PENNSYLVANIA
WILDLIFE ACTION PLAN
2025–2035

Species of Greatest Conservation Need Species Accounts

Appendix 1.4 - Mammals

West Virginia Water Shrew
Eastern Water Shrew
Long-tailed Shrew
Maryland Shrew
North American Least Shrew
Little Brown Bat
Indiana Bat
Eastern Small-footed Bat
Northern Long-eared Bat
Silver-haired Bat
Tricolored Bat
Eastern Red Bat
Northern Hoary Bat
Appalachian Cottontail
Snowshoe Hare
Eastern Fox Squirrel
Northern Flying Squirrel
Prairie Deermouse
Allegheny Woodrat
Rock Vole
Alleghanian Spotted Skunk

Suggested Species Account Citation Format:

Account author last name, first initial, additional authors as applicable. Species common name (*Scientific name*) *In* Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission. 2026. Pennsylvania Wildlife Action Plan, 2025-2035. C. Haffner, D. Day, and N. Welte, editors. Pennsylvania Game Commission and Pennsylvania Fish and Boat Commission, Harrisburg, Pennsylvania.

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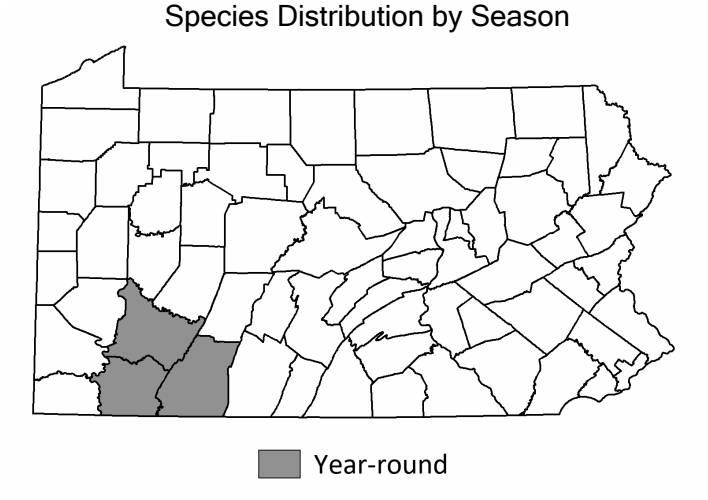
West Virginia Water Shrew

Sorex palustris punctulatus

Michael R. Scafini — *Pennsylvania Game Commission*



J. Wisgo, Western Pennsylvania Conservancy



Conservation Profile

PA 10-Year Conservation Goal: Maintain existing populations in southwestern Pennsylvania through 2035.

NatureServe Global Rank: G5

IUCN Red List Designation: Not Evaluated

IUCN Red List Trend: Not Assessed

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Data Deficient

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S3

State Rank Year: 2024

PA Legal Designation: Threatened

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of <30% to Relatively Stable

Cumulative Threat Impact: Low

Season: Year-round

Specific Habitat Requirements: Clear mountain streams at elevations greater than 457 to 610 meters (1,500 to 2,000 feet) with high quality, moderate flow and bordered by deeply undercut stream banks, exposed tree root balls, rock, brush piles, and greater than 75 percent ground cover.

Primary Habitat: Forested Upland

Primary Habitat Type: High Elevation Forests

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Year-round

Threat Category: Industrial and Military Effluents **Threat Impact:** Low

Specific Threat: Potential leaching or discharge of chemicals associated with hydraulic fracturing for natural gas can degrade water quality.

Action Category: Detection and intervention

Specific Action: Prevent the leaching or discharge of chemicals associated with hydraulic fracturing for natural gas into waterways in southwest Pennsylvania.

Objective: Maintain that natural gas extraction companies are in compliance with current laws and continue enforcement on those companies who do not comply.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Record the number of environmental violations committed by drilling companies and monitor overall stream health.

Potential Collaborators: Other federal agency, Pennsylvania Department of Environmental Protection, Pennsylvania Game Commission

Locations: HUC8 Watershed: Youghiogheny, Lower Monongahela, Cheat, N. Br. Potomac, Conemaugh, Kiskiminetas

Other species likely to benefit from this action: Terrestrial and aquatic fauna

Season: Year-round

Priority	Need	Partners
1	Define the northernmost range of this species within Pennsylvania and determine if range overlaps with eastern water shrew (Sorex albibarbis) (Hart 2010).	Pennsylvania Game Commission, Conservancies & Land Trusts
2	Identify the extent of genetic differentiation between American (West Virginia) water shrew (Sorex punctulatus) and eastern water shrew (S. albibarbis).	Universities & research institutions, Pennsylvania Game Commission, Conservancies & Land Trusts
3	Determine population densities relative to available habitat.	Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Conduct surveys along the Allegheny Front and within the Allegheny Mountain section northward of the current known range to determine if there is range overlap with eastern water shrew (Sorex albibarbis).	Conservancies & Land Trusts, Pennsylvania Game Commission
2	Use mark and recapture methods in conjunction with low impact surveys (live traps) at known locations to determine population densities (Hart 2010).	Pennsylvania Game Commission, Conservancies & Land Trusts

Name: Pennsylvania Natural Heritage Inventories

Lead(s) : Pennsylvania Natural Heritage Program/Western Pennsylvania Conservancy

Link: http://www.naturalheritage.state.pa.us/

Description: Since 2012, Western Pennsylvania Conservancy / Pennsylvania Natural Heritage Program has been actively conducting surveys for this species to identify new populations and determine range extent.

Name: Terrestrial Small Mammal Database

Lead(s) : Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all Pennsylvania Game Commission permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the Wildlife Diversity Division's Endangered & Nongame Mammal Section Supervisor.

Environmental Protection Agency. 2010. Erosion, sediment and runoff control for roads and highways. Environmental Protection Agency, Washington, D.C. Available from http://www.epa.gov/owow/nps/education/runoff.html (accessed January 2015).

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NatureServe. 2015. Sorex palustris punctulatus. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, VA. Available from http://explorer.natureserve.org (accessed January 2015).

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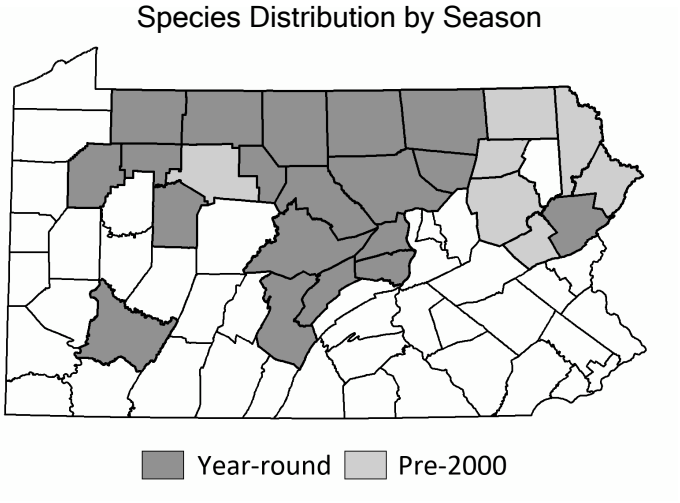
Eastern Water Shrew

Sorex albibarbis

Michael R. Scafini — *Pennsylvania Game Commission*



C. Eichelberger, Western Pennsylvania Conservancy



Conservation Profile

PA 10-Year Conservation Goal: Determine the distribution and model all potential habitat in Pennsylvania based on inventory results, and examine its validity as a distinct species from the American (West Virginia) Water Shrew.

NatureServe Global Rank: G5

IUCN Red List Designation: Not Evaluated

IUCN Red List Trend: Not Assessed

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Data Deficient

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S3

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of <30% to Relatively Stable

Cumulative Threat Impact: Medium

Season: Year-round

Specific Habitat Requirements: High-quality primary and secondary order streams with moderate flow, deeply undercut banks and other streamside structure (rock shelters, rock jumbles, and brush piles), and high to low gradients. Sites may or may not have dense ground cover. Streams flow through hardwood dominated forests at lower elevations, and primarily mixed forests at higher elevations >457 meters (1500 feet).

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Year-round

Threat Category: Agricultural and Forestry Effluents **Threat Impact:** Low

Specific Threat: Atmospheric deposition of heavy metals and acid mine drainage suppress invertebrate prey populations.

Action Category: Mitigate human environmental impact

Specific Action: Remediate acid mine drainage.

Objective: Install AMD treatment facilities at 5 point sources where eastern water shrews once likely existed by 2035.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** The number of stream miles that are restored and made suitable for eastern water shrews.

Potential Collaborators: Businesses, Local agencies & municipalities, Pennsylvania Department of Environmental Protection, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission

Locations: HUC8 Watershed: Mid. Delaware-Mongaup-Brodhead, Lackawaxen, U. Susquehanna-Lackawanna, U. Susquehanna-Tunkhannock, U. Susquehanna, Owego-Wappasening, Chemung, Tioga, Pine, Mid. W. Br. Susquehanna, Sinnemahoning, U. Allegheny, U. Genesee, Clarion, Mid. Allegheny-Tionesta, U. W. Br. Susquehanna, U. Juniata, Bald Eagle, Lower W. Br. Susquehanna, Lehigh, Conemaugh

Other species likely to benefit from this action: Terrestrial and aquatic species.

Season: Year-round

Priority	Need	Partners
1	Is the eastern water shrew a distinct species from the American water shrew genetically and morphologically?	Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions
2	To which species do specimens captured between the published ranges of the two subspecies belong?	Pennsylvania Game Commission, Businesses, Universities & research institutions
3	Presumed to be a useful bioindicator, is the eastern water shrew an effective tool to monitor the impacts of shale gas exploration?	Pennsylvania Department of Environmental Protection, Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Determine the distribution of the eastern water shrew in Pennsylvania. Specifically, determine how far south and west the species occurs.	Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions

Name: Pennsylvania Natural Heritage Inventories

Lead(s) : Pennsylvania Natural Heritage Program/Western Pennsylvania Conservancy

Link: http://www.naturalheritage.state.pa.us/

Description: Since 2012, Western Pennsylvania Conservancy / Pennsylvania Natural Heritage Program has been actively conducting surveys for this species to identify new populations and determine range extent.

Name: Terrestrial Small Mammal Database

Lead(s) : Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all Pennsylvania Game Commission permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the Wildlife Diversity Division's Endangered & Nongame Mammal Section Supervisor

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Enders, J. E. 1985. Water Shrew (Sorex palustris albibarbis) (Cope). Pages 385-386 in H. H. Genoways and F. J. Brenner, editors. Species of special concern in Pennsylvania. Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.

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Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

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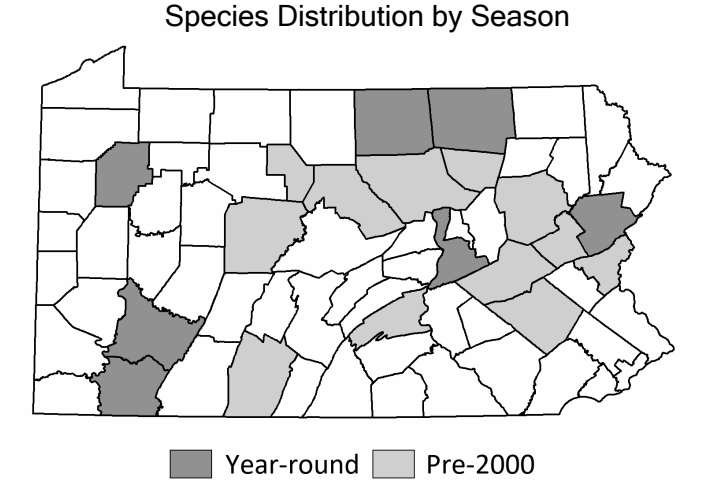
Long-tailed Shrew

Sorex dispar

Katelyn A. Otterbein *Pennsylvania Game Commission*



C. Eichelberger, Western Pennsylvania Conservancy



Conservation Profile

PA 10-Year Conservation Goal: Improve confidence in current distribution by continued investigations of the species' historic range.

NatureServe Global Rank: G4

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Unknown

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Data Deficient

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S4

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Relatively stable (<=10% change)

Cumulative Threat Impact: Low

Season: Year-round

Specific Habitat Requirements: Cool, moist forests with rocky talus deposits. Often associated with mesic hardwood and mixed hardwood-conifer, and conifer forests with rhododendron component. Almost always associated with rocky, talus substrates.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Habitat Comments:

Season: Year-round

Threat Category: Utility and Service Lines **Threat Impact:** Low

Specific Threat: Disturbance and fragmentation of rocky deposits, especially those associated with seeps and streams.

Action Category: Conserve via zoning or informal designations

Specific Action: Minimize or avoid habitat fragmentation by siting projects outside of known or potential habitat.

Objective: Review all proposed projects for negative impacts to long-tailed shrews, offer siting guidance, and provide best management practices.

Action Priority: 2-High **Action Urgency:** Initiate within 5 years **Measure:** Acres of habitat avoided or protected.

Potential Collaborators: Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Allegheny woodrat, Alleghanian spotted skunk, eastern small-footed bat, rock vole

Season: Year-round

Priority	Need	Partners
1	What are the patterns of population demography and local extinction/colonization for the species?	Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources
2	What is the impact of fragmentation and disturbance on long-tailed shrews?	Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources

Season: Year-round

Priority	Survey	Partners
1	Detailed surveys are needed to determine more precise distribution statewide.	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all PGC permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the State Mammalogist. Also capture reporting forms are supplied with all small mammal special use permits.

Hart, J. 2010. The rock shrew (Sorex dispar). Pages 365-366 in M. A. Steele, M. C. Brittingham, T. J. Maret, and J. F. Merritt, editors. Terrestrial vertebrates of Pennsylvania: a complete guide to species of conservation concern. The Johns Hopkins University Press, Baltimore, Maryland.

Kirkland, G. L., Jr. 1981. Sorex dispar and Sorex gaspensis. Mammalian Species 155:1-4

Kirkland, G. L., Jr., and H. M. Van Deusan. 1979. The shrews of the Sorex dispar group: Sorex dispar (Batchelder) and Sorex gaspensis (Anthony and Goodwin). American Museum Novitates 2675:1-21.

