FORESTRY
As They Decay, Logs Tell A Story
By Susan Palmer
The Register-Guard
Published: Wednesday, August 24, 2005

ANDREWS EXPERIMENTAL FOREST - Ambrosia beetles have a nose for alcohol. It's what attracts them to downed Douglas firs, which give off ethanol - ethyl alcohol - on the forest floor.

The beetles are among the first insects to move into dead trees, and they bring with them a host of other invading critters.

Think of them as veritable taxi cabs, said Mark Harmon, an Oregon State University professor of forest science.

Among those hitching a ride: a fungus the beetles rely on to digest the wood. Then there's the odd mite, nematode and protozoa, all seeking the mother lode of nutrients that a downed tree represents.

"A Douglas fir, when it dies, hosts thousands of species," Harmon said.

He should know. Harmon is involved in a long-term study of rotting trees at the Andrews Experimental Forest, a 16,000-acre tract tucked inside the boundaries of the Willamette National Forest east of Blue River Lake and about 50 miles east of Eugene.

Researchers are wrapping up the first 20 years of the project, but they're only a tenth of the way complete. The plan is to track the decay process in 530 downed logs for another 180 years.

Two centuries of rot might seem a bit extreme, but the timeline reflects the speed at which things unfold in forests, Harmon said.

An old growth stand near Lookout Creek, one of six sites where logs have been placed, tagged and regularly examined since the study began, demonstrates his point. There, giant Douglas fir, hemlock and cedar tower over lacy vine maple, ferns and Pacific dogwood. In the duff below, a dozen logs of various diameters slowly decay. Many of the living trees in the grove have been around for centuries, and some of the dead carcasses will linger that long, too.

But not all of them will, Harmon said, and that's one of the interesting things discovered in the first 20 years of the project.

Tree rot progresses at unique rates, depending on the species, the various fungi that move in, the moisture content, the geographic location, even the size of the tree.

Red cedar can hold up for centuries, Harmon said. Pacific silver fir, on the other hand, will rot down to nothing in a scant 50 to 60 years.

In the grove, a 20-year-old cedar log, its heartwood exposed, resounded with a solid thunk when Harmon kicked it, but he easily punched a hole with his thumb in a nearby silver fir, so decayed that it had begun to lose its shape.

The results run contrary to expectations, he said. Foresters assumed that wood decomposed at a fairly steady rate.

The new information has implications on forest management, he said.

"If a forest is killed by fire, how long will the (remaining) fuel be around? Hemlock, true firs, some of the pines, they go really fast. Douglas firs last a lot longer," he said.

There were other surprises for researchers, who believed it would take years before wood nutrients such as nitrogen began enriching the forest. In fact, fungi invade a downed log and, with the leaching effects of rain, quickly release nutrients.

Brown rot fungi attack the cellulose in a tree, Harmon said, leaving lignin, a structural material that helps build soil. White rot fungi, on the other hand, break down the lignin, leaving little structure

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Harmon examines brown rot in a slice of Western hemlock, a species that decays quickly.

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behind.

For those whose interest in fungus doesn't extend beyond edible mushrooms, there's a practical side to such knowledge.

Nature isn't the only thing interested in breaking down a log's cellular structure. Humans do it, too, when they turn wood into paper.

Pulp mills use chemicals to break down lignin in a process that can produce pollutants such as dioxin, Harmon said. Finding a fungus that does the same thing without harmful chemical byproducts might prove useful, he said.

When the research first began in the mid-1980s, most logging operations cleared out a logging site, taking not only the trees, but the woody debris as well. It was a practice common in North America and Europe, where countries such as Germany and Sweden saw no value in decomposing wood.

When the research began, loggers hired to help place the downed trees at Andrews demanded an explanation for leaving perfectly good wood to rot, Harmon said.

Twenty years later, it's an accepted forest practice, and Harmon, only half kidding, has coined a term for exploring the role that dead trees play in forest health. He calls it morticulture.

Growing trees and allowing them to die and remain in the forest serves two purposes, one aesthetic, the other pragmatic, he said.

Aesthetically, people like a diverse forest, where species such as bluebirds and woodpeckers, which require dead trees, can thrive.

Pragmatically, there's no telling what researchers will find as they study the thriving habitat that dead trees become. Maybe it's a fungus that can help transform the paper-making industry. Maybe it's a substance that could become the basis for a useful medicine, such as taxol, a cancer-fighting compound found in the 1980s in the Pacific yew, Harmon said.

The study, funded by the National Science Foundation and the Forest Service, is still in its infancy. Researchers, besides keeping an eye on beetles and other bugs, will be trying to establish just how many trees, especially those with commercial value, need to be left for the overall health of the forest.

"That's our next big area of research," he said.