



# Montana's Bats:

## Distribution, Conservation Status, and Roost Site Overview

June 1<sup>st</sup>, 2013

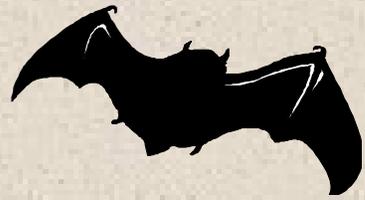
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MONTANA  
**Natural Heritage  
Program**

<http://mtnhp.org>



# Bats of the World

- Evolved from shrew-like ancestors 50 million years ago
- 1,100 species described
- 20% of all mammal species
- Chiroptera - Mega and Micro
- Range in weight from 2 grams with 6.5 inch wingspan (bumblebee bat) to 3 pounds and 6 ft wingspan fruit bats



# Bat Adaptations

- Insectivore
- Flight
- Echolocation
- Hibernation/migration
- Delayed fertilization/implantation
- Small litter size/long life span
- Specialists & generalists
- Temperature regulation-torpor





## Why Should We Care About Bats?

- A single little brown bat can eat 1,200 mosquito-sized insects in one hour.
- A colony of 150 big brown bats can eat 33 million cucumber beetles each summer.
- The 20 million Mexican free-tailed bats from Bracken Cave, Texas eat 200 tons of insects nightly.
- Tropical bats pollinate plants and help reseed forests.
- Bats have inspired new medical treatments
- Kids like bats!

# **Rabies in Montana**

(Source MT DPHHS)

**Bats: 5-10% +**

From 1996-1999: 901 tested with 67+ (7.5%)

**Skunks: Frequent +**

From 1996-1999: 304 tested with 122+ (40%)

**Raccoons: Rare +**

From 1996-1999: 134 tested with 0+

# Major Conservation Issues

- Loss of natural roost habitats – trees, rock outcrops
- Drowning hazards at artificial watering sites
- Loss of prey species (pesticides)
- White-Nose Syndrome
- Collisions hazards, including wind turbines

# White-Nose Syndrome

For Latest Info: <http://whitenosesyndrome.org/>

- 7 species affected, including 3 Montana species
- Has killed 5.7 to 6.7 million bats in N.A. since 2006  
(USFWS January 17, 2012 news release)
- Caused by cold-adapted fungus: *Geomyces destructans*  
(Lorch et al. 2011, Nature 480: 376-378)

• Predicted regional extinction of Little Brown Myotis by 2026

(Frick et al. 2010, Science 329: 679-682)

• *G. destructans* on bats across Europe, but no mass mortality there

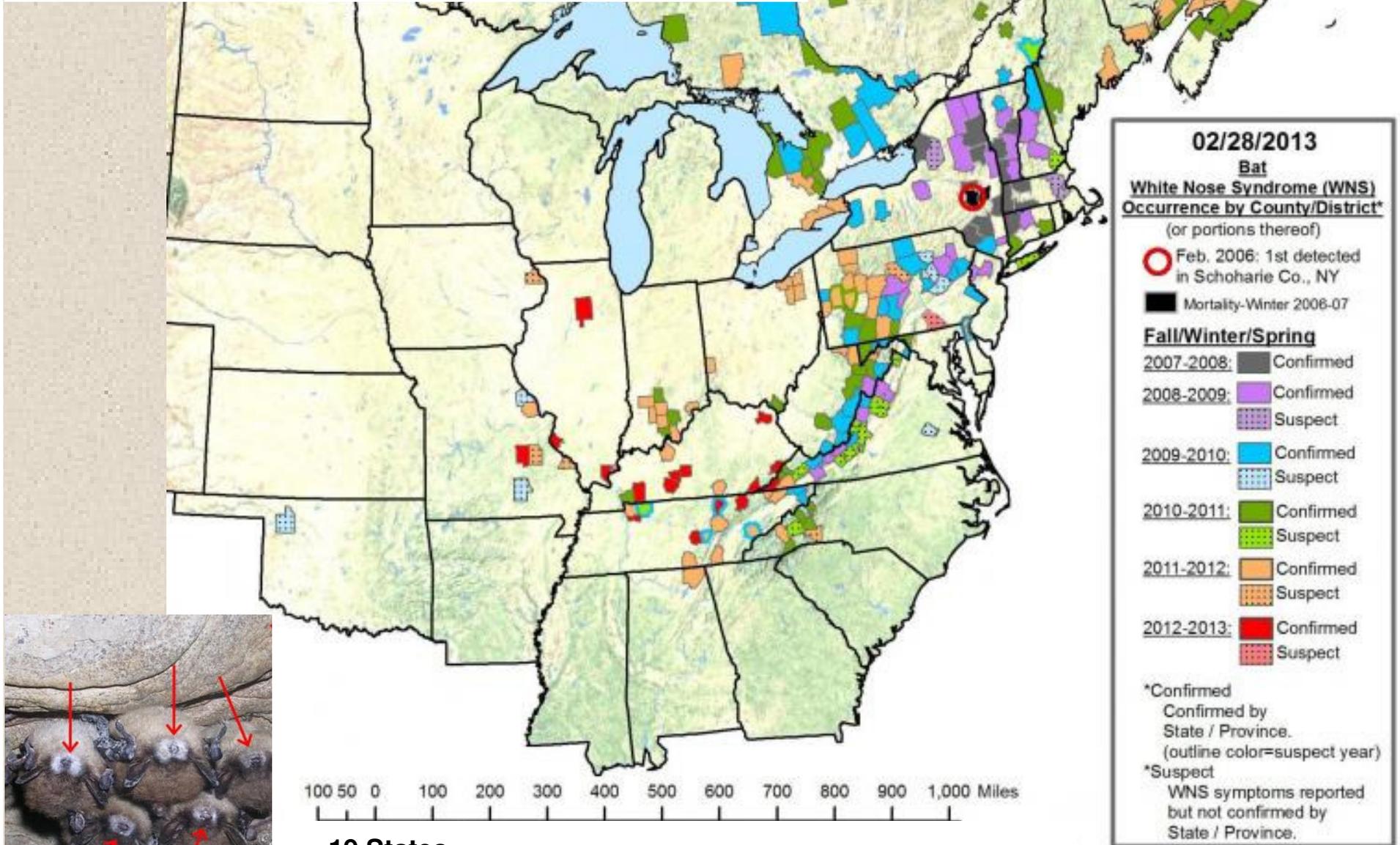
(Puechmaille et al. 2011, PLoS One 6(4)e19167)



(Frick et al. 2010, Science 329: 679-682)

# White-Nose Syndrome

<http://whitenosesyndrome.org>



- 19 States  
 - 4 Canadian Provinces

# Wind Energy Development and Bats

- Of North America's 45 bat species, mortalities of 11 have been detected at wind energy facilities (Kunz et al. 2007)

- 75% of documented mortalities have been of migratory foliage roosting species: Hoary Bat, Eastern Red Bat, and Silver-haired Bat (Kunz et al. 2007, *Frontiers in Ecology and the Environment* 5(6): 315-324)



Figure 2. The three species of migratory tree bats most frequently killed at wind turbine facilities in North America. (a) Hoary bat (*Lasiurus cinereus*), (b) eastern red bat (*L. borealis*), and (c) silver-haired bat (*Lasionycteris noctivagans*)

- 7 Montana bat species have had documented mortalities at wind energy facilities in North America and at least 3 species have documented mortalities at Montana wind energy facilities (Kunz et al. 2007, Poulton and Erickson 2010, Judith Gap Final Report)
- Most bats are killed on nights with low wind speed ( $< 6$  m/s where wind turbine cut-in speeds are typically 3.5 - 4.0 m/s) (Arnett et al. 2008, *JWM* 72(1): 61-78)
- Fatalities increase before or after storm fronts (Arnett et al. 2008, *JWM* 72(1): 61-78)
- Highest fatalities during late summer and early fall (Arnett et al. 2008, *JWM* 72(1): 61-78)
- Mortalities are often skewed toward males (Arnett et al. 2008, *JWM* 72(1): 61-78)

# Direct Collision versus Barotrauma

- Direct contact with turbine blade in 50% of fatalities
- 90% of bat fatalities involve internal hemorrhaging
- Pressure drops of 5-10 kPa with tip speeds of 55-80 m/s

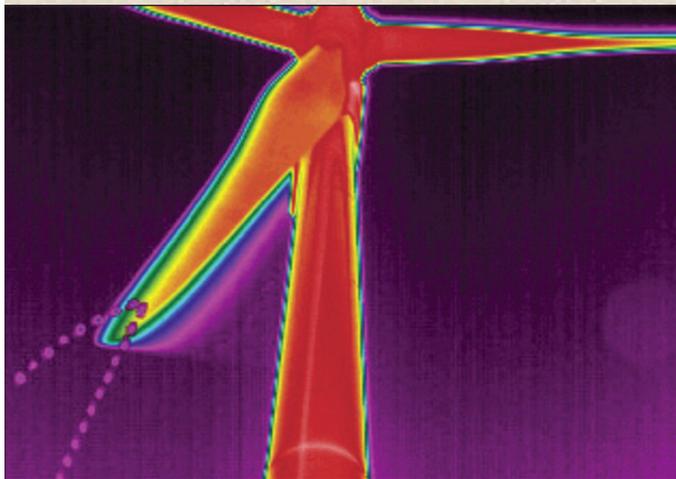
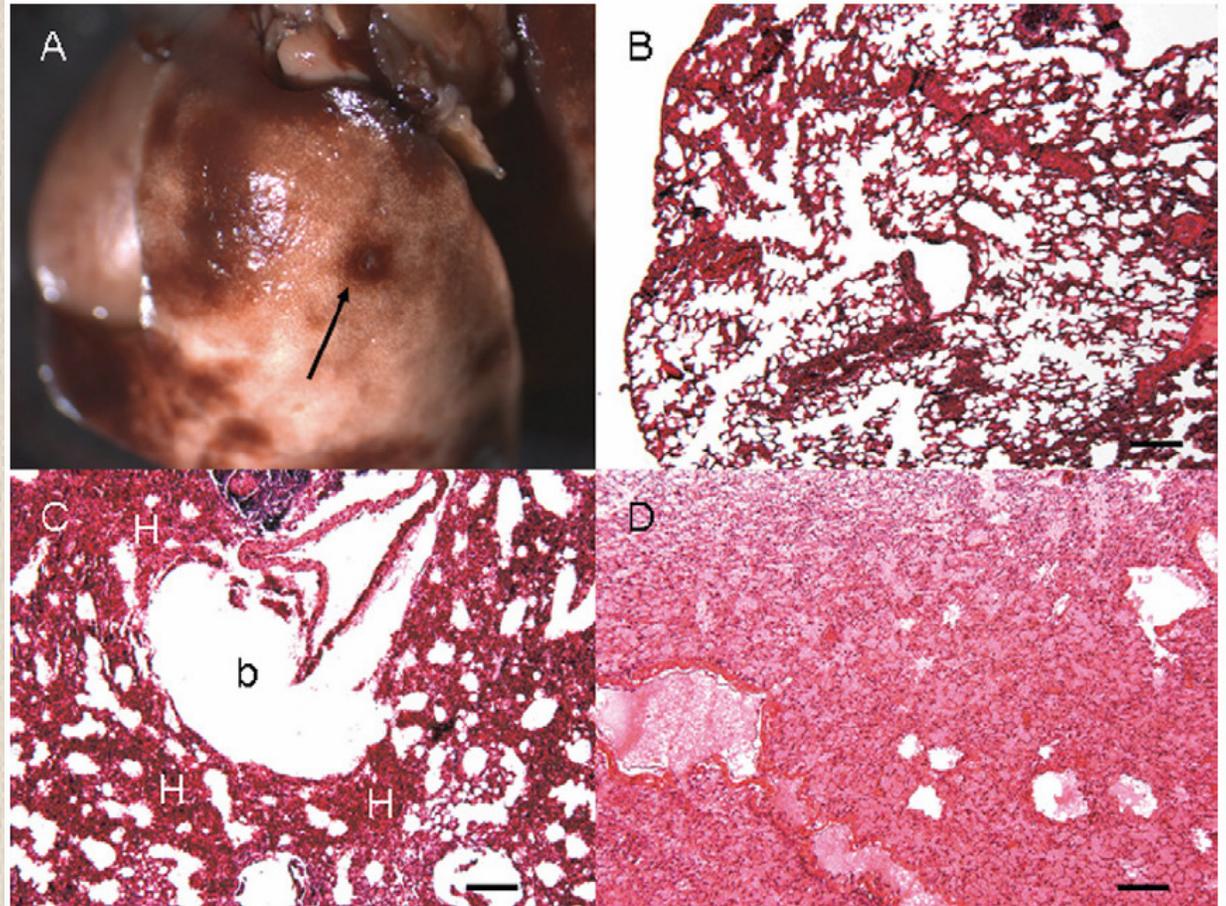


Figure 3. Thermal infrared image of a modern wind turbine rotor, showing the trajectory of a bat that was struck by a moving blade (lower left).

(Kunz et al. 2007, *Frontiers in Ecology and the Environment* 5(6): 315-324)



(Baerwald et al. 2008, *Current Biology* 18(16): R695-R696)

Figure 1. Pulmonary barotrauma in bats killed at wind turbines.

(A) Formalin-fixed *L. noctivagans* lung with multifocal hemorrhages and a ruptured bulla with hemorrhagic border (arrow). Histological sections of bat lungs stained with hematoxylin and eosin (100X). (B) Normal lung of an *L. noctivagans*. (C) Lung of *Eptesicus fuscus* found dead at a wind turbine with no traumatic injury. There is extensive pulmonary hemorrhage (H), congestion, and bullae (b). (D) Lung of *L. cinereus* found dead at a wind turbine with a fracture of the distal ulna and radius. 90% of the alveoli and airways are filled with edema. Bar = 100  $\mu$ m.

# Major Bat Conservation Issues

Wind Turbine Impacts Documented

White-Nose Syndrome and Wind Turbine Impacts Documented

Common Name	Scientific Name	4-Code	MT Range/No. Recs
Pallid Bat	<i>Antrozous pallidus</i>	<b>ANPA</b>	 44
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	<b>COTO</b>	 261
<b>Big Brown Bat</b>	<b><i>Eptesicus fuscus</i></b>	<b>EPFU</b>	 773
Spotted Bat	<i>Euderma maculatum</i>	<b>EUMA</b>	 50
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	<b>LANO</b>	 1,037
Eastern Red Bat	<i>Lasiurus borealis</i>	<b>LABO</b>	 21
Hoary Bat	<i>Lasiurus cinereus</i>	<b>LACI</b>	 828
California Myotis	<i>Myotis californicus</i>	<b>MYCA</b>	 159
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	<b>MYCI</b>	 636
Long-eared Myotis	<i>Myotis evotis</i>	<b>MYEV</b>	 820
<b>Little Brown Myotis</b>	<b><i>Myotis lucifugus</i></b>	<b>MYLU</b>	 1,165
<b>Northern Myotis</b>	<b><i>Myotis septentrionalis</i></b>	<b>MYSE</b>	? 1
Fringed Myotis	<i>Myotis thysanodes</i>	<b>MYTH</b>	 113
Long-legged Myotis	<i>Myotis volans</i>	<b>MYVO</b>	 316
Yuma Myotis	<i>Myotis yumanensis</i>	<b>MYYU</b>	 23



# Bats of Montana

- 5 Species of Concern

- 4 Potential Species of Concern

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# Montana's Resident Bats 1

Little Brown Myotis



Long-legged Myotis



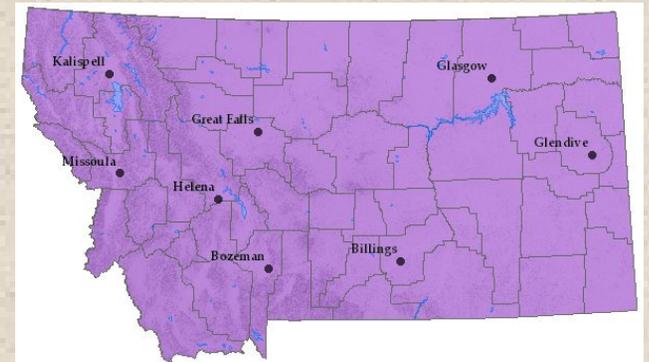
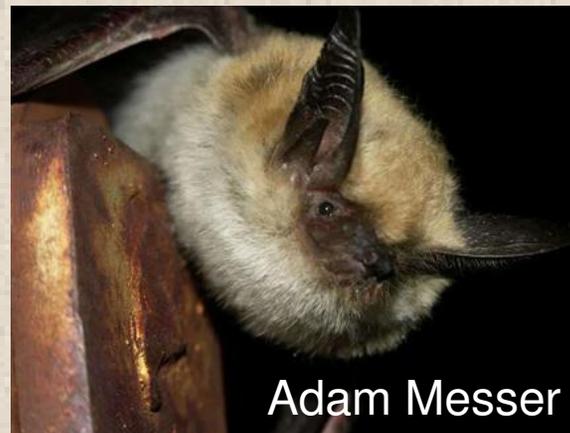
Western Small-footed Myotis



Big Brown Bat



Long-eared Myotis

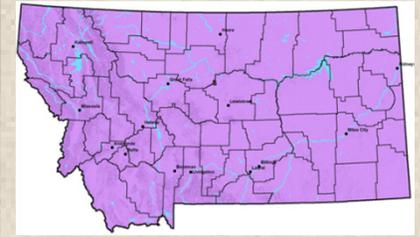


# Montana's Resident Bats 2

## Townsend's Big-eared Bat (SOC)



## Silver-haired Bat (PSOC)

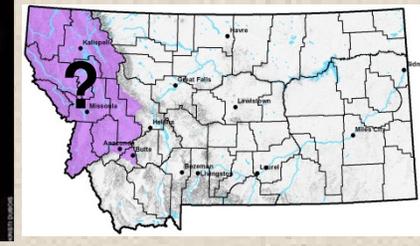


\* No winter captures, but acoustic evidence of winter presence.

