

Pennsylvania Guidance on Surveying Transportation Structures for Bat and Bird Occupancy

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Created by the U.S. Fish and Wildlife Service (USFWS) Pennsylvania Field Office with input from the Pennsylvania Game Commission (PGC) to assist the Pennsylvania Department of Transportation (PennDOT) and other transportation entities in Pennsylvania.

Why Survey for Bats and Birds?

Bridges, culverts, and other transportation structures inadvertently provide potential artificial bat roosts and bird nesting habitat. Construction, maintenance, and operational activities at these structures may destroy habitat features or cause direct disturbance to bats and birds, especially if done during sensitive times of the year. This is of particular concern when a structure is used by federally- or state-listed threatened or endangered species (T&E species) protected under the federal Endangered Species Act of 1973 (16 U.S.C. § 1531 - 1544) or Title 58 Chapter 75 of the Pennsylvania Code, or by migratory birds protected under the federal Migratory Bird Treaty Act (16 U.S.C. § 703 - 712).

Surveying structures for bat or bird occupancy ahead of construction and maintenance has multiple benefits. Knowledge of species presence allows transportation agencies to plan their projects to avoid and minimize impacts to listed species, and to consult for take authorization if impacts are unavoidable. In addition, data of wildlife use at structures help conservation agencies understand and protect populations of threatened, endangered, and at-risk species in partnership with the transportation agencies.

Survey Guidance for Bats

Do I Need to be a Qualified Bat Surveyor?

No, you do not need to be a qualified bat surveyor to conduct a bat use assessment of a transportation structure. However, you should be comfortable with the below guidance, review the cited resources, and ensure you are able to thoroughly assess the structure with the equipment you that have.

A large and complex structure would benefit from having a qualified bat surveyor, ideally with experience in bat bridge/culvert assessments. The benefit of a qualified bat surveyor is that they can identify bat species (distinguishing between T&E species versus common species) to aid in environmental review. They may also have specialized equipment (such as acoustic detectors or scopes) and may assist in planning the project to avoid and minimize disturbance to bats.

When Should I Survey for Bats?

Optimal Timeframe:

Between May 15 and August 15 (PGC's maternity season), and ideally the latter half of this season (after July 4) when pups have begun flying and can escape disturbance. The reason for this recommended timeframe is to assess for maternity colony use, in which a colony of bats habitually return to the structure annually to raise their young. If a structure is being used by a large enough colony, then it is possible to find guano, staining, and other bat use signs after August 15, but be aware that signs (guano especially) break down over time so accurate detection of bat use decreases over time. If a maternity colony is small, then presence is difficult to detect by signs alone.

Note about drones: it is possible that bats perceive drones as aerial predators. Therefore, we discourage the use of drones during the sensitive maternity season and would recommend coordination with us prior to use.

Additional Timeframes:

During the routine bridge or structure safety inspection. If a structure's safety inspection happens to occur within the maternity season, the inspector can opportunistically document bat presence, signs of bats, or bat absence. If the safety inspection is outside this timeframe, the inspector may still document signs of use (guano, staining, or ammonia odor from guano) that positively identify bat use of the structure. However, lack of signs outside of the maternity season does not necessarily mean lack of bat use, because some signs (such as guano) break down over time.

Noting bat use during the safety inspection is not intended to be an in-depth or time-consuming survey. Instead, the purpose is to take advantage of time already spent at routine inspections to proactively note potential bat use ahead of planning projects or maintenance activities. If the safety inspection can demonstrate the inspection surveyed the entirety of the structure or areas in which bats could potentially occupy, negative survey results may be valid for two years and not require a separate survey.

If bats are found during the inspection, please avoid disturbing them. It may be possible to continue the safety inspection on portions of the structure away from the roosting bats.

During the project design and planning phase, a more in-depth bat survey can be conducted, particularly on structures that had bats or signs of bats during the routine safety inspection. At this stage you may wish to retain a qualified bat surveyor to identify species, or aid in planning the project to avoid and minimize disturbance to bats.

