

# Small Mammals and Bats in Managed Forests of the Pacific Northwest



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## Small Mammals and Bats

- Some characteristics of the fauna
  - Who are these guys?
- A brief natural history of the Insectivores, Rodents, and Bats
- Forest environments as habitat
  - Important habitat elements, their occurrence, and arrangement in space and time
- Influences of forest management on communities of small mammals and bats



## Some Useful Terms

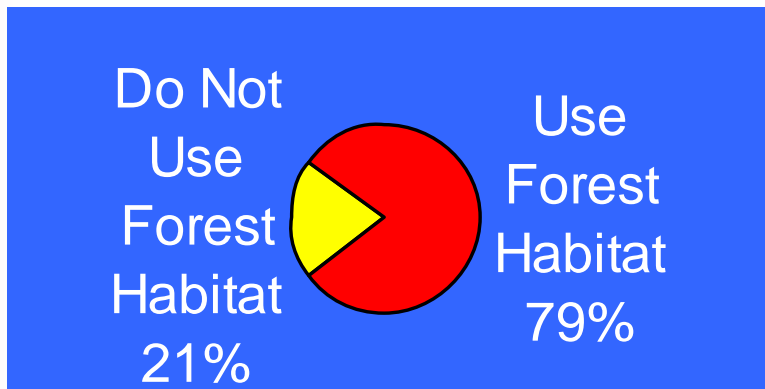
- **Habitat:** An area with the combination of resources and environmental conditions that promotes occupancy by individuals of a given species and allows those individuals to survive and reproduce.
  - **Habitat Sink:** A habitat incapable of supporting a reproductively active population.
  - **Area Sensitive Species:** A species that requires large areas of a particular habitat to survive.
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## And a Couple More

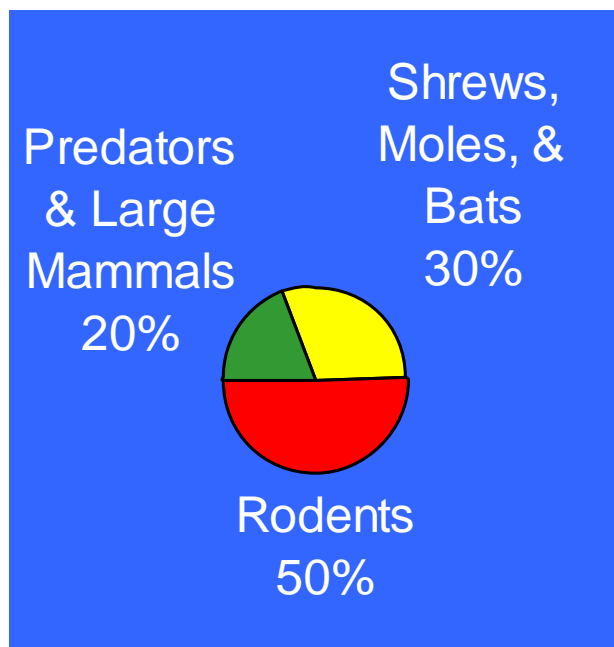
- **Coarse-grained Species:** A species whose individuals perceive their environment as consisting of large habitat patches. Must manage for all life history requirements.
- **Fine-grained Species:** A species whose individuals perceive their environment as consisting of small habitat patches. Must manage an array of habitats.

# Mammals in Washington



- 86 of 109 terrestrial species use forests
- Details of natural history and geographic distribution vary widely

# Mammals in Washington

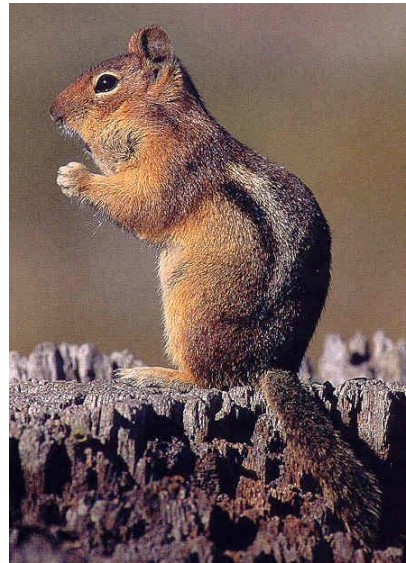


- Most species are small
- Most are rodents, shrews, moles, or bats
- The most familiar mammals (big and diurnal) are the most uncommon

