Fringed Myotis

Myotis thysanodes

REGULATORY STATUS

USFWS: No special status
USFS R2: Sensitive
USFS R4: No special status
Wyoming BLM: Sensitive
State of Wyoming: Nongame Wildlife

CONSERVATION RANKS

USFWS: No special status
WGFD: NSS3 (Bb), Tier II
WYNDD: G4, S2S3
Wyoming Contribution: LOW
IUCN: Least Concern

STATUS AND RANK COMMENTS

The Wyoming Natural Diversity Database (WYNDD) has assigned Fringed Myotis (*Myotis thysanodes*) a range of state conservation ranks because of uncertainty in the population trend of the species in Wyoming.

NATURAL HISTORY

Taxonomy:

There are three recognized subspecies of Fringed Myotis, with some researchers recognizing a fourth [1-3]. Two subspecies occur in Wyoming with *M. t. thysanodes* found across most of the state. A unique subspecies, *M. t. pahasapensis* is found in the Black Hills of northeastern Wyoming [3].

Description:

Identification of Fringed Myotis is possible in the field by experienced observers. Fringed Myotis is a medium-sized bat overall but large among *Myotis* species. Pelage color varies across the species' range. Dorsal fur ranges from yellow-brown to dark olive-brown. Ventral fur is similar in coloration but paler. Appearance of *M. t. pahasapensis* in the Black Hills is unique. Dorsally, the subspecies is brown ochraceous buff and ventrally it is light ochraceous buff [4]. The ears are long (16–20 mm) and very dark in color with a long tragus [3, 5]. Wing and tail membranes are very dark and nearly opaque [5, 6]. Females are significantly larger than males but are otherwise identical in appearance [3]. Juveniles are indistinguishable from adults by around 21 days of age except for open epiphyseal closures [4]. The species is similar in appearance to other *Myotis* species in the "Long-eared" group. Members of this group that occur in Wyoming include Northern Long-eared Myotis (*M. septentrionalis*) and Long-eared Myotis (*M. evotis*). Fringed Myotis can be differentiated from both by the presence of distinct fringe of hairs protruding from the posterior edge of the uropatagium [5].

Distribution & Range:
Fringed Myotis is widely distributed across western North America from southern Mexico north to southwestern Canada. Wyoming is on the northeastern edge of the species' range. Locally, seasonal changes in distribution may be observed as individuals move between summer range and winter hibernacula. In Wyoming, the species is widely distributed across much of the state with the exception of portions of the Great Divide and Powder River Basins in southcentral and northeastern Wyoming respectively [7].

Habitat:
Fringed Myotis is associated with a broad range of habitat types but generally occupies dry habitats such as grasslands, deserts, and shrublands. More specifically, Fringed Myotis is found where these habitats are interspersed with mature Ponderosa Pine (*Pinus ponderosa*), pinyon-juniper (*Pinus* spp.-*Juniperus* spp.), or oak (*Quercus* spp.) forest [4]. In the summer, a variety of day roost structures are used depending on local availability of structures [8]. Reproductive females congregate in maternity colonies, sites where they raise offspring, in a variety of structures including caves, abandoned mines, human-made structures, rock crevices, and trees [4]. Males roost in similar structures but generally singly or in small groups [4]. Roost use studies conducted in and around Wyoming indicate that Fringed Myotis roosted in rock crevices, Ponderosa Pine trees [9], interstitial spaces of the boulder field at the base of Devils Tower [10], and abandoned mines, cabins, and large rock structures [8]. While roost use of the species has not been evaluated across most of Wyoming, it is likely similar to that observed in these studies. In winter, Fringed Myotis hibernates, but few hibernation sites have been documented across the species' range, and only 1 hibernaculum is known from a cave in southeastern Wyoming [11]. The few documented hibernation sites range-wide have included caves and abandoned mines [4].

Phenology:
Phenology of Fringed Myotis is largely unknown in Wyoming but is likely similar to that observed in other parts of the species' range [3]. Breeding occurs in late summer or early fall after females leave maternity roosts [3, 4]. Like most bat species in North America, females store spermatozoa through the winter, and fertilization and implantation of the egg occurs from late April to mid-May [3]. Gestation ranges from 50 to 60 days, and females bear a single, altricial offspring in late June to mid-July. Young are capable of flight around 16 days after birth [4]. Fringed Myotis migrates towards hibernation sites in late summer or early fall, where it hibernates during winter, entering hibernation sometime in September and emerging in April [3].

Diet:
Fringed Myotis is insectivorous, and beetles comprise the majority of the diet. However, a variety of other insect classes including Lepidoptera, Diptera, Neuroptera, Hymenoptera, and Homoptera among others are consumed when abundant [4].

CONSERVATION CONCERNS

Abundance:
Continental: WIDESPREAD
Wyoming: UNCOMMON
There are no estimates of abundance of Fringed Myotis in Wyoming. In Wyoming and elsewhere, evidence suggests that the species is uncommon at a statewide scale but is locally abundant where suitable habitat exists [4]. During bat inventories across Wyoming, Fringed Myotis comprised a very small proportion of total bat captures and acoustic recordings [12-18], but was one

of the most commonly captured bat species at Devils Tower National Monument [10, 19, 20], supporting the notion that the species is generally uncommon but locally abundant.

Population Trends:
Historic: UNKNOWN
Recent: UNKNOWN
Both historic and recent population trends of Fringed Myotis are largely unknown in Wyoming and elsewhere throughout its range.

Intrinsic Vulnerability:
MODERATE VULNERABILITY
Fringed Myotis is moderately vulnerable to extrinsic stressors. The species has low fecundity, giving birth to only a single pup each year [3]. Fringed Myotis demonstrates high site fidelity, with individuals returning to the same general area season after season. Reproductive females in particular utilize the same maternity roost sites on an interannual basis [4]. This vulnerability is exacerbated by the specific combination of limited habitat characteristics such as arid habitats interspersed with mature forests that contain both suitable roosting structures and surface water that the species requires, and disturbance to any component of these habitats may result in local declines or extirpations [4].

Extrinsic Stressors:
MODERATELY STRESSED
Fringed Myotis may face potential population declines resulting from global climate change, as the number of pregnant or lactating Fringed Myotis was significantly lower in years that had below average precipitation [21]. Following climate models, these precipitation patterns are predicted to become more frequent throughout the western United States, including Wyoming, and may result in population declines from decreased reproductive rates [21]. While in summer day roosts, Fringed Myotis is easily disturbed by human activity. This is particularly true for females nearing parturition and may result in abandonment of maternity roost sites [4]. Similarly, Fringed Myotis is likely negatively affected by recreational activities. For example, rock climbing has been cited as a potential stressor for the species in northern Colorado, where a number of maternity colonies exist in areas that receive frequent use by climbers [8]; the combination of high-use rock climbing areas and roosts of Fringed Myotis in Wyoming is unknown and in need of further evaluation. Disturbance from visitors to caves and abandoned mines used as hibernacula represents a substantial threat to cave-roosting bats and bat habitat where human visitors occur [22]. Even a small number of short duration disturbances lead to significant increases in arousal events and subsequent energy expenditures that may lead to increased mortality of hibernating bats [23, 24]. White-nose Syndrome (WNS) is a fungal disease that affects hibernating bats. WNS has killed several million bats in North America [25, 26]. The pathogenic fungus *Pseudogymnoascus destructans* (formerly *Geomyces destructans*) that causes WNS has not been detected within the range of Fringed Myotis or in Wyoming to date [27], but it is thought that the disease will continue to expand westward. It is unknown if Fringed Myotis will be affected by WNS, but other bat species in the genus *Myotis* have experienced large population declines from the disease [25].

KEY ACTIVITIES IN WYOMING

Bats have received increasing research attention across North America and in Wyoming. To address concerns regarding potential WNS infection of bats in Wyoming, the Wyoming Game and Fish Department (WGFD) in cooperation with the Wyoming Bat Working Group authored

