

BAT BIOLOGY & HABITAT MANAGEMENT GUIDE FOR MONTANA FOREST & WOODLOT OWNERS

From comic book characters to base jumping wingsuits, bats inspire many as the only flying mammals on the planet. Others see them as harbingers of evil and threats to their health. Somewhere between fear and fascination, bats represent a remarkable and valuable group of animals in our fields and forests. In this publication you will learn more about the fascinating world of bats and how you can manage for them in your working forests.

Bats comprise nearly a quarter of all mammal species and perform many valuable ecological functions. Bats can consume their weight in forest insects on a nightly basis (over 500 mosquitoes per hour). Some of their preferred prey include our most damaging agricultural and forest pests. Fruit and nectar-eating bats are important pollinators and seed dispersers in tropical and desert environments.



Bat habitat provides roosting and foraging opportunities.

All 15 bat species known to occur in Montana use grasslands and forests for roosting and foraging during some portion of their life cycle. Some of these species (e.g. hoary and eastern red bats) are migratory and leave the state after summer. Others, such as the little brown bat and Townsend's big-eared bat, occur year-round in Montana and hibernate during the winter.

ROOST HABITAT PREFERENCES FOR MONTANA BAT SPECIES

Bat Species	Trees	Rocks/Cliffs	Caves/Mines	Built Structures	Bat Houses
Big Brown	x	x	x	x	x
California Myotis	x	x	x	x	
Eastern Red Bat	x				
Fringed Myotis	x		x	x	
Hoary Bat	x				
Little Brown Myotis	x	x	x	x	x
Long-eared Myotis	x	x	x	x	
Long-legged Myotis	x	x	x	x	
Northern Myotis	x	x	x		
Pallid Bat		x	x	x	
Silver-haired Bat	x		x	x	
Spotted Bat		x			
Townsend's Big-Eared			x	x	
Western small footed	x	x	x	x	
Yuma Myotis	x	x	x	x	x



Bat exiting rock, photo by Nathan Schwab



Hoary bat, photo by Krisi Dubois



Little Brown bat, photo by Krisi Dubois



Silver-haired bat, photo by Krisi Dubois

WHITE-NOSE SYNDROME (WNS)

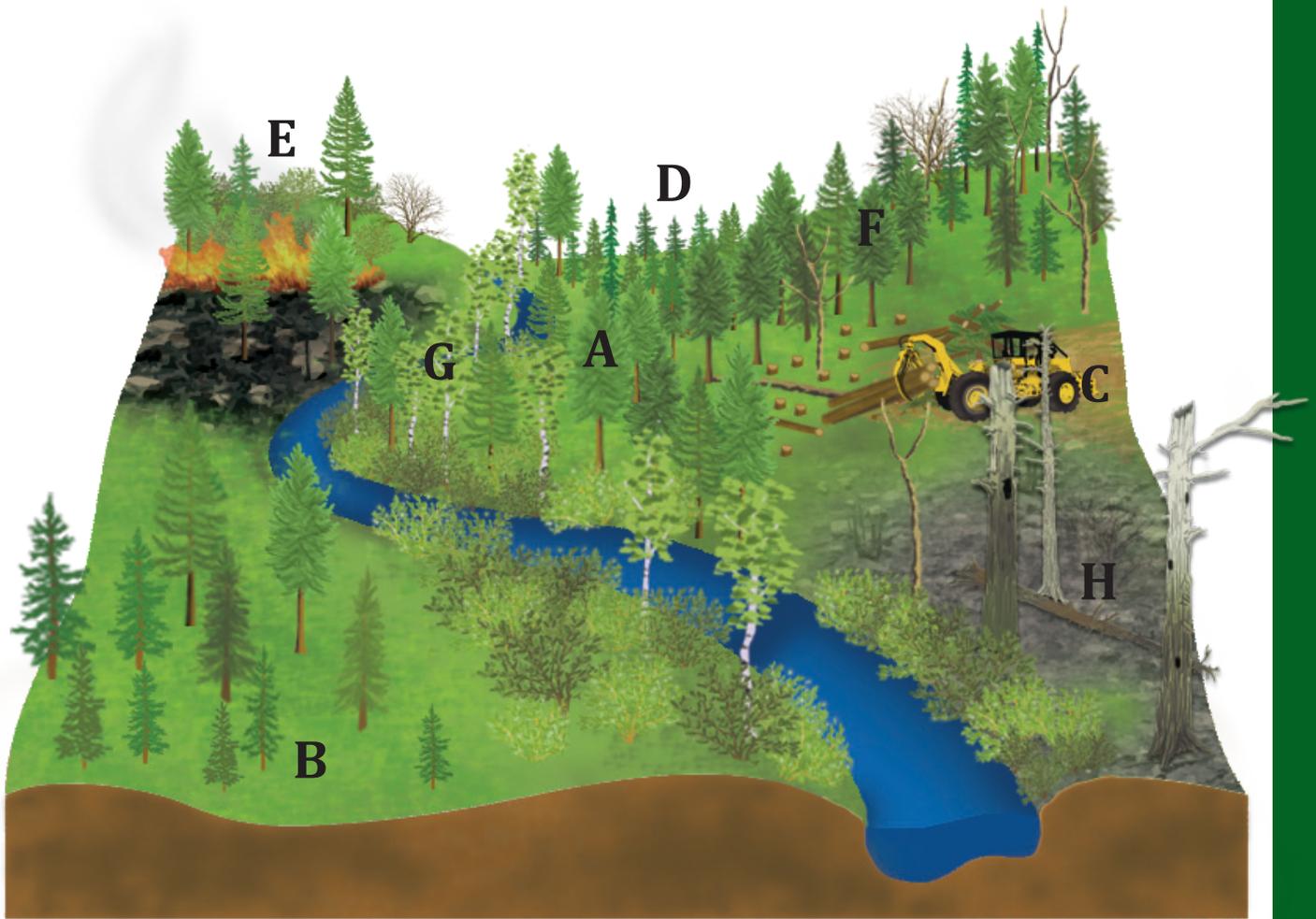
White-Noise Syndrome (WNS) is caused by a fungus ominously named *Pseudogymnoascus destructans* (*Pd*), believed to have been inadvertently brought by humans from Europe. WNS has killed more than 6 million bats in the northeast and Canada since its arrival from Europe in 2006. Since that time, WNS has spread rapidly across the eastern and midwestern USA and is now found in 40 states. WNS fungus lives on cave floors and is transmitted by migrating bats and on the apparel of human cave visitors. WNS causes dehydration, tissue erosion, and blood acidosis, forcing bats to come out of hibernation early. The northern long-eared bat, one of 12 North American bat species susceptible to WNS, has experienced population decline estimated at 97 to 100% across the species' range and was recently classified as endangered under the Endangered Species Act. WNS fungus, *Pd*, was first detected in Montana in 2020 and WNS in bats was first detected in early 2021. There is no cure for WNS, although researchers have been testing various treatments for infected bats to improve survival. Attention has been focused on where populations of susceptible bat species exist and how land management might affect or protect these bat species as WNS spreads across the country. Visit www.whitenosesyndrome.org for more information.