Kirkland, G. L., Jr., and H. W. Snoddy. 1999. Biogeography and community ecology of shrews (Mammalia: Soricidae) in the northern Appalachian Mountains. Pages 167-175 in R. P. Eckerlin, editor. Proceedings of the Appalachian Biogeography Symposium. Virginia Museum of Natural History, Special Publication 7.

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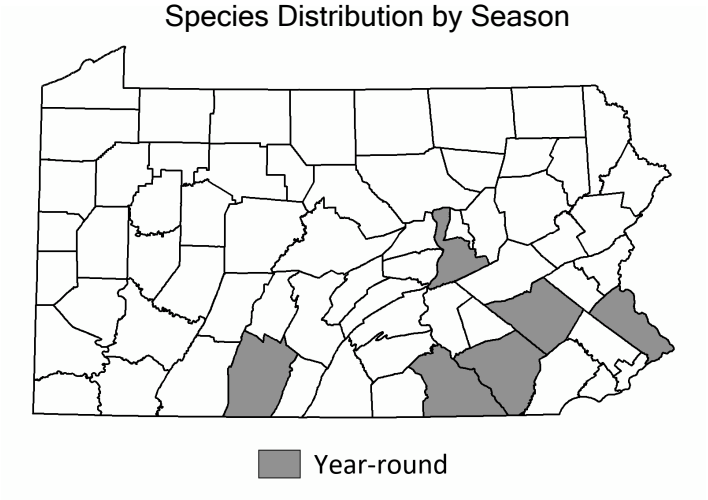
Maryland Shrew

Sorex fontinalis

Katelyn A. Otterbein *Pennsylvania Game Commission*



John Wible, Carnegie Museum of Natural History



Conservation Profile

PA 10-Year Conservation Goal: Maintain existing populations in south-central and southeastern Pennsylvania through 2035.

NatureServe Global Rank: G4Q

IUCN Red List Designation: Not Evaluated

IUCN Red List Trend: Not Assessed

Identified Conservation Priority by Established Groups: No

Northeast U.S.RSGCN: Not RSGCN

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S5

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Unknown

Cumulative Threat Impact: Low

Season: Year-round

Specific Habitat Requirements: Found in multiple habitats, but prefers those that are moist including sedge-grass meadows, woodlands, and hedgerows in early successional areas (Merritt 1987). This species is seldom captured on ridge tops or elevations above 300 meters (984 feet) (Kirkland 1985).

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Shrubland/grassland

Season: Year-round

Threat Category: Housing and Urban Areas **Threat Impact:** Low

Specific Threat: Conversion of natural lands and early successional habitats to urbanized landscapes.

Action Category: Conservation planning

Specific Action: Conserve habitat and supporting landscapes within the core of the species' range to prevent conversion to non-suitable habitat.

Objective: Coordinate with developers to mitigate the loss of core habitat within the next 10 years.

Action Priority: 3-Medium **Action Urgency:** Initiate immediately **Measure:** Number of acres within core of species' range protected.

Potential Collaborators: Conservancies & Land Trusts, Non-governmental organizations, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Physiographic Province: Piedmont, Ridge and Valley, Appalachian Plateaus

Other species likely to benefit from this action: North American least shrew, potentially prairie deer mouse

Season: Year-round

Priority	Need	Partners
1	Where are populations of this species still found within the state, including northern and westernmost range boundaries?	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions
2	What is the ecological relationship between this species and masked shrew (Sorex cinereus) (Whitaker and Hamilton 1998)?	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Initiate surveys for this species beginning at the periphery of the known range in southeast Pennsylvania and extend surveys north and west to determine the range extent within Pennsylvania.	Pennsylvania Game Commission, Universities & research institutions, Conservancies & Land Trusts

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all PGC permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the State Mammalogist.

Kirkland, G. L. 1985. Maryland Shrew (Sorex fontinalis). Pages 381-383 in H. H. Genoways and F. J. Brenner, editors. Species of special concern in Pennsylvania. Carnegie Museum of Natural History, Pittsburgh, Pennsylvania.

Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

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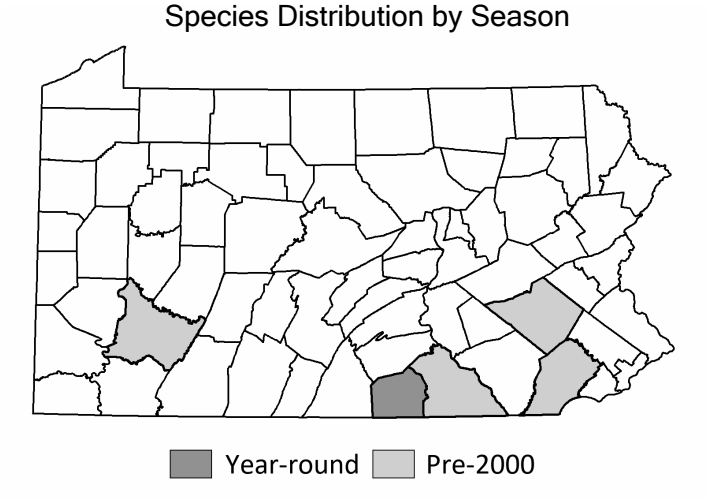
North American Least Shrew

Cryptotis parvus

Katelyn A. Otterbein — *Pennsylvania Game Commission*



Michael Jeffords



Conservation Profile

PA 10-Year Conservation Goal: Identify current breeding population extent within Pennsylvania.

NatureServe Global Rank: G5

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Data Deficient

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S1

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 10-30%

Cumulative Threat Impact: Very High

Season: Year-round

Specific Habitat Requirements: The least shrew is an inhabitant of open areas. In Pennsylvania, early successional communities are preferred and include native grasslands, old fields, abandoned pastureland, and weedy meadows (Merritt 1987). Inhabited sites are usually associated with a water source (Hart 2010).

Primary Habitat: Open Upland

Primary Habitat Type: Grasslands

Primary Specific Habitat: Shrubland/grassland

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Predation by native predators.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Manage habitats around known North American least shrew populations to provide needed cover.

Objective: Manage habitats at 5 known North American least shrew sites in the next 10 years.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of sites treated.

Potential Collaborators: Conservancies & Land Trusts, Other federal agency, Pennsylvania Game Commission, Private Landowners

Locations: Physiographic Province: Ridge and Valley, Piedmont

Other species likely to benefit from this action: Maryland shrew, potentially prairie deer mouse

Season: Year-round

Threat Category: Annual and Perennial Non-timber Crops **Threat Impact:** High

Specific Threat: Intense farming practices do not allow fields to lie fallow.

Action Category: Economic incentives and disincentives

Specific Action: Support and expand economic incentives for farmland preservation.

Objective: Reserve 200 ha (500 acres) of core North American least shrew habitat in the next 10 years.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of acres of habitat reserved.

Potential Collaborators: Conservancies & Land Trusts, Other federal agency, Pennsylvania Game Commission, Private Landowners

Locations: Physiographic Province: Ridge and Valley, Piedmont

Other species likely to benefit from this action: Maryland shrew, potentially prairie deer mouse

Season: Year-round

Threat Category: Other Ecosystem Modifications **Threat Impact:** High

Specific Threat: Loss of suitable maintained habitats.

Action Category: Economic incentives and disincentives

Specific Action: Incentivize retention of short-term uncultivated farmland.

Objective: Maintain 200 ha (500 acres) of existing core habitat for North American least shrews for the next 10 years.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Acres of habitat reserved.

Potential Collaborators: Conservancies & Land Trusts, Other federal agency, Pennsylvania Game Commission, Private Landowners

Locations: Physiographic Province: Ridge and Valley, Piedmont

Other species likely to benefit from this action: Maryland shrew, potentially prairie deer mouse

Season: Year-round

Priority	Need	Partners
1	What are the preferred habitat characteristics for this species?	Pennsylvania Game Commission, Universities & research institutions, Other federal agency, Conservancies & Land Trusts
2	What is the current distribution of the species in Pennsylvania?	Conservancies & Land Trusts, Other federal agency, Pennsylvania Game Commission, Universities & research institutions
3	What are the effects of habitat management techniques such as prescribed fire on North American least shrews?	Universities & research institutions, Pennsylvania Game Commission, Other federal agency, Conservancies & Land Trusts

Season: Year-round

Priority	Survey	Partners
1	Re-survey sites in southcentral Pennsylvania recently known to harbor viable populations of least shrews to determine the current population status.	Pennsylvania Game Commission, Conservancies & Land Trusts, Other federal agency, Universities & research institutions
2	Conduct de novo surveys for this species in appropriate habitat beginning within the current known range in southcentral Pennsylvania and extend surveys to other regions of Pennsylvania.	Universities & research institutions, Pennsylvania Game Commission, Other federal agency, Conservancies & Land Trusts

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all PGC permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the State Mammalogist.

Hart, J. A. 2010. Least Shrew (Cryptotis parva). Pages 342-345 in M. A. Steele, M. C. Brittingham, T. J. Maret, and J. F. Merritt, editors. Terrestrial vertebrates of Pennsylvania: a complete guide to species of conservation concern. The Johns Hopkins University Press, Baltimore, Maryland.

Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

NatureServe. 2015. Cryptotis parva. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, VA. Available from http://explorer.natureserve.org (accessed February 2015)

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Little Brown Bat

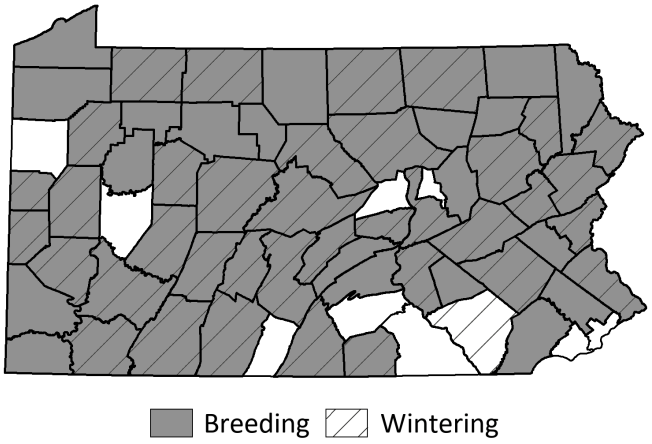
Myotis lucifugus

Michael R. Scafini *Pennsylvania Game Commission*



G. Turner, Pennsylvania Game Commission

Species Distribution by Season



Conservation Profile

PA 10-Year Conservation Goal: Maintain or increase current population abundance and distribution through 2035.

NatureServe Global Rank: G3G4

IUCN Red List Designation: Endangered

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Under Review

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Breeding

State Rank (Season): S2B

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of >90%

Cumulative Threat Impact: Medium

NatureServe Global Rank: G3G4

IUCN Red List Designation: Endangered

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Under Review

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Wintering

State Rank (Season): S2N

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Increase of >25%

Cumulative Threat Impact: Very High

Season: Breeding

Specific Habitat Requirements: Various habitats from forested to urban areas and human structures. Foraging commonly occurs in riparian areas and over water.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Central Appalachian Dry Oak-Pine Forest

Season: Wintering

Specific Habitat Requirements: Primarily found in caves, mines, and tunnels but also minimal use of fissures within rock outcroppings and highwalls outside of the traditional hibernacula environment.

Primary Habitat: Subterranean

Primary Habitat Type: Mines & Tunnels

Primary Specific Habitat: NA

Season: Breeding

Threat Category: Housing and Urban Areas **Threat Impact:** Low

Specific Threat: Improper exclusion (or razing of structure) of maternity colonies and young results in direct mortality and lower recruitment into breeding population.

Action Category: Training and individual skill development

Specific Action: Improve exclusion techniques to limit mortality.

Objective: To lessen impacts from habitat loss and exclusions from human structures.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of bat boxes installed, or exclusions performed during proper timing.

Potential Collaborators: Pennsylvania Game Commission, Private Landowners

Locations: Statewide

Other species likely to benefit from this action: All bat species found in Pennsylvania during summer months.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage non-living habitat components

Specific Action: Manipulate/improve conditions within bat hibernacula.

Objective: To decrease internal temperatures to within 3-7 degrees C (37-45 degrees F) via increased airflow or retention of cold air.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of bat hibernacula cooled to within suitable temperature range.

Potential Collaborators: Conservancies & Land Trusts, Other state agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Develop and deploy white-nose syndrome treatment options, including PEG-8000.

Objective: To eliminate or reduce clinical signs of disease.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of lesions caused by pathogen or number of bats counted surviving exposure to disease.

Potential Collaborators: Pennsylvania Game Commission, Universities & research institutions

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Recreational Activities **Threat Impact:** High

Specific Threat: Human entry into bat hibernacula during the winter months, causing bat disturbance from torpor.

Action Category: Detection and intervention

Specific Action: Install bat-friendly gates that allow bats to enter hibernacula, but keep people out, while also enforcing this policy via fines/prosecution.

Objective: To allow bats to move freely into and within bat hibernacula without additional disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat gates breached each year.

Potential Collaborators: Businesses, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species.

Season: Breeding

Priority	Need	Partners
1	Determine where additional little brown bat maternity colonies are located statewide, in order to monitor and protect.	Pennsylvania Game Commission, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources
2	Determine if habitat manipulations (forestry practices) have beneficial effects on insect populations and, thus, bats.	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Season: Wintering

Priority	Need	Partners
1	Determine where surviving bats are located during the hibernation period.	Pennsylvania Game Commission
2	Determine if juveniles born since white-nose syndrome arrival are surviving.	Pennsylvania Game Commission, Universities & research institutions
3	Determine if infection levels are decreasing in survivors.	Pennsylvania Game Commission, Universities & research institutions

Season: Breeding

Priority	Survey	Partners
1	Survey all newly discovered maternity colonies for persistence and growth.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Private Landowners

Season: Wintering

Priority	Survey	Partners
1	Continue to survey known hibernation sites prioritized by use either before or after white-nose syndrome.	Pennsylvania Game Commission
2	Quantify amount of white-nose syndrome infection via ultraviolet wing photography in late winter/early spring.	Pennsylvania Game Commission, Universities & research institutions

Name: Appalachian Bat Count **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc/wildlife/wildlife-surveys/appalachian-bat-count.html

Description: Each year, volunteers count bats exiting summer roosts between May 15th and August 1st. Species, type of structure, and weather is recorded.

