Woodland Fish & Wildlife

Bats and Small Woodlands

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Introduction

Bats are small flying mammals that come out at night, emerging from crevices in rocks, trees, caves, bridges and buildings with the ability to fly in complete darkness! Bats are a remarkably diverse and wide spread species group, with important ecological roles.

Bats have enormously important, and generally unseen, ecological roles. In the Pacific Northwest, bats are best known for providing insect control. A nursing little brown bat can consume her weight in insects in a single night (WDFW, Living with Wildlife), which calculates out to about 2,800 mosquitos per bat, per night! Colonies, typical of the Pacific Northwest, may contain many hundreds, or even thousands, of bats. It is estimated that the pest control services provided by bats save farmers more than $3 billion annually. A single bat colony can thus consume large numbers of insects that would otherwise damage or consume valuable plants, such as food sources or trees, or bite us. Birds consume vast numbers of insects too, but they mostly work the day shift. Many insects only come out at night (think moths). Nocturnal bats, therefore, are the primary predator of numerous forest damaging species such as defoliating moths and cambium eating beetles. All of the bat species in Oregon and Washington are insectivorous (eat insects). Bats also assist in nutrient cycling by widely distributing droppings (guano). Bat guano is rich in nutrients, phosphorous and nitrogen in particular, which are important for tree growth and plant productivity. Note: Though some bats are pollinators, we don't have any bats in Oregon and Washington that are considered pollinators.

Globally, bats are the second most diverse mammalian species group (Order Chiroptera – behind Rodentia), with approximately 1,300 species worldwide (www.batcon.org). Specific information on bats in Oregon and Washington is found in Table 1. Note that at the time of this publication, the Keen's myotis status as a separate species is under review. Oregon and Washington provide a wide array of habitats supporting ecosystems where bats thrive. In general bats use a variety of habitats both natural and human constructed.

This publication will help small woodland owners understand which bats live in Oregon and Washington forests, what role these bats play, and their importance to forest ecosystems. We will address threats to bats, how bats support forest ecosystem health, and how small woodland owners can help promote bat habitat, and therefore, bat populations.

Canyon bat

Parastrellus hesperus

Townsend big-eared bat

Corynorhinus townsendii. Photo by Eliana Pool

Little brown bat

Myotis lucifugus. Photo by Shawn Thomas

Spotted bat

Euderma maculatum

Species		Range	Habitat Requirements
Little brown bat	Myotis lucifugus	Throughout OR/WA	Uses a variety of habitats ranging from forest to urban. Commonly found around water sources, in both hardwood and conifer forests, and using structures such as buildings, mines, and bridges. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Yuma bat	Myotis yumanensis	Throughout OR/WA	Uses a variety of habitats usually in close proximity to a water source including hardwood and conifer forests, grasslands, shrub-steppe and deserts. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Long-eared myotis	Myotis evotis	Throughout OR/WA	Commonly uses rock outcrops and large diameter snags (>16") within dense conifer forests.
Long-legged myotis	Myotis volans	Throughout OR/WA	Found in conifer forests, deserts, dry rangelands and riparian areas. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
California myotis	Myotis californicus	Throughout OR/WA	Inhabits dry forests, shrub-steppe, arid-grasslands and deserts as well as coastal hardwood and conifer forests, meadows, and riparian zones. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Western small-footed myotis	Myotis ciliolabrum	East of Cascades in OR and WA	Inhabits dry climates in conifer forests, deserts, shrublands, riparian areas and grasslands in relative proximity to rock features such as caves and cliffs. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Keen's myotis	Myotis keenii	Coastal WA (not found in OR)	Restricted to lower elevation coastal conifer forests where large trees, large diameter snags (>16"), rock crevices and caves are present.
Fringed myotis	Myotis thysanodes	Throughout OR/WA	Found in dry forests throughout the PNW utilizing large diameter snags (>16"), rock crevices, caves, mines, buildings, bridges and green trees often near water.
Big brown bat	Eptesicus fuscus	Throughout OR/WA	In western Oregon species is often associated with coniferous and deciduous forests. Utilizes areas above tree canopy, streams, canyons, and in forest transition areas such as along roads, in clearings and along the forest edge to hunt. Also found in buildings, mines, and under bridges. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Pallid bat	Antrozous pallidus	East of Cascades in OR/WA and in SW OR	Inhabits dry forests open oak and ponderosa and farmland. Also utilizes live trees, large diameter snags (>16"), rock crevices, mines, buildings, and bridges.
Spotted bat	Euderma maculatum	East of the Cascades in OR/WA	Found in dry climates and areas where tall cliffs exist, open pine forests, and in conifer and aspen forests. Utilizes riparian zones and meadows for foraging. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Townsend's big-eared bat	Corynorhinus townsendii	Throughout OR/WA	Inhabits coastal and dry conifer forests, grasslands, and deserts; using caves, bridges, mines, buildings, hollow trees, marshes, streams and riparian areas. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Hoary bat	Lasiurus cinereus	Throughout OR/WA	Found at high elevations throughout a variety of habitats. Large diameter trees (>16") with sloughing bark are important habitat components.
Canyon Bat	Parastrellus hesperus	East of Cascades in OR and in SE WA	Found in lowland arid environments, especially deep canyons and in other rocky areas. Large diameter snags (>16") and trees with sloughing bark are also important adjacent to these areas.
Silver-haired bat	Lasionycteris noctivagans	Throughout OR/WA	Occurs in structurally complex forest environments and associated riparian zones. Large diameter snags (>16") and trees with sloughing bark are important habitat components.
Brazilian free-tailed bat	Tadarida brasiliensis	Southern OR (not found in WA)	Range extends as far north as Roseburg, OR. Species does not tend to hibernate, usually seeking out sources of warmth during cold months. Uses hollow trees, caves, bridges, and buildings. Large diameter snags (>16") and trees with sloughing bark may also be important.