# They're Everywhere...



Creeping vole



Golden-mantled ground squirrel



Townsend's Big-eared Bat



Townsend's mole hills

- They use every stratum of the forest. Species are:
  - in the ground
  - on the ground
  - in the shrubs
  - in the trees
  - In the air
- Forest layers are one key to diversity

# The Insectivores



Masked shrew



Shrew-mole



Townsend's mole & coast mole

- Ten shrews and the most abundant mammal:  
Trowbridge's shrew
- The shrew-mole
- Two moles
- Along with bats, the least known of our mammalian fauna



# The Rodents



Columbian ground squirrel

- More rodents worldwide than any other group
- 48% of Washington's terrestrial mammals are rodents (51 species)

# Squirrels



Western gray squirrel



Yellow-pine chipmunk



Golden-mantled ground squirrel

- Three chipmunks
- Four tree squirrels
- Five ground squirrels

# Gophers

Pockets!



Northern pocket gopher

- Two gophers are associated with forest edges and open canopy forests
- They can delay forest regeneration

# Mice



Deer & Keen's mice



Pacific & western jumping mice

- Next to the shrews, mice are the most abundant mammals
- Two deer mice
- Two jumping mice

# Voles or Meadow Mice



Townsend's vole



Southern red-backed vole



Montane vole

- Nine vole species are most numerous in pre-canopy stages where many construct runways and burrow systems
- They feed on leafy vegetation and some readily girdle young trees

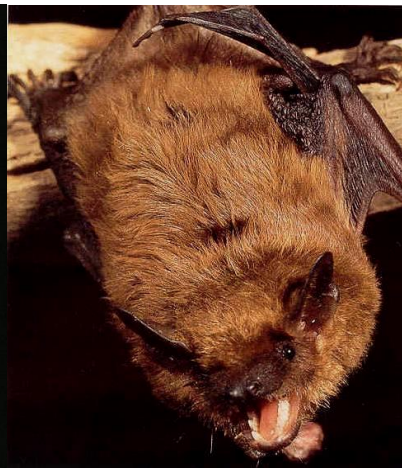
## And a Native Rat



Bushy-tailed wood rat

- Relative of the desert pack rat
- Inhabits cliffs, rock outcrops, and old buildings in forests
- They collect trinkets

# Washington's Forest Bats



- 4 desert species
- 11 forest dwelling
  - Townsend's Big-eared Bat
  - Big brown bat
  - Hoary bat
  - Silver-haired bat
- All are insectivorous

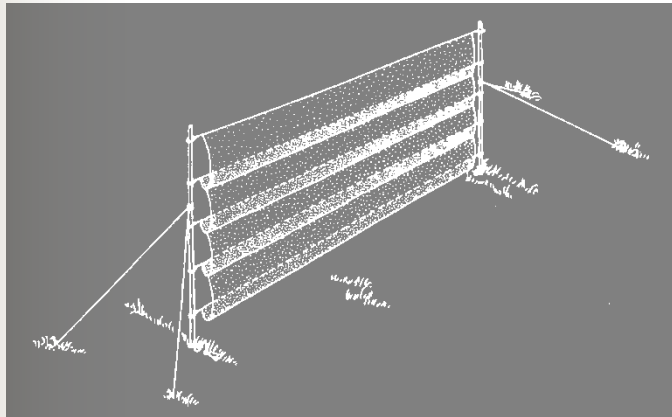
# Washington's Forest Bats



- Townsend's big-eared bat is a listed species
- 7 *Myotis* species
- Keen's myotis is our only PNW endemic bat



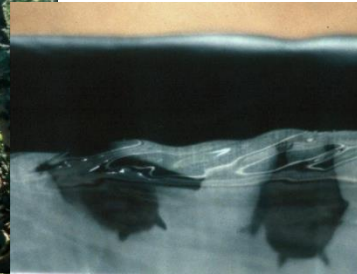
# Approaches for Studying Bats



Daubenton's bat (John Altringham 2000)