Name: North American Bat Monitoring Program (NABat) **Lead(s) :** U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Name: Winter hibernacula surveys **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Each year, between January 1st and March 15th, Pennsylvania Game Commission personnel and other qualified individuals survey cave, mines, and tunnels for bats. Bat species and location, cave and roost temperatures, and presence of white-nose syndrome is recorded.

Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

PENNSYLVANIA
WILDLIFE ACTION PLAN

Indiana Bat

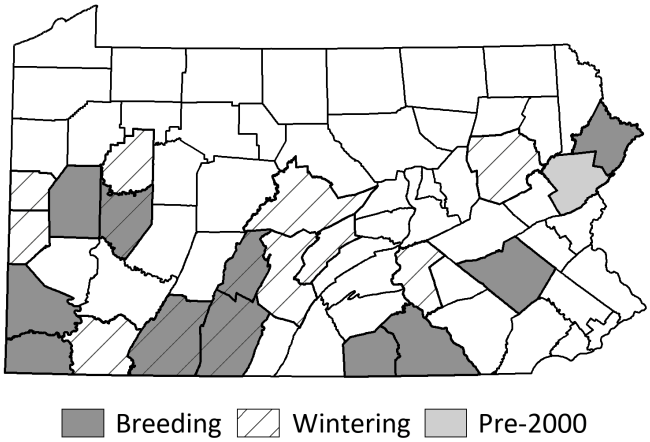
Myotis sodalis

Michael R. Scafini *Pennsylvania Game Commission*



G. Turner, Pennsylvania Game Commission

Species Distribution by Season



Conservation Profile

PA 10-Year Conservation Goal: Maintain or increase current population abundance and distribution through 2035.

NatureServe Global Rank: G2

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Breeding

State Rank (Season): S1B

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of >90%

Cumulative Threat Impact: High

NatureServe Global Rank: G2

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Wintering

State Rank (Season): S1N

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of >90%

Cumulative Threat Impact: Very High

Season: Breeding

Specific Habitat Requirements: Riparian, bottomland or upland forests, old fields and pastures. Many roosts include shagbark and shellbark hickories. Proximate to hibernation area for males. Maternity sites typically located in forests with abundant shagbark hickories in flood-prone areas.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: South-Central Interior Mesophytic Forest

Season: Wintering

Specific Habitat Requirements: Caves and mines where temperatures range from 2-10 degrees C (36-50 degrees F). Temperatures selected for are more typically in the 2-4 degrees C (36-39 degrees F) range, especially after white-nose syndrome arrived.

Primary Habitat: Subterranean

Primary Habitat Type: Caves & Karst

Primary Specific Habitat: NA

Season: Breeding

Threat Category: Housing and Urban Areas **Threat Impact:** Low

Specific Threat: Permanent forested habitat loss reduces foraging and roosting habitat quality and quantity. In addition, improper exclusions of bats from structures can lead to direct mortality.

Action Category: Training and individual skill development

Specific Action: Improve exclusion techniques, including the addition of bat boxes and time-of-year restrictions, to limit mortality to bat maternity colonies.

Objective: To lessen impacts of habitat loss and exclusions from human structures.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat boxes installed, or exclusions performed, during proper timing.

Potential Collaborators: Pennsylvania Game Commission, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All bat species.

Season: Breeding

Threat Category: Housing and Urban Areas **Threat Impact:** Low

Specific Threat: Permanent forested habitat loss reduces foraging and roosting habitat quality and quantity. In addition, improper exclusions of bats from structures can lead to direct mortality.

Action Category: Conservation planning

Specific Action: Retain existing trees with roosting potential and plant preferred/beneficial roost trees whenever possible.

Objective: To lessen the impacts from habitat loss due to new construction (homes and other structures) by maintaining or planting suitable roost trees for use during the maternity season.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of natural (tree) roosts available.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All bat species.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage non-living habitat components

Specific Action: Manipulate/improve conditions within bat hibernacula.

Objective: To decrease internal temperatures to within 3-7 degrees C (37-45 degrees F) via increased airflow or retention of cold air.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of bat hibernacula cooled to within suitable temperature range.

Potential Collaborators:

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Develop and deploy white-nose syndrome treatment options, including spraying of PEG-8000.

Objective: To eliminate or reduce clinical signs of disease.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of lesions caused by pathogen or number of bats counted surviving exposure to disease.

Potential Collaborators: Pennsylvania Game Commission, Universities & research institutions, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Recreational Activities **Threat Impact:** Low

Specific Threat: Human entry into bat hibernacula during the winter months, causing bat disturbance from torpor.

Action Category: Detection and intervention

Specific Action: Install bat-friendly gates that allow bats to enter hibernacula, but keep people out, while also enforcing this policy via fines/prosecution.

Objective: To allow bats to move freely into and within bat hibernacula without additional disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat gates breached each year.

Potential Collaborators: Businesses, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Breeding

Priority	Need	Partners
1	Determine the seasonal movements of Indiana bats between maternity colonies in summer to winter hibernacula, via radio telemetry.	Pennsylvania Game Commission

Season: Wintering

Priority	Need	Partners
1	Determine if juveniles born since white-nose syndrome arrival are surviving.	Pennsylvania Game Commission, Universities & research institutions
2	Determine if infection levels are decreasing in survivors.	Universities & research institutions, Pennsylvania Game Commission

Season: Breeding

Priority	Survey	Partners
1	Survey all newly discovered maternity colonies for persistence and growth.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources

Season: Wintering

Priority	Survey	Partners
1	Continue to search for new hibernacula that could have Indiana bats, by tracking fall movements of this species via telemetry.	Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission
2	Quantify amount of white-nose syndrome infection via ultraviolet wing photography in late winter/early spring.	Pennsylvania Game Commission, Universities & research institutions
3	Determine where surviving bats are located and if consolidation to core areas is occurring.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources

Name: Appalachian Bat Count **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc/wildlife/wildlife-surveys/appalachian-bat-count.html

Description: Each year, volunteers count bats exiting summer roosts between May 15th and August 1st. Species, type of structure, and weather is recorded.

Name: North American Bat Monitoring Program (NABat) **Lead(s) :** U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Name: Winter hibernacula surveys **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Each year, between January 1st and March 15th, Pennsylvania Game Commission personnel and other qualified individuals survey cave, mines, and tunnels for bats. Bat species and location, cave and roost temperatures, and presence of white-nose syndrome is recorded.

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Turner, G. G., D. M. Reeder, and J. T. H. Coleman. 2011. A five-year assessment of mortality and geographic spread of white-nose syndrome in North American bats and a look to the future. Bat Research News 52:13-27.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

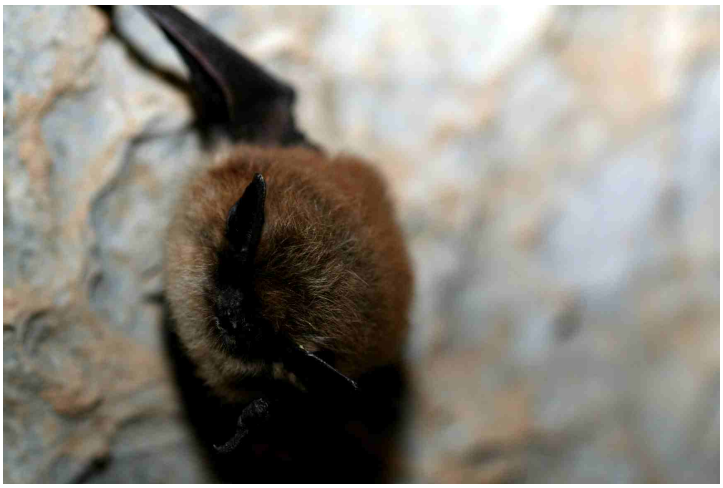
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PENNSYLVANIA
WILDLIFE ACTION PLAN

Eastern Small-footed Bat

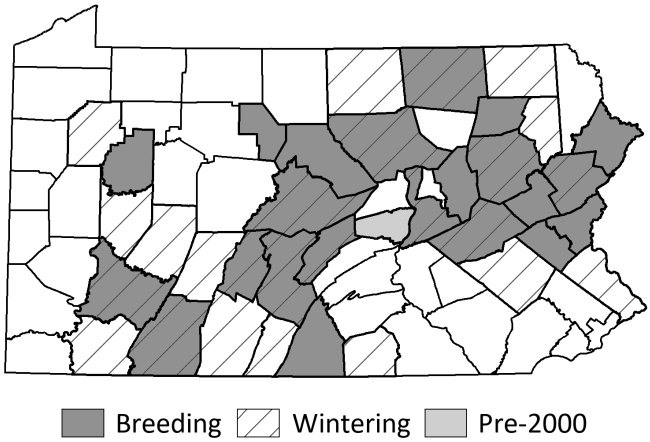
Myotis leibii

Michael R. Scafini *Pennsylvania Game Commission*



G. Turner, Pennsylvania Game Commission

Species Distribution by Season



Conservation Profile

PA 10-Year Conservation Goal: Maintain or increase population abundance and distribution through 2035.

NatureServe Global Rank: G4

IUCN Red List Designation: Endangered

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: High Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: High

SGCN Season: Breeding

State Rank (Season): S3B

State Rank Year: 2024

PA Legal Designation: Threatened

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 30-50%

Cumulative Threat Impact: Medium

NatureServe Global Rank: G4

IUCN Red List Designation: Endangered

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: High Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: High

SGCN Season: Wintering

State Rank (Season): S4N

State Rank Year: 2024

PA Legal Designation: Threatened

PA Abundance: Unknown

PA Short-term Trend (10-year): Increase of >25%

Cumulative Threat Impact: Low

Season: Breeding

Specific Habitat Requirements: Deciduous/mixed forested areas containing rock outcrops and talus.

Primary Habitat: Subterranean

Primary Habitat Type: Other Subterranean

Primary Specific Habitat: NA

Season: Wintering

Specific Habitat Requirements: Caves and mines, also rock outcrops and talus.

Primary Habitat: Subterranean

Primary Habitat Type: Caves & Karst

Primary Specific Habitat: NA

Season: Breeding

Threat Category: Mining and Quarrying **Threat Impact:** Low

Specific Threat: Mining and quarrying cause direct mortality and remove roosting and foraging habitat.

Action Category: Conservation planning

Specific Action: Minimize disturbance in forests containing abundant rocky outcrops and loose rocks.

Objective: Prevent summer roost disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of sites containing forested habitat with abundant rocky outcrops and loose rocks that have appropriate forest management plans.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Statewide

Other species likely to benefit from this action: Allegheny woodrat, northern long-eared bat

Season: Breeding

Threat Category: Roads and Railroads **Threat Impact:** Low

Specific Threat: Roosting structure destruction.

Action Category: Conservation planning

Specific Action: Avoid rock destruction. If unavoidable, minimize impact through a seasonal restriction and mitigate habitat loss.

Objective: Prevent summer roost disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of sites where avoidance measures were planned and implemented.

Potential Collaborators: Other state agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Statewide

Other species likely to benefit from this action: Allegheny woodrat, norther long-eared bat

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage non-living habitat components

Specific Action: Manipulate/improve conditions within bat hibernacula.

Objective: Reduce internal temperatures so that the white-nose syndrome fungus (Pd) does not spread to bats as quickly, thereby decreasing infection and increasing survival.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Count surviving bats during annual and biennial winter surveys and measure reduction in white-nose syndrome fungus (Pd) load/extent during research visits.

Potential Collaborators: Conservancies & Land Trusts, Other federal agency, Other state agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: Little brown bat, big brown bat, northern long-eared bat, Indiana bat, and tricolored bat.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Develop and deploy white-nose syndrome treatment options, including PEG-8000.

Objective: To eliminate or reduce clinical signs of disease.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of lesions caused by pathogen or number of bats counted surviving exposure to disease.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions

Locations: Statewide

Other species likely to benefit from this action: Northern long-eared bat, little brown bat, tricolored bat, Indiana bat, and big brown bat.

Season: Wintering

Threat Category: Recreational Activities **Threat Impact:** Negligible

Specific Threat: Human entry into bat hibernacula during the winter months, causing bat disturbance from torpor.

Action Category: Detection and intervention

Specific Action: Install bat-friendly gates that allow bats to enter hibernacula, but keep people out, while also enforcing this policy via fines/prosecution.

Objective: To allow bats to move freely into and within bat hibernacula without additional disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat gates breached each year.

Potential Collaborators: U.S. Fish and Wildlife Service, Businesses, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Breeding

Priority	Need	Partners
1	Determine current distribution and abundance in Pennsylvania to prioritize conservation efforts.	U.S. Fish and Wildlife Service, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission
2	Identify specific characteristics of preferred summer roost sites, especially areas used by reproductive females.	Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts

Season: Wintering

Priority	Need	Partners
1	Determine population trends through continued hibernacula surveys, including the identification of smaller hibernacula and hibernacula other than typical caves and mines.	Conservancies & Land Trusts, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Universities & research institutions
2	Determine current distribution and abundance in Pennsylvania to prioritize conservation efforts.	U.S. Fish and Wildlife Service, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Season: Breeding

Priority	Survey	Partners
1	Continued mist-netting surveys to determine current distribution and abundance in the state.	Pennsylvania Game Commission, Businesses, Non-governmental organizations, Universities & research institutions
2	Radio telemetry studies to identify characteristics of preferred summer roost sites, especially trees used by reproductive females.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Businesses, Universities & research institutions

Season: Wintering

Priority	Survey	Partners
1	Hibernacula surveys to monitor bat population trends and site manipulation and polyethylene glycol (PEG)-spraying effectiveness.	Pennsylvania Game Commission, Interested Public, Conservancies & Land Trusts

Name: Appalachian Bat Count

Lead(s) : Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc/wildlife/wildlife-surveys/appalachian-bat-count.html

Description: Each year, volunteers count bats exiting summer roosts between May 15th and August 1st. Species, type of structure, and weather is recorded.

Name: North American Bat Monitoring Program (NABat)

Lead(s) : U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Name: Winter hibernacula surveys

Lead(s) : U.S. Fish and Wildlife Service; Pennsylvania Game Commission

Link: N/A

Description: Each year, between January 1st and March 15th, Pennsylvania Game Commission personnel and other qualified individuals survey cave, mines, and tunnels for bats. Bat species and location, cave and roost temperatures, and presence of white-nose syndrome is recorded.

Best, T. L., and J. B. Jennings. 1997. Myotis leibii. Mammalian species 547:1-6.

Dunn J. P., and J. S. Hall. 1989. Status of cave-dwelling bats in Pennsylvania. Journal of the Pennsylvania Academy of Science 63:166-172.

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Hitchcock, H. B. 1955. A summer colony of the least bat, Myotis subulatus leibii (Audubon and Bachman). Canadian Field Naturalist 69:31.

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Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

PENNSYLVANIA
WILDLIFE ACTION PLAN

Northern Long-eared Bat

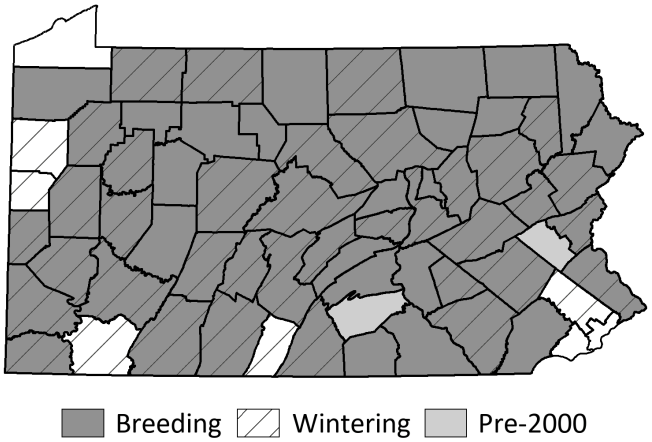
Myotis septentrionalis

Michael R. Scafini — *Pennsylvania Game Commission*



G. Turner, Pennsylvania Game Commission

Species Distribution by Season



Conservation Profile

PA 10-Year Conservation Goal: Maintain or increase population abundance and distribution through 2035.

NatureServe Global Rank: G2G3

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Breeding

State Rank (Season): S1B

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of >90%

Cumulative Threat Impact: Medium

NatureServe Global Rank: G2G3

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Wintering

State Rank (Season): S1N

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 50-70%

Cumulative Threat Impact: Very High

Season: Breeding

Specific Habitat Requirements: Deciduous/mixed forested areas containing mature trees with exfoliating bark/snags, also human structures.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Central Appalachian Dry Oak-Pine Forest

Season: Wintering

Specific Habitat Requirements: Caves, mines, and tunnels as well as non-traditional hibernacula such as rock outcroppings.

Primary Habitat: Subterranean

Primary Habitat Type: Caves & Karst

Primary Specific Habitat: NA

Season: Breeding

Threat Category: Logging and Wood Harvesting **Threat Impact:** Low

Specific Threat: Mature tree removal to create or maintain young forests limits potential roosting sites.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Implement forestry best management practices. Leaving numerous good roosting trees while maintaining young forests will allow for proper foraging and proper roosting habitat, given this species switches roosts within the foraging area almost daily.

Objective: Maintain mature forest habitat and preserve potential roost trees.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of hectares (acres) of mature forest that have appropriate forest management plans.

Potential Collaborators: Businesses, Conservancies & Land Trusts, Other federal agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Private Landowners

Locations: Statewide

Other species likely to benefit from this action: Most bat species, northern flying squirrel

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage non-living habitat components

Specific Action: Manipulate/improve conditions within bat hibernacula.

Objective: To decrease internal temperatures to within 3-7 degrees C (37-45 degrees F) via increased airflow or retention of cold air.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of bat hibernacula cooled to within suitable temperature range.

Potential Collaborators: U.S. Fish and Wildlife Service, Conservancies & Land Trusts, Other state agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Develop and deploy white-nose syndrome treatment options, including PEG-8000.

Objective: To eliminate or reduce clinical signs of disease.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of lesions caused by pathogen or number of bats counted surviving exposure to disease.

Potential Collaborators: Pennsylvania Game Commission, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Recreational Activities **Threat Impact:** Low

Specific Threat: Human entry into bat hibernacula during the winter months, causing bat disturbance from torpor.

Action Category: Detection and intervention

Specific Action: Install bat-friendly gates that allow bats to enter hibernacula, but keep people out, while also enforcing this policy via fines/prosecution.

Objective: To allow bats to move freely into and within bat hibernacula without additional disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat gates breached each year.

Potential Collaborators: U.S. Fish and Wildlife Service, Businesses, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Breeding

Priority	Need	Partners
1	Determine current distribution and abundance to prioritize conservation efforts.	Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, U.S. Fish and Wildlife Service
2	Identify specific characteristics of preferred summer roost trees, especially trees used by reproductive females.	Conservancies & Land Trusts, Pennsylvania Game Commission

Season: Wintering

Priority	Need	Partners
1	Determine population trends through continued hibernacula surveys.	Pennsylvania Game Commission

Season: Breeding

Priority	Survey	Partners
1	Continued mist-netting surveys to determine current distribution and abundance in the state.	Conservancies & Land Trusts, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Businesses
2	Radio telemetry studies to identify characteristics of preferred summer roost trees, especially trees used by reproductive females.	Businesses, Pennsylvania Game Commission

Season: Wintering

Priority	Survey	Partners
1	Continued hibernacula surveys to monitor population trends.	Pennsylvania Game Commission, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources

Name: North American Bat Monitoring Program (NABat) **Lead(s) :** U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Name: Winter hibernacula surveys **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Each year, between January 1st and March 15th, Pennsylvania Game Commission personnel and other qualified individuals survey cave, mines, and tunnels for bats. Bat species and location, cave and roost temperatures, and presence of white-nose syndrome is recorded.

Caceres, M. C., and R. M. R. Barclay. 2000. Myotis septentrionalis. Mammalian Species 634:1-4.

Dunn J. P., and J. S. Hall. 1989. Status of cave-dwelling bats in Pennsylvania. Journal of the Pennsylvania Academy of Science 63:166-172.

Foster R. W., and A. Kurta. 1999. Roosting ecology of the northern bat (Myotis septentrionalis) and comparisons with the endangered Indiana bat (Myotis sodalis). Journal of Mammalogy 80:659-672.

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PENNSYLVANIA
WILDLIFE ACTION PLAN

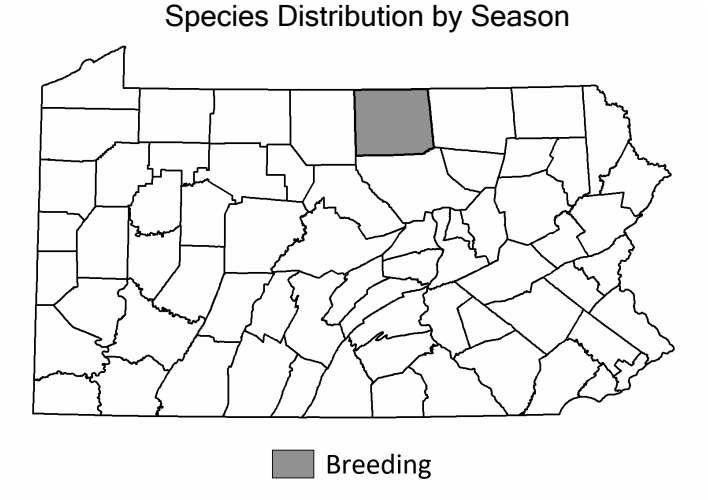
Silver-haired Bat

Lasionycteris noctivagans

Michael R. Scafini *Pennsylvania Game Commission*



C. Butchkoski, Pennsylvania Game Commission



Conservation Profile

PA 10-Year Conservation Goal: By 2035, determine the distribution of the breeding population in Pennsylvania, model suitable habitat, and map important migratory corridors.

NatureServe Global Rank: G4

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Low

SGCN Season: Breeding

State Rank (Season): S1B

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of <30% to Relatively Stable

Cumulative Threat Impact: High

Season: Breeding

Specific Habitat Requirements: Maternity roost: Deciduous forest with adjacent agricultural fields (data deficient in Pennsylvania). Resident male: Coniferous and mixed forests adjacent to wetlands and open water bodies, or high elevation deciduous upland forests. Migrants: Various habitats, including forests and rock crevices, particularly near open water for foraging. Known to use human structures as well.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Breeding

Threat Category: Renewable Energy **Threat Impact:** Medium

Specific Threat: Direct mortality from wind turbines.

Action Category: Stewarding wild individuals

Specific Action: Implement best practices for reducing mortality at wind energy installations.

Objective: Reduce turbine-caused mortalities.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of wind turbines with higher cut-in speeds and/or acoustic deterrents.

Potential Collaborators: Businesses, Conservancies & Land Trusts, Pennsylvania Game Commission

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Piedmont

Other species likely to benefit from this action: Tricolored bat, northern hoary bat, eastern red bat

Season: Breeding

Priority	Need	Partners
1	How prevalent and consistent are silver-haired bat breeding colonies/individuals in Pennsylvania?	Pennsylvania Game Commission
2	What are silver-haired bat breeding individual/colony ecological needs and space use in Pennsylvania?	Pennsylvania Game Commission
3	What cumulative impacts are Pennsylvania's wind facilities having on silver-haired bat breeding and migratory populations?	Pennsylvania Game Commission

Season: Breeding

Priority	Survey	Partners
1	Identify silver-haired bat breeding individual/colony locations in Pennsylvania.	Pennsylvania Game Commission

Name: Bat Net and Trap Database **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc

Description: Pennsylvania Game Commission biologists compile annual data from contractor mist-netting efforts in PA and report captures per unit of mist-netting effort.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the Wildlife Recovery Division's Protected Mammal Section Supervisor.

Name: North American Bat Monitoring Program (NABat) **Lead(s) :** U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Doutt, J. K., C. A. Heppenstall, and J. E. Guilday. 1998. Mammals of Pennsylvania. Ninth edition. Pennsylvania Game Commission, Harrisburg, Pennsylvania.

Kwiecinski, G. 2010. Silver-haired Bat (Lasionycteris noctivagans). Pages 345-348 in M. A. Steele, M. C. Brittingham, T. J. Maret, and J. F. Merritt, editors. Terrestrial Vertebrates of Pennsylvania: A Complete Guide to Species of Conservation Concern. The Johns Hopkins University Press, Baltimore, Maryland.

Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Schiltter, D. A. 1985. Silver-haired bat (Lasionycteris noctivagans) (Le Conte). Pages 391-394 in H. H. Genoways and F. J. Brenner, editors. Species of special concern in Pennsylvania. Carnegie Musuem of Natural History, Pittsburgh, Pennsylvania.

Taucher, J., T. M. Librandi Mumma, and W. A. Capouillez. 2012. Pennsylvania Game Commission Wind Energy Voluntary Cooperative Agreement third summary report. Pennsylvania Game Commission. Harrisburg, Pennsylvania.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

PENNSYLVANIA
WILDLIFE ACTION PLAN

Tricolored Bat

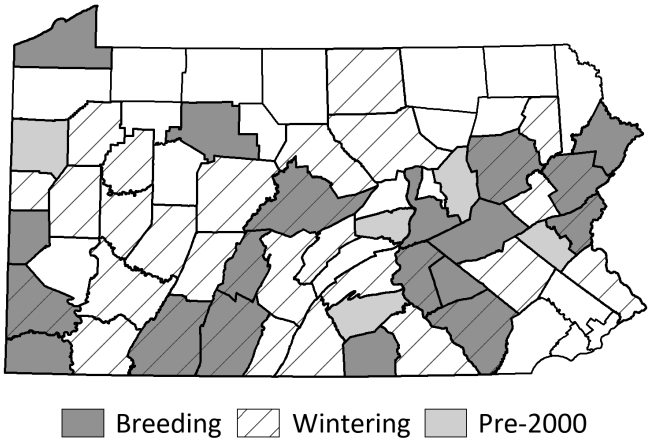
Perimyotis subflavus

Michael R. Scafini — *Pennsylvania Game Commission*



C. Butchkoski, Pennsylvania Game Commission

Species Distribution by Season



Conservation Profile

PA 10-Year Conservation Goal: Maintain or increase population abundance and distribution through 2035.

NatureServe Global Rank: G3G4

IUCN Red List Designation: Vulnerable

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Proposed Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Breeding

State Rank (Season): S2B

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of >90%

Cumulative Threat Impact: High

NatureServe Global Rank: G3G4

IUCN Red List Designation: Vulnerable

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Proposed Endangered

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Wintering

State Rank (Season): S2N

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 30-50%

Cumulative Threat Impact: Very High

Season: Breeding

Specific Habitat Requirements: Human structures, trees, and cavities.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Unknown

Season: Wintering

Specific Habitat Requirements: Slightly warmer locales from 7.8-11.7 degrees C (46-53 degrees F).

Primary Habitat: Subterranean

Primary Habitat Type: Caves & Karst

Primary Specific Habitat: NA

Season: Breeding

Threat Category: Renewable Energy

Threat Impact: Low

Specific Threat: Direct mortality from wind turbines.

Action Category: Stewarding wild individuals

Specific Action: Implement best practices for reducing mortality at wind energy installations.

Objective: Reduce turbine-caused mortalities.

Action Priority: 2-High

Action Urgency: Initiate immediately

Measure: Number of wind turbines with higher cut-in speeds and/or acoustic deterrents.

Potential Collaborators: Pennsylvania Game Commission, Businesses, Conservancies & Land Trusts, Other federal agency, U.S. Fish and Wildlife Service

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Piedmont

Other species likely to benefit from this action: All bat species.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases

Threat Impact: Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage non-living habitat components

Specific Action: Manipulate/improve conditions within bat hibernacula.

Objective: To decrease internal temperatures via increased airflow or retention of cold air.

Action Priority: 1-Highest

Action Urgency: Initiate immediately

Measure: Number of bat hibernacula cooled to within suitable temperatures to both reduce white-nose syndrome fungus (Pd) growth and allow bat survival.

Potential Collaborators: Conservancies & Land Trusts, Pennsylvania Game Commission, Universities & research institutions, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Very High

Specific Threat: Direct mortality from white-nose syndrome (Pseudogymnoascus destructans).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Develop and deploy white-nose syndrome treatment options, including spraying of PEG-8000.

Objective: To eliminate or reduce clinical signs of white-nose syndrome.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of lesions caused by pathogen or number of bats counted surviving exposure to white-nose syndrome.

Potential Collaborators: Pennsylvania Game Commission, Universities & research institutions, U.S. Fish and Wildlife Service

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Wintering

Threat Category: Recreational Activities **Threat Impact:** Negligible

Specific Threat: Human entry into bat hibernacula during the winter months, causing bat disturbance from torpor.