Bat Biology

Bats are nocturnal mammals with surprisingly long life spans and slow reproductive rates given their small size. Once they make it through the juvenile stage, bats are thought to usually live for 10 to 20 years, and generally have only one or two young per year (BatCon.org).

Echolocation

Bats use echolocation to catch food. To echolocate, bats send out sound waves from the mouth or nose. When the sound waves hit an object, they produce echoes. The echo bounces off the object and returns to the bats' ears, allowing them to locate the position of the prey. They are the only mammal that hunts at night while flying.

Nursery sites

Nursery sites, otherwise known as maternity colonies, are only occupied by breeding females and their young. Nursery sites are usually well protected, disturbance free environments such as tree crevices or cavities, rock crevices, caves, old buildings and abandoned mines. The population sizes at these nursery sites depend on the habitat type and species. For instance, in caves, large colonies or groups can be found, whereas in trees numbers may be smaller due to limited space. Some species do not form large maternal aggregations, but still seek out the same types of habitats.

Maternity season for bats of the Pacific Northwest generally begins in June and the young or pups are able to fly by late August (BatCon.org). During the end of the summer months or beginning of winter in Oregon and Washington, they mate, and then enter partial or full hibernation, a low energy resting state. They give birth to offspring 40-60 days after they come out of hibernation. Some species such as the Townsend's big-eared bat and the hoary bat give birth after a longer gestation period (90-100 days). As mammals, bats give birth to live pups, usually 1-2 but as many as four, and nurse their offspring during the first stages of their life.

Day roosting

Natural day roost sites include cracks and cavities in snags, under loose bark, hollow trees, caves and rock crevices. Manmade roosts are plentiful, such as under bridges, attics, under roofing, abandoned buildings and under shutters or eaves of buildings. During the day bats may experience a resting state known as torpor, though sometimes they are observed foraging and drinking water during the day or low light levels. Essentially, torpor is a state of decreased physiological activity, usually by a reduced body temperature and metabolic rate and is a period of time wherein the bat roosts in order to conserve energy. Bats also utilize torpor during food shortages and bad weather. For some species they do this in medium-large groups, for others this is a solitary activity. It is important to note that day roosting bats are easily disturbed, which can be detrimental because this causes a bat's metabolic rate and body temperature to increase, depleting the bat of limited energy reserves.