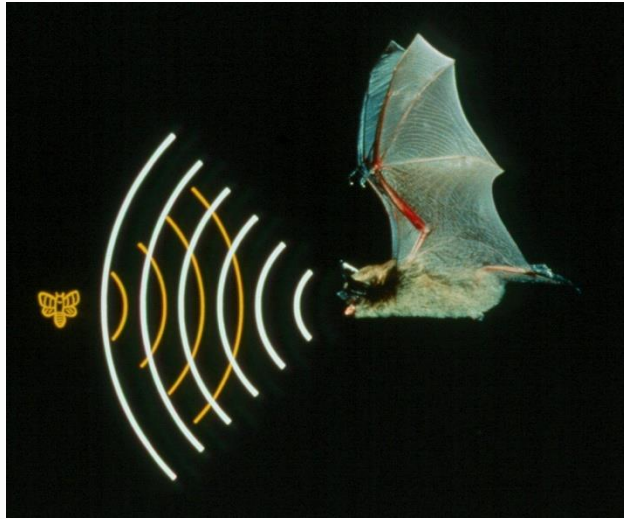
- Early work with shotguns
- Mist nets were an improvement
- Radio-telemetry with miniature transmitters
- Harp or Tuttle traps
- Echolocation detectors

# Harp or Tuttle Traps

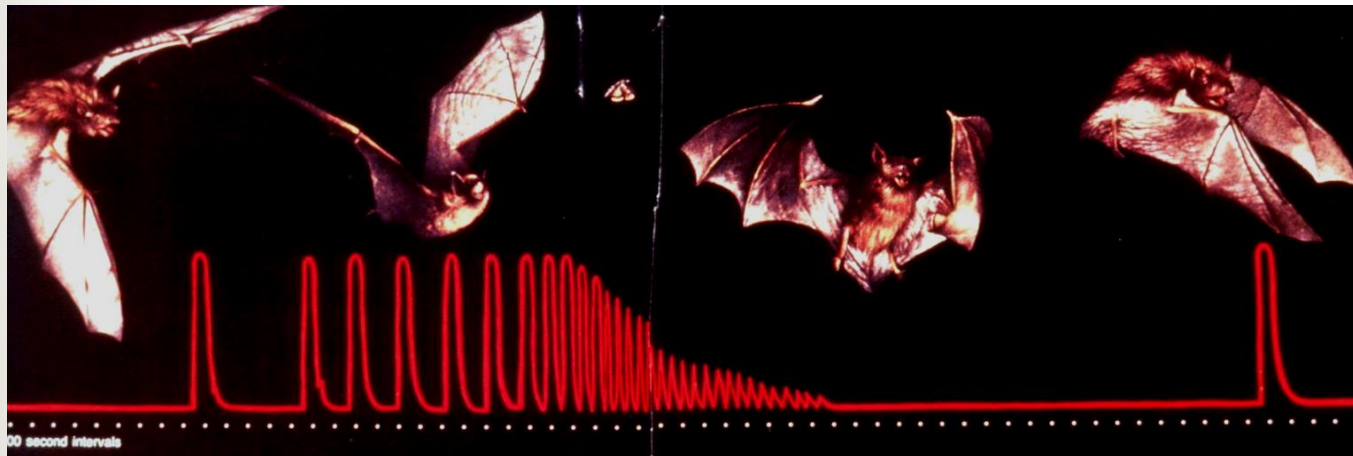


- Ingenious design!
- Very effective in restricted flyways, but sample smaller areas than mist nets
- Fairly easy on the bats
- Fairly easy on the batters

# All PNW Bats Echolocate



- Larynx makes loud outgoing call
- Echo used for navigation and feeding
- Most calls 23-70 kHz

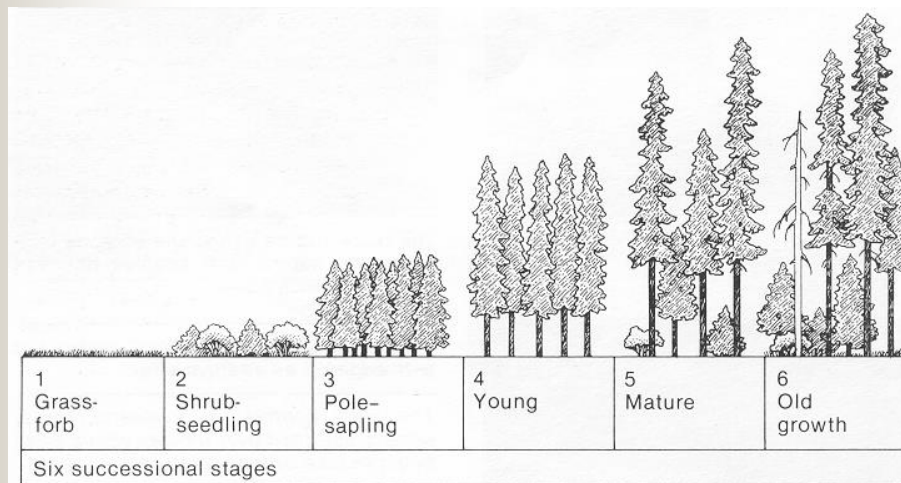




# Key Factors Influencing Habitat Quality

- Presence of forest successional stage appropriate for a given species
- Presence and diversity of habitat elements of importance to particular species within a stand
- Juxtaposition of contrasting habitats – the effects of edge on species richness and the management of species using habitats in fine-grained manner
- Spatial extent of appropriate habitat – does it exceed a minimum threshold? Is it too large?

