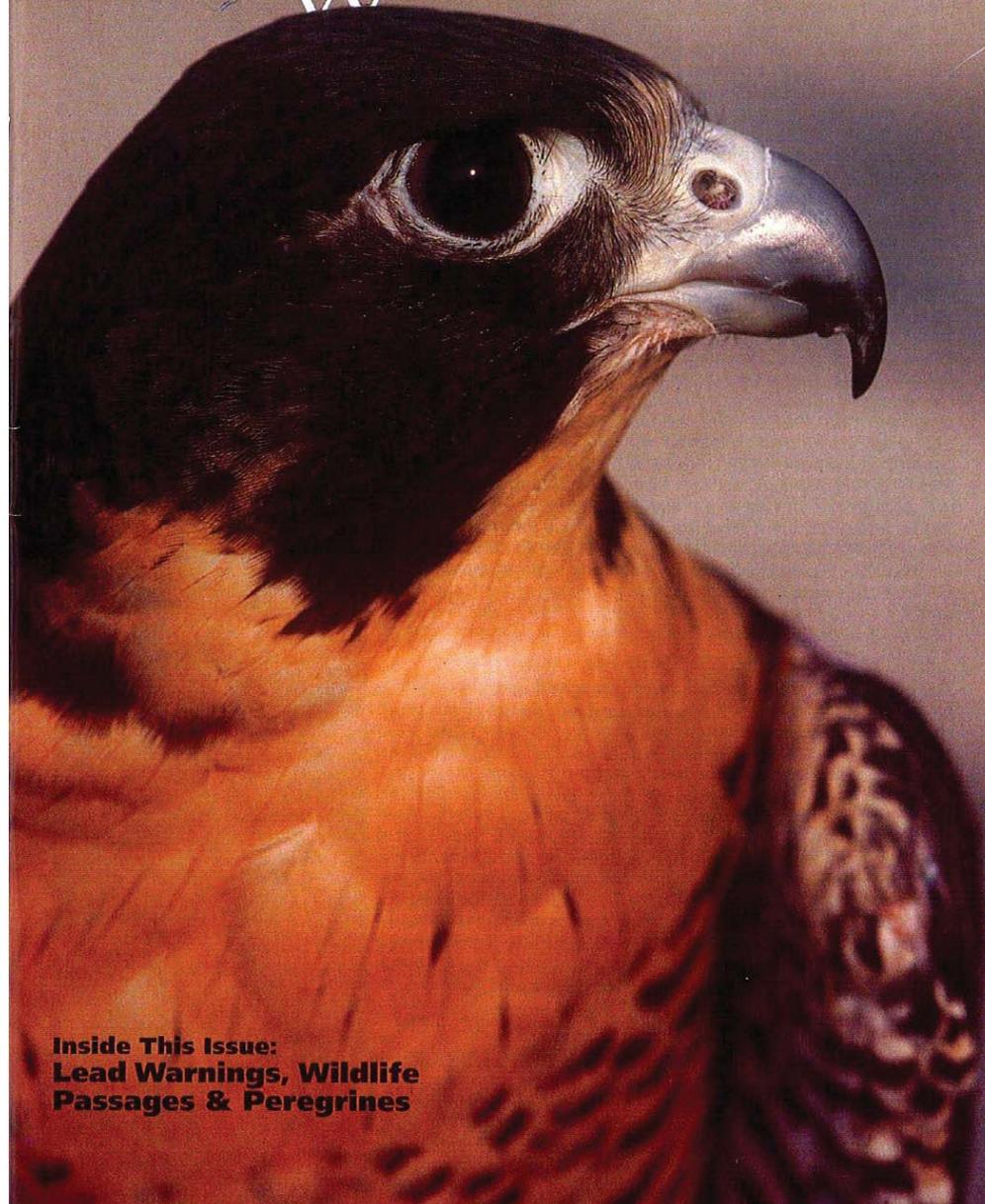


MASSACHUSETTS WILDLIFE

No. 4, 2007

\$3.00



**Inside This Issue:
Lead Warnings, Wildlife
Passages & Peregrines**

Safe Passage: Getting Wildlife Across Route 2

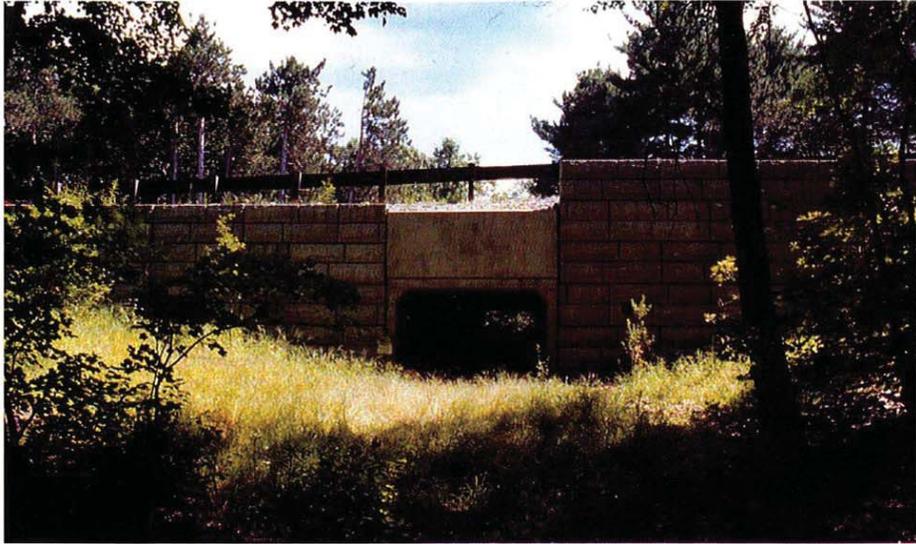


Photo © by Lydia Rogers

by Dan Stimson

It's one thing to install "wildlife passages" to provide a safe route for animals to cross a busy highway. But how do you determine if the animals actually use them?

As I walk along the side of the highway cars race by unceasingly. A tractor-trailer roars by, its weight shaking the ground and its speed nearly blowing off my hat. I wonder why a raccoon or a fox would ever venture anywhere near this spot. Along its journey from Boston to Williamstown, Route 2 bisects twenty-five cities and towns. As one might expect, the amount of traffic increases greatly as it approaches Boston. Just 20 miles west of the city, 50,000 cars travel on Route 2 through the town of Concord daily. This amount of traffic poses a serious barrier for a diversity of wildlife in the area.

A fatal vehicle crossover crash in the neighboring town of Lincoln in 1998 spurred a study of the roadway. The study ultimately led to the inclusion of median barriers, separating east- and west-bound traffic and preventing similar tragedies from occurring in the future. The plan made it much safer for those

