Wildlife Management Notes

No. 4

SNAGS, CAVITY TREES, AND DOWNED LOGS

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Snags, cavity trees, and downed logs provide habitat for a wide variety of wildlife species; as such, they are important components of the forest. Snags are standing dead or dying trees, and downed logs are simply logs that are on or near the forest floor. Cavity trees are live trees with holes or other structures big enough to shelter animals. This includes trees with only limb cavities. Limb cavities are more important to some wildlife species than large hollow trees. Snags are created by lightning, storm breakage, fire, disease, insects, drought, flooding, cultural practices, and possibly other factors that contribute to tree mortality.

The value of these components to a forest ecosystem is becoming more evident. In intensively managed forests the number of snags, rotting logs on the ground, and cavity trees is usually reduced by short rotations, elimination of cull (poorly formed) trees, and control of causes of tree mortality. However, with a little knowledge of the needs of animals that use snags, cavity trees, and downed logs you can provide these important habitat features in your stewardship plan.

Tree mortality (snag or downed log creation) naturally occurs in forests; snags may represent one to five percent (or more in some cases) of standing trees in mature forests in Oklahoma. Live cavity trees also develop from genetic defects, animal use, and other physical factors. These dying trees are a part of gap succession, where the forest continually creates small openings through tree mortality, an important part of a mature forest. The gap succession process may take years or even decades. As a snag decays, it eventually falls to the forest floor, where it becomes a downed log. Fallen logs represent an enormous mass on the forest floor that contributes to nutrient cycling, site productivity, structural diversity, moisture retention, and other forest processes. Windthrown trees bypass the snag stage to create downed logs directly from live trees.

OSU OKLAHOMA COOPERATIVE EXTENSION SERVICE

Division of Agricultural Sciences and Natural Resources

IMPORTANCE OF SNAGS, CAVITY TREES, AND DOWNED LOGS

Approximately 20 percent of the entire forest fauna rely on dead and dying wood for food or other habitat essentials such as cover and space. When any one of the habitat essentials falls below the threshold for a particular species, it is impossible for that population to persist. A variety of wildlife species use snags, cavity trees, and downed logs for nesting, roosting, foraging, perching, and territorial or other displays. Some of the species that use snags, cavity trees, and downed logs are game animals, but many others are insectivorous nongame birds and mammals that help control forest pests. Research indicates that many forest insects are kept at low levels by insectivorous birds and small mammals that eat insects during all or part of their life cycle. In addition, many species of amphibians, reptiles, insects, plants, fungi, lichens, and bacteria are dependent on snags, cavity trees, and downed logs. All are important components of forest diversity.

USERS OF SNAGS, CAVITY TREES, AND DOWNED LOGS

Birds

Birds represent a large portion of vertebrate fauna that are dependent on snags and cavity trees. Of particular concern to natural resource managers are cavity nesters. Cavity nesters represent 20 to 40 percent of the birds in a forest and sometimes as much as 66 percent. Primary cavity users, such as pileated woodpeckers, pioneer excavation holes for nesting and breeding purposes. Secondary cavity users, such as American kestrels, use natural cavities and cavities abandoned by primary cavity users. Some species prefer live cavity trees while others prefer dead cavity trees. Oklahoma birds that depend on snags and/or cavity trees in forest ecosystems include:

wood duck
common goldeneye
bufflehead
hooded merganser
common merganser
yellow-bellied sapsucker
downy woodpecker
red-cockaded woodpecker
tree swallow
white-breasted nuthatch
red-breasted nuthatch
turkey vulture

American kestrel
screech owl
great horned owl
barred owl
red-headed woodpecker
hairy woodpecker
eastern bluebird
great crested flycatcher
black-capped chickadee
purple martin
brown creeper
red-tailed hawk

merlin
northern flicker
pileated woodpecker
red-bellied woodpecker
Carolina wren
house wren
winter wren
prothonotary warbler
tufted titmouse
osprey
northern saw-whet owl

Mammals

Snags, cavity trees, and downed logs also are very important in the life cycles of many land mammals. These forest structures provide denning sites, thermal cover, protective cover, and food. Small mammals that use downed woody materials make up to 70 to 90 percent of the species present and 75 to 99 percent of the number of individuals over a wide variety of forest types and developmental stages. Oklahoma mammals that depend on snags, cavity trees, and downed logs in forest ecosystems include:

Virginia opossum
eastern cottontail
black bear
long-tailed weasel
eastern spotted skunk
striped skunk
woodland vole
cotton mouse

silver-haired bat
gray squirrel
raccoon
bobcat
least shrew
river otter
deer mouse

gray fox
southern flying squirrel
mink
southern short-tailed shrew
Elliot's short-tailed shrew
ringtail
white-footed mouse

Reptiles and Amphibians

Much less is known about the relationship between snags and downed logs with respect to reptiles and amphibians in Oklahoma. In other areas such as the Pacific Northwest, reptiles and amphibians make up to 93 percent of the species and 99 percent of individuals that use downed wood. Oklahoma reptiles and amphibians associated with snags and downed logs in forest ecosystems include:

ringed salamander
marbled salamander
bullfrog
red-eared slider
fence lizard
black racer
speckled king snake
flathead snake

Rich Mtn. salamander
dwarf salamander
river cooter
box turtle
five-lined skink
ringneck snake
copperhead
red-bellied snake

smallmouth salamander
slimy salamander
painted turtle
green anole
broadhead skink
black rat snake
timber rattlesnake

Fish

Snags and live trees that fall into streams are important links between terrestrial and aquatic habitats. They also contribute to structure and function in stream ecosystems. Downed logs in streams often create small waterfalls and plunge pools, aerating streams and providing ideal structures for fish and other aquatic organisms. Downed logs in streams also provide food for aquatic insects and other small organisms that make up a substantial part of the diet of many fish.

