

ABANDONED RAILROAD TUNNELS AS ARTIFICIAL BAT HIBERNACULA

Ohio DOT Preserves History and Protects Habitats

**TIMOTHY M. HILL,
MATT PERLIK, AND
CHRISTOPHER STARON**

Hill is Administrator, Perlik is Assistant Environmental Administrator, and Staron is Environmental Specialist, Office of Environmental Services, Ohio Department of Transportation, Columbus.

In 2016, ecologists from the Ohio Department of Transportation's (DOT's) Office of Environmental Services (OES) conducted a routine ecological check for a small transportation maintenance project, addressing a potentially hazardous underground void beneath a rural state route. Little did the ecologists realize that this route in hilly southeast Ohio sat atop one of several long-forgotten abandoned railroad tunnels—and that its discovery would lead to the preservation of one of the largest previously unknown bat hibernacula in Ohio.

During the Appalachian coal boom of the late 1800s, railroads tunneled through the hills of southeast Ohio to facilitate coal shipments to outside markets. Built with countless hand-cut, hand-laid stones, these tunnels—10 in all, some as long as 2,300 feet—were bypassed in the mid-1900s, sealed with brick or dirt, and left

in place. In the decades that followed, the tunnels either were broken into by nearby residents or the dirt around their openings eroded, allowing access. At some point, bats began to use the tunnels, which offered warmth in the winter, a continuous water supply, and many bat roosting sites in the nooks and crevices among the hand-laid bricks.

Public Safety Concerns in the Abandoned Rail Tunnels

It became evident that other, non-bat residents used the tunnels as local hangouts. The tunnels showed evidence of graffiti, camp fires, and other human activity. During a late winter visit to the tunnels, many dead bats were found. Investigators collected the bats, expecting to confirm that the bats died of white-nose syn-

Above: Little brown bat (*Myotis lucifungus*). Inset: The interior of Tunnel 9, facing the entrance. (Photo: Chris Staron, Ohio DOT)

Photos: Chris Staron, Ohio DOT



The external entrance to abandoned railway Tunnel 9 in Harrison County, Ohio.



Tricolor bats (*Perimyotis subflavus*) were observed roosting along the ceiling of Tunnel 9.

drome (WNS). To the Ohio DOT wildlife biologist's surprise, however, necropsies indicated tiny white pellets in the bodies of the bats. The bats had been shot off the ceiling by Airsoft pellet guns—meaning that kids posed a greater risk to the bats than disease.

White-Nose Syndrome

Most bat hibernacula in Ohio have experienced a death rate of nearly 100% from WNS, an emerging fungal disease in North American bats. The WNS fungus was introduced from Europe in the 2000s and has spread across eastern North America. It attacks the bare skin of bats, growing on their bodies in the cool, moist environment of winter hibernacula and irritating

the skin. This makes bats awaken over and over during their winter hibernation, increasing their metabolism and burning the fat reserves needed to survive the long winter. Eventually, bats with WNS burn through their fat reserves and die from starvation before emerging from the hibernaculum in the spring.

Surprising Discovery

A visual survey in abandoned railroad Tunnel 9 found two species of bats: the tricolored bat (*Perimyotis subflavus*) and the little brown bat (*Myotis lucifugus*). The finding of little brown bats was significant: once one of the most common bats in Ohio, with population estimates in the hundreds of thousands, the little brown bat species had all but died out in Ohio from WNS.

Tunnel 9 contained 217 little brown bats, making the site the second largest hibernacula of little brown bats in Ohio. Ohio DOT senior ecologist Chris Staron questioned how the bats were surviving at this site and not dying from WNS. Ohio DOT then partnered with Joe Johnson of Ohio University, who was very interested in the newly discovered little brown bat hibernacula.

After temperature and humidity monitors were placed throughout Tunnel 9 and left there during the winter of 2017, another surprising discovery was found:

the tunnel's average winter temperature is below 40 degrees Fahrenheit. These are considered very cold temperatures for hibernating bats. Why, then, were bats in this cold hibernacula not dying from WNS? As it turned out, the low temperature in the railroad tunnel kept the fungus dormant. Bats were not irritated and awakened by the fungus and were able to hibernate normally the entire winter.

A few years earlier, Greg Turner of the Pennsylvania Department of Natural Resources had been working to create a cold hibernacula at a nature cave in central Pennsylvania to slow the growth of WNS. Ohio DOT biologists compared Tunnel 9's data with the Pennsylvania cave data and found a striking similarity in temperatures (see Figure 1, below)—the temperatures in Tunnel 9 almost matched those of the Pennsylvania cave. Although Tunnel 9's temperatures were slightly warmer, they reduced fungal growth enough to allow bats to survive the winter. The cold hibernaculum of the Pennsylvania cave appears to be working—hibernating bat populations have increased there from year to year.