## California Myotis



## Yuma Myotis (PSOC)



# Montana's "Migratory" Bats

Possibly present in winter, but no or limited evidence of winter presence to-date.  
Possible that these species are partial migrants within their overall range.

## Pallid Bat (SOC)



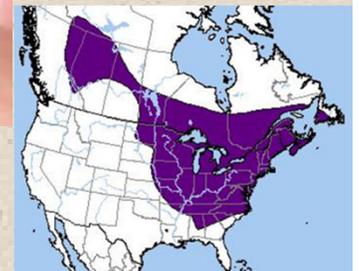
## Spotted Bat (SOC)



## Fringed Myotis (SOC)



## Northern Myotis (PSOC)

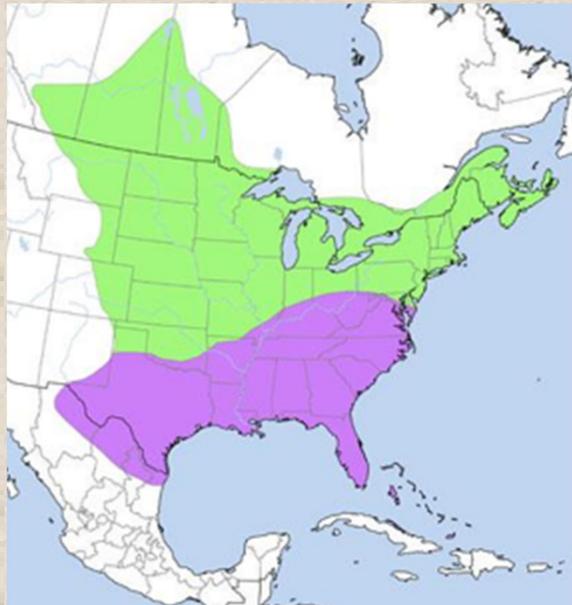


# Montana's True Migratory Bats

Eastern Red Bat (PSOC)

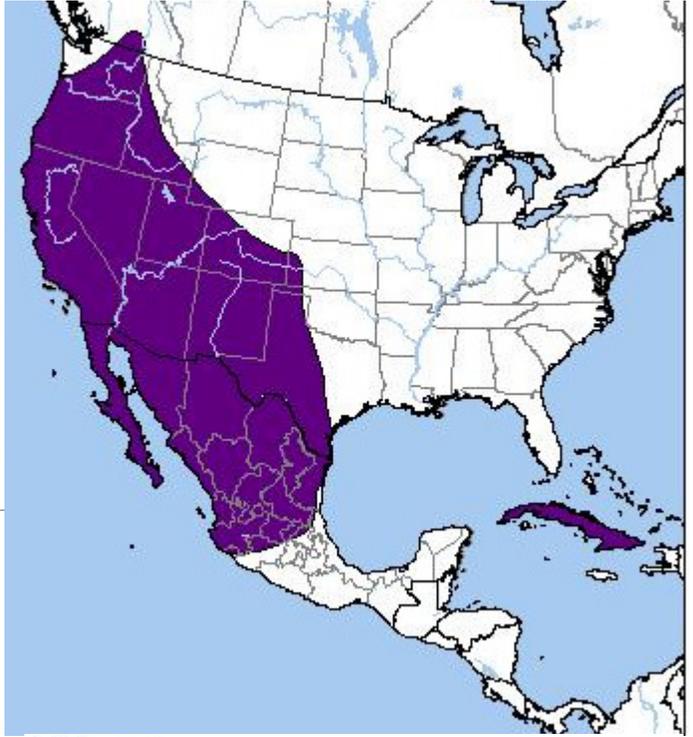


Hoary Bat (SOC)



# Pallid Bat

**SOC, G5, S3**



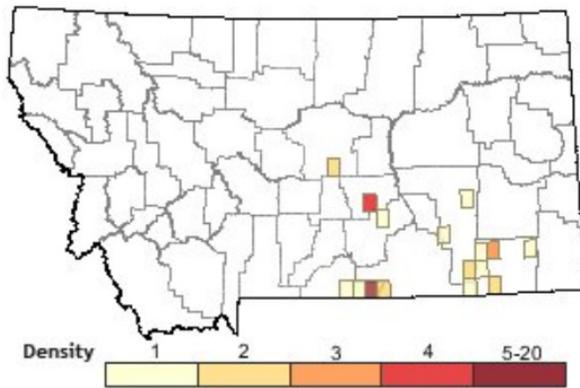
## Summary of Observations Submitted for Montana

Number of Observations: 44

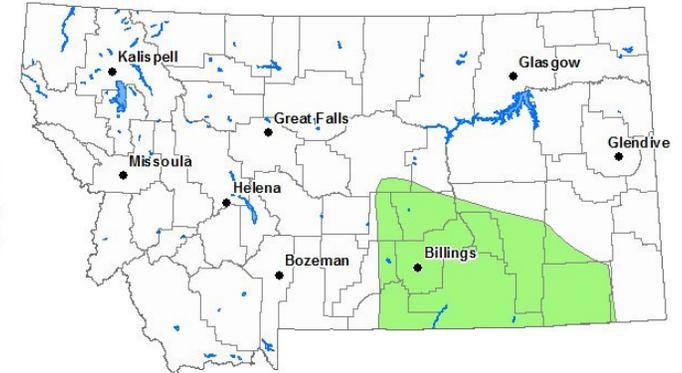
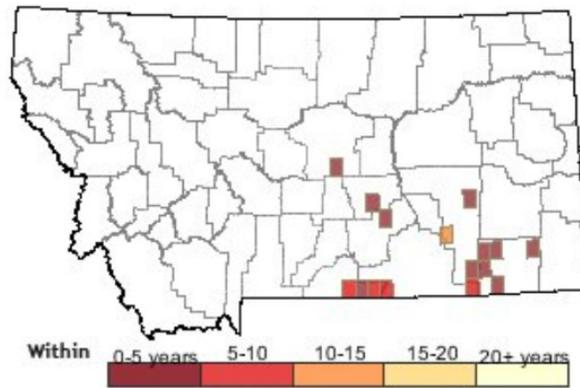
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[Map Help and Descriptions](#)

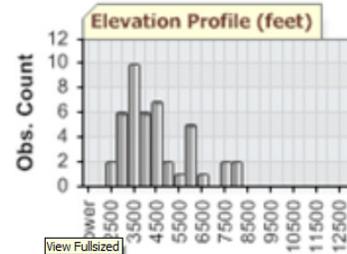
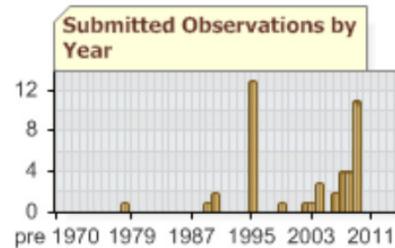
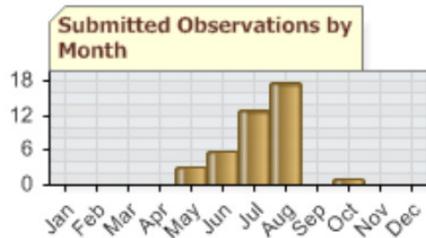
Relative Density



Recency

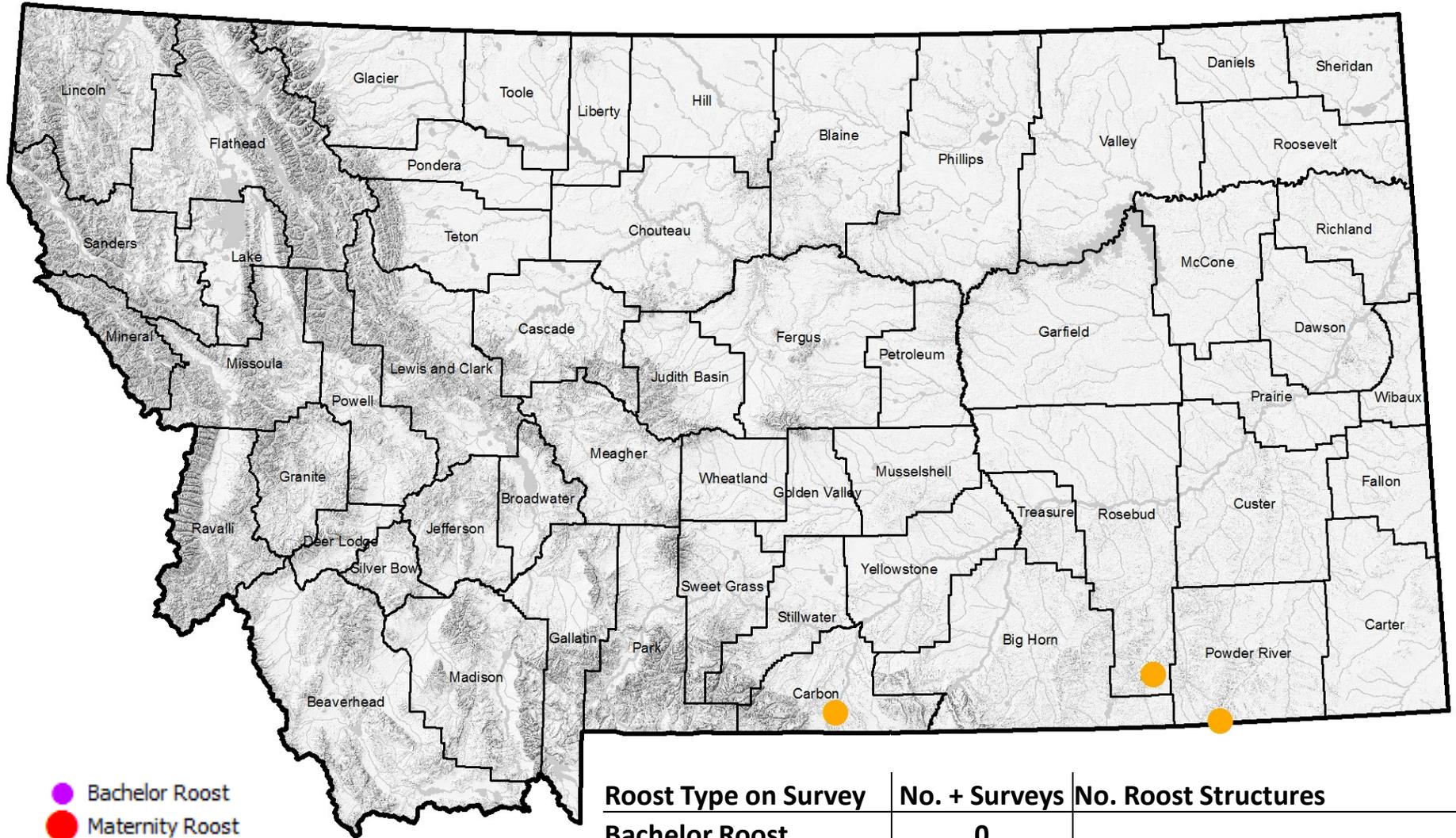


Range Year-round Summer Winter Migratory Historic Introduced



(Records associated with a range of dates are excluded from time charts)

# Pallid Bat Roost Use Type Overview



- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

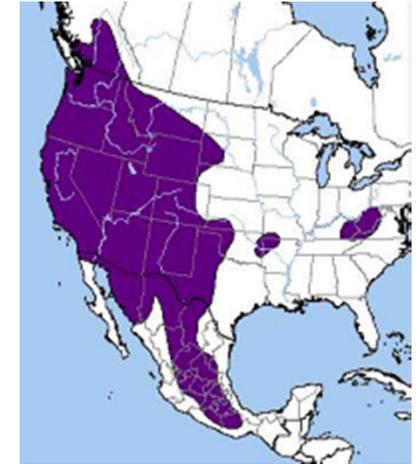
Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	0	
Hibernacula	0	
Day and Night Roost	3	2 Rock Outcrops, 1 Tractor
Night Roost	0	

# Townsend's Big-eared Bat

## SOC, G3G4, S3



Kristi DuBois



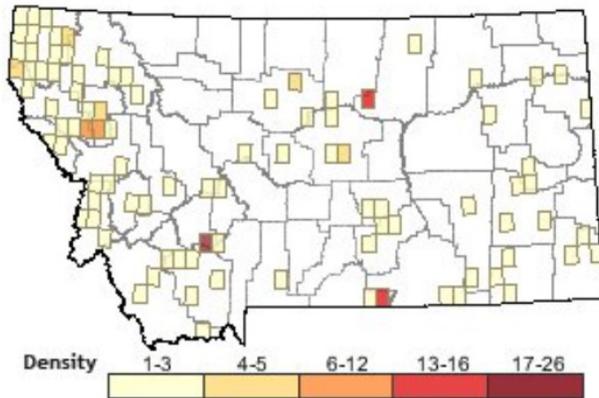
### Summary of Observations Submitted for Montana

Number of Observations: 260

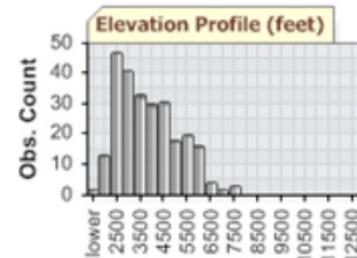
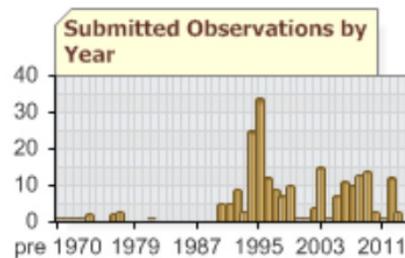
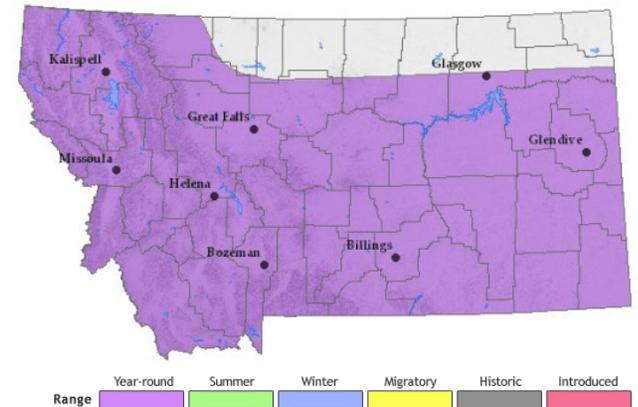
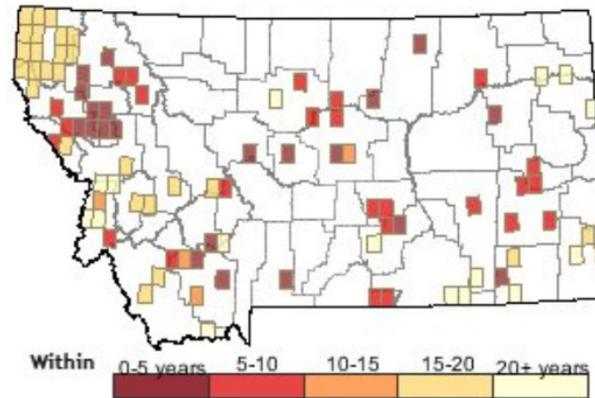
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[Map Help and Descriptions](#)