Action Category: Detection and intervention

Specific Action: Install bat-friendly gates that allow bats to enter hibernacula, but keep people out, while also enforcing this policy via fines/prosecution.

Objective: To allow bats to move freely into and within bat hibernacula without additional disturbance.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of bat gates breached each year.

Potential Collaborators: U.S. Fish and Wildlife Service, Businesses, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Statewide

Other species likely to benefit from this action: All hibernating bat species in Pennsylvania.

Season: Breeding

Priority	Need	Partners
1	Determine distribution of tricolored bats across the landscape during summer.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, U.S. Fish and Wildlife Service, Conservancies & Land Trusts

Season: Wintering

Priority	Need	Partners
1	Determine where surviving bats are located and if consolidation to core areas is occurring.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts, U.S. Fish and Wildlife Service
2	Determine if juveniles born since white-nose syndrome arrival are surviving.	Pennsylvania Game Commission, U.S. Fish and Wildlife Service, Universities & research institutions
3	Determine if infection levels are decreasing in survivors.	U.S. Fish and Wildlife Service, Pennsylvania Game Commission, Universities & research institutions

Season: Breeding

Priority	Survey	Partners
1	Survey all newly discovered maternity colonies for persistence and growth.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, U.S. Fish and Wildlife Service, Conservancies & Land Trusts

Season: Wintering

Priority	Survey	Partners
1	Continue to search for new hibernacula that could have tricolored bats.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts
2	Monitor infection loads from white-nose syndrome via ultraviolet light to see if decreases are occurring.	Pennsylvania Game Commission, Universities & research institutions

Name: Appalachian Bat Count **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc/wildlife/wildlife-surveys/appalachian-bat-count.html

Description: Each year, volunteers count bats exiting summer roosts between May 15th and August 1st. Species, type of structure, and weather is recorded.

Name: North American Bat Monitoring Program (NABat) **Lead(s) :** U.S. Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

Fujita, M. S., and T. H. Kunz. 1984. Pipistrellus subflavus. Mammalian species. American Society of Mammalogists No. 228.

Merritt, J. F. 1987. Guide to the mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Sandel, J. K., G. R. Benatar, K. M. Burke, C. W. Walker, T. E. Lacher Jr., and R. L. Honeycutt. 2001. Use and selection of winter hibernacula by the eastern pipistrelle (Pipistrellus subflavus) in Texas. Journal of Mammalogy 82:173-178.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

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WILDLIFE ACTION PLAN

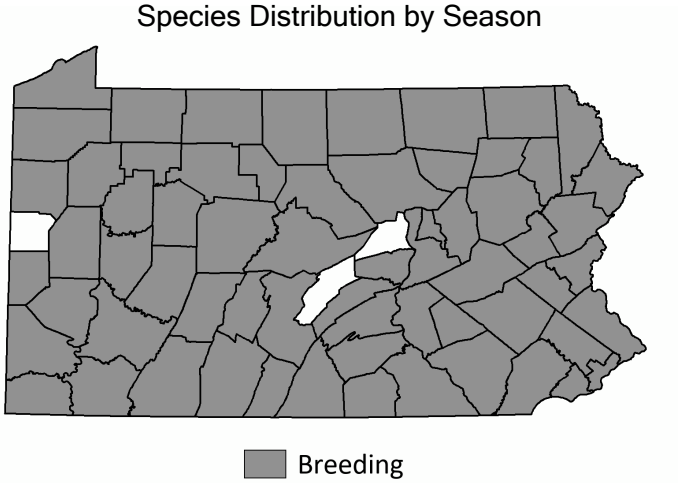
Eastern Red Bat

Lasiurus borealis

Michael R. Scafini *Pennsylvania Game Commission*



G. Turner, Pennsylvania Game Commission



Conservation Profile

PA 10-Year Conservation Goal: By 2035, determine the Pennsylvania breeding distribution, model suitable habitat, and map post-breeding dispersal.

NatureServe Global Rank: G3G4

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Low

SGCN Season: Breeding

State Rank (Season): S4B

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Relatively stable (<=10% change)

Cumulative Threat Impact: Medium

Season: Breeding

Specific Habitat Requirements: Primary habitat includes mixed forest, coniferous forest, woody scrubland, perennial herbaceous, and low-density urban areas (Mistry 2010). Secondary habitats include broadleaf forest, mixed forest, annual herbaceous, palustrine herbaceous, palustrine woody, open water, and urban high-density areas.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Unknown

Habitat Comments: Eastern red bats migrate south during the fall to southeastern states (Cryan 2003) and are thus typically absent from PA during the winter. Predictive models to determine sites of high bat activity are needed, to determine where wind turbines should not be located, to avoid bat mortality.

Season: Breeding

Threat Category: Renewable Energy

Threat Impact: Medium

Specific Threat: Direct mortality from wind turbines.

Action Category: Stewarding wild individuals

Specific Action: Implement best practices for reducing mortality at wind energy installations.

Objective: Reduce turbine-caused mortalities.

Action Priority: 2-High

Action Urgency: Initiate immediately

Measure: Number of wind turbines with higher cut-in speeds and/or acoustic deterrents.

Potential Collaborators: Businesses, Conservancies & Land Trusts, Pennsylvania Game Commission

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Piedmont

Other species likely to benefit from this action: Tricolored bat, silver-haired bat, northern hoary bat

Season: Breeding

Priority	Need	Partners
1	What cumulative impacts are Pennsylvania's wind facilities having on eastern red bat breeding and migratory populations?	Businesses, Conservancies & Land Trusts, Pennsylvania Game Commission
2	What deterrent methods (e.g., turbine blade manipulation, ultrasonic devices) most effectively reduce eastern red bat mortalities at wind facilities?	Pennsylvania Game Commission, Businesses, U.S. Geological Survey

Season: Breeding

Priority	Survey	Partners
1	Determine if, and to what extent, eastern red bat winter activity occurs in Pennsylvania.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources

Name:

Lead(s) : Pennsylvania Game Commission; U.S. Geological Survey

Link: N/A

Description:

Monitoring Need: Although eastern red bats appear to be abundant and common throughout the state, given the high levels of mortality with wind turbines, it is imperative that an in-depth, statewide population monitoring program be established.

Name: Bat Net and Trap Database

Lead(s) : Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc

Description: Pennsylvania Game Commission biologists compile annual data from contractor mist-netting efforts in PA and then report captures per unit of mist-netting effort.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the Wildlife Recovery Section's Protected Mammal Section Supervisor

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Name: North American Bat Monitoring Program (NABat)

Lead(s) : U.S.Geological Survey

Link: https://www.nabatmonitoring.org/

Description: A statistically rigorous and nationally coordinated bat monitoring program for determining the impacts of the many stressors on bat populations and the efficacy of conservation management actions.

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Mistry, S. 2010. Eastern red-bat (Lasiurus borealis). Pages 366-369 in M. A. Steele, M. C. Brittingham, T. J. Maret, and J. F. Merritt, editors. Terrestrial Vertebrates of Pennsylvania: A Complete Guide to Species of Conservation Concern. The Johns Hopkins University Press, Baltimore, Maryland.

Taucher, J., T. M. Librandi Mumma, and W. A. Capouillez. 2012. Pennsylvania Game Commission Wind Energy Voluntary Cooperative Agreement third summary report. Pennsylvania Game Commission. Harrisburg, Pennsylvania.

Whitaker Jr., J. O., and W. J. Hamilton Jr. 1998. Mammals of the eastern United States, 3rd edition. Cornell University Press, Ithaca, New York.

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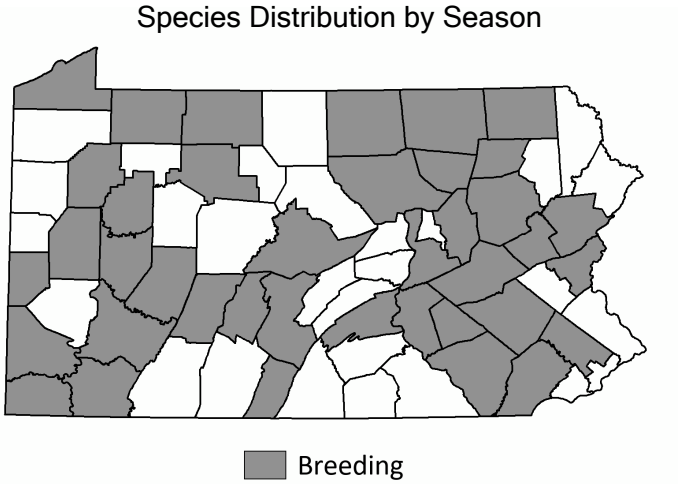
Northern Hoary Bat

Lasiurus cinereus

Michael R. Scafini *Pennsylvania Game Commission*



C. Eichelberger, Western Pennsylvania Conservancy



Conservation Profile

PA 10-Year Conservation Goal: Document mortalities (e.g., wind energy) to assist range-wide population status assessment.

NatureServe Global Rank: G3G4

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Unknown

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Low

SGCN Season: Breeding

State Rank (Season): S4B

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Unknown

Cumulative Threat Impact: Medium

Season: Breeding

Specific Habitat Requirements: Northern hoary bats generally roost amongst foliage, but individuals have been found hanging on the sides of buildings, in a woodpecker hole, in caves, in a gray squirrel nest, and under a plank.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Breeding

Threat Category: Renewable Energy

Threat Impact: Low

Specific Threat: Direct mortality from wind turbines.

Action Category: Stewarding wild individuals

Specific Action: Implement best practices for reducing mortality at wind energy installations.

Objective: Reduce turbine-caused mortalities.

Action Priority: 2-High

Action Urgency: Initiate immediately

Measure: Number of wind turbines with higher cut-in speeds and/or acoustic deterrents.

Potential Collaborators: Pennsylvania Game Commission, Businesses, Conservancies & Land Trusts

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Piedmont

Other species likely to benefit from this action: Tricolored bat, eastern red bat, silver-haired bat

Season: Breeding

Threat Category: Viral/Prion-induced Diseases

Threat Impact: Medium

Specific Threat: Northern hoary bats are susceptible to rabies, which is fatal.

Action Category: Basic research and status monitoring

Specific Action: Conduct rabies prevalence surveillance.

Objective: Documentation of rabies-positive individuals.

Action Priority: 3-Medium

Action Urgency: Initiate immediately

Measure: Number of rabies investigations and positives documented.

Potential Collaborators:

Locations: Statewide

Other species likely to benefit from this action: Eastern red bat, Myotis spp., big brown bat

Season: Breeding

Priority	Need	Partners
1	What deterrent methods (e.g., turbine blade manipulation, ultrasonic devices) most effectively reduce northern hoary bat mortalities at wind facilities?	Businesses, Non-governmental organizations, Pennsylvania Game Commission, Universities & research institutions
2	What cumulative impacts are Pennsylvania's wind facilities having on northern hoary bat breeding and migratory populations?	Pennsylvania Game Commission

Season: Breeding

Priority	Survey	Partners
1	Mist-net surveys using tall (i.e., quad-high) nets over relatively open flyways.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts, Other federal agency, Other state agency

Name: Northern hoary bat rabies surveillance **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Continued rabies monitoring and recording of all northern hoary bats submitted for testing (i.e., symptomatic or human exposure).

Monitoring Need: Develop standardized statewide reporting and data recording procedures.

Klug BJ, Turmelle AS, Ellison JA, Baerwald EF, Barclay RM. Rabies prevalence in migratory tree-bats in Alberta and the influence of roosting ecology and sampling method on reported prevalence of rabies in bats. J Wildl Dis. 2011 Jan;47 (1):64-77. doi: 10.7589/0090-3558-47.1.64. PMID: 21269998.

Ma X, Monroe BP, Cleaton JM, Orciari LA, Gigante CM, Kirby JD, Chipman RB, Fehlner-Gardiner C, Gutiérrez Cedillo V, Petersen BW, Olson V, Wallace RM. Public Veterinary Medicine: Public Health: Rabies surveillance in the United States during 2018. J Am Vet Med Assoc. 2020 Jan 15;256(2):195-208. doi: 10.2460/javma.256.2.195. PMID: 31910075.

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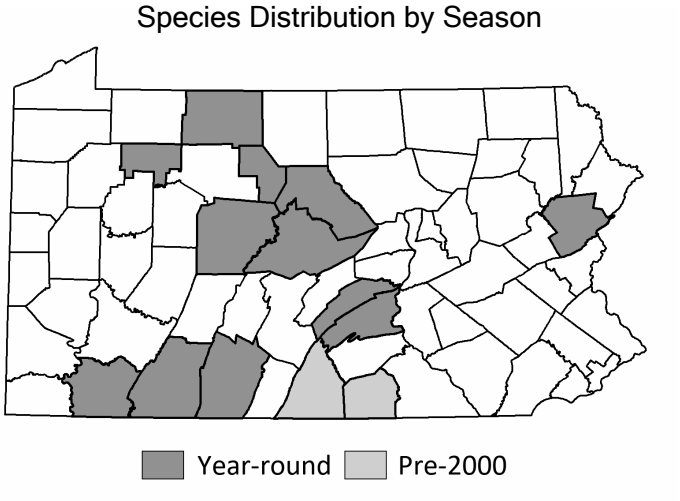
Appalachian Cottontail

Sylvilagus obscurus

Emily S. Boyd *Pennsylvania Game Commission*



Carly Lesser & Art Drauglis, Creative Commons, CC BY-SA-2.0



Conservation Profile

PA 10-Year Conservation Goal: Maintain species population size through 2035 and improve data confidence to allow detection of +/- 10% change over 10 years.

NatureServe Global Rank: G4

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups:

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S3

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Relatively stable (<=10% change)

Cumulative Threat Impact: High

Season: Year-round

Specific Habitat Requirements: High elevation flat ridgetops dominated by mountain laurel; small, recently planted pine plantations with significant grass and forb cover; young clearcuts; also high elevation beaver meadows with thickets.

Primary Habitat: Forested Upland

Primary Habitat Type: High Elevation Forests

Primary Specific Habitat: Northern Appalachian-Acadian Rocky Heath Outcrop

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Stewarding wild individuals

Specific Action: Partner with Pennsylvania Department of Agriculture to restrict importation of lagomorph, lagomorph-associated products, or associated equipment, feed, items, or materials from places known or suspected to be affected by Rabbit Hemorrhagic Disease Virus-2 (RHDV2).

Objective: Prevent RHDV2 introduction into Pennsylvania's wild lagomorph population.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of coordinating meetings.

Potential Collaborators: Other state agency, Pennsylvania Game Commission, Universities & research institutions

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Snowshoe hare, eastern cottontail

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Outreach, communication and distribution

Specific Action: Conduct Rabbit Hemorrhagic Disease Virus (RHDV2) public education campaigns, including decreasing wild lagomorph exposure to domestic rabbits, reporting lagomorph mortality, and vaccinating domestic rabbits against RHDV2.

Objective: Coordinate presentations, pamphlets, articles, website content, etc. to educate the public on RHDV2.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of presentations, pamphlets, articles, and website updates created.

Potential Collaborators: Other state agency, Pennsylvania Game Commission, Universities & research institutions

Locations: Statewide

Other species likely to benefit from this action: Snowshoe hares, eastern cottontails

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High - Low

Specific Threat: Hybridization with eastern cottontails (limited).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: In areas where the species is known to occur, implement habitat management strategies that retain greater percent canopy cover.

Objective: Implement habitat management to retain high canopy cover at 5 Appalachian cottontail sites over 10 years.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of sites treated.

Potential Collaborators:

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action:

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Basic research and status monitoring

Specific Action: Opportunistic surveillance and rapid response to lagomorph mortality events to immediately detect Rabbit Hemorrhagic Disease Virus-2 (RHDV2) and reduce disease spread.

Objective: Respond to all reports of 2 or more lagomorph mortalities in the next 10 years and collect and test samples for RHDV2.

Action Priority: 3-Medium **Action Urgency:** Initiate immediately **Measure:** Number of samples tested.

Potential Collaborators: Pennsylvania Game Commission, Private Landowners, Universities & research institutions

Locations: Statewide

Other species likely to benefit from this action: Snowshoe hares, eastern cottontails

Season: Year-round

Priority	Need	Partners
1	What habitat management practices are most beneficial to Appalachian cottontails?	Pennsylvania Game Commission, Universities & research institutions
2	What is the abundance and distribution of Appalachian cottontails in Pennsylvania?	U.S. Geological Survey, Universities & research institutions
3	How do eastern cottontails affect Appalachian cottontails?	Pennsylvania Game Commission, Universities & research institutions
4	How does habitat influence Appalachian cottontail survival?	Pennsylvania Game Commission, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Survey high elevation areas >244 m (800 ft) using DNA collection (pellets), rabbit harvest, and/or trap and release.	Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources, Other federal agency
2	Identify the acreage with suitable habitat conditions at appropriate elevations for Appalachian cottontail and occupancy of suitable habitat by Appalachian and eastern cottontails.	Pennsylvania Game Commission
3	Survey for, and compare the distribution of, Appalachian cottontails and eastern cottontails in Pennsylvania high elevation areas (>244 m (800 ft)).	Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources, Other federal agency

Name: Appalachian cottontail head collection **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Since fall 2014, the Pennsylvania Game Commission has collected heads from legally harvested cottontails within Appalachian cottontail habitat or exhibiting Appalachian cottontail physical characteristics to increase knowledge of Appalachian cottontail distribution in Pennsylvania.

Name: Lagomorph pellet collection **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Biologists are collecting all lagomorph pellets found in Appalachian cottontail habitat. The DNA in the pellets will be used to identify species and will help to increase knowledge of distribution of the three lagomorph species found in Pennsylvania.

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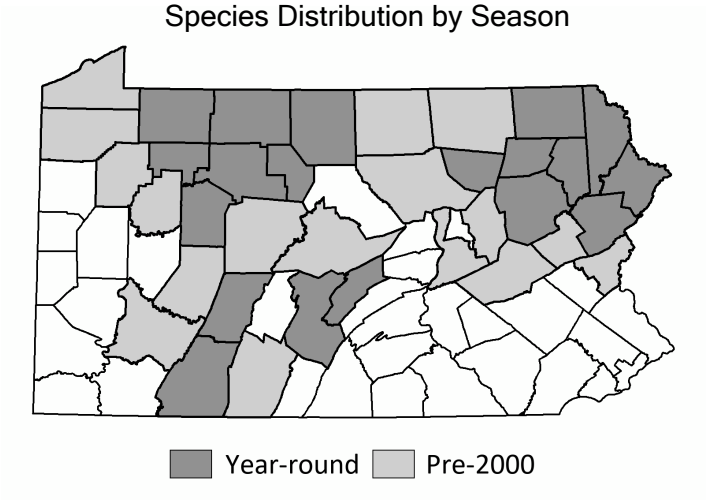
Snowshoe Hare

Lepus americanus

Emily S. Boyd *Pennsylvania Game Commission*



J. Dingel, Pennsylvania Game Commission



Conservation Profile

PA 10-Year Conservation Goal: Maintain species population in Pennsylvania at current levels through 2035. Improve confidence in data to allow detection of +/- 10% change over 10 years. Establish multi state species working to group to identify research priorities and standardize monitoring techniques,

NatureServe Global Rank: G5

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups: No

Northeast U.S.RSGCN: Not RSGCN

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S3

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Unknown

Cumulative Threat Impact: Very High

Season: Year-round

Specific Habitat Requirements: Snowshoe hares in Pennsylvania occupy diverse habitat types but are dependent on specific features within those habitats which provide year-round cover and access to food. Hares depend on features such as high stem densities (>10,000 stems/ha), coarse woody debris, conifer trees or shrubs which retain low lying branches, and those that otherwise increase the cover value of understories to hide from mammalian predators. Similarly, hares depend on vegetation that is at least 3m tall to provide cover from avian predators even when deeper snow cover is present.

Primary Habitat: Forested Upland

Primary Habitat Type: High Elevation Forests

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Year-round

Threat Category: Housing and Urban Areas **Threat Impact:** Low

Specific Threat: Reduces and fragments available habitat and populations, especially in northeast Pennsylvania.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Use habitat management techniques to promote snowshoe hare population connectivity.

Objective: Implement habitat management beneficial to snowshoe hares across 10,000 acres (4,047 ha) in priority snowshoe hare areas over the next 5 years.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of acres treated in priority areas with habitat management specifically geared towards benefitting snowshoe hares.

Potential Collaborators: Conservancies & Land Trusts, Non-governmental organizations, Other federal agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions, U.S. Geological Survey

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Ruffed grouse, Appalachian cottontail

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Stewarding wild individuals

Specific Action: Partner with Pennsylvania Department of Agriculture to restrict importation of lagomorph, lagomorph-associated products, or associated equipment, feed, items, or materials from places known or suspected to be affected by Rabbit Hemorrhagic Disease Virus-2 (RHDV2).

Objective: Prevent RHDV2 introduction into Pennsylvania's wild lagomorph population.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of coordinating meetings.

Potential Collaborators: Other state agency, Pennsylvania Game Commission, Universities & research institutions

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Appalachian cottontail, eastern cottontail

Season: Year-round

Threat Category: Other Impacts **Threat Impact:** High

Specific Threat: Reduced snowfall is causing increased predation risk due to winter coat color mismatch (Zimova et al 2016).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Use habitat management techniques to promote annual snowshoe hare survival and population connectivity.

Objective: Implement habitat management beneficial to snowshoe hares across 10,000 acres (4,047 ha) in priority snowshoe hare areas over the next 5 years.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of acres treated in priority areas with habitat management specifically geared towards benefitting snowshoe hares.

Potential Collaborators:

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Ruffed grouse, Appalachian cottontail

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Outreach, communication and distribution

Specific Action: Conduct Rabbit Hemorrhagic Disease Virus (RHDV2) public education campaigns, including decreasing wild lagomorph exposure to domestic rabbits, reporting lagomorph mortality, and vaccinating domestic rabbits against RHDV2.

Objective: Coordinate presentations, pamphlets, articles, website content, etc. to educate the public on RHDV2.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of presentations, pamphlets, articles, and website updates created.

Potential Collaborators: Other state agency, Pennsylvania Game Commission, Universities & research institutions

Locations:

Other species likely to benefit from this action: Appalachian cottontail, eastern cottontail

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** Medium

Specific Threat: Although not yet found in the wild in the eastern US, rabbit Hemorrhagic Disease Virus-2 causes high levels of mortality in domestic rabbits and multiple wild lagomorph species in the western US and other parts of the world.

Action Category: Basic research and status monitoring

Specific Action: Opportunistic surveillance and rapid response to lagomorph mortality events to immediately detect Rabbit Hemorrhagic Disease Virus-2 (RHDV2) and reduce disease spread.

Objective: Respond to all reports of 2 or more lagomorph mortalities in the next 10 years and collect and test samples for RHDV2.

Action Priority: 3-Medium **Action Urgency:** Initiate immediately **Measure:** Number of samples tested.

Potential Collaborators: Pennsylvania Game Commission, Private Landowners, Universities & research institutions

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Appalachian cottontail, eastern cottontail

Season: Year-round

Priority	Need	Partners
1	Which factors influence annual snowshoe hare survival and population connectivity in Pennsylvania?	Universities & research institutions
3	What is the optimal method for monitoring snowshoe hare response to habitat management activities and population trends?	Universities & research institutions
3	Which Pennsylvania habitat supports the highest snowshoe hare abundance and what habitat management is best in these habitats?	Universities & research institutions, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Other federal agency
4	What is the prevalence of Pennsylvania snowshoe hare brown winter phenotypes and what advantage, if any, does this phenotype provide to hares?	Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Conduct updated statewide surveys to estimate population trends.	Universities & research institutions
2	Survey of snowshoe hare hunters to assess opinions and knowledge of Pennsylvania's snowshoe hare population and its management.	Pennsylvania Game Commission
3	Survey high elevation areas >244 m (800 ft) for snowshoe hares using DNA collection (fecal pellets) and field cameras to better understand distribution.	U.S. Geological Survey, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Name: Lagomorph pellet collection **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Opportunistic collection of lagomorph fecal pellets for DNA analysis.

Monitoring Need: Improving snowshoe hare distribution information in Pennsylvania will improve our ability to implement habitat management where it will benefit hares most effectively.

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Zimova, M., L. S. Mills, and J. J. Nowak. 2016. High fitness costs of climate change-induced camouflage mismatch. Ecology Letters 19:299–307.

Zimova, M., L. S. Mills, P. M. Lukacs, and M. S. Mitchell. 2014. Snowshoe hares display limited phenotypic plasticity to mismatch in seasonal camouflage. Proceedings of the Royal Society B 281:20140029.

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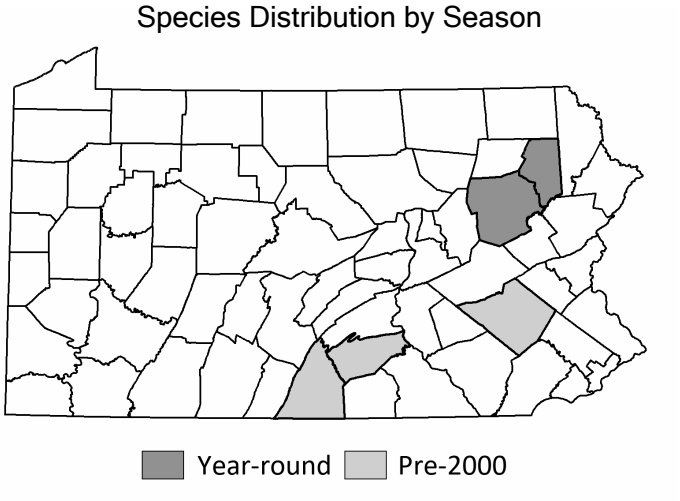
Eastern Fox Squirrel

Sciurus niger vulpinus

Emily S. Boyd *Pennsylvania Game Commission*



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Conservation Profile

PA 10-Year Conservation Goal: Improve confidence in distribution and abundance data and determine degree of genetic variability between S. n. vulpinus subspecies, including comparisons with populations from Virginia, Maryland, and West Virginia.

NatureServe Global Rank: G5T4T5

IUCN Red List Designation: Not Evaluated

IUCN Red List Trend: Not Assessed

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S2

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Relatively stable (<=10% change)

Cumulative Threat Impact: High

Season: Year-round

Specific Habitat Requirements: Open, park-like woods with sparse ground cover adjacent to open areas such a fields, lawns, and other mown areas.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Central Appalachian Dry Oak-Pine Forest

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Western fox squirrel (Sciurus niger rufiventer) is possibly diluting/hybridizing the eastern fox squirrel gene pool (Steele and Zeggers 2010).

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Reduce western fox squirrel (Sciurus niger rufiventer) source populations near known eastern fox squirrel populations (Sciurus niger vulpinus).

Objective: Reduce cross breeding potential between eastern and western fox squirrels.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of eastern fox squirrel populations that are protected.

Potential Collaborators: Pennsylvania Game Commission, Universities & research institutions, U.S. Department of Defense

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Piedmont

Other species likely to benefit from this action:

Season: Year-round

Threat Category: Introduced Genetic Material **Threat Impact:** High

Specific Threat: Hybridization between fox squirrel subspecies.

Action Category: Outreach, communication and distribution

Specific Action: Conduct outreach to discourage wildlife relocation, specifically western fox squirrel subspecies.

Objective: Reduce human-caused western fox squirrel subspecies introduction to new parts of Pennsylvania.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of outreach materials or events.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Private Landowners, Universities & research institutions, U.S. Department of Defense

Locations: Statewide

Other species likely to benefit from this action:

Season: Year-round

Priority	Need	Partners
1	To what extent do eastern and western fox squirrels interbreed?	Pennsylvania Game Commission, U.S. Department of Defense, Universities & research institutions
2	To what extent do eastern and western fox squirrel populations overlap in Pennsylvania?	Pennsylvania Game Commission, U.S. Department of Defense, Universities & research institutions
3	Are there specific habitat management practices that can be implemented to benefit eastern fox squirrels?	Pennsylvania Game Commission, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Use genetic analysis to determine eastern and western fox squirrel distributions and hybridization rate.	Pennsylvania Game Commission, Universities & research institutions

Name: No monitoring program available.

