



MANAGING WILDLIFE LEAVE TREES IN THE PACIFIC NORTHWEST

RETAINING STRUCTURES THROUGH HARVEST

A growing body of research supports the importance of leaving structures for wildlife during harvest. Here we help forest landowners and operators understand the importance of wildlife leave trees and other retained structures, and how to leave them in forest harvest units to provide important elements of wildlife habitat.

Retaining some structures during forest harvest, such as wildlife leave trees and down wood, is required by law for certain harvest types in Oregon and

Washington. The practice of retaining these structures contributes to wildlife conservation and is an important component of forest sustainability certifications such as the Sustainable Forestry Initiative, the Forest Stewardship Council and the American Tree Farm System. Structures such as standing dead trees, legacy trees and stumps, wildlife leave trees and down wood retained during harvest are often critical for wildlife living in managed forest landscapes.

Understanding retained structures

There are many kinds of retained structures that are important for wildlife: legacy trees, snags, wildlife leave trees and down wood.

WILDLIFE LEAVE TREES Living tree or snag. Required by law for certain timber harvest activities. Rules vary by harvest activity.



SNAG Standing dead tree. Snags are voluntary to leave, but some can be counted as wildlife leave trees for state law or forest certification.

High stump
Created by retaining part of the tree during tree felling. Typically less than 10 feet tall in Oregon and Washington.

Created snag
Typically created by a mechanical harvester or tree climber. Typically greater than 15 feet tall.



HAVE A PLAN FOR SAFETY

Standing wildlife trees, snags and legacy trees may present an overhead safety hazard. When planning forest management activities, complementary decisions can accomplish multiple objectives, including habitat, safety and productivity.



LEGACY TREE A tree that has been retained during prior harvest activities, or survived stand-replacing natural disturbances. Often these trees are of poor value at the mill, which also makes them excellent wildlife trees. It's voluntary for landowners to retain these trees.

WHAT ABOUT SLASH?

Research is ongoing concerning the effectiveness of slash piles for wildlife, but many species have been observed using them. The science supports the importance of down wood for wildlife species, and we're still learning about the importance of piled down wood.



HOW BIG SHOULD RETAINED STRUCTURES BE?

Research shows that a variety of wildlife species use many different sizes of retained structures. Larger-diameter down logs and standing trees last longer, but smaller standing trees and down wood are useful too. When planning harvest activities, identify wildlife retention structures as part of the planning process. Larger is better, but all are important. Remember that all larger wood should be excluded from any burn pile or firewood cutting area.



DOWN WOOD Dead wood on the forest floor. Required by law in Oregon and Washington for certain harvest activities.

Slash pile Logging debris, or “slash,” that will likely be piled and removed. Slash piles also function as wildlife habitat and should be considered for retention where wildfire risks are low and other reforestation needs are considered. It is voluntary for landowners to retain these piles.

Habitat pile Piled slash intentionally left for wildlife. Can be large or small. Larger pieces piled together are sometimes called “bio-dens.” It is voluntary for landowners to retain these piles.



Guiding principles for retaining structures to benefit wildlife

Evidence suggests that an organized, planned approach for retaining structures increases the effectiveness of those structures for wildlife use. Researchers from the National Council for Air and Stream Improvement, Inc., Weyerhaeuser Company, the United States Geological Service, Michigan State University, Oregon State University and partners have been studying retained structures to help forest managers determine the best way to leave these in forest harvest areas. For more detailed background information, see the following sources:

Barry, A. M., J. C. Hagar and J. W. Rivers. 2018. Use of created snags by cavity-nesting birds across 25 years. *J. Wildl. Manage.*, 82:1376–1384.

Hane, M. E., A. J. Kroll, A. Springford, J. Giovanini, M. Rochelle and E. B. Arnett. 2019. Survival dynamics of mechanically topped Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) snags in Douglas-fir plantations, Oregon, USA. *For. Ecol. Manage.*, 433:105–110.

Hane, M. E., A. J. Kroll, J. R. Johnson, M. Rochelle and E. B. Arnett. 2012. Experimental effects of structural enrichment on avian nest survival. *For. Ecol. Manage.*, 282:167–174.

Kroll, A. J., J. Verschuyl, J. Giovanini and M. G. Betts. 2017. Assembly dynamics of a forest bird community depend on disturbance intensity and foraging guild. *Journal of Applied Ecology*, 54:784–793.

