

Pennsylvania Woodlands

Dead wood for wildlife

NUMBER 7

Most of us would have little difficulty responding if asked what value trees have for people. Living trees provide shade. Trees filter air and produce oxygen with their leaves. Trees can soften the impact of rain, prevent soil erosion, produce food, and are pleasing to the eye. Harvested trees provide many valuable products for people. When a tree is cut, it can be used to frame, insulate, or heat a house. This article was written and reproduced on paper made from trees.

But most of us would have much difficulty relating the value that trees have for wildlife, especially dead trees. Trees do have special value for wildlife. Dead parts of live trees and dead trees, whether standing (snags) or fallen (logs), are particularly important resources.

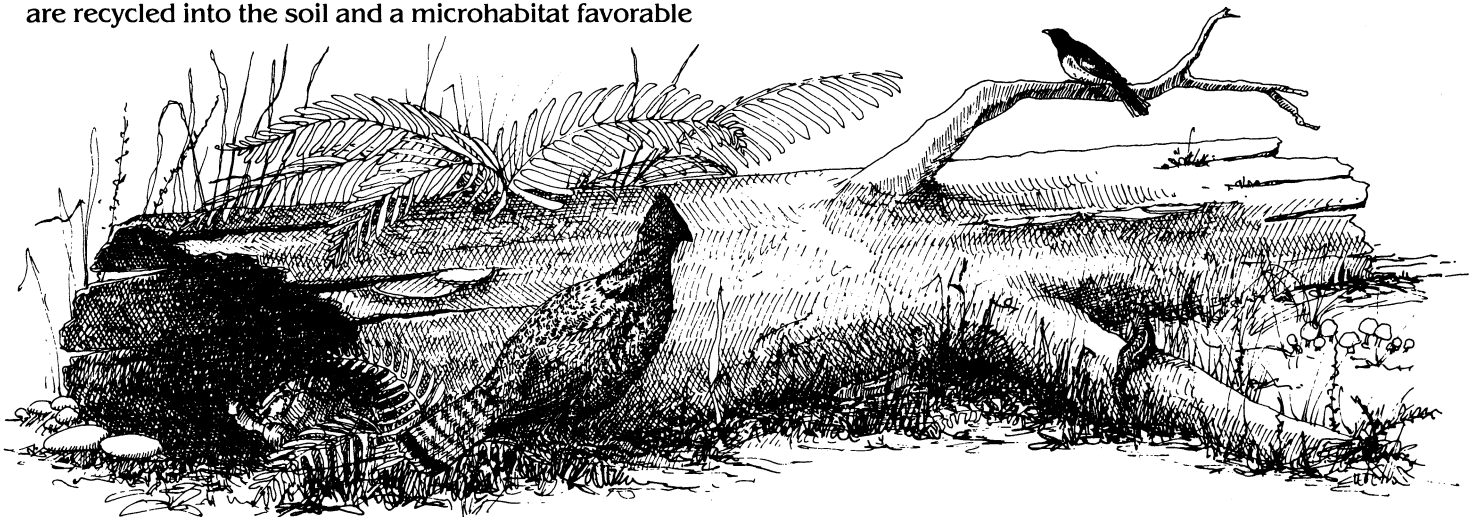
Felling a tree for whatever reason alters wildlife habitat. The effects can be beneficial or detrimental, planned or haphazard. Some people believe leaving dead trees in the forest to rot is a waste of resources. However, dead trees offer both shelter and food to many wildlife species. Dead limbs and trees are a natural and desirable part of wildlife habitat. The existence of numerous species depends on the presence of dead trees. A fallen tree becomes infested with fungi and insects. As the tree decomposes, nutrients are recycled into the soil and a microhabitat favorable

for the growth of new tree seedlings is often created.

Insects, salamanders, snakes, mice, and shrews seek refuge in rotting logs. Skunks, bears, and woodpeckers repeatedly return to these cafeterias for easy pickings. Depending on a log's location relative to good cover, a grouse may use it as a drumming site. Some rot-resistant logs have been used by generations of ruffed grouse.

The accumulation of organic material, including damp, rotting wood and leaves, favorably affects mushroom populations. Mushrooms are food for insects, turtles, birds, mice, squirrels, and deer. During critical winter periods, highly nutritious mushrooms can compensate for nutrient deficiencies in the native forage of deer.

