Characterization of Juvenile Wood in Lodgepole Pine in the Intermountain West

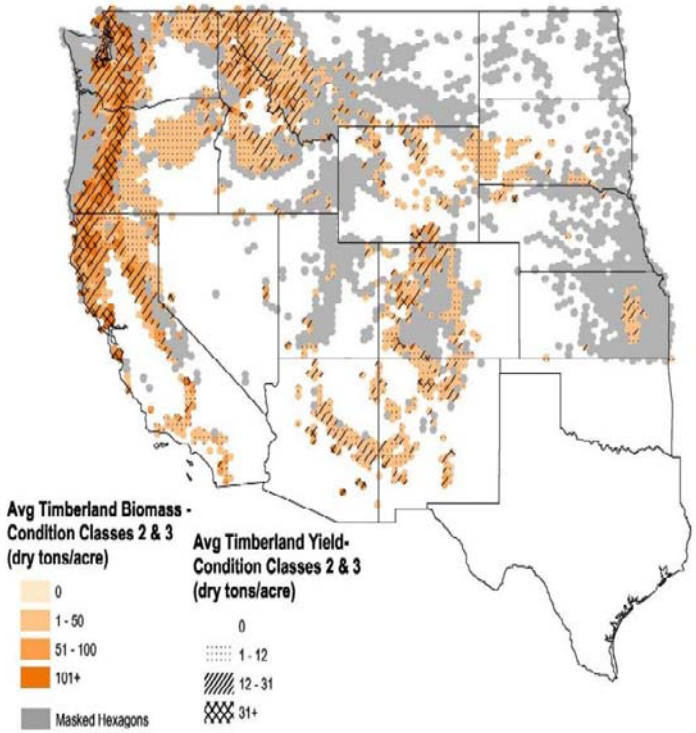
Thomas M. Gorman

University of Idaho

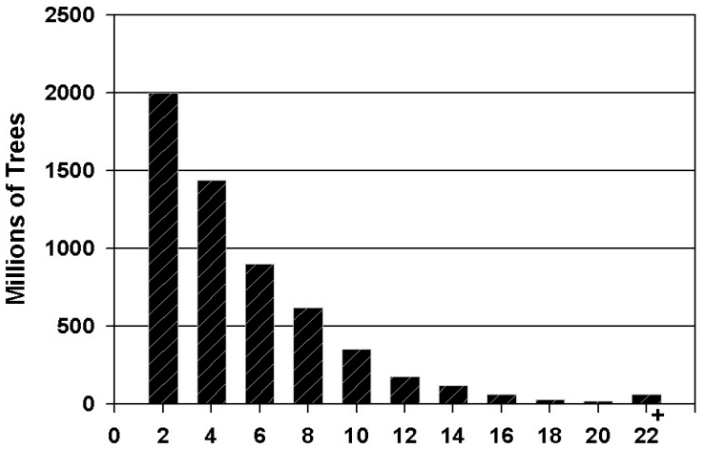
David E. Kretschmann

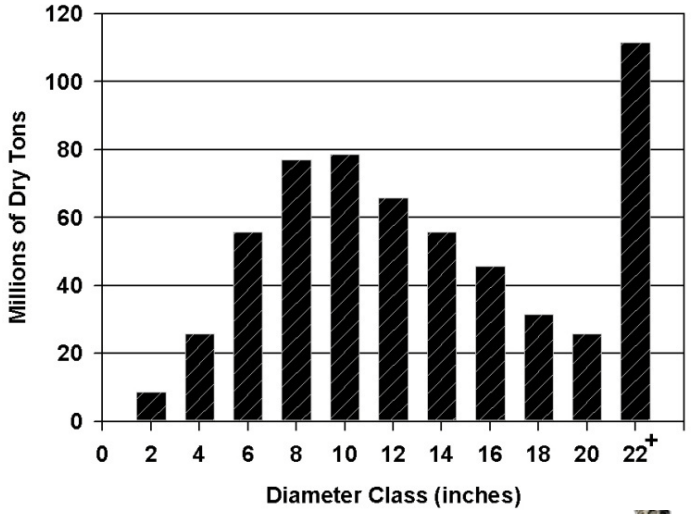
Forest Products Laboratory

Potential high-priority fuel reduction thinning needs on timberland in the western United States