Linden, D. W., G. J. Roloff and A. J. Kroll. 2012. Conserving avian richness through structure retention in managed forests of the Pacific Northwest, USA. *For. Ecol. Manage.*, 284:174–184.

Linden, D. W. and G. J. Roloff. 2013. Retained structures and bird communities in clearcut forests of the Pacific Northwest, USA. *For. Ecol. Manage.*, 310:1045–1056.

Linden, D. W. and G. J. Roloff. 2015. Improving inferences from short-term ecological studies with Bayesian hierarchical modeling: white-headed woodpeckers in managed forests. *Ecol. Evol.*, 5:3378–3388.

Sultaire, S. M., A. J. Kroll, J. Verschuyl, D. A. Landis and G. J. Roloff. 2021. Effects of varying retention tree patterns on ground beetle (Coleoptera: Carabidae) taxonomic and functional diversity. *Ecosphere*, 12(7):e03641.

Sultaire, S. M., A. J. Kroll, J. Verschuyl and G. J. Roloff. 2021. Stand-scale responses of forest-floor small mammal populations to varying size, number, and location of retention tree patches. *For. Ecol. Manage.*, 482:118837.

SCIENCE-BASED RETAINED

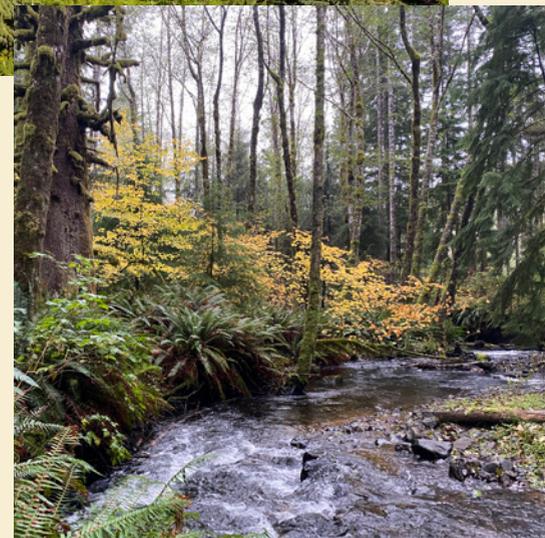


Leave the required wildlife trees adjacent to riparian buffers

One of the ways to maximize the variety of wildlife supported by wildlife leave trees is to retain them adjacent to riparian buffers. Leaving wildlife trees next to riparian buffers also helps protect the riparian buffer from wind, snow and ice, and may also be operationally preferable.

COMMON SPECIES THAT BENEFIT FROM RIPARIAN BUFFERS

include (left to right): northern red-legged frog, yellow warbler, yellow-breasted chat and western red-backed salamander.



STUDIES REGARDING WILDLIFE LEAVE TREES

left standing near riparian areas are ongoing, and have focused on how the structures benefit wildlife – everything from birds to beetles. Overall, there tends to be greater abundance and diversity of animal species when wildlife leave trees are retained adjacent to riparian areas than if they are left in isolated locations within harvested stands.

STRUCTURE GUIDANCE



Retain wildlife leave trees in upland patches

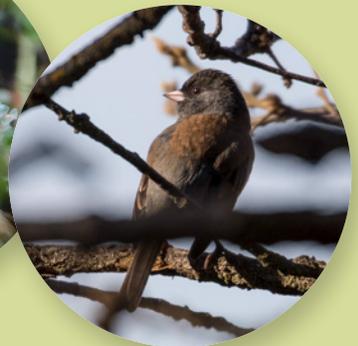
If you choose upland retention (i.e., wildlife leave trees upslope and away from the riparian buffer), leave small patches of trees rather than individual trees. Patches should have at least 15 trees to encourage use by a greater variety of animal species. Larger patches may support a greater abundance of each species, and will also protect individual wildlife leave trees from succumbing to damage or being toppled by wind, ice and snow.

Disturbances such as wind and ice may cause your wildlife trees to fall down. Leave trees that become down wood still provide important habitat for wildlife. Down wood is one of the retained structures that benefit wildlife.