Ruffed grouse and rufous-sided towhees, among other species, nest under partially elevated logs. Depending on their size, hollow logs can shelter a variety of forest mammals such as shrews, chipmunks, and bears. Foxes and coyotes also may use logs for dens. For some mammals, including deer mice, chipmunks, and squirrels, log tops are highways over the forest floor. Often the rattlesnake coils next to a log and waits for food to arrive.



Logs and stumps meet the special habitat requirements of the redback and slimy salamander. The four-toed and longtailed salamanders hide in moist, decaying wood. The eggs of the northern spring salamander are laid in running water under logs. Greater and lesser gray tree frogs may be found in hollow trees, under loose bark, or in rotted logs during the summer. Seven species of turtles bask on logs that are in or near water. The eastern box turtle may burrow under a log during hot weather. The northern fence lizard is found in log piles and around stumps and hibernates in the rotting wood. Special habitat requirements of the five-lined skink include open woods with logs and slash piles.

Snakes use logs for shelter and food-seeking activity. Some species, such as the eastern garter snake and the eastern worm snake, hibernate in rotting wood. At least 19 kinds of salamanders and 26 species of reptiles make some use of logs, stumps, bark, and slash piles in Pennsylvania's forests. Ecologists believe dead wood is one of the greatest resources for animal species in the forest.

Wildlife use of dead snags and cavity trees

Standing dead tree (snags) and dead parts of live trees offer both room and board for many kinds of wildlife. Tree cavities in live or dead trees are used by 35 species of birds and 20 species of mammals in Pennsylvania (Tables 1 and 2).

Wood ducks look for tree cavities near water. Barn owls look for nest sites that are near large fields. Bluebirds can nest in wooden fence posts bordering farm fields, or they can occupy holes in snags that are left in recently clearcut areas. Unlike the barn owl and bluebird, pileated woodpeckers are birds of the big woods and nest in tree holes far from fields. Table 1 lists the habitat of 35 bird species that nest in tree cavities.

In addition to location, the nature of the cavity tree is important to wildlife. Some species choose a cavity in either a live or a dead tree; this is not true of all species. The yellow-bellied sapsucker, for example, constructs a new cavity each year in a live tree. The northern flicker, on the other hand, uses or excavates cavities in dead trees. Whether a snag is hard (sound) or soft (punky) also determines which birds use it. The pileated and hairy woodpeckers choose to nest in hard snags. The brown creeper nests under exfoliating bark of hard snags. The black-capped and Carolina chickadees prefer to excavate nesting cavities in soft snags.