"A strategic plan for white-nose syndrome in Wyoming" in 2011. This document presents a plan of action to minimize impacts of WNS if it is detected in states adjacent to or in Wyoming [28]. To facilitate early detection of the disease, WGFD requires researchers to evaluate all bats captured during research activities for signs of WNS infection using the Reichard Wing-Damage Index [29]. Beginning in 2012, WGFD personnel placed temperature and humidity loggers in a number of known or suspected hibernacula across Wyoming to determine if climatic conditions at those sites are favorable for growth of *P. destructans*. Personnel have also begun collecting swabs from hibernating bats and hibernacula substrates in an effort to assist with early detection of *P. destructans*. While placing loggers, surveyors also searched for hibernating bats but no Fringed Myotis were documented during these surveys [30-32]. WGFD conducts periodic surveys at known hibernacula throughout the state, resulting in a single known hibernaculum for Fringed Myotis, despite the fact that the species occurs in many portions of Wyoming [11]. Several studies have been completed or are underway that have increased our understanding of bat species in the state, including Fringed Myotis. Both WGFD and the WYNDD have conducted numerous bat inventories across the state including a statewide forest bat inventory from 2008 to 2011 [12-15, 33, 34], a statewide inventory of cliffs, caves, and rock outcroppings from 2012 to 2015 [16-18, 35], an inventory of bats at Devils Tower National Monument from 2010 to 2011, a bat monitoring effort in southern Wyoming from 2011 to 2013 [36-38], and bat surveys in northeastern Wyoming in 2014 and 2015 [7]. Fringed Myotis was captured and recorded during these investigations, but, with the exception of surveys at Devils Tower National Monument, Fringed Myotis represented a small proportion of the bat community [7, 12, 16-19, 33-35]. In 2015, WYNDD developed a bat monitoring plan and initiated survey activities at Bighorn Canyon National Recreation Area (BICA). The primary objective of this monitoring plan is to develop a baseline activity level or other index of abundance for Little Brown Myotis (*M. lucifugus*) that can be used to detect changes in populations within BICA through time, but Fringed Myotis was frequently recorded throughout the area [39]. In 2016, WYNDD fitted four pregnant or lactating female Fringed Myotis with radio transmitters and tracked them to day roosts. These individuals utilized crevices in rock outcroppings and interstitial spaces among boulders near the base of the tower [10]. In addition to research activities, many conservation organizations and federal and state agencies, including WGFD, have developed outreach and education materials to inform the general public of the importance bats and concerns regarding the persistence of bats in the future.

ECOLOGICAL INFORMATION NEEDS

Habitat associations and use of Fringed Myotis in Wyoming are poorly understood. This is particularly true in regards to summer day roost and winter hibernacula use and selection. All aspects of phenology are poorly understood, especially for this species in Wyoming. There are no robust estimates of abundance or population trends for Fringed Myotis but these data would be useful in the face of potential stressors such as WNS, human recreation, and land management practices. As of 2016, WNS has not been documented in Wyoming but continued monitoring of this disease is an essential component of minimizing potential effects of the disease on bats in Wyoming.

MANAGEMENT IN WYOMING

This section authored solely by WGFD; Nichole L. Bjornlie. Very little is known about the wintering locations of Fringed Myotis in Wyoming. Although WNS has not been detected in the state, the westward progression of the fungus necessitates the need for these data before it

reaches Wyoming. Consequently, priorities will focus on locating and systematically surveying hibernacula to monitor populations and recommend and assist with bat-friendly closures of important caves and mines where needed. In 2016, WGFD began a project in collaboration with the state of Nebraska to evaluate occurrence, abundance, and reproductive status of bats in eastern Wyoming, which represents an important zone of overlap between eastern and western bat species, including Fringed Myotis. Mist-net surveys will continue to implement WNS protocols and assessment in an effort to assist with early detection should the fungus reach the state. Habitat assessments will be incorporated with survey efforts to better understand what influences species presence and distribution at a finer scale and to develop management and conservation recommendations. In addition to inventory projects, WGFD, in collaboration with the Wyoming Bat Working Group and other state-wide partners, will implement the North American Bat Monitoring Program that will use acoustic monitoring to assist with state and region-wide assessment of bat trends, which are currently lacking. Additional priorities will include updating and revising the Conservation Plan for Bats in Wyoming and the Strategic Plan for WNS in Wyoming. Finally, outreach and collaboration with private landowners will remain a priority to ensure conservation of bats and bat habitat.