Hibernation and migration

Talus slopes, cliff faces, caves (especially for Townsend's big-eared bats), old buildings and cracks in rock faces are used during hibernation periods and are referred to as hibernacula. These environments are preferred because they tend to provide a specific set of needs required for hibernation. Hibernation is an extended form of torpor and has additional associations with day length and hormone changes. Many bat species found in Oregon and Washington are known to hibernate, or go into a low-energy sleep state for an extended period of time during winter months. This enables bats to survive periods of reduced food availability and temperatures. During this time, bats are capable of reducing their heart rates to ten beats per minute. Lack of disturbance, sunlight and predators, as well as a consistent cool and humid climate, are all necessities for hibernating bats. Bats are very sensitive to fluctuations in temperature, choosing hibernation locations based on temperature and humidity levels. They must be able to maintain a low energy, low temperature body state without freezing and be able to conserve water. However, not all bats hibernate. Some species are thought to migrate, although locations and routes are not well understood. Three species, hoary bat, California myotis and silver-haired bats are known to migrate to lower elevations or warmer locations and only experience short periods of torpor.

Yuma myotis bat

Myotis yumanensis. Photo from USFS

Hoary bat

Aeorestes cinereus. Photo from USFS

Threats to Bats

Bats are extremely sensitive to changes in their environment. Threats to bats include habitat loss (particularly removal of dead trees with cavities and loose bark), human disturbance of sensitive foraging, roosting and hibernation

habitats (human disturbance often leads to more energy output from bats which can lead to inability to reproduce), and climate change. Further study is needed to understand specific threats to bats in terms of climate change, but it is well known that bats are sensitive to small fluctuations in their microhabitats and even small changes in temperature can disrupt their life cycle. In addition, disease such as White Nose Syndrome threaten bat survival (see call out box below).

White Nose Syndrome (WNS)

White-nose syndrome (WNS) is a fungal disease that has severely impacted North American bat populations. WNS was first discovered in 2006 in New York State. Since then it has spread throughout North America impacting bat populations. WNS was first discovered in Washington in 2016. In March of 2016, one little brown bat tested positive for WNS near North Bend Washington, 1,300 miles further west than the previous westernmost detection. Scientists sampled guano (bat droppings) from under a bridge in the North Bend, WA, area in July 2016 and detected the fungal pathogen (Pseudogymnoascus destructans, the vector for WNS, abbreviated to Pd). Then, in April 2017, two Myotis species bats were found again in the North Bend area and guano samples tested positive in May of that year. In 2017, a second contamination area within Mount Rainer National Park confirmed four bats had contracted the fungus (https://www.whitenosesyndrome.org). Subsequent to these detections, as of 2018, WNS has been found at other sites in King County and Pd in Lewis County. Yuma bats have also now been detected with the disease in Washington. There are no known cases of WNS in Oregon as of the date of this publication.

Usually WNS is spread from bat to bat, but humans can also be vectors, carrying the disease on clothing and shoes from one bat habitat to the next. WNS cannot be contracted by humans or other animals, but can be extremely lethal to entire bat colonies. During the winter bats are more susceptible to WNS, since the fungus spreads more readily while they are close together, in larger colonies. The pathogen attacks the pulmonary systems of bats, resulting in a white fuzz on their faces. The fungus causes the bat's skin to become irritated and they arise from hibernation or torpor more frequently, utilizing energy they should be saving. It is unknown how severely bat populations in OR/WA will be impacted by WNS. Typically, bats in the Pacific Northwest (PNW) hibernate in smaller colonies than in the eastern U.S. and in some areas of the PNW, temperatures can be conducive to some form of prey year-round. It is certain that WNS has been devastating to bat populations in portions of the eastern U.S. and Canada. It is estimated that more than six million bats have already died from the disease as of 2018 (USDA, Bats Need Your Help!). Bats are the most susceptible to WNS during hibernation, and since bat species in the PNW do not hibernate in large colonies as consistently as eastern bats, it is unknown, but possible that the spread of the disease may be less severe on western species.

Rabies

It is estimated that less than one-half of one percent of bats host the rabies virus. Bats with rabies can only transmit the virus to humans or other mammals through exchange of fluids i.e. biting or consumption (if an infected bat is consumed by a mammalian predator). Bats are not aggressive and occurrences of sick bats biting humans are extremely rare. In all instances of potential human exposures involving bats, the bat in question should be safely collected, if possible, and submitted to a local government agency for rabies diagnosis. That said, if handling a bat is necessary (inside of your home for example), use precautions such as wearing leather gloves and capturing the animal with a box. Rabies post exposure prophylaxis is recommended for all persons who have been bitten, scratched, or have had mucous membrane exposure to a bat, unless the bat is available for testing and is negative for evidence of rabies (https://www.cdc.gov/rabies/). It is important to report to your local authority any interaction with a bat where a person is bitten or scratched (https://www.oregon.gov/oha/PH/ProviderPartnerResources/LocalHealthDepartmentResources/Pages/lhd.aspx). It is advised that if you see a bat on the ground to leave it where it is. Bats should never be handled by untrained and unvaccinated persons or be kept as pets.

