

LIFE AFTER DEATH

The amazing productivity of dead trees, both standing and fallen. **By Ellen Horowitz**

High on a ridgetop, the silver skeleton of a wind-scoured pine beckoned. As I walked beneath its thick, gnarly branch stubs, my hand followed the sleek contours of the tree's twisted trunk until I came upon an old woodpecker hole. It was late summer, nesting season was long over, and I couldn't resist the temptation to ask, "Hello, is anybody home?" Feeling certain no one was, I followed the question with a gentle knock. The unexpected answer—a bat—shot out of the hole.

I don't know who was more surprised—the bat or me—but that long-ago moment still reminds me of just how many animals rely on dead trees. In Montana, more than 60 species of wildlife use dead trees or logs for feeding, nesting, roosting, resting, denning, or drumming.

Standing dead trees (commonly called snags) and downed logs are the overlooked and underappreciated life-giving parts of any forest. Living trees with heart-rot decay,

broken or dead tops, and large dead branches also function as snags. And they too can be filled with wildlife.

Everyone knows that healthy live trees are wonderful for wildlife. Birds nest in their branches, insects eat the leaves, and the trees convert carbon dioxide into oxygen that all life on earth needs. What makes dead trees so valuable to wildlife are the small and large holes and cavities that provide shelter for birds, squirrels, bats, and even bears. Openings also allow moisture and fungi to get inside the structure and trigger rot and decay that attract insects eaten by wildlife.

"Believe it or not, a dead tree often holds more living creatures than a similar-size live tree," says Torrey Ritter, regional nongame wildlife biologist for Montana Fish, Wildlife & Parks in Missoula.

Woodpeckers, with their chisel-like bills, are renowned for drilling holes in trees, which they and other wildlife use for roosting and nesting. Fungi that cause decay also create cavities that house dozens of species. These openings can range in size from small knot-holes to entire hollow trees. Almost any injury to a tree's protective bark—caused by fire scars, lightning strikes, storm damage, insects, antler rubs, bears, and humans—can produce openings for ecologically essential fungal spores.

Fungi perform the critical job of decomposing and recycling forest nutrients. Some mycorrhizal fungi transport nutrients to trees and other plants to help



LEFT TO RIGHT: JEREMI HOLLIMAN; GARY KRAMER

PREDATORS' PREFERENCE Forest carnivores like American martens (above) and fishers den in fallen tree cavities and prey on small mammals attracted to logs.



Little brown myotis



THE LIVING FOREST Organisms that use dead trees and stumps include, from left to right, various mushroom species, red-breasted nuthatches, Lewis's woodpeckers, and northern flickers.



FAMILY AFFAIRS Snags can provide homes for dozens of bird species, including (above left) pileated woodpeckers and (above right) wood ducks.



them grow. But it's the decay-creating fungi that give "primary" cavity nesters—woodpeckers, flickers, and sapsuckers—a chance to make their holes. Without decay, even the strongest woodpecker wouldn't be able to excavate tree trunks. Some studies suggest that woodpeckers may even "soften" dead trees by transporting fungi they pick up on their beaks from infected trees.

KEYSTONE SPECIES

Woodpeckers—a family that includes flickers and sapsuckers—evolved to drill tree holes. Their stout bills pound into and gouge out wood, and their musculoskeletal structure prevents whiplash and headaches from repeated hammering. The birds' toes provide grip for clinging and walking up tree trunks, and the powerful tail braces the bird's lower body against the tree to offset the forward strokes of the head.

Woodpeckers are often described as keystone species or keystone architects because their holes are essential for a variety of "secondary" cavity users. These songbirds, raptors, waterfowl, and small mammals cannot excavate new cavities themselves but use existing ones for nesting, denning, or shelter. Researchers estimate that about 25 percent of bird species nesting in the Northern Rocky Mountain forests are cavity nesters. "Loss of

Ellen Horowitz is a writer in Columbia Falls.

a keystone species like the pileated woodpecker could lead to cascading effects including harm to other species," Ritter says.

CREATING MORE CAVITIES

Nest cavities provide better protection from the elements and predators than open nests. A typical woodpecker nest consists of an entrance hole and a short horizontal tunnel leading to a vertical pouchlike chamber within the tree trunk. The entrance is chiseled out just wide enough for the woodpecker to slip through.

Most woodpeckers excavate a new nest hole each spring, leaving their previous years' models as turnkey homes for other wildlife. Western and mountain bluebirds, tree and violet-green swallows, and house wrens are just a few of the secondary cavity nesters

that use the old nests. Once these birds claim a suitable abode, they build their own nest atop the woodchips left behind by the original architect and occupant. Chickadees and nuthatches also use woodpecker or natural holes (though both can whittle their own original nest cavities in soft, decayed wood if necessary).

