

## **APPENDICES**

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## Pallid bat (*Antrozous pallidus*, ANPA)



### Species Ecology

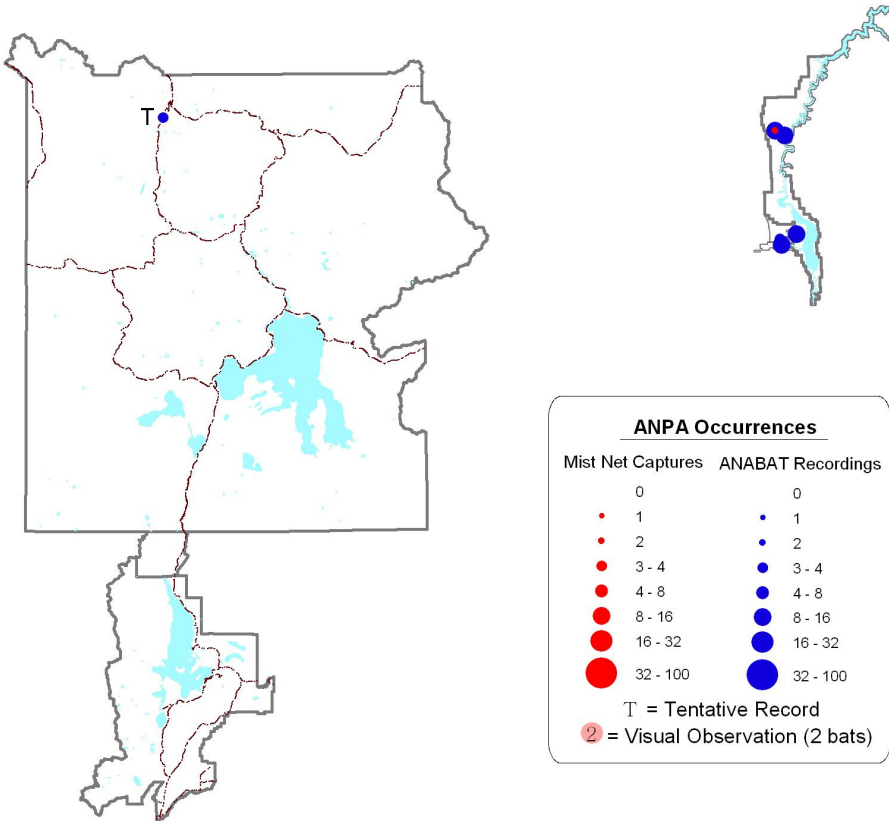
The pallid bat inhabits low desert shrublands, juniper woodlands, grasslands, and nearby cottonwood-riparian zones. It is most common in low, arid regions with rocky outcrops. Roost structures are usually rock crevices and buildings, but also rock piles, tree cavities, shallow caves, and abandoned mines. It likely hibernates in narrow crevices within caves and abandoned mines.

The pallid bat emerges about 1 hour after sunset to forage. It primarily gleans large insect prey from the ground and vegetation, but also forages in flight within about 3 m (10 ft) of the ground.

### Status in GRYN

Due to its roost preferences, very few areas in Wyoming are suitable for the pallid bat. Statewide surveys in the 1990s found this species roosting in only 5 sites. **BICA:** Bighorn Canyon is one of the best such sites due to its warm, arid climate and abundant cliff roosting habitat. The BICA population should be considered permanent and a major contribution to this bats persistence in the state.

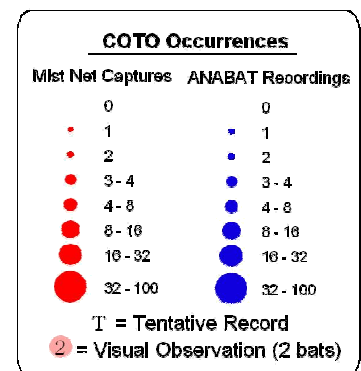
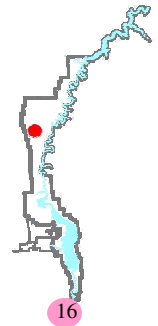
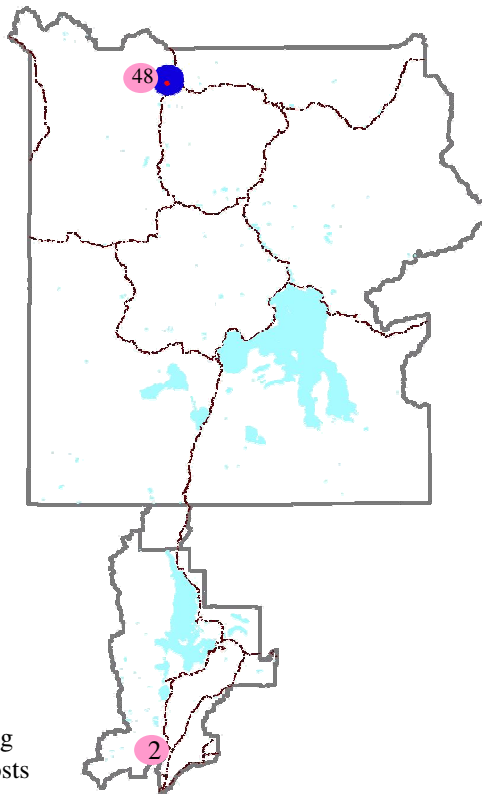
**YNP:** Several potential pallid bat calls were recorded in the Mammoth area of YNP, but none were captured. The habitat there seems suitable, but if they occur there the population is likely small and may not be permanent. Further investigation is required to determine their status in YNP.



### Survey Notes

Pallid bats are best surveyed with mist nets at ground level. They are easy to identify in-hand based on size, pelage color, and facial morphology. They can be detected with ANABAT®, but recordings can be confused with other 30k bats. Guano accumulation in night roosts is a useful survey tool when many are present.

## Townsend's big-eared bat (*Corynorhinus townsendii*, COTO)



### Species Ecology

The most critical and restrictive feature of Townsend's big-eared bat ecology is the requirement for large cavern-like structures for roosting during all stages of its life-cycle. Maternity roosts are even more limiting, as they must be consistently warm throughout the breeding season. This results in a general preference for warm, low-mid elevation habitats. Otherwise, habitat use is fairly general and driven by prey availability. Townsend's big-eared bat forages primarily along edge habitats (e.g., forest edges, intermittent streams), but also in forests and along vegetated stream corridors. All reports indicate that it is an agile flier specializing on moths, which it captures on the wing. It occurs in Wyoming year-round, migrating short distances to hibernate in thermally stable caves.

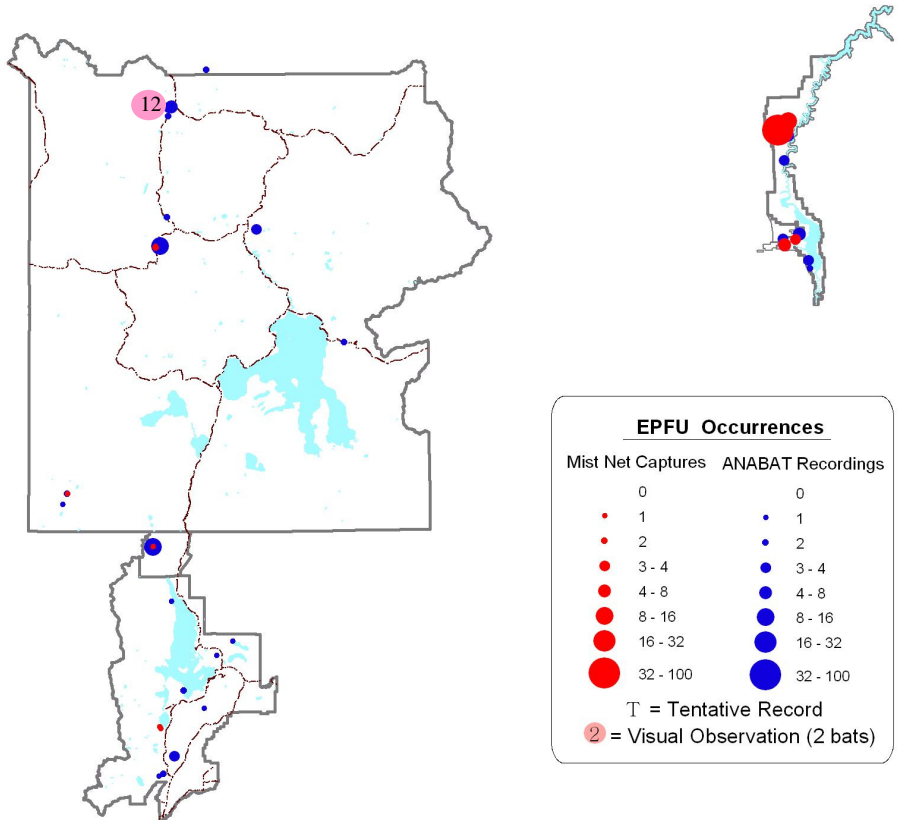
### Status in GRYN

Townsend's big-eared bats occur throughout the west, but populations are small and localized due to restrictive roost requirements, particularly for maternity colonies. It is crucial that suitable caves be protected from extensive human intrusion, as these bats are sensitive to disturbance. **BICA** and nearby BLM and Reservation land contain geological features ideal for the formation of roost caves. There are several known maternity colonies in the vicinity of Bighorn Canyon and it is likely that smaller ones exist that have not yet been identified. In **YNP**, the Mammoth Terraces hold an isolated, but regularly breeding, population of Townsend's due to the thermal caves in the area. Devil's Kitchen is the only documented maternity colony, but other fishers and sink-holes in the area have similar potential. Further, the cooler caves of the upper terraces are likely the summer home of bachelor male bats. Bachelor males have been documented in abandoned ranch buildings in the south of **GTNP**, but no females have been found. *Further research is required* to determine if a maternity colony is associated with these bachelors.

### Survey Notes

Townsend's can be difficult to survey using standard techniques. They emit very "quiet" echolocation calls that are difficult to detect with ANABAT<sup>®</sup> except at close range. Once recorded, calls are easy to identify. They are also wary of mist nets, but those that are captured are easy to identify based on facial morphology. The best way to identify presence of these bats is to seek out suitable roosting structures and use ANABAT<sup>®</sup> where the bats are likely to emerge, or along restricted flyways nearby. Within the roost they are usually in the open, so visual searches during the day are also possible if proper care is taken to minimize disturbance.

## Big brown bat (*Eptesicus fuscus*, EPFU)



### Species Ecology

The big brown bat is found in most of North America and is a year-round resident throughout Wyoming. It occupies a variety of habitats, including cottonwood riparian woodlands, sagebrush steppe, juniper woodlands, conifer forests, aspen woodlands, and can often be found in urban areas and around manmade structures. It may be more abundant in deciduous forests and woodlands than coniferous areas (Kurta and Baker 1990), which is born out by our surveys in GRYN. Big brown bats are known for their tendency to roost in buildings, but they also use rock crevices, caves, abandoned mines, bridges, and tree cavities.

The big brown bat emerges at or just before sunset and forages most intensely for the first 2 hours after emergence. The big brown bat is a generalist forager, often feeding over meadows, pastures, and tree canopies; around ranch buildings; along tree-lined streets and riparian areas; and under streetlights.

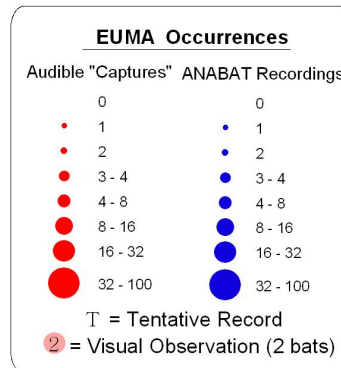
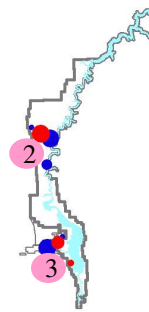
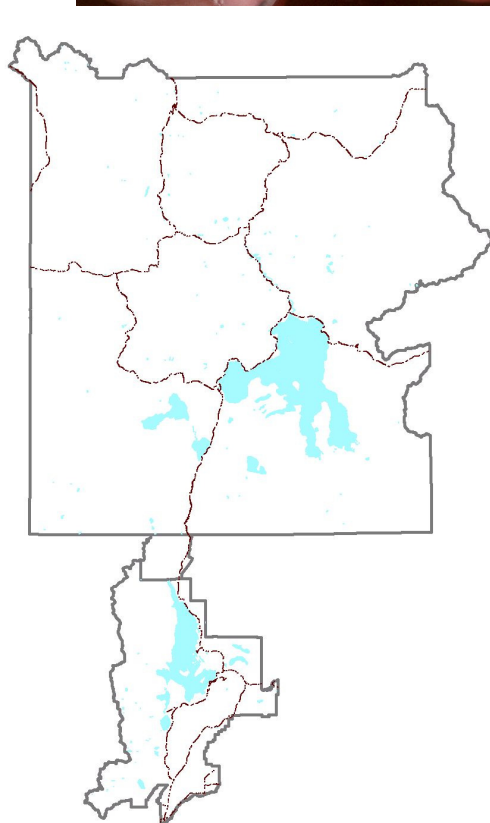
### Status in GRYN

Big brown bats are found at varying abundance throughout GRYN. They seem to be somewhat more abundant in **BICA** than in the other park units. Although frequently detected via ANABAT® in **YNP** and **GTNP**, they were rarely captured in those areas and one wonders if some purported occurrences were not in fact the calls of silver-haired bats. Earlier surveys of bats roosting in buildings found them to regularly occur in park structures (Bogen and Geluso 1999).

### Survey Notes

Big brown bats are wary of mist nets and can be hard to catch for this reason. They are often detected, visually and with ANABAT®, flying around nets shortly after sunset. Given their generalist foraging strategy, nets are best placed over water where bats are likely to drink after emergence from day roosts. Experienced bat researchers find them easy to identify in-hand, due to their large size, facial morphology, and dentition. Their calls are easy to detect with ANABAT®, but can easily be confused with those of the silver-haired bat, making further confirmation important.

## Spotted bat (*Euderma maculatum*, EUMA)



### Species Ecology

Throughout its wide range, the spotted bat uses a variety of habitats from desert shrub to coniferous forest, but roosting habitat is almost exclusively rocky cliffs on or near substantial cliff features. Suitable habitat in Wyoming is associated with rocky cliffs and karst formation near permanent water, a situation especially prevalent in the Bighorn Basin.

The spotted bat generally begins foraging well after dark along large, set routes. It forages primarily for moths while flying high (> 10 m) above the ground, usually above canopy height near forest openings. Foraging has been observed in black oak, ponderosa pine, pinyon-juniper, moderate to large riparian habitat (often in canyons), wetlands, meadows, and old agricultural fields.

### Status in GRYN

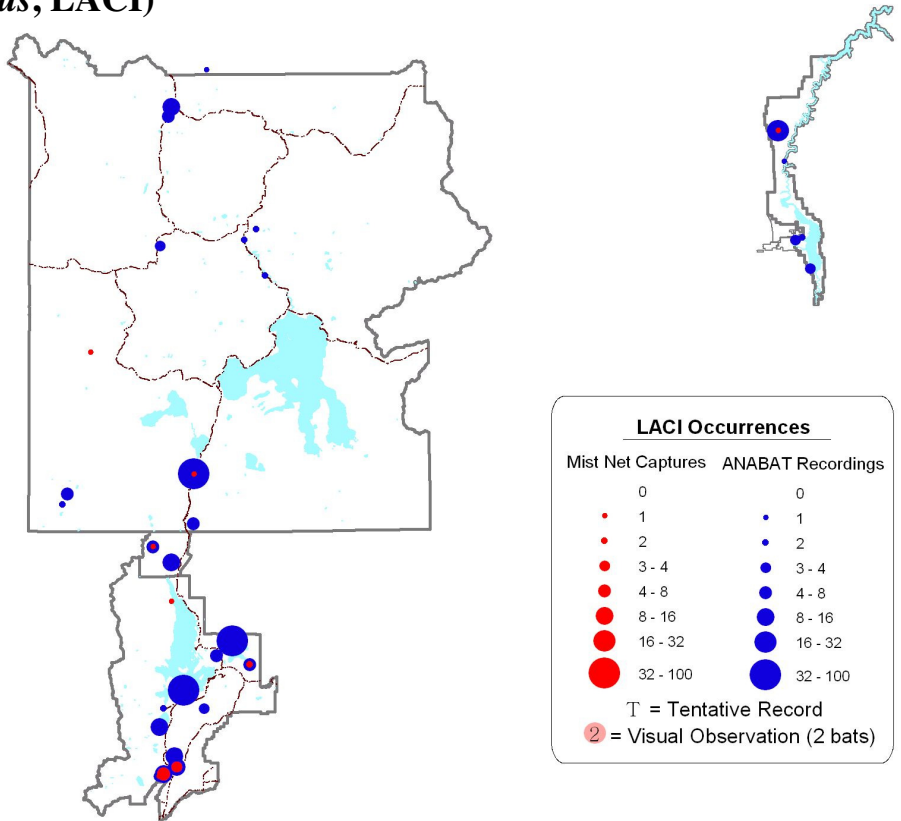
The spotted bat is a widespread species, but is severely restricted in distribution and usually occurs in low

numbers due to its restrictive roosting requirements and specialization on capturing high-flying moths. **BICA** is one of the few places in Wyoming where they regularly occur. Together with Tent Sleep Canyon it can be considered the most important location in the state for this species. Neither **GTNP** nor **YNP** have suitable habitat for the spotted bat.

### Survey Notes

Spotted bats are extremely difficult to capture via mist nets and somewhat difficult to record with ANABAT<sup>®</sup> because they roost exclusively on tall cliffs and forage over large areas high above the ground. However, their calls are loud and sufficiently low in frequency that people with good high-frequency hearing can detect them with the un-aided ear. Thus, simple auditory surveys, often accompanied by spotlighting, are the best way to search for spotted bats.

## Hoary bat (*Lasiurus cinereus*, LACI)



### Species Ecology

The hoary bat is one of the largest and most striking bats in the Rocky Mountain West. It is also the most widespread of all American bats, although it occurs at generally low densities throughout its range. This is partly due to the fact that it roosts singly in the foliage of trees (deciduous; cottonwood, aspen and conifer; especially lodgepole pine), rather than communally in geologic or human structures. For this reason it is highly associated with forested habitats. Forests having a mixture of forest and small open areas are ideal, since hoary bats often roost and forage along forest edges.

Hoary bats usually forage late in the evening, often 2 to 5 hours after sunset. They are fast, rather than agile, flyers and feed mostly on moths and other large-bodied insects, the presence of which seems to be a factor in their abundance. They are also one of Wyoming's few long-distance migrants, likely wintering in more southern states.

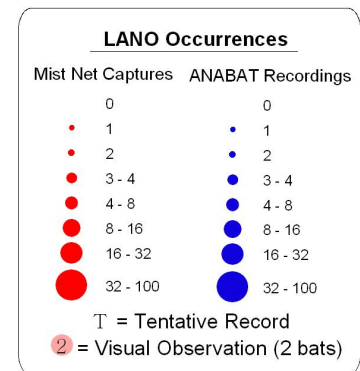
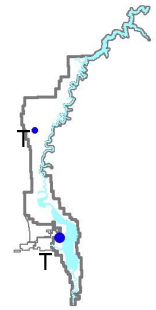
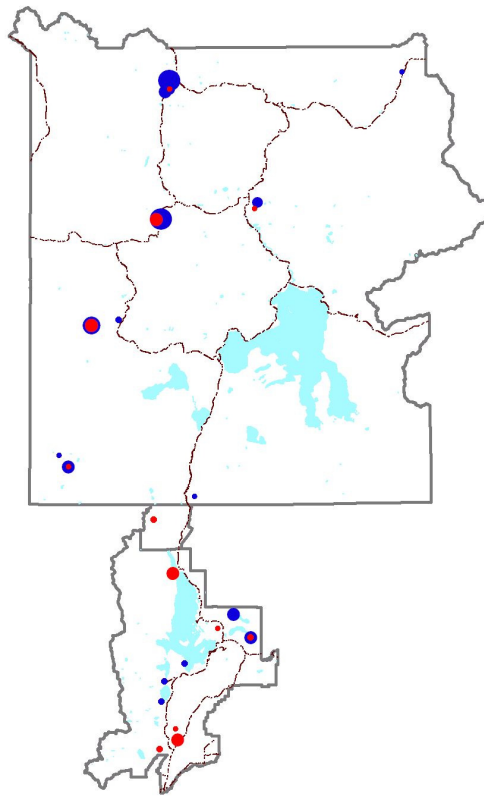
### Status in GRYN

Although found in all park units of the GRYN, the hoary bat seems to be most abundant in **GTNP**, which is the only park unit where it was regularly recorded and captured. This makes sense from a habitat perspective, since GTNP provides an ideal mix of vegetation over a relatively large area; conifer forest regularly broken by open areas and intermixed with large tracts of deciduous trees (cottonwoods and aspens). This mix of characteristics occurs in the other parks, but at more isolated level. Hoary bats in **BICA** and **YNP** seem to be less common.

### Survey Notes

The hoary bat flies high in areas that cannot easily be netted and is thus often under-represented in mist-net surveys. Therefore, although some can be captured in strategically placed mist nets, it is better to use acoustic monitoring to survey for hoary bats. They are fairly easy to detect with ANABAT® and have a distinctive call signature for this region (a subset of its calls overlap with those of the Brazilian free-tailed bat, which is not regularly found in Wyoming).

## Silver-haired bat (*Lasionycteris noctivagans*, LANO)



### Species Ecology

The silver-haired bat is found in most of North America at varying abundance. It is commonly associated with montane forest that has open water (e.g., lakes, ponds, streams) and occurs most frequently in late-successional forest with high snag densities. Forest types include conifer, mixed deciduous-conifer, juniper, aspen, cottonwood, and willow. The silver-haired bat roosts almost exclusively in trees. Reproductive females normally roost in small colonies within tree cavities, while males and non-reproductive females roost singly under loose bark or within cracks and crevices.

The silver-haired bat flies later in the evening, often foraging 2 to 4 hours after sunset and again 6 to 8 hours after sunset. The silver-haired bat usually forages close to the ground (i.e., < 8ft). Although a somewhat generalist feeder, it is a slow and agile flier, making it good at pursuing small, swarming insects at short distances. It is one of two long-distance migrants in Wyoming (the other being the hoary bat), likely flying to southern states for winter.

### Status in GRYN

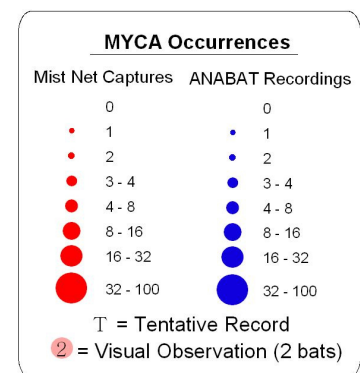
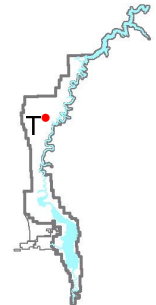
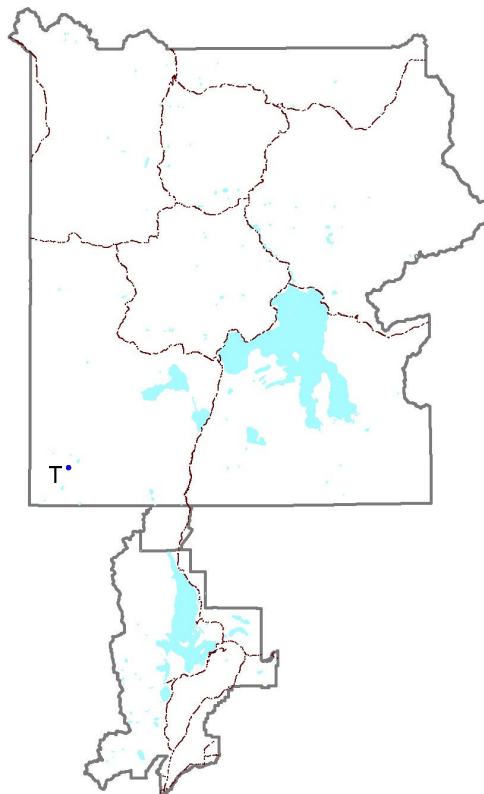
Like the other tree roosting species of the GRYN (i.e., hoary bat), the silver-haired bat is found in much of the GRYN but seems to occur most regularly in **GTNP**. Unlike the hoar bat, however, it is fairly common in **YNP** and was only found in **BICA** based on a few questionable records from ANABAT<sup>®</sup>. Being largely a montane forest bat, BICA may be too low and arid to support a population of silver-haired bats, although they are likely to occur in the highlands to either side of the canyon (e.g, the Pryor Mountains and Bighorn Mountains).

### Survey Notes

The silver-haired bat is susceptible to capture via mist nets, depending on habitat, and particularly over water sources. It is easy to detect acoustically, but its calls are difficult to distinguish from those of big brown bats and Brazilian free-tailed bats (where they occur). However, experienced observers can distinguish these three species in flight, so combining active acoustic surveys with visual observation using spotlights can be effective.



## California myotis (*Myotis californicus*, MYCA)



### Species Ecology

The California myotis is found typically in deserts, grasslands, juniper woodlands, and arid interior basins, but it can also occur in forested and montane regions. It often inhabits rock-walled canyons where water is available and where it can forage among trees, such as cottonwood and willow. In summer, the California myotis typically roosts in crevices associated with rocks, cliffs, trees (snags), and/or buildings.

The California myotis emerges shortly after sunset, after which it is most active, with another peak of activity possible after midnight. It is small, slow, and highly maneuverable, allowing it to forage close to obstacles such as vegetation and rock surfaces. Thus, it seems to forage along margins of tree clumps, around the edge of the tree canopy, but can less frequently be found feeding over water and in open country. It often feeds on swarms of small, flying insects using a very erratic flight pattern within about 3 m (10 ft) of the ground.

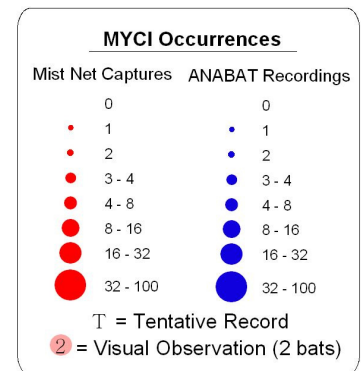
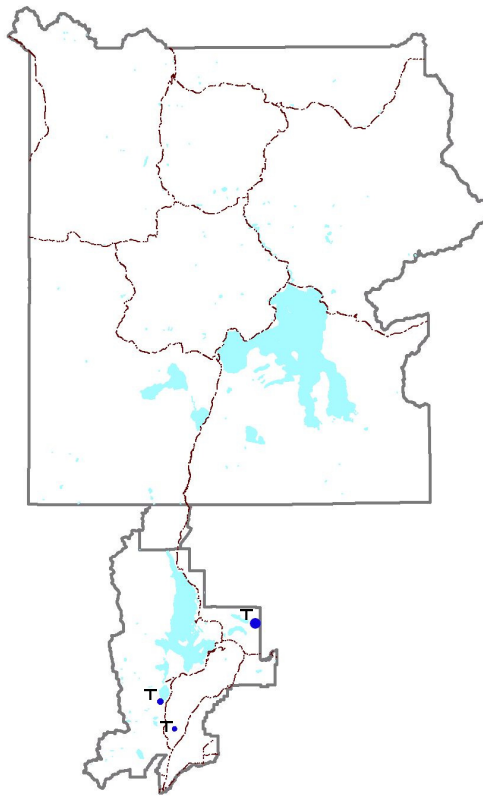
### Status in GRYN

We documented no definite occurrences of California myotis in GRYN, but captured one possible specimen in **BICA** and recorded a suspicious call in the Bechler Valley of **YNP**. We suspect its occurrence in both parks to be occasional, given that it occurs regularly in southwestern Wyoming and north central Idaho and the GRYN lies roughly between these areas. We documented no occurrence of this species in **GTNP**. Further investigation is warranted.

### Survey Notes

The California myotis can be captured in mist nets, but its habit of foraging around vegetation rather than water makes it more difficult to catch. Further, in-hand it can be extremely difficult to distinguish from the western small-footed myotis (where they co-occur). California myotis is easy to detect acoustically, but ANABAT<sup>®</sup> recordings of its calls can be difficult to distinguish from those of Yuma myotis. Experienced observers can distinguish its flight behavior from that of Yuma myotis, so combining active acoustic recording with visual observation can be an effective survey tool.

## Western small-footed myotis (*Myotis ciliolabrum*, MYCI)



### Species Ecology

The western small-footed myotis is commonly associated with middle and low-elevation arid, rocky areas (such as canyons, cliffs, rock outcrops, and badlands) within a variety of habitats (e.g., montane forest, juniper woodlands, sagebrush steppe, shortgrass prairie). Diurnal roosts are varied, but tend to be rock shelters (crevices, overhangs, cliffs, and under rocks), caves, and abandoned mines. Unlike many other species, it will roost at ground level.

Small-footed myotis typically forages along cliffs and rocky slopes in dry areas, but can forage over water when California myotis are not present. It begins foraging at or shortly after sunset, but activity may not peak until later (e.g., 10 - 11 PM and 1 - 2 AM). It is highly maneuverable, often foraging low to the ground (i.e., <10 ft) among boulders, shrubs, and trees, feeding on a variety of small, soft-bodied insects, especially moths.

### Status in GRYN

Although widely distributed in the western United States the western small-footed myotis is not considered abundant. It seems to be common in Wyoming based on surveys of abandoned mines, but appears relatively sparse in the GRYN. **BICA** is the only park unit with confirmed occurrences, all of which were in cottonwood gallery forest. They seem to be common in some localized areas of Yellowtail Wildlife Habitat Management Area near the south end Bighorn Canyon. **YNP** is likely too high and cool for small-footed myotis. Some echolocation recordings in **GTNP** looked suspiciously like this species, but they were few and no captures were made. Given its habitat characteristics, GTNP likely does not support a viable population of small-footed myotis. Further investigation is warranted.

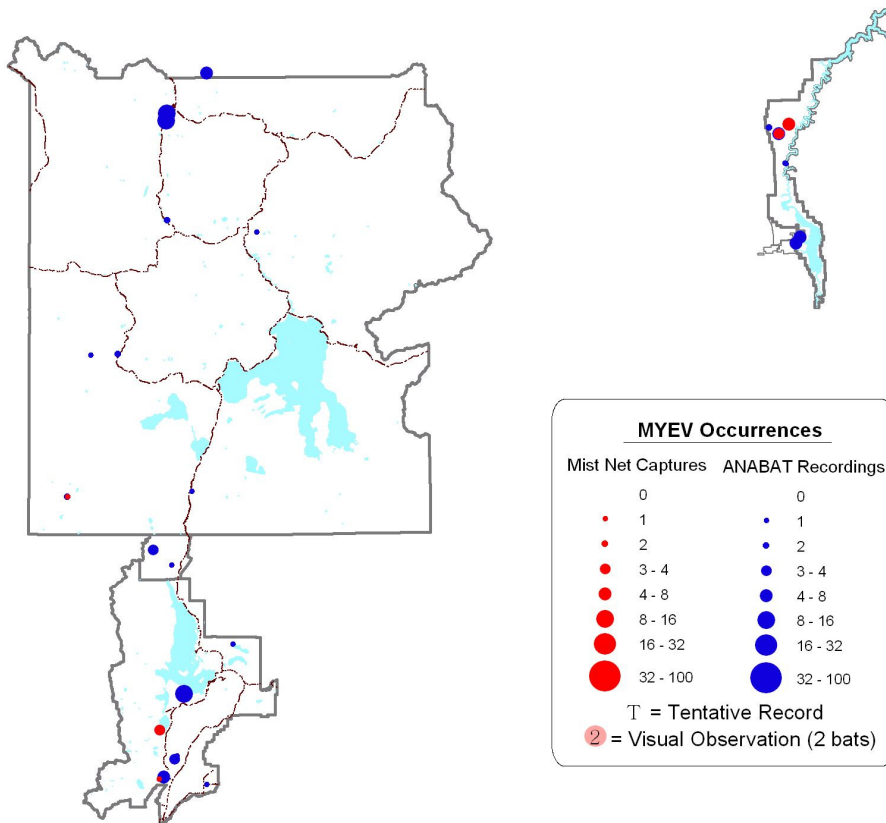
### Survey Notes

In general the small-footed myotis can be captured in mist nets, particularly if nets are placed in flyways among vegetation (e.g., cottonwood gallery forest in BICA). Once in hand, identification is straightforward based on pelage and membrane characteristics, as long as the surveyor is experienced in distinguishing among myotis species. Small-footed myotis are easy to detect acoustically, but ANABAT<sup>®</sup> recordings are difficult to distinguish from other 40 kHz myotis and visual identification in flight is difficult without substantial experience.

## Long-eared myotis (*Myotis evotis*, MYEV)



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WYNDD



### Species Ecology

The long-eared myotis inhabits most of western North America including Wyoming, where it is uncommon relative to other species. Common habitat of long-eared myotis is coniferous forest and woodland (e.g., juniper, ponderosa pine, subalpine spruce-fir). It is more likely in areas close to a water source and near rock outcrops. Roosts are primarily in large snags, but can sometimes be in buildings, rock crevices, caves, and abandoned mines. Very few maternity colonies have been located in Wyoming.

Foraging times are variable. The long-eared myotis is slow and maneuverable, typically foraging near vegetation and over rivers, streams, and ponds within forest, but also over other open areas (e.g., camp-grounds, forest openings). It can catch insects both by aerial pursuit, hovering and gleaning. Primary food sources are moths and small beetles. Long-eared myotis are colonial and after feeding they often gather in night roosts that are near, but separate from, day roosts.

### Status in GRYN

The long-eared myotis occurs in low numbers throughout the GRYN and is not discernibly more abundant in any particular park unit, although fewer were captured in YNP than either BICA or GTNP. ANABAT® recordings were made at entrances to abandoned ranch buildings in GTNP, suggesting possible night use of those structures.

### Survey Notes

The long-eared myotis is readily captured in mist nets at both aquatic and terrestrial sites, particularly along roads and cut lines through trees. However, in-hand it can be difficult to distinguish from fringed myotis by those without such experience. It is easy to detect acoustically, but only a subset of passively collected ANABAT® calls are diagnostic, the rest being easily confused with other 30 kHz bats, notably fringed myotis.

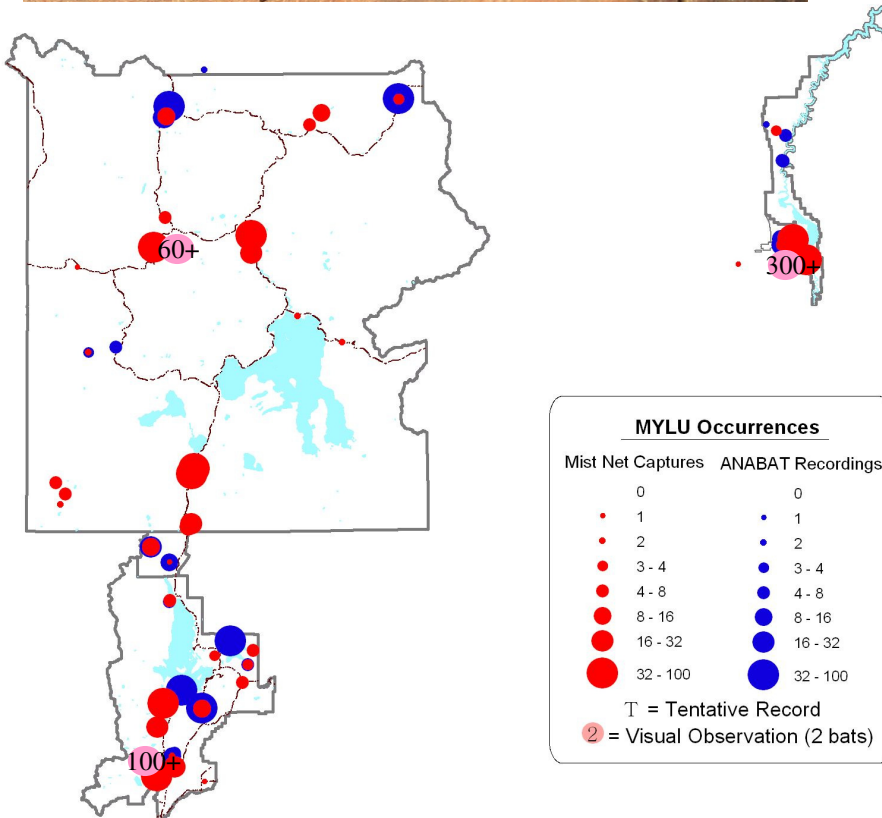
## Little brown bat (*Myotis lucifugus*. MYLU)



### Species Ecology

In Wyoming, the little brown myotis is most common in conifer forest, streamside riparian areas, woodlots, shelterbelts, and urban areas; usually found near open water and absent from hot, arid lowlands. During summer, the little brown bat uses a wide variety of roosts including buildings, trees (cavities and loose bark), bridges, rock crevices, caves, and abandoned mines. It is one of the most common species in Wyoming's buildings.

The little brown bat begins to forage at dusk. It is small, slow, and highly maneuverable, allowing it to forage close to obstacles and pursue insects over short distances. It mainly forages over water, often within a few feet of the surface, but also in open woodlands and forest openings. Although an opportunistic feeder, it feeds mainly on small, soft-bodied, flying insects, particularly emerging aquatic insects (e.g., caddis flies, mayflies, midges, mosquitoes).



### Status in GRYN

The little brown bat inhabits is a year-round resident throughout Wyoming. It is by far the most common bat in the GRYN, occurring at high abundance relative to other bats at most survey sites. Many buildings in **YNP**, **GTNP**, and a few in **BICA** have large roosting colonies of little brown bats (see also Bogen and Geluso 1999). In fact, such structures seem important to the health of its populations within the GRYN. It is a voracious feeder on common pest insects (e.g., mosquitoes), making these building-centered populations an asset to visitors.

### Survey Notes

Given their habit of feeding at the surface of calm water, little brown bats are easily surveyed with mist nets placed over water bodies. In-hand, they are very difficult to distinguish from Yuma myotis, although they are much more common. Using ANABAT®, its calls are easy to distinguish from Yuma's, making the combination of mist nets and ANABAT® effective. Using ANABAT® alone, little brown bat calls are easily confused with other 40 kHz myotis in Wyoming, namely small-footed myotis and long-legged myotis, but a subset can be distinguished by experts.

## Fringe-tailed bat (*Myotis thysanodes*, MYTH)

### Species Ecology

When trying generalize published information on the fringe-tailed bat, they are mostly found in dry habitats where open areas (e.g., grasslands and deserts) are interspersed with mature forests (usually ponderosa pine, pinyon-juniper, or oak), creating complex mosaics with ample edges and abundant snags. It seems that this type of habitat usually occurs at mid-elevations in the Rocky Mountains and that ideal sites are near water and have abundant roosts. Fringed-myotis in Wyoming seem to roost predominantly in crevices of cliff or in large, middle-aged snags in mature conifer forest.

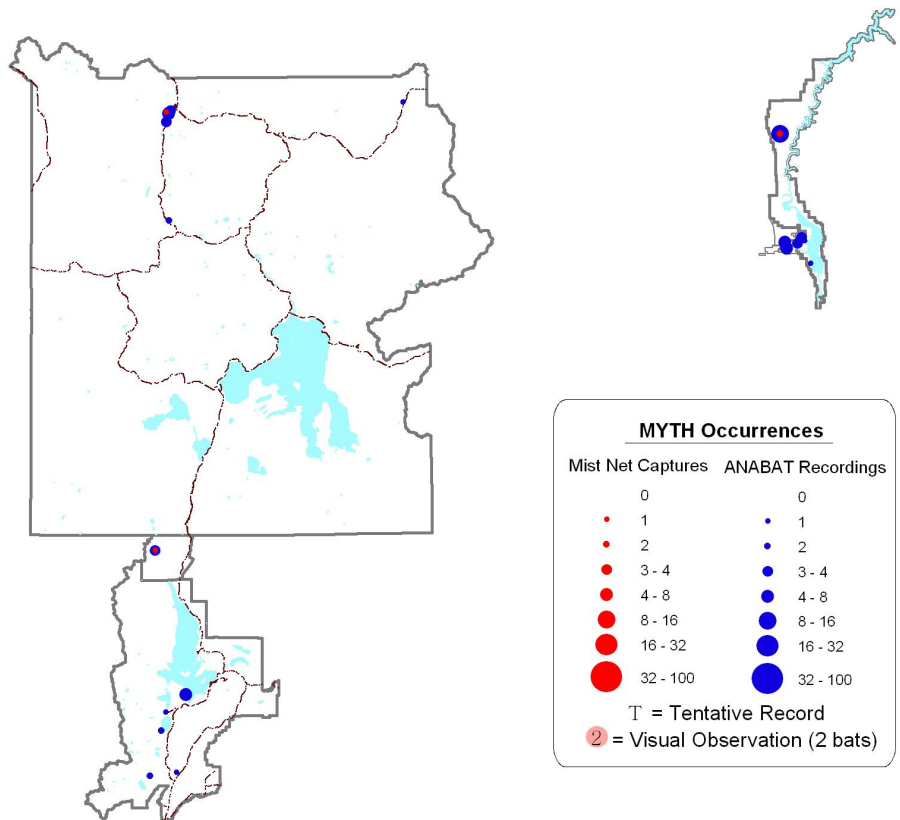
The fringed-tailed bat likely eats mostly beetle and moths, which it can capture on the wing or by gleaning from vegetation. They are adapted to fly in vegetatively cluttered environments, which means they probably forage in interior forest and/or along forest edges.

### Status in GRYN

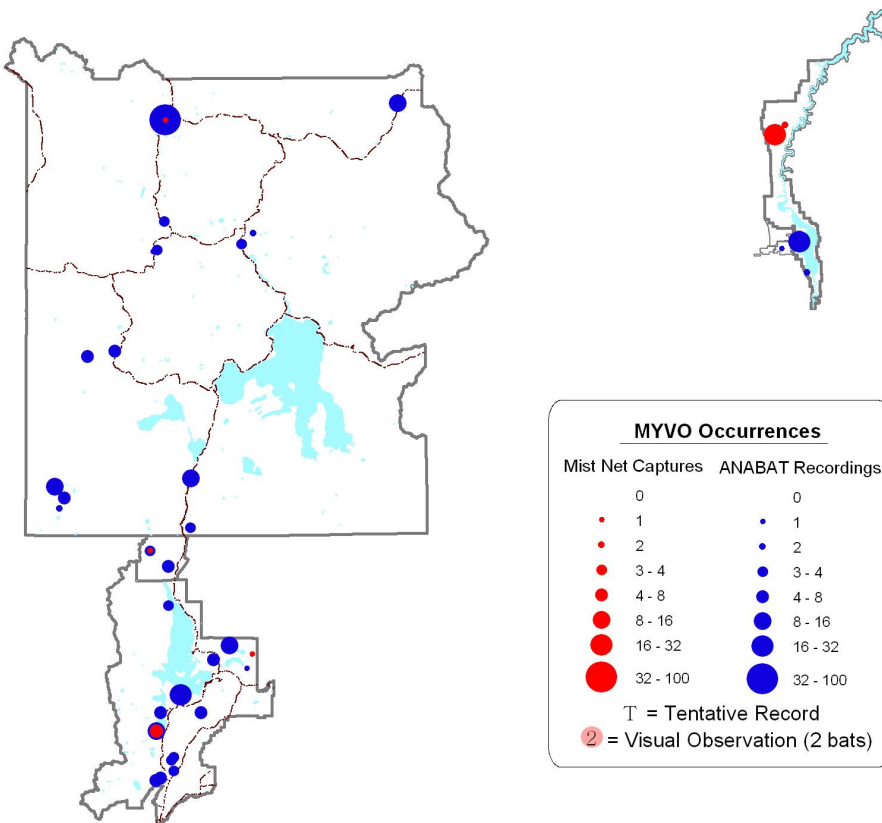
Fringed myotis occurred in all three park units of the GRYN, with BICA containing the greatest relative abundance. It seemed regular, if not truly common, in **BICA**, where abundant cliff habitat exists for roosting surrounded by a patchwork of arid forest and grassland. It seemed to occur at low numbers in much of **GTNP**, presumably roosting in snags, as no evident cliff habitat seemed to drive distribution. In **YNP**, fringed myotis turned up a few times, primarily in the vicinity of Mammoth, which is much like BICA in its mixture of cliffs and dry forest habitat. Further investigation of the roost use of this species in each park is merited.