Developing and Promoting Bat Habitat

Bats are a vitally important forest dwelling species. Some bats require specific habitat types but throughout Oregon and Washington there are a large variety of environments that they inhabit. Providing habitat for bats on small woodlands is an important part of forest management, and there are many considerations for protecting existing bats and developing and promoting bat habitat.

In areas known to support bats it is important to avoid disturbing roosting bats or colonies, especially during winter months, as they may be hibernating or in torpor and only have enough energy to last them until they have an opportunity to forage for food again. Since the bats in Oregon and Washington rely solely on insects, providing habitat for native moths, beetles, and wasps for example, is important. The following sections detail methods for improving bat habitat on small woodlands.

Keen's myotis

Myotis keenii

Foraging Habitat

Good quality foraging habitat is critical for bat survival. Improving foraging habitat on small woodlands is a great way to assist bats. There are several ways to promote foraging habitat:

- Preserve, create and enhance open water sites. Especially near roost sites such as large diameter snags (>16"), standing trees, or bat boxes.
- Install escape ramps (e.g., branch for a bat to crawl up) in man-made water sources like troughs and water tanks.
- Avoid using barbed-wire or hog wire fence across water sources as bats may be injured when flying around the water.
- Protect and plant native riparian vegetation, promoting horizontal and vertical habitat diversity.
- Create/maintain small forest openings.
- Remove invasive riparian vegetation species that inhibit overall habitat diversity.
- Carefully follow all labels when applying herbicides or outdoor chemicals.
- Limit use of pesticides and insecticides.

Foraging Habitat

Photo by Ken Bevis

Roosting Habitat

In addition to foraging, bats need roost sites for survival. Landowners can promote roosting habitat on their property by:

- Retain all legacy trees, large diameter snags (>16") and stumps (>8' tall); especially those with loose bark.

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Consider leaving old structures on your forest property for bats! Big or small, they create habitat!

Working with a number of cooperators, the Forest Service repaired and repurposed a historic farmhouse to provide a safe, dependable maternity roost for a colony of 100+ Townsend's big-eared bats (*Corynorhinus townsendii*) from May through September each year.

Photos courtesy Brett Carre & Cathy Flick, Columbia River Gorge National Scenic Area.

- Identify trees for future snag recruitment.
- Retain trees that have cavities or bark with crevices and sloughing bark.
- Create "skips or gaps" (openings and undisturbed areas) of habitat to increase diversity of habitat types in the stand.
- Conduct vegetation modification work during the non-critical maternal roosting and hibernating months, allowing bats to move around to other suitable roosts in the season when food and water is more abundant.
- Avoid and/or delay activities if you see bats emerging at night or flying around an entry to a roost in numbers greater than ten. It is possible you have a maternity roost.
- Retain cliff, talus and boulder habitats. Create forested buffers around these habitats to protect from disturbance.
- Retain caves and provide a forested buffer. Caves are known to be used by hibernating bats and for housing by maternity colonies. Add bat gates on cave entrance if appropriate to keep humans out and to minimize risk of disturbance/spread of WNS.
- Keep old sheds or outbuildings known to be used by bats.
- Construct and install bat boxes, where appropriate (see section below for more information on installation of bat boxes).
- Bats are also known to use bridges, old barns, buildings, mines, and culverts for roost sites. If these are located on your property, use bat-friendly materials to encourage use. Bat friendly techniques include roughened surfaces and crevices to facilitate roosting.

Hibernacula

Hibernacula is critical to bat survival. In most cases, hibernacula will be natural structures on the landscape and as long as they stay free from disturbance, they will provide adequate habitat. In some cases smaller colonies of bats will use houses,

Silver-haired bats on downed log

Lasionycteris noctivagans. Photo by Jake Pool

Bat Boxes

Installing a bat box can be a great way to attract and maintain bats on your property or forest. There are two common types of bat boxes. The "standard" boxes are roost boxes, providing crevices and mimicking loose bark. "Maternity" boxes are larger, multi-chambered structures. If you know you have substantial bat activity, consider a maternity box.