Relative Density

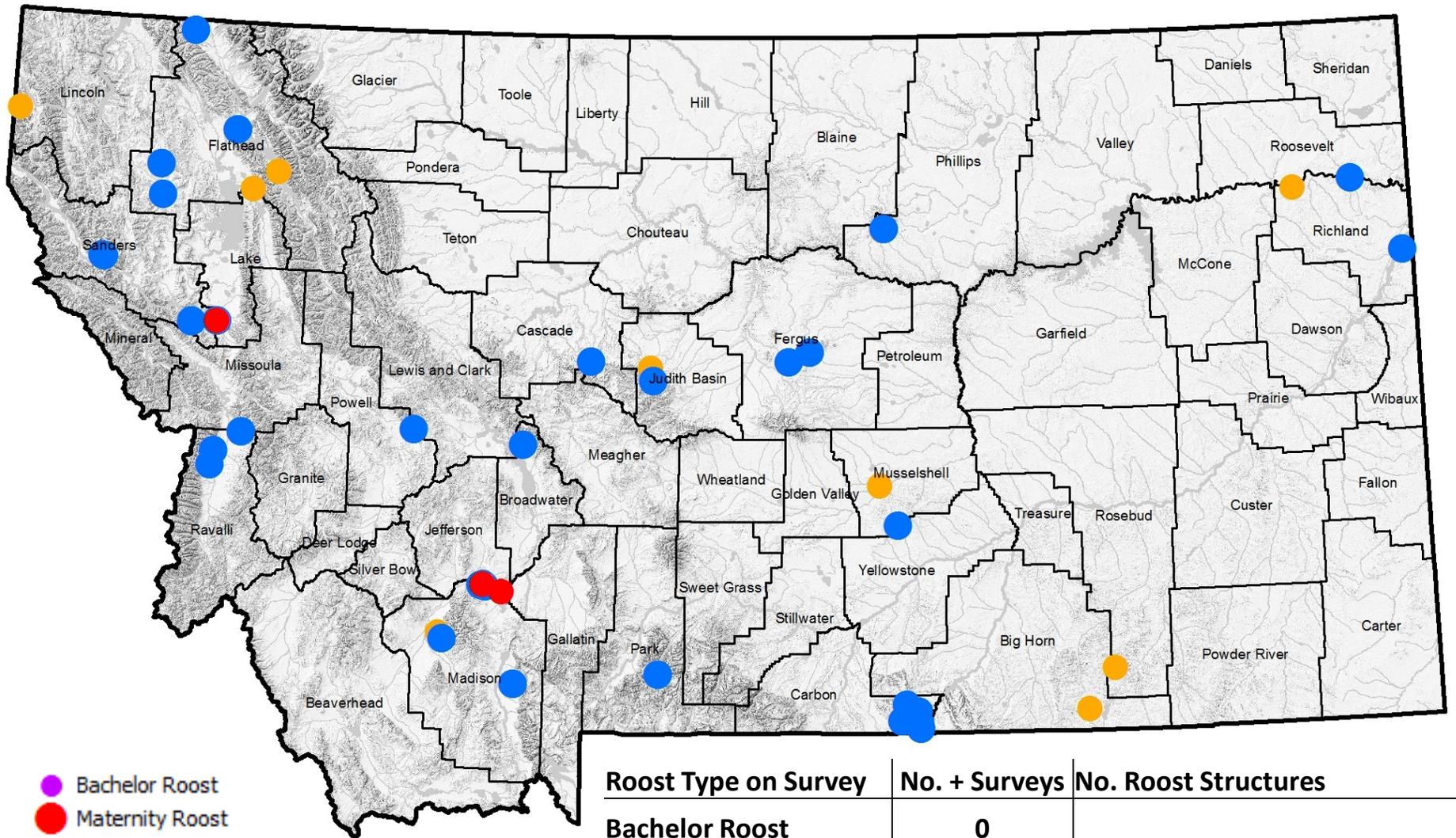


Recency



(Records associated with a range of dates are excluded from time charts)

# Townsend's Big-eared Bat Roost Use Type Overview

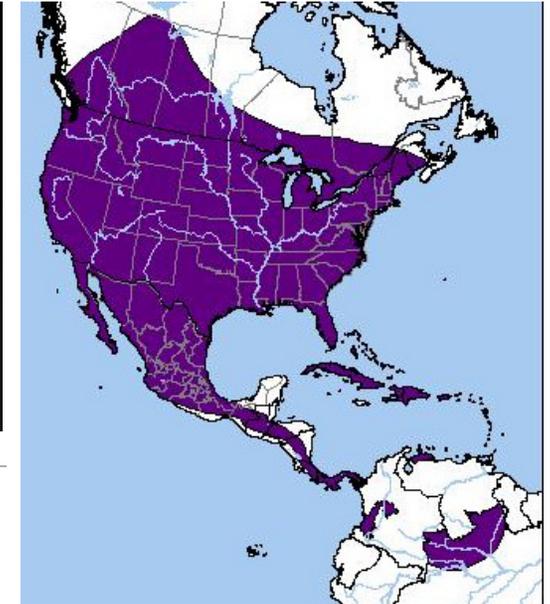


- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	13	2 Caves, 1 Mine
Hibernacula	69	18 Caves, 20 Mines, 1 Tunnel
Day and Night Roost	33	6 Buildings, 7 Caves, 7 Mines
Night Roost	0	

# Big Brown Bat G5, S4

Adam Messer



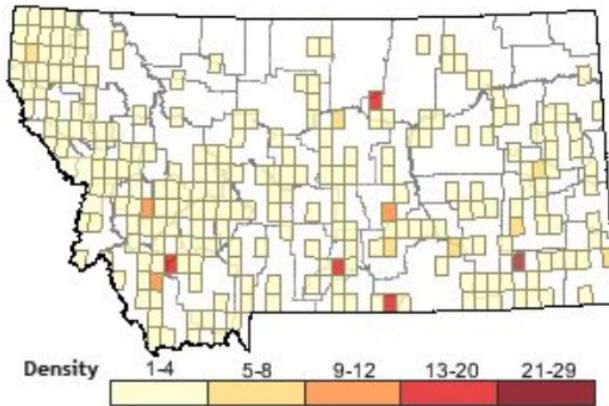
## Summary of Observations Submitted for Montana

Number of Observations: 752

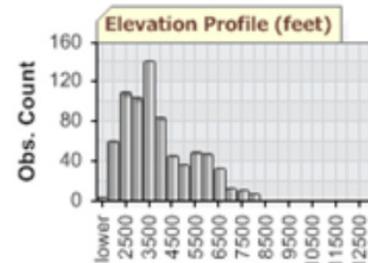
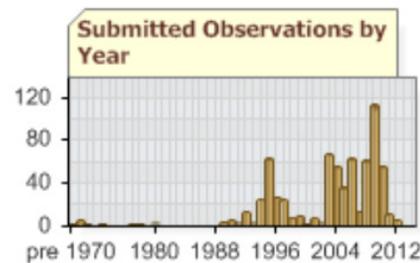
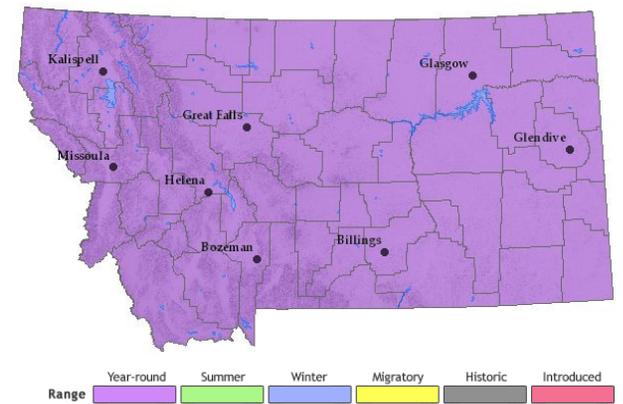
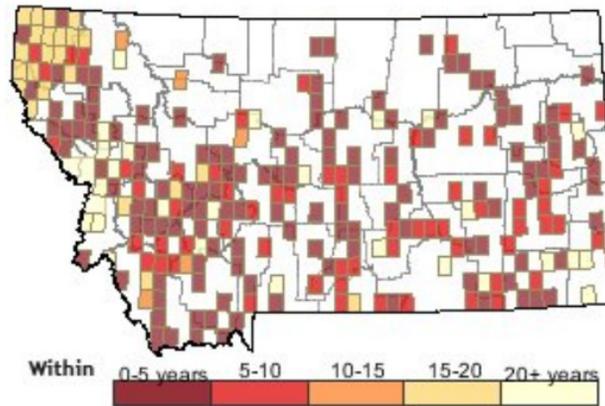
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[Map Help and Descriptions](#)

Relative Density

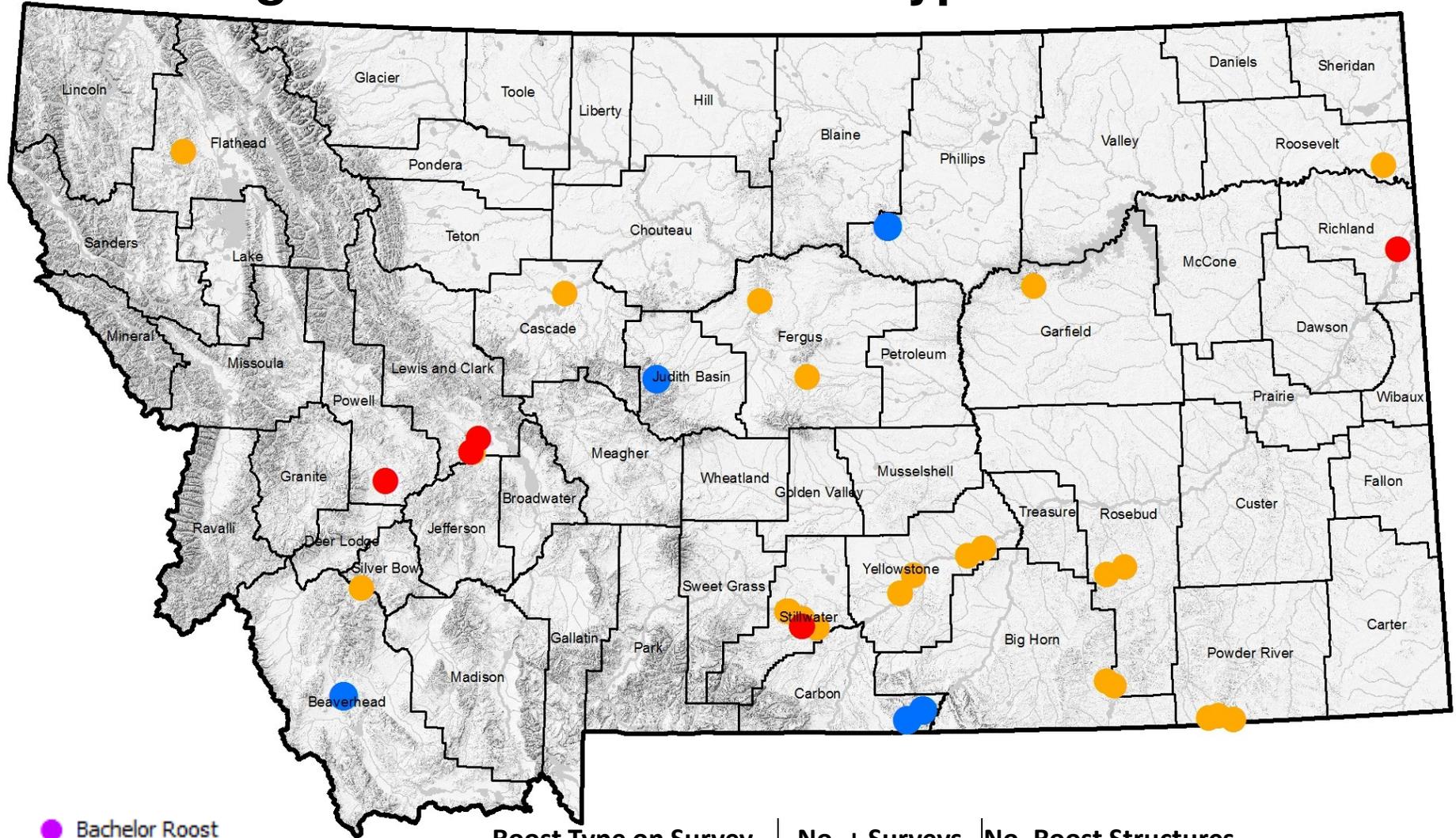


Recency



(Records associated with a range of dates are excluded from time charts)

# Big Brown Bat Roost Use Type Overview



- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	12	1 Bridge, 5 Buildings
Hibernacula	6	3 Caves, 2 Mines
Day and Night Roost	44	9 Bridges, 9 Buildings, 5 Rock Outcrops
Night Roost	0	

# Spotted Bat

## SOC, G4, S3



Dick Dede, Jr.

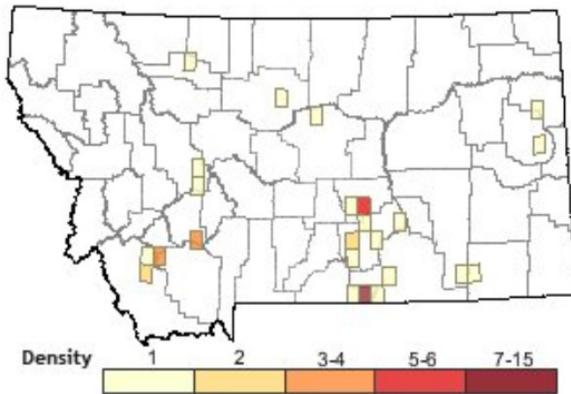
### Summary of Observations Submitted for Montana

Number of Observations: 51

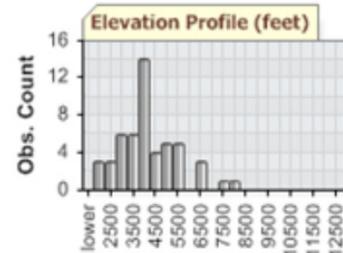
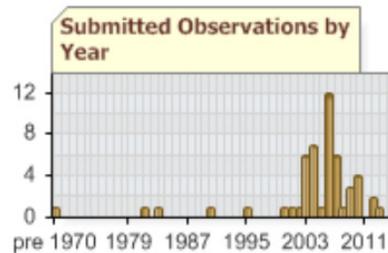
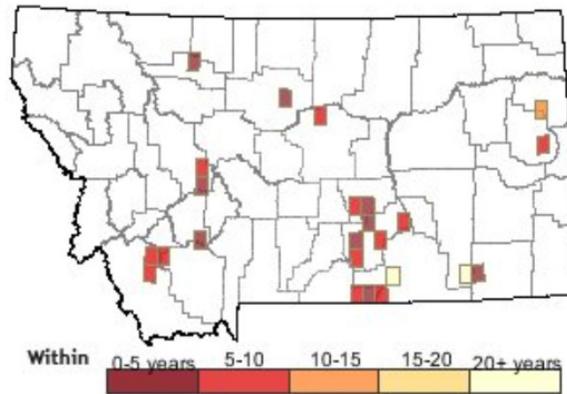
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[Map Help and Descriptions](#)

