Woodland Fish & Wildlife

Habitat Piles
Tools for Family Forestland Owners

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Introduction

Food, water, cover and space are the four essential requirements for wildlife survival. More often than not, wild animals are living on a razor's edge. If one of these crucial life needs isn't met, even for a short time, it can mean death for the individual and even total loss of the local population. This may sound dramatic, but it's true.

In woodland habitat, cover (or shelter) is present in many forms. Woody material on the ground is a special and valuable form of cover. It is essential to a wide range of species, especially invertebrates, small mammals, birds, amphibians and reptiles, and is easily provided or retained via forest management. Dead and dying wood, particularly of larger sizes, is a vital ecosystem resource, both as habitat for scores of species and a component of energy flow and nutrient cycling (Harmon et al. 1986). The ecological value of retaining down wood, or "coarse woody debris," as it's often called in scientific literature, is supported by a growing wealth of evidence.

Managed landscapes sometimes lack features that add complexity to the landscape, such as down logs, unique or large trees, and snags. When management removes these features or does not replenish them over time, it can result in a shortage of suitable habitat for some wildlife species. This is why retaining or creating woody structure is a priority recommendation for landowners, and is sometimes required by forest practice law (OFRI 2020).

Fortunately for both wildlife and landowners, assembling woody material into a long-lasting Habitat Pile is a simple yet effective management tool to supplement natural habitat and promote healthy wildlife communities. The use of constructed piles isn't a particularly new practice, but it is becoming more widely recommended, and is increasingly supported by scientific research that shows it having real conservation value (Sullivan et al. 2012, Sullivan and Sullivan 2019).

Woody material on the forest floor provides valuable habitat for many organisms

Photo by: Jon Cox,
inset photo by: Mike Cafferata

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What Are Habitat Piles, And What Are They For?

Habitat Piles are structures deliberately constructed from logs, limbs, and other materials, of various sizes and configuration, that are placed and retained for wildlife to use. These structures provide places for wildlife to rest, roost, nest, perch, feed, stay cool (or warm), stay dry, hunt, and evade predators. They also provide nutrients and foundation to plants and fungi as they decompose. They're typically made with on-site material that is created naturally or by a management activity. The term "Habitat Pile" is sometimes considered synonymous with "brush pile," but they're not quite the same thing. "Bio-den" is another term sometimes applied to these structures.

These Habitat Piles are not a perfect replacement for legacy structures, but can serve as surrogates in their absence. Ideally, retaining larger trees, which leads to the natural recruiting of dead wood, is part of managing forests for wildlife habitat. Constructed piles can help bridge the gap as trees grow large and serve as effective habitat enhancements in any managed forest.

Log surrogates piles combine small logs to simulate a large log

Photos by: Jon Cox, Fran Cafferata

Benefits Of Habitat Piles

Habitat Piles benefit many members of the forest community in one way or another. Mammals, birds, reptiles, amphibians, invertebrates, plants and fungi will make use of them right away and into the future.

Mammals

Small mammals in particular benefit from Habitat Piles, since the piles provide excellent hiding places. Ground-dwelling animals like mice, voles, chipmunks and rabbits can escape predators and harsh conditions in the interstitial spaces of piles. Perhaps surprisingly, some bats will take refuge within aggregations of lumber or firewood (NDOW 2022); thus they may also benefit from Habitat Piles as a roosting site, as well as a source of insect prey.

A recent study (Sullivan and Sullivan 2019) was the first to investigate the long-term effects of constructed woody structures on small mammal populations. They monitored populations of several small mammal species in cut forest sites both with and without constructed piles, as well as in uncut forest, over a 12-year period in British Columbia. Data showed their sites with constructed piles and windrows had a total mean small mammal abundance 1.8 to 2.4 times higher than in the other sites. This pattern was observed in the first five years, and continued to the 12-year mark. The authors see this as strong support for using piles as a means of habitat retention and to help maintain ecological systems, as the small animal populations that benefit directly in turn support predators.

