Using Wood Quality Measures to Evaluate Second-Growth Redwood

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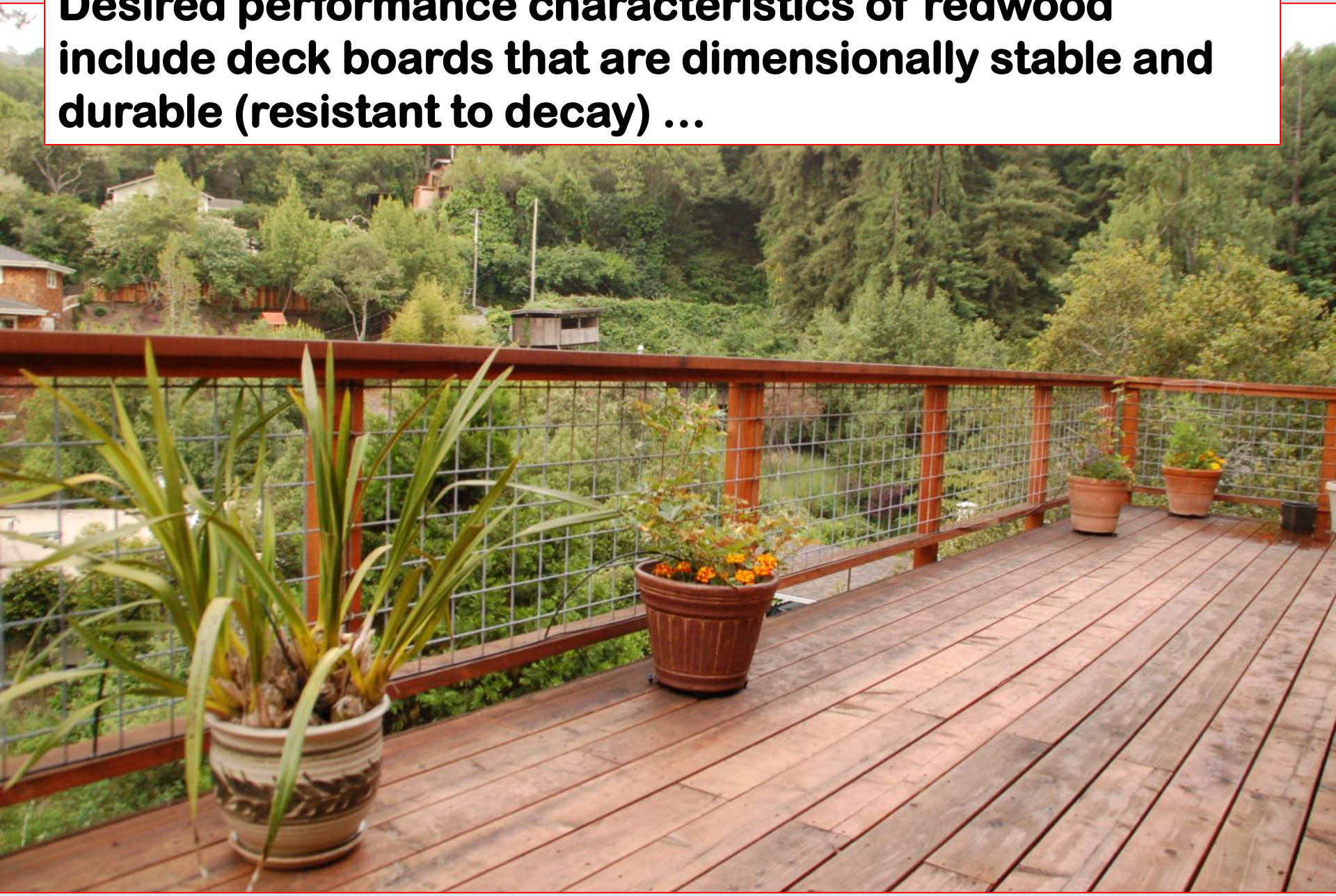
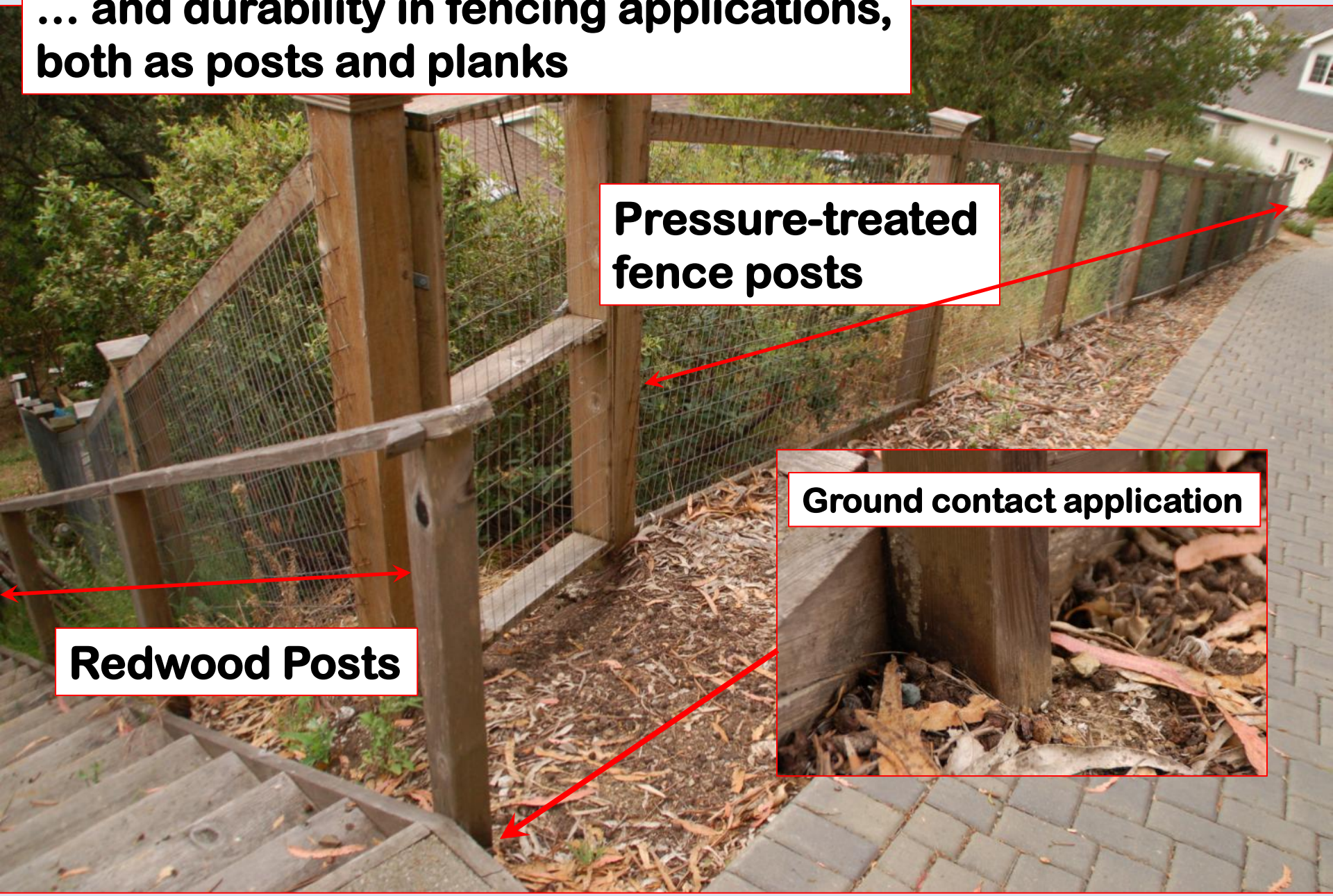
Desired performance characteristics of redwood include deck boards that are dimensionally stable and durable (resistant to decay) …