Bat Survey Methodology

Multiple guidance documents exist for how to conduct a bat bridge, culvert, or structure survey. These include Appendix K of the USFWS *Range-wide Indiana Bat & Northern Long-eared Bat*

Survey Guidelines (Appendix K, starting on p.69) and the *New Jersey Guidance on Surveying Transportation Structures for Bat Occupancy* (both linked below). Here, we aim to summarize the similarities of existing guidance documents and provide Pennsylvania-specific notes.

The safety of personnel is paramount. Surveyors should coordinate with the agencies if they suspect potential bat presence in a structure that is unsafe for surveying.

Recommended Equipment

This is not a required or exhaustive list of equipment. Rather, your choice of equipment should be tailored to the structure.

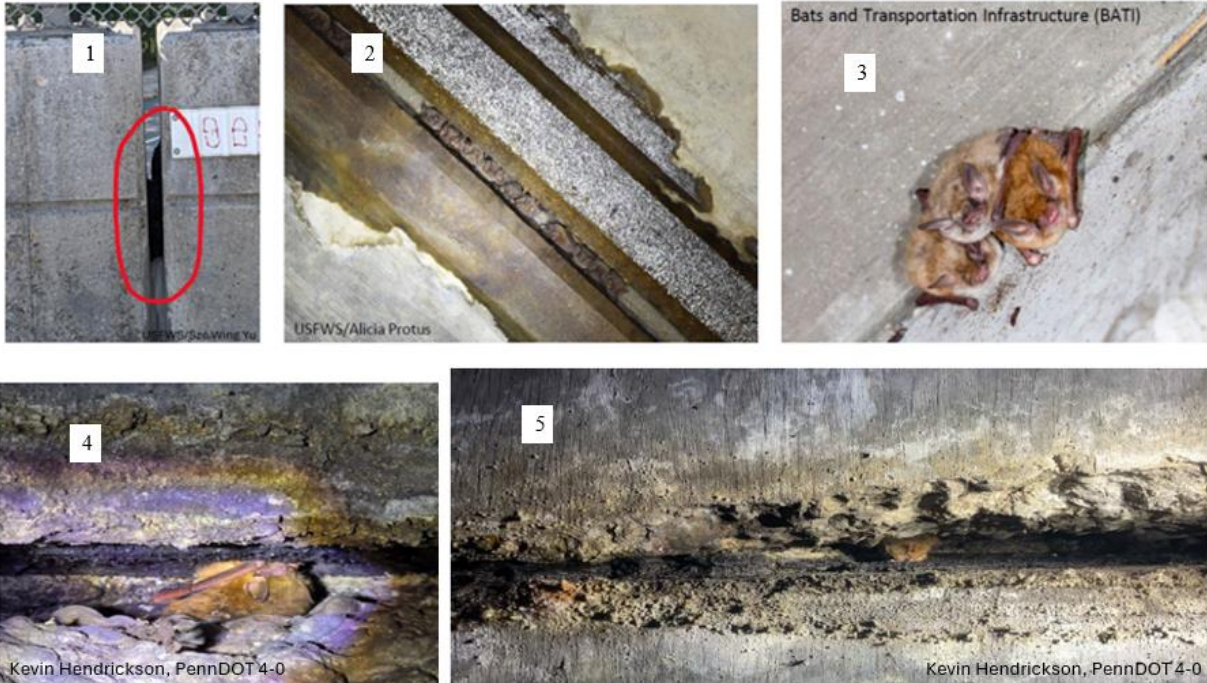
- A high-powered flashlight, headlamp, or spotlight (> 600 lumens)
- Binoculars and/or spotting scope
- Camera with zoom/telephoto lens and video recording capability
- Data forms and writing utensil
- Personal protective equipment (hard hat, safety vest, dust mask/respirator, gloves, sturdy footwear as required by your organization)
- Optional but helpful equipment:
 - Mirror or camera on a telescoping pole
 - Endoscope or borescope
 - Drone with a light and camera and video capability (please contact us prior to using drones; this is a relatively new method and needs some discussion on efficacy and safety first)
 - Acoustic bat detectors
 - Thermal camera
 - Handheld GPS
 - Guano sampling materials
 - Equipment for reaching difficult places, particularly over water, such as ladders, kayaks, or specialized bridge inspection vehicles
 - Extra batteries and the ability to store data (SD cards, upload to the cloud)