# Forest Succession



- Primary driver of species composition
- Pre- vs. post-canopy faunas ( $\approx 15-20$  yrs)
- Predominant habitat occupancy patterns: pre-canopy, post-canopy, and generalist species

# Small Mammals & Forest Succession

Vagrant shrew

Townsend's mole

Meadow voles

Jumping mice

Deer mouse

Gophers

Ground squirrels

Chipmunks

Marsh and Trowbridge's shrews

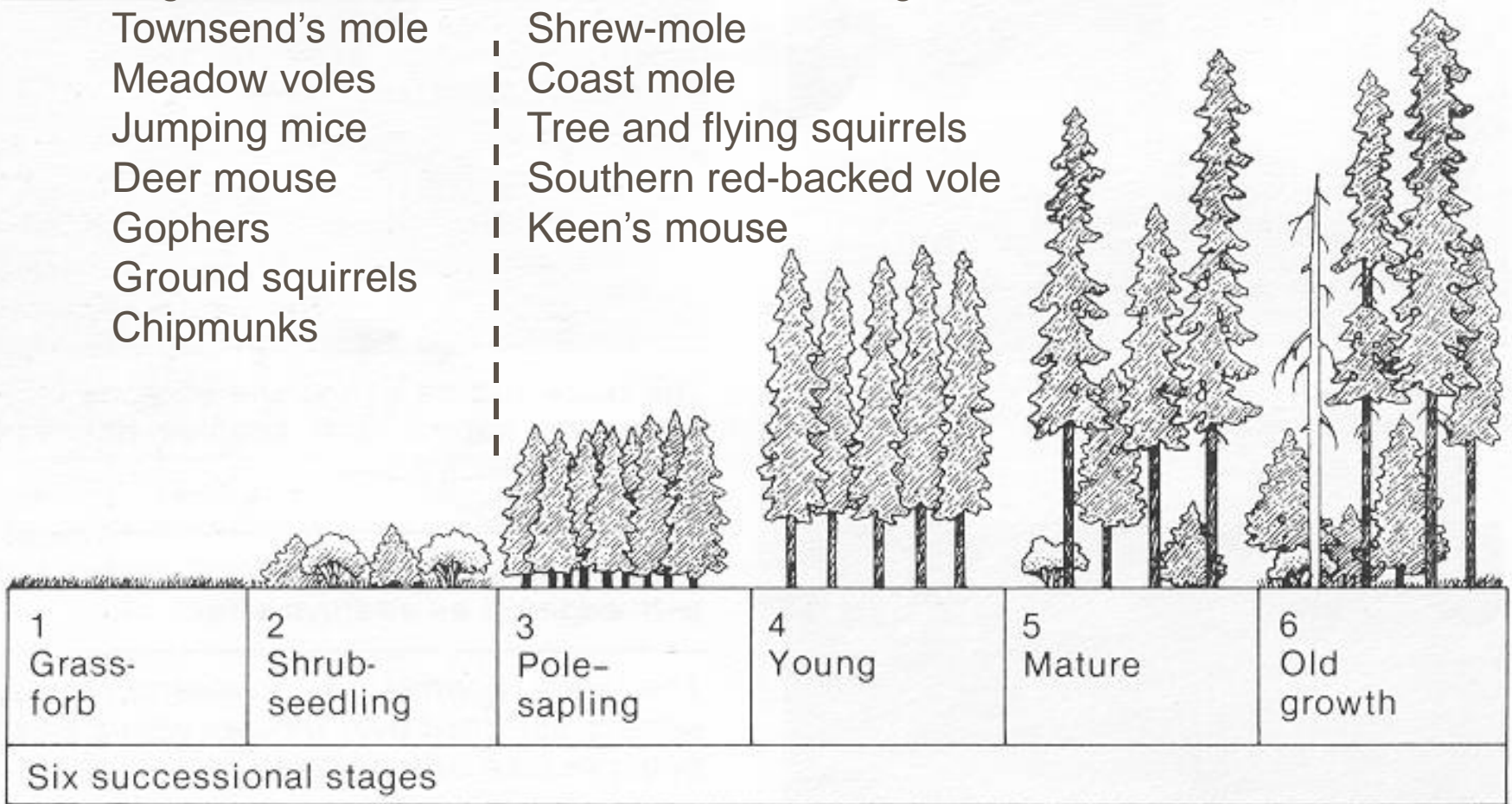