North America's largest woodpecker, the pileated, needs large-diameter trees for its massive interior nests. The pileated's egg-shaped entryway measures about 4 inches high and 3.5 inches wide. The spacious nesting chamber, chiseled into decaying heart-

wood, averages 18 to 24 inches deep and 8 inches wide. It takes three to six weeks for the woodworkers to complete construction. The cavernous nests are later used by wood ducks, buffleheads, goldeneyes, and hooded mergansers, as well as northern pygmy, northern saw-whet, flammulated, screech, and boreal owls.

Studies in northwestern Montana's western larch (tamarack) forests show that a 20-inch-diameter tree is usually more than 200 years old, and that pileated woodpecker nest trees average 29 inches in diameter. Unfortunately, such old, large trees are uncommon in many managed forests.

Northern flickers are Montana's second largest woodpecker and the one most common in many forests. Some smaller ducks and raptors make do with a flicker's more cramped quarters when nothing else is available.

A large tree perforated with cavities becomes a high-rise condo for multiple species if there's sufficient distance between holes.

"Believe it or not, a dead tree often holds more living creatures than a similar-size live tree."



Mountain bluebird



Northern flying squirrel

CLOCKWISE FROM TOP: LEFT, RICK CLARK; ALEX BADAIEV; ERIN BRAATEN; DONALD M. JONES

CLOCKWISE FROM TOP: LEFT, DANIEL ELLISON; GARY KRAMER; KERRY T. NICKOU

Researchers in northwestern Montana documented a red-naped sapsucker, a tree swallow, and a mountain chickadee all nesting in a single western larch snag. Researchers in the Bitterroot Valley documented Lewis's woodpeckers nesting in a tree with one to three other bird species, including an American kestrel. Near Missoula, researchers recorded a northern pygmy owl and a northern saw-whet owl simultaneously nesting in the same snag. The pygmy owl took the west-facing cavity about 8 feet up while the saw-whet chose an east-facing cavity 19 feet above ground level.

Birds aren't the only wildlife using tree

cavities. Shannon Hilty, FWP regional nongame wildlife biologist in Great Falls, says that at least eight of Montana's 15 bat species use cavities or crevices within snags for roosting. "These features provide vital habitat for female bats raising pups," Hilty says. Flying squirrels, tree squirrels, and American martens use tree cavities for denning, resting, and protection. Raccoons, porcupines, short-tailed weasels, mice, and bushy-tailed woodrats also shelter in woody openings. The list goes on and on.

OTHER USES OF SNAGS

Almost every part of a dead tree is a type of habitat. Exposed high branches provide hunting perches for kestrels, hawks, and bald eagles. The Lewis's woodpecker, unlike most members of its family, launches from its perch to snatch insects midair before returning to the branch to dine.

Treetops are used for musical performances in springtime. An olive-sided flycatcher's easy-to-recognize song resembling the phrase, "Quick, three beers," carries long distances from a high perch. Some woodpeckers select trees with large, hollow branches as drumming towers to advertise territory and announce themselves to mates or potential mates.

A broken-topped tree is one of the few

natural platforms that can support an osprey's large stick nest. Great gray owls also use large, broken-topped snags for nesting, if located near a forest edge suitable for hunting.

Flocks of Vaux's swifts require large, hollow old-growth conifers or cottonwoods for communal roosting and nesting. The opening and cavity must be big enough to allow dozens or even hundreds of birds to fly in and out. As nightfall approaches, the swifts begin to swarm, moving in unison through the sky until making a final spiraling descent into the tree. Once inside, they cling vertically to the interior walls with their tiny claws.

Bears will overwinter in hollow or partially hollow trees, or in tree openings as high as 50 feet above ground. In 2018, a webcam in Glacier National Park kept tabs on a black bear waking up from his long winter sleep in a hollow tree (see the video by scanning the QR code on the "Hollow homes" sidebar, page 27).

Another habitat is hidden where loose bark recedes from the trunk of a large dead or dying tree. This specialized space is used by brown creepers, the only North American birds that construct nests behind sloughing bark. Several bat species, including the long-eared myotis, little brown, and silver haired, also squeeze themselves behind loose snag bark to roost.



MORE CRITTERS Clockwise from top left: American kestrel emerging from a cavity; ruffed grouse drumming on a downed log; boreal toad in a charred stump depression that gathers water; yellow-pine chipmunks keeping an eye out for predators; bull trout hiding from otters and ospreys under downed dead branches and logs; a great gray owl with two chicks in a broken-top tree.

WHEN A SNAG TOPPLES

Even when a dead tree falls, its story continues. As world-renowned forest ecologist Jerry Franklin, a professor emeritus at the University of Washington in Seattle, wrote, “At the time a tree dies, it has only partially fulfilled its potential ecological function.” Even forests with vast numbers of dead trees—like those hit by severe beetle kill or wildfire—are considered healthy by forest ecologists. For instance, male ruffed grouse conduct their springtime drumming display atop downed logs—something they can’t do when a tree is live and upright. Juncos frequently choose nest sites in the space underneath partially supported logs.