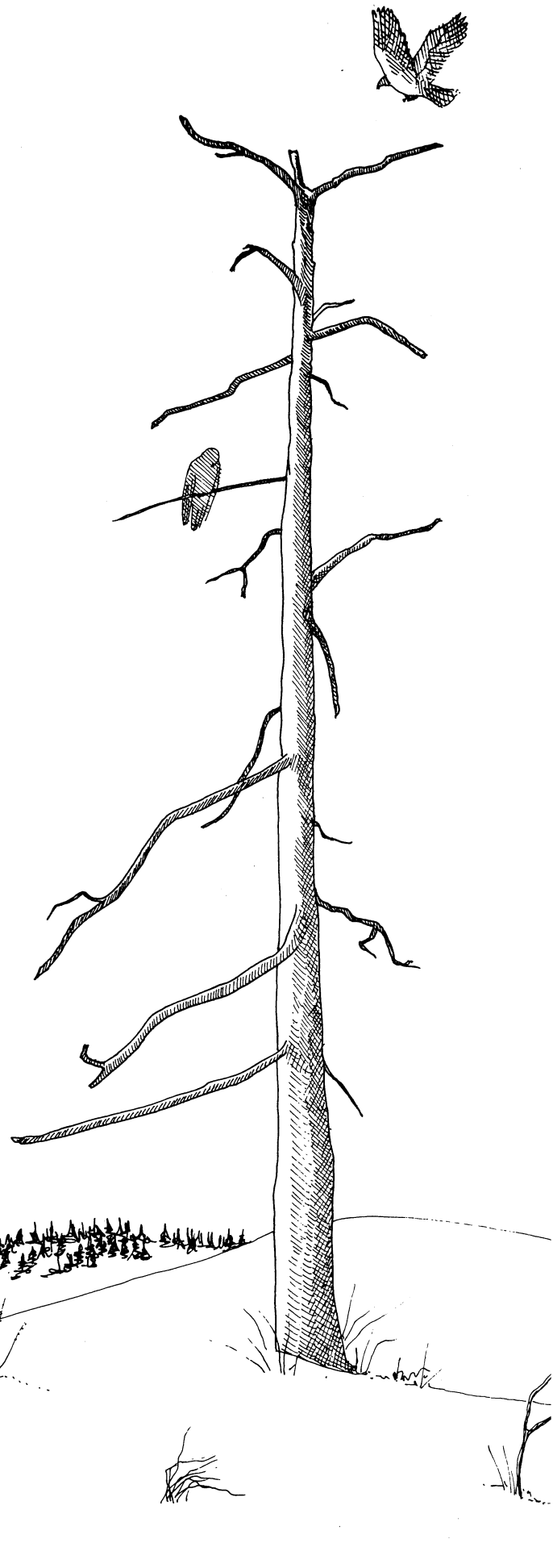


TABLE 1. Birds that use tree cavities in Pennsylvania.

CAVITY-USING BIRDS	CUTTING SITE AND TYPE OF CUTTING ACTIVITY*					FREQUENTLY CHOSEN CAVITY TREE TYPE**		
	FOREST INTERIOR		FOREST-FIELD EDGE	NEAR WATER, WETLAND	SCATTERED TREES, LARGE FIELDS	LT	DEAD	
	A	B	C	D	E		HS	SS
Wood Duck				x		x	x	x
Hooded Merganser				x		x	x	x
American Kestrel			x		x	x	x	x
Barn Owl			x		x	x	x	?
Screech Owl		x	x		x	x	x	x
Barred Owl	x			x		x	x	x
Saw-whet Owl	x			x			x	x
Great Horned Owl	x	x	x	x	x	x	x	x
Chimney Swift			x	x	x	x	x	x
Northern Flicker		x	x	x	x		x	x
Pileated Woodpecker	x			x		x	x	
Yellow-bellied Sapsucker	x	x	x	x		x		
Hairy Woodpecker	x			x		x		
Downy Woodpecker	x	x	x	x			x	x
Red-headed Woodpecker		x	x	x	x	x	x	x
Red-bellied Woodpecker	x	x		x		x	x	?
Great Crested Flycatcher	x	x	x	x		x	x	x
Tree Swallow			x	x		x	x	x
Black-capped Chickadee	x	x	x	x				x
Carolina Chickadee	x	x	x	x				x
Tufted Titmouse		x	x	x		x	x	x
White-breasted Nuthatch	x	x	x	x		x		
Red-breasted Nuthatch	x			?		x	x	x
Brown Creeper	x			x			x	
Winter Wren	x	?		x		x	x	x
Carolina Wren	x	x	x	x		x	x	x
House Wren		x	x	x	x	x	x	x
Bewick's Wren		x	x	x	x	x	x	x
Prothonotary Warbler	x			x		x	x	x
Eastern Bluebird		x	x		x	x	x	x
Purple Martin		x	x		x		x	?
European Starling			x		x	x	x	x
House Sparrow			x		x	x	x	x
Turkey Vulture	x	x	x	x				x
Black Vulture	x	x	x	x				x
TOTAL:	19	19	24	27	14	26	29	27
PERCENT:	54	54	69	77	40	74	83	77

* **Type of tree cutting activity.** **A:** partial cutting within a woodlot, often a diameter limit cut or thinning; **B:** cutting heavy enough to create clearings within a woodlot, often a clearcut; **C:** cutting within 100 feet of a field, often fuelwood removal; **D:** any cutting near a stream, pond or within other wetland sites; **E:** Removal of trees competing with crops or for purposes of site development, often the elimination of a fencerow.

** **Cavity tree type.** **LT:** a live tree with a cavity large enough to shelter the indicated species; **HS:** a hard or firm, dead snag with or without bark and with a cavity large enough to shelter the indicated species; **SS:** a soft, punky, dead snag with a suitable cavity.



TABLE 2. *Mammals that use tree cavities in Pennsylvania.*

Opossum	Red Squirrel
Pipistrel Bat	Eastern Flying Squirrel
Little Brown Bat	Northern Flying Squirrel
Keen Bat	Chipmunk
Indiana Bat	Deer Mouse
Silver-haired Bat	White-footed Mouse
Big Brown Bat	Porcupine
Evening Bat	Raccoon
Gray Squirrel	Black Bear
Fox Squirrel	Long-tailed Weasel

Only the squirrels and perhaps one or two kinds of bats are obligate cavity nesters. Other species may use cavities if they are available.

