+F</b>   | 0.75 a        | 7,746 a | .392 a | 1.39 a      | 12,656 a | .543 a |
| <b>SP+H+F</b> | 0.64 a        | 7,180 a | .402 a | 1.36 a      | 11,951 a | .530 a |

VALUES FOR THE SAME VARIABLE WITH A DIFFERENT LETTER ARE STATISTICALLY DIFFERENT AT THE .05 LEVEL

# **Effect of Mid Rotation Fertilization**

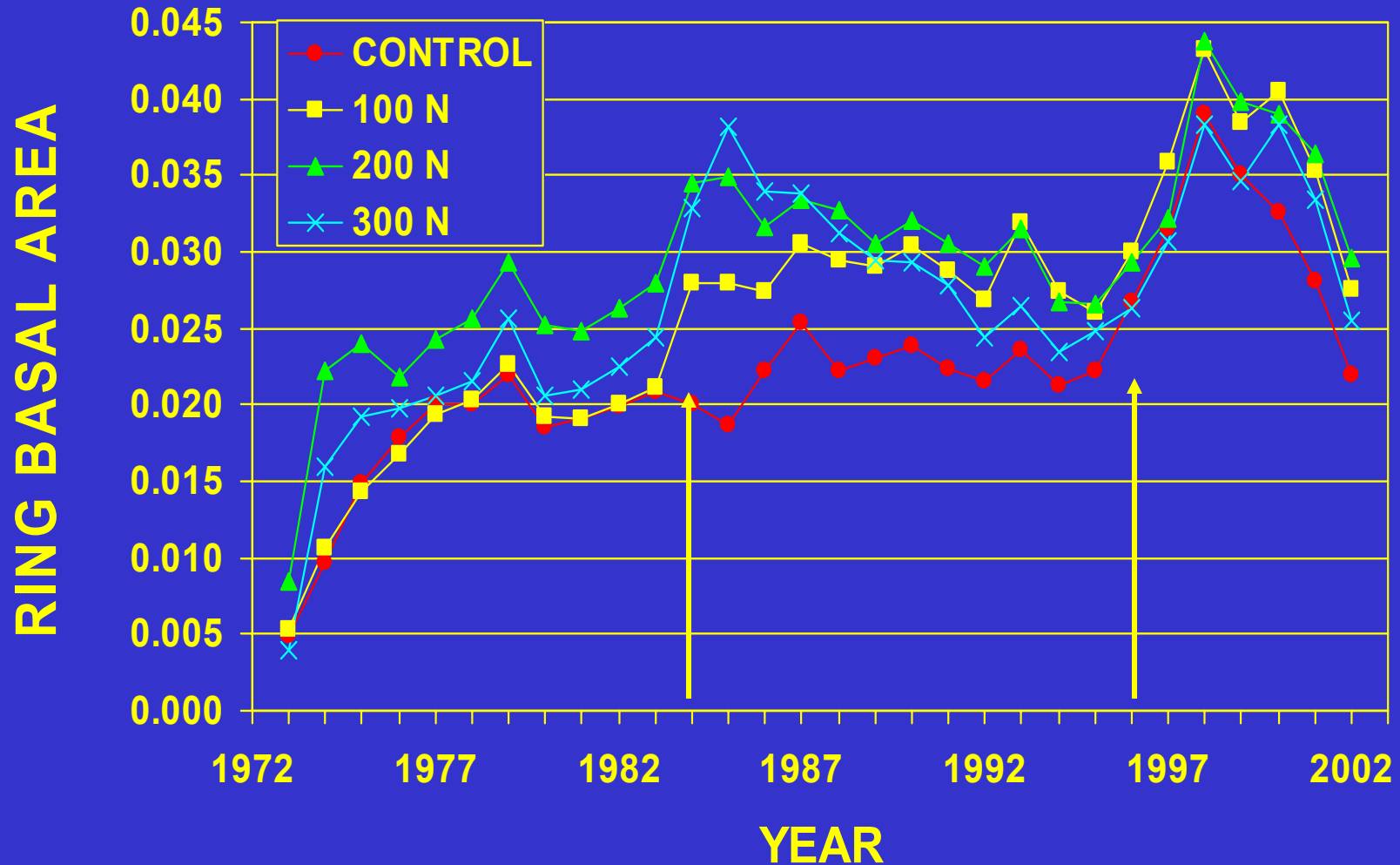
**(NCSU RW-13)**



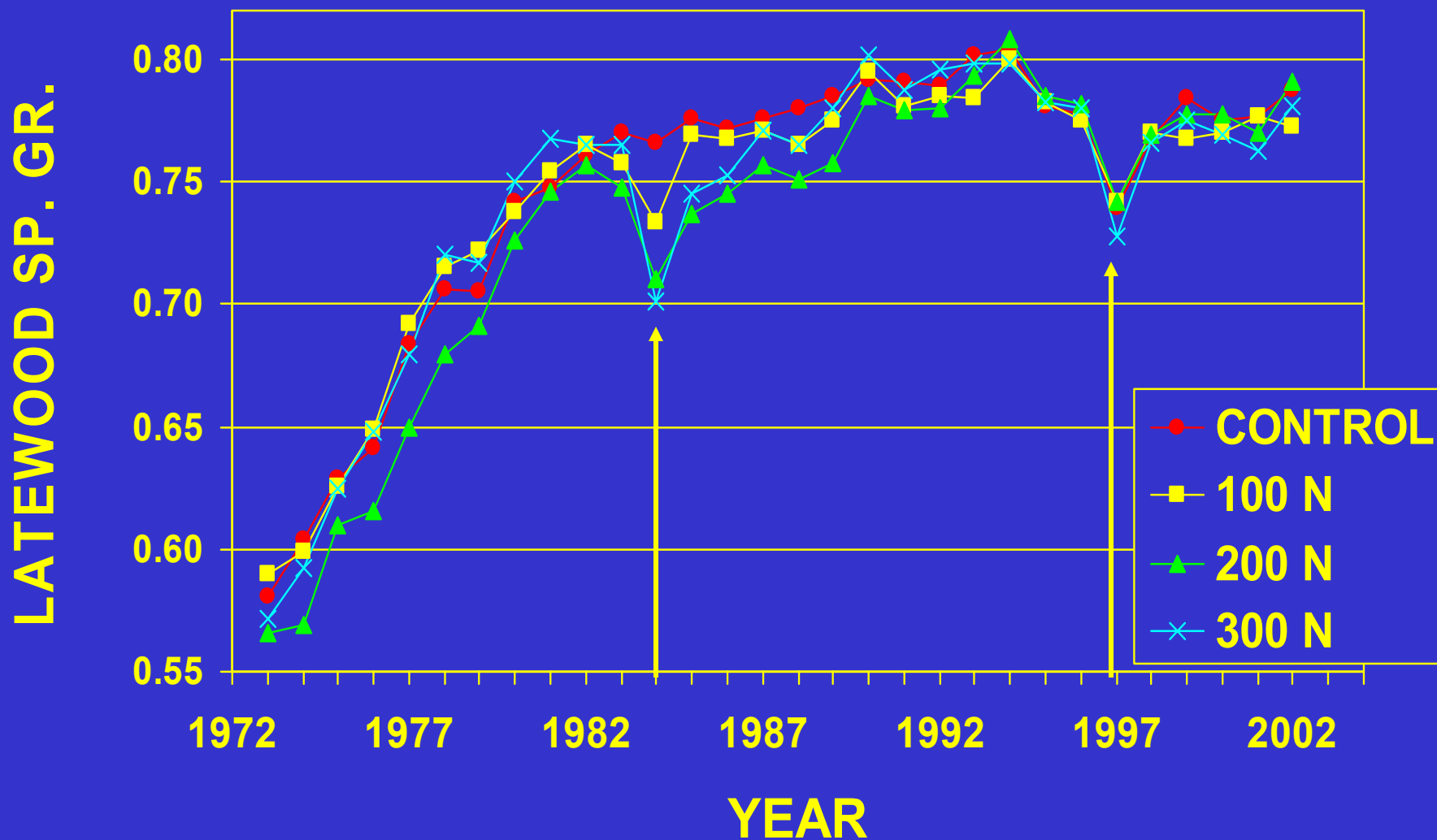
**12 mm core**

# EFFECT OF MID-ROTATION FERTILIZATION IN MARCH 1984 AND WINTER 1996 ON RING BASAL AREA GROWTH

(NCSU RW-13, NEW BERN, NC)