Shrew-mole

Coast mole

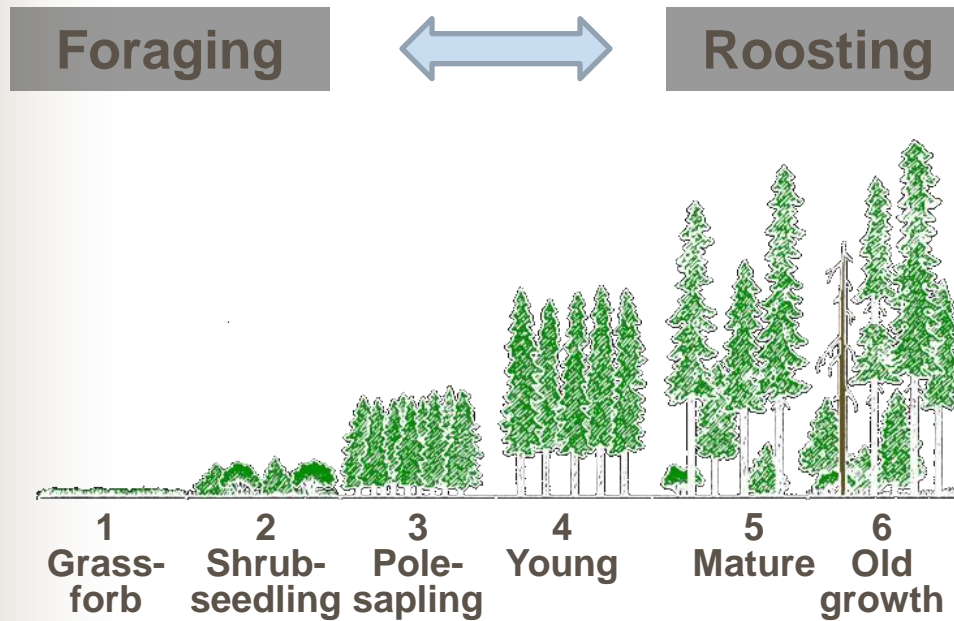
Tree and flying squirrels

Southern red-backed vole

Keen's mouse



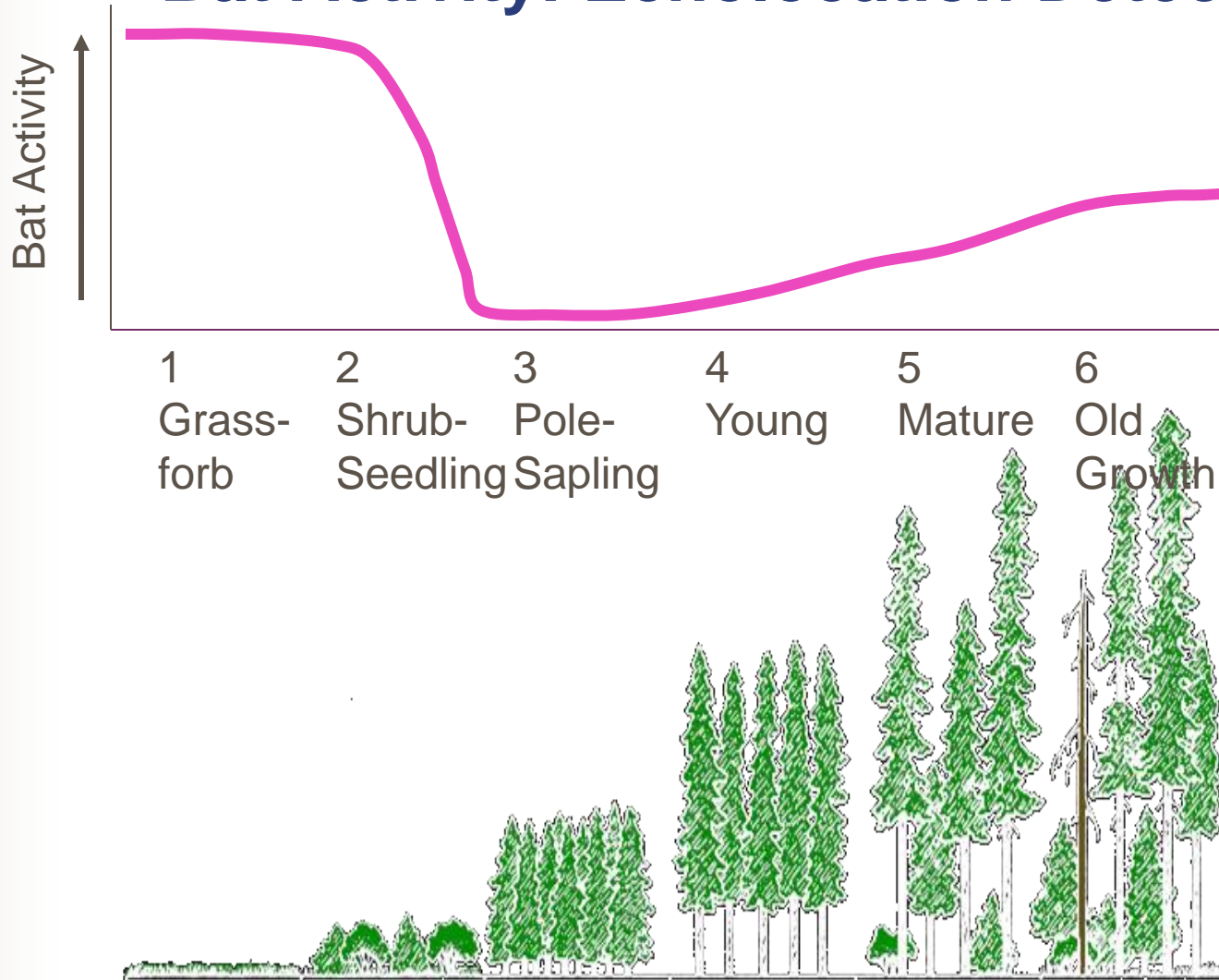
# Bats & Forest Succession



Successional Stages

- Use early successional areas and water bodies for foraging
- Roost in forests with suitable trees and snags
- High quality habitat is close to food, water, and roosts
- Commuting a hassle for bats as well!