WNS infected little brown bats in NY cave.

Photo by Al Hicks, NY Dept of Environmental Conservation

BAT HABITAT ELEMENTS TO CONSIDER IN FOREST MANAGEMENT ACTIVITIES



Bats are very adaptable, but they seek shelter during different times of the year to meet life cycle requirements. Bats seek **hibernation roosts (or hibernacula)** during winter when they are in extended periods of deep sleep (torpor) to survive cold weather. Bats select hibernacula in environments that provide cool and stable temperatures. **Maternity roosts** are sought by pregnant females over a 6-9 week period in the summer to gather and give birth to pups. Some species return to the same site year after year. **Daytime (diurnal) roosts** are used by males and females outside the breeding and hibernating seasons and may occur in trees (live or dead), built structures (old buildings, bridges), underground sites (mines, sink holes and talus) and rock cliffs. Preferred bat foraging sites for insects are in forest openings and around water such as ponds, potholes and slow moving streams. Roost sites can be miles from foraging sites, connected by stream courses or forested cover.

FOREST MANAGEMENT AND BATS

Bat habitat has 3 basic components:

FORAGING

DRINKING

STRUCTURES FOR ROOSTING

Nearly all Montana bats rely on forests for survival. Forest management practices can positively or negatively affect roosting and foraging habitat components. The table below shows how some commonly used forest management practices can benefit bat habitat.

Even-Aged Management

- A** Irregular shaped blocks create more “edge” habitat for foraging bats. Herbaceous growth following logging can increase insect populations for foraging bats. Retention of snags and defective green trees left standing add value as potential roosts.

Uneven-Aged Management

- B** Open stands with green trees and snags allow more sunlight to create warmer roosts for maternity activity. Gaps in the canopy create shrub stands providing insects for foraging. Diverse forest structure and species following harvest provide a variety of roost sites. Retention of snags adds value for potential roosts.

Site Preparation

- C** Vegetation control can restore early successional plant communities that promote insects for foraging. Care should be taken to prevent loss of snags and reserve green trees that serve as roost trees.

Thinning

- D** Increased tree spacing in dense stands allows bats to more easily access roost trees and promotes sunlight to the forest floor, increasing plant growth that provides increased insect prey for foraging bats. Retention of snags adds value for potential roosts.

Prescribed Fire

- E** Bats benefit from creation of new roost trees resulting from fire-created snags and green cull trees. Fire decreases stand density and promotes shrub growth that enhances insect populations for foraging bats. Short term loss of snags and reserve green trees should be avoided where possible.