Where to Look

- All vertical crevices (note: the most ideal crevices for bats are those ½ - 1¼" wide and >4" deep if sealed at the top, or >12" deep if not sealed)
- Expansion joints and vertical spaces between end walls/bridge deck
- Pier caps or surfaces that may catch guano
- Other crevices in the structure
- Rough surfaces/spalls and vertical surfaces on I-beams
- Guiderails and gaps in concrete parapet
- Plugged drain pipes
- Bird nests (bats can hang on these!)

What to Look For

- Visible or audible bats.** Bats may be visible in crevices or hanging exposed on the structure. Listen carefully for high-pitched squeaking/chirping sounds - bats make social calls audible to humans. There may be a noticeable rodent smell.

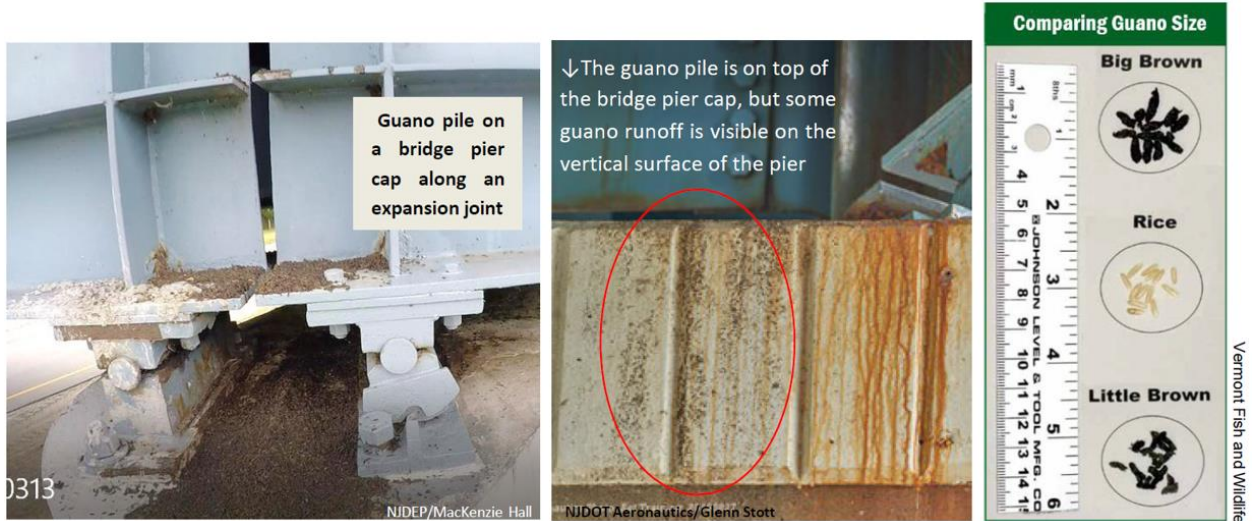


Clockwise from top left: 1) a big brown bat colony in the parapet gap of a bridge spanning a busy highway in New Jersey. They habituated to the traffic noise below but became more active when humans walked by for a closer look; 2) Bats roosting in a parapet gap in New Jersey; 3) Bats roosting exposed; 4 and 5) A tricolored bat roosting in an expansion joint of a large two-celled concrete culvert under I-81 in District 4-0.

- Urine staining.** Urine stains appear as wet-looking areas when bats have recently used the structure as a roost. When dry, urine staining may have light-colored mineral deposits, but it can be difficult to tell apart from water staining. If staining has algae growing in it, it's more likely to be water staining.