driving along this section of roadway. Unfortunately, it also made it even more difficult for our four-legged neighbors to connect with habitats on opposite sides of the highway. To help counter this problem, MassHighway designed and installed four wildlife passages under the highway as part of the road improvement project. The passages — concrete box culverts ranging in size from 3' high by 4' wide to 6' high by 9' wide — stretch across and beneath four lanes of traffic. They are rather long and skinny passages.

It was hoped that these passages would be used by animals that needed to move between habitats on both sides of the highway, but it wasn't known if they would be a success. Studies around the world had led to the logical conclusion that animals prefer relatively wide open structures, with a lot of light at the end of the tunnel. It wasn't clear whether a 112' long "soda straw" of a box culvert

Left: One of four pre-cast concrete culverts installed to allow wildlife to pass safely underneath Route 2 in Concord.

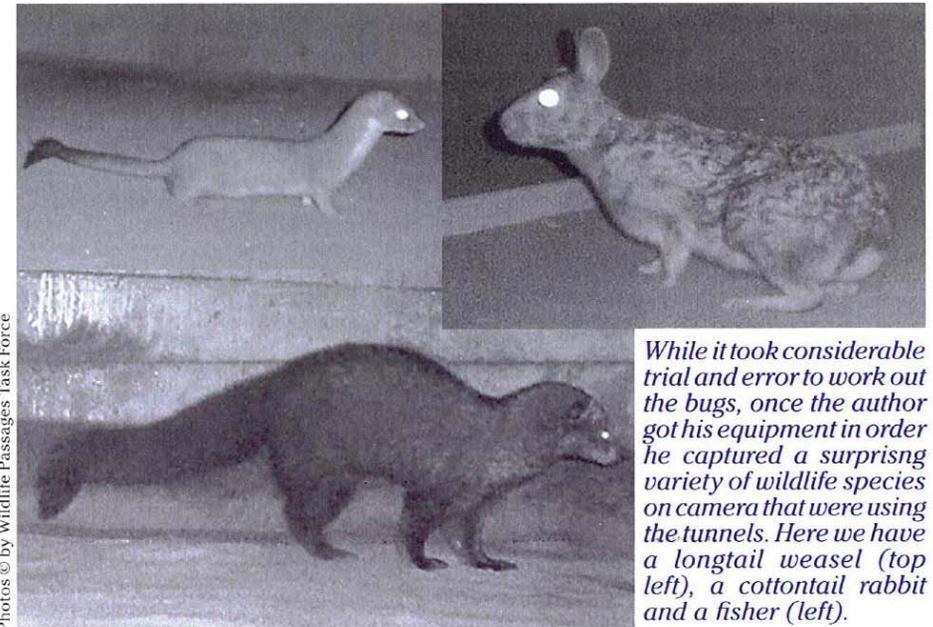
would support the passage of many of our New England wildