

Pallid Bat

Antrozous pallidus

REGULATORY STATUS

USFWS: No special status
USFS R2: No special status
USFS R4: No special status
Wyoming BLM: No special status
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 Pallid Bat (*Antrozous pallidus*) a state conservation rank ranging from S2 (Imperiled) to S3 (Vulnerable) because of uncertainty about the species' abundance and population trends in Wyoming.

NATURAL HISTORY

Taxonomy:

Many authors recognize six or seven subspecies of Pallid Bat based on morphological variation across their range^{1, 2}. Following these subspecific designations, only *A. p. pallidus* occurs in Wyoming³. Recent molecular analyses suggest that Pallid Bat falls into three genetically differentiated groups across the species' range. However, taxonomy has not been modified based on these findings^{4, 5}.

Description:

Pallid Bat is identifiable in the field and is large among bats in Wyoming. Dorsal pelage is light brown to pale yellow with hairs lighter at the base than at the tip. Ventral pelage is lighter and may be nearly white². Wing and tail membranes are pinkish-brown. The ears are long (25–33 mm), translucent light pink in color, and completely separate at the base^{2, 3, 6}. The tragus is long and pointed, extending at least half the length of the ear². The snout is blunt with the paracanth gland forming two, low-profile lumps on the top. Females may be slightly larger than males but are otherwise identical in appearance². Pallid Bat is easily differentiated from other long-eared bats that occur in Wyoming; Townsend's Big-eared Bat (*Corynorhinus townsendii*) has longer ears that meet at the base, and Spotted Bat (*Euderma maculatum*) has black dorsal pelage with three white spots.

Distribution & Range:

Pallid Bat is widely distributed across arid habitats in southwestern and western North America, from central Mexico north to far southern British Columbia. An isolated subspecies is endemic

to Cuba². Wyoming is on the far northwestern edge of the species' distribution, but Pallid Bat is found across most of the basins in the state with the exception of the Powder River Basin in northeastern Wyoming⁶. Confirmed breeding has been documented in just 1 of the 28 latitude/longitude degree blocks in the state in northcentral Wyoming⁷.

Habitat:

Pallid Bat is typically associated with arid deserts, grasslands, and shrublands^{2, 8}. The species has also been documented in low abundances within coniferous forests². Within these habitats, Pallid Bat is generally found in the vicinity of rocky outcrops or cliffs. In summer, these rocky features are used as day roosts, where Pallid Bat congregates in small colonies in cracks and crevices. Use of other roost structures have been noted, including caves, mines, tree cavities, and human structures². Roosts or hibernation sites used in winter are largely unknown⁸.

Phenology:

The phenology of Pallid Bat is poorly understood in general, but is likely variable across its range depending upon elevation and latitude. Copulation likely occurs in late fall or early winter (i.e., October to December)². Fertilization of the egg is delayed until spring. One or two altricial pups are born about nine weeks following fertilization. Young are volant around 40 days after birth. The species is assumed to hibernate in winter across its range, but timing and duration of hibernation are entirely unknown².

Diet:

Pallid Bat is a dietary generalist, feeding by gleaning prey items from the ground and vegetation. The majority of the diet is comprised of large arthropods such as scorpions, crickets, and beetles². Vertebrate prey including small lizards and small mammals comprise approximately 25% of the diet². Pallid Bat has also been documented opportunistically feeding on nectar pooled in flowers of Cardon Cactus (*Pachycereus pringlei*)⁹.

CONSERVATION CONCERNS

Abundance:

Continental: WIDESPREAD

Wyoming: UNCOMMON

There are no estimates of abundance for Pallid Bat in Wyoming.

Population Trends:

Historic: UNKNOWN

Recent: UNKNOWN

There are no population trend estimates available for Pallid Bat in Wyoming. Local extirpations have been noted at a number of sites in central Arizona, but it is unknown if similar patterns have occurred in other portions of Pallid Bat range, including Wyoming¹⁰.

Intrinsic Vulnerability:

MODERATE VULNERABILITY

Pallid Bat is moderately vulnerable to extrinsic stressors in Wyoming. Habitat use tends to be broad, although the availability of cliffs and rocky outcrops are limited landscape features. Pallid Bat is a gregarious species, frequently congregating in large groups of up to 100 individuals at day roosts^{2, 11}. Females and juveniles congregate in maternity colonies and, unlike most bat species, males also roost together. Because Pallid Bat congregates in large numbers at hibernacula and other roost sites, regional populations are vulnerable to single catastrophic

events at these sites. The species has low fecundity, with females giving birth to one or two pups per year^{2, 12}.

Extrinsic Stressors:

MODERATELY STRESSED

Pallid Bat is sensitive to disturbance by human visitors at summer day roosts and hibernacula, and displacement from these structures has been documented¹⁰. This is exacerbated by the species' gregarious nature, leading to the potential displacement of a large number of individuals. All hibernating bats are sensitive to disturbance from visitors to caves and abandoned mines used as hibernacula¹³. 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^{14, 15}. Because Pallid Bat hibernates, it is potentially susceptible to the pathogenic fungus *Pseudogymnoascus destructans* (formerly *Geomyces destructans*) that causes White-Nose Syndrome (WNS) that was first documented in North America in 2006¹⁶. Large declines of several bat species in eastern North America have resulted from WNS. Annual declines of 30 to 99% have been documented at hibernacula known to have WNS infected bats, with local extinctions of some bat species^{16, 17}. As of 2016, WNS has not been documented in Wyoming¹⁸. It is assumed that WNS will eventually occur in the state, but it is unknown if WNS will affect bats, including Pallid Bat, to the same degree in Wyoming as in other areas of North America.

KEY ACTIVITIES IN WYOMING

State and federal wildlife and land management agencies have taken several actions to protect bat species from WNS. The Wyoming Game and Fish Department (WGFD), along with the Wyoming Bat Working Group, developed "A strategic plan for white-nose syndrome in Wyoming" in 2011¹⁹. This plan is intended to minimize the impacts of WNS once it is detected in Wyoming or adjacent states. 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 Index²⁰, and to implement WNS decontamination protocols when handling bats or conducting hibernacula surveys. 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 these sites are favorable for growth of *P. destructans*. Preliminary results suggest that temperature and relative humidity in known hibernacula could facilitate the growth of the fungus^{21, 22}. Personnel have also begun collecting swabs of hibernating bats and hibernacula substrates in an effort to assist with early detection of *P. destructans*. Collectively, WGFD and WYNDD have conducted statewide systematic and project-specific surveys for bats since 2008, with numerous, smaller scale projects occurring prior to this time. Acoustic surveys in southeastern Wyoming resulted in 71 detections of Pallid Bats²³. Beginning in 2012, WGFD conducted a bat inventory of cliff and canyon habitats across Wyoming. A total of 41 captures and 154 acoustic recordings of Pallid Bat were made from 2012-2015²⁴⁻²⁷. In 2012 and 2013, WYNDD conducted bat surveys across southern Wyoming and captured 7 Pallid Bats and made 39 recordings across these two years^{28, 29}.

ECOLOGICAL INFORMATION NEEDS

Pallid Bat in the wild remains one of the least studied bat species, especially in the northern portions of its range, which includes Wyoming³⁰. Current subspecific taxonomy is based largely on morphological variation and does not align with recent genetic evidence⁴⁻⁶. Habitat

associations and use are poorly understood in general but especially in Wyoming. This is particularly true for use and selection of summer day roosts and winter hibernacula. Similarly, phenology is very poorly understood. Estimates of abundance and population trends are unknown in Wyoming but important in evaluating the status of the species in the face of intrinsic and extrinsic factors specific to Pallid Bat.

MANAGEMENT IN WYOMING

This section authored solely by WGFD; Nichole L. Bjornlie. Very little is known about population trends and roosting locations of Pallid Bat in Wyoming. Although WNS has not been detected in the state, the westward progression of the fungus and recent confirmation of WNS in Washington necessitates the need for these data before it reaches Wyoming. Consequently, priorities will focus on locating and monitoring hibernacula as well as other roost locations (e.g., maternity roosts) to monitor populations and recommend and assist with bat-friendly closures of important roosts. 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 Pallid Bat. Mist-net surveys will continue to implement WNS protocols and assessment in an effort to assist with early detection should the disease reach the state. Habitat assessments will be incorporated with survey efforts to better understand what influences species presence and distribution at a finer scale. 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. 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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REFERENCES