**Relative Density**

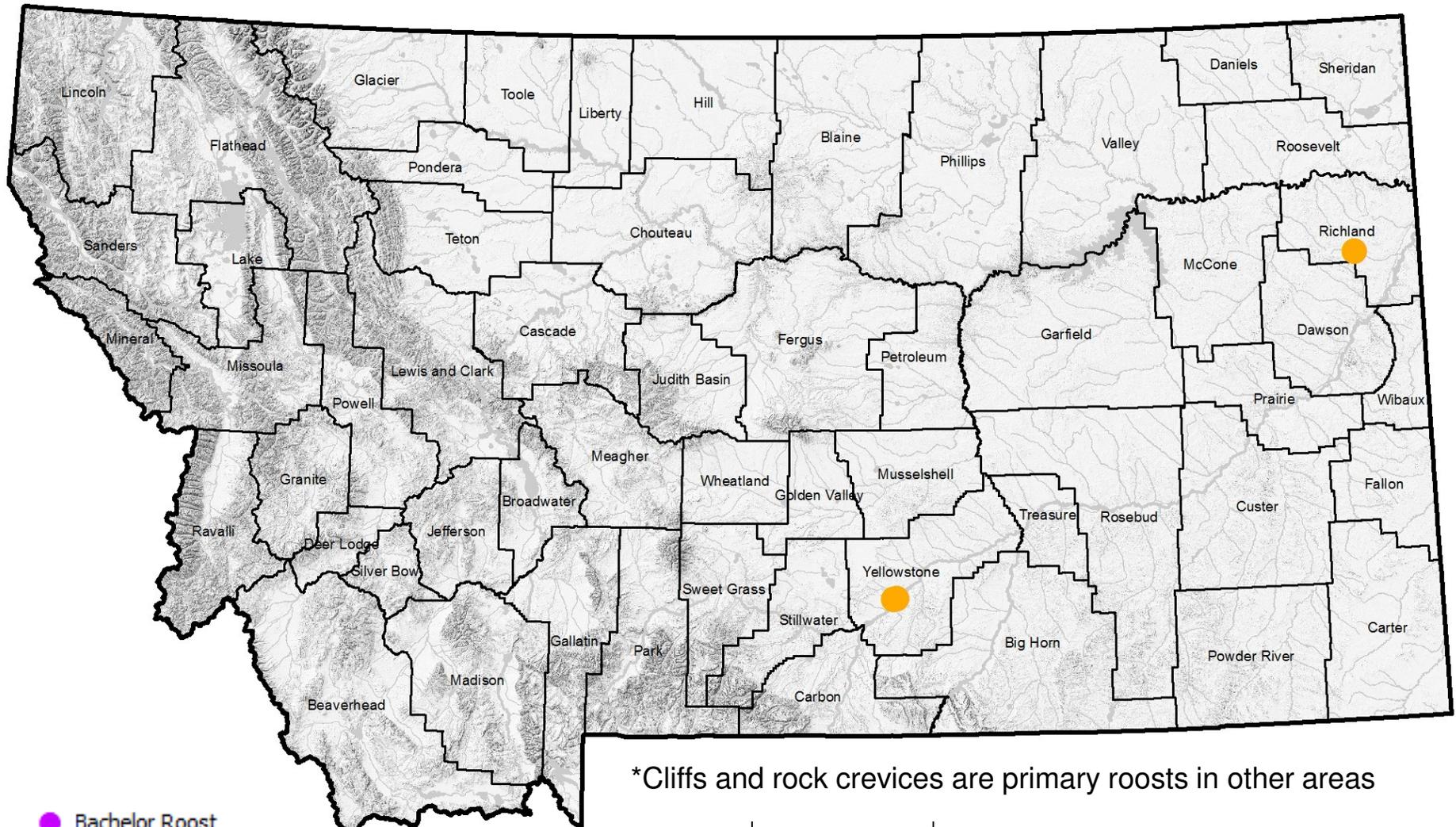


**Recency**



(Records associated with a range of dates are excluded from time charts)

# Spotted Bat Roost Use Type Overview

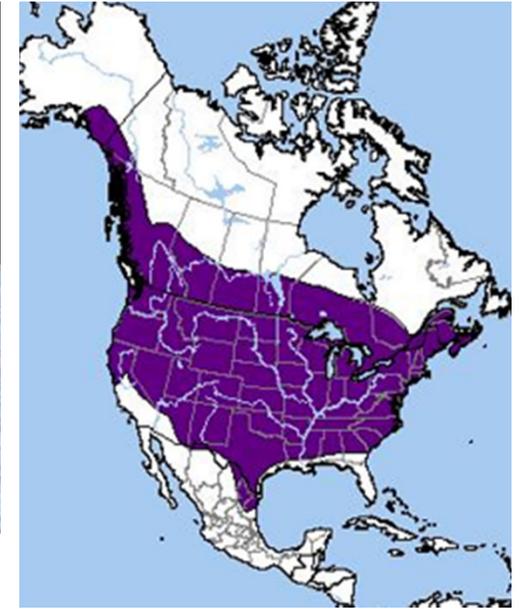


- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	0	
Hibernacula	0	
Day and Night Roost	3	1 House, 1 Parking Garage, 1 Electric Meter
Night Roost	0	

# Silver-haired Bat

## PSOC, G5, S4



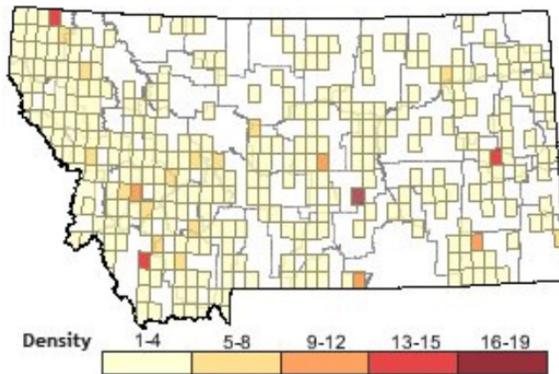
### Summary of Observations Submitted for Montana

Number of Observations: 1012

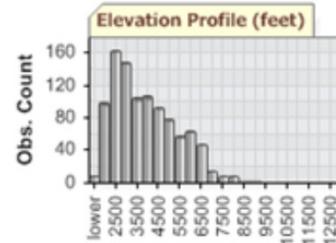
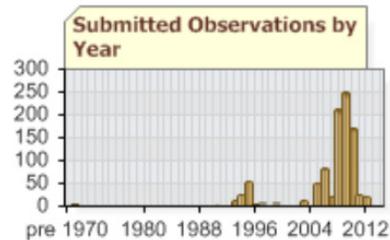
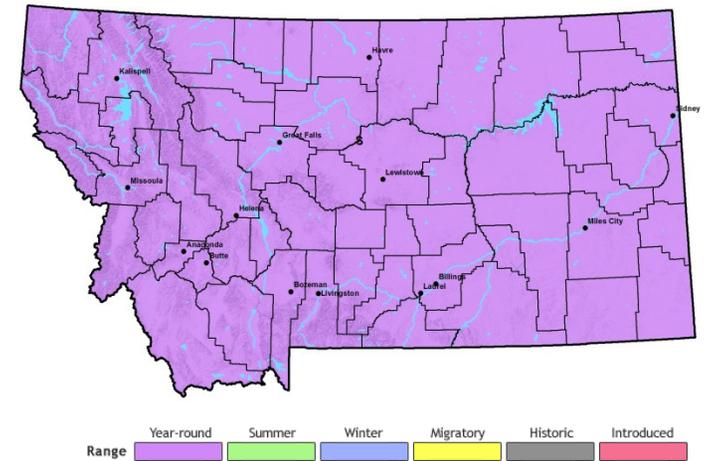
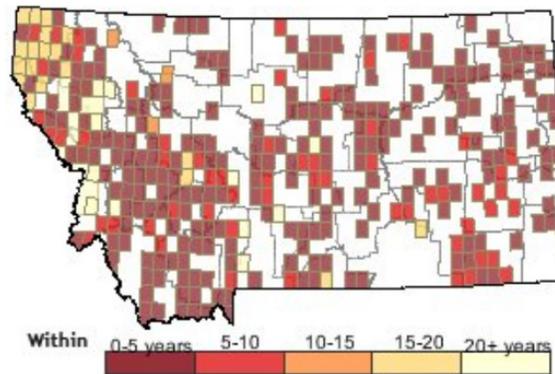
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**Relative Density**

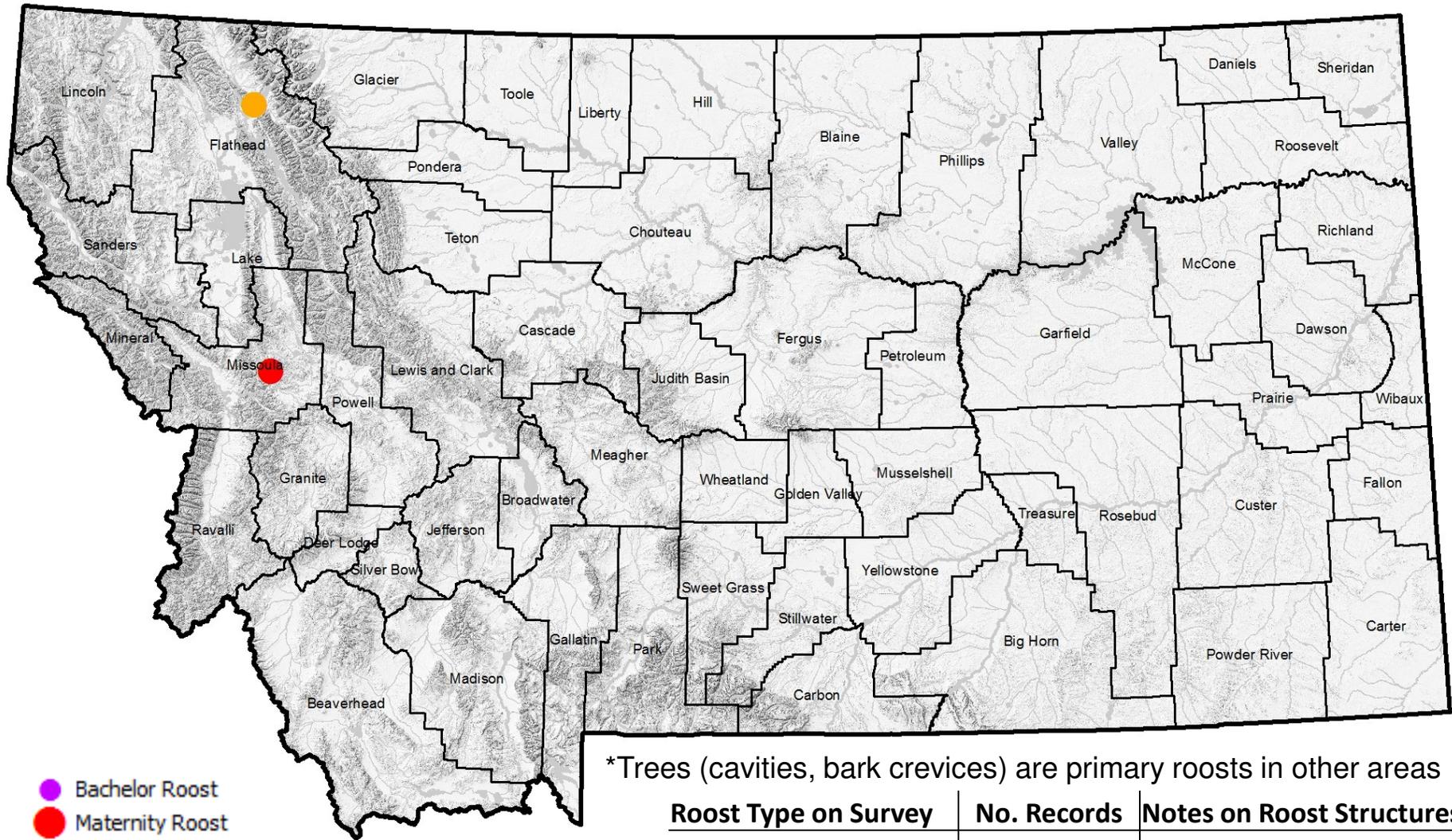


**Recency**



(Records associated with a range of dates are excluded from time charts)

# Silver-haired Bat Roost Use Type Overview



\*Trees (cavities, bark crevices) are primary roosts in other areas

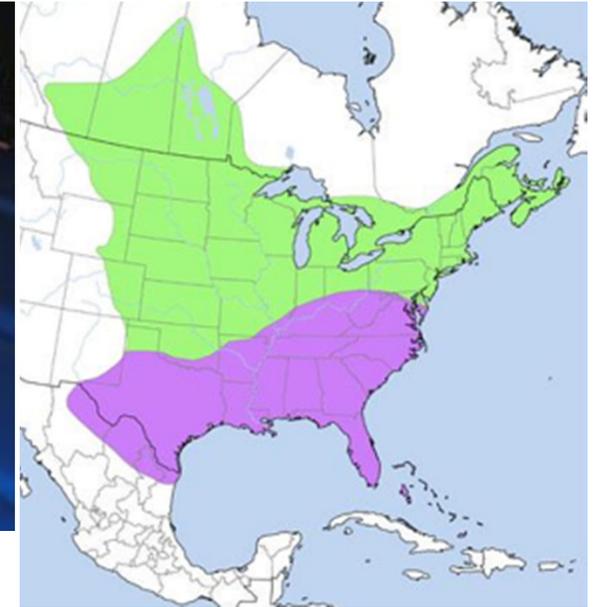
Roost Type on Survey	No. Records	Notes on Roost Structures
Bachelor Roost	0	
Maternity Roost	1	1 Ponderosa Pine snag
Hibernacula	0	
Day and Night Roost	1	Inside animal hide
Night Roost	0	

# Eastern Red Bat

## PSOC, G5, SU



Susan Lenard & Bryce Maxell



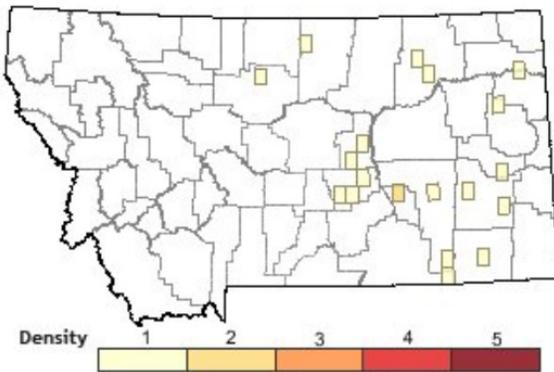
### Summary of Observations Submitted for Montana

Number of Observations: 21

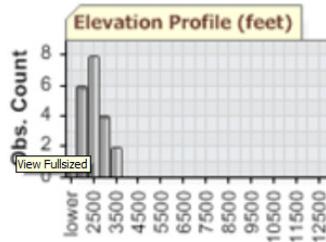
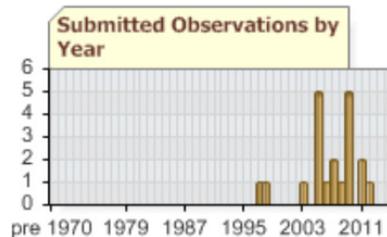
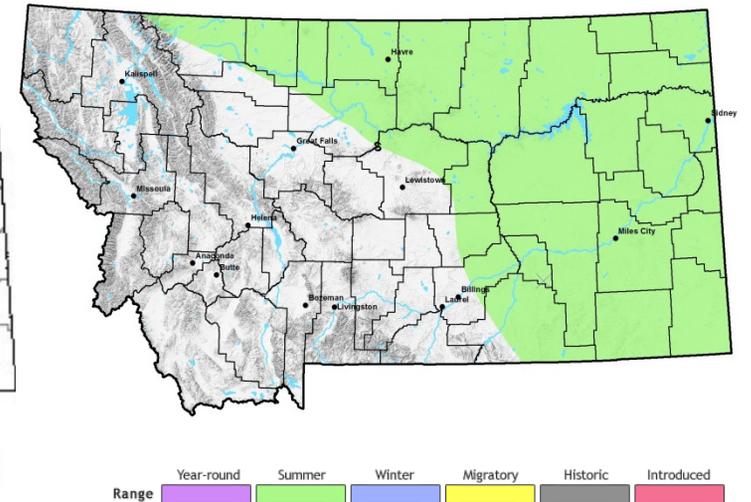
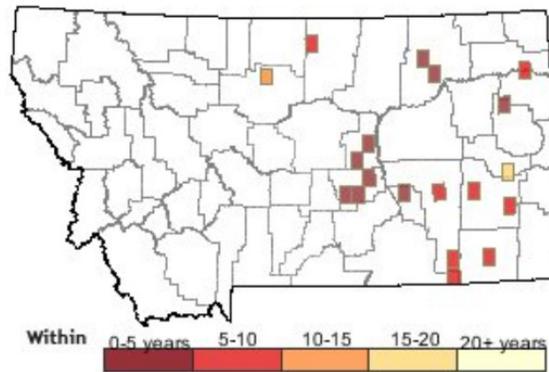
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density



Recency

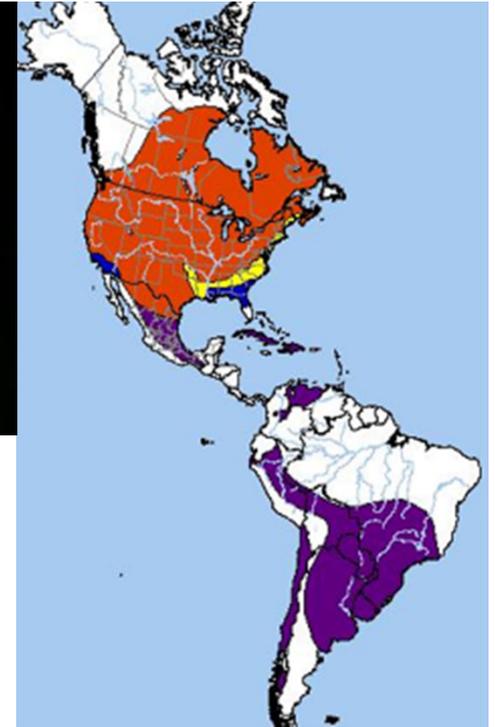


(Records associated with a range of dates are excluded from time charts)

\*No roost information for Montana, but known to roost in deciduous tree foliage in other areas.

# Hoary Bat

## SOC, G5, S3



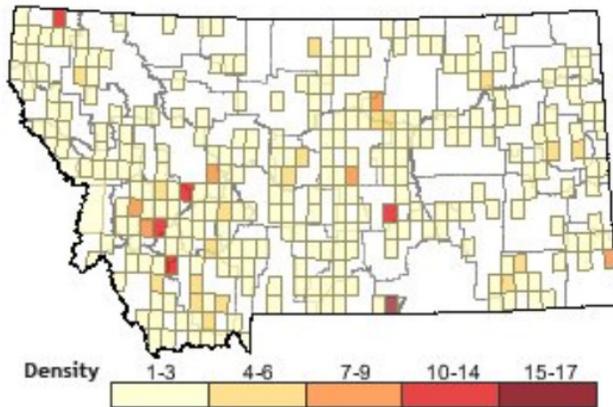
### Summary of Observations Submitted for Montana

Number of Observations: 813

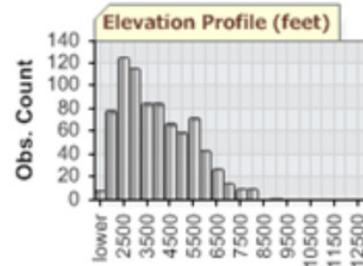
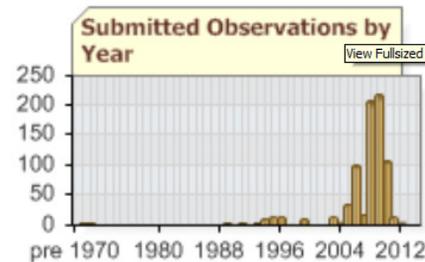
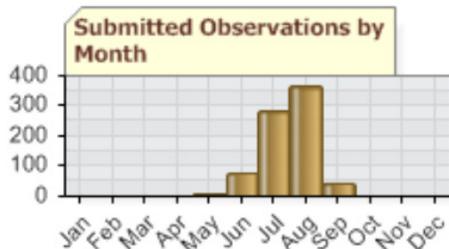
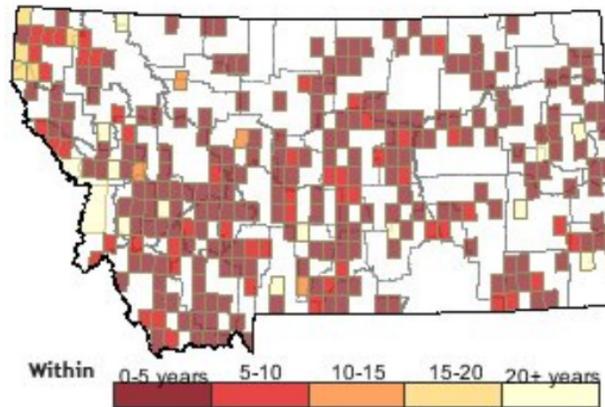
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

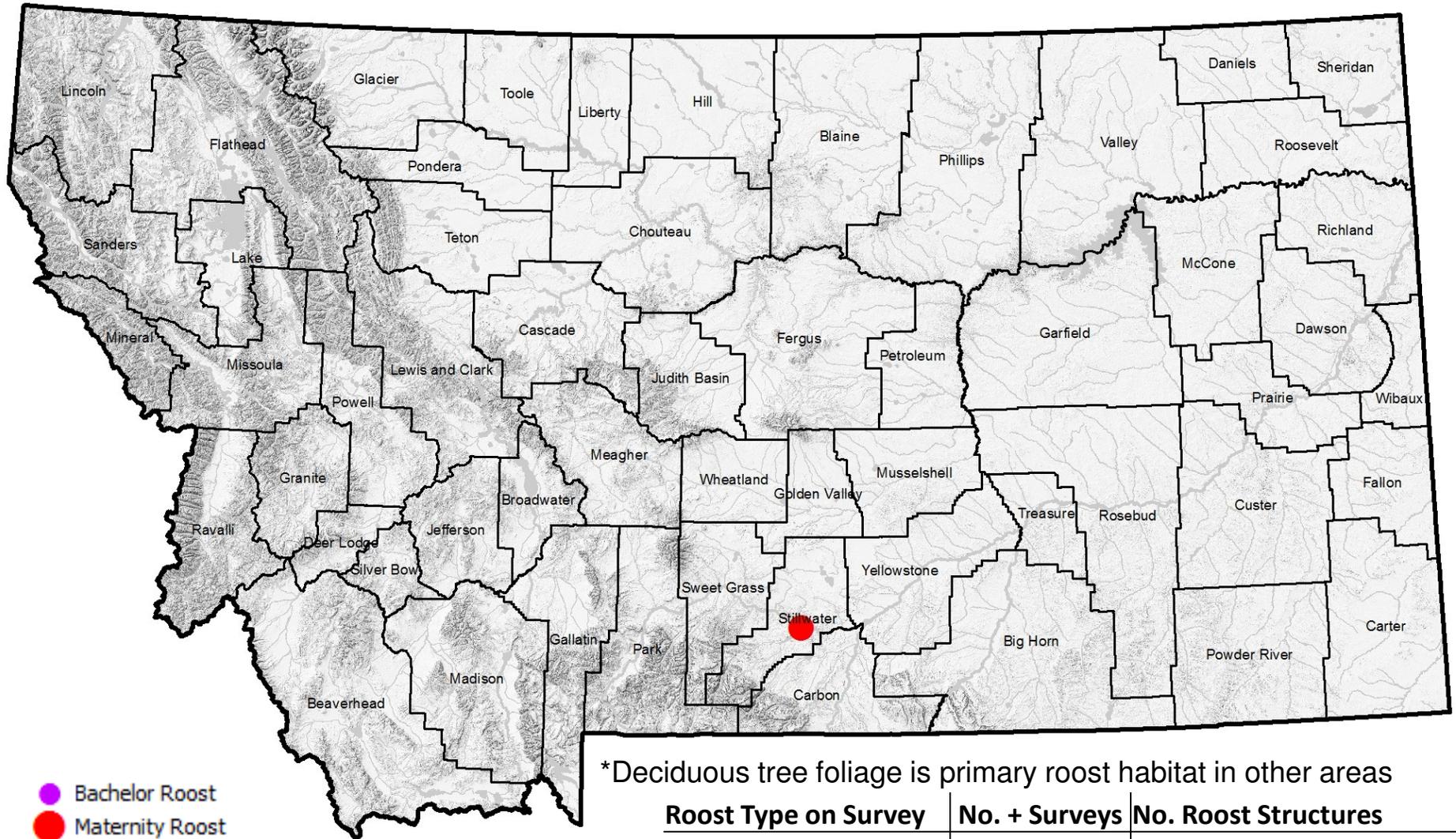


Recency



(Records associated with a range of dates are excluded from time charts)

# Hoary Bat Roost Use Type Overview



\*Deciduous tree foliage is primary roost habitat in other areas

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	1	<b>1 Bridge (Hendricks 2005)</b>
Hibernacula	0	
Day and Night Roost		
Night Roost	0	

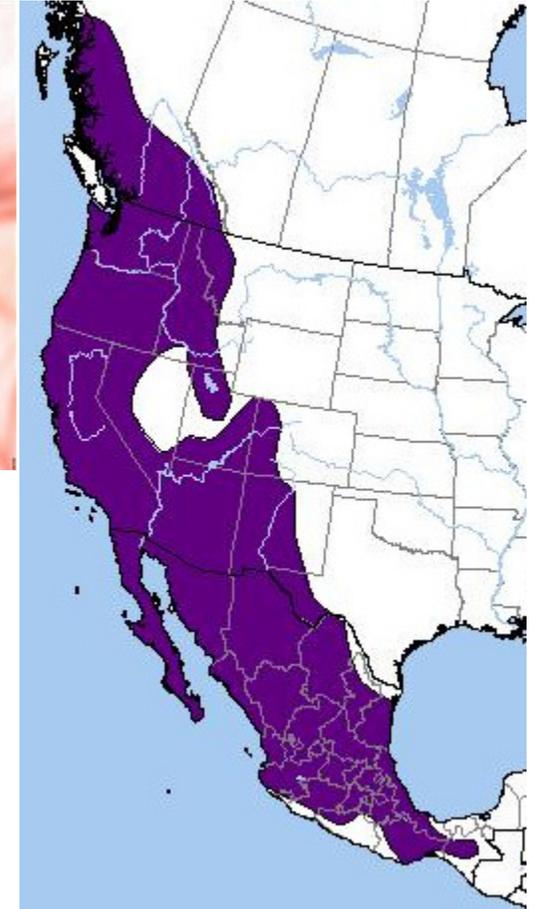
# California Myotis

## G5, S4

\*No roost information for Montana, but are known to use rock crevices, trees, caves, and mines in other areas.



Kristi DuBois



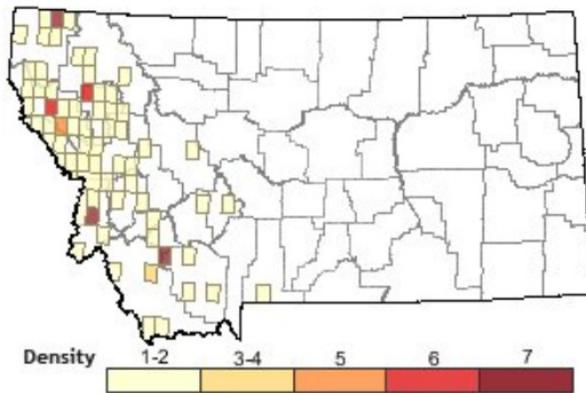
### Summary of Observations Submitted for Montana

Number of Observations: 141

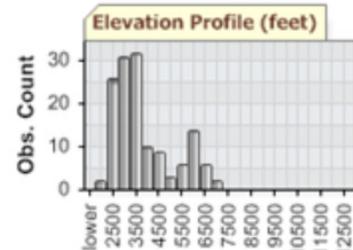
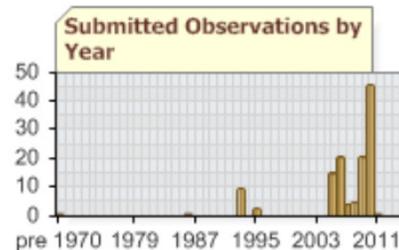
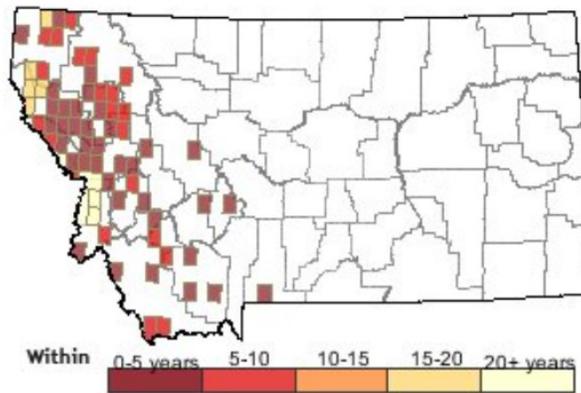
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density



Recency



(Records associated with a range of dates are excluded from time charts)

# Western Small-footed Myotis G5, S4



Kristi DuBois



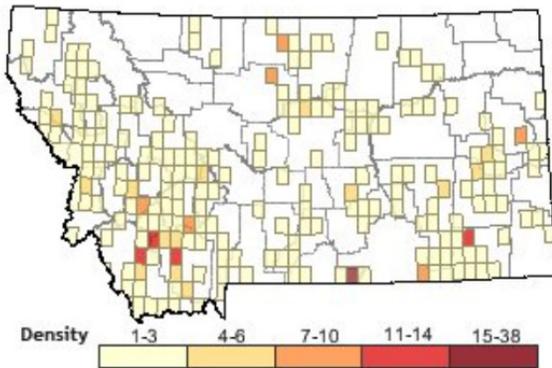
## Summary of Observations Submitted for Montana

Number of Observations: 622

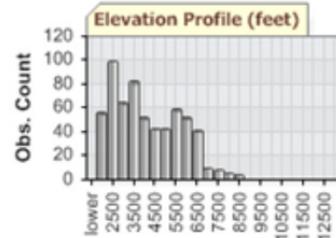
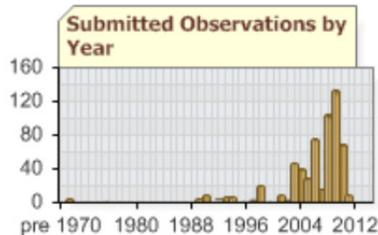
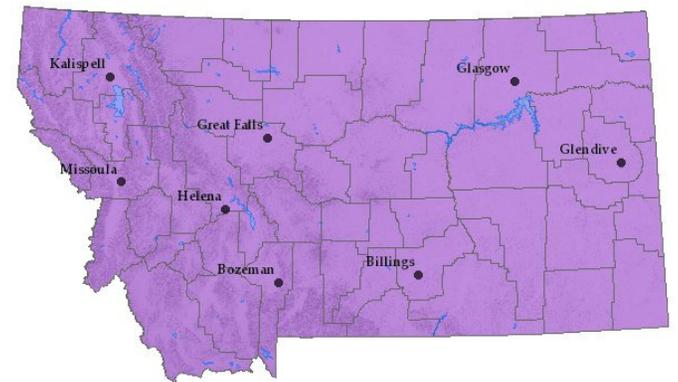
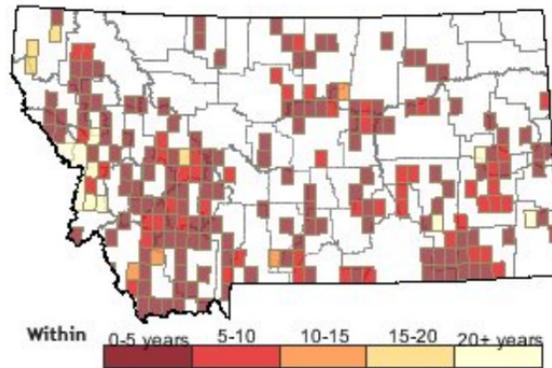
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

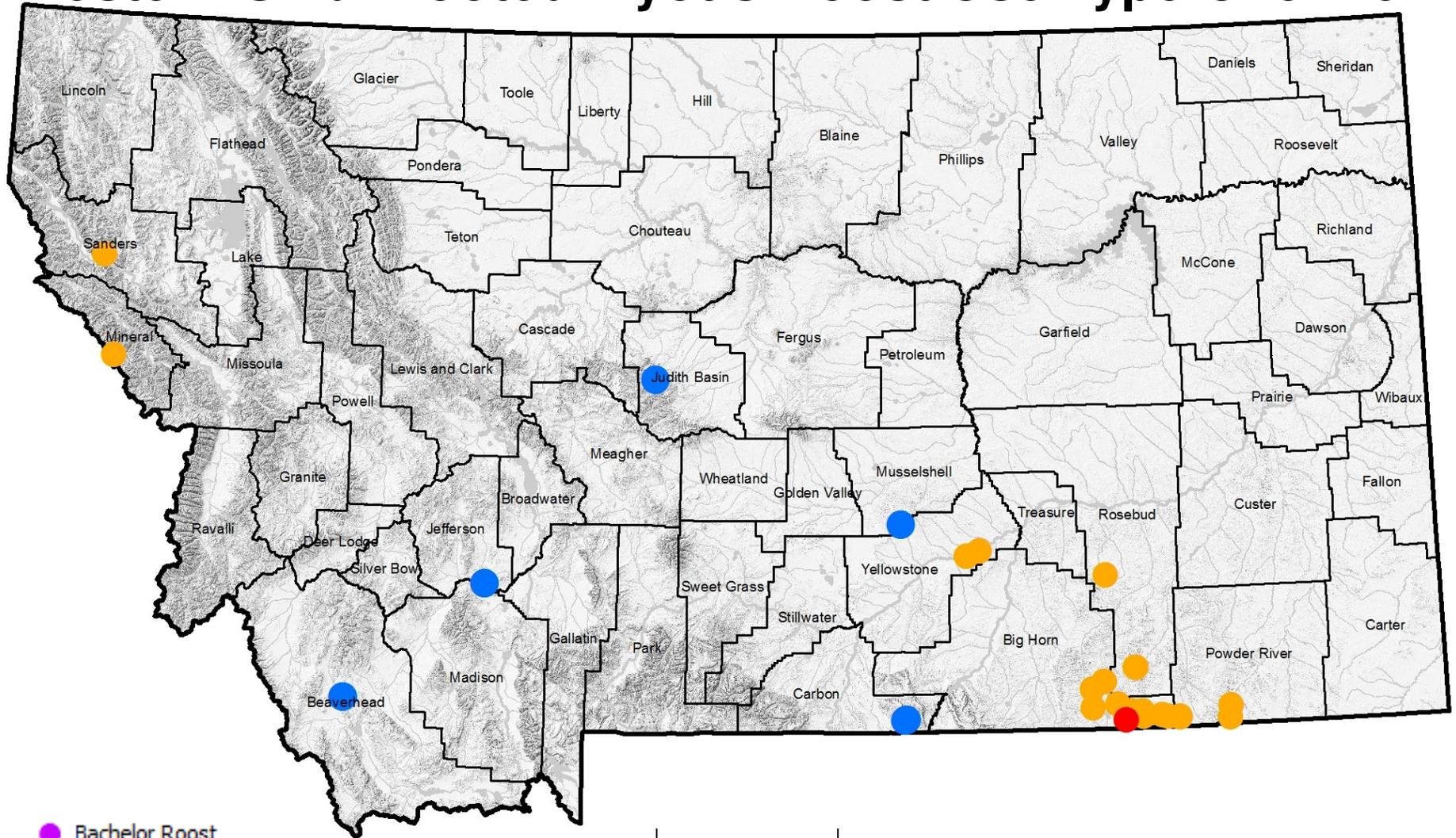


Recency



(Records associated with a range of dates are excluded from time charts)

# Western Small-footed Myotis Roost Use Type Overview

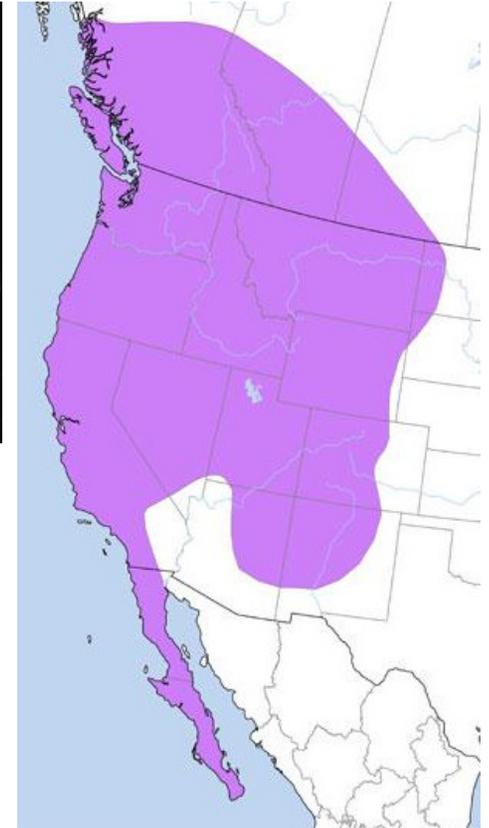


- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	1	1 Rock Outcrops
Hibernacula	11	2 Caves, 6 Mines
Day and Night Roost	24	16 Rock Outcrops, 2 Bridges, 2 Buildings, 3 Mines
Night Roost	0	

# Long-eared Myotis

## G5, S4



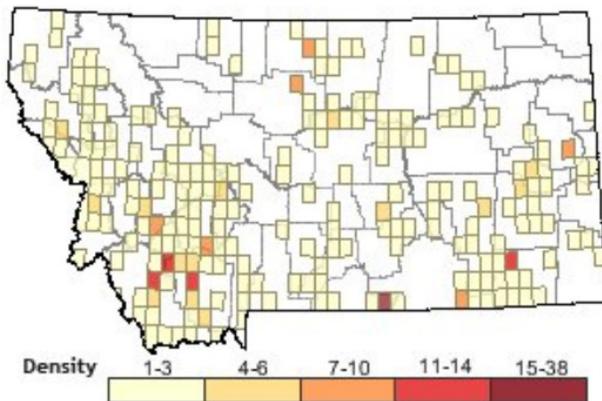
### Summary of Observations Submitted for Montana

Number of Observations: 622

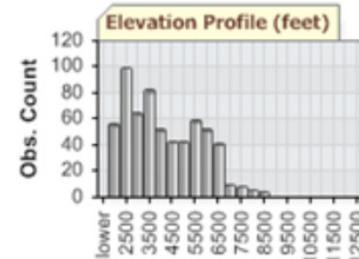
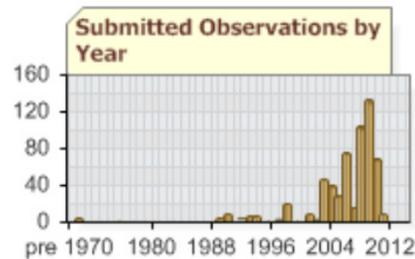
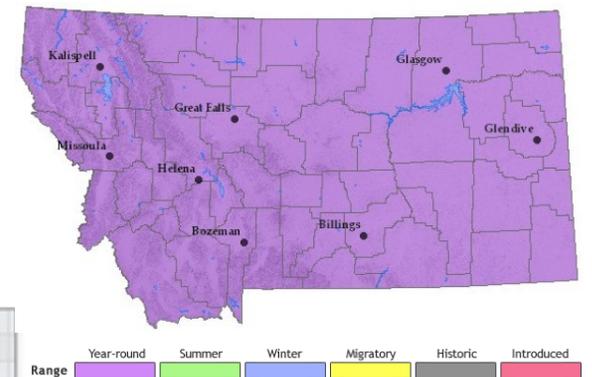
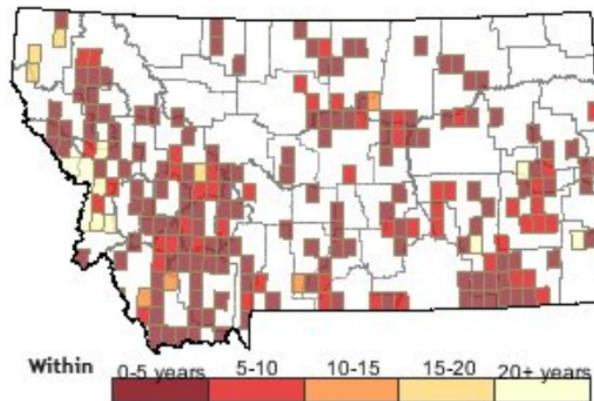
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

**Relative Density**

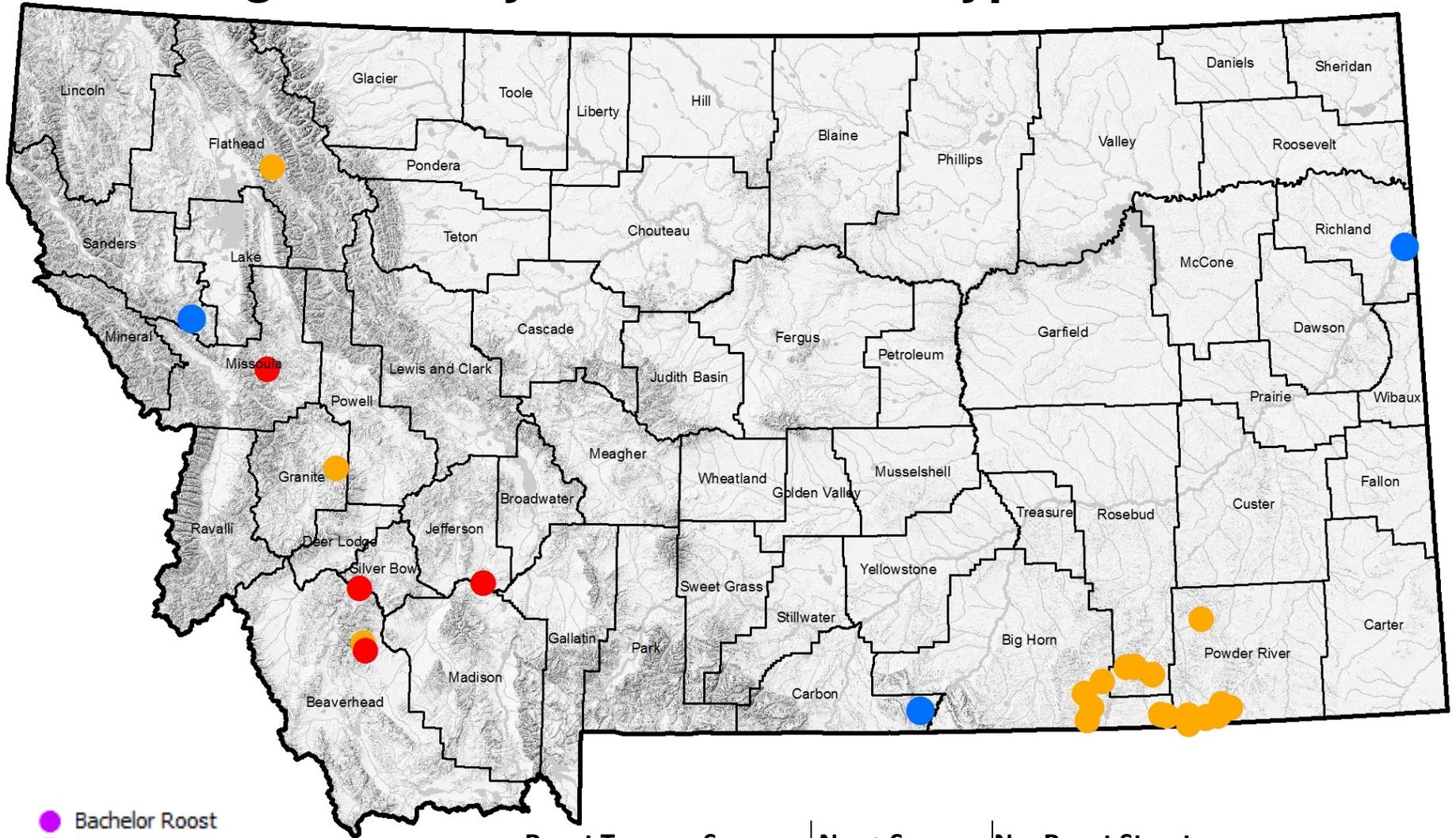


**Recency**



(Records associated with a range of dates are excluded from time charts)

# Long-eared Myotis Roost Use Type Overview



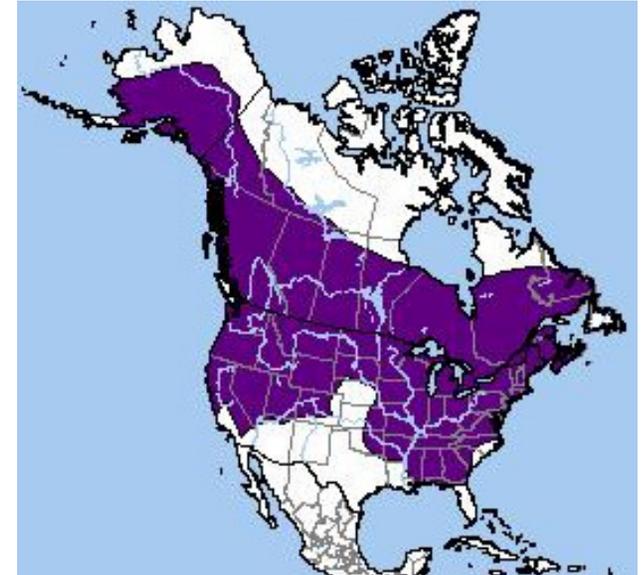
- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	5	1 Cave, 1 Tree, 2 Rock Outcrops
Hibernacula	3	1 Cave, 2 Mines
Day and Night Roost	28	25 Rock Outcrops, 2 Buildings, 1 Cave
Night Roost	0	

# Little Brown Myotis

## G3, S4

Ryan Rauscher



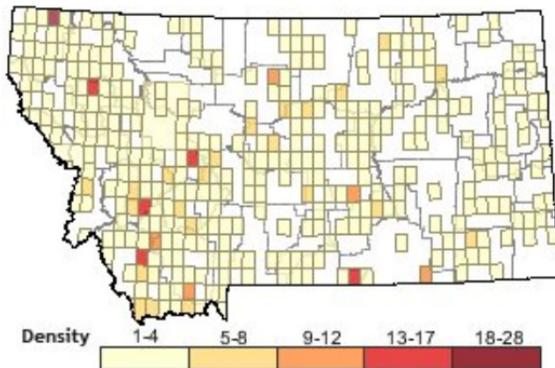
### Summary of Observations Submitted for Montana

Number of Observations: 1133

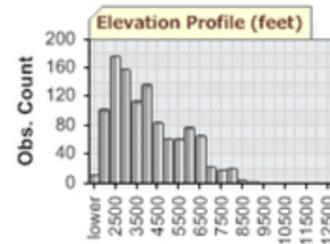
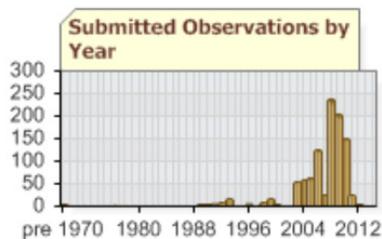
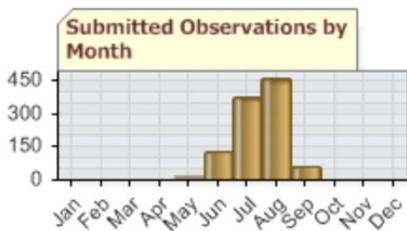
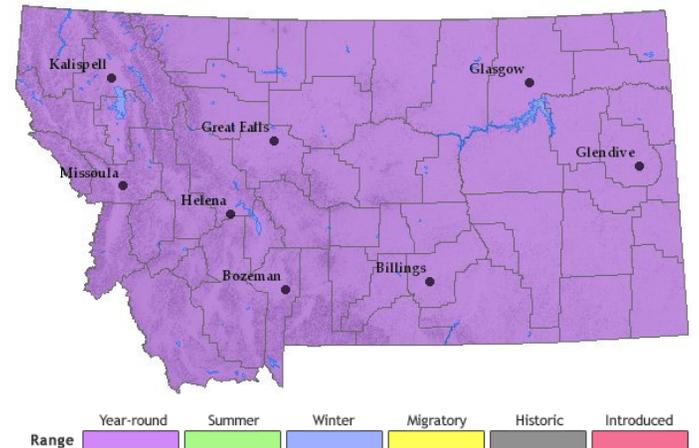
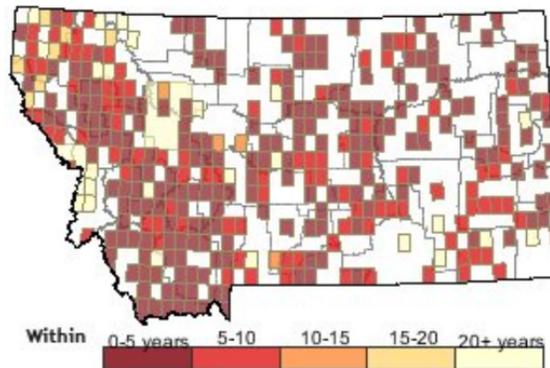
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

