MANAGING DECAYING TREES

FOREST STEWARDSHIP MANAGEMENT NOTE #28

"There is life in dead trees."
- Animal Inn -

INTRODUCTION

The role of decaying trees is one of the most widely misunderstood aspects of woodland management. Many foresters formerly thought of decaying trees only as dangerous and ugly sources of diseases and pests. Now, however, most foresters understand that moderate numbers of dead trees not only provide critical habitat for many kinds of wildlife, such trees actually improve forest health in many ways. For example, adequate populations of hole-nesting birds can suppress insect outbreaks (#8,10,14). Unfortunately, many well-meaning landowners still strive to obtain as much of their firewood as possible from dead trees.

Michigan's Forest Stewardship Incentive Program (SIP) recognizes the value of decaying trees for wildlife by cost-sharing the protection and creation of snags and cavity trees. The use of large woody debris to improve stream habitat may also be eligible for cost-sharing.

This Note summaries the value of decaying trees for wildlife and other woodland ecosystem functions and provides guidelines for ensuring an adequate supply of such trees in private, nonindustrial woodlands. Sources of further information are listed.

TYPES OF DECAYING TREES AND WHY THEY ARE VALUABLE

1. TYPES OF DECAYING TREES

LIVE CAVITY TREES - Many living trees develop cavities or hollows in them. Such trees are called den trees when their cavities are used by mammals. Cavities usually develop from wounds or diseased spots, but such trees are often otherwise healthy and may live for many decades, although some deteriorate quickly.

SNAGS - The term "snag" refers to dead, or nearly dead, trees that are still standing. Snags often contain cavities, and depending on tree species and the type of decay organisms present, they may be short- or long-lived. The classification of a snag as "hard" or "soft" is somewhat subjective (#10). Generally, hard snags are dead or partially dead trees with at least some limbs remaining and with fairly sound wood. Soft snags are in advance stages of decomposition (punky) and rarely have limbs.

DOWN TREES - The rate of decay usually increases when trees fall to the ground, but some tree species remain recognizable for many decades even when down. Fallen trunks and big limbs are often called large (or coarse) woody debris.

2. VALUE TO WILDLIFE - "Dying and dead wood provides one of the two or three greatest resources for animal species in a natural forest, and...if fallen timber and slightly decayed trees are removed the whole system is gravely impoverished of perhaps more than a fifth of its total fauna" (#8).

The importance of dying and dead trees comes from their use by wildlife as homes, cafeterias, and airports (#14). Many types of birds, mammals, and other kinds of wildlife nest or den in tree cavities or under loose bark (#8). Such trees also provide food in the form of insects and fungi for a changing sequence of animal species as they gradually decay (#8). Furthermore, many wildlife species that neither live in nor feed on dying and dead trees, use them extensively as launching pads for hunting or perches for resting.

Species, such as woodpeckers, that make their own cavities in trees are called primary excavators, whereas those that use natural cavities or those made by primary excavators are called secondary users.

3. VALUE TO AQUATIC LIFE - Large woody debris that falls into streams provides cover for fish, attachment surfaces for small organisms, and nutrients for fueling aquatic food chains (#11). Logs in streams also have beneficial effects on water flow, causing eddies that remove sediment and expose gravel beds that are need by spawning fish. Techniques for stream habitat improvement rely heavily on the use of strategically placed logs (FSMN #31).

Partially submerged logs along the edges of wetlands, ponds, and lakes, as well as floating logs, provide basking and resting sites for amphibians, reptiles, birds, and mammals.

4. VALUE TO SOIL - Decaying wood contributes to the vigor of forests by releasing the nutrients stored in trees and recycling them for new growth. Downed wood generates as much as a third of the organic matter in forest soil (#1), improving its fertility and its moisture-holding capacity. As sites for nitrogen fixation, rotting logs further contribute to soil fertility and forest productivity (#11).

5. VALUE TO VEGETATION - The trunks of fallen trees often become "nurse logs" on which wildflower and tree seedlings proliferate (#16). When trees that fall pull up their roots, the exposed soil in the pit and on the root mound create additional types of sites for tree regeneration.

MANAGING DECAYING TREES IN PRIVATE WOODLANDS

1. OBJECTIVES FOR DECAYING TREES

TYPES OF DECAYING TREES - To encourage a diversity of wildlife, landowners should strive for a diversity of decaying tree types, including live cavity trees, snags, and down trees of various species, diameters (especially large), heights, and degrees of decomposition. For landowners who want to promote selected species, detailed information is available on the types of decaying trees and locations preferred by specific kinds of wildlife (#3,5,7,9,10,12,16,17).