The best way to install a bat box is to mount it on a pole or building. Resist mounting bat boxes on live trees as they generally do not receive enough sunlight to keep bats warm. When installing a bat box, look for an area that receives 6-8 hours of direct sunlight and is facing south, southwest, or southeast. Bat boxes should be painted flat black or dark brown and mounted in areas at least somewhat protected from the weather and mounted at least 12-20 feet off the ground. In addition, they should be near water sources such as streams, rivers, lakes or ponds. In western Washington, bat experts with Bats Northwest have found that maternity and nursery colonies will use robust bat boxes specially built with dividers and heavy materials. You can make or purchase bat boxes and there are many sources online to help. Please see http://www.batcon.org/resources/getting-involved/bat-houses for more information on the construction of bat boxes.

You can determine if bats are using your boxes by simply looking inside with a flashlight from below during the day, watching for bats leaving at dusk, or looking for droppings below the box by way of a board or smooth surface. Sometimes it takes a while for bats to find boxes, particularly in settings with alternative habitats. If no bats find your box after three years, move it to a new location.

Example of a bat condo

Bat Condo. Photo by Mike Atamian (WDFW)

Bat box

An example of a bat box design

Long-eared myotis

Myotis evotis

Big brown bat

Eptesicus fuscus. Photo from USDA Forest Service Southern Research Station, USDA Forest Service, SRS, Bugwood.org

barns, and other man-made structures for hibernacula. Landowners can promote hibernaculum on their property by:

- Avoiding noise, light, or vibration disturbance near a hibernaculum during fall and winter months.
- Avoiding or minimizing land modification that may change the temperature or moisture at the hibernaculum, this includes salvage and other vegetation modification activities.
- Installing special "bat gates" (gates that allow access to the mine or shaft by bats but not humans) on mines or shafts used by bats.
- Retaining old structures where they exist and support bats.

Summary

The Pacific Northwest is home to an abundant variety of bat species that play vital roles in the region's economic and biological stability. Bats today are faced with complex issues that scientists are actively studying. Much is still unknown about how bats of the Pacific Northwest will be impacted by changes to their environment in the future. Consider, that there are many ways, big and small, to assist bats. Small woodland owners who manage their woodlands for bats are crucial to the overall success of the species.

Now, with all of that in mind, on the next warm evening take a moment to watch for these amazing mammals in their element, zipping around with agility, sending out sound waves to catch insects like mosquitos, working hard to make every woodland a healthier place to call home.

Mythology — Bats have generated many outdated and untrue ideas, including:

All bats eat blood – FALSE, only three species in the world consume blood and none of these occur in the Pacific Northwest.

Bats are blind – FALSE, bats have as good or even better eye sight than humans.

Bats fly into hair – FALSE, they are likely feeding on insects above your head or they are roosting (upside down) and need space to fly away so it may seem like they are flying into your hair.

Bats are flying mice – FALSE, bats are mammals in the taxonomic Order Chiroptera, and not closely related to rodents (Order Rodentia).

Bats reproduce like crazy – FALSE, bats are slow to reproduce.

Bats are dirty – FALSE, bats are fastidious groomers and colonies with large concentrations of guano are rare.

Bats always carry rabies – FALSE, only a small number of bats have rabies and it is extremely difficult to catch.

For More Information

- **https://www.dfw.state.or.us/wildlife/living_with/bats.asp**
- **https://myodfw.com/wildlife-viewing/species/bats**
- **https://wdfw.wa.gov/publications/01504/**
- **https://wdfw.wa.gov/species-habitats/diseases/bat-white-nose**
- **https://www.whitenosesyndrome.org**
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Washington Department of Fish and Wildlife: Living with Bats https://wdfw.wa.gov/species-habitats/living.

Washington Fish & Wildlife: White Nose Syndrome https://wdfw.wa.gov/conservation/health/wns/

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Yuma myotis

Myotis Yumanensis in bridge. Photo by Shawn Thomas

About the Woodland Fish and Wildlife Group

The Woodland Fish and Wildlife Group is a consortium of public agencies, universities, and private organizations which collaborates to produce educational publications about fish and wildlife species, and habitat management, for use by family forest owners in the Pacific Northwest.

Currently available publications can be viewed and downloaded, free of charge, at the organization's website:

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