- **Guano.** Piles of guano accumulate on horizontal surfaces (e.g., ledge or ground) under colony roost locations, especially near the bats’ entrance and exit points. Unlike fibrous rodent droppings, bat guano pellets can be crushed easily and contain shiny bits of insects. When stormwater hits guano piles it can cause guano staining along vertical surfaces- this staining looks ‘gritty’, like coffee grounds. Guano piles and staining can be very dark and obvious for extremely large colonies but is usually more subtle.



- *Note about guano:* it is possible to collect guano samples and send to a lab for species identification, such as Northern Arizona University’s Species from Feces (<https://in.nau.edu/bat-ecology-genetics/sff/>).

Culverts

Appendix K of the *Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines* (p. 74) suggests the following **minimum culvert dimensions** for determining Indiana bat, northern long-eared bat, and tricolored bat suitability. If a site meets 1) the minimum entrance height/diameter for a particular species and 2) is 23 feet or greater in length*, it may be considered suitable to survey.

Species	Minimum Culvert Entrance Height/Diameter (feet)
Indiana Bat	4
Northern Long-eared Bat	4.5
Tricolored Bat	3*

* Tricolored bats have been documented in culverts as small as 2 feet in diameter, however, these instances are rare.

Bats may be perched on the walls of the culvert or in gaps and crevices. Equipment used to investigate utility conduits (remote controlled cameras or borescopes) may be helpful for surveying culverts.

Data Forms and Photos

PennDOT may wish to have their own internal process for documenting bat use during safety inspections.

For bat bridge or culvert surveys, the typical form is Appendix D of the FHWA/FRA/FTA Bat Programmatic Biological Opinion User's Guide¹ available here: <https://www.fws.gov/media/users-guide-appendices-e-range-wide-programmatic-consultation-indiana-bat-and-northern-long>

Please include some close-up photos representative of the investigated portions of the structure to corroborate the data on the form. For example, a few photos of the parapet gaps, of the tops of piers showing guano (or lack of guano), etc.

Likelihood of Detecting Maternity Use vs. Occasional Bat Use

There are two ways that bats use bridges, culverts, and other structures. One way is as a maternity colony. A colony of female bats may return annually to the same structure to raise their young. From a conservation perspective, it is imperative to avoid disturbing a maternity colony during the maternity season and to preserve the characteristics of the structure that they use (the crevice-like habitats).

The other way bats use a structure is as an occasional day roost. One or very few bats (<5) may roost in a structure to rest. It seems that northern long-eared bats and tricolored bats may roost in culverts during their spring or fall "migrations" between their summer habitat and winter hibernacula (pers comm. with biologists at the USFWS New Jersey and Virginia Field Offices). The likelihood of detecting this type of bat use is low due to its infrequency and small number of bats. Therefore, it is possible to find one or a few bats present prior to construction or maintenance, despite finding no bats during the maternity season. The likelihood of this scenario is very low, but not zero.

If such a scenario occurs and the project was reviewed as within the scope of the FHWA/FRA/FTA Bat Programmatic Biological Opinion, then PennDOT is covered under this programmatic's Incidental Take Statement and can use Appendix E of the User's Guide to document the bat use: <https://www.fws.gov/media/users-guide-appendices-e-range-wide-programmatic-consultation-indiana-bat-and-northern-long>

¹ The whole title is the User's Guide for the Programmatic Biological Opinion/Conference Opinion for Transportation Projects in the Range of the Indiana Bat, Northern Long-Eared Bat, and Tricolored Bat (entire document dated January 2025; the form in Appendix D is dated March 2022).

To proactively alert construction workers of the possibility of T&E bat presence, PennDOT may wish to include the following language in their project plans or bid documents:

“If workers find roosting bats or birds actively nesting in the culvert, they should pause work, avoid disturbing the species, and contact PennDOT and the USFWS PA Field Office for further guidance.”

How Long Does a Negative Assessment Last?

The recommendation is 2 years for negative results (no bats or signs found). It may be wise to do an assessment prior to construction to ensure bat absence is still the case.