- [1] Wilson, D. E., and Reeder, D. M., (Eds.) (2005) *Mammal Species of the World. A Taxonomic and Geographic Reference (3rd ed)*, Johns Hopkins University Press.
- [2] Hermanson, J.W., and O'Shea, T. J. (1983) *Antrozous pallidus*, *Mammalian Species* 213, 1-8.
- [3] Adams, R. A. (2003) *Bats of the Rocky Mountain West: Natural History, Ecology, and Conservation*, University Press of Colorado, Boulder, Colorado.
- [4] Weyandt, S. E., and Van Den Bussche, R. A. (2007) Phylogeographic structuring and volant mammals: the case of the pallid bat (*Antrozous pallidus*), *Journal of Biogeography* 34, 1233-1245.
- [5] Lack, J. B., Wilkinson, J. E., and Van den Bussche, R. A. (2010) Range-wide population genetic structure of the pallid bat (*Antrozous pallidus*) - incongruent results from nuclear and mitochondrial DNA, *Acta Chiropterologica* 12, 401-413.
- [6] Buskirk, S. W. (2016) *Wild Mammals of Wyoming and Yellowstone National Park*, University of California Press, Oakland, California.
- [7] Orabona, A., Rudd, C., Grenier, M., Walker, Z., Patla, S., and Oakleaf, B. (2012) Atlas of birds, mammals, amphibians, and reptiles in Wyoming, p 232, Wyoming Game and Fish Department Nongame Program, Lander, WY.

- [8] Rambaldini, D. A. (2005) *Antrozous pallidus* - Pallid Bat, Western Bat Working Group, <http://wbwg.org/western-bat-species/>.
- [9] Frick, W. F., Heady, P. A., and Hayes, J. P. (2009) Facultative nectar-feeding behavior in a gleaning insectivorous bat (*Antrozous pallidus*), *Journal of Mammalogy* 90, 1157-1164.
- [10] O'Shea, T. J., and Vaughan, T. A. (1999) Population changes in bats from central Arizona: 1972 and 1997, *Southwestern Naturalist* 44, 495-500.
- [11] Vaughan, T. A., and Oshea, T. J. (1976) Roosting ecology of the Pallid Bat, *Antrozous pallidus*, *Journal of Mammalogy* 57, 19-42.
- [12] Bassett, J. E. (1984) Litter size and postnatal-growth rate in the Pallid Bat, *Antrozous pallidus*, *Journal of Mammalogy* 65, 317-319.
- [13] Hester, S. G., and Grenier, M. B. (2005) A conservation plan for bats in Wyoming, Wyoming Game and Fish Department Nongame Program, Lander, WY.
- [14] Boyles, J. G., and Brack, V., Jr. (2009) Modeling survival rates of hibernating mammals with individual based models of energy expenditure, *Journal of Mammalogy* 90, 9-16.
- [15] Thomas, D. W. (1995) Hibernating bats are sensitive to nontactile human disturbance, *Journal of Mammalogy* 76, 940-946.
- [16] Frick, W. F., Pollock, J. F., Hicks, A. C., Langwig, K. E., Reynolds, D. S., Turner, G. G., Butchkoski, C. M., and Kunz, T. H. (2010) An Emerging Disease Causes Regional Population Collapse of a Common North American Bat Species, *Science* 329, 679-682.
- [17] Frick, W. F., Puechmaille, S. J., Hoyt, J. R., Nickel, B. A., Langwig, K. E., Foster, J. T., Barlow, K. E., Bartonicka, T., Feller, D., Haarsma, A.-J., Herzog, C., Horacek, I., van der Kooij, J., Mulkens, B., Petrov, B., Reynolds, R., Rodrigues, L., Stihler, C. W., Turner, G. G., and Kilpatrick, A. M. (2015) Disease alters macroecological patterns of North American bats, *Global Ecology and Biogeography* 24, 741-749.
- [18] White-nose Syndrome.org. (2015) White-nose Syndrome.org A coordinated response to the devastating bat disease, <http://whitenosesyndrome.org/>.
- [19] Abel, B., and Grenier, M. (2011) A strategic plan for White-nose Syndrome in Wyoming, p 27, Wyoming Game and Fish Department, Lander, Wyoming.
- [20] Reichard, J. D., and Kunz, T. H. (2009) White-nose syndrome inflicts lasting injuries to the wings of little brown myotis (*Myotis lucifugus*), *Acta Chiropterologica* 11, 457-464.
- [21] Beard, L. (2016) Surveillance of Hibernating Bats and Environmental Conditions at Caves and Abandoned Mines in Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., Ed.), pp 97-113, Wyoming Game and Fish Department.
- [22] Beard, L. (2015) Surveillance of hibernating bats and environmental conditions at caves and abandoned mines in Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Rudd, C. K., Eds.), pp 163-193, Wyoming Game and Fish Department.
- [23] Abel, B., and Grenier, M. (2012) Inventory of Bats in Forests of Southeastern Wyoming: Acoustic Surveys, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Grenier, M. B., Abel, B., and Cudworth, N., Eds.), pp 155-181, Wyoming Game and Fish Department.
- [24] Abel, B., and Grenier, M. (2013) Inventory of Bats in Cliffs and Canyons of Western Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A., Ed.), pp 234-265, Wyoming Game and Fish Department.
- [25] Yandow, L., and Grenier, M. (2014) Inventory of Bats Associated with Cliff and Canyon Habitats of Western Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Cudworth, N., Eds.), pp 253-284, Wyoming Game and Fish Department.
- [26] Yandow, L., and Beard, L. (2015) Inventory of Bats Associated with Cliff and Canyon Habitats of Eastern Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Rudd, C. K., Eds.), pp 133-162, Wyoming Game and Fish Department.
- [27] Beard, L. (2016) Inventory of Bats Associated with Cliff and Canyon Habitats of Eastern Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., Ed.), pp 115-141, Wyoming Game and Fish Department.
- [28] Abernethy, I. M., Andersen, M. D., and Keinath, D. A. (2012) Bats of southern Wyoming: distribution and migration year 2 report. Prepared for the USDI Bureau of Land Management by the Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.