# EFFECT OF MID-ROTATION FERTILIZATION IN MARCH 1984 AND MARCH 1997 ON LATEWOOD SPECIFIC GRAVITY (ALL TREATMENTS FERTILIZED IN 1997) (NCSU RW-13 NEEW BERN, NC)



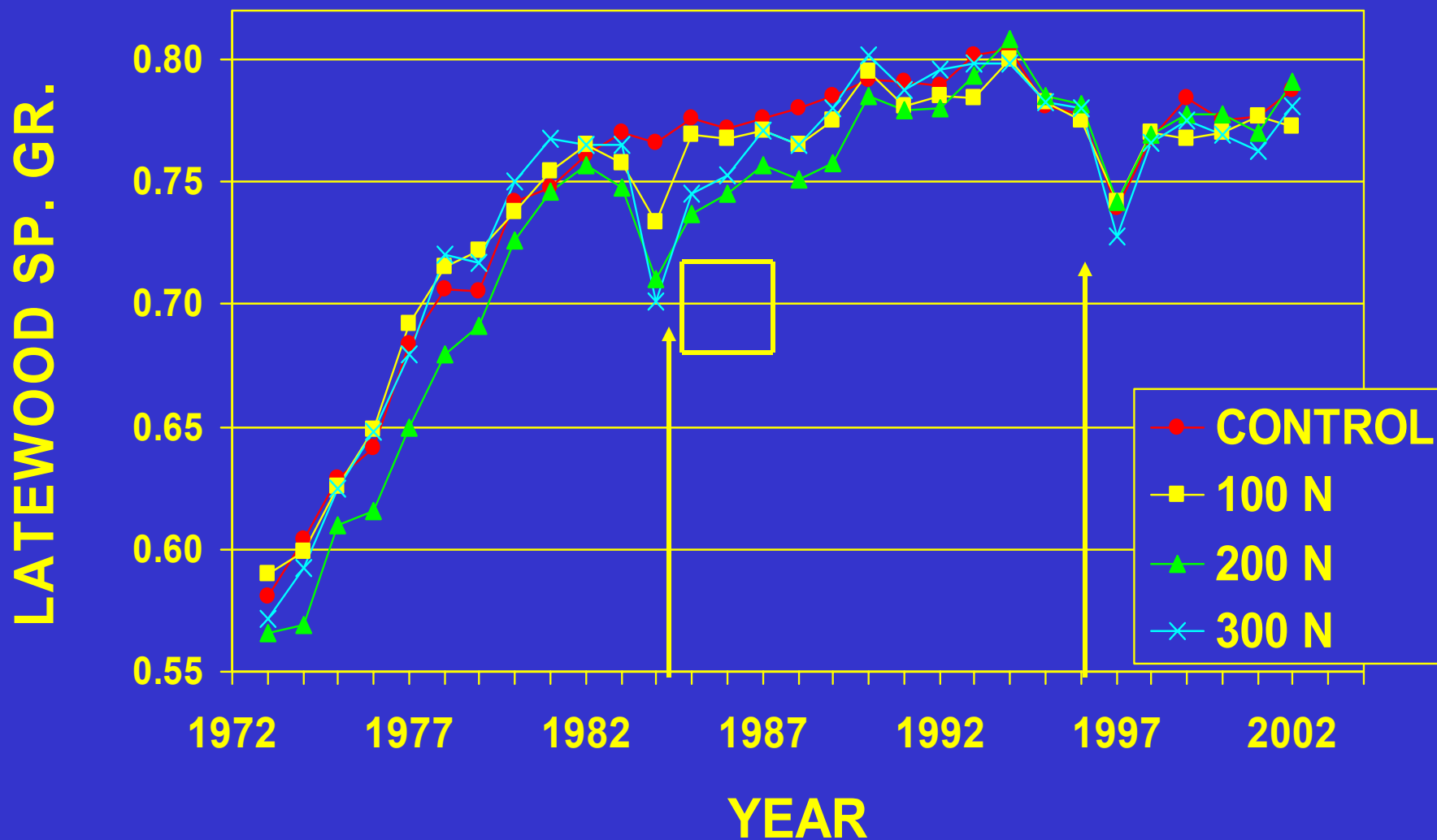


**AVERAGE RING SPECIFIC GRAVITY FOR 3 YEARS  
AFTER TREATMENT IN 1984 USING 1983 VALUES  
AS COVARIATE  
NCSU-RW13 – NEW BERN, NC**

|                  | 1983               | 1984          | 1985          | 1986          |
|------------------|--------------------|---------------|---------------|---------------|
| <b>TREATMENT</b> | <b>(COVARIATE)</b> |               |               |               |
| <b>CONTROL</b>   | <b>.557</b>        | <b>.583a</b>  | <b>.578a</b>  | <b>.578a</b>  |
| <b>100 N</b>     | <b>.543</b>        | <b>.568ab</b> | <b>.583a</b>  | <b>.583a</b>  |
| <b>200 N</b>     | <b>.536</b>        | <b>.559b</b>  | <b>.565ac</b> | <b>.565ac</b> |
| <b>300 N</b>     | <b>.548</b>        | <b>.557b</b>  | <b>.558bc</b> | <b>.558bc</b> |

**VALUES WITHIN SAME YEAR WITH DIFF. LETTER ARE SIGNIF. DIFF. AT .05 LEVEL**

# EFFECT OF MID-ROTATION FERTILIZATION IN MARCH 1984 AND MARCH 1997 ON LATEWOOD SPECIFIC GRAVITY (ALL TREATMENTS FERTILIZED IN 1997) (NCSU RW-13 NEEW BERN, NC)





**EFFECT OF DIFFERENT LEVELS OF NITROGEN  
FERTILIZATION PER ACRE AT MID-ROTATION ON  
LOBLOLLY PINE STIFFNESS, STRENGTH AND SG**

**(NCSU RW-13 NEW BERN, NC)**

| <b>TREATMENT</b> | <b>MOE<br/>(mpsi)</b> | <b>MOR<br/>(PSI)</b> | <b>SG</b>   |
|------------------|-----------------------|----------------------|-------------|
| <b>CONTROL</b>   | <b>1.58a</b>          | <b>14,594a</b>       | <b>.58a</b> |
| <b>100 N</b>     | <b>1.63a</b>          | <b>15,423a</b>       | <b>.59a</b> |
| <b>200 N</b>     | <b>1.48a</b>          | <b>14,645a</b>       | <b>.59a</b> |
| <b>300 N</b>     | <b>1.29b</b>          | <b>13,275b</b>       | <b>.55b</b> |

**VALUES WITHIN SAME VAR WITH DIFF. LETTER ARE SIGNIF. DIFF. AT .05 LEVEL**

**Effect of Annual  
Competition Control  
and Initial Planting  
Density on Lumber  
Grade**

**(UGA-SPACING)**



# **LOBLOLLY PINE TREATMENTS**

## **B.F. GRANT MEMORIAL FOREST SPACING STUDY**

**PLANTED 1983**

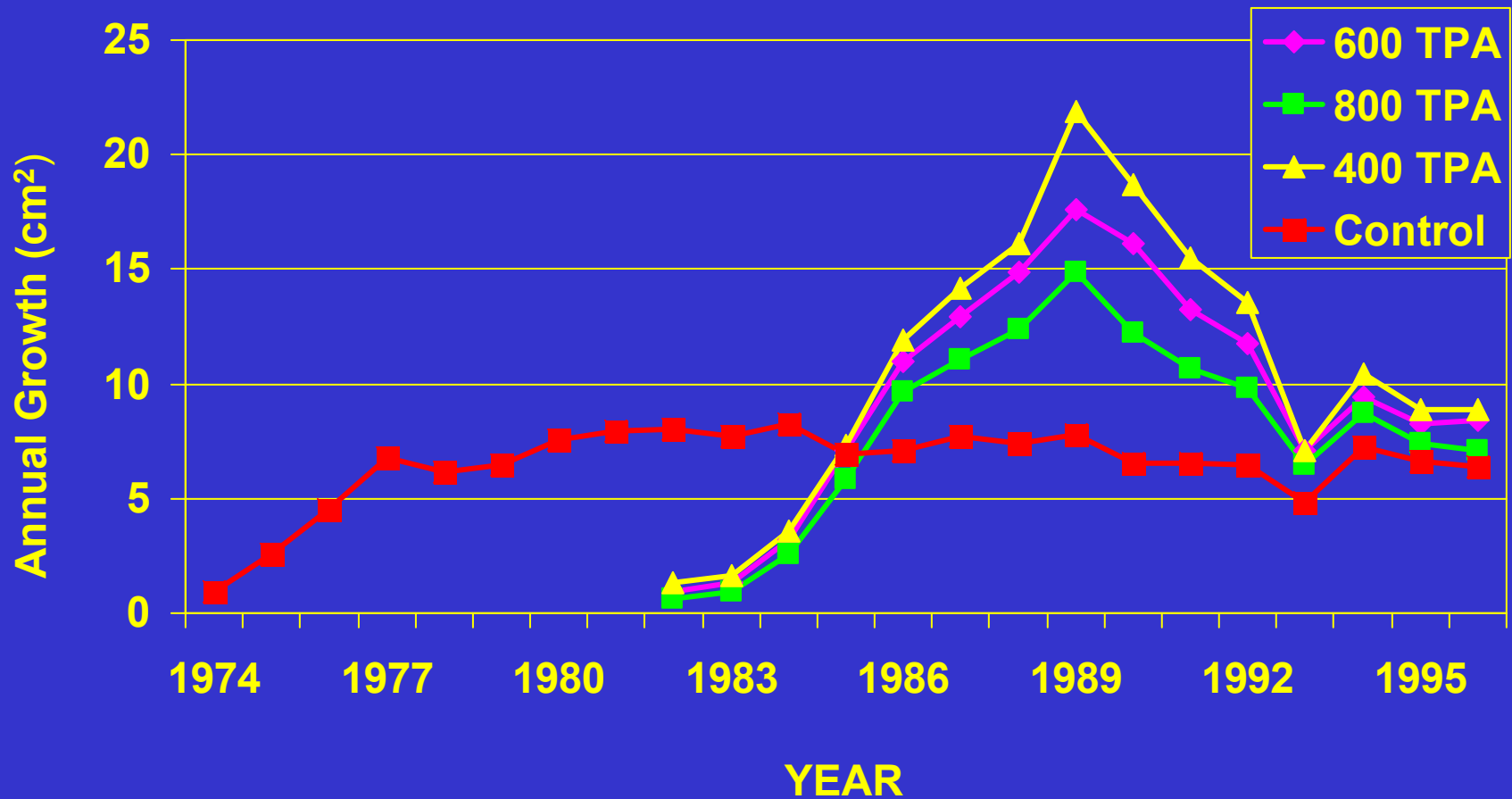
**400 TPA, WEED CONT., NO FERT, UNTINNED HARVESTED AGE 14**

**600 TPA, WEED CONT., NO FERT, UNTINNED HARVESTED AGE 14**

**800 TPA, WEED CONT., NO FERT, UNTINNED HARVESTED AGE 14**

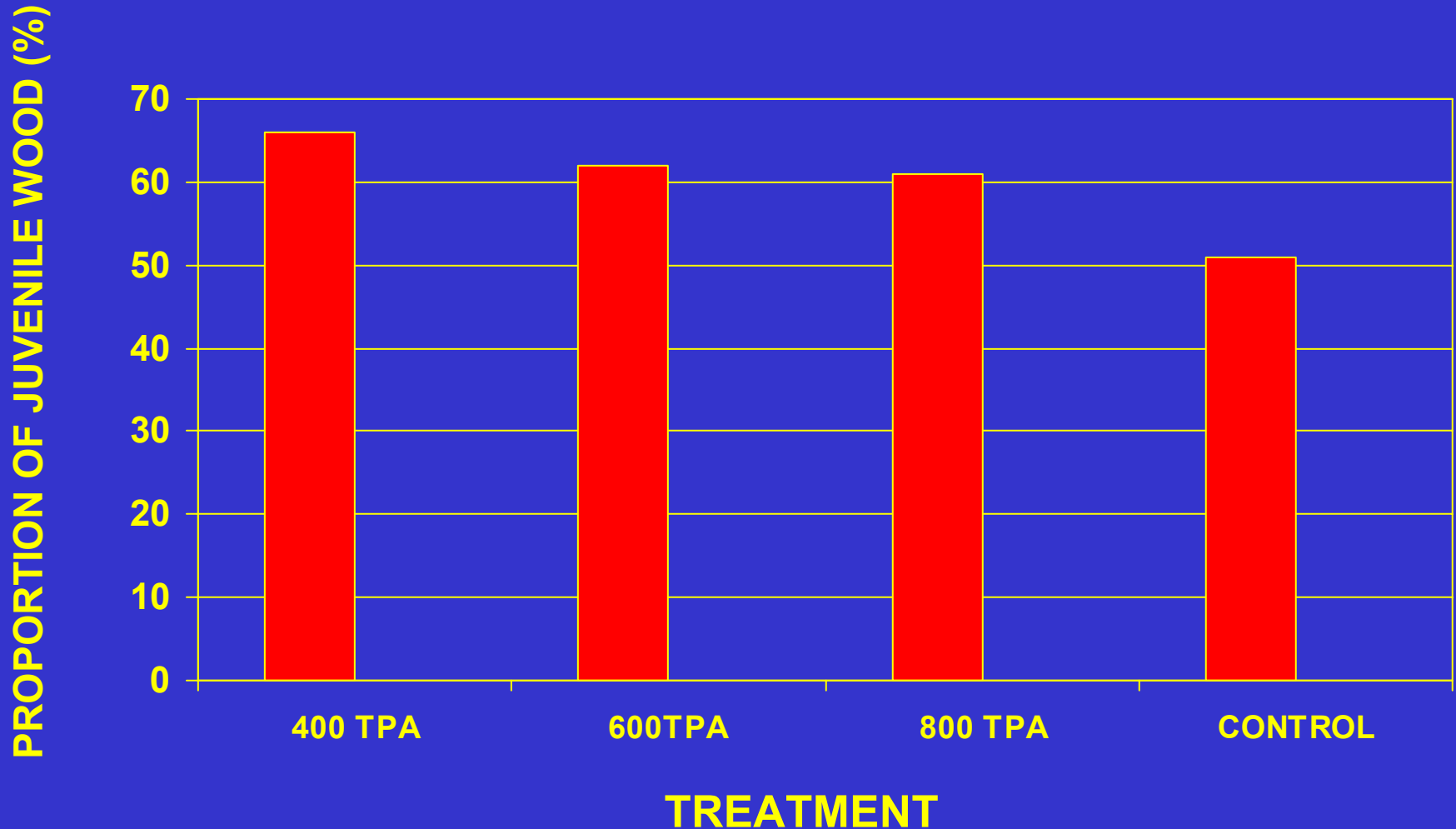
**OPERATIONAL CONTROL, HANCOCK CO., PLANTED 1973 AT 605  
TPA NO WEED CONT., NO FERT., THINNED 1990 TO 250 TPA,  
HARVESTED AT AGE 24**

# Total Annual Growth per Tree For Loblolly Pine in The Piedmont by Treatment





# PROPORTION OF LOBLOLLY PINE SAWLOG STEM WOOD VOLUME CLASSIFIED AS JUVENILE WOOD

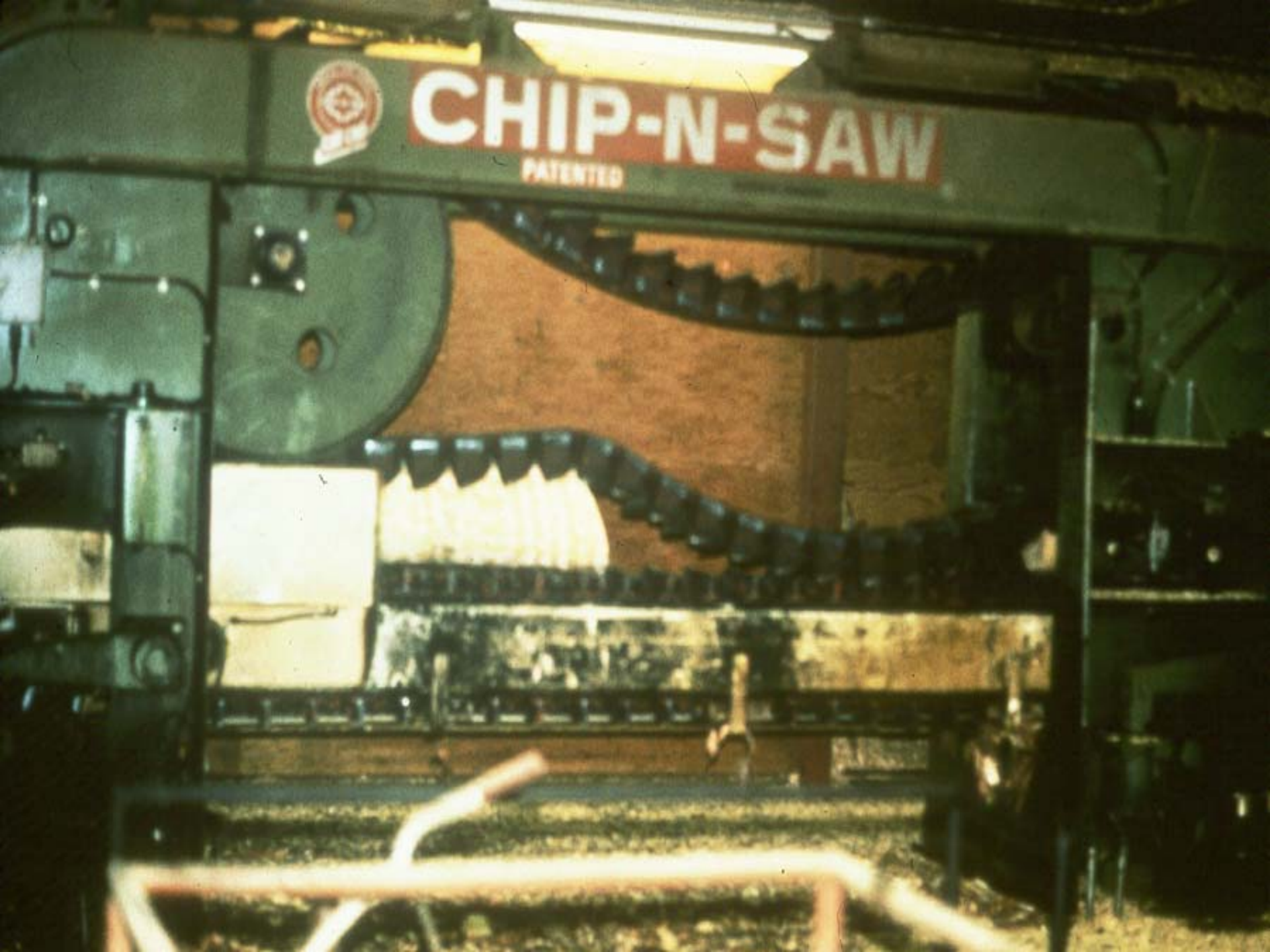


# Number of Loblolly Pine Sample Trees Processed into Lumber by Treatment and DBH Class

| Treatment | DBH Class (IN.) |    |    |    | Total |
|-----------|-----------------|----|----|----|-------|
|           | 8               | 9  | 10 | 11 |       |
|           | ----- NO. ----- |    |    |    |       |
| 400 TPA   | 9               | 6  | 10 | 4  | 29    |
| 600 TPA   | 10              | 11 | 7  | 6  | 34    |
| 800 TPA   | 13              | 15 | 5  | 0  | 33    |
| Control   | 8               | 9  | 9  | 8  | 34    |



**CHIP-N-SAW**  
PATENTED



# AVERAGE PROPORTION OF LUMBER BY LUMBER GRADE FOR LOBLOLLY PINE CHIPPING SAW SAMPLE TREES BY TREATMENT

| LUMBER GRADE | TREATMENTS        |                   |                   |                   |
|--------------|-------------------|-------------------|-------------------|-------------------|
|              | 14 YR.<br>400 TPA | 14 YR.<br>600 TPA | 14 YR.<br>800 TPA | 24 YR.<br>CONTROL |
|              | ----- % -----     |                   |                   |                   |
| NO. 1 & BTR. | 14                | 21                | 19                | 43                |
| NO. 2        | 52                | 59                | 57                | 50                |
| NO. 3 & 4    | 34                | 20                | 24                | 7                 |

**AVERAGE PROPORTION OF TOTAL LUMBER GRADE  
BELOW NO. 2 BY CASUAL TYPE DEFECT FOR 14 YEAR  
UNTHINNED LOBLOLLY PINE PLANTED 400, 600 AND  
800 TPA AND 24 YEAR THINNED CONTROL**

| DEFECT TYPE                   | TREATMNTS         |                   |                   |                   |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|
|                               | 14 YR.<br>400 TPA | 14 YR.<br>600 TPA | 14 YR.<br>800 TPA | 24 YR.<br>CONTROL |
|                               | ----- % -----     |                   |                   |                   |
| WANE, SKIP.                   | 8                 | 3                 | 7                 | 2                 |
| DRYING (BOW, TWIST,<br>CROOK) | 7                 | 4                 | 3                 | 1                 |
| < 15% LATEWOOD                | 6                 | 5                 | 8                 | 0.5               |
| KNOTS                         | 13                | 7                 | 5                 | 3                 |

**PROPORTION OF NO. 2 AND BTR 8/4 LUMBER WITH MOE  
REQUIRED TO MAKE 2400F-2.0E, 1800F-1.6E OR 1200F-1.2E MSR  
GRADES, BELOW MSR GRADE OR GRADE NO. 3 OR 4 FOR 14  
YEAR UNTHINNED LOBLOLLY PINE PLANTED 400, 600 AND 800 TPA  
AND 24 YEAR THINNED CONTROL**

| <b>MSR GRADE</b>            | <b>TREATMNTS</b>          |                           |                           |                           |
|-----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|                             | <b>14 YR.<br/>400 TPA</b> | <b>14 YR.<br/>600 TPA</b> | <b>14 YR.<br/>800 TPA</b> | <b>24 YR.<br/>CONTROL</b> |
|                             | ----- % -----             |                           |                           |                           |
| <b>2400F-2.0E</b>           | <b>2</b>                  | <b>1</b>                  | <b>0</b>                  | <b>4</b>                  |
| <b>1800F-1.6E</b>           | <b>1</b>                  | <b>4</b>                  | <b>1</b>                  | <b>25</b>                 |
| <b>1200F-1.2E</b>           | <b>21</b>                 | <b>30</b>                 | <b>39</b>                 | <b>45</b>                 |
| <b>BELOW MSR MIN. MOE</b>   | <b>41</b>                 | <b>44</b>                 | <b>34</b>                 | <b>19</b>                 |
| <b>NO. 3 &amp; 4 LUMBER</b> | <b>35</b>                 | <b>21</b>                 | <b>20</b>                 | <b>7</b>                  |