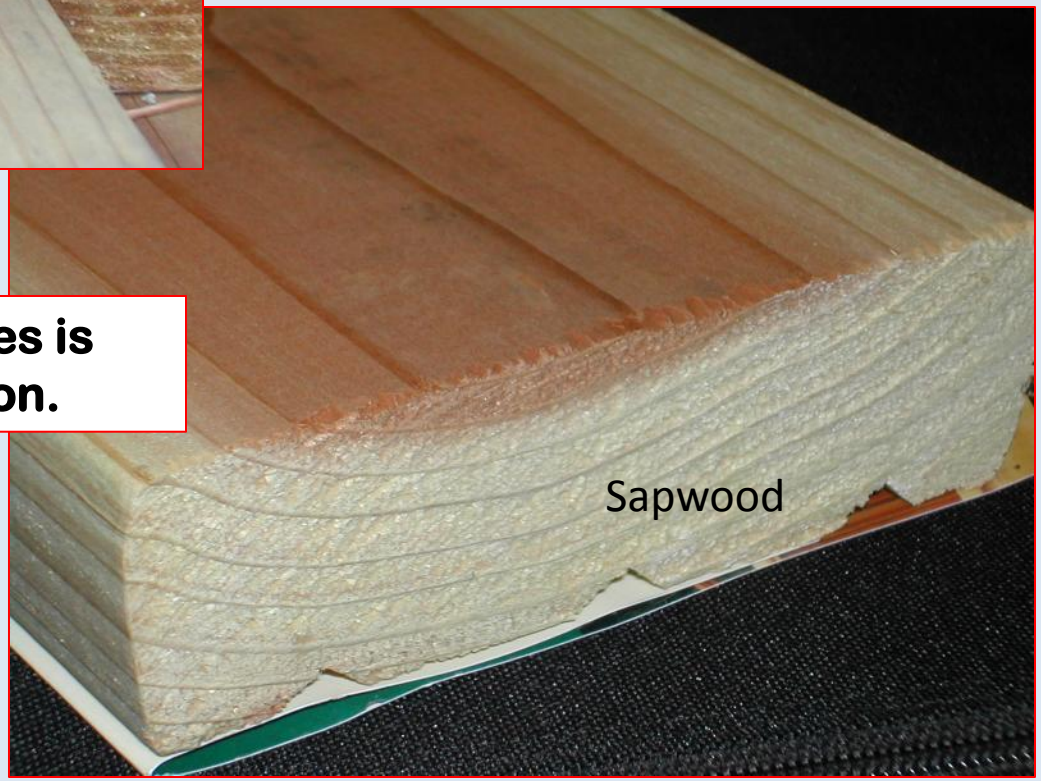


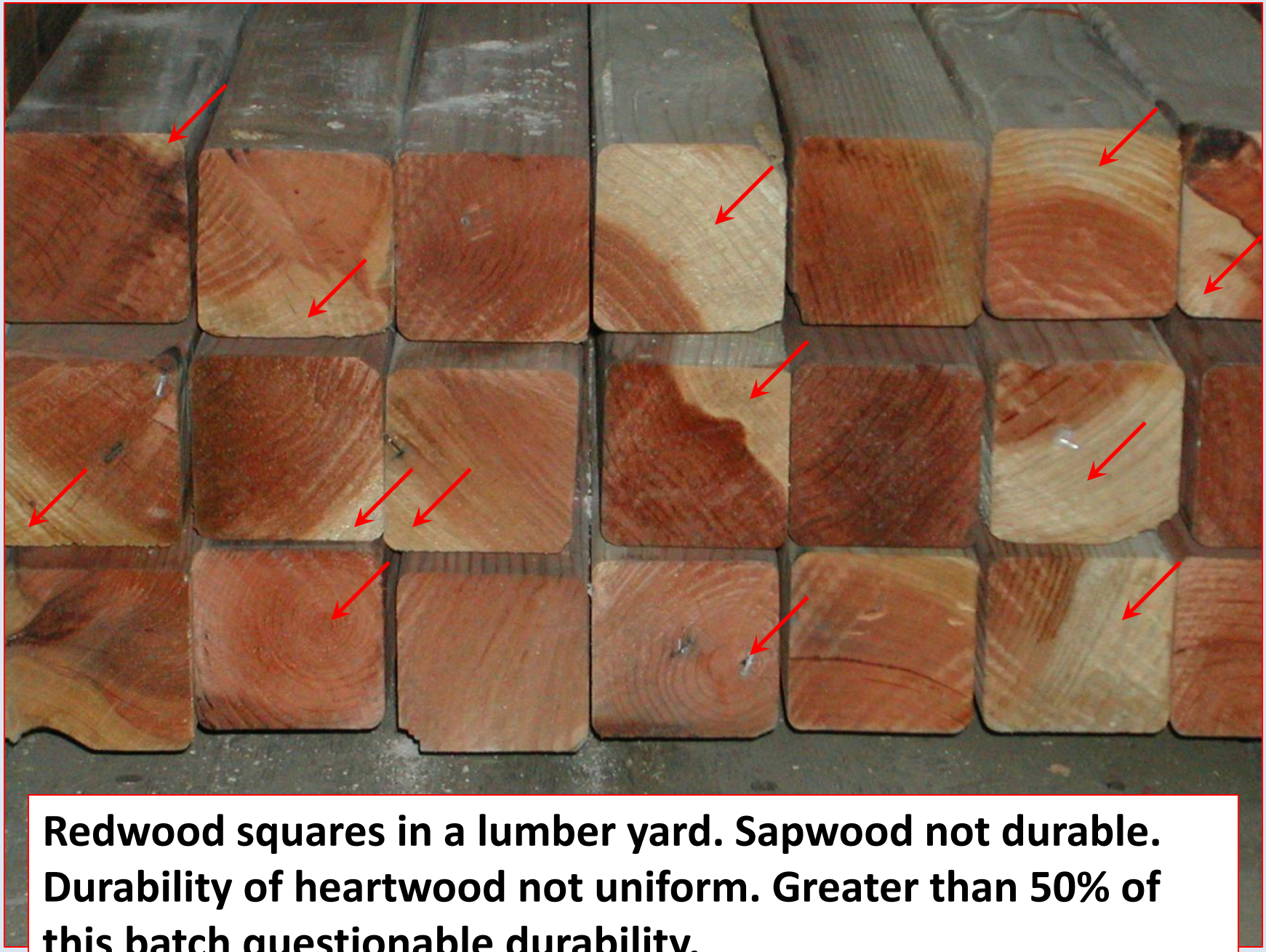
… and durability in fencing applications, both as posts and planks



Redwood deck boards in a lumber yard. Boards that include pith are not as durable as boards with heartwood that do not contain the pith (Clark and Scheffer, 1983)