CONTRIBUTORS

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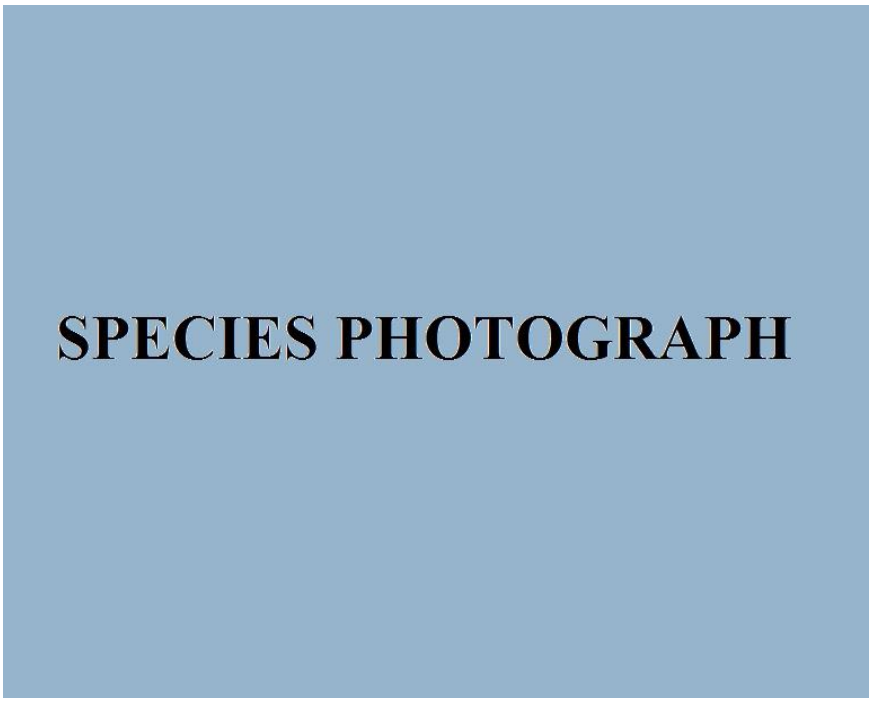

Figure 1: Photo not available.

Figure 2: North American range of *Myotis thysanodes*. (Map from: Patterson, B. D., et al. (2007) Digital Distribution Maps of the Mammals of the Western Hemisphere, version 3.0, NatureServe, Arlington, Virginia.)

HABITAT PHOTOGRAPH

Figure 3: Photo not available.

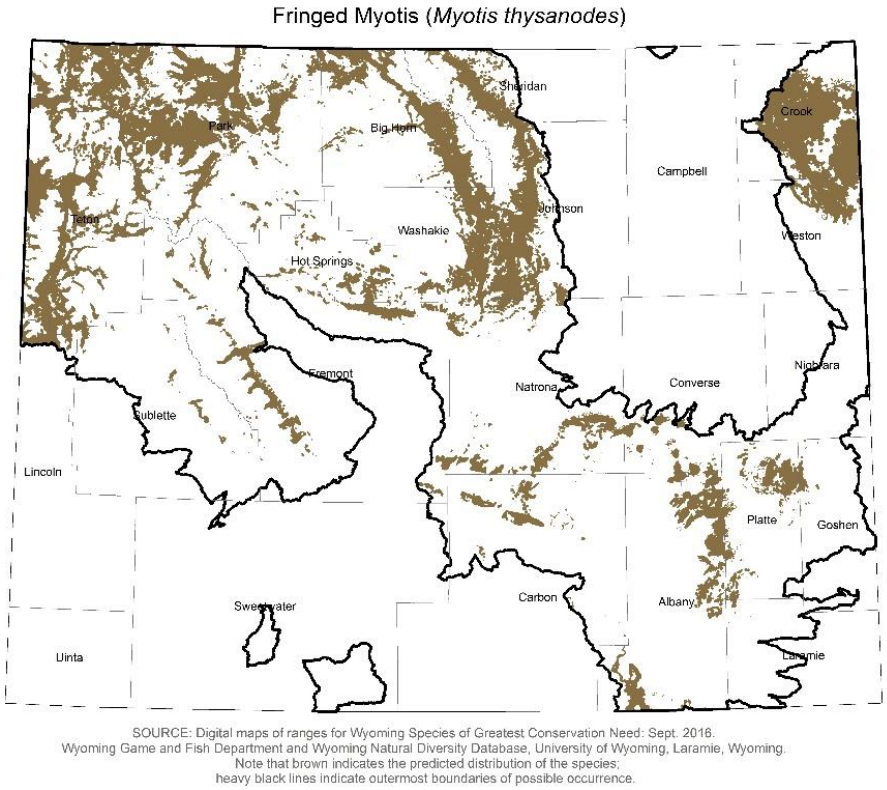

Figure 4: Range and predicted distribution of *Myotis thysanodes* in Wyoming.