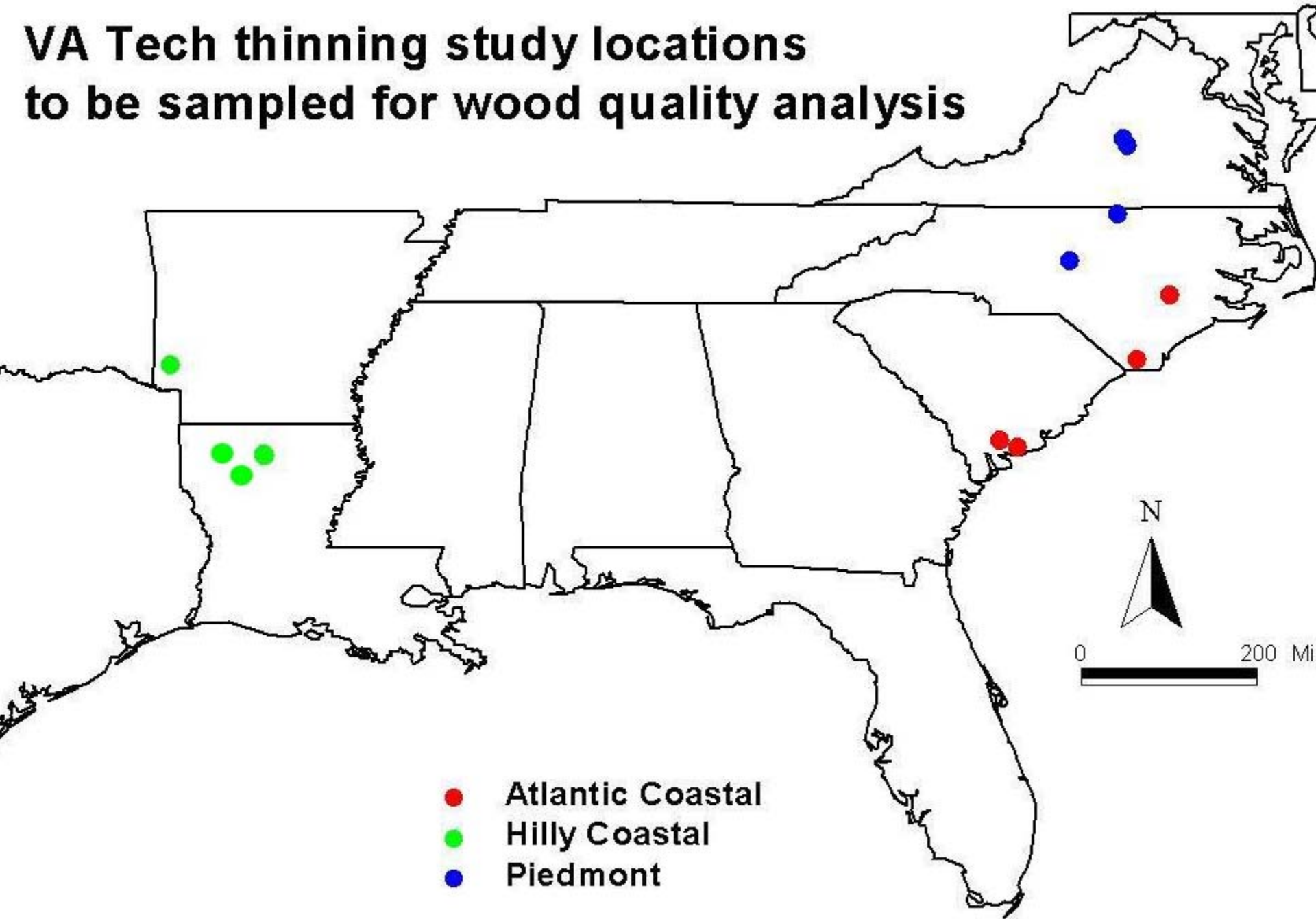
# SPIB STRUCTURAL LIGHT FRAMING DESIGN VALUES

| LUMBER<br>GRADE | EXTREME FIBER<br>IN BENDING | MODULUS OF<br>ELASTICITY |
|-----------------|-----------------------------|--------------------------|
|                 | Fb<br>(psi)                 | (MOE)<br>(mil psi)       |
|                 |                             | <b>2X4</b>               |
| SELECT          | 2850                        | 1.8                      |
| NO. 1           | 1850                        | 1.7                      |
| NO. 2           | 1500                        | 1.6                      |
| NO. 3 AND STUD  | 850                         | 1.4                      |
|                 |                             | <b>2X8</b>               |
| SELECT          | 2300                        | 1.8                      |
| NO. 1           | 1500                        | 1.7                      |
| NO. 2           | 1200                        | 1.6                      |
| NO. 3           | 700                         | 1.4                      |
|                 |                             | <b>2X12</b>              |
| SELECT          | 1900                        | 1.8                      |
| NO. 1           | 1250                        | 1.7                      |
| NO. 2           | 1250                        | 1.6                      |
| NO. 3           | 575                         | 1.4                      |