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- [29] Abernethy, I. M., Andersen, M. D., and Keinath, D. A. (2014) Bats of southern Wyoming: distribution and migration year 3 report. Prepared for the USDI Bureau of Land Management by the Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.
- [30] Rambaldini, D. A., and Brigham, R. M. (2008) Torpor use by free-ranging pallid bats (*Antrozous pallidus*) at the northern extent of their range, *Journal of Mammalogy* 89, 933-941.



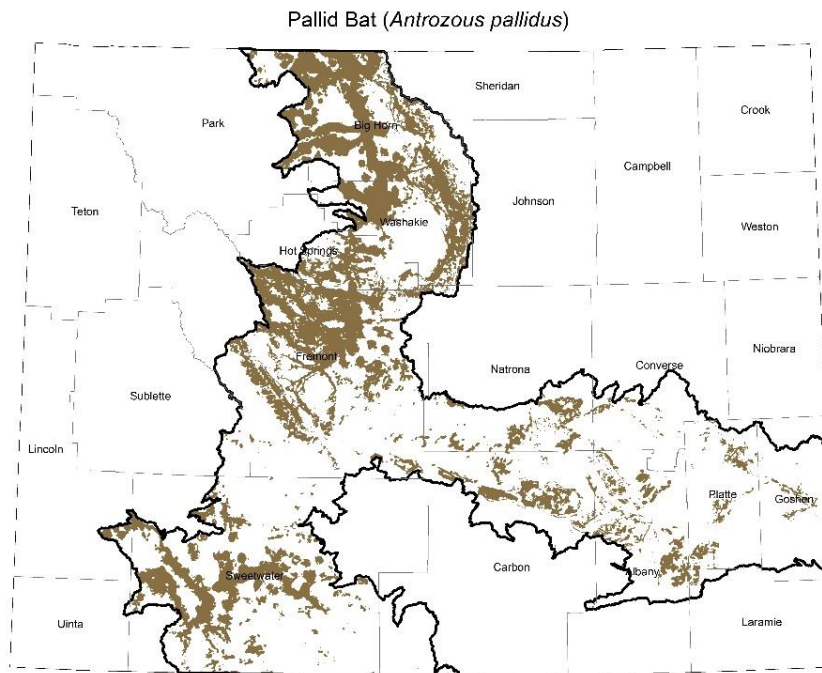
Figure 1: Adult Pallid Bat in flight. (Photo courtesy of Robert J. Luce)



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



Figure 3: Arid shrubland in extreme southern Sweetwater County, Wyoming in the vicinity of rock outcroppings typical of habitat occupied by Pallid Bat. (Photo courtesy of Ian M. Abernethy)



SOURCE: Digital maps of ranges for Wyoming Species of Greatest Conservation Need: Sept. 2016.
Wyoming Game and Fish Department and Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.
Note that brown indicates the predicted distribution of the species;
heavy black lines indicate outermost boundaries of possible occurrence.

Figure 4: Range and predicted distribution of *Antrozous pallidus* in Wyoming.



Figure 5: Ventral view of a female Pallid Bat captured in Wyoming. (Photo courtesy of Becky Abel, WGFD)