Several recent and ongoing studies in the Pacific Northwest have tested the usefulness of retaining slash piles for Pacific marten (*Martes caurina*) and Pacific fisher (*Pekania pennanti*), both forest-dwelling members of the weasel family. The work of Wilk and Martin (2017, 2018) suggests that woody piles may be a practical and effective management tool for maintaining Pacific marten and their small-animal prey.

Larger mammals are also commonly seen at Habitat Piles. At one managed site in western Washington, Cafferata Consulting monitors a Habitat Pile using a trail camera. Many species have been captured by this camera at the pile in a relatively short time, including Roosevelt elk (*Cervus canadensis roosevelti*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), American black bear (*Ursus americanus*) and coyote (*Canis latrans*). Using a trail camera to keep an eye on the goings-on

This Habitat Pile in western WA is a hub for large mammal activity

Photos by: James Butch

at your own Habitat Pile(s) can be highly informative, entertaining and just plain rewarding, giving you an unobtrusive glimpse into the lives that benefit from your work.

Birds

Brush-loving birds such as dark-eyed juncos and other sparrows will make use of Habitat Piles for hiding, singing, nesting, perching and foraging. Flycatchers use the top of piles as a perch in between sallying bouts for insects (Porter 2021). Habitat Piles are a well-known and widely implemented strategy to enhance habitat for quail (Eddy 2015), particularly in the Southeast United States. Similarly, grouse and turkeys may find them an attractive place to rest or nest. Woodpeckers will feast on insects living within the wood, and owls and other raptors will benefit from the presence of small mammals to prey upon.

Brush-loving bird species will make good use of Habitat Piles

Bewicks wren

Dark-eyed junco

Ruffed grouse and other ground nesters may lay their eggs in the safety of a Habitat Pile

Ruffed grouse nest

Hairy woodpecker

Photos on this page by: Jon Cox

Reptiles and Amphibians

Forest-floor denizens such as lizards, snakes, frogs, salamanders and other related creatures will take advantage of Habitat Piles on the landscape. To be successful, forest amphibians need stable, moist microhabitats to provide refuge when conditions are hot and dry. Piles in more open, warmer settings will more likely support reptiles, and those in more moist, shaded settings will better provide for amphibians. As a group, amphibians are considered to be significantly imperiled by climate change. Shoo et al. (2011) recommend installing microclimate and microhabitat refuges as one of their top three suggested management actions to hedge against the negative effects of climate change on amphibians.

Northern alligator lizard

Pacific chorus frog

Recent research near Cle Elum, Washington, in a ponderosa pine/Douglas-fir forest used trail cameras to monitor how wildlife use Habitat Piles. Cameras were placed for 15 days in August and September of 2022. Thousands of photos were gathered, with continuous monitoring. Nineteen wildlife species observed using these piles are listed below. (Larsen and Hess, unpublished data, 2023).

American kestrel, American robin, bobcat, California ground squirrel, Townsend's chipmunk, dark-eyed junco, deer mouse, Douglas squirrel, golden-mantled ground squirrel, hairy woodpecker, northern flicker, rufous hummingbird, spotted towhee, striped skunk, Townsend's solitaire, western fence lizard, western tanager, white-crowned sparrow, yellow-bellied marmot.

Invertebrates and Others

The smallest creatures of the forest need food, water and shelter, too, and it's easy to imagine how a Habitat Pile could help arthropods (insects, arachnids, millipedes, etc.) and mollusks (slugs and snails, etc.). These secluded, shady, damp microcosms made of decaying wood are appealing to a menagerie of tiny crawling creatures. By supporting the invertebrate community, Habitat Piles contribute to ecosystem functions including pollination, processing detritus and carrion, and sustaining insectivorous wildlife.

Plants and fungi can use sturdy piles as an anchor point to grow from, and will readily use nutrients as the pile's wood naturally breaks down. Nothing will go to waste. See Table 1 below for a list of some of the organisms that will benefit or are likely to benefit from Habitat Piles.

Damp microcosms within and around piles will support invertebrates and fungi, like this banana slug and chanterelle mushroom

Photo by: Jon Cox

Table 1: Some of the organisms that will benefit from habitat piles in the Pacific Northwest

Mammals	Birds	Reptiles and Amphibians	Invertebrates and Others
Rabbits	Quail	Snakes	Bees
Foxes	Wrens	Lizards	Beetles
Weasels	Sparrows	Frogs	Ants
Chipmunks	Thrushes	Toads	Termites
Squirrels	Grouse	Salamanders	Spiders
Raccoons	Towhees	Newts	Centipedes
Voles	Robins	Turtles	Millipedes
Skunks	Woodpeckers		Earthworms
Mice	Jays		Slugs
Bears	Hummingbirds		Snails
Woodrats	Flycatchers		Mosses
Coyotes	Hawks		Lichens
Deer	Owls		Fungi
Bats			Plants

Types Of Habitat Piles

While any woody material that is arranged into a heap will inevitably provide shelter to critters, there are actually some important distinctions to be made between types of piles. Different choices in construction material and method will affect the pile's longevity and usefulness as a habitat supplement.

There are three basic types of piles in forestry settings.

1. Slash Pile

Miscellaneous woody material left over from forestry activities is commonly referred to as "slash." Slash piles are created by aggregating these leftovers, mainly limbs and stumps, into big piles, usually at logging landings. Contemporary mechanized logging commonly creates enormous piles. These piles are often burned to clear space and reduce fuels, but they can also be retained to benefit wildlife. Since larger woody material is of a premium to wildlife, and more difficult to burn, it is recommended that stumps and any wood about 8 inches or more in diameter be left out of a slash pile that's set to be burned. These items can simply be piled and left alone, scattered or ideally used to construct more intricate piles (OFRI 2021, 2022).

Stumps can be separated from other forestry byproducts, piled, and left to benefit wildlife

Photos by: Mike Cafferata

2. Brush Pile

"Brush pile" describes any type of pile where smaller-diameter material is stacked as waste, generally intended for disposal. If left, these piles will provide wildlife benefit, but this is often an accidental outcome. Brush piles use the smallest woody material and have the shortest structural habitat lifespan; as finer material decomposes more rapidly it collapses into a heap, and the openings used by many wildlife species disappear. Brush piles are typically made up of smaller debris such as branches, shrub clippings or brambles, and usually lack a structural base of larger, more durable material. They break down and collapse in a few years, and have less functional usefulness to wildlife compared to piles made with larger material. Brush piles are often burned or chipped, but can also be retained to benefit wildlife. Even though they may not last decades, modest brush piles will serve as home to an array of creatures.

3. Constructed Habitat Piles

These are designed, built and maintained with the intention of being an effective and long-lasting habitat structure. There are several commonly suggested designs for Habitat Piles that allow just about anyone to use the stems of small trees, stumps, larger-diameter limbs and smaller materials in construction. The primary design concept is, "Put the big stuff on the bottom" and create interior spaces sized for your target animals. While slash piles and brush piles will undoubtedly benefit wildlife in some capacity, that capacity is relatively limited in comparison to a structure constructed and maintained in perpetuity specifically for wildlife.

Best Management Practices (BMPs) For Habitat Piles

1. How to Build Habitat Piles

Construction is the main thing that sets apart an effective, long-lasting Habitat Pile from a typical slash pile or brush pile, though any and all types of structures can serve as habitat. A Habitat Pile is specifically designed and built to maximize its longevity and usefulness to wildlife. There is no single correct way to make a Habitat Pile; there are

There's no single correct way to build a Habitat Pile, and they can take many forms

Photos by: Ken Bevis

Raptors will benefit from the presence of small mammals and other prey

Red tailed hawk. Photo by: Jon Cox

American kestrel. Photo by: Jon Cox

many variations on the theme, and usually each pile is a product of opportunity and proximity to materials. However, following some general guidelines will help keep it simple and effective. A little bit of thought and engineering will go a long way, and could mean the difference between a structure that lasts a year or one that lasts 10 times that, and one that provides some, or LOTS of habitat value. Sullivan and Sullivan (2019) saw their woody debris piles still standing tall and supporting small mammals 12 years after construction!

- **Standard Habitat Pile**: The largest material is placed in the bottom three to seven layers of the pile to form a base, or deck, and is spaced out to allow gaps. Larger chunks of wood or stumps can be incorporated. The gaps are crucial to allow wildlife to enter and exit the structure at will. This will give the rest of the pile a solid foundation to sit upon, and make the pile as appealing as possible to small animals. Bevis (2017, 2019) details the general building process, which can be adapted to fit particular needs or modified for creativity's sake. Working by hand, piles should be about 10 to 20 feet in diameter, and about 5 to 8 feet high. If machinery is available, they can be built up to 20 feet wide and 10 feet high. Material should be added in layers, with the top few layers being finer material to create a brushy rooftop at least 18 inches deep. As you build, maintain low-level openings large enough for a medium-size animal to fit through, such as a coyote or bobcat. Sometimes you can lean branches against the outside of the pile like a fortress, providing ground-level escape cover for species such as rabbits or snowshoe hares. Malone (2021) gets more specific, suggesting the lower pile be made of larger poles 4 inches or more in diameter laid in four to six perpendicular layers, which allows for plenty of access tunnels. The resulting work can resemble a messy log cabin, built on a sturdy base made up of layers of smaller-diameter logs. It will be tall and wide, covered with branches from the surrounding stand, and will be a safe haven for any brush- or wood-loving species.
- **Log Surrogate Pile**: These piles use multiple smaller logs to imitate a single large log in a parallel structure. Malone (2021) suggests building surrogate log structures that are 12 to 20 feet long and 2 feet wide. You can build a crib to hold the individual wood pieces in place, by vertically driving in stakes or branches on both sides of the log structure to accommodate your desired length and width. Once the crib is built, fill it with smaller logs stacked tightly together, or just stack lengths of small-diameter logs atop each other in a parallel pattern, six or more deep. Large down wood is important to ground-dwelling animals that need moisture, such as amphibians, mollusks and arthropods. Plants and fungi thrive on them, exploiting their nutrients as they decay. These log surrogates are simple structures made of smaller logs brought together to help supplement large natural logs.
- **Bio-Den Sites**: If you're able to use larger material – logs or stumps, for example – consider arranging the lowest-level material in a way that creates adequate space for denning mammals such as mink or marten, raccoons, porcupines, foxes, bobcats or even bears. Logs (or rocks) can be positioned in a tunnel-like manner, leading to larger hollows in the lowest levels of the piles, providing adequately sized entrances. In snowy country, these entrances can be tiered up at various levels to provide for snowshoe hares.
- **Rock Piles**: These can be constructed using aggregates of larger stones (12 to 24 inches in diameter), stacked deeply to provide cracks, caves and other interstitial spaces within the pile. Culverts or other man-made materials can be incorporated into the structure, if desired, but large, hollow bamboo poles are even better. These piles mimic talus slopes and rock outcrops, providing useful habitats for reptiles such as alligator lizards and small mammals such as chipmunks. Branches can be piled on top of the rock pile as well, using the rocks as the core of the pile.

2. Number and Position of Piles

Getting the first Habitat Pile built is good, but Bevis (2017, 2019) and Malone (2021) recommend building two to three piles per acre, about a hundred feet from each other. Bevis (2017) suggests an arrangement of piles built in clusters of three, spaced 25 to 50 feet apart rather than singly, as a network of piles may allow wildlife to travel more safely between them. Having more piles may also create redundancy, allowing population resilience should a pile be somehow lost or become inhabited by a predator. Place them strategically in areas where wildlife will benefit most

from a little extra shelter, such as near sources of food and water, near streams and wetlands, near the edges of field and forest, and in areas where timber harvest has taken place.

Piles placed near wet areas may provide terrestrial habitats for amphibians, such as frogs and salamanders. They can also serve as "stepping stones" to help amphibians and reptiles, such as turtles, move between aquatic and upland habitats (ODFW 2015), and help other small wildlife cross less-than-suitable habitat areas.

1. Maintenance

Basic maintenance of Habitat Piles is minimal, but periodic work will help them last longer. If they fall apart or collapse they can be reconstructed, and new material added over time as decay runs its course. Small material, which generally will be sitting on top of larger pieces, will break down more quickly, so replenish opportunistically or as needed. If the pile collapses and the gaps at the bottom close up, some wildlife will no longer be able to enter and exit; if that happens, repair may be needed to keep the pile fully functional.

These two log surrogate piles are close together allowing wildlife to safely travel from one to another

Photo by: Mike Cafferata

Are There Risks To Having Habitat Piles?

The two main concerns related to Habitat Piles are fire danger and pests. These are valid concerns for any landowner to have and should be considered, but with a little forethought we can enjoy our wildlife habitat enhancements while minimizing these potential risks.

1. Fire

Piles of wood are flammable. To minimize potential dangers from a pile igniting and spreading flames, build piles a safe distance from infrastructure or green trees with low canopy. Place piles at least 30 feet from standing trees that could act as ladder fuels. That way, in the event of a fire the burning pile has little potential to spread flames to trees or structures. Bennett, Goheen and Duggan (2019) of the OSU Extension Land Steward Program recommend a balanced approach to providing wildlife habitat and maintaining a property that is resistant to fire. Creating piles in strategic locations while reducing fuels across the majority of the project areas can effectively provide habitat while reducing fire risk. For more information on reducing fuels in a wildlife-friendly way, Bevis and Strong (2016) address these issues.

2. Pests: Insects and Small Mammals

Habitat Piles are generally benign repositories of decaying wood. However, depending on the season, the wood species used and the amount of material, they can potentially harbor dangerous bark beetles. To minimize the odds of this happening, WA DNR Forest Entomologist Glenn Kohler recommends (personal comm. 2023) not piling large amounts of green wood from any pine species, such as lodgepole (*Pinus contorta*) or ponderosa pine (*Pinus ponderosa*), between January and August. This will deny bark beetles the environment they need to thrive during their most active seasons. Allow large stems to fully dry before aggregating them, since the beetles can't survive in dry wood. This likely means large pieces should be cut smaller in order to dry faster. Anything that speeds drying will help the process along and reduce risk (Bevis 2017). General advice if using pine is to avoid making a lot of piles in one season (keep it to one or two), avoid constructing them January through August, and try to include as much non-pine as possible, especially if they're constructed in the spring. Douglas-fir (Pseudotsuga menziesii) is typically not a concern regarding pests, since the more troublesome beetles do not use it as host, though drought conditions can exacerbate the threat from species that do use it (Kohler 2023).

Build piles away from human structures to minimize rodents moving into your home

Photos by: Fran Cafferata

Bark Beetle damage to trees

Photo by: Jon Cox

Natural Habitat Pile

Photo by: Jon Cox

Sometimes Habitat Piles can create circumstances where wildlife lives too close for human comfort. If concerned about uninvited guests such as chipmunks, mice or other rodents coming from the Habitat Pile (their home) to buildings (your home), make sure to maintain these piles at a distance from structures or items of value that could be damaged by these critters.

Summary

Habitat Piles are a basic yet extremely effective management tool to enhance a property's wildlife habitat quality. Thinning and fuels reduction projects present golden opportunities to employ these techniques. Habitat Piles help counteract the loss of legacy structures, and benefit overall ecosystem function. With just the materials on-site and a little ingenuity, these piles can simulate and supplement natural habitat for many years. They're a valuable alternative, or addition, to chipping and burning treatments. Over time they'll decay and cycle back as nutrients into the ecosystem. Lastly, but importantly: Providing Habitat Piles is a fun and rewarding experience, especially when inhabitants can be observed in a clandestine way, such as with trail cameras. Piles are hubs of wildlife activity that will draw in many species and act as focal points for wildlife happenings and interactions on your woodlands.

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Snag

Photo by: Jon Cox

Creating a Natural Habitat Pile

Photo by: Fran Cafferata

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Legacy stump

Photo by: Mike Cafferata

For questions about regulations for small mammals and other information contact your local Fish and Wildlife Office. . . Also contact your forestry agency about use of chemicals (e.g., rodenticides) for purposes of forest management.

Oregon Department of Fish and Wildlife: myodfw.com

Washington Department of Fish and Wildlife: wdfw.wa.gov

Oregon Department of Forestry: www.oregon.gov/ODF

Washington Department of Natural Resources: www.dnr.wa.gov

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