Forest Corridors

- F** Leaving strips and buffer strips provides edges for foraging and can be used as travel corridors providing roost trees.

Streamside Management Zones

- G** Riparian areas are one of the highest quality habitats for bats, providing both foraging opportunities over water and adjacent roosting trees and snags. Selective harvest in these SMZs promotes understory shrub growth which increases insects that bats feed on.

Wildfire

- H** Wildfire can create additional roosting habitat for bats in dead and damaged trees. Wildfire can also adversely affect bat habitat by creating large disturbance areas devoid of the vegetation that support insects for foraging bats.

HOW ARE BATS STUDIED?

Until recently, little was known about how bats use managed forests in Montana. New technology has allowed investigators to track bat movements and use acoustic monitoring to determine the species diversity and habitat. A recent 3-year study with Montana Natural Heritage Program on Weyerhaeuser, F.H. Stoltze Land & Lumber, and Stimson Lumber Company lands in Montana is providing insights on roost selection and movements by bats in managed forests. Microphones placed in the woods record the species specific high frequency echo-location signals emitted by bats navigating their environment and feeding on insects near water and in forest clearings. Tiny radio transmitters attached to bats have yielded valuable information on the roost selection and daily movements of bats. These studies confirm that 11 of the 15 bat species present in Montana are using managed forests for foraging and roosting. Bats frequently re-use the same daytime roost sites for many days and may travel up to 16 kilometers (10 miles) from night foraging sites to day roost sites. Bats were found to be highly versatile, for example, flying over open water at temperatures as low as -18°C (0°F) to drink during brief breaks in hibernation. Radio-tagged bats roosted in snags and large live trees left in riparian management zones as well as rock cliffs and crevices located near slow-moving streams and ponds.



Spectrogram of Little brown bat



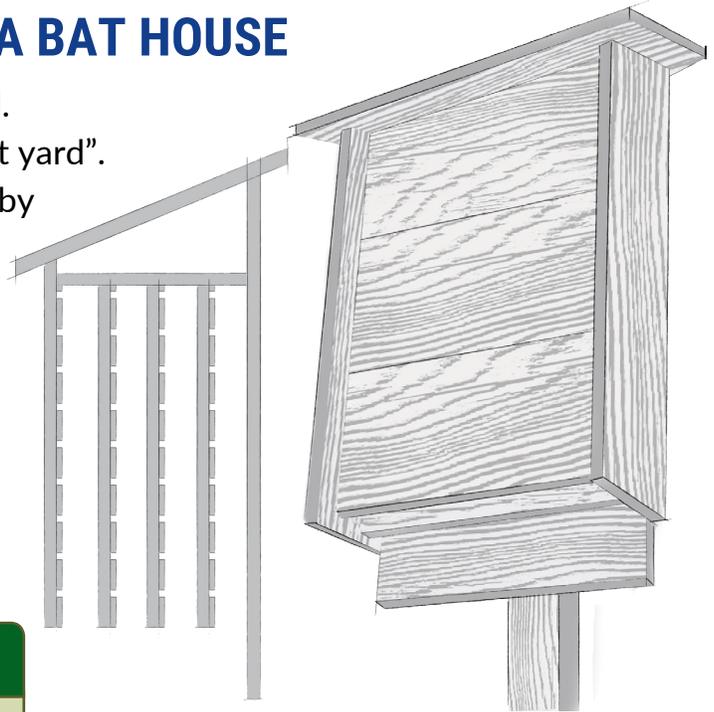
Spectrogram of Silver haired bat

Spectrograms are representations of the species-specific acoustic “signature” for bats. The sound picked up by the microphone at an acoustic sampling station is recorded, digitally sorted, and classified by bat species.

BUILD A BAT HOUSE

- ▶ Bring insect control into your backyard.
- ▶ Make your backyard an interesting “bat yard”.
- ▶ Keep bats from roosting in your home by giving them their own house.

Visit <https://www.nwf.org/garden-for-wildlife/cover/build-a-bat-house> to find complete instructions on how to build a bat house.



HELPFUL WEBSITES

 **Bat Prevention**
<http://www.wildlife-removal.com/bat-prevention.html>

 **Montana Fish, Wildlife, & Parks**
<https://fwp.mt.gov/conservation/wildlife-management/bats>

 **US Fish & Wildlife Service**
<https://www.fws.gov/story/2023-05/peering-future-bats>

 **Montana Natural Heritage Program**
<https://fieldguide.mt.gov/displaySpecies.aspx?family=Vespertilionidae>

 **Bat Conservation International**
<https://www.batcon.org/>

 **Sustainable Forestry Initiative®**
<https://forests.org/>



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Bats

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 Species

Big Brown Bat
Eptesicus fuscus

California Myotis
Myotis californicus