STANDARD MANAGEMENT PRACTICES

It is important to provide snags and cavity trees of various sizes, although large snags and cavity trees are generally used by a wider variety of species than small snags and cavity trees. Important practices for obtaining large snags and cavity trees are either (1) scheduling portions of each forest management unit for long rotations (more than 80 years) or (2) using uneven-aged management with selective harvesting of individual trees. Any type of harvesting should leave snags, cull trees, and cavity trees standing, while leaving naturally downed trees in place. Cull trees that could produce future snags and cavity trees are those with fungal conks, dead branch stubs, large sections of dead wood, or existing cavities. Continual recruitment of snags and cavity trees on a long term basis should provide sufficient downed logs for the forest floor.

As a basic guideline, stands of 40 acres or more should be established in pine and hardwood types. Stands of at least 40 or more acres are necessary for some area-sensitive song birds. In areas of large blocks of timber or where surrounding land use precludes larger stands, smaller stands down to 10 acres may be used.

TYPES OF ROTATIONS

In general, long harvest rotations of 80 to 120 years provide more opportunities for snag and cavity tree recruitment. For long rotation stands, choosing a minimum rotation period depends on the ability of the site to grow trees. Stands with a lower site productivity should have longer rotation periods than stands with a higher site productivity. For example, a dry site with poor soils may require 120 years to meet snag and cavity tree objectives while a more moist site with high quality soils may only require 80 years. Listed below are several alternatives for when long rotations are not practical.

A. Small patches of long rotation stands can be interspersed throughout short- rotation stands. Research suggests that 1/4 acre per five acres interspersed throughout the stand may be sufficient to provide enough old snags.

B. A narrow belt with a long rotation stand between short rotation stands can provide snags and cavity trees for both short rotation stands.

C. Uneven-aged, selectively cut stands can be interspersed and maintained as snag and cavity tree reservoirs in even-aged management areas the same way long rotation stands can.

D. Avoid clear-cutting patterns that create forest islands.

E. Consider leaving permanent uncut buffer strips, especially in or near riparian zones and between large clear cut areas.

F. Retain key areas or clumps of trees for periodic creation of snags by deadening.

G. Retain selected individual trees to carry through at least two rotations.

REGENERATION

The preference for regeneration practices to retain snags, cavity trees, and downed logs under even-aged management is shelterwood, seedtree, and clear-cutting, respectively. Scattered mature trees and snags should be retained at the rate of three to eight per acre to carry through the rotation. When stands are selectively cut under uneven-aged management, future snags should be identified and marked. Retention of snags and cavity trees will provide future downed logs.

Intermediate Treatments

THINNING

When precommercially thinning pine or hardwood stands to regulate stocking densities or species composition and prolonging the benefits of regeneration, keep the following recommendations in mind.

A. Thin lightly to improve stand growth and open up the canopy.

B. Do not conduct sanitation cuts, or if absolutely necessary, minimize the use of this procedure.

C. Leave snags if they do not represent a safety hazard.

D. Leave cull trees that are desirable for snag recruitment.

E. Leave downed logs where they fall or if necessary place them so they follow the contours of the hillside.

F. Leave all cavity trees, including those with limb cavities.

Prescribed Burning

Prescribed burning is used to achieve many management objectives including reduction of wildfire hazard, wildlife habitat enhancement, site preparation, and controlling plant community composition and structure. These objectives are often different but can be highly complimentary. Prescribed fire fits in well with the long- term strategy for snag recruitment throughout the life of the stand. Managing for snags and downed logs while reducing fire danger are highly complimentary. The greatest danger and the most problematic to fire hazard management is reduction of fine fuels. Fine fuels represent the greatest potential source for fire ignition and spread. Reduction of large logs and snags probably contributes little to overall fire hazard reduction in most stands, unless they are located near a management or property boundary where they might "chimney" sparks into another area not scheduled for burning. Below are a few considerations to help maintain snags and downed logs.

A. Conducting controlled burning after precipitation has occurred over an extended period preserves wildlife logs and snags and reduce fine fuels.

B. Burning intervals of three to five years with low intensity fire will provide a reasonable reduction in fine fuels and a highly productive understory.

C. When more frequent burning intervals are required (e.g., for quail management) snag recruitment should be closely monitored.

D. When fuel and moisture conditions leave the survival of snags and downed logs in doubt during a prescribed burn, it may be desirable to disc or rake around them to prevent their ignition and loss.