- Most trees in high priority treatment areas are in diameter classes below 25 cm (10 inches) dbh.
- Thinning at risk stands is often imperative to reduce fire risk, even for stands that are eventually to be subjected to controlled burns.
- The costs of fuel reduction treatments often exceeds the value of the material removed, finding higher value uses for the thinnings is a major focus of Forest Service Research.





Some advantages of using logs in the round form instead of sawing them into lumber include:

- Less susceptible to warp during drying
- Lower processing cost
- Load-carrying capacity two to four times that of largest rectangular member that can be sawn from a log
- Potential for higher economic value

Park pavilion, Townsend, Montana

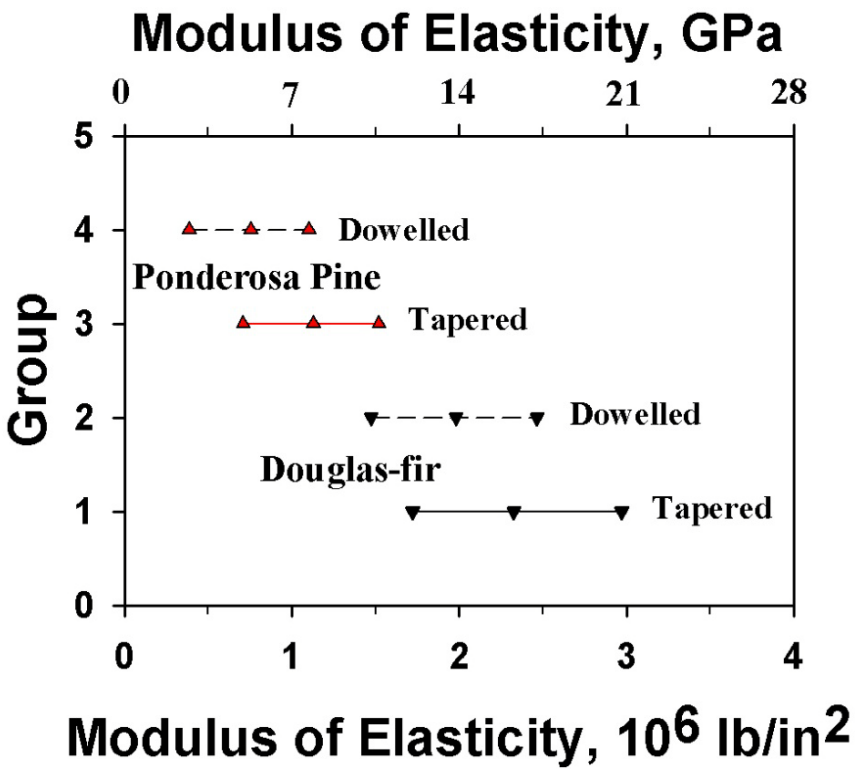
Rattlesnake Creek bridge, Missoula, Montana

