Fighting Forest Blights

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AMERICAN CHESTNUTS

Imagine redwoods disappearing completely from the coastal range of northern California and southern Oregon, and then imagine biologists on the verge of bringing them back a century later, when few can remember what it was like to walk among these giants. What you have just pictured resembles what the forests of eastern North America have experienced over the last century, since an introduced blight brought the reign of the American chestnut (*Castanea dentata*) to an end.

American chestnuts once dominated eastern forests ranging from southern Ontario to Mississippi, providing high-quality timber as well as abundant fall mast for numerous wildlife species: black bears, white-tailed deer, squirrels and other rodents, and many birds, including the now-extinct passenger pigeons. The aggressive canker disease caused by *Cryphonectria parasitica* rendered nearly 4 million hectares of chestnuts functionally extinct. They persist today as an understory shrub that sprouts vigorously from the root collars of stumps or other seedlings, but becomes reinfected by blight before reaching reproductive maturity.

Restoration of this foundation species is now within reach, after decades of research by the American Chestnut Foundation (TACF) to breed blight resistance into American chestnuts through hybridization with the blight-resistant Chinese chestnut (*Castanea mollissima*). But reintroducing the American chestnut to its former range is fraught with other obstacles, which Douglass Jacobs, of Purdue University's Department of Forestry and Natural Resources, details in the July issue of *Biological Conservation.*

The issues that need to be addressed, says Jacobs, include government policy limitations, public acceptance, the economics and logistics of wide-scale dissemination of hybrids, additional threats posed by other exotic pests, and the potential spread of chestnuts beyond their natural range. Where to plant chestnuts will depend in part on understanding how they grow, which has been difficult to ascertain since their downfall. Another question about the hybrids is whether they will be considered native or introduced species, which will have important management ramifications that also affect where the trees can be planted.

Another concern Jacobs raises, based in part on research showing American chestnuts outcompeting native tree species in Wisconsin, is the potential for aggressive regeneration of blight-resistant chestnuts at the expense of other forest types. "There are significant concerns at present in regard to maintaining certain native forest tree species, such as oaks, in Midwestern forests," he says. "Introducing a new competitor...is likely to accelerate the current trend toward a decline of oak [and other] species."

Restoring American chestnuts will be a major undertaking requiring the cooperation of federal agencies. "A major accomplishment in this regard," Jacobs says, "was made recently when the US Forest Service signed a memorandum of understanding with TACF to make US Forest Service lands and additional resources available for chestnut restoration." The laws that govern public lands may have to be modified, too, if the once-dominant monarch is to be allowed to return.

OAK WOODLANDS

What would happen if a similar blight were to invade forests today? Are we any better equipped to deal with invasive pathogens than we were a century ago? For an answer, we can look to the oak forests of California and Oregon, which are under attack from *Phytophthora ramorum,* the plant pathogen that causes sudden oak death (SOD). For the last decade, plant specialists and others have been racing to stem the onslaught of SOD, but current land-use and forestry practices may be part of the problem.

A study by Ross Meentemeyer, of the University of North Carolina–Charlotte, and colleagues at Sonoma State University and the University of California–Davis, indicates that land-use changes and fire suppression policies have helped to establish and increase the spread of *P. ramorum.* Their work will appear in an upcoming issue of *Ecological Applications.*

By analyzing landscape changes seen in aerial photographs taken in 1942 and 2000, the researchers show that oak woodlands in Sonoma County, California, have increased in area and density over the last 58 years. While this may seem to be a positive trend, the increased abundance of infectious host trees actually makes oaks more susceptible to SOD.

P. ramorum infection takes two forms: a lethal canker infection in the primary hosts (oaks), and a nonlethal foliar infection in plants such as bay laurel, which leads to spore production and transmission of the pathogen to other hosts. Not only has the increased density of the bay laurel population contributed to SOD's spread, but according to previous work by Meentemeyer and Emiko Condeso, of Sonoma State University, *P. ramorum* thrives in cooler microclimates such as those produced when trees fill in forest canopy gaps (*Journal of Ecology,* March 2007).

The current policy of fire suppression, the authors suggest, has led to land-cover changes that facilitate disease spread and increase forests' vulnerability to tree mortality. The rapidly proliferating foliar host bay laurel is more common in areas not subjected to recurrent fire. Oaks beyond the sapling stage are fire resistant and might have been better protected from SOD if the occasional fire had been allowed to burn.

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