Additional Bat Structure Resources

USFWS Bats and Transportation Structures video:
<https://www.youtube.com/watch?v=iuFwkT7q8Ws>

USFWS NJFO Guidance on Surveying Transportation Structures for Bat Occupancy:
https://www.fws.gov/sites/default/files/documents/20220926_NJ_BatsBridges_SurveyGuidance_withbirds.pdf

USFWS *Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines* (Appendix K, starting on p.69, dated 2024): <https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines>

Pennsylvania Qualified Bat Surveyors: <https://www.fws.gov/media/pennsylvania-qualified-surveyors>

Survey Guidance for Birds

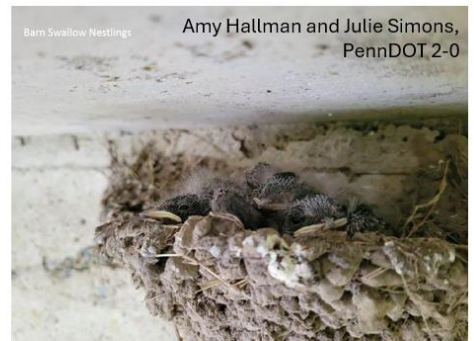
What Species of Birds May Nest in Our Structures?

Besides pigeons (which are not a T&E species and not protected under the federal Migratory Bird Treaty Act), the most likely species to nest on transportation structures include eastern phoebes, cliff swallows, and barn swallows. Peregrine falcons sometimes nest on tall bridges which mimic their natural cliff-side nesting sites.

The *Second Atlas of Breeding Birds in Pennsylvania* by Wilson, Brauning, and Mulvihill (2012) contains an index listing species that nest in bridges, and Appendix F of this book contains species breeding dates. Below is a table of these species (and a few more), their nest building date range, and fledged young date range. The nest is no longer used for the season once the latter date range is past.

Species	Nest Building Date Range	Fledged Young Date Range
American Kestrel	Apr 11 - Jul 15	May 15 - Sep 11
Barn Swallow	Apr 18 - Jul 29	Apr 26- Aug 28
Chimney Swift	May 23 - Jun 30	May 27 - Aug 5
Cliff Swallow	Apr 12 - Jul 9	Jun 14 - Aug 9
Common Raven	Feb 10 - May 28	Apr 8 - Aug 28
Eastern Phoebe	Mar 20 - Jul 21	May 1 - Aug 9
Herring Gull	Apr 20 - Jun 19*	May 29 - Jul 3
Northern Rough-winged Swallow	Apr 14 - Jul 28	May 23 - Jul 30
Osprey	Mar 31 - Jul 23	Jun 6 - Aug 3
Peregrine Falcon	May 1 - Jul 1*	Jun 25 - Jul 15
	* No dates for nest building, so the range is when they have eggs. Herring gulls and peregrines nest in depressions/scrapes and don't "build" a nest	

What Do the Nests Look Like?



Above, left to right: barn swallow nests, an eastern phoebe nest, and barn swallow nestlings. Found in June in District 2-0.



Above, left to right: Cliff Swallow Nests, eastern phoebe nest, eastern phoebe chicks.

When Should I Look for Nests?

Look for bird nests starting at the nest building date range. However, nests will remain after young have fledged, so you can still reliably find nests during a bridge inspection months after the above dates.

What if I Find a Bird Nest?

There are conservation measures regarding vegetation removal, nest building prevention, artificial lighting, chemical use, and noise. Please contact the USFWS for more information on avoiding and minimizing impacts to birds. In general, if the structure is known to have nesting birds, schedule potentially disturbing activities outside of their nesting season.

During the nest building period, potential nesting surfaces should be monitored for any nesting activity. Nests without birds or eggs that are new or partially completed can be removed, and continue to monitor for new attempts of nest building. However, if an active nest has been established (there are eggs or young), then do not disturb or displace the birds and their nests. Doing so may lead to nest and young abandonment.

Additional Bird Structure Resources

USFWS bird and transportation avoidance and minimization measures:

<https://www.fws.gov/story/avoidance-and-minimization-measures-transportation>

USFWS general information on migratory birds: <https://www.fws.gov/about-reducing-impacts-migratory-birds>