Logs, stumps, and large fallen tree limbs create miniature overpasses and highway systems that allow squirrels and chipmunks

to race across the forest floor, as well as places for small rodents to sun, eat, and watch for predators.

This “coarse woody debris,” Hilty says, is especially critical to voles, shrews, and mice that remain active throughout winter. “It can create a more extensive ‘subnivean’ [beneath the snow] space that provides foraging habitat and pockets of different sizes and pathways.” American martens and fishers in turn hunt

“At the time a tree dies, it has only partially fulfilled its potential ecological function.”

the small rodents in the woody structure.

Fish also benefit from dead trees that topple into mountain streams and rivers. Bull trout, especially, use this underwater cover to hide from predators like otters and ospreys. Wind blows ants, beetles, and other insects that feed on downed trees and branches into streams, providing essential protein for many fish species.

Toppled trees also create stream pools and side channels, while rootwads of fallen trees are used by otters, mink, American dipper, Pacific wrens, and other animals.

Many other forest organisms find hidden habitats within and beneath logs. Fungi begin the decomposition process. Mites, spiders, snails, slugs, millipedes, and pill bugs are detritivores that dine on the decaying organic matter. Carpenter ants, often



ORGANIC MATTER EATERS Centipedes, millipedes, sow bugs (above), slugs, snails, earthworms, and a wide range of insects, such as earwigs, ground beetles, and spring-tails, are detritivores that eat dead trees and provide food for birds and other wildlife.

mistakenly blamed for eating trees, are simply taking advantage of easy digging within a log or stump’s soft, fungus-infested heartwood to build their nests. In the forest, carpenter ants play a beneficial role by preying on other insects and recycling organic matter. They also provide protein-rich food for pileated woodpeckers and bears.

Another thing logs do is soak up water

like a sponge, helping them retain moisture even during summer drought. Salamanders, rubber boas, and boreal toads burrow or shelter beneath the cool, moist logs to wait out the heat of the day.

Finally, logs turn into soil. Slowly decomposing over the course of decades or centuries, the downed tree trunks enrich the forest floor while supporting the growth of lichens, mosses, and mushrooms on their surfaces. In moist forests, they serve as nursery logs, providing seedbeds for other plants, including trees, to get their start

“Dying and dead wood provides one of the...greatest resources for animal species in a natural forest,” wrote Charles S. Elton, a British ecologist and contemporary of Aldo Leopold. “[If] fallen timber and slightly decayed trees are removed, the whole system is gravely impoverished of perhaps more than a fifth of its fauna.”

The next time you come upon snags while walking through the woods, don’t mourn for the dead trees. Celebrate the life those vital habitats are giving to wildlife today—from songbirds to black bears—and will continue to give, even when toppled and decayed, far into the forest’s future. 🐻



RENEWAL Even trees grow from old, dead trees, completing a full circle of forest life.

Hollow homes

A “hollow” tree is defined as one with such advanced decay throughout its interior heartwood that a hollow core forms. Biologists consider large-diameter (20-plus inches) hollow trees especially useful to wildlife. Studies in northeastern Oregon indicate that roosting and nesting Vaux’s swifts require a tree averaging 27 inches wide and 85 feet tall. Hollow treetops for denning black bears average more than 43 inches wide and 57 feet high.

Hollow snags and hollow logs always start with a live tree. The hollowing process begins when the live tree is damaged. Strong winds, for example, may snap off a treetop or large branch, exposing it to airborne heart-rot fungal spores. Deep fire scars at the tree base can also create an opening for fungal spores. These fungi do their work only in live trees.

After many decades, the decayed heartwood detaches from the sapwood, resulting in a hollow chamber. Since the live outer sapwood isn’t affected, the tree retains its hard, protective shell while continuing to grow. In other words, a tree can be hollow and still very much alive.

Because they look intact from the outside, hollow trees can be tough to identify unless there’s an obvious opening. But they are worth finding, because these trees always house some sort of wildlife. Look for live trees with:

- ▶ a broken top,
- ▶ evidence of multiple pileated (or other) woodpecker cavities,
- ▶ appearance of shelf fungi close to branch stubs or live branches, or
- ▶ hollows (knotholes) where large branches have broken off. ■



A black bear peers out from its den in a hollow log.



Scan the QR code at left to see a sleepy black bear emerging after hibernation in a large Glacier National Park snag cavity.

CLOCKWISE FROM TOP: LEFT, JAY STYLES; DONALD M. JONES; JEREMY ROBERTS; JOHN LAMBING; PAT CLAYTON; DONALD M. JONES

CLOCKWISE FROM TOP: LEFT, KATIA SCHULZ; SHUTTERSTOCK; RICK CLARK