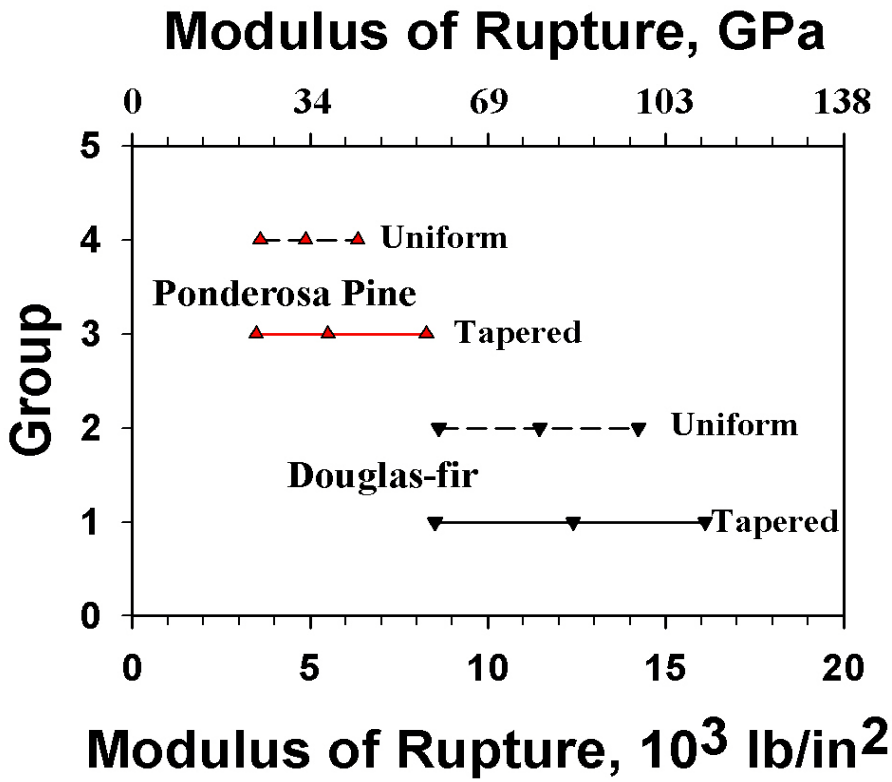
Six-inch-diameter lodgepole pine used in 5,000 ft^2 library in Darby, Montana.

Our research is intended to improve the utilization of small diameter roundwood for use as structural members by:

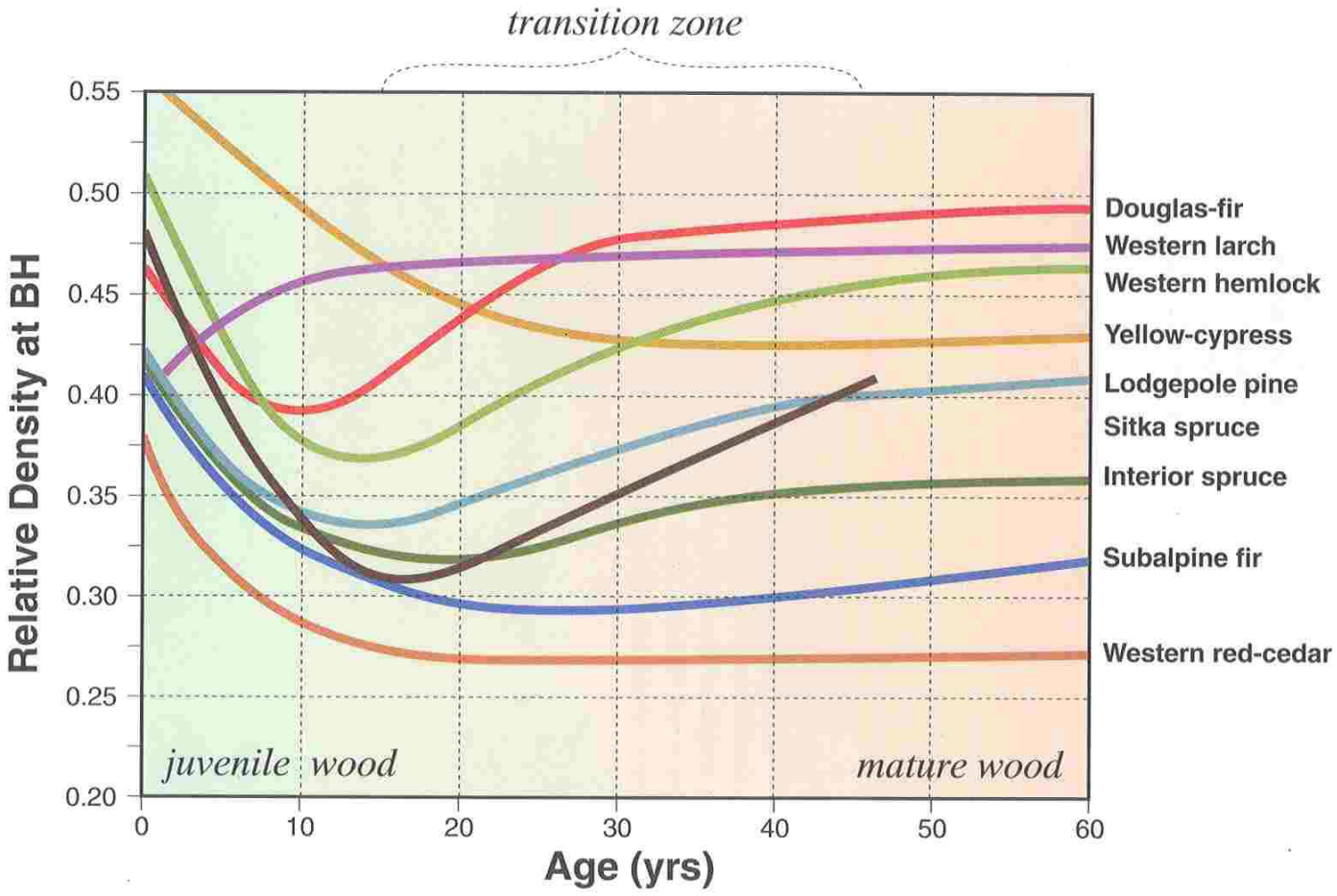
- evaluating the physical and mechanical properties of small diameter logs
- determining the effect of doweling on strength
- developing grading systems to establish allowable design values
- improving structural connections