In addition to the soundness and location of a cavity tree, other factors that may affect its use by wildlife are:

- The size of the cavity. Will the entrance accommodate a bluebird, a barn owl, a squirrel, a raccoon, or a bear?
- The diameter and height of the cavity tree. The house wren and bluebird rarely nest in holes more than 12 feet above the ground, while pileated woodpecker cavities are found higher than 15 feet. Generally speaking, the larger the cavity nester, the larger the diameter of the tree selected for nesting.
- The direction faced by the cavity entrance. Screech owls, for example, often choose cavities with north-facing entrances and consequently, low internal-light levels.
- The relationship to other cavity trees. Cavity trees chosen by gray and fox squirrels are often located near other cavity trees.
- The nature of the woodlot. Although most species choose stands of deciduous trees or mixed stands including some evergreens, the sawwhet owl prefers stands of evergreens. Whether a cavity tree is located in a woodlot with a dense or open understory also affects its use by some species. Hairy and downy woodpeckers prefer open and dense understories, respectively. Similarly, dense understories favor gray squirrels whereas more open understories attract fox squirrels.
- The time of the year. Cavity trees are used for nesting, roosting, winter shelter, escape, food storage, and foraging. One researcher found that amphibian and reptilian use was highest in the summer and early fall, followed by high mammalian use in the late fall and winter. Bird use is greatest in spring and early summer. People cleaning bird boxes in early March frequently evict deer mice from their winter apartment.

The presence of cavities or the possibility of excavating cavities in wood with heart rot or other decay is not the only attraction of a dying or dead tree for wildlife. Snags are a common source of insects and other invertebrates. This food source may be exceptionally important for overwintering birds.

If snags are houses and cafeterias, they are also airports. Flycatchers use snags for launch sites as they sally forth time and again after flying insects. A snag that borders a field or orchard may be used constantly by hawks and owls while they wait for an errant field mouse. Similarly, kingfishers, ospreys, and bald eagles perch on or fish from dead trees standing in or near water. At least 30 kinds of birds commonly use snags for foraging perches. In addition, the indigo bunting, northern mockingbird, and crow are among species that regularly use snags for singing perches.

Using dead wood for wildlife rather than fuelwood requires some choices. The fuelwood value of a hollow tree must be weighed against the possible value of a squirrel potpie. A favorite raccoon den in a hollow oak could yield four young raccoons per year. If a prime pelt is worth \$10.00, is the dead tree worth \$40.00 per year?

Aside from food or dollar values, the recreational values of such species are, for many of us, worth leaving a few hollow trees and logs on every acre. You may be hunting squirrels, wood ducks or grouse, or trying to take that special photograph of a bluebird. The entertaining chickadee on your bird feeder may have been born in the hollow aspen tree behind your house. These values are not measured by dollars, but by feeling.

The poet Robert Frost put one such intangible value in perspective:



*The way a crow
Shook down on me
The dust of snow
From a hemlock tree*

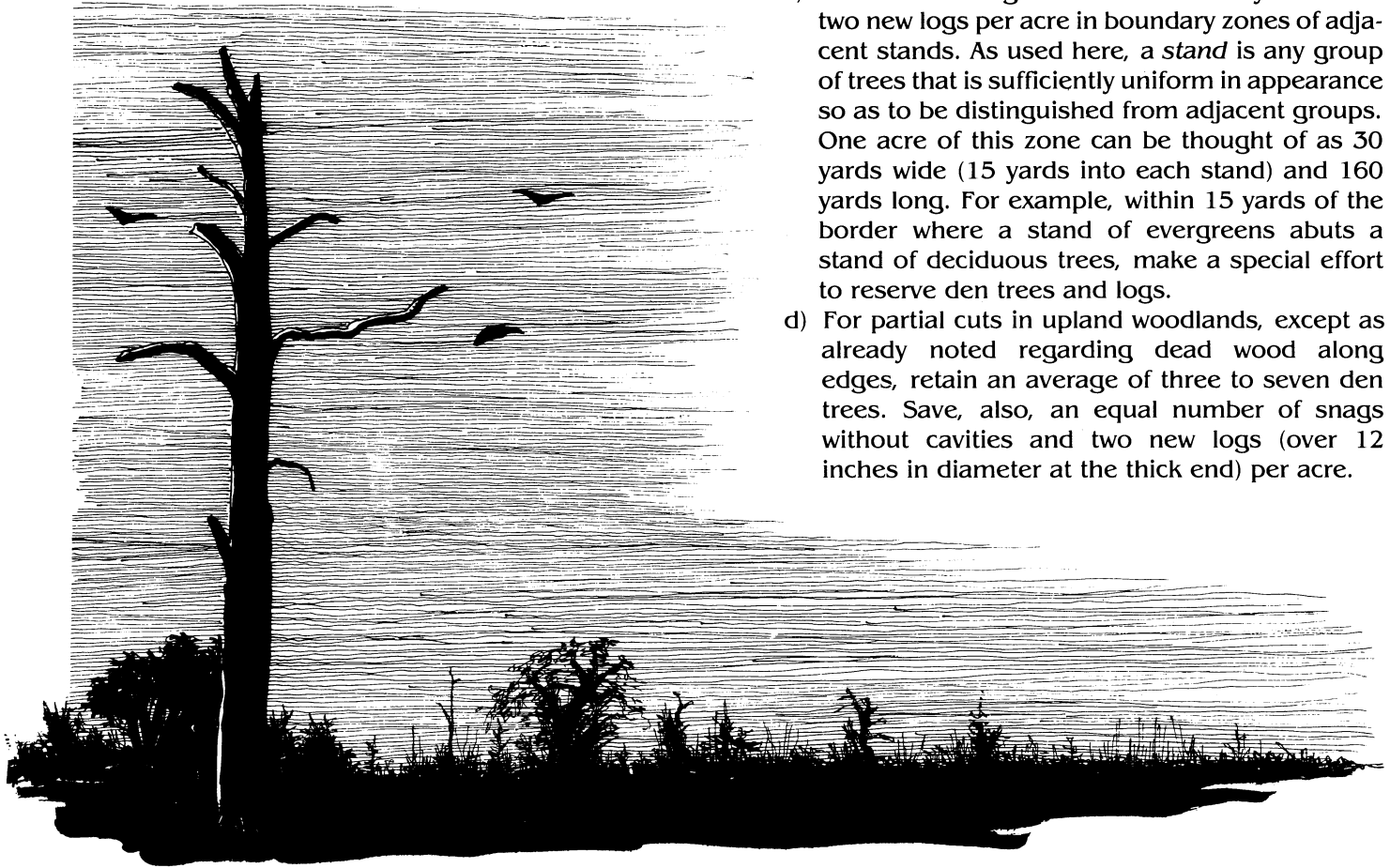
*Has given my heart
A change of mood
And saved some part
Of a day I had rued.*

Insect populations

The regulation of insect populations is a complex issue. Insects form a major part of the diet of 80 percent of the cavity-using birds in Table 1. Nine of 20 mammals using tree cavities depend on insects for food. Shrews, salamanders, and reptiles that make use of logs, stumps, bark, and slash piles constitute an additional 50 species that forage for insects.

Insect damage to trees is a significant cause of loss. Insectivorous cavity-nesting birds, in many cases, play an important role in the regulation of forest insect populations. Scientists believe that the most important role of birds is the prevention, rather than the suppression, of insect infestations. The protection of cavity-nesting bird populations by promoting forest diversity and leaving snags and den trees is advocated as an economical means to help prevent insect outbreaks in the managed forest.

Many people are familiar with the purple marten's ability to consume large quantities of flying insects. A single purple marten may consume hundreds of mosquitoes in one evening, but bats are the champion. They are the only major predator of night-flying insects. A single big brown bat can consume thousands of mosquitoes before dawn. It is evident that woodlots are best protected from insects by a full complement of species including birds, mammals, reptiles, and amphibians. The alternative could be loss of annual tree growth or expensive spraying of insecticides.



MANAGEMENT CONSIDERATIONS

1. Selective cutting, when only a portion of the trees in a stand is removed in activities such as fuelwood cutting or timber stand improvement, is most likely to be concentrated in areas of vehicle accessibility. This procedure results in removal of snags and logs from *woodland border zones* and fencerows and from *wooded bottoms* traversed by both stream and road. These are precisely the sites where use by wildlife and competition for available nesting and cover sites are greatest (Table 1). Observing the following guidelines can lessen the detrimental aspects of tree harvests in these "edge zones."