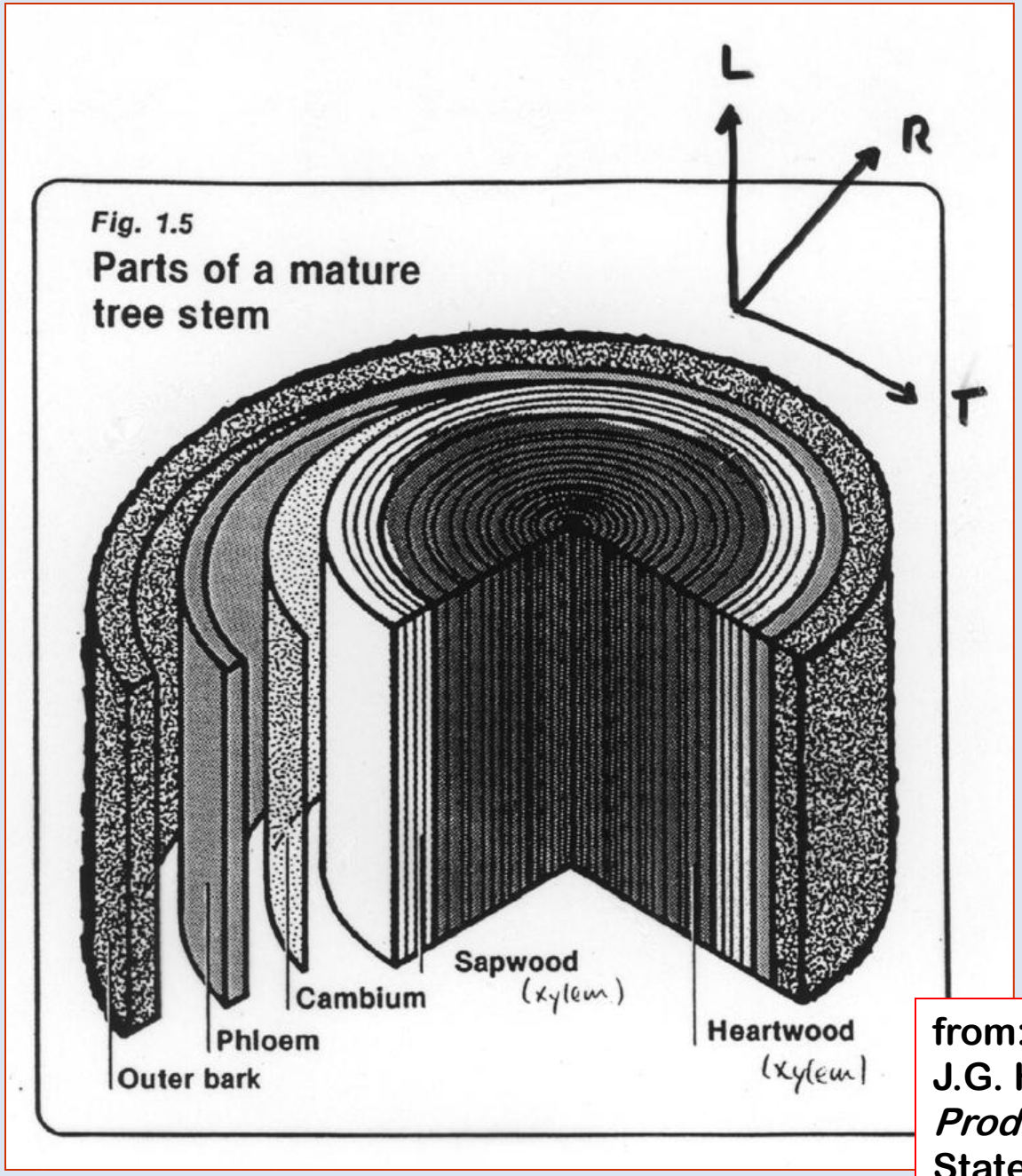
The sapwood of any wood species is not resistant to fungal degradation.



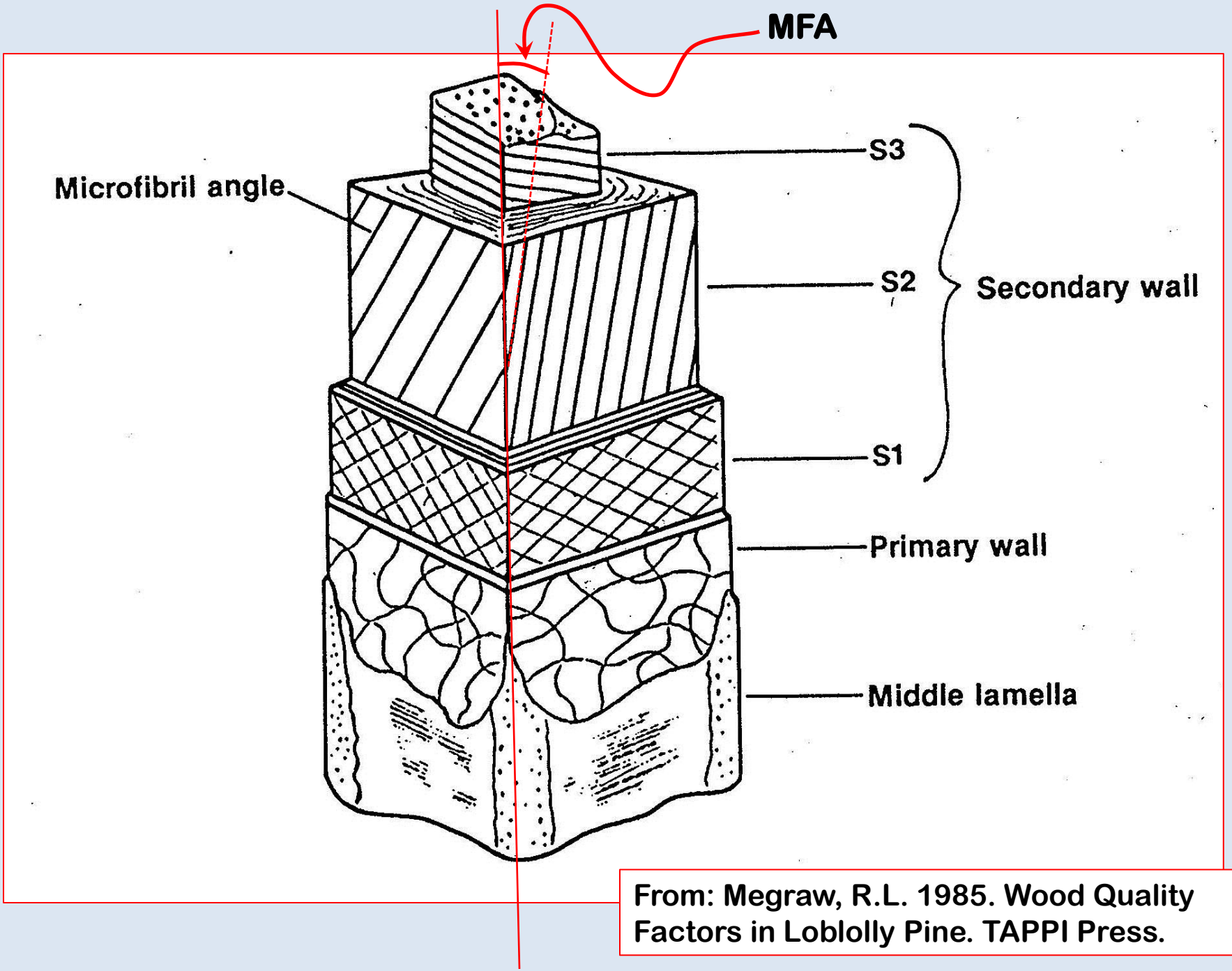


Redwood squares in a lumber yard. Sapwood not durable. Durability of heartwood not uniform. Greater than 50% of this batch questionable durability.