Effect of doweling on strength properties of structural roundwood





Juvenile wood in western species (Jozsa and Middleton 1994)



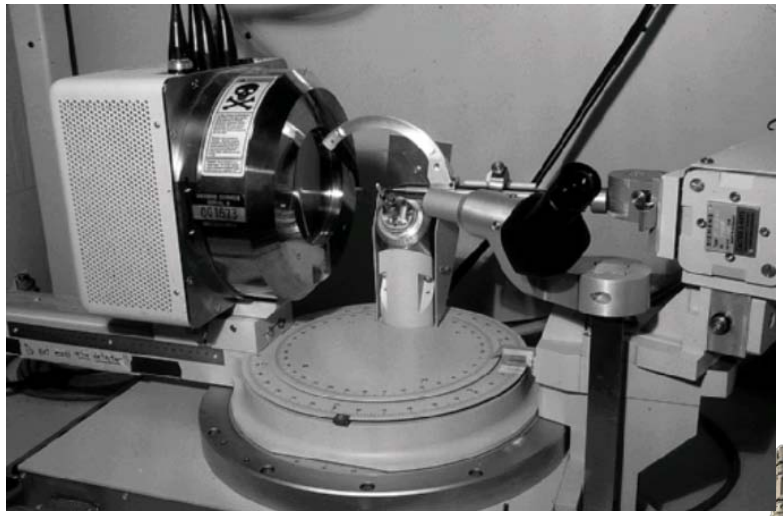
OBJECTIVE

The objective of this study was to measure longitudinal shrinkage and microfibril angle to estimate the juvenile wood-mature wood transition in lodgepole pine across a wide range of geographic locations in the western U.S.