# Bat Activity: Echolocation Detection



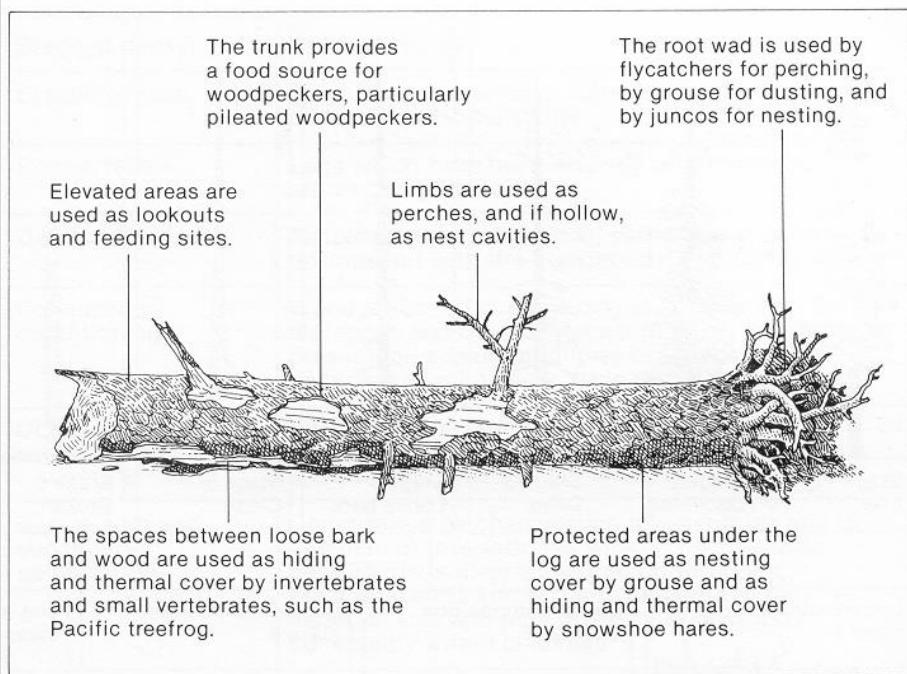


## Young Dense Sites (Dog-hair)



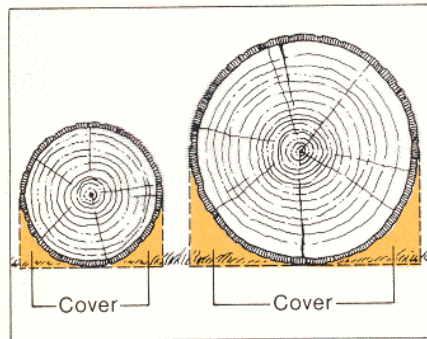
- 30-40 yrs after harvest
- High tree density
- Small diameter trees
- Poor development of understory and ground-level vegetation

# Within a Forest Stand: Logs as Habitat for Small Mammals

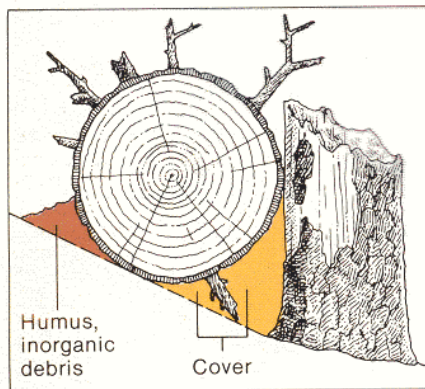


- Protection from physical environment
- Protection from predators
- Food sources
- Lookout structures
- Display structures
- Travel routes

# Logs as Habitat for Small Mammals



*Figure 49. The amount of cover provided by logs for small vertebrates is directly related to size of the log; the larger the log, the longer it takes to decompose and the longer it provides effective cover.*



- Large logs provide more habitat and they last longer
- We are still realizing benefits from stumps and logs from the original forest