LOCATIONS OF DECAYING TREES - In general, decaying trees should be distributed throughout the woodland, but they will tend to be more valuable to wildlife in certain areas. For example, large-diameter cavity trees are especially valuable near water bodies as nest sites for waterfowl. Because they are relatively undisturbed, riparian buffer zones are another good location for decaying trees (#5). Live cavity trees and snags are also especially valuable along the edges of openings, both as nest sites and perches for open country birds. For safety reasons, trees with a high risk of falling should not be retained near areas frequented by people, such as roads and trails.

DENSITIES OF DECAYING TREES - The more important wildlife is to the landowners, the more decaying trees should be present, up to a point. According to Michigan SIP guidelines, the optimum densities for marking decaying trees to be protected for wildlife are 2-4 live cavity trees per acre (preferably 15" or greater in diameter) and 4-8 existing snags (preferably of a variety of species and sizes). These figures are meant as averages over many acres; densities in small areas are likely to vary widely. Wildlife populations are not likely to be substantially increased by higher densities of decaying trees, nor will timber production be improved by lower densities. Density guidelines for down trees call for 4 hollow butt sections of felled trees per acre (#14).

SAFETY - In addition to eliminating high risk trees along roads and trails, personal safety must be a priority. For example, logging contracts that specify protection of snags should allow exceptions for trees the workers think are dangerous. Two other approaches used to reduce hazards are the clustering snags in patches that can be avoided by workers and the creation of snags from green trees following cutting (#11). Safety guidelines have been published for retaining snags in some timber types (#2).

2. SPECIFIC MANAGEMENT PRACTICES

OLD GROWTH RESERVES - Old growth forests tend to have high proportions of large, decaying trees (#4). Thus, priority should be given to establishing at least small, permanently uncut areas (#10, FSMN #38).

SELECTIVE HARVESTS - Because many decaying trees are not particularly valuable to wildlife, thinning operations can improve stand quality and still retain the snags and cavity trees needed for wildlife purposes (#15). Beyond the general recommendation to retain a variety of decaying trees types, the following kinds should be favored during thinning operations (#5):

The largest, relatively sound snags in the stand - these last longer and more species can nest in them (bigger is better in this case).
Snags with old woodpecker holes - these provide sites for secondary cavity nesters.
Trees located near water bodies.
Large trees with broken off tops - these provide the best nest sites for several large bird species.
Trees with signs of animal use (gnawing, claw marks, droppings, hair, etc.).
Trees that also produce wildlife food.
Windfirm trees (#20) with no evidence of root or butt rot.

Tree species that are long-lived or that stand dead for a long time, such as sugar maple, white pine, and oak species.

CLEARCUT HARVESTS - Retention of snags, live cavity trees, and other green trees in clearcut areas is gaining support (#11, FSMN #17). Much experimentation is needed here, but it is clear that leaving decaying trees in clearcuts and along their edges greatly increases their value to wildlife (#5). Without retention of some large trees, clearcut areas will not be available to cavity-dependent species again for several decades. The following practices will greatly improve the wildlife value of clearcut areas (#14):

Do not clearcut within 30 yards of water.
Within clearcuts, reserve at least a 1/3- to 1/5-acre clump of trees containing a cavity tree every 5 acres.
Beyond reserved clumps, reserve an average of 6-13 individual decaying trees per acre (same criteria as above).
Noncommercial sections of butt logs should be left at the felling site. In addition, at least 2 sound logs over 12" in diameter should be retained per acre.
Woody debris (slash) should be reserved on at least 10% of the area.

TIMBER HARVEST INTERVAL - As trees age, they are more likely to develop cavities and to die, so increasing the number of years between clearcut harvests (rotation length) or selective harvests (re-entry period) will tend to increase the density of decaying trees (#5).

ARTIFICIAL CREATION OF DECAYING TREES - If the density of decaying trees is too low and waiting for more to develop naturally is not acceptable, all three types can be artificially created. Down trees, of course, can be readily created simply by felling selected trees.

Snags can also be readily created by girdling, although trees may not die for several years after being girdled. To be properly girdled, a ring (preferably two) should be cut into the wood layer 1" deep completely around the trunk with a chainsaw or an axe (#8,18). A 3-4" gap should be created in the inner bark so that it cannot grow back together. Trees may also be killed with herbicides or by combining girdling and herbicide treatment.