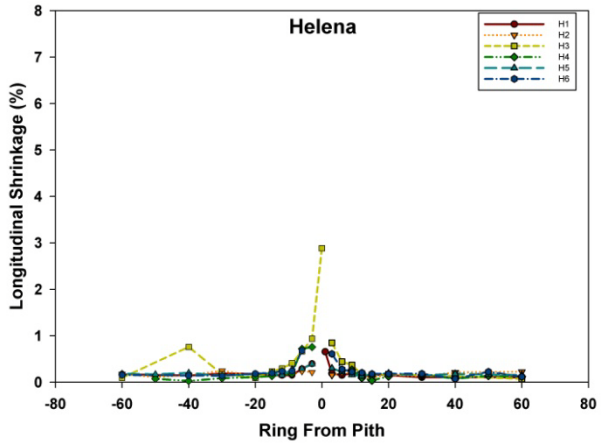
Four sites selected for sampling

1) dry site, intermediate growing season,
2) wet site, short growing season,
3) mid-range precipitation, intermediate growing season, and
4) mid-range precipitation, long growing season.

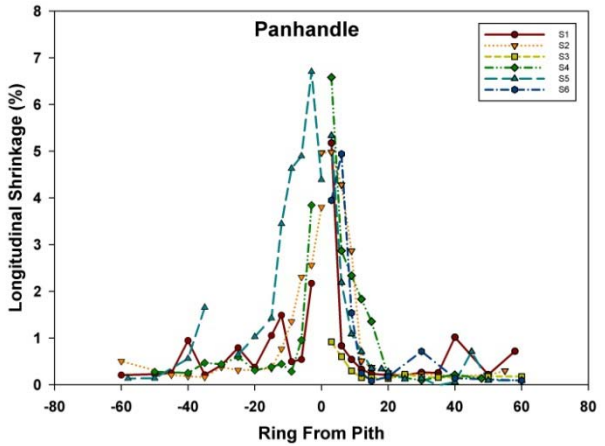
Methodology



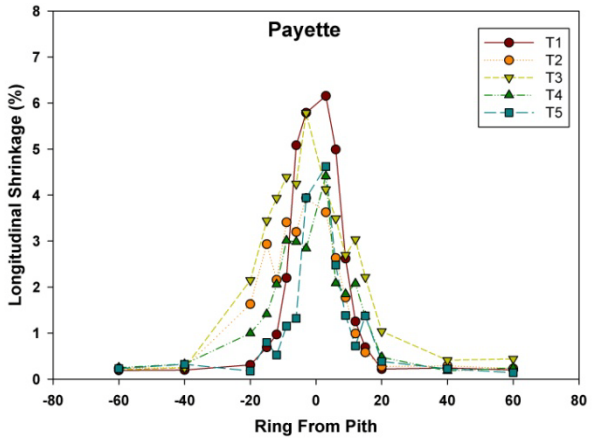