- We are not replacing these elements

# Bat Day Roosts: Large Living Trees



- Exfoliating bark of old trees provides roosts unlike young conifers
- Source for large snags
- Roosts often are on southern exposures and on forest edges

# Bat Day Roosts: Large Snags



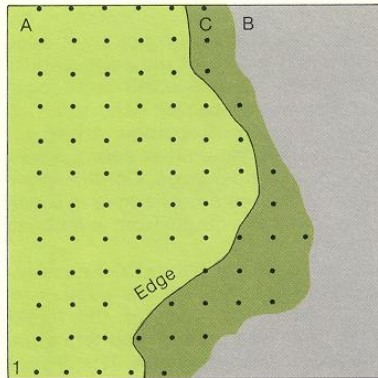
- Provide thermal choices for bats
- Cavities provide space for maternity colonies
- May need buffering with live trees as they decompose
- Need to work out replacement schedules

# Super-canopy Trees and Snags

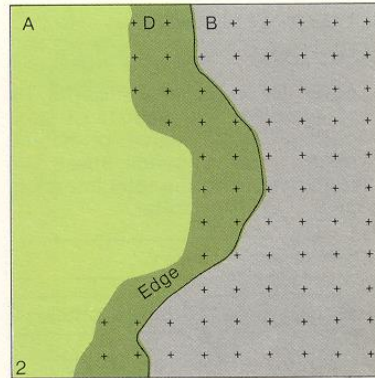


- We know from radio-telemetry work that bats often will roost in the largest tree or snag in a stand
- In addition to excellent roosting habitat these trees may serve as navigational features

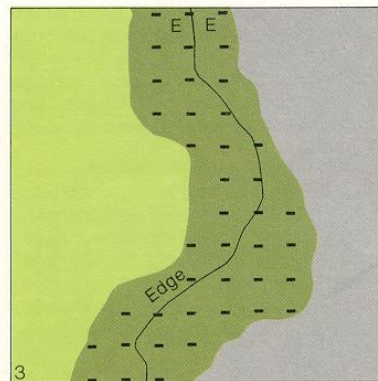
# The Edge Effect



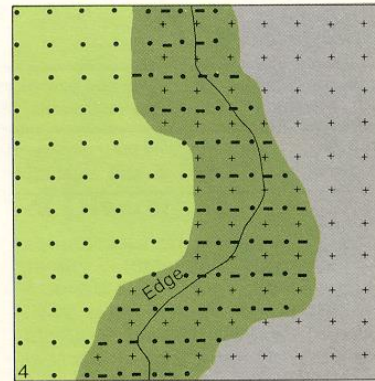
Some wildlife from plant community A overlaps into B within ecotone C.