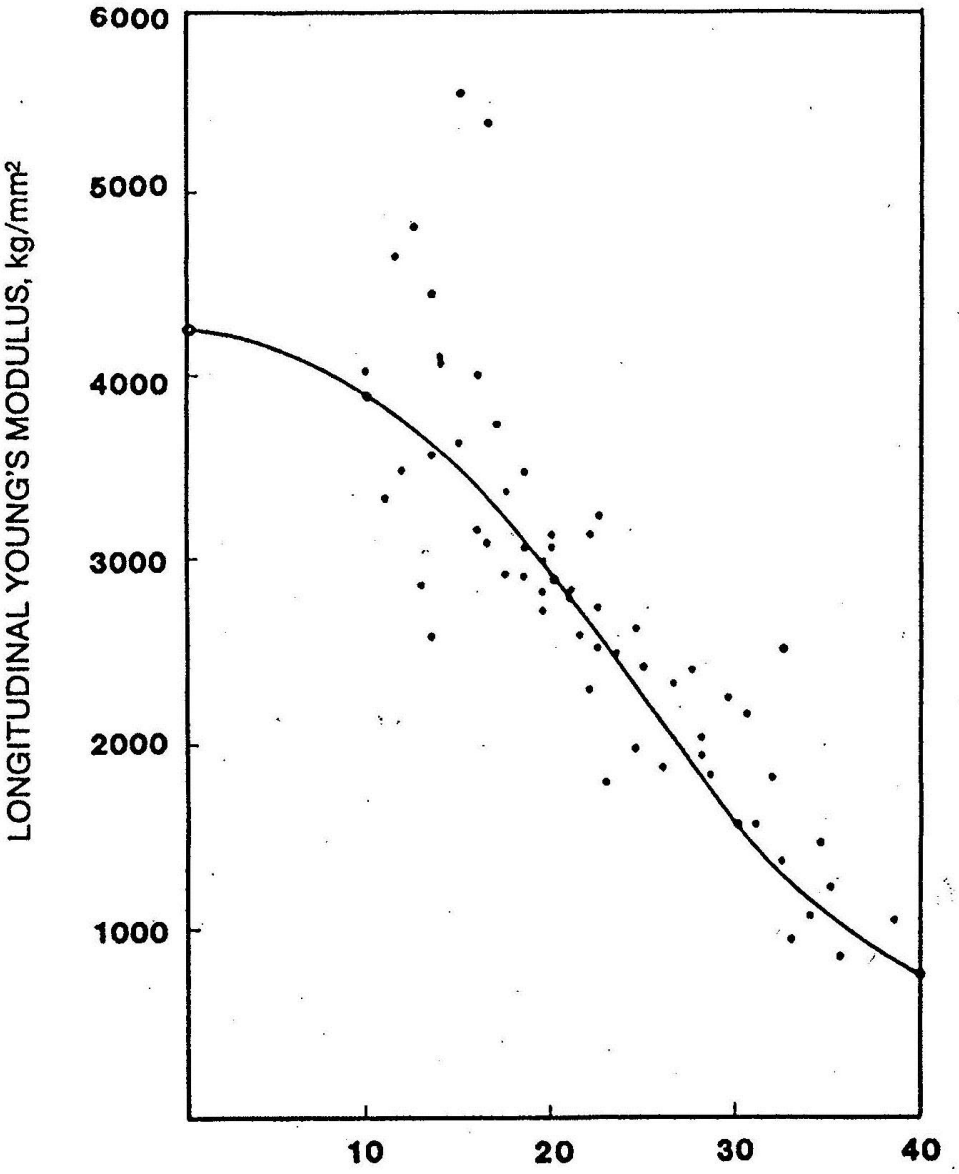

Warp in fence board, In this case, not redwood, but still result of non-uniform longitudinal dimensional change, common when juvenile wood included in board.

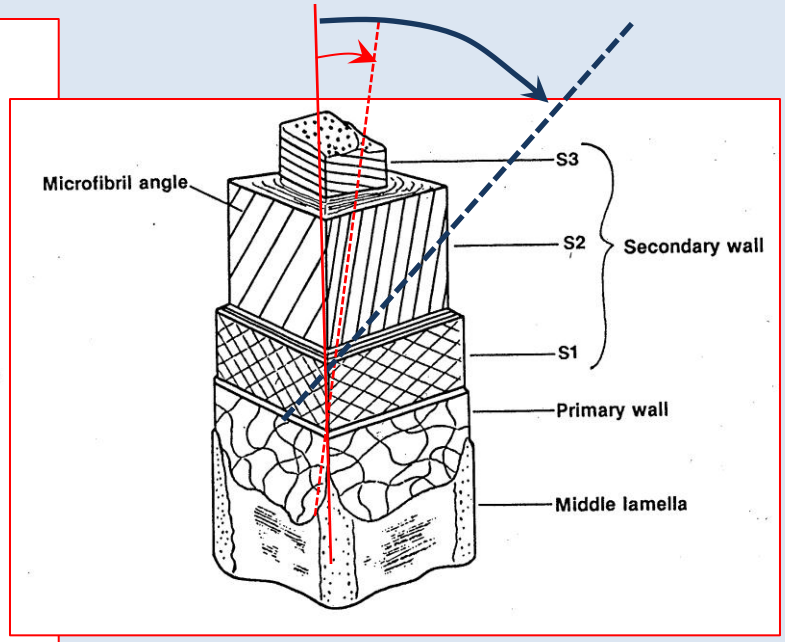


from: Bowyer, J.L., R. Shmulsky, and J.G. Haygreen. 2003. *Forest Products and Wood Science*. Iowa State University Press.



From: Megraw, R.L. 1985. Wood Quality Factors in Loblolly Pine. TAPPI Press.





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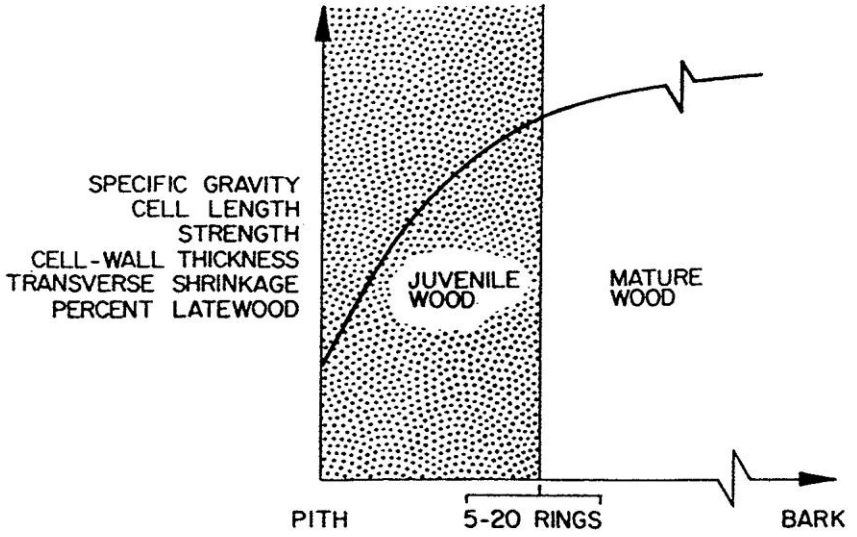
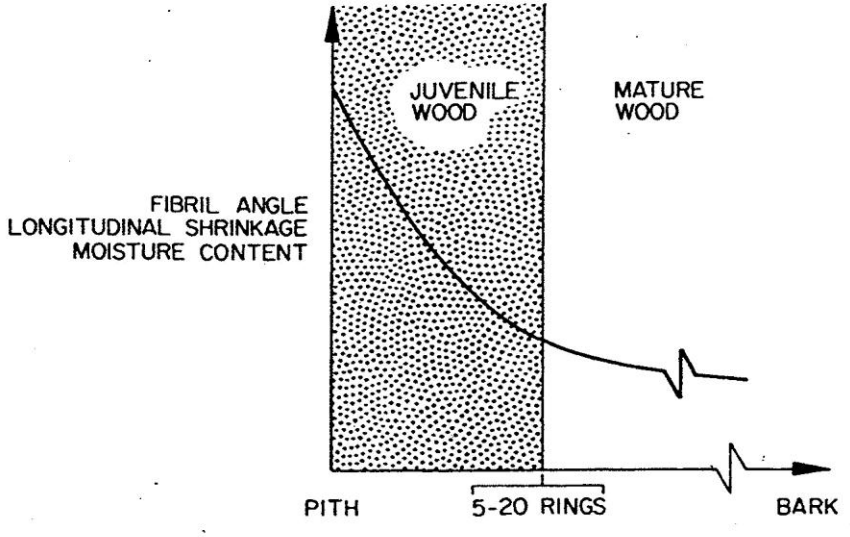


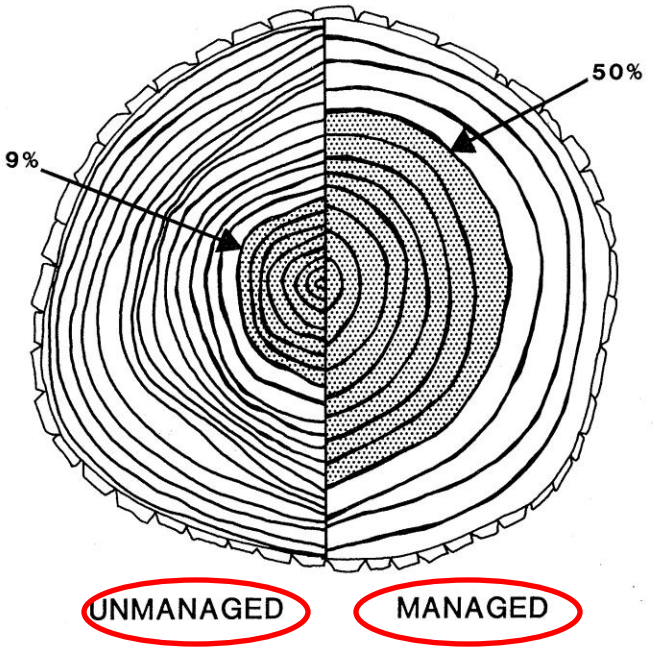


From: Bendsten and Senft. 1986. Wood and Fiber Science, 18(1)

Manage for what?

Volume or some measure of quality that would be relevant to in-service performance expectation?

SYMPOSIUM
ON
UTILIZATION OF THE
CHANGING WOOD RESOURCE
IN THE SOUTHERN UNITED STATES



June 12-13, 1984

North Carolina State University
Raleigh, North Carolina

Wood samples were taken from stumps 5 months after a 2010 harvest in a second-growth forest in Humboldt County.

Four trees were sampled, two fast and two slow growing at stump height

Tree 2 – Fast 72 years old

Tree 3- Slow 88 years old

Tree 6– Fast 74 years old

Tree 4- Slow 100 years old

Tree #	Number of rings detected	Classification	Canopy position	Stump height, in.	Diameter, in.
2	72	Fast	Dominant	27	30.5
6	74	Fast	Dominant	9	37
3	88	Slow	Codominant	14	20.5
4	100	Slow	Codominant	8	17.5

Samples processed at UC Richmond Field Station (old Forest Products Lab)

Initial breakdown on band saw and radial arm saw

After radial arm saw, squaring edges on jointer.

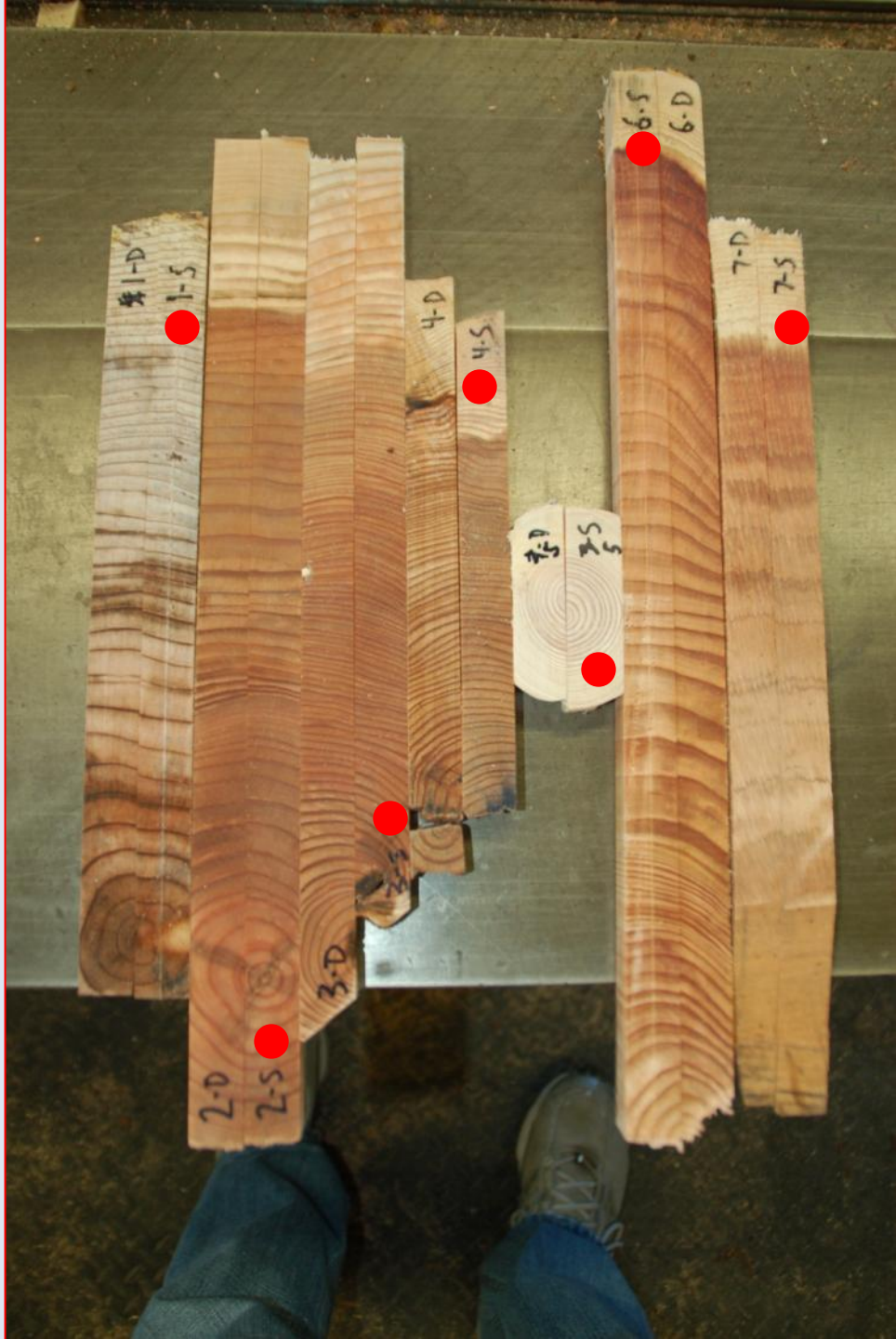
Cut to final [18 mm x 18 mm] dimension on table saw.