Longitudinal shrinkage results



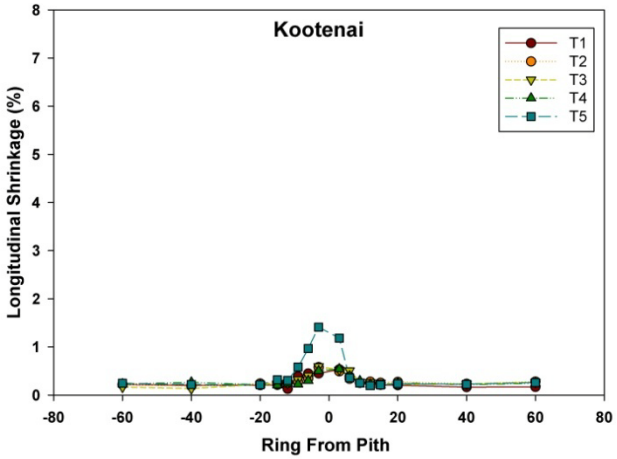
dry site, intermediate growing season



wet site, short growing season

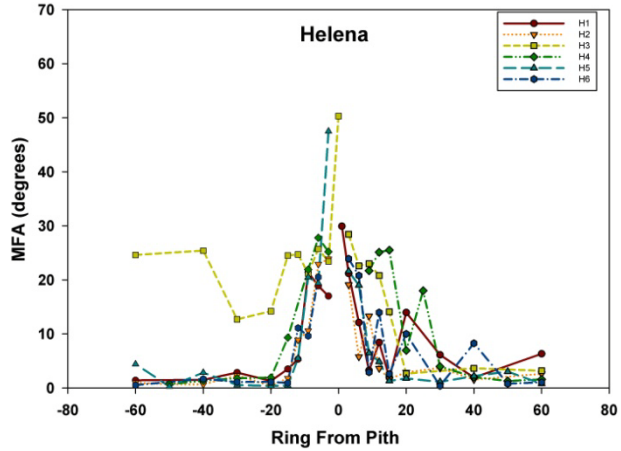


mid-range precipitation,
intermediate growing season

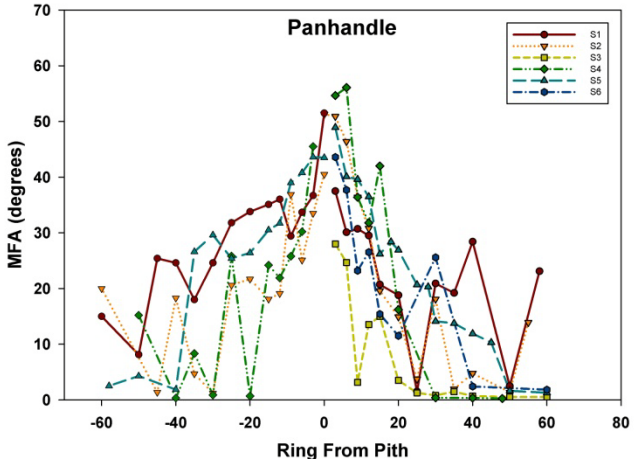


mid-range precipitation,
long growing season

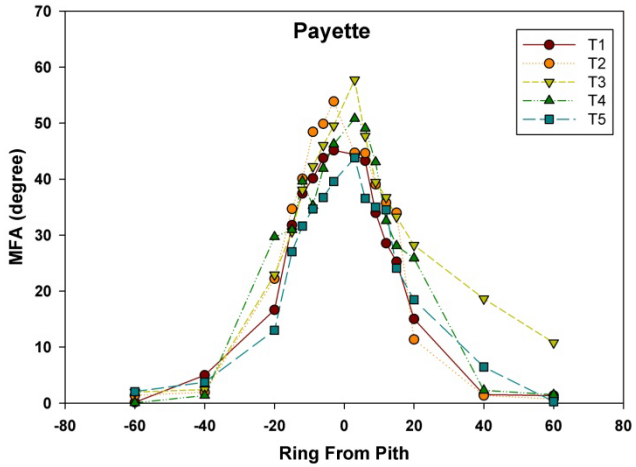
