Beetle kill salvage operation from the Cumberland Plateau in Tennessee. (Photo by Doug Murray, Tennessee Forest Watch)

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The Southern Pine Bark Beetle and Forestry on the Cumberland Plateau in Tennessee: Uniformity and Vulnerability

The biologically rich hardwood forests of the Cumberland Plateau in Tennessee are considered by many organizations (Doris Duke Charitable Trust, The Nature Conservancy, and World Wildlife Fund) to be among the highest conservation-value forests remaining in North America today. Over the last 20 years, tens of thousands of acres of these forests on the Cumberland Plateau have been converted to large industrial pine plantations (Evans et al. 2002). Between 1998 and 2002, many of these loblolly pine monocultures were decimated by southern pine bark beetle (SPB) whose epidemic-level infestations occurred at unprecedented proportions. Pine stands located on state recreation lands and owned by small landowners were also severely affected. The economic loss associated with this recent SPB epidemic on the Plateau in Tennessee has been estimated at over 100 million dollars (TDF 2002), in a region already considered to be one of the most economically depressed in the country.

The recent SPB epidemic is often referred to by Tennessee media, politicians and even foresters as "an act of God" implying that this tragedy was a random event for which there was little or no human causality. As such, there has been no public investigation into what happened on the Plateau and how such an epidemic could be prevented in the future. Nonetheless, tax dollars are now being spent to ameliorate the economic losses and to fund the University of Tennessee Extension Service, who recommend that landowners affected by SPB replant in pine (Clatterbuck and Tankersley 2002).

> *"How do we manage for forest sustainability in a region where short-term, corporate land-use decisions can affect forest conditions across an entire landscape and therefore potentially jeopardize long-term public values?"*

From a biological standpoint, the southern pine bark beetle responded in a very predictable fashion to a vastly expanded and highly vulnerable food supply created by the very deliberate land-use decisions of industrial forestry companies in the region. The southern pine bark beetle (*Dendroctonus frontalis*) is an insect native to the southern United States whose distribution closely reflects that of its two preferred hosts: loblolly pine (*Pinus taeda*) and shortleaf pine (*Pinus echinata*) (Flamm 1988). In forest conditions of presettlement

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times, SPB susceptible pine was distributed within a matrix of less susceptible tree species across the southern landscape, rendering unlikely epidemic-level SPB outbreaks such as we are seeing today (Showalter and Turchin 1993; Perkins and Matlack 2002). The drought-prone, upland environment of the Cumberland Plateau is outside the native range of loblolly pine, a species adapted to bottomland, coastal plain

"[T]he southern pine bark beetle responded in a predictable fashion to…very deliberate land-use decisions."

environments (Perkins and Matlack 2002). Heavily stocked stands of loblolly pine (such as those intended for pulping) and loblolly stands that are stressed by limited water availability have been shown to be particularly susceptible to epidemic-level SPB infestations in which immature and healthy trees are killed (Lorrio 1988). Over the last half-century, the interval between SPB outbreaks throughout the South has decreased, while the intensity and distribution of each outbreak has increased substantially (Belanger *et al.* 1993; Price *et al.* 1992). Over this same time period there has been an accelerated increase in the establishment and spread of industrial pine plantations across this region (Evans et al 2002; Wear and Greis 2002). The presence of these large continuous monocultures of pine has greatly enhanced the dispersibility and outbreak intensity of SBP across the southern landscape (Perkins and Matlack 2000). Ecological models predict that the SPB range will expand northward in the coming decades and become more established in areas such as the Cumberland Plateau (which is currently on the edge of its range) as major epidemics in plantations become less inhibited by low winter temperatures (Ungerer et al. 1999).

All available evidence suggests that epidemic-level outbreaks of SPB are not going to go away in landscapes increasingly dominated by pine plantation activity. In light of this, the U.S Forest Service has abandoned pine plantation forestry on the tablelands of the Bankhead National Forest in Alabama and is in the process of trying to restore native forest communities there. What about the privately owned landscape of the Cumberland Plateau in Tennessee? What policies should be instituted there by state or local governments to safeguard the sustainability of forest resources in the future? Should paper companies engaged in hardwood conversion to pine be allowed to become certified as "sustainable" forestry operations? Should large plantation owners bear responsibility for creating an environment that is now riskier for small-land owners considering investing in pine? Should tax dollars be spent subsidizing such a high risk economic venture, particularly when other forest values are compromised in the process? How do we manage for forest sustainability in a region where short-term, corporate land-use decisions can affect forest conditions across an entire landscape and therefore potentially jeopardize long-term public values? Forestry on the Cumberland Plateau is truly at a crossroads. The first step in addressing these issues in Tennessee will be to create a process by which future forest policy can be grounded in the best available science. This is clearly not happening at the present time.

Literature Cited

Belanger, R.P., Hedden, R.L. and P.L. Lorio, Jr. 1993. Management strategies to reduce losses from the southern pine beetle. Southern Journal of Applied Forestry 17: 150-154.

Clatterbuck, W. and L. Tankersley. 2001. Forest management and decision-making after the southern pine bark beetle. http://fwf.ag.utk.edu/sites/spb/pine2/SPBadvice.pdf

Evans, J.P., N. Pelkey, and D. Haskell. 2002. An assessment of forest change on the Cumberland Plateau in Southern Tennessee: Small Area Forestry Demonstration Project for the Southern Forest Resource Assessment. Report on file with U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service. Landscape Analysis Lab Research Report #5. Available at: http://lal.sewanee.edu/saa/intro.html

Flamm, R.O. 1988. The Southern Pine Bark Beetle. Dynamics of Forest Insect Populations. Plenum Press, New York.

Lorio, P.L. 1988. Growth and differential balance relationships in pines affect their resistance to bark beetles. In: Mattson, W.J., Levieva, J., Bernard-Dagan, C. (Eds.). Mechanisms of Woody Plant Defenses Against Insects. Springer, New York. Pp 73-92.

Perkins, T.E. and G.R. Matlack. 2002. Human-generated pattern in commercial forests of southern Mississippi and consequences for the spread of pests and pathogens. Forest Ecology and Management 157:143-154.

Price, T.S., C. Doggett, J.L. Pye and T.P. Holmes, eds. 1992. A history of southern pine beetle outbreaks in the southeastern United States. Sponsored by the Southern Forest Insect Work Conference. The Georgia Forestry Commission, Macon, GA. 65 p.

Showalter, T.D. and P. Turchin. 1993. Southern pine beetle infestation develop ment: interaction between pine and hardwood basal areas. Forest Science 39:201-210.

Tennessee Division of Forestry. 2002. Database: Tennessee southern pine beetle counties -1998 – 2002.

Ungerrer, M.J., M.P. Ayres and M.J. Lombardero. 1999. Climate and the northern distribution of Dendroctonus frontalis. Journal of Biogeography 26: 1133-1145.

Wear, D. and J. Greis., eds. 2002. Southern forest resource assessment. Gen. Tech. Rep. SRS-53. Asheville, NC: USDA Forest Service, Southern Forest Research Station. 635p.

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