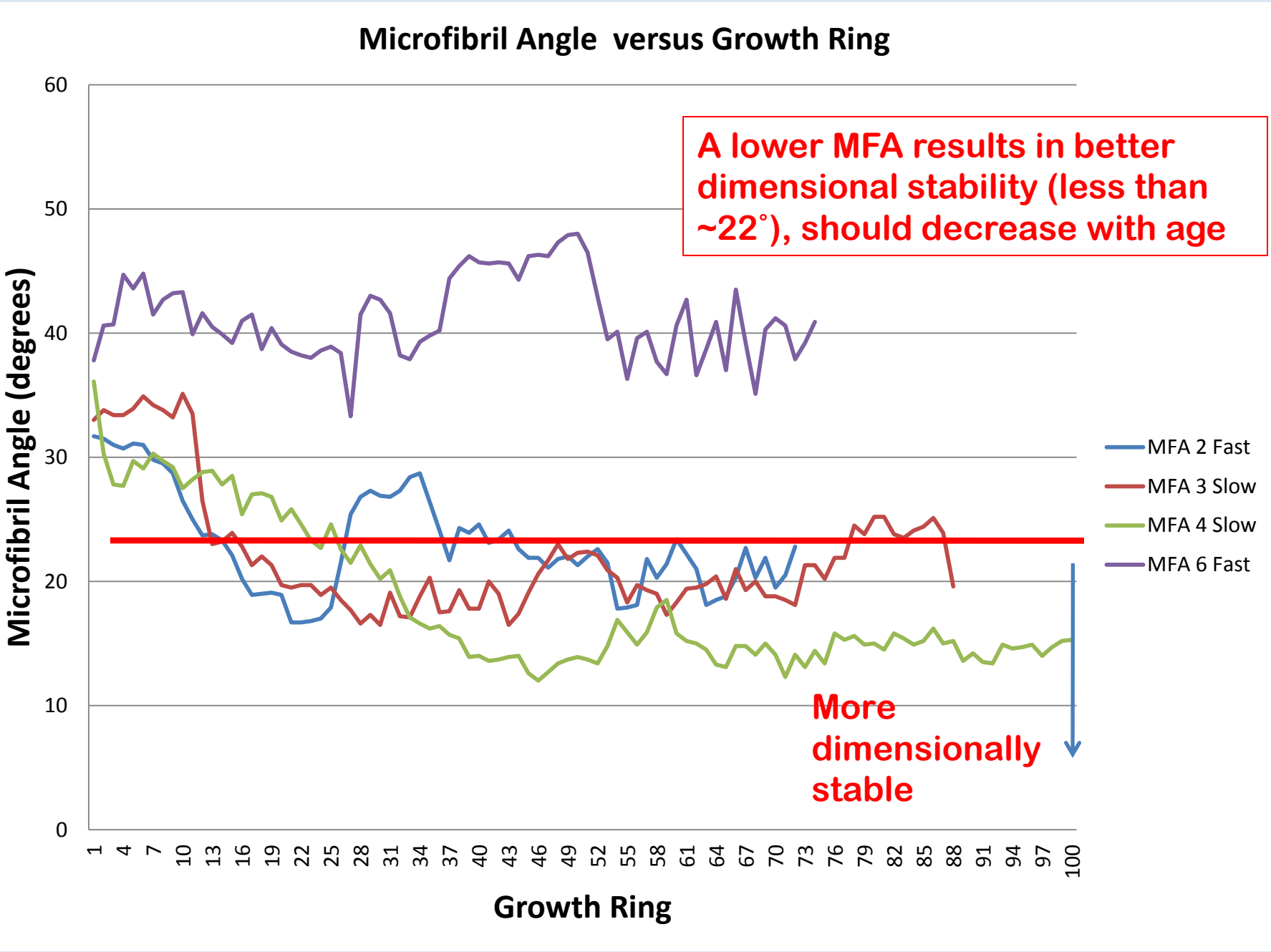
Final size 18 mm x 18 mm x radius. After equilibrating in environment room:

- "S" samples sent to FP Innovations, Paprican Division, Vancouver, BC for measurement of the following properties using Silviscan analysis:
  - age
  - density
  - modulus of elasticity (MOE)
  - microfibril angle (MFA)

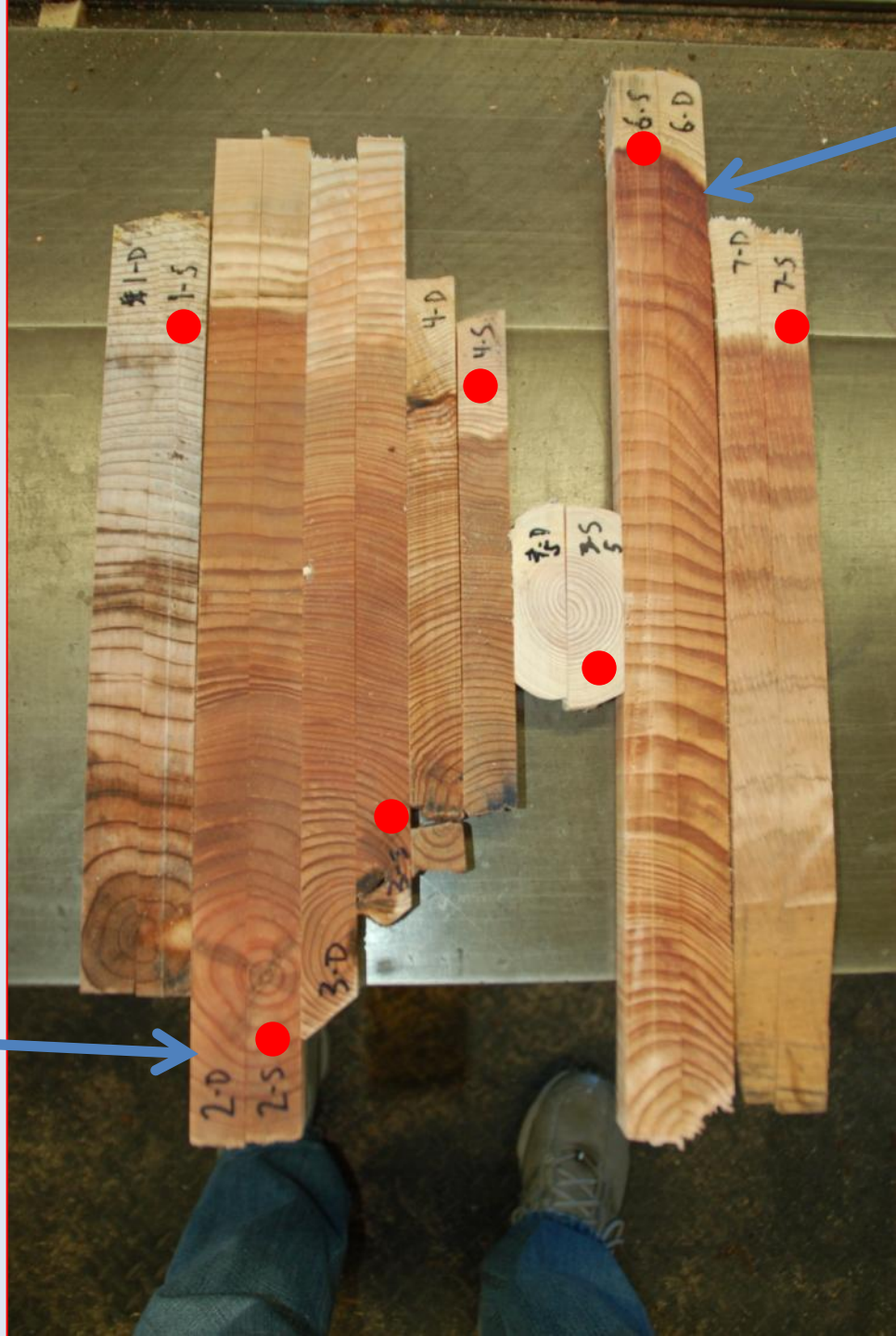
- "D" (durability) samples sent to Professor David Jones, Mississippi State University, for soil block (decay) testing.