Microfibril angle results



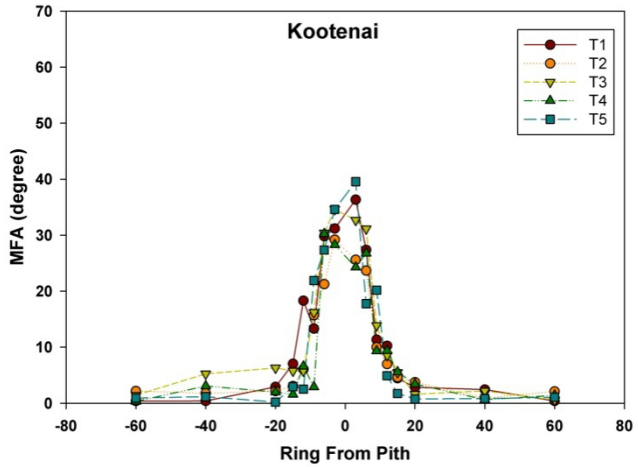
dry site, intermediate growing season



wet site, short growing season

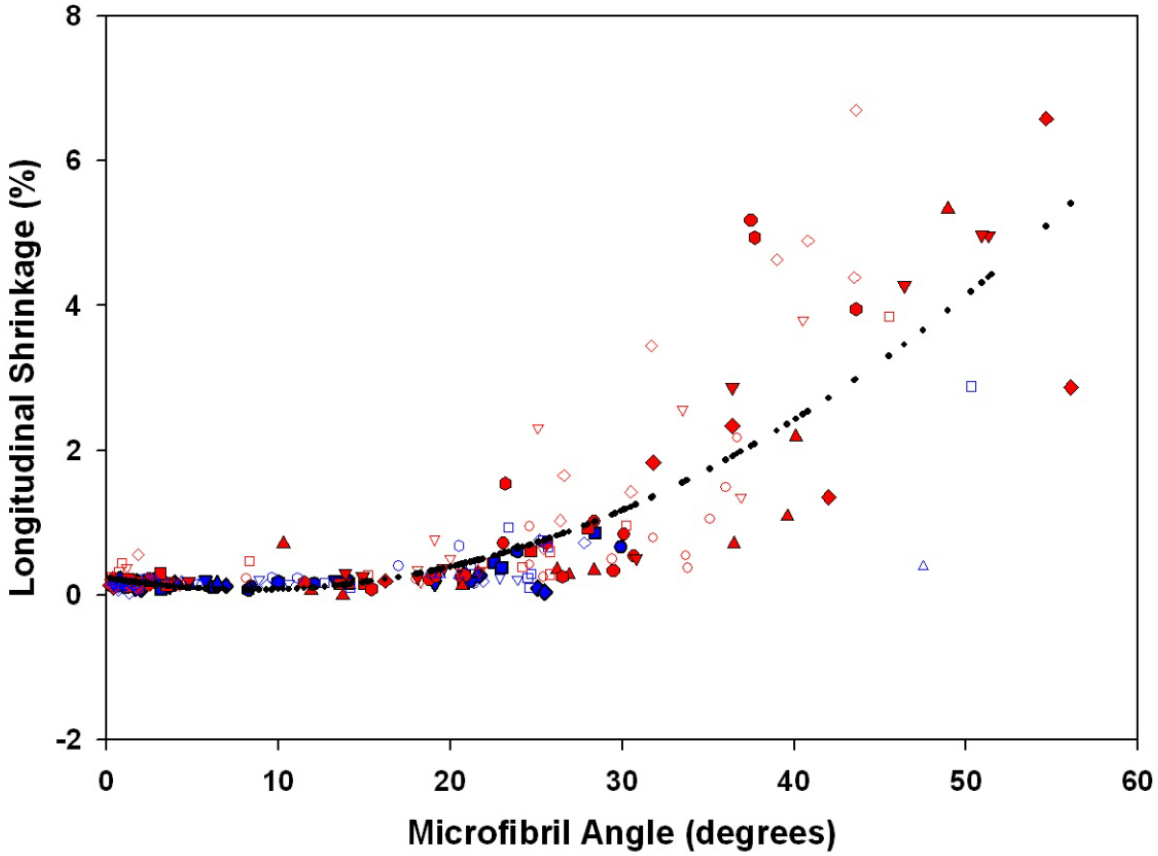


mid-range precipitation, intermediate growing season



mid-range precipitation, long growing season

Relationship between longitudinal shrinkage and microfibril angle for all measurements