Lead(s) :

Link: N/A

Description:

Derge, K. L. 1997. Habitat use by sympatric eastern fox squirrels (Sciurus niger vulpinus) and gray squirrels (Sciurus carolinensis) at forest farmland interfaces of the Valley and Ridge Province, Pennsylvania. Thesis, Pennsylvania State University, University Park, Pennsylvania.

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Steele, M. A., and D. A. Zeggers. 2010. Eastern fox squirrel (Sciurus niger vulpinus). Pages 352-354 in M. A. Steele, M. C. Brittingham, T. J. Maret, J. F. Merritt, editors. Terrestrial Vertebrates of Pennsylvania: A Complete Guide to Species of Conservation Concern. The Johns Hopkins University Press, Baltimore, Maryland.

Zegers, D. A. 1985. Eastern fox squirrel. Pages 399-402 in H. H. Genoways and F. J. Brenner, editors. Species of special concern in Pennsylvania. Carnegie Museum of Natural History, Special Publication 11, Pittsburgh, Pennsylvania.

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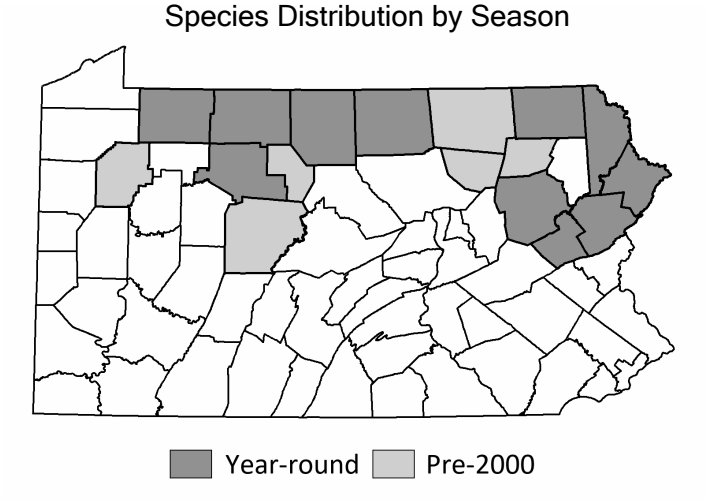
Northern Flying Squirrel

Glaucomys sabrinus macrotis

Michael R. Scafini *Pennsylvania Game Commission*



Larry Master, U.S. Fish and Wildlife Service



Conservation Profile

PA 10-Year Conservation Goal: Maintain known populations and metapopulations in northeastern Pennsylvania and expand current known range (~15% of Pennsylvania historic range) to 25% of historic range; Improve confidence in current distribution through historic range investigations.

NatureServe Global Rank: G5TNR

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Stable

Identified Conservation Priority by Established Groups:

Northeast U.S.RSGCN: Data Deficient

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S1

State Rank Year: 2024

PA Legal Designation: Endangered

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 30-50%

Cumulative Threat Impact: High

Season: Year-round

Specific Habitat Requirements: Mature, mixed-deciduous-hemlock/spruce/fir stands with closed canopies, open ground cover with a rhododendron component, and thick leaf litter. The best habitats have a red spruce component.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Year-round

Threat Category: Introduced Genetic Material **Threat Impact:** High

Specific Threat: Hybridization with southern flying squirrel (Glaucomys volans), stemming from climate warming and habitat loss.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Plant or daylight red spruce trees and promote conifer diversity.

Objective: Daylight existing red spruce trees or plant 5,000 red spruce in next 10 years.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of trees planted or number of acres of existing spruce daylighted.

Potential Collaborators: Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Private Landowners

Locations: Physiographic Section: Glaciated Low Plateau, Deep Valleys, High Plateau, Anthracite Valley, Glaciated Pocono Plateau. HUC8 Watershed: Mid. Delaware-Mongaup-Brodhead, Lehigh, Lackawaxen, U. Susquehanna-Lackawanna, U. Susquehanna-Tunkhannock, Owego-Wappasening, U. Susquehanna, Mid. W. Br. Susquehanna, Pine, Tioga, U. Allegheny, Mid. Allegheny-Tionesta, Clarion, U. W. Br. Susquehanna, Bald Eagle, Lower W. Br. Susquehanna, Mid. Allegheny-Redbank

Other species likely to benefit from this action: Snowshoe hare, Yellow-bellied Flycatcher, Blackpoll Warbler

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** High

Specific Threat: Loss of mature eastern hemlock stands due to hemlock woolly adelgid.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Assess hemlock loss due to hemlock woolly adelgid and proactively remediate impacts (e.g., replace dead stands with red spruce).

Objective: Identify hemlock habitat within 1-mi (1.6 km) radius of known populations and assess levels of risk to aphid infestation; plant red spruce seedlings in areas where hemlock loss is deemed most significant.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Quantify hemlock loss in primary and secondary stands around known populations; determine survival and growth of red spruce where planted.

Potential Collaborators: Conservancies & Land Trusts, Non-governmental organizations, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Physiographic Section: High Plateau, Deep Valleys, Glaciated Low Plateau, Anthracite Valley, Glaciated Pocono Plateau, Glaciated High Plateau. HUC8 Watershed: Mid. Allegheny-Redbank, U. W. Br. Susquehanna, Mid. W. Br. Susquehanna, Pine, Lower W. Br. Susquehanna, Clarion, U. Allegheny, Tioga, U. Susquehanna-Tunkhannock, Lackawaxen, Mid. Delaware-Mongaup-Brodhead, U. Susquehanna-Lackawanna

Other species likely to benefit from this action: American Goshawk, snowshoe hare, aquatic fauna, silver-haired bat, Yellow-bellied Flycatcher

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Southern flying squirrel northward movement has increased resource competition and exposes northern flying squirrels to a nematode parasite, Strongyloides robustus.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Plant or daylight red spruce trees and remove mast-bearing trees within northern flying squirrel habitat.

Objective: Daylight existing red spruce trees or plant 5,000 red spruce in next 10 years.

Action Priority: 1-Highest **Action Urgency:** Initiate within 5 years **Measure:** Number of trees planted or number of acres of existing spruce daylighted.

Potential Collaborators: Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Universities & research institutions

Locations: Physiographic Section: Glaciated Low Plateau, Anthracite Valley, Glaciated Pocono Plateau, High Plateau, Deep Valleys, Glaciated High Plateau. HUC8 Watershed: Mid. Delaware-Mongaup-Brodhead, U. Susquehanna-Lackawanna, Lehigh, Mid. Allegheny-Tionesta, Sinnemahoning, Lower W. Br. Susquehanna, U. Susquehanna-Lackawanna, Lackawaxen, Pine, Tioga, Chemung, Owego-Wappasening, U. Susquehanna, U. Allegheny, Clarion, Mid. W. Br. Susquehanna, Bald Eagle, U. W. Br. Susquehanna, Mid. Allegheny-Redbank

Other species likely to benefit from this action: Snowshoe hare, Yellow-bellied Flycatcher, Blackpoll Warbler

Season: Year-round

Priority	Need	Partners
1	What is the hybridization extent between northern (G. sabrinus macrotis) and southern (G. volans) flying squirrels?	Conservancies & Land Trusts, Universities & research institutions, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources
2	Can noninvasive DNA samples be used to identify flying squirrels and detect hybridization?	Pennsylvania Game Commission, Universities & research institutions, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts
3	What are northern flying squirrel diet preferences in Pennsylvania and how do they compare to what is available on the landscape?	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Universities & research institutions, Conservancies & Land Trusts
4	What is the prevalence of Strongyloides robustus infection in Pennsylvania northern flying squirrel populations?	Universities & research institutions, Pennsylvania Game Commission

Season: Year-round

Priority	Survey	Partners
1	Annual surveys (could include autonomous recording unit [ARU], live-trapping, environmental DNA [eDNA], and/or nest box surveys) at known, historic, and potential occupancy sites. When applicable, genetic sample and fecal pellet collection should occur during surveys.	Conservancies & Land Trusts, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Universities & research institutions
2	Habitat suitability surveys, using geographic information systems (GIS) and ground-truthing, conducted every 5-10 years within a 1.6 km (1 mi) and 8 km (5 mi) radius of known occupied sites to determine persistence and evaluate habitat changes from human-caused stressors.	Universities & research institutions, Pennsylvania Game Commission, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources

Name: Pennsylvania Game Commission occupancy surveys **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Nest-box surveys and live-trapping conducted at sites throughout the state to assess occupancy and gather samples.

Comments: These surveys are on-going.

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc

Description: A database compiling all PGC permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the state mammalogist.

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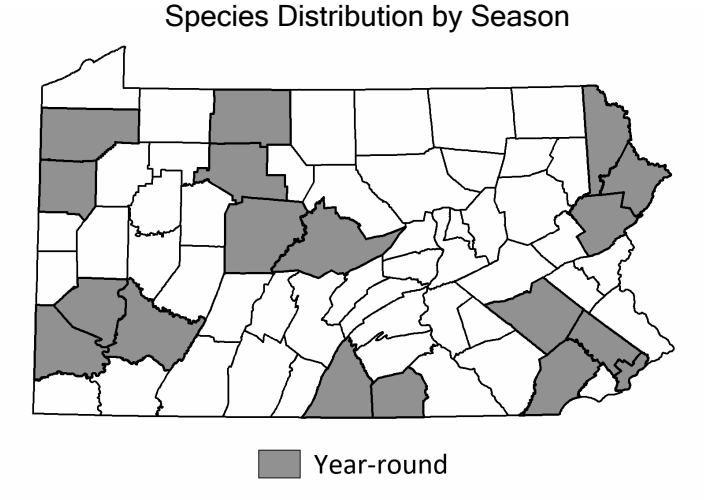
Prairie Deermouse

Peromyscus maniculatus bairdii

Katelyn A. Otterbein — *Pennsylvania Game Commission*



John Wible, Carnegie Museum of Natural History



Conservation Profile

PA 10-Year Conservation Goal: By 2035, determine this subspecies' distribution, model potential habitat in Pennsylvania, and examine genetic and morphological distinctions with other Peromyscus maniculatus subspecies.

NatureServe Global Rank: G5T5

IUCN Red List Designation: Not Evaluated

IUCN Red List Trend: Not Assessed

Identified Conservation Priority by Established Groups: No

Northeast U.S.RSGCN: Not RSGCN

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S3S5

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 10-90%

Cumulative Threat Impact: High - Low

Season: Year-round

Specific Habitat Requirements: Inhabits most open habitats with some herbaceous layer. Historically, it may have naturally occurred on the sand dune grasslands and adjacent glacial prairie habitats in northwestern Pennsylvania. Land clearing expanded its range southward and eastward. In the Midwest, it is known to live in grasslands, fallow fields, grassy sand dunes, and even cultivated fields.

Primary Habitat: Open Upland

Primary Habitat Type: Grasslands

Primary Specific Habitat: Shrubland/grassland

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** High - Low

Specific Threat: Opportunistic predation by nearly all predators (including feral cats); Presence of non-native mice and rats may also increase competition and predation.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Manage invasive species populations (e.g., feral cat, house mouse, Norway rat) within the species' core range.

Objective: At 3 locations where prairie deer mice exist, reduce the density of invasive predators and competitors within 5 years.

Action Priority: 3-Medium **Action Urgency:** Initiate within 5-10 years **Measure:** Number of prairie deer mouse sites treated.

Potential Collaborators: Conservancies & Land Trusts, Pennsylvania Game Commission, U.S. Department of Agriculture-Animal and Plant Health Inspection Service

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: least shrew, Maryland shrew

Season: Year-round

Priority	Need	Partners
1	Is the prairie deermouse distinct enough from its conspecifics to be considered a distinct species?	Pennsylvania Game Commission, Universities & research institutions
2	Determine potential conservation actions for this subspecies and examine the impact existing habitat management activities (e.g., prescribed fire) may have on this subspecies.	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Determine the current distribution of this subspecies in Pennsylvania.	Pennsylvania Game Commission, Conservancies & Land Trusts, Universities & research institutions

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: https://www.pa.gov/agencies/pgc

Description: A database compiling all Pennsylvania Game Commission permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the state mammalogist.

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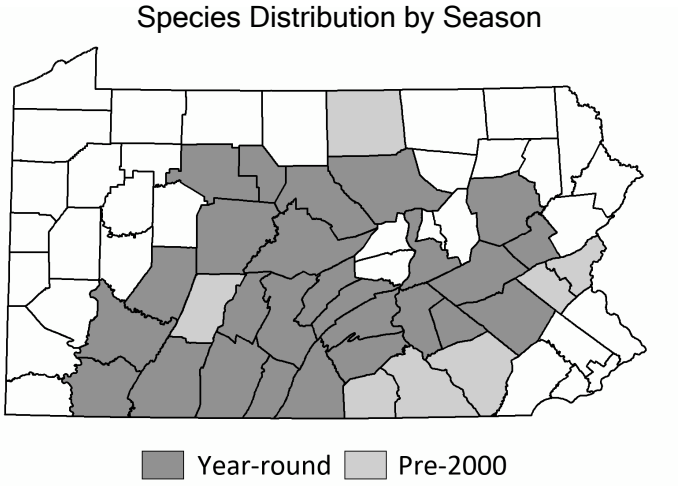
Allegheny Woodrat

Neotoma magister

Katelyn A. Otterbein *Pennsylvania Game Commission*



J. Kosack, Pennsylvania Game Commission



Conservation Profile

PA 10-Year Conservation Goal: Maintain viable breeding populations in each region of the state.

NatureServe Global Rank: G3

IUCN Red List Designation: Near Threatened

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Very High Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Medium

SGCN Season: Year-round

State Rank (Season): S2

State Rank Year: 2024

PA Legal Designation: Threatened

PA Abundance: Unknown

PA Short-term Trend (10-year): Decline of 10-30%

Cumulative Threat Impact: Very High

Season: Year-round

Specific Habitat Requirements: Extensive expanses of sandstone and/or limestone rock outcrops in unfragmented oak-hickory forest communities.

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Central Appalachian Dry Oak-Pine Forest

Season: Year-round

Threat Category: Invasive Non-native/Alien Species/Diseases **Threat Impact:** High

Specific Threat: Loss of American chestnut mast as a food source due to chestnut blight. Decreased oak mast availability due to spongy moth infestations.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Plant mast-producing species in close proximity to Allegheny woodrat sites.