Creating cavities is a more difficult operation, but methods have been developed using drills (#3,7) and chainsaws (#6,17). The process of cavity development can also be started by cutting off a 4- to 6-inch diameter limb of a tree 20 inches or more in diameter, leaving a stub about 6 inches from the trunk (#3). Or, chop out a section of bark and sapwood 6 x 6 inches at the base of a suitable tree (#8). Ash, basswood, beech, elm, hemlock, mulberry, and sycamore are especially good trees to select for future cavity trees as they readily form hollows. Installing nest boxes is probably an easier alternative in most cases and brings results much sooner (#3, FSMN #24).

REFERENCES

FSMN #'s refer to other Forest Stewardship Management Notes in this series.

#1 Ackerman, J. 1993. When the bough breaks. Nature Conservancy, May/June 1993.
#2 Anonymous. 1986. Guidelines for selecting live or dead standing tree wildlife habitat. USDA Forest Service, Pacific Northwest Region.
#3 Anonymous. 1981. ow to attract cavity-nesting birds to your woodlot. USDA Forest Service, North Central Forest Experiment Station.
#4 Anonymous. 1965. Tree dens for wildlife. USDA Soil Conservation Service, JS-58.
#5 Brawn, J.D., et al. 1984. Nest site characteristics of cavity nesting birds in central Missouri. USDA Forest Service RN NC-314.
#6 Carey, A.B. and J.D. Gill. 1983. Direct habitat improvement-some recent advances. In: Snag habitat management--proceedings of the symposium. USDA Forest Service GTR RM-99. Related videotape available on loan from: Portland Habilitation Center, Inc., PNW Publications, 2750 S.E. Mailwell Dr., Milwaukie, OR 97222.
#7 Decker, D.J. and J.W. Kelley. 1982. Enhancement of wildlife habitat on private lands. Cornell Coop. Extension Publication - Information Bulletin 181.
#8 DeGraaf, R.M. and A.L. Shigo. 1985. Managing cavity trees for wildlife in the northeast. USDA Forest Service GTR NE-101.
#9 Elton, C.S. 1966. The pattern of animal communities. Wiley.
#10 Evans, K.E. and R.N. Conner. 1979. Snag management. Pages 214-225 in R.M. DeGraaf and K.E. Evans (eds.), Management of north central and northeastern forests for nongame birds. USDA Forest Service GTR NC-51.
#11 Franklin, J.F. 1992. Forest stewardship in an ecological age. SUNY College of Environmental Science and Forestry, Faculty of Forestry Misc. Publication Number 27.

#12 Hardin, K.I. and K.E. Evans. 1977. Cavity nesting bird habitat in the oak-hickory forest...a review. USDA Forest Service GTR NC-30.
#13 Harvey, M.M. 1992. Animal Inn: a new tool for tree farmers. TreeFarmer, May/June 1992.
#14 Hassinger, J. and J. Payne. 1986. Dead wood for wildlife. Pennsylvania Woodlands, Number 7. Pennsylvania State University Extension.
#15 Healy, W.M., et al. 1989. Cavity trees in sawtimber-size oak stands in central Massachusetts. Northern Journal of Applied Forestry 6:61-65.
#16 Hunter, M.L., Jr. 1990. Wildlife, forests, and forestry. Principles of managing forests for biological diversity. Prentice Hall.
#17 Payne, N.F. and F. Copes. 1988. Wildlife and fisheries habitat improvement handbook. USDA Forest Service Wildlife and Fisheries Admin. Rept. (unnumbered).
#18 Perkey, A.W., et al. 1993. Crop tree management in eastern hardwoods. USDA Forest Service NA-TP-19-93.
#19 Scott, V.E., et al. 1977. Cavity-nesting birds of North American forests. USDA Forest Service, Agriculture Handbook 511.
#20 Tubbs, C.H., et al. 1987. Guide to wildlife tree management in New England northern hardwoods. USDA Forest Service GTR NE-118.

RESOURCES

Animal Inn, P.O. Box 5487, Bend, OR 97708-5487. 503/385-5942.

Animal Inn is a national public education campaign to conserve, through value awareness, specific kinds of dead, hollow, or fallen trees for wildlife and fish habitat. It provides brochure, leaflets, stickers, signs, etc.

CITATION: Burnett, Christopher D. 1994. Managing decaying trees. Michigan Forest Stewardship Management Note #28. Michigan Department of Natural Resources, Forest Management Division.

ACKNOWLEDGEMENTS: This project was supported, in part, by a grant from the Michigan Department of Natural Resources and the USDA Forest Service.