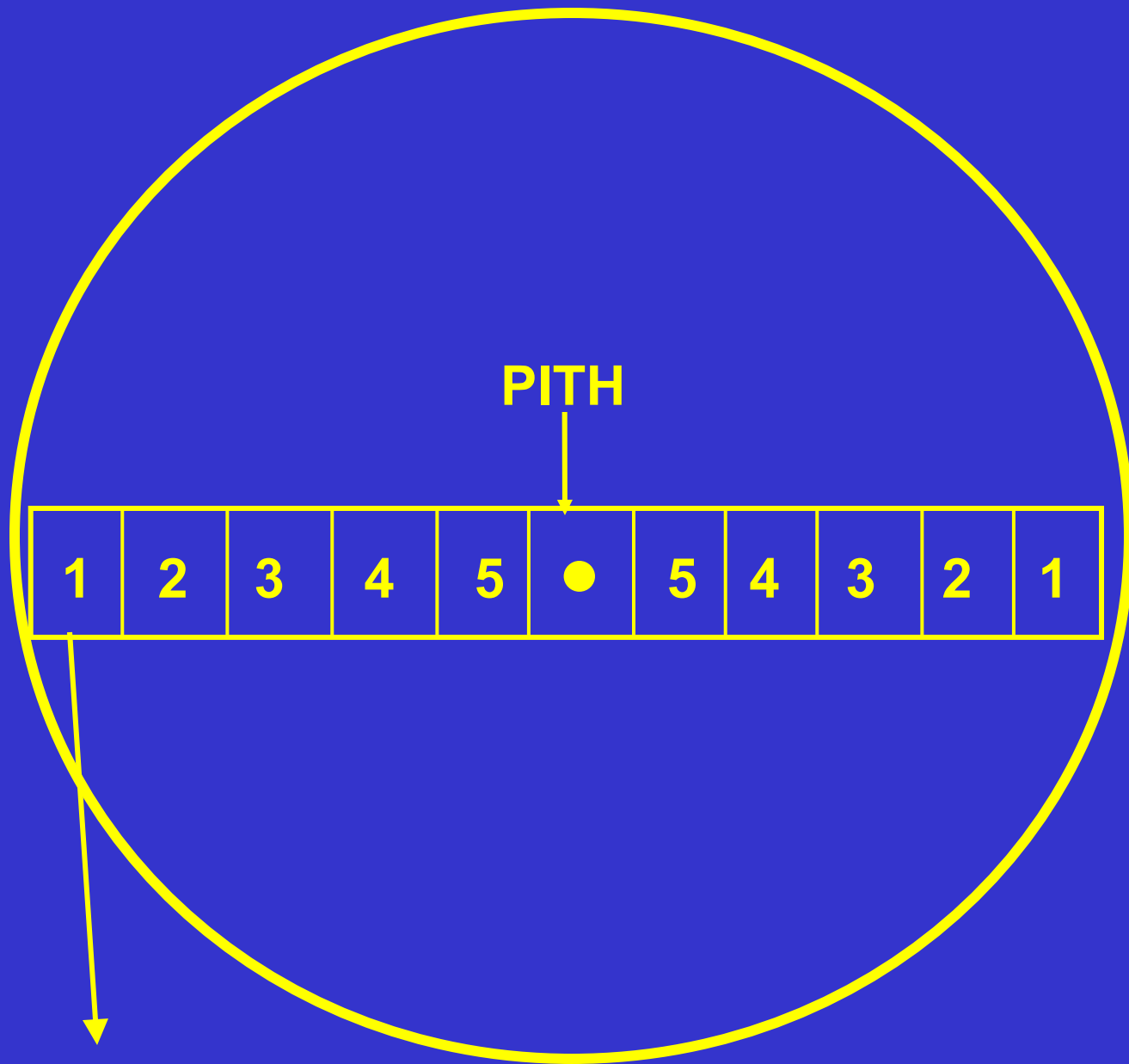


**Effect of Rotation Age,  
Rate of Growth and  
Geographic Location  
on MOE and MOR**

# VA Tech thinning study locations to be sampled for wood quality analysis







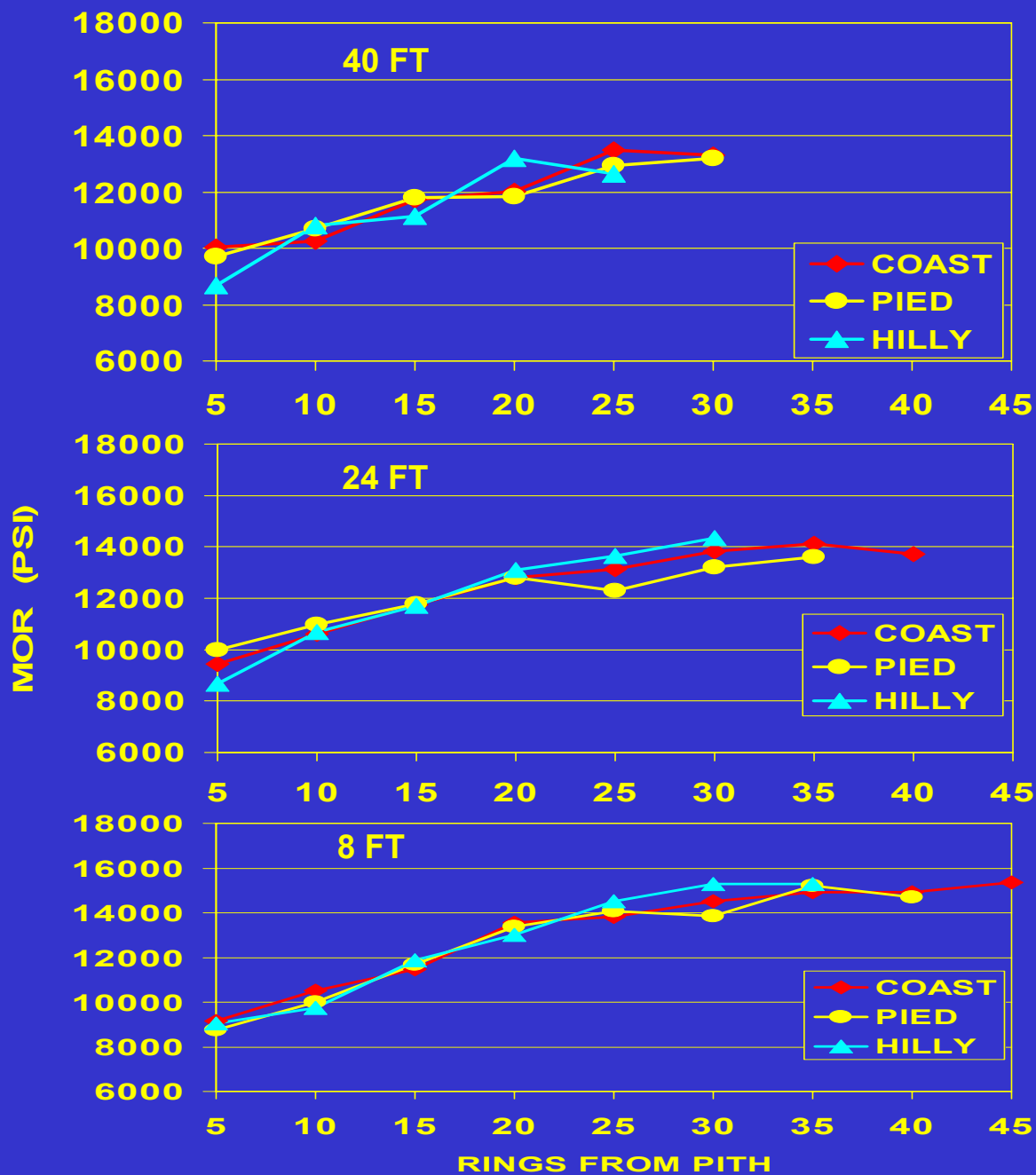
**1X1X16 INCH STATIC BENDING SAMPLES  
CUT FROM 2 FT. BOLTS**



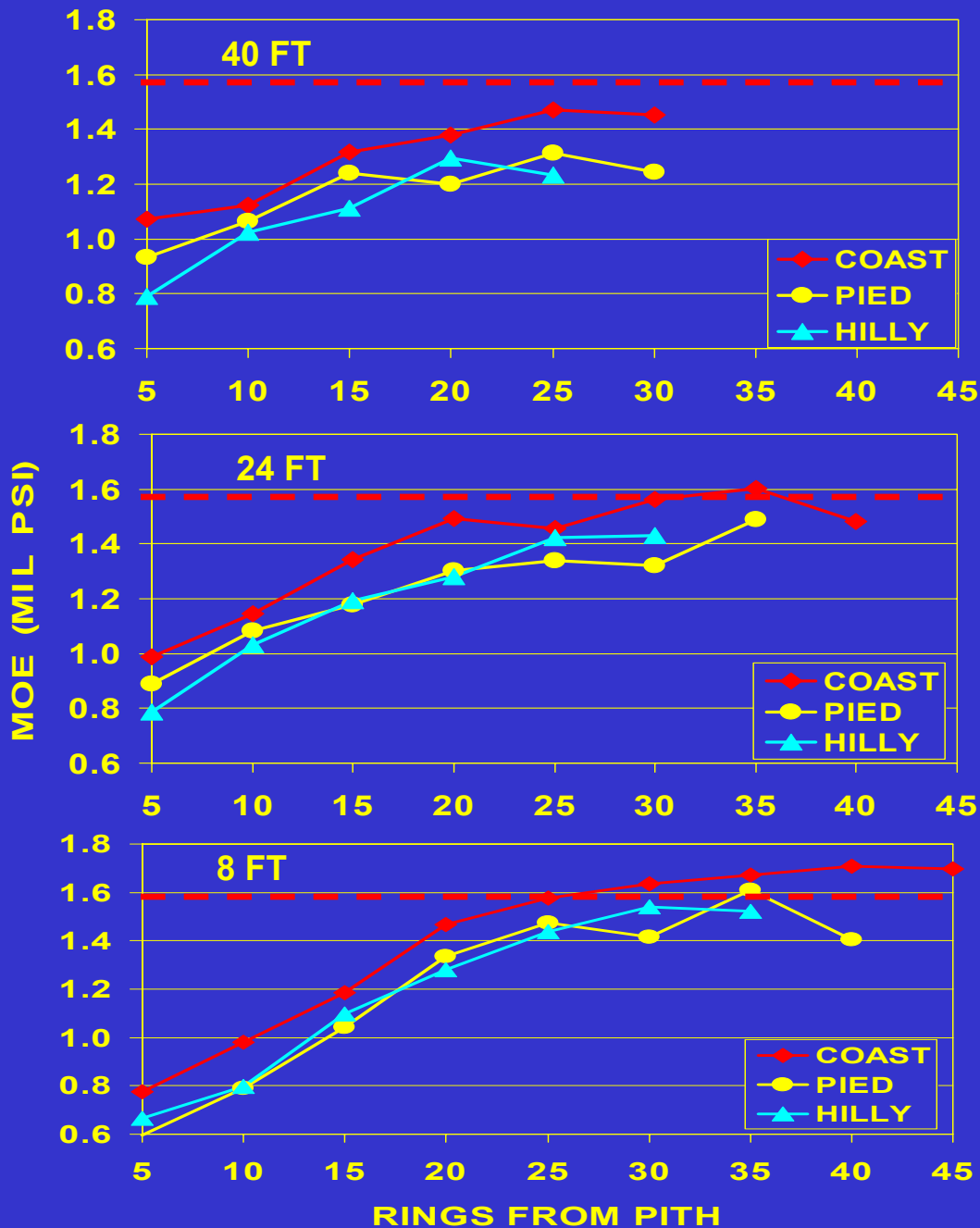
UGA0908



# AVERAGE MOR BY REGION AND HEIGHT LEVEL OVER RINGS FROM PITH

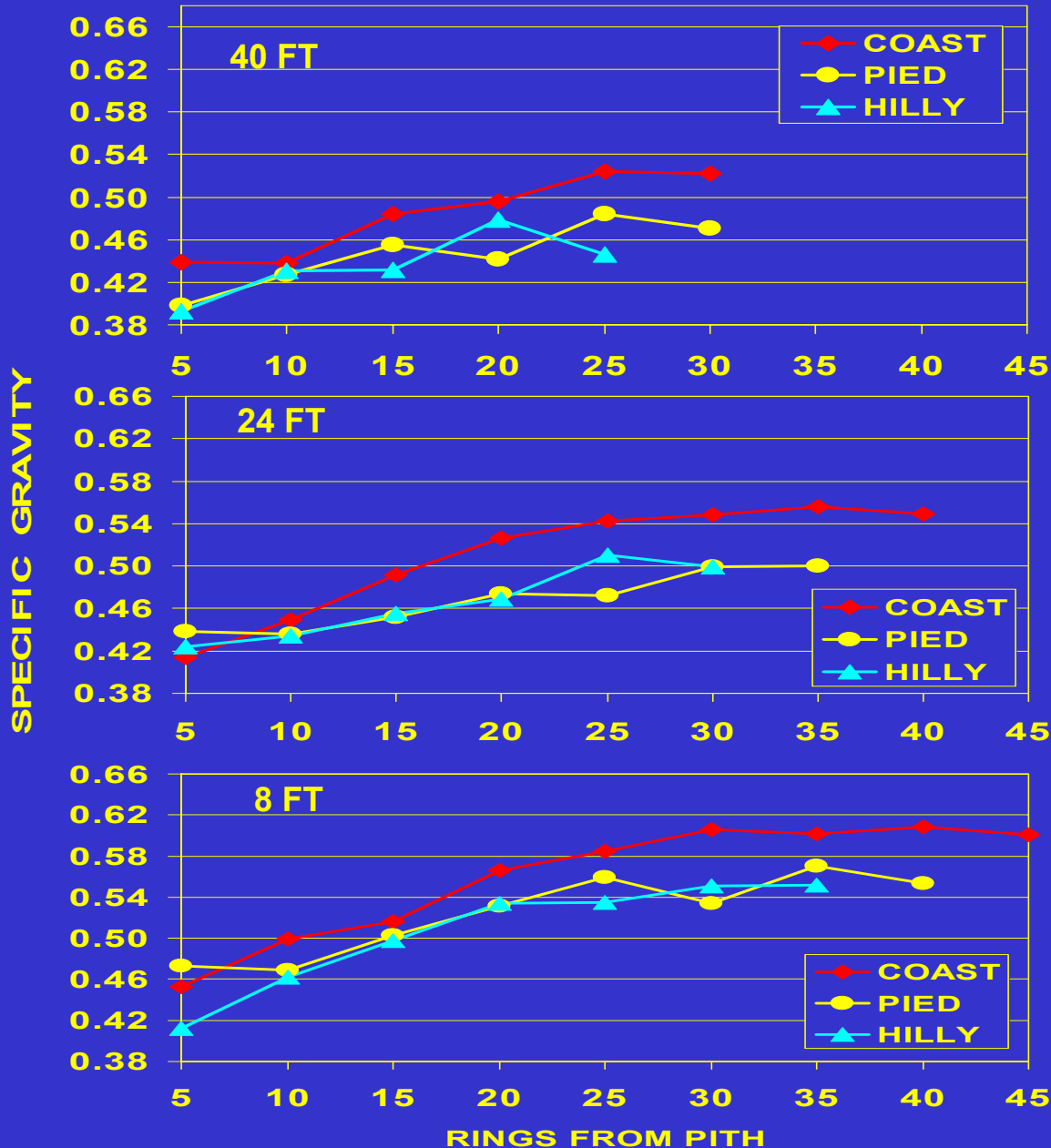


# AVERAGE MOE BY REGION AND HEIGHT OVER RINGS FROM PITH





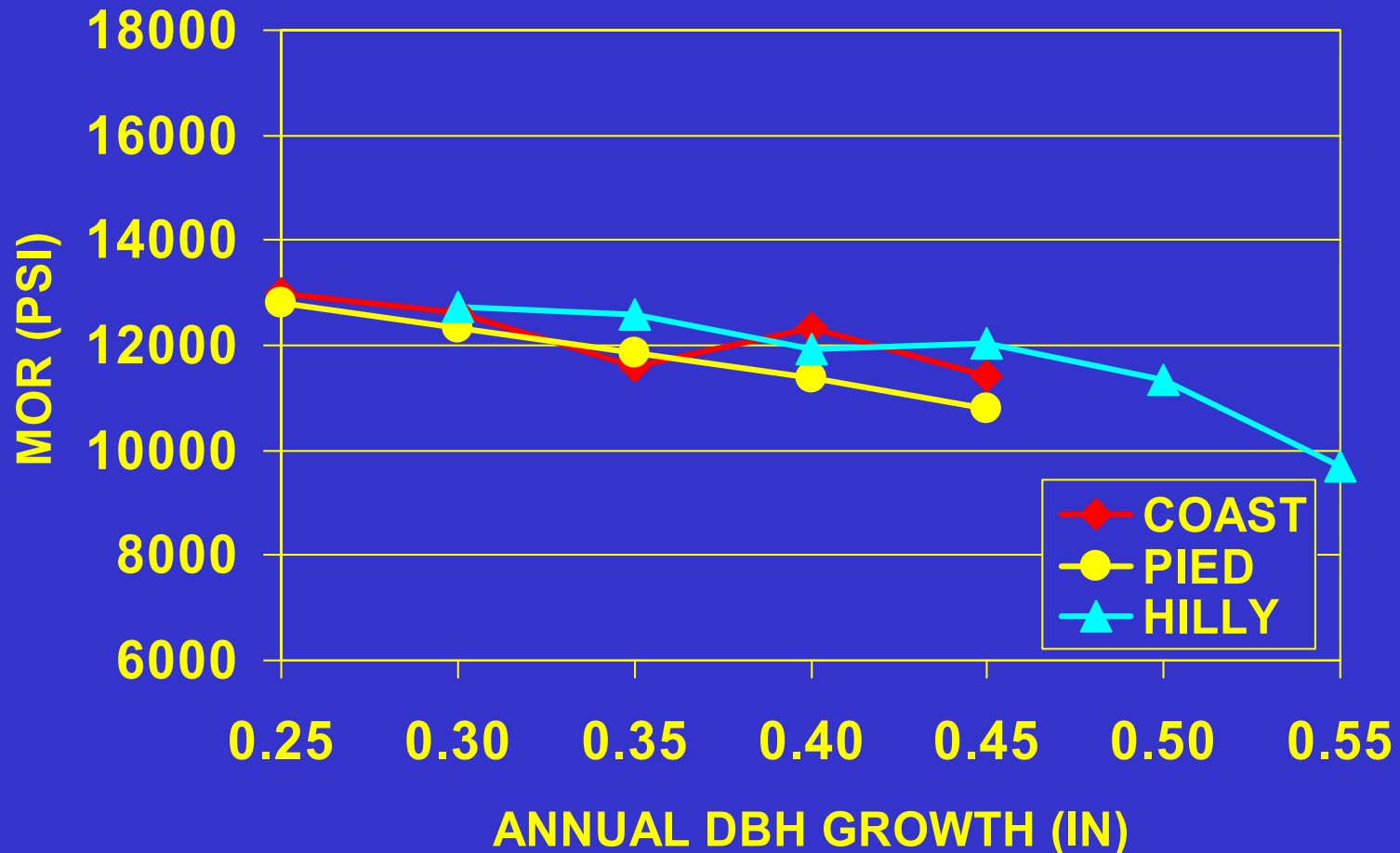
# AVERAGE STATIC BENDING SAMPLE SG BY REGION AND HEIGHT OVER RINGS FROM PITH



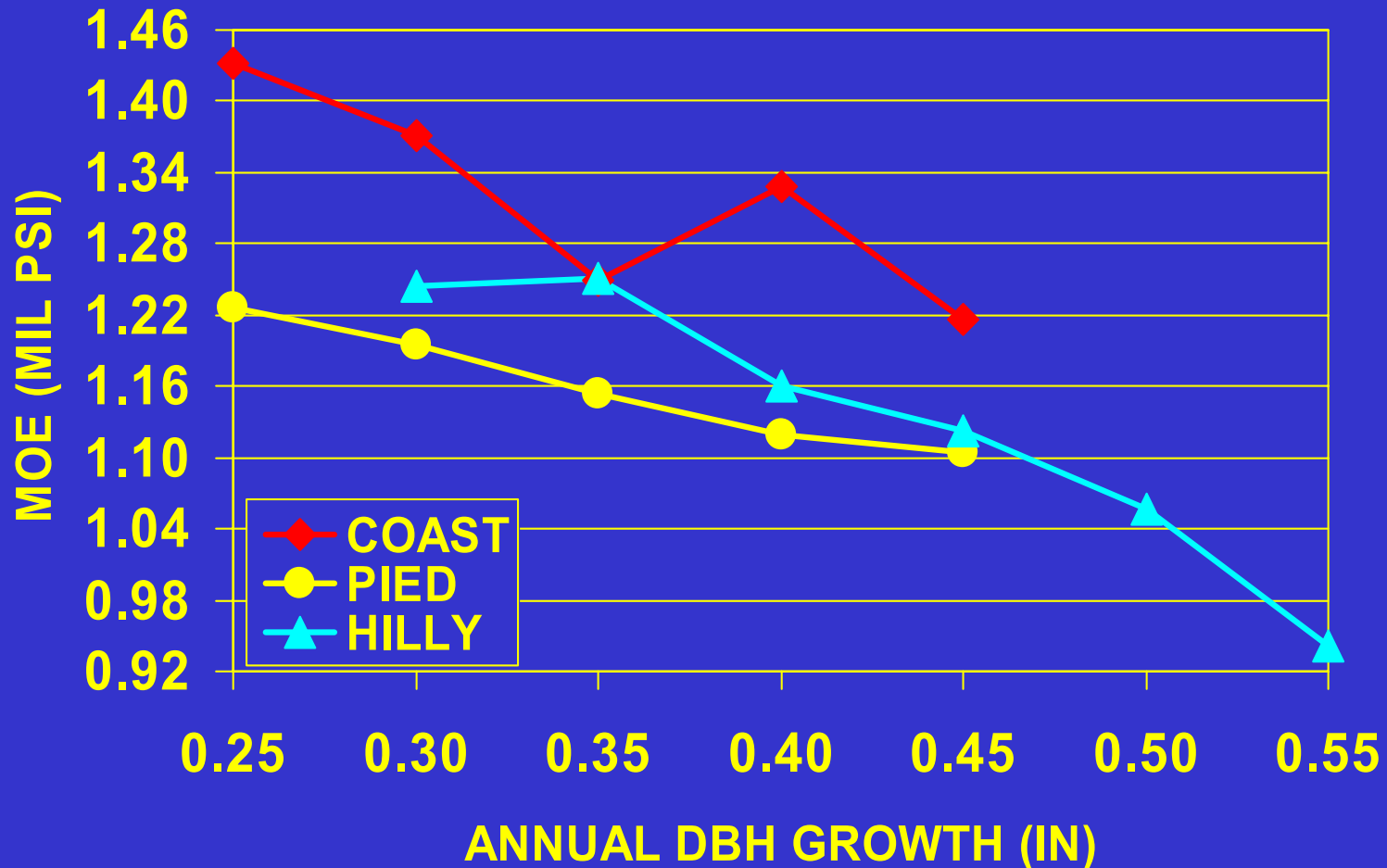
# SOUTHERN PINE TREE PRODUCT CLASSES AND STUMPAGE VALUES

| <b>PRODUCT</b>      | <b>BUTT MIN<br/>DIAMETER<br/>DIB</b> | <b>MINIMUM<br/>LENGTH</b> | <b>TOP<br/>DIB</b> | <b>STUMPAGE<br/>VALUE<br/>PER TON</b> |
