

Summary of Properties of Tanoak for Railroad Ties

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Tanoak is available in reasonable quantities in southwestern Oregon, but it has never been utilized to any significant extent. The recent concerns about the spread of *Phytophthora ramorum* or Sudden Oak Death, have increased interest in utilization of this species. Despite its limited use, tanoak has been the subject of a number of studies related to treatment and durability.

Material Properties: Tanoak has properties that are intermediate between those of red and white oak and is about 30% more dense than Douglas-fir. As a result it has higher hardness, modulus of rupture, modulus of elasticity and compressive strength values (Table 1)

Natural Durability: Untreated tanoak has very low durability, lasting only 4 years in soil contact in western Oregon compared to 7 years for untreated Douglas-fir in the same location (Morrell et al., 1999).

Treatment: The sapwood of tanoak is relatively easily treated, while the darker heartwood can be very resistant to treatment. The heartwood is visible at the time of cutting, but the color fades with time. Tanoak ties were generally well treated with either creosote or pentachlorophenol. Similar trials with waterbornes suggested that tanoak was also treatable with these systems. Incising improves sapwood treatment and likely reduces the development of deep checks but did not noticeably improve treatment of darker heartwood.

Performance in Track: Creosoted tanoak and Douglas-fir ties were installed in mainline track located near Dome Arizona along with a variety of western softwood species. A 1981 report found that 65% of the tanoak ties were still in track after 22 years, while 35% of Douglas-fir ties installed 5 years earlier at the site were still in service (Miller and Houghton, 1981). Unfortunately, the test was discontinued before it was completed. The results; however, would suggest that treated tanoak will perform well in mainline track.

Table 1. Comparison of material properties of Douglas-fir and tanoak		
Property	Douglas-fir ¹	Tanoak ²
Specific Gravity (12 % MC)	0.48	0.66
Shear (lb/in ²)	1130	2180
Side Hardness (lb)	710	1410
Compression Perpendicular (lb/in ²)	800	1080
Modulus of elasticity (lb/in ²)	1.95 X 10 ⁶	1.80 x 10 ⁶
Modulus of Rupture(lb/in ²)	12,400	16,300
Tie Service Life ³	>27 year	>22 years
Sources: ¹ USDA Wood Handbook. 1999; ² Niemiec et al., 1995; ³ Miller and Houghton, 1981		

Conclusion

Tanoak has the material properties necessary to perform as a tie, the ability to be properly preservative treated and, based upon limited performance tests, can perform well in mainline track

Literature Cited

Graham, R.D. 1955. Seasoning and preservative treatment of tanoak. Forest Products Journal 4(2):92-95.

Miller, D.J. 1961. Oregon woods for crossties. Forest Products Journal 11"579-582.

Miller, D.J. and P.R. Houghton. 1981. Performance of western wood species as crossties in mainline railroad track. Forest Products Journal 31(5):51-58.

Morrell, J.J. , D.J. Miller, and P.F. Schneider. 1999. Service life of treated and untreated fence posts: 1996 post farm report. Research Contribution 26, Forest Research Laboratory, Oregon State University, Corvallis, Oregon

Niemiec, S.S., G.R. Ahrens, S. Willits, and D.E. Hibbs. 1995. Hardwoods of the Pacific Northwest. Research Contribution 8, Forest Research Laboratory, Oregon State University, Corvallis, Oregon

USDA. 1999. Wood Handbook: Wood as an engineering material. General Technical Report FPL-GTR-113, Forest Products Laboratory, Madison, Wisconsin.