### Survey Notes

Fringe-tailed bats can be captured in mist nets, but since they forage around vegetation, typically near forested areas, methods of survey not tied to water bodies (e.g., canopy netting) will likely be most productive. In-hand they can be mistaken for long-eared myotis (*M. evotis*) if careful attention is not given to evaluating the trailing edge of the tail membrane. Their echolocation calls are distinctive if a good recording is obtained, which is difficult to do with a stationary ANABAT9<sup>®</sup> unit. Conducting active acoustic surveys along forest edges and netting openings along those edges where calls are detected seems to be a valid survey strategy for this species.



## Long-legged myotis (*Myotis volans*, MYVO)



### Survey Notes

Since long-legged myotis forage around vegetation, it occurs in water-based mist nets below its proportion in the local chiroptofauna (only one was captured in all YNP, despite many suspected ANABAT<sup>®</sup> recordings). It is easy to detect acoustically, but its calls are easy to confuse with other 40 kHz myotis, particularly little brown bats flying in cluttered areas. Its long tail membrane may be distinguishable in flight to experienced observers, so visual observation combined with active ANABAT<sup>®</sup> recording is likely an effective survey option.

### Species Ecology

Suitable habitat for long-legged myotis in Wyoming includes mature montane forest, ponderosa pine and juniper woodlands, and montane shrubs and willows near forested areas; primarily at mid to high elevations with many snags. During summer, females form maternity colonies in tree cavities, buildings, rock crevices, and under loose bark. Most roosts are in large-diameter snags with loose bark, near forest openings, and near permanent water. Males will roost more broadly. Migration is unclear, as it has not been documented hibernating in Wyoming.

The long-legged myotis emerges in early evening and is active most of the night; activity may peak 3 - 4 hours after sunset. It is a rapid, direct flier that pursues prey in open areas (e.g., campgrounds, small clearings), vegetated riparian areas, and around forest canopy. Although feeding on a variety of soft-bodied insects, it mainly eats moths.

### Status in GRYN

The long-legged myotis occurs throughout Wyoming *where suitable habitat exists*. Portions of all GRYN parks appear to contain suitable habitat, as defined above. It is difficult to get a sense of abundance, because *M. volans* is difficult to catch in nets and its echolocation calls can easily be confused with the more common little brown bat. We estimate that it is common in **GTNP**, locally common in **YNP**, and somewhat common in **BICA**. Like other tree-roosting bats, its fate in these areas depends largely on the state of mature forests.

## Yuma myotis (*Myotis yumanensis*, MYYU)



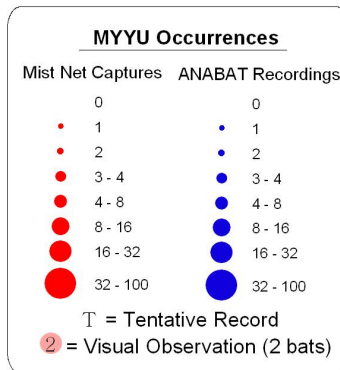
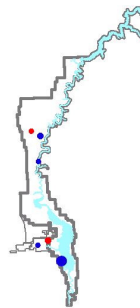
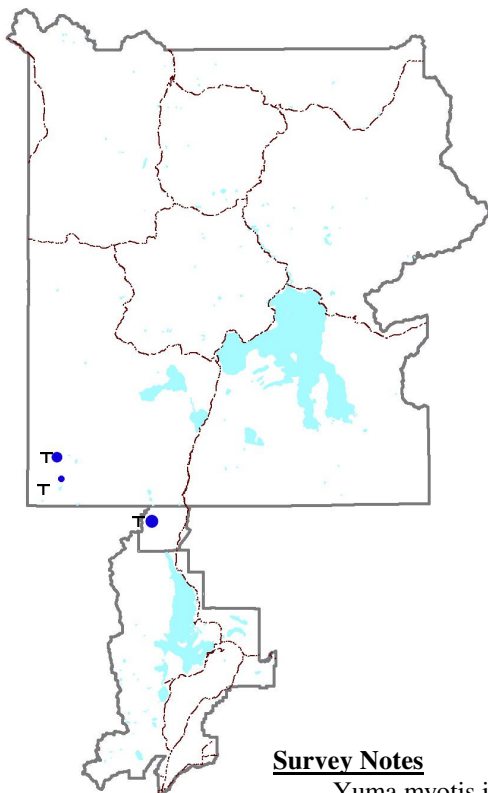
### Species Ecology

The Yuma myotis is found mostly in low-mid elevation arid areas, but in a variety of habitats including deserts, woodlands, grasslands, sagebrush steppe, and riparian corridors. Despite occurring in arid areas, it is closely associated with water features, and usually occurs near permanent sources of water. Maternity colonies and day roosts may be in buildings, trees, caves, abandoned mines, bridges, or cliff crevices, always close to water.

The Yuma myotis emerges just after sunset to begin foraging. It forages almost exclusively over water features (often a few centimeters above the surface), but may in open habitats when prey is abundant. Like the little brown bat, it feeds opportunistically on a variety of insects, primarily aquatic and soft-bodied insects (e.g., caddis flies, mayflies, flies, moths, small beetles).

### Status in GRYN

All occurrences in GRYN may be disjunct from the main range of Yuma myotis. The best GRYN habitat for them occurs in **BICA**, where a relatively arid landscape and suitable roost sites occur in proximity to large, open bodies of water. It occurred uncommonly but regularly in BICA during this survey, and one confirmed maternity roost was found in Yellowtail Wildlife Habitat Management Area. Occurrence of Yuma myotis in **YNP** and **GTNP** is more tentative, based on several localized sets of ANABAT® recordings in the Bechler Valley and John D. Rockefeller Parkway. These habitats are not ideal for the species and likely do not support reliable populations. However, Yuma myotis occurs just west of YNP in Idaho, so there is the possibility of a stable, albeit peripheral, population; *further investigation is required.*



### Survey Notes

Yuma myotis is difficult to survey in Wyoming. Although its water-skimming foraging strategy makes it vulnerable to capture in mist nets, in the GRYN it seems to forage over large bodies of water that are extremely difficult to net. In-hand it is very difficult to distinguish from the little brown bat, even by experts. Further, although it is easy to detect acoustically, its calls can be difficult to distinguish from California myotis. The foraging behavior of these two species is markedly different, so active recording combined with visual observation by experienced bat biologists may be an efficient survey method.