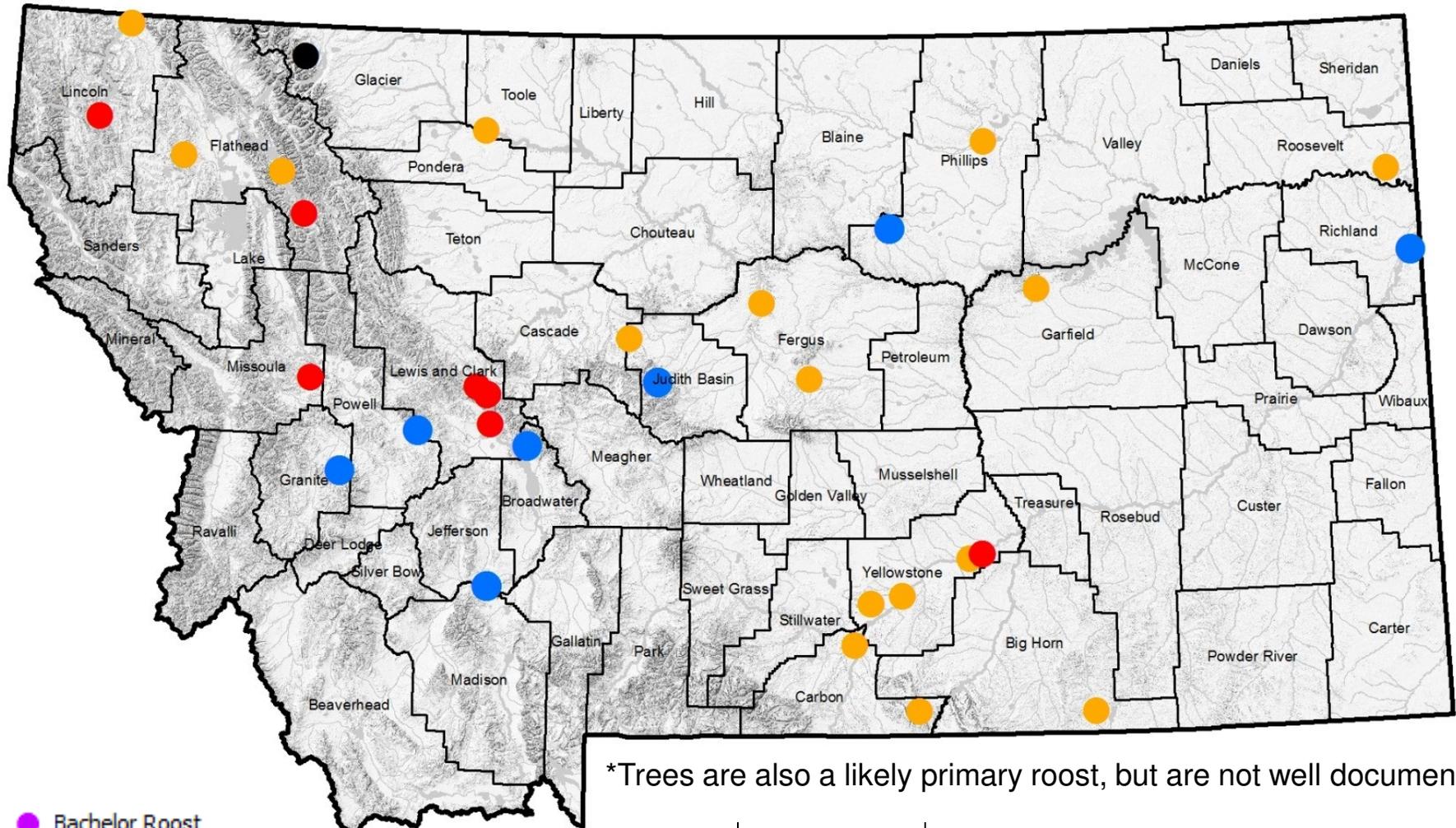


Recency



(Records associated with a range of dates are excluded from time charts)

# Little Brown Bat Roost Use Type Overview



\*Trees are also a likely primary roost, but are not well documented.

- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

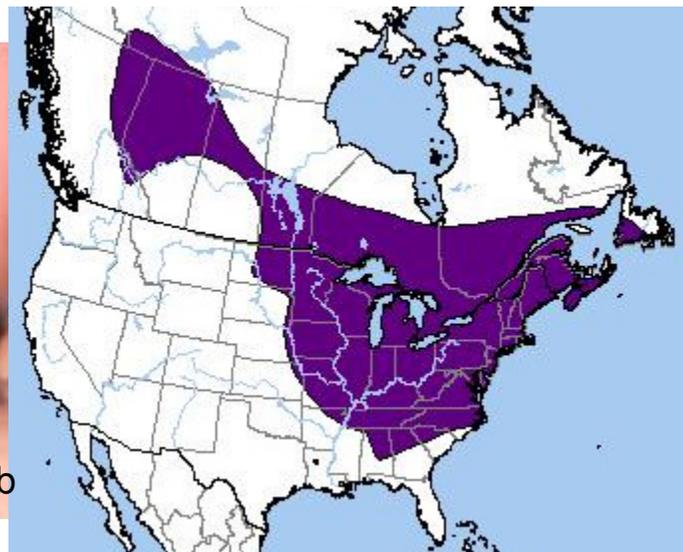
Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	16	1 Bridge, 7 Buildings
Hibernacula	12	6 Caves, 1 Mine
Day and Night Roost	36	1 Bat House, 5 Bridges, 10 Buildings, 1 Cave
Night Roost	1	1 Building

# Northern Myotis

## PSOC, G1G3, S2S4



Lewis Young & Nathan Schwab



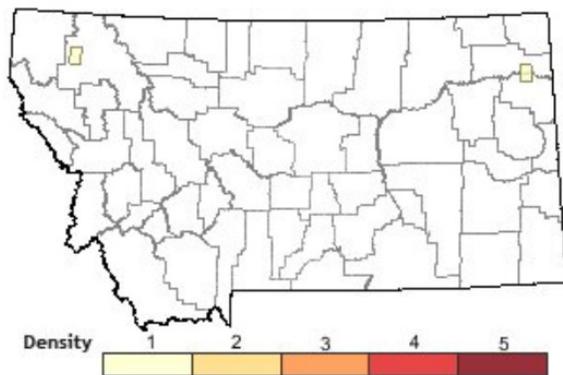
### Summary of Observations Submitted for Montana

Number of Observations: 2

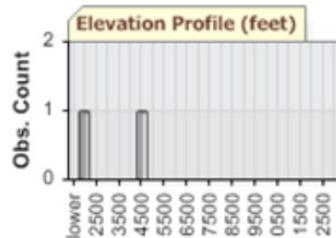
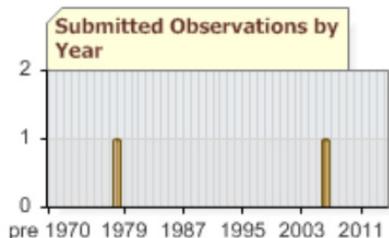
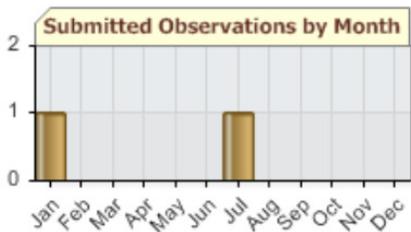
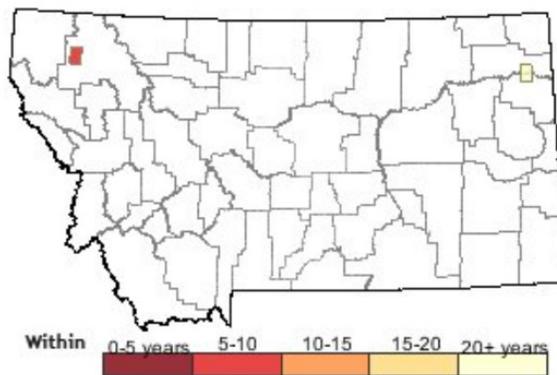
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

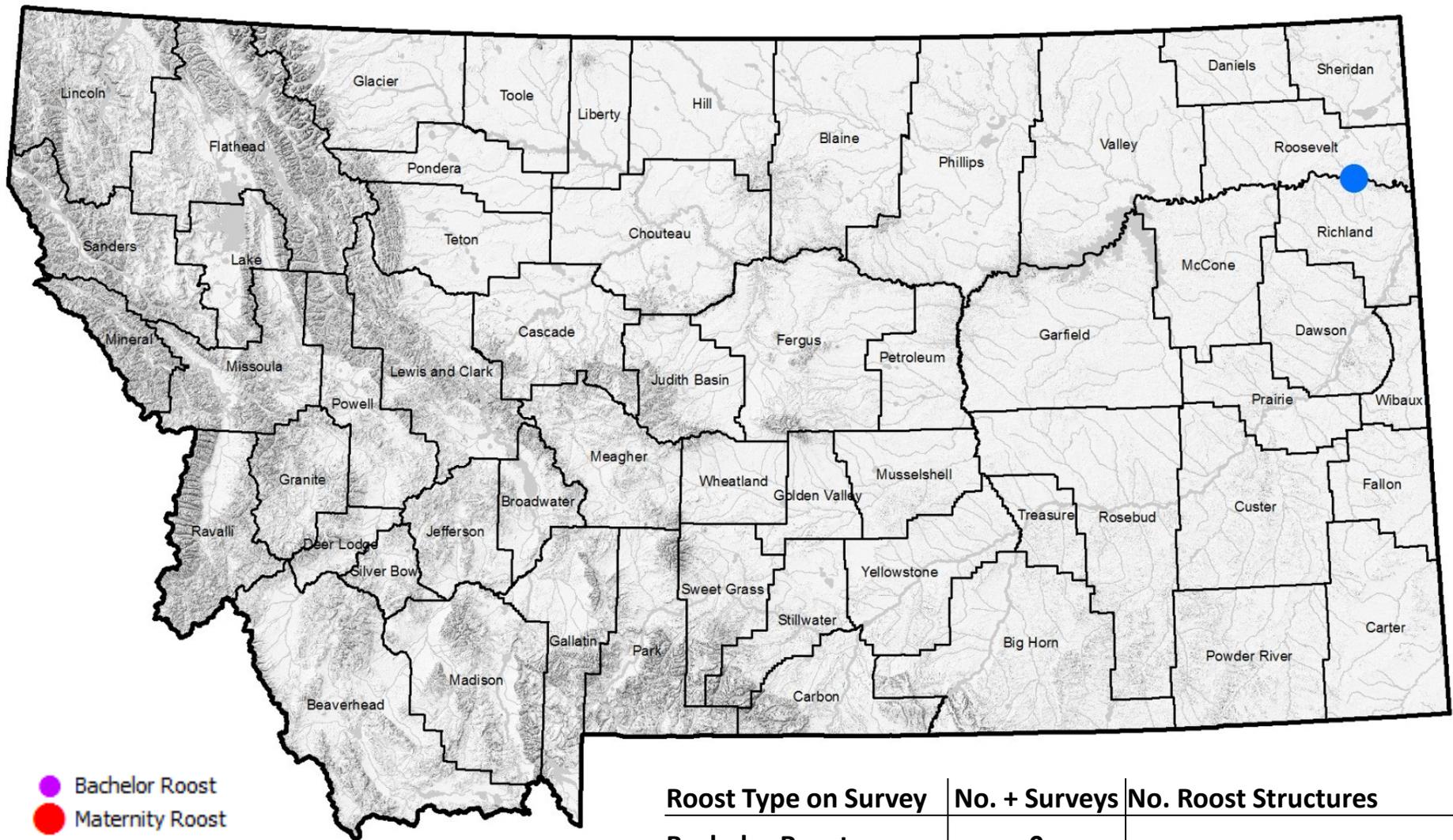


Recency



(Records associated with a range of dates are excluded from time charts)

# Northern Myotis Roost Use Type Overview



- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	0	
Hibernacula	1	1 Mine
Day and Night Roost	0	
Night Roost	0	

# Fringed Myotis

## SOC, G4, S3



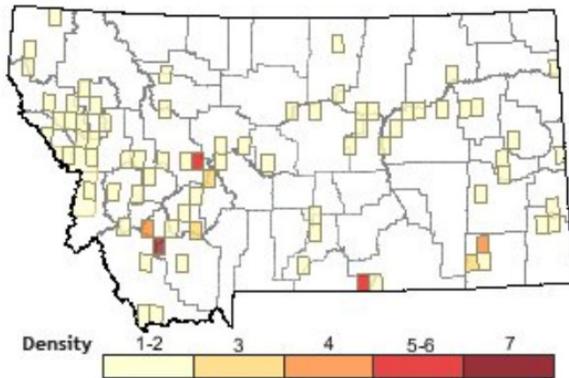
### Summary of Observations Submitted for Montana

Number of Observations: 112

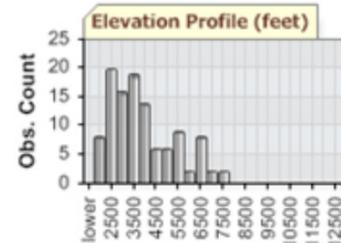
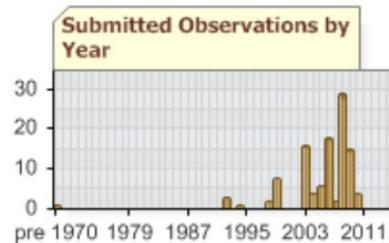
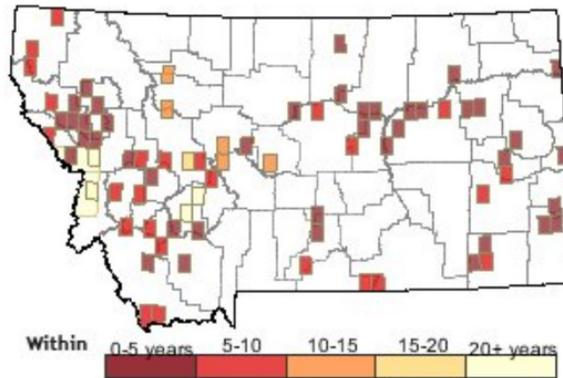
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

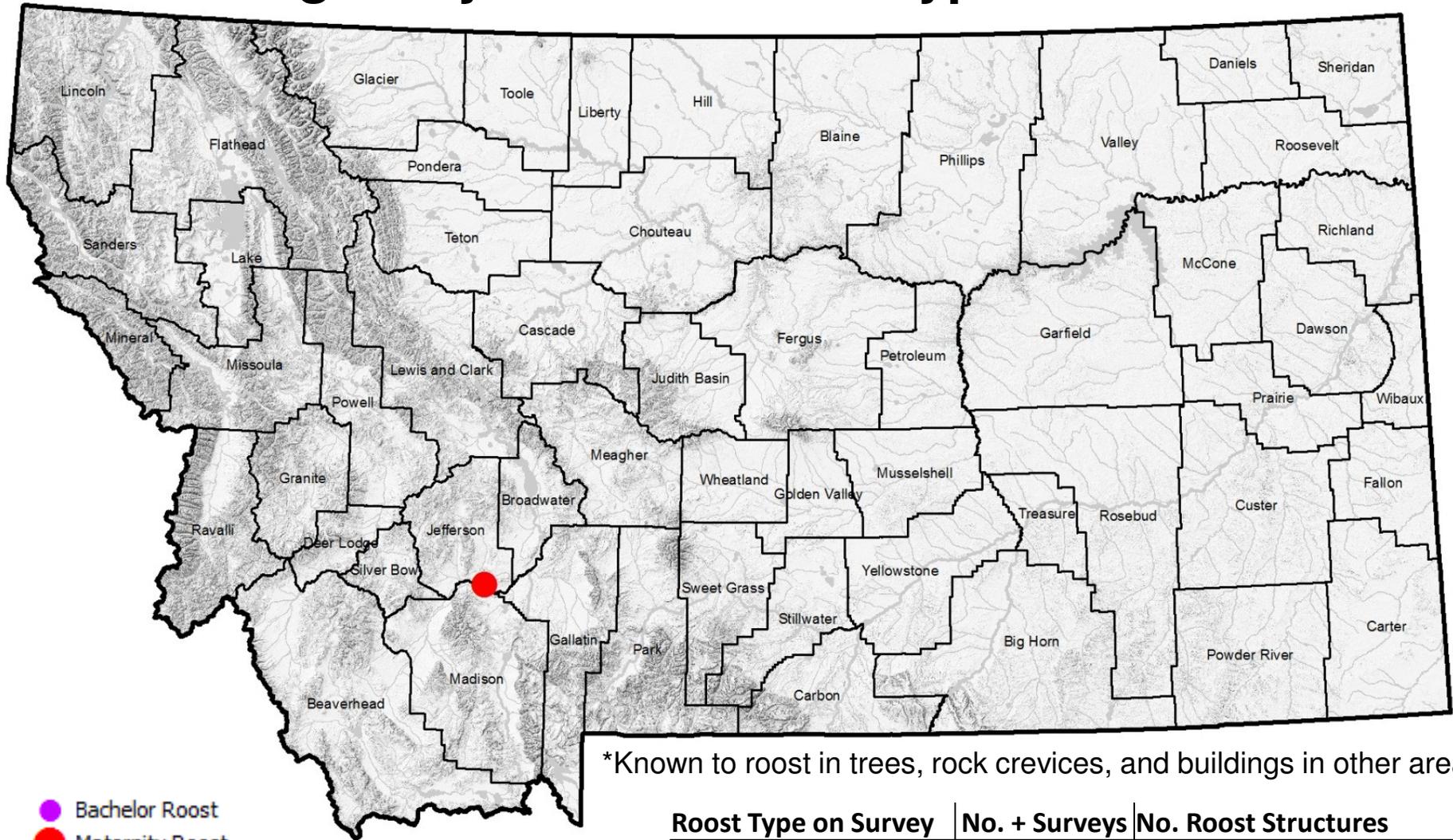


Recency



(Records associated with a range of dates are excluded from time charts)