RESULTS NOT AVAILABLE YET

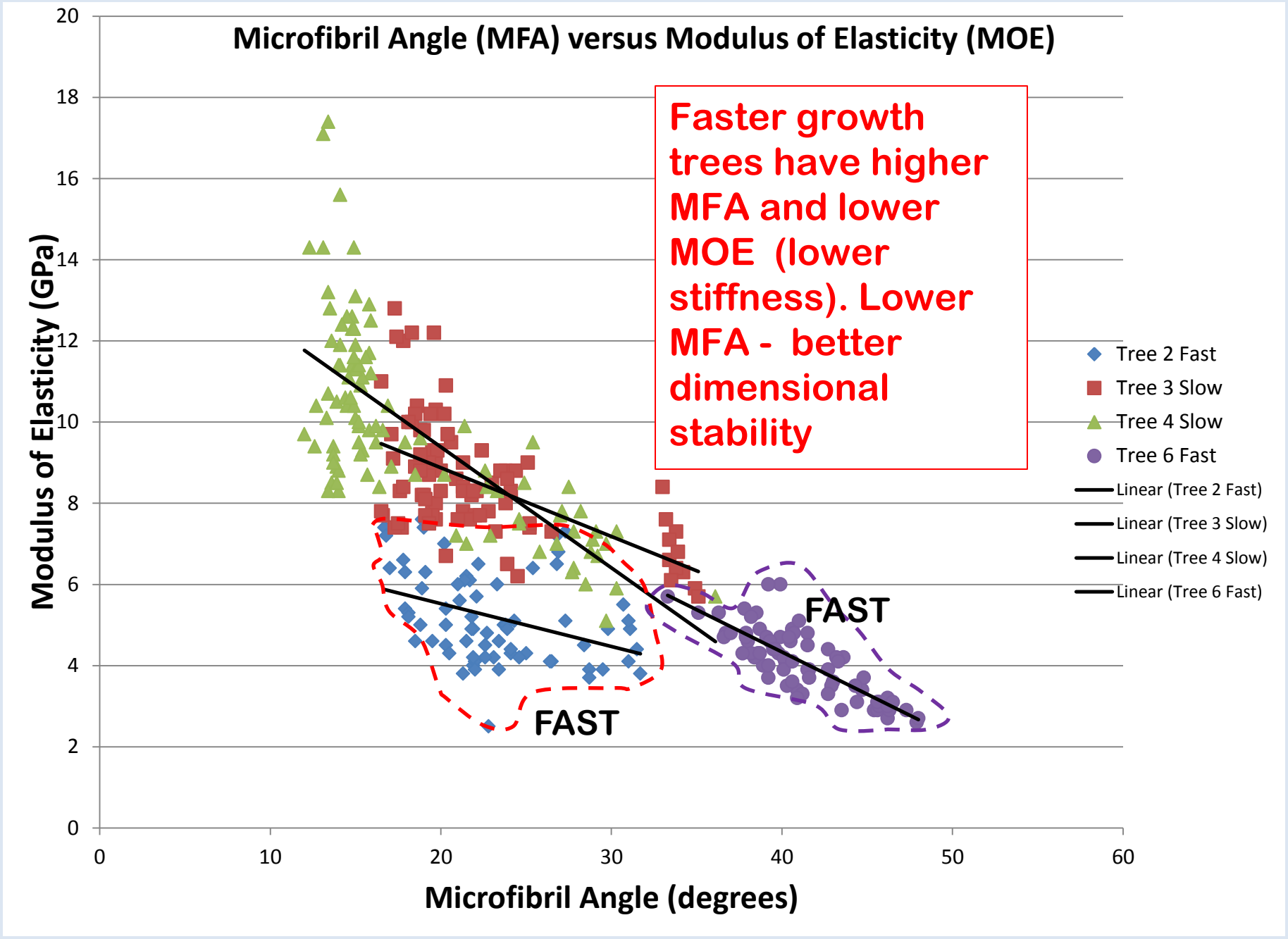



Microfibril Angle versus Growth Ring
A lower MFA results in better dimensional stability (less than ~22˚), should decrease with age
More dimensionally stable
Microfibril Angle (degrees)
Growth Ring
0
10
20
30
40
50
60
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
46
49
52
55
58
61
64
67
70
73
76
79
82
85
88
91
94
97
100
MFA 2 Fast
MFA 3 Slow
MFA 4 Slow
MFA 6 Fast