Preservation of a Valuable Ohio Resource

Seeing an opportunity to preserve this now-valuable resource, Staron partnered with the Ohio Department of Natural

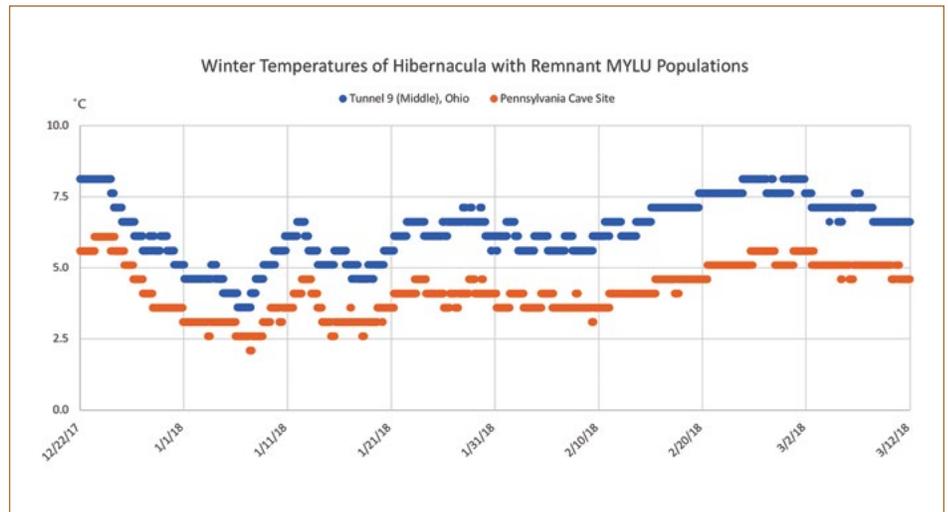


FIGURE 1 Winter temperature trends in Tunnel 9 in Ohio (blue) compared with natural cave hibernacula in Pennsylvania (orange). (Source: Joe Johnson, Ohio University)



The east end bat gate at Tunnel 9, under construction in July 2018 (left) and completed (right). The west end gate also was completed in July and includes a locking human access door for future research. The gates were finished in time for bats' fall swarming activities. (Photo: Chris Staron, Ohio DOT)

Resources (ODNR) and Ohio University to develop a conceptual plan to build bat gates at the tunnel. Staron worked with Ohio DOT survey and design teams to develop tunnel-specific bat gate plans, based on designs from the ODNR Division of Mineral Resource Management and Forestry (see Figure 2, below). The Ohio DOT OES purchased the steel and other materials needed for the gates. ODNR employs a team that designs and installs bat gates on abandoned coal-mine openings throughout southeastern Ohio; this team built the gates.

For Ohio DOT, the goal was simple: install bat gates to eliminate the risk to human safety and preserve bat hibernacula.

Preserving hibernacula protects the most sensitive, and perhaps most critical, component of a bat's life cycle.

As of fall 2018, Ohio DOT is working on gating and protecting four of the other known historic railroad tunnels as bat hibernacula. Historic mapping indicates that although there may be as many as 10 tunnels in the area, Ohio DOT has only located five of them. More tunnels may be harboring bats. Tunnel 9 is now gated and the bats are protected. Ohio DOT will continue to work with ODNR and the U.S. Fish and Wildlife Service (FWS) to gate and adjust the other four tunnels to make them successful hibernaculum for bats.

U.S. FWS Conservation Credit

Ohio DOT partnered with U.S. FWS so that the DOT could achieve bat conservation credits as a return on their investment in the gate installation and conservation easements. FWS agreed that conservation easements should be placed on the forested property immediately above and adjacent to the tunnels and their ownership transferred to a long-term conservation steward. These steps are essential not only to protect the immediate hibernacula within the tunnels but also the foraging areas immediately surrounding each tunnel. Ohio DOT also is considering acquiring additional forested property near the tunnel openings for potential long-term preservation and bat conservation.

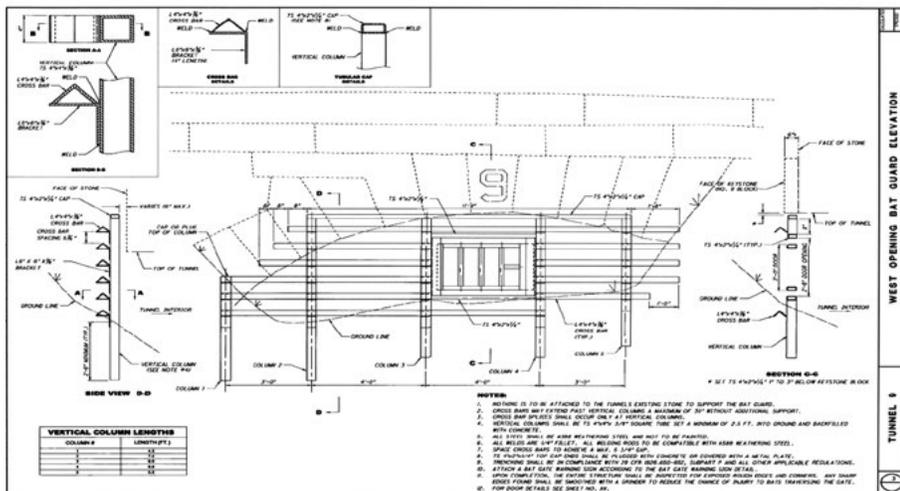


FIGURE 2 Early conceptual drawing of the east end bat gate design for Tunnel 9 in Harrison County, Ohio.

BAT FACTS

More than 1,100 species of bats can be found across the globe, comprising one-quarter of all mammalian species. Forty species of bats live in the United States alone.

Bats can eat up to 1,200 mosquitoes per hour, can live for more than 30 years, and can fly at speeds of up to 60 mph.

Resource: The Nature Conservancy. Top 10 Bat Facts. www.nature.org/en-us/about-us/where-we-work/united-states/arizona/stories-in-arizona/top-10-bat-facts. Accessed February 5, 2019.