SNAG AND CAVITY TREE RECRUITMENT

How Many Snags and Cavity Trees?

Based upon naturally occurring snag density in virgin Oklahoma forests, we recommend three to eight large snags (greater than 10 inches in diameter at breast height (DBH)) per acre as a reasonable target. Set the total number of snags and cavity trees higher than this to provide for different species preferences. See Table 1 for snag and cavity tree objectives for different habitat types found in Oklahoma. These numbers should support a highly diverse community of wildlife.

Table 1. Snag and Cavity Objectives

HABITAT TYPE	DBH (IN)	SNAGS/ACRE	CAVITY TREES/ACRE
OAK-HICKORY	>20	2	3
	10-20	4	4
	TOTAL	6	7
HARDWOOD-PINE	>20	2	3
	10-20	4	4
	TOTAL	6	7
CROSS TIMBERS	>20	2	2
	10-20	3	3
	TOTAL	5	5

Snag Selection Factors

Numerous factors affect how desirable snags are to the fauna that require them at some time during their life cycle. Of particular importance to any individual animal may be **size**, **quality**, **species**, and **location** of snags. If snag recruitment is low in a particular area, then the manager may wish to recruit snags by killing selected trees.

Size of Snag

Snags should be a minimum DBH of 10 inches; however, it may be more useful to look at the requirements of individual wildlife species. For example, the optimum DBH for most owl species is greater than 20 inches, and many woodpecker species may experience reduced clutch sizes if there is a lack of larger diameter snags. In general, larger snags are more suitable to a wider variety of fauna. Animals with lower DBH requirements can still utilize larger snags quite efficiently, but animals with large DBH requirements cannot use small snags.

Quality of Snag

If recruitment of snags is necessary, the method of killing the tree will influence quality of the snag, decay pattern, and suitability for certain fauna. Girdling is one of the easiest ways to kill a tree. A wide diversity of snag conditions and quality could be achieved by using the following three types of induced tree mortality:

A. Girdling,
B. Single-stem injection with approved herbicides, and
C. Fungus inoculation.

Species of Snag Selected

The easiest and possibly the best approach is to allow snag species selected to mirror species that make up the live trees in the stand. It also may be desirable to (1) favor tree species that decay slowly and (2) determine which tree species are already in use in an area and recruit those species as snags. In general, deciduous trees are better for developing cavities and becoming nesting trees than coniferous trees.

Location of Snags

A rule of thumb may be to provide some snags instead of no snags at all. For example, one snag in the middle of a 40-acre field is better than none. This type of snag is particularly desirable to species that like to use isolated perches, such as American kestrels and bluebirds. Snags dispersed across the landscape induce the least competition among territorial species, but clumped snags may facilitate foraging efficiency and nesting behavior of other species. Ideally, providing both clumps of snags and widely dispersed individual snags should support a wider diversity of wildlife.

General Snag Considerations

Safety is as major concern of foresters, and snags can represent certain safety hazards. Loggers should be encouraged to use their own judgement to distinguish between safe and unsafe snags. As important as snags are to the forest, they should

always be kept away from houses, high use recreational areas such as trails, and fire guards. If a snag must be cut, leaving a high stump (approximately four to six feet) will retain more habitat.

CAVITY NEST BOXES

Meeting the long-term needs of many species of forest fauna requires maintenance of snags, cavity trees, and downed logs. Cavity nest boxes can temporarily substitute these needs and provide short term habitat for some cavity nesters. Oklahoma provides incentives for constructing and maintaining nest boxes. Here are a few of the requirements for selected cavity nesters:

Species	Floor (in.)	Diameter of Entrance (in.)	Entrance above Floor (in.)	Height above Ground (ft.)
eastern bluebird	4x4	1-1/2	6-10	3-6
Carolina chickadee	4x4	1-1/8	7	4-15
tufted titmouse	4x4	1-1/4	7	4-15
white-breasted nuthatch	4x4	1-3/8	7	5-15
house wren	4x4	1-1/4	4-6	4-10
Bewick's wren	4x4	1-1/4	4-6	4-10
Carolina wren	4x4	1-1/2	4-6	4-10
prothonotary warbler	4x4	1-3/8	4-6	3-12
great-crested flycatcher	6x6	1-3/4	6-8	6-20
purple martin	6x6	2	1-2	6-25
screech owl	8x8	3	9-12	10-30
American kestrel	8x8	3	9-12	10-30
wood duck	12x12	4	17	10-30

MANAGEMENT OPTIONS/SIP COST-SHARE OPPORTUNITIES

Low Intensity
Snag recruitment (SIP-8; SR3)
Nest boxes, roosting poles, platforms, and cavity excavation (SIP; WH3)

Mid Intensity
Snag recruitment (SIP-8; SR3)
Nest boxes, roosting poles, platforms, and cavity excavation (SIP; WH3)
Prescribed burning (SIP-8; PB3, PB4)

High Intensity
Snag recruitment (SIP-8; SR3)
Nest boxes, roosting poles, platforms, and cavity excavation (SIP; WH3)
Prescribed burning (SIP-8; PB3, PB4)
Brush pile construction (SIP-8; BP3)

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