When leaving upland patches of trees, consider using them to buffer important habitat features such as a legacy tree, stump or log, or a small non-fish-bearing stream, seep or headwater area, or other habitat type unique to the area.

COMMON SPECIES FOUND IN UPLAND PATCHES

include (left to right): olive-sided flycatcher, chipmunk species, red-tailed hawk and dark-eyed junco.





Clumped snags



Natural snag



Created snag

Retain snags whenever and wherever you can

Decades of research support the importance of snags for wildlife – especially for cavity-nesting birds such as woodpeckers, chickadees and purple martins. Bats and other denning/roosting mammals also benefit from snags. Leave snags whenever and wherever you can when planning harvest activities.

- Retain all existing snags whenever and wherever possible, as long as it is safe to do so.
- In areas with few natural snags, creating snags may be an effective option. Both conifer and hardwood species are beneficial.
- When creating snags, the taller the better, but all are beneficial, and choose large-diameter trees. Larger-diameter trees can be used by a wider diversity of species. Smaller-diameter snags are also beneficial for wildlife, but decay faster and fall over more quickly than larger-diameter trees.
- Consider placing some created snags within upland patches of wildlife trees, to protect them from wind, ice and snow.
- Consider retaining high stumps in areas where snags aren't safe. High stumps will benefit bats and some cavity-nesting birds. These can be scattered throughout the harvest unit

COMMON SPECIES THAT BENEFIT FROM SNAGS

include (left to right): pileated woodpecker, purple martin, black-capped chickadee, and red-breasted sapsucker.





Retain legacy structures on the landscape

- Retain all legacy material, especially standing large trees, large undecayed stumps and large-diameter down wood.
- Consider clumps of wildlife leave trees or snags around legacy features.
- Avoid disturbance to legacy features during forest management.
- Legacy material should not be in piles planned for burning or used for firewood.

Down wood

The science supports retention of down wood for wildlife. In addition, some down wood is required by law in Oregon and Washington. The rules differ depending on where your harvest is planned; we recommend double-checking the applicable forest practice rules. The following are suggestions for retaining down wood.

- Avoid disturbance to down wood during harvest.
- Leave down wood scattered in the harvest unit or in piles.
- Construct habitat piles using large chunks and slash from thinning and logging operations.
- Label habitat piles to avoid having them burned during slash burning or cut for firewood.
- Habitat piles may provide homes for many wildlife species. Think about placement of piles and reforestation needs.
- Place habitat piles near edges of harvest units, riparian areas and other areas where they increase habitat connectively and will be protected.



Habitat pile

Considerations for retaining structures through harvest

PRE-PLANNING

Here's where you consider the layout of the retained structures prior to the harvest:

- How large is the harvest unit, and how many wildlife leave trees are required by law or are being left voluntarily to support biodiversity?
- Have retained structures been added to the harvest contract?
- Have you talked to the logging operator about what to do if they see wildlife?
- Have you talked to the logging operator about the plan for retaining structures and protecting them during logging? The operator may be able to help identify structures for retention.
- Are there riparian areas, special areas, wetlands, seeps or springs where you can clump wildlife leave trees?
- Are there snags in the unit, and can you safely leave them?
- Can you leave a wildlife leave tree patch around any existing snags?
- Are there legacy or other features that would benefit from a wildlife leave tree patch of 15 or more trees to be retained adjacent or around them?
- Are there any legacy down logs present, and how will they be protected from damage during operations?
- Are there adequate down logs present prior to harvest, or will you likely have to cull logs to retain? Do you need to plan to purposefully fell trees to add down wood?
- Are you leaving a purpose-built habitat pile?
- Are the wildlife leave trees and other structures marked on a map or in GIS? How is this being communicated to everyone working on the timber harvest plan?
- Who is responsible for identifying and marking the retained structures in the timber harvest unit?
- Will the retained structures be in locations that allow for future forest management activities and operations to be conducted safely?

DURING HARVEST

- How are the legacy features being protected?
- Can you build habitat piles as you go? Remember to keep all large wood (anything bigger than a dinner plate at the large end) out of slash piles; leave them scattered or put them in habitat piles instead.
- Is there a monitoring plan for the identified retention specifications?

POST-HARVEST

- Has signage been installed on retained structures at risk of being removed?
- Have leave tree areas been identified on maps of the timber harvest unit?



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