## Appendix 2: Geographic Information System (GIS) Data

The CD-ROM found in the back cover of this report contains a folder labeled "bat\_inv." All information in this folder can be easily accessed if it is copied to a hard drive in the following folder: C:\ArcWork\. The folder contains the following items:

Name	Size	Type	Date Modified
BackgroundFiles		File Folder	10/28/2005 3:26 PM
DataFiles		File Folder	10/28/2005 3:26 PM
info		File Folder	10/28/2005 11:22 AM
Bat Inventory Data.mxd	129 KB	ESRI ArcMap Document	10/28/2005 3:27 PM

1. **BackgroundFiles** contains several GIS shapefiles with basic park data (i.e., roads, water bodies, unit boundaries), for use as coarse spatial references when viewing the data on-screen.
2. **DataFiles** contains a shapefile, a metadata file, and a Microsoft Excel workbook containing summary information of the data collected during this bat inventory (see below). Each column of information presented in the survey data shapefile and workbook are described in the metadata document.

Name	Size	Type	Date Modified
Metadata for surveydata1283.htm	26 KB	HTML Document	10/28/2005 3:21 PM
surveydata1283.dbf	48 KB	DBF File	10/28/2005 1:45 PM
surveydata1283.prj	1 KB	PRJ File	10/28/2005 1:48 PM
surveydata1283.sbn	5 KB	SBN File	10/28/2005 1:45 PM
surveydata1283.sbx	1 KB	SBX File	10/28/2005 1:45 PM
surveydata1283.shp	3 KB	SHP File	10/28/2005 1:48 PM
surveydata1283.shp.xml	27 KB	XML Document	10/28/2005 3:24 PM
surveydata1283.shx	1 KB	SHX File	10/28/2005 1:48 PM
SurveyData.xls	50 KB	Microsoft Excel Worksheet	10/28/2005 1:34 PM

3. **info** contains information essential to ArcMap for reading the rest of this data. It should not be modified or removed.
4. **Bat Inventory Data.mxd** is an ArcMap project that references all the above noted data files and provides symbology useful for viewing the data.

*Note: As stated in "Metadata for surveydata1283.htm," all shapefiles are projected using the Universal Transverse Mercator projection based on the 1983 North American Datum (NAD1983). The definitions of each field in "surveydata1283" and "SurveyData.xls" are listed in the section on "Entity and Attribute Information" of the same metadata file and reprinted in the following table.*



**Table A2-1. Field Definitions for "surveydata1283.shp" and "SurveyData.xls," as reported in the html file "Metadata for surveydata1283.htm." Row colors have the following meanings: Yellow = general site information, Pink = information from mist net activities, Blue = information from Anabat® activities, Green = summary information on species diversity.**

<b>Field Label</b>	<b>Field Definition</b>
SITE	Survey Site: Code used to define a given survey site during inventory activities.
PARKUNIT	Park Unit: The park unit (BICA, GTNP, or YNP) in which this survey site occurs.
SUBUNIT	Sub-unit: Coarse geographic reference for the location of the survey site within the Greater Yellowstone Network
LOCATION	Survey Site Location: Textual discription of where the survey site is located.
EASTING	UTM Easting: X-coordinate for survey site in UTM Zone 12, NAD 1983.
NORTHING	UTM Northing: Y-coordinate for survey site in UTM Zone 12, NAD 1983.
DATUM	Datum in which the point was recorded ... should be NAD1983 for all sites.
SURVEY	Survey Activity: Categorical definition of the type of survey performed at each site.
TOTCAP	Total Captures: Total number of bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
ANPA	Number of pallid bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
COTO	Number of Townsend'd big-eared bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
EPFU	Number of big brown bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
EUMA	Number of spotted bats documented at a given survey site. Values only for those sites were mistnetting activities occurred.
LACI	Number of hoary bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
LANO	Number of silver-haired bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYCA	Number of california myotis captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYCI	Number of myotis cilliolabrum captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYEV	Number of long-eared myotis captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYLU	Number of little brown bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYTH	Number of fringed-tailed bats captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYVO	Number of long-legged myotis captued at a given survey site. Values only for those sites were mistnetting activities occurred.
MYYU	Number of Yuma myotis captued at a given survey site. Values only for those sites were mistnetting activities occurred.
EFFORT_CAP	Capture Effort: The mist net sampling effort expended at a given survey site, reported in net area hours (NAH). NAH is the area of nets operated on a site (in square meters) multiplied by the length of time (in hours) that those nets were active.
CAP_PER_EF	Captures per Effort: The number of bats captured at a given survey site per unit of sampling effort at that site. Reported as bats per NAH.
CAP_RICH	Capture Richness: the number of different species identified at a given site as a result of mist net activities.
SPECPEREFF	Species Per Effort: The number of different bat species documented at a given site per unit of sampling effort at that site. Reported as number of species per NAH.
TOTCALL	Total Calls: Total number of unique bat calls recorded at a given survey site. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
UNKNBAT	Unkown Bat Call: The number of calls recorded at a given survey site that could not be distinguished to the species level. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
MULTICALL	Multiple Calls: The number of Anabat files at a given site that contained calls of more than one bat.

<b>Field Label</b>	<b>Field Definition</b>
AB25K	Number of unique bat calls identifiable as a 25 kilohertz bat, but not identifiable to the species level. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AB30K	Number of unique bat calls identifiable as a 30 kilohertz bat, but not identifiable to the species level. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AM40K	Number of unique bat calls identifiable as a 40 kilohertz bat, but not identifiable to the species level. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AM50K	Number of unique bat calls identifiable as a 50 kilohertz bat, but not identifiable to the species level. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AANPA	Number of unique bat calls identifiable as coming from a palid bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
ACOTO	Number of unique bat calls identifiable as coming from a Townsend's big-eared bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AEPFU	Number of unique bat calls identifiable as coming from a big brown bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AEUMA	Number of unique bat calls identifiable as coming from a spotted bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
ALACI	Number of unique bat calls identifiable as coming from a hoary bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
ALANO	Number of unique bat calls identifiable as coming from a silver-haired bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYCA	Number of unique bat calls identifiable as coming from a california myotis. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYCI	Number of unique bat calls identifiable as coming from a western small-footed myotis. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYEV	Number of unique bat calls identifiable as coming from a long-eared myotis. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYLU	Number of unique bat calls identifiable as coming from a little brown bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYTH	Number of unique bat calls identifiable as coming from a fringe-tailed bat. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYVO	Number of unique bat calls identifiable as coming from a long-legged myotis. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
AMYYU	Number of unique bat calls identifiable as coming from a Yuma myotis. Reported only for sites where echolocaiton calls were recorded with Anabat equipment.
HRS_CAL	Hours Call: The sampling effort at a given survey site where echolocation calls were recorded. Reported as Anabat hours (i.e., the number of hours an Anabat unit was recording at the site).
CAL_PER_HR	Calls per Hour: The number of unique echolocation calls recorded at a given survey site per hour of Anabat operation.
CAL_RICH	Call Richness: The number of different species of bats whose echolocation calls were recorded at a given site.
SPEC_PER_HR	Species per Hour: The average number of different species recorded per hour of Anabat operation at a given site.
RICHNESS	Richness: The total number of species "conclusively" recorded at a given site using both Anabat recordings and mist net captures.
SPEC_LIST	Species List: The list of species documented at a given site based on both mist net captures and Anabat recordings. Those documented only through recordings are preceeded by the letter "a" (e.g., aCOTO).
POSSIBLESP	Possible Species: A list of species for which only vague Anabat were the only evidence that they occurred at the site. Thus, they could possibly occur there, but we do not have conclusive evidence to that effect.