# Fringed Myotis Roost Use Type Overview



\*Known to roost in trees, rock crevices, and buildings in other areas

- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

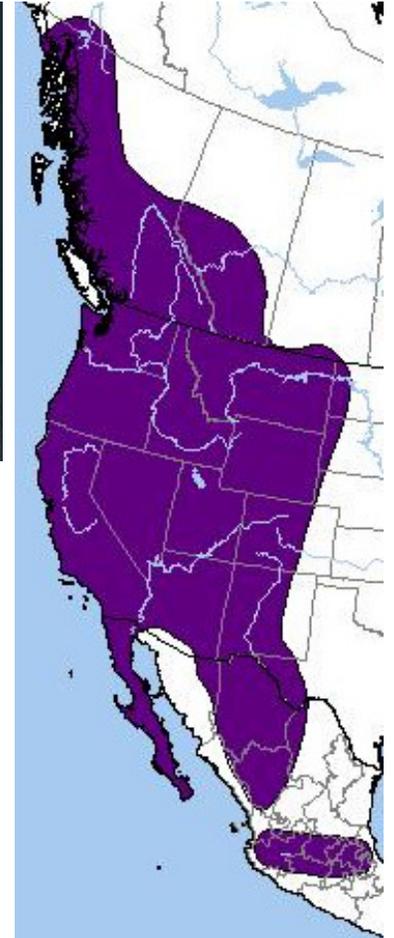
Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	1 Cave
Maternity Roost	1	
Hibernacula	0	
Day and Night Roost	0	
Night Roost	0	

# Long-legged Myotis

## G5, S4



Kristi DuBois



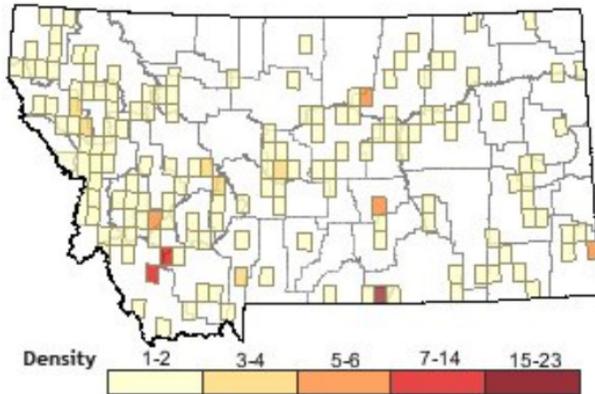
### Summary of Observations Submitted for Montana

Number of Observations: 315

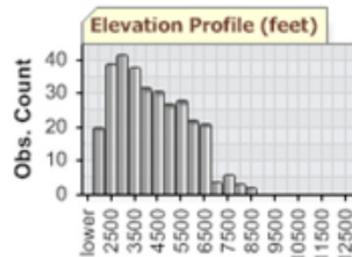
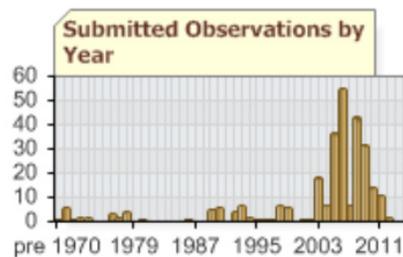
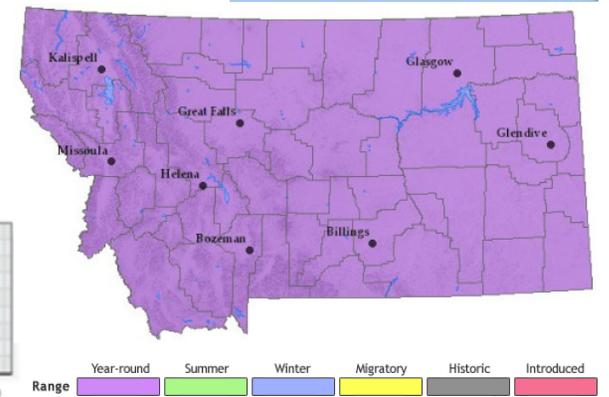
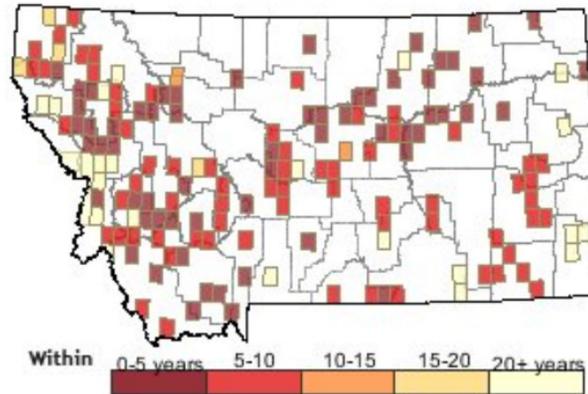
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density

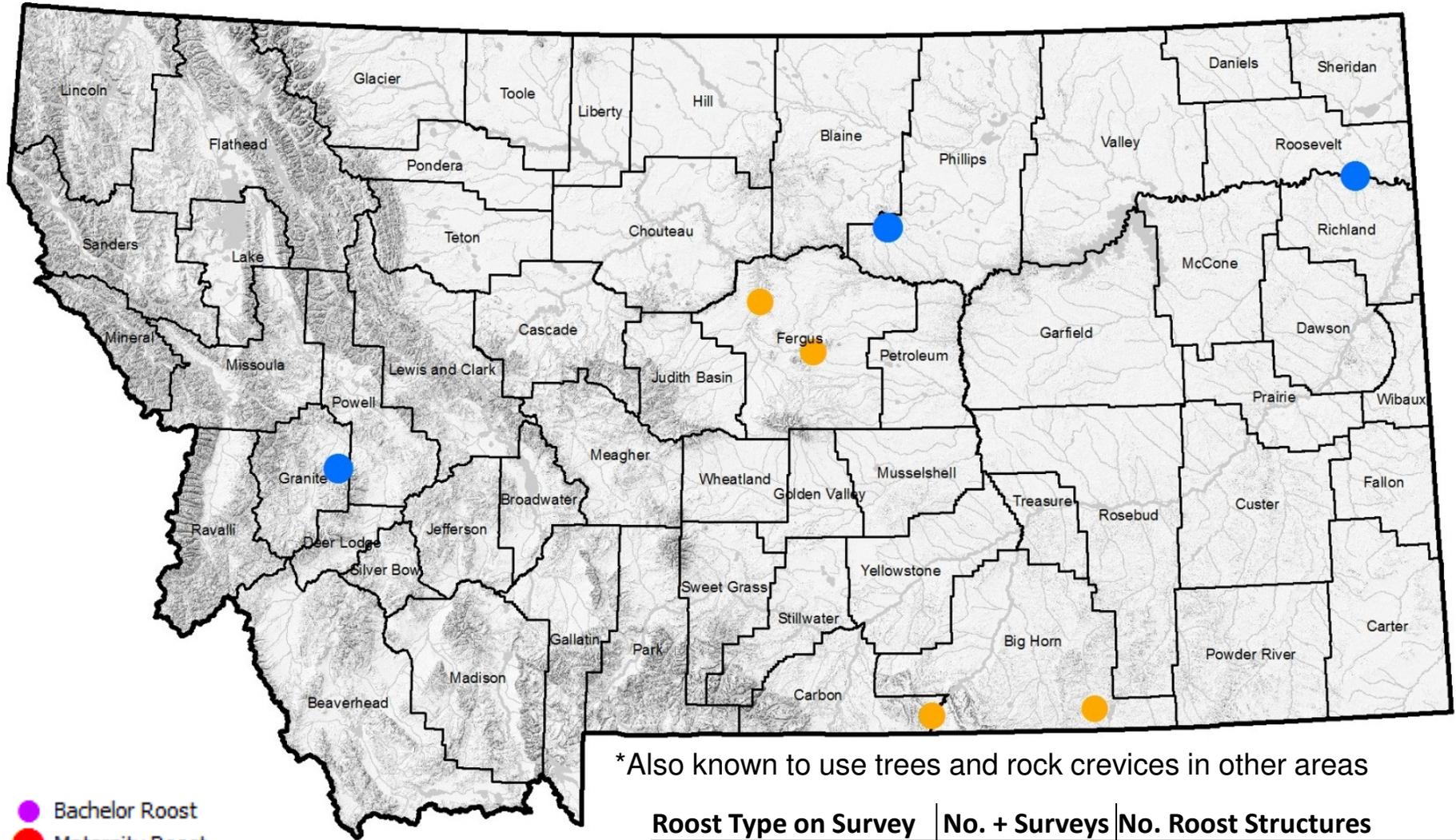


Recency



(Records associated with a range of dates are excluded from time charts)

# Long-legged Myotis Roost Use Type Overview



- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

\*Also known to use trees and rock crevices in other areas

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	
Maternity Roost	0	
Hibernacula	6	2 Caves, 1 Mine
Day and Night Roost	2	1 Building, 1 Mine
Night Roost	0	

# Yuma Myotis

## PSOC, G5, S3S4



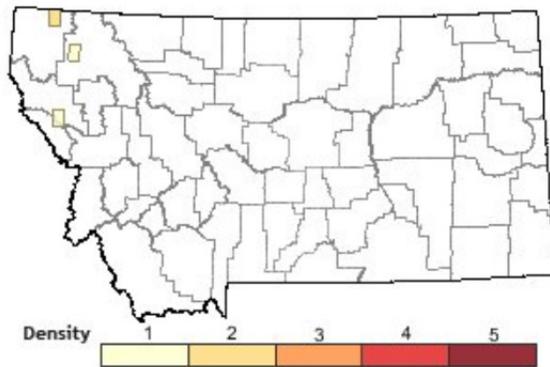
### Summary of Observations Submitted for Montana

Number of Observations: 4

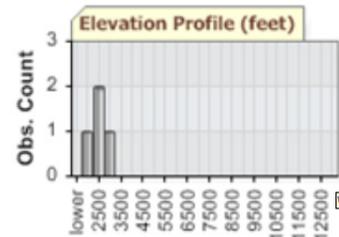
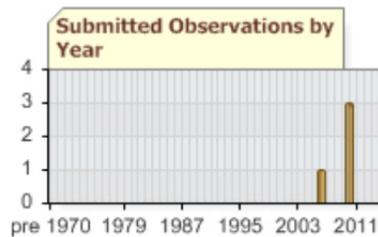
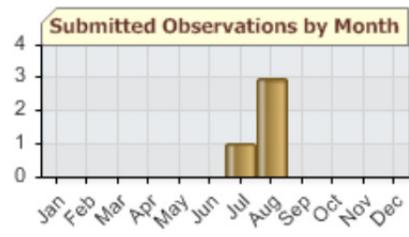
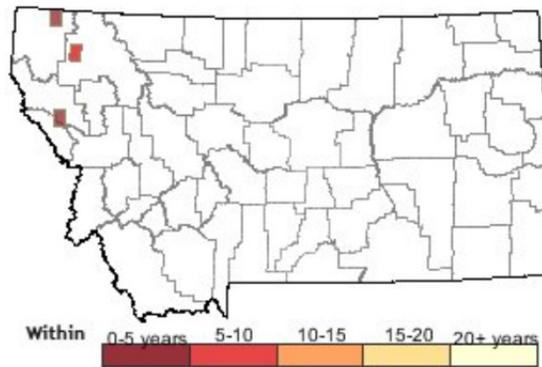
(Click on the following maps and charts to see full sized version)

[Map Help and Descriptions](#)

Relative Density



Recency

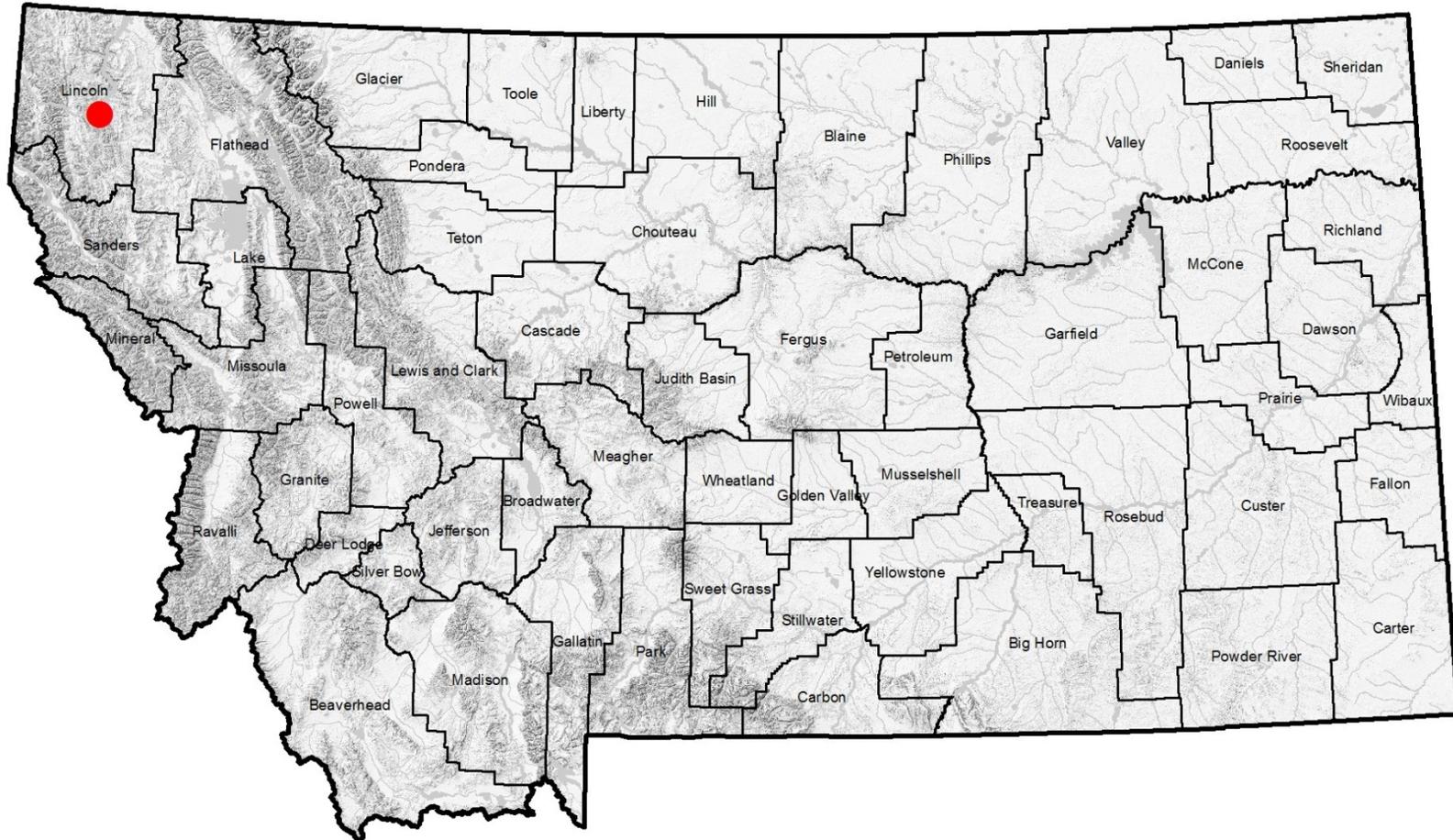


(Records associated with a range of dates are excluded from time charts)



# Yuma Myotis Roost Use Type Overview

\*Call data strongly supports this, but genetic confirmation is needed.



- Bachelor Roost
- Maternity Roost
- Hibernacula
- Day and Night Roost
- Night Roost

Roost Type on Survey	No. + Surveys	No. Roost Structures
Bachelor Roost	0	1 Building
Maternity Roost	1*	
Hibernacula	0	
Day and Night Roost	0	
Night Roost	0	