

OAK DECLINE IN MISSOURI: HISTORY REVISITED

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INTRODUCTION

In the 1980s, following extreme winters in the late 1970s and severe droughts in 1976, 1980, and 1983, dead and dying scarlet and black oaks were found on 185,000 acres of the Mark Twain National Forest. That decline event was linked to environmental stresses (Law and Gott 1987). Severe oak decline is now affecting an estimated 500,000 acres on the Mark Twain. High-risk stands are predisposed to severe damage because mature scarlet (*Quercus coccinea* Muenchh.) and black oak (*Q. velutina* Lam.) dominate in fully stocked stands on droughty sites. The current decline was triggered by serious moisture deficits from 1999 until mid-May, 2001. Insects and diseases contributing to tree death and decline include *Armillaria* root rot, twolined chestnut borer (*Agrilus bilineatus* Weber), red oak borer (ROB) (*Enaphalodes rufulus* Haldeman), and insect defoliators.

The extensive areas now occupied by dense scarlet and black oak stands are artifacts of European settlement that replaced shortleaf pine (*Pinus echinata* Mill.) and oak-pine forests and woodlands of long-standing (Nelson 2002). Prior to European settlement, much of the Missouri Ozarks had more-open forests and woodlands dominated by shortleaf pine and maintained by large herbivores and by frequent, low-intensity fires set by Native Americans (Nigh 1992, Guyette and Cutter 1991, Yatskievych 1999, Stambaugh 2001). After extensive logging between 1870 and 1930, these lands were subjected to annual burning and overgrazing by free roaming livestock, resulting in erosion and loss of soil moisture holding capacity. Forest fire control began in the mid-1930s, which allowed sprouts and seedlings of the red oak group to survive and develop. Missouri botanist Julian Steyermark, in his 1937 study of newly acquired national forest lands, reported a hodgepodge of vegetation with some species out of place and others occurring in disproportional numbers.

METHODOLOGY

In winter 2001/2002 permanent oak mortality monitoring plots were established in 57 stands throughout portions of the Mark Twain National Forest located in the Ozarks.

- 43 high risk stands (upland scarlet/black oak > 70 years old)
- 10 DFC (desired future condition) stands (majority of stocking in shortleaf pine/white oak, with black/scarlet oak stocking < 40 percent)

- 4 Riparian stands to monitor oaks on drainageways/lower slopes

Tree species and condition were tallied using 10-BAF variable radius plots on 5 points/stand; three 1/100th acre regeneration plots were established at each sampling point (Mielke 2001).

RESULTS

Severe decline symptoms, mortality and ROB attacks were limited almost exclusively to the red oak group. Forest health was rated good only in the DFC stands; riparian and high risk stands were fair. Red oak borers (ROB) infested 85-90 percent of the red oak group to some degree in all stands except riparian stands, which had only 69 percent of red oaks attacked. All stand categories had comparable ratings for > 33 percent crown dieback (~ 40 percent), and ~ 8 percent red oak BA mortality in 2001. All districts had high percentages of red oak BA affected by ROB (70-98 percent). However, the average number of ROB attacks/tree was greatest on the Potosi/Fredericktown, Houston/Rolla and Cassville Districts. Ratings for red oak crown dieback > 33 percent varied from 28-48 percent between districts. White oak reproduction generally exceeded red oak group reproduction on all districts, in agreement with earlier surveys (Law and Johnson 1989) (Davidson 1990). Shortleaf pine reproduction was less abundant than that of oak species and pine regeneration was absent on some districts.

DISCUSSION

Based on monitoring of the 1980s decline on the Doniphan/Eleven Point District (Law and Johnson 1989), further decline and mortality of red oaks in declining stands is anticipated. Scarlet and black oak components in heavily stocked mature stands should be harvested and regenerated with mixtures including more drought-tolerant, longer-lived white oaks and shortleaf pine. Otherwise, red oak decline and mortality are likely to recur frequently in the Missouri Ozarks - history will continue to be revisited.

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