- a) Avoid cutting or removing hollow trees and limbs on the ground or standing trees (live or dead) within 15 yards of a field. In woodland areas that are immediately adjacent to this zone, reserve an average of from five to ten den trees per acre. Retain all existing logs with varying degrees of decomposition and at least four new logs (e.g., hollow butt sections of felled trees) per acre.
- b) Avoid cutting or removing hollow trees and limbs within 30 yards of water zones (e.g., streamside riparian zones). In woodland acres that are immediately adjacent to this waterside zone, reserve up to 25 den trees (average 15) per acre. Again, retain logs as described in "a" above.
- c) Retain an average of five to ten cavity trees and two new logs per acre in boundary zones of adjacent stands. As used here, a *stand* is any group of trees that is sufficiently uniform in appearance so as to be distinguished from adjacent groups. One acre of this zone can be thought of as 30 yards wide (15 yards into each stand) and 160 yards long. For example, within 15 yards of the border where a stand of evergreens abuts a stand of deciduous trees, make a special effort to reserve den trees and logs.
- d) For partial cuts in upland woodlands, except as already noted regarding dead wood along edges, retain an average of three to seven den trees. Save, also, an equal number of snags without cavities and two new logs (over 12 inches in diameter at the thick end) per acre.

2. Clearcutting, when most of the trees in an area are removed, creates a temporary opening and edge in a woodland, and extra bird species are attracted to the forest (Table 1). Under these circumstances, larger woodlands can be attractive to 27 cavity-nesting birds, and most cavity-using mammals and other species if the following guidelines are applied.

Clearcuts, in which all trees, dead or alive, are removed, have a long-term detrimental impact on wildlife dependent on dead wood. The young trees that spring up following clearcutting are not large enough to provide the configuration of dead wood accumulated in the mature stands before clearcutting, and a dead-wood deficit develops about 15 years after cutting. This deficit occurs earlier if slash is removed by fuelwood cutters. This deficit may span 40 or more years. For example, depending on its location in Pennsylvania, a clean 20-acre clearcut site is relatively unattractive to 100 or more wildlife vertebrates (birds, mammals, amphibians, and reptiles) for 40 or more years. Conversely, observing the following guidelines can help provide long-term benefits for these same species.

- a) Do not clearcut within 30 yards of water. Partial cutting in this waterside buffer strip should be confined to the solid, live, hardwood trees. Note: Slopes next to streams should have wider buffer strips; the steeper the slope, the wider the buffer.
- b) Within clearcuts, reserve at least a $\frac{1}{3}$ - to $\frac{1}{5}$ -acre clump of trees for every 5 acres clearcut. Each clump should contain one or more live trees with a squirrel-sized (2 $\frac{1}{2}$ inches) or larger den entrance. Partial cutting within these tree clusters should be avoided.
- c) Beyond clumps, an average of six to thirteen individual den trees and other snags can be reserved per acre. Den trees should be maintained along clearcut borders, in finger draws, and at the lower end of slopes that will help minimize blowdowns. Blowdowns are not, however, wholly objectionable because they contribute logs to the forest floor over time. This process benefits a different set of wildlife species.
- d) Logs are important as wildlife habitat because they last longer than slash. For best distribution of logs on clearcut sites, noncommercial sections of butt logs should not be piled at the log-loading site. Rather, they should be severed from the saleable portion of the log and left at the felling site. Logs oriented along the contour will slow erosion and trap debris. In addition to all older logs with varying degrees of decomposition, at least two new logs (over 12 inches in diameter at the large end) should be retained for every acre cut.
- e) Woody debris (slash) should be reserved on at least 10 percent of the area being clearcut.

3. Additional management tips:

- a) No one can have everything on every acre. In effect, all of the above guidelines should be prefixed with: "If the choice exists...."
- b) A uniform distribution of cavity trees may be both impractical and, from the standpoint of wildlife, undesirable. The figures used in #1 and #2, above, are averages that should be used as guidelines. A few acres may have an excess of cavity trees. This excess can compensate for the many acres that have few or no cavity trees.
- c) If the choice exists, large (over 19 inches dbh), medium (10 to 19 inches dbh), and smaller (less than 10 inches dbh) den trees should be reserved on the same acre, especially in edge zones. A mixture of both live and dead cavity trees is also desirable.
- d) If cavity trees do not exist where you want them, reserve trees with potential for developing a cavity. Candidates include dead or partially dead trees, e.g., a live tree with a broken top.

SUMMARY

Dead wood, both standing and down, serves as important wildlife habitat. Wildlife evolved in forests where dead wood was never removed in the name of woodland management. The increasing demand for forest products has, in many instances, resulted in a lack of dead wood habitat for wildlife. Application of the management guidelines listed in this publication can help to provide some of this important habitat in your woodland.

Can you afford to provide some wood for wildlife habitat, to leave some dead and dying trees, as well as a few hollow logs on every area? Considering the many rewarding values of wildlife that are dependent on this resource, the question might better be phrased: Can you afford not to do this?

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