Some wildlife from plant community B overlaps into A within ecotone D.



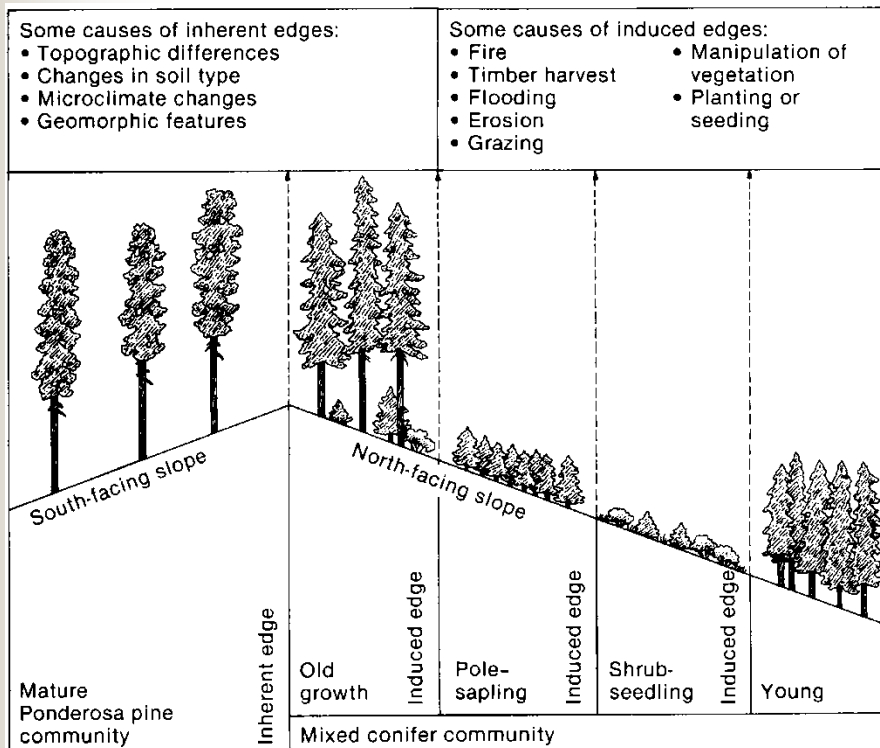
Some wildlife is particularly adapted to ecotone E.



The total wildlife use in the ecotone indicates the habitat and species richness associated with edges.

- As discussed by Aldo Leopold
- High species richness at edges because of the overlap effect and the presence of species that are edge specialists – game species and predators

# Inherent and Induced Edges



- Edges can be long or short lasting
- The degree of contrast at edges can be a habitat and aesthetic issue
- Induced edges have been used to increase local habitat diversity





## The Edge Effect vs. Effects of Edges

- Current discussion often centers on “area sensitive” species that require a minimum area of interior forest habitat to survive
- For these species, such as the spotted owl, extensive edge discounts the functional value of forest habitat
- In some landscapes agencies minimize the effects of edge – concentrating disturbance in one area, closing roads, reducing perimeter to area ratios (round or globular-shaped harvests)



# Factors of Decline for Small Mammals

- Forest conversion to urban/suburban development and agriculture
- Simplification or elimination of habitat elements within stands (esp. large living trees and large woody debris) results in low species richness
- Dense young forests with low ground-level productivity have low vertebrate species richness and abundance
- Increased uniformity of forest age (and structure) over large areas results in low species richness and reduced probability of colonization



# Management Actions to Increase Local Diversity of Small Mammals

- Retain forest habitat
- Replace critical habitat elements – provide large trees and snags across rotations
- Maintain a mix of early and late successional stages to provide for pre- and post-canopy species
- Strive for forest patches of 20-25 acres or larger to provide interior forest conditions
- Thin dense young stands to increase production of vegetation at ground level



## Factors of Decline for Bats

- Forest conversion to urban/suburban development and agriculture
- Loss of very large trees and snags
- Wetland drainage and elimination of beavers
- Creation of large acreages of dense, young forests (dog-hair)—effective elimination of bat habitat



## How to Retain Our Forest Bats?

- Retain forest habitat
- Maintain large live trees and snags on uplands (one / 7 acres?) not just within riparian zones
- Thin dense, young forests to enhance flight space and tree size
- Bats seem willing to use harvest patches as they used foraging gaps in old forests, but quality roosts must be maintained nearby