|---------------------|--------------------------------------|---------------------------|--------------------|---------------------------------------|
|                     | <b>(IN)</b>                          | <b>(FT)</b>               | <b>(IN)</b>        | <b>(\$)</b>                           |
| <b>PULPWOOD</b>     | <b>5</b>                             | <b>15</b>                 | <b>2</b>           | <b>7-8</b>                            |
| <b>CHIPPING SAW</b> | <b>9</b>                             | <b>25</b>                 | <b>6</b>           | <b>18-20</b>                          |
| <b>SAWTIMBER</b>    | <b>13</b>                            | <b>16</b>                 | <b>6</b>           | <b>35-60</b>                          |

# EFFECTS OF AVERAGE RATE OF ANNUAL DBH GROWTH ON WT TREE STEM WOOD STRENGTH FOR PLANTED LOBLOLLY PINE BY REGION



# EFFECT OF AVERAGE RATE OF ANNUAL DBH GROWTH ON WT TREE STEM WOOD STIFFNESS FOR PLANTED LOBLOLLY PINE BY REGION



# SUMMARY

## PLANTED LOBLOLLY PINE

- TO REDUCE KNOT SIZE AND DIAMETER OF JUVENILE WOOD CORE PLANT LOBLOLLY PINE > 500 TPA
- COMP CONTROL PLUS FERT AT PLANTING DOES NOT SIGNIFICANTLY EFFECT MOE, MOR OR SG BUT SIGNIFICANTLY INCREASES DIAMETER OF JUVEJNILE WOOD CORE
- MID-ROTATION FERT WITH > 200 N / ACRE CAN INCREASE GROWTH BUT SIGNIFICANTLY REDUCES MOE, MOR AND SG IMEDIATELY AFTER TREATMENT

# **SUMMARY**

## **PLANTED LOBLOLLY PINE**

- **TO INCREASE PROPORTION OF WOOD WITH MOE  $\geq$  1.6 MIL PSI HARVEST LOBLOLLY CHIPPING SAW TREES AT AGE 20-25 IN COASTAL PLAIN AND AT AGE 30-35 IN PIEDMONT & HILLY COASTAL PLAIN**
- **PLANTING LOBLOLLY AT ACCESSIVELY WIDE SPACINGS ( <400 TPA) CAN SIGNIFICANTLY INCREASE DIAMETER GROWTH BUT ALSO CAN SIGNIFICANTLY REDUCE MOE**

