

Danger lurks underground for oak seedlings

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Robert Swihart, professor of forestry and natural resources, found that pine voles, when given a choice, prefer to eat oak roots. Swihart believes voles are part of the reason oak trees are having difficulty regenerating in forests. Credit: Purdue Agricultural Communication photo/Tom Campbell

Scientists trying to understand why oaks are starting to disappear from North American forests may need to look just below the surface to find some answers.

Purdue University researcher Robert Swihart found that pine voles, small rodents that live underground, prefer oak roots to those of other commonly growing seedlings. The study identifies the rodents as a possible factor leading to high oak mortality rates that are threatening the resource base of the hardwood industry.

"You see a lot of mature oaks, but you don't see a lot of oaks in the



understory beneath the canopy. If you don't see them there, you won't see mature oaks in 20 to 30 years," Swihart said. "We are facing a period in our history that could lead to a great crash in oak availability."

Swihart offered pine voles a selection of tree roots to eat in the laboratory, and they overwhelmingly gravitated toward oak roots. Voles caused more than twice as much damage to white oak roots than northern red oak and black cherry, and more than six times more damage to white oak than black walnuts. The voles snubbed yellow poplar roots altogether.

"Either the oak roots were much more nutritious and had higher energy content, or they contained fewer toxins, or some combination of those factors. Those are the main reasons an animal will choose one food item over another," Swihart said.

Swihart's study has been published in the current edition of the *Canadian Journal of Zoology*.

Under a variety of growing conditions, oak seedlings have comparatively high mortality rates, allowing other trees such as shade-tolerant maples and sun-loving, fast-growing tulip poplars to make up larger percentages of hardwood forests. Most of the studies on why oaks have a hard time regenerating have focused on competition from other seedlings, the use of acorns as food for small animals above the ground and the use of oak seedlings as food for deer.

"A lot of the focus has been on what's occurring above ground. We decided to look at what's going on below the ground," Swihart said. "We know pine voles can do a lot of damage in apple orchards, but there is little, except for a few anecdotal accounts, of what they do in their natural environment."



Swihart got the idea for his study from Ron Rathfon, a Purdue Extension forestry specialist in southern Indiana who has studied oak mortality issues. Rathfon found in 2006 that animals, later determined to be pine voles, had been responsible for killing at least 19 percent of the dead oak seedlings observed in his study area. He said the voles, which are common to eastern deciduous forests, were likely responsible for the majority of oak seedling mortality because many seedlings went missing, suggesting the voles had eaten or removed the entire plants.

There is little overall loss of oak forest to date, but Rathfon said that might change if foresters, the timber industry and landowners do not implement practices that better manage long-term oak growth and development.

"We do see some data that more shade-tolerant trees - particularly sugar maples - are becoming more prominent," Rathfon said. "It is a gradual, subtle shift that is taking place."

Swihart said the loss of oaks would have other serious effects besides losses to the hardwood industry.

"Oak mortality could reduce the capacity of hardwood forests to support wildlife populations that rely on oaks for food - everything from deer and turkey down to mice and songbirds," Swihart said.

Source: Purdue University

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