Segmented regression to determine to predict juvenile transition period

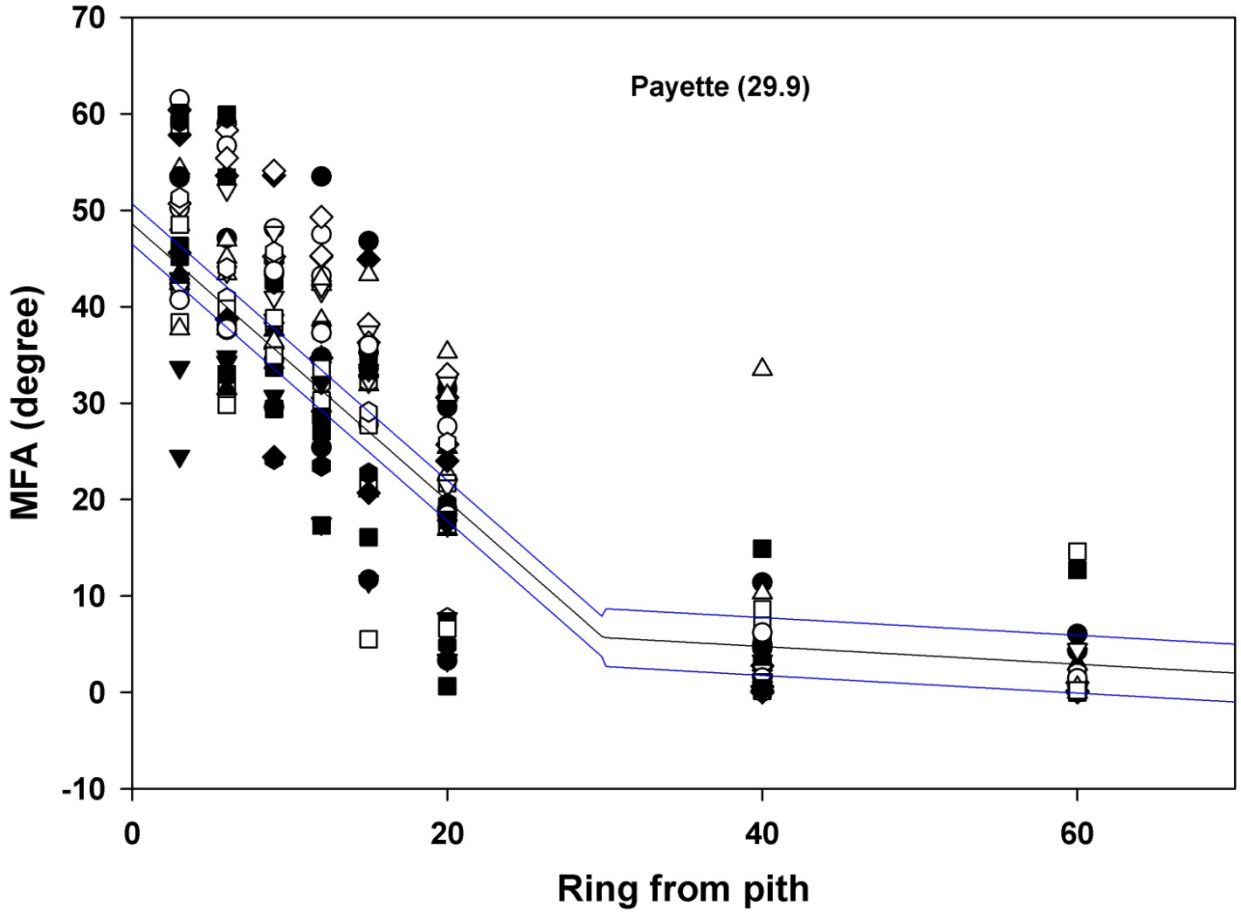


Table 1: Summary of segmented regression prediction of juvenile wood transition – years to reach mature wood

	National Forest	Longitudinal shrinkage	Microfibril angle
	Helena	8.7	14.0
	Panhandle	13.9	30.1
	Payette	20.8	29.9
	Kootenai	10.0	13.3

Conclusions

- A good correlation was found between longitudinal shrinkage and microfibril angle. Either method could be used to determine the juvenile wood transition in lodgepole pine.
- Significant differences in the juvenile wood transition period were found between the four sites.
- These results are useful for establishing parameters meaningful to the characterization of juvenile wood in the western conifers when utilized as solid-sawn products and structural composites.

ACKNOWLEDGEMENTS

Lincoln Ranger District, Helena National Forest

Avery Ranger District, Panhandle National Forests

McCall Ranger District, Payette National Forest

Yaak Ranger District, Kootenai National Forest

Coalition for Advanced Wood Structures