Objective: Plant a mix of mast-producing species at five active woodrat sites within the next ten years.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of sites treated.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley

Other species likely to benefit from this action: Alleghanian spotted skunk

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Mortality caused by exposure to raccoon roundworm, increased competition for food resources, and overall habitat degradation caused by white-tailed deer.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Increase food availability while limiting competition.

Objective: Increase and protect food availability at 5 priority sites in the next 10 years via habitat management actions (e.g., prescribed fire, crop tree releases, plant mast producers, install deer exclosure fencing).

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of sites treated.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Physiographic Province: Ridge and Valley, Appalachian Plateaus

Other species likely to benefit from this action: Long-tailed shrew, rock vole

Season: Year-round

Threat Category: Roads and Railroads **Threat Impact:** High

Specific Threat: Habitat fragmentation from railroads and roads which can lead to barriers to dispersal and increased predation.

Action Category: Conserve via zoning or informal designations

Specific Action: Avoid major construction projects (e.g., highways) through core habitat.

Objective: Review all proposed projects for negative impacts to woodrats, offer siting guidance, and provide best management practices.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of projects reviewed that would impact woodrats, and percent that were able to minimize or avoid such impacts.

Potential Collaborators: Pennsylvania Game Commission

Locations: Physiographic Province: Ridge and Valley, Appalachian Plateaus

Other species likely to benefit from this action: Alleghanian spotted skunk, eastern small-footed bat, long-tailed shrew, rock vole

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Mortality caused by exposure to raccoon roundworm, increased competition for food resources, and overall habitat degradation caused by white-tailed deer.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Decrease, or maintain low levels of, raccoon roundworm prevalence within woodrat habitat and dispersal corridors.

Objective: Treat, using anthelmintic baits, 6 priority sites for raccoon roundworm in the next 10 years.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of sites treated.

Potential Collaborators: Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission

Locations: Physiographic Province: Ridge and Valley, Appalachian Plateaus

Other species likely to benefit from this action:

Season: Year-round

Threat Category: Problematic Native Species/Diseases **Threat Impact:** High

Specific Threat: Mortality caused by exposure to raccoon roundworm, increased competition for food resources, and overall habitat degradation caused by white-tailed deer.

Action Category: Reintroduce or relocate individuals

Specific Action: Introduce wild or captive-bred individuals to existing populations with low genetic diversity or to extirpated habitats.

Objective: Increase genetic diversity or to re-establish populations.

Action Priority: 2-High **Action Urgency:** Initiate immediately **Measure:** Number of released individuals.

Potential Collaborators: Local agencies & municipalities, Other state agency, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Private Landowners, Universities & research institutions

Locations: Physiographic Province: Appalachian Plateaus, Ridge and Valley, Appalachian Plateaus, Ridge and Valley. Physiographic Section: High Plateau, Anthracite Upland

Other species likely to benefit from this action:

Season: Year-round

Priority	Need	Partners
1	What are preferred and avoided food sources at remaining Allegheny woodrat populations across the state, especially those that have maintained stable populations without human intervention?	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts, Universities & research institutions
2	Evaluate short- and long-term effects of woodrat-specific habitat improvement practices on woodrat reproduction and survival.	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts, Universities & research institutions
3	Which best practices should be used to ensure successful Allegheny woodrat reintroductions?	Pennsylvania Game Commission, Universities & research institutions
4	How do Allegheny woodrats disperse across the landscape?	Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, Conservancies & Land Trusts, Universities & research institutions
5	What is the efficacy of anthelmintic bait on reducing raccoon roundworm prevalence?	Pennsylvania Game Commission, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, Universities & research institutions

Season: Year-round

Priority	Survey	Partners
1	Continued inventory and trapping surveys to document woodrat presence, and data analyses to characterize differences in successful versus declining metapopulations.	Pennsylvania Game Commission, Universities & research institutions
2	Continued surveys that measure the woodrat reproduction and survival where woodrat-specific habitat management has been, or will be, implemented.	Pennsylvania Game Commission, Universities & research institutions
3	Allegheny woodrat mortality opportunistic surveillance to assess raccoon roundworm prevalence and impact.	Pennsylvania Game Commission, Universities & research institutions

Name: Statewide Allegheny Woodrat Inventory and Monitoring Program **Lead(s) :** Pennsylvania Game Commission

Link: N/A

Description: Each year, a subset of potential and known sites are surveyed for evidence of woodrat activity, food availability, and habitat quality. Techniques currently include live trapping, camera trapping, and visual surveys but could expand to new methods such as environmental DNA (eDNA) and detection dogs.

Monitoring Need: Understanding where this species still persists is critical to implementing recovery actions.

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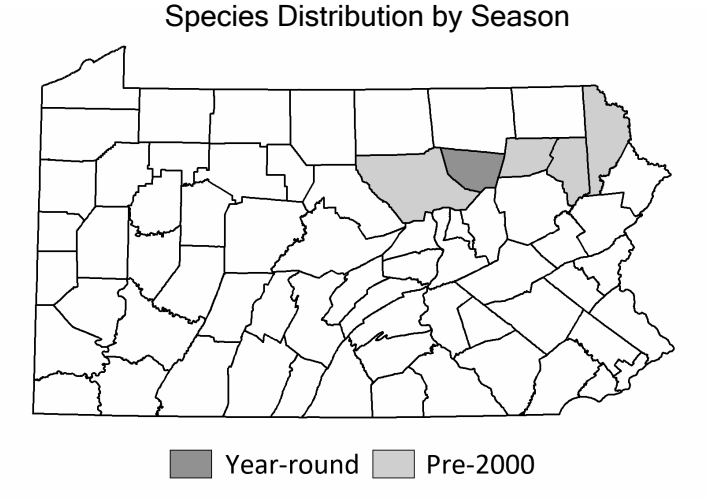
Rock Vole

Microtus chrotorrhinus

Michael R. Scafini — *Pennsylvania Game Commission*



C. Butchkoski, Pennsylvania Game Commission



Conservation Profile

PA 10-Year Conservation Goal: Improve data confidence to allow detection of +/- 10% change over 10 years.

NatureServe Global Rank: G5

IUCN Red List Designation: Least Concern

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: High Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Low

SGCN Season: Year-round

State Rank (Season): S3

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Unknown

Cumulative Threat Impact: Low

Season: Year-round

Specific Habitat Requirements: High elevation, northern hardwood forests characterized by rocks and talus, streams, mosses, and heavy forb cover (Kirkland and Jannett 1982, Orrock et al. 1999, Orrock and Pagels 2003, Hart 2010).

Primary Habitat: Forested Upland

Primary Habitat Type: High Elevation Forests

Primary Specific Habitat: Appalachian (Hemlock)-Northern Hardwood Forest

Season: Year-round

Threat Category: Oil and Gas Drilling **Threat Impact:** Low

Specific Threat: Habitat disturbance from oil and gas industry infrastructure, which includes well pads, pipelines, and roads.

Action Category: Basic research and status monitoring

Specific Action: Evaluate habitat fragmentation impacts to develop best management practices that reduce potential impacts.

Objective: Locate and quantify abundance at two sites before and after drilling to determine impacts caused by fragmentation to this species.

Action Priority: 3-Medium **Action Urgency:** Initiate immediately **Measure:** Change in abundance of this species.

Potential Collaborators: Businesses, Conservancies & Land Trusts, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Township Zoning Boards

Locations: Physiographic Section: Glaciated Low Plateau, Anthracite Valley, Glaciated Pocono Plateau

Other species likely to benefit from this action: Masked shrew, smoky shrew, long-tailed shrew, woodland jumping mouse

Season: Year-round

Priority	Need	Partners
1	Evaluation of the effects of habitat disturbance, and specifically oil and gas projects, on rock voles.	Businesses, Pennsylvania Game Commission, Conservancies & Land Trusts, Private Landowners

Season: Year-round

Priority	Survey	Partners
1	Surveys to determine baseline population parameters and demographics (can include trapping, tagging, and radio-telemetry).	Businesses, Conservancies & Land Trusts, Pennsylvania Game Commission, Private Landowners
2	Surveys to determine the impacts of oil and gas projects on rock voles before and after habitat fragmentation.	Businesses, Conservancies & Land Trusts, Pennsylvania Game Commission, Private Landowners

Name: Terrestrial Small Mammal Database **Lead(s) :** Pennsylvania Game Commission

Link: http://www.pgc.pa.gov

Description: A database compiling all PGC permitted terrestrial small mammal surveys in a standardized format.

Comments: While the website does not provide links to the specific database or forms, contact should be made to the state mammalogist.

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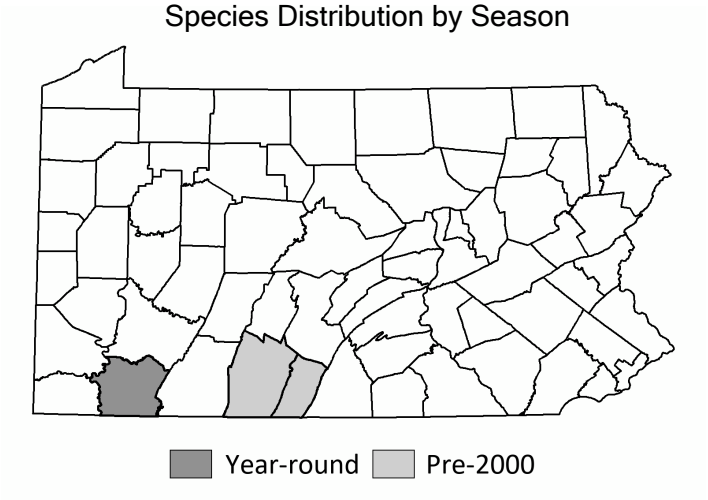
Alleghanian Spotted Skunk

Spilogale putorius

Katelyn A. Otterbein ***Pennsylvania Game Commission***



Bob Gress



Conservation Profile

PA 10-Year Conservation Goal: Establish one self-sustaining population in Pennsylvania by 2035.

NatureServe Global Rank: G4

IUCN Red List Designation: Vulnerable

IUCN Red List Trend: Decreasing

Identified Conservation Priority by Established Groups: Yes

Northeast U.S.RSGCN: Moderate Concern

Federal Listing Status: Not Listed

Feasiblity of Recovering or Sustaining the PA Population: Low

SGCN Season: Year-round

State Rank (Season): S1

State Rank Year: 2024

PA Legal Designation: Not Listed (Protected)

PA Abundance: Unknown

PA Short-term Trend (10-year): Unknown

Cumulative Threat Impact: High

Season: Year-round

Specific Habitat Requirements: Typically associated with young, dense forests or mature forests with dense shrubs in the Appalachian Mountains (Eastern Spotted Skunk Cooperative Study Group 2020). Rocky outcrops, dense understory, closed canopy, vines, and steep slopes seem important (Reed and Kennedy 2000, Lesmeister et al. 2008, Lesmeister et al. 2013).

Primary Habitat: Forested Upland

Primary Habitat Type: Forests & Woodlands

Primary Specific Habitat: Central Appalachian Pine-Oak Rocky Woodland

Season: Year-round

Threat Category: Viral/Prion-induced Diseases **Threat Impact:** Medium

Specific Threat: Rabies virus and canine distemper virus are highly contagious diseases known to cause mortality in spotted skunks and other mesocarnivores.

Action Category: Basic research and status monitoring

Specific Action: Perform rabies virus and canine distemper virus surveillance in all opportunistically collected live or dead Alleghanian spotted skunks and sympatric mesocarnivore species to determine prevalence and impacts of these diseases.

Objective: Opportunistically screen for rabies and canine distemper viruses in mesocarnivore species found within the range of Alleghanian spotted skunks in Pennsylvania.

Action Priority: 1-Highest **Action Urgency:** Initiate immediately **Measure:** Number of animals tested for rabies and distemper.

Potential Collaborators: Pennsylvania Game Commission

Locations: Physiographic Section: Allegheny Mountain, Allegheny Front, Appalachian Mountain, Great Valley, South Mountain

Other species likely to benefit from this action:

Season: Year-round

Threat Category: Logging and Wood Harvesting **Threat Impact:** Low

Specific Threat: Reduced dense, woody understory and midstory from incompatible forestry practices.

Action Category: Manage plants, animals, fungi, or bacteria

Specific Action: Conduct habitat enhancement projects that create a dense understory and closed canopy at three sites known to support Alleghanian spotted skunks.

Objective: Improve Alleghanian spotted skunk habitat at three sites.

Action Priority: 3-Medium **Action Urgency:** Initiate within 5 years **Measure:** Number of sites treated.

Potential Collaborators: Pennsylvania Game Commission

Locations: Physiographic Section: Allegheny Mountain, Allegheny Front, Appalachian Mountain, Great Valley, South Mountain

Other species likely to benefit from this action:

Season: Year-round

Priority	Need	Partners
1	Determine the current distribution of Alleghanian spotted skunks in Pennsylvania using methods such as camera trap surveys and eDNA sampling.	Pennsylvania Game Commission, Conservancies & Land Trusts
2	Characterize Alleghanian spotted skunk habitat use, home ranges, and dispersal in Pennsylvania.	Pennsylvania Game Commission, Conservancies & Land Trusts
3	Determine disease (e.g., canine distemper virus and rabies virus) prevalence in Alleghanian spotted skunks in Pennsylvania.	Pennsylvania Game Commission, Conservancies & Land Trusts

Season: Year-round

Priority	Survey	Partners
1	Conduct eDNA and camera trap surveys to determine Alleghanian spotted skunk presence/absence in Pennsylvania. Surveys should target late September to early May when detection is highest (Hackett et al. 2007).	Pennsylvania Game Commission, Conservancies & Land Trusts
2	Conduct mark-recapture studies at active Alleghanian spotted skunks sites to determine baseline population parameters such as number of breeding individuals and survival.	Pennsylvania Game Commission, Conservancies & Land Trusts
3	Deploy GPS collars on a subset of Alleghanian spotted skunks to analyze survival, habitat use, home ranges, and dispersal.	Pennsylvania Game Commission, Conservancies & Land Trusts
4	Opportunistically surveil for parasitic cranial worm (Skrjabingylus) prevalence, using Alleghanian spotted skunk or striped skunks (as proxy) skull and fecal examination, to determine population impacts.	Pennsylvania Game Commission, Universities & research institutions

Name: None known

Lead(s) :

Link: N/A

Description:

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