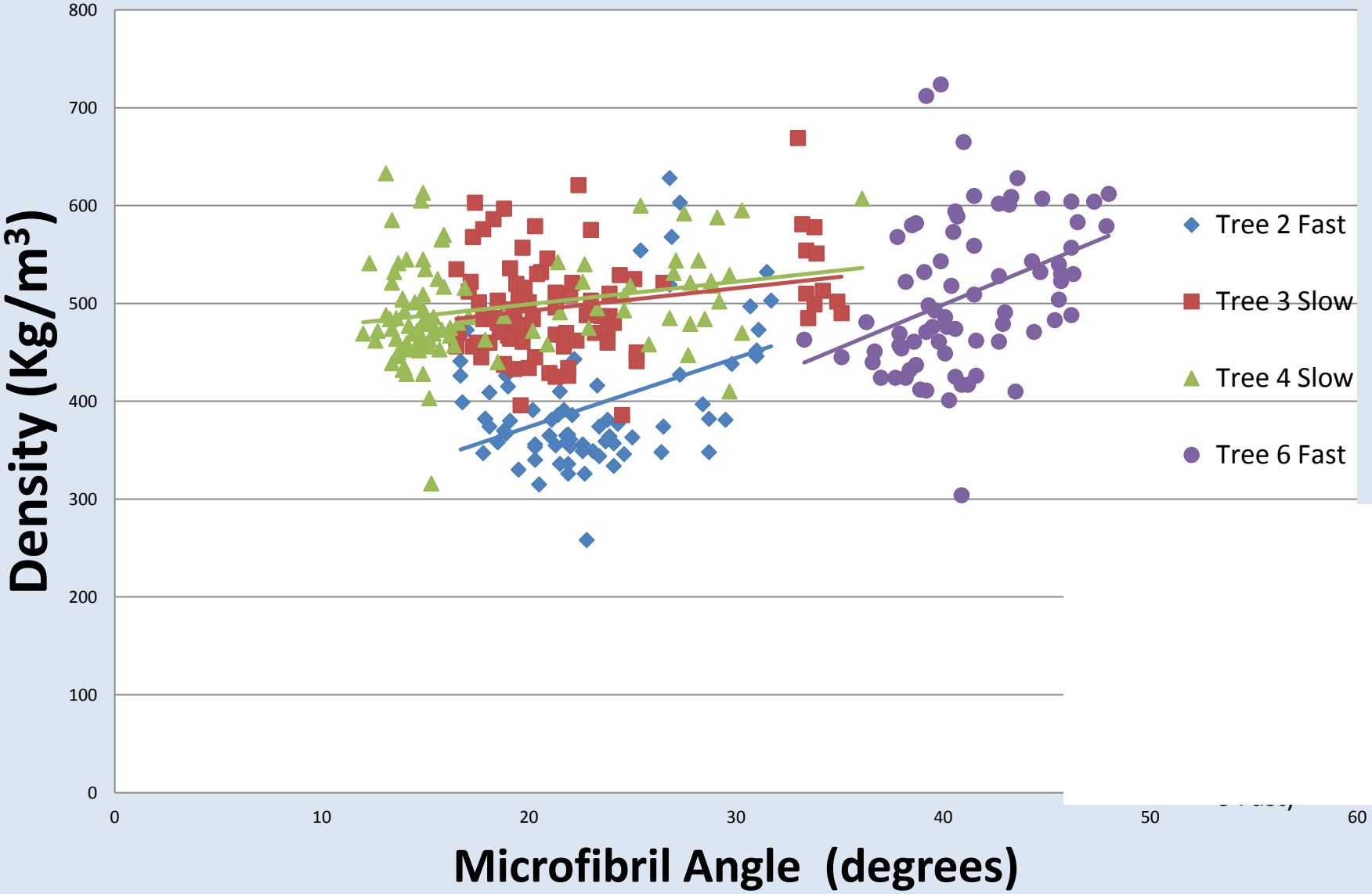
Fast growth #6 and #2



Fast Growth Trees

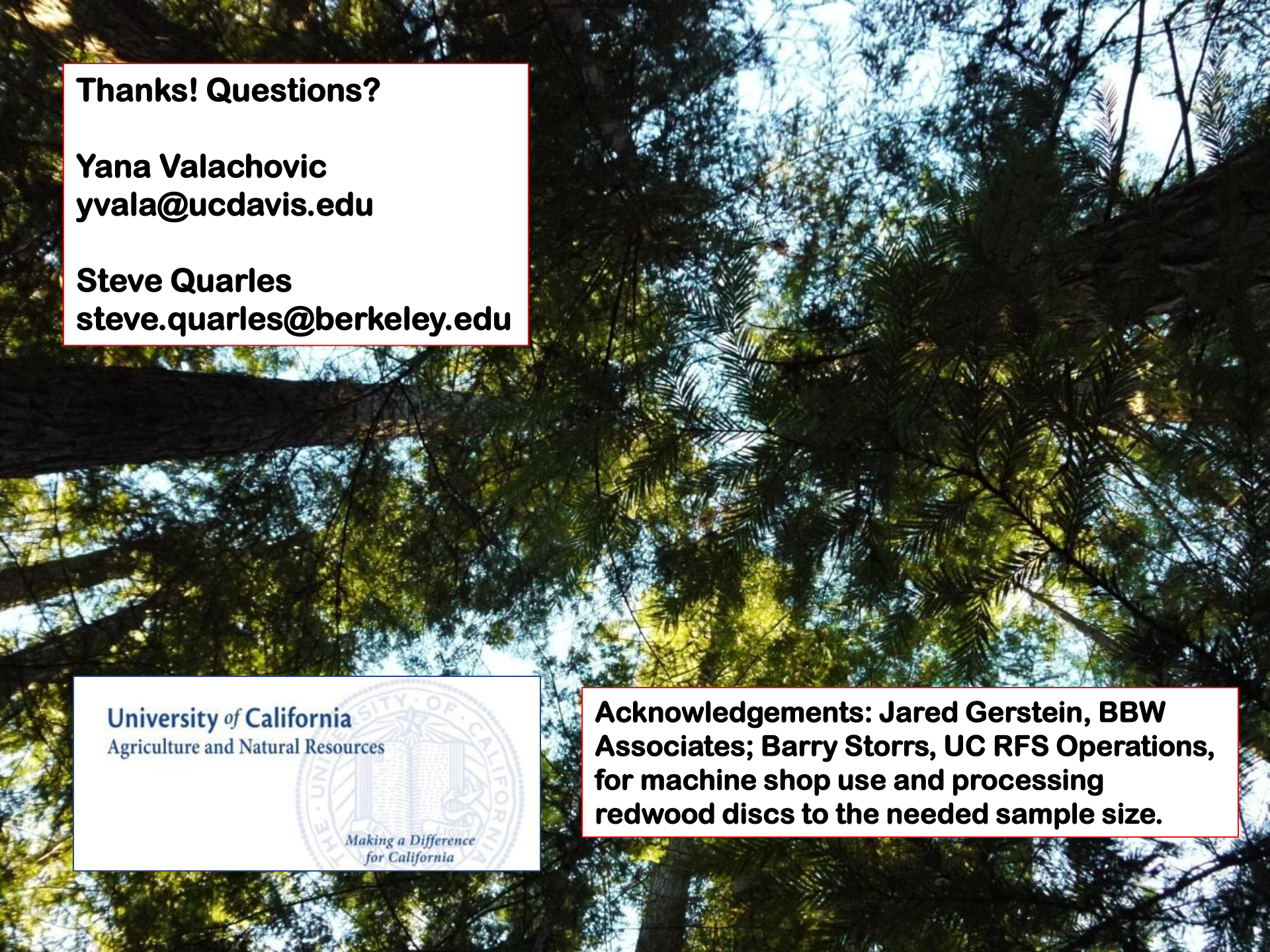

Microfibril Angle (MFA) versus Modulus of Elasticity (MOE)
Faster growth trees have higher MFA and lower MOE (lower stiffness). Lower MFA - better dimensional stability
Modulus of Elasticity (GPa)
Microfibril Angle (degrees)
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60
FAST
FAST
Tree 2 Fast
Tree 3 Slow
Tree 4 Slow
Tree 6 Fast
Linear (Tree 2 Fast)
Linear (Tree 3 Slow)
Linear (Tree 4 Slow)
Linear (Tree 6 Fast)

Microfibril Angle versus Density



Summary and Conclusions

- **This is only a micro case study and I am interested in working on a larger study that could address genetic variability.**
- **Waiting for the durability soil block tests and extractives.**
- **MOE (stiffness) – clear relationship. Fast growth trees show lower MOE than slower growth trees.**
- **MFA – clear relationship in Tree # 6. More variability, probably because of variable growth rate, in Tree #2. Although we did not measure longitudinal shrinkage, the relationship with MFA should follow.**
- **Relationships suggest that these are measurable statistics in redwood and that they behave as we would expect based on research on other species.**
- **How can we best prepare for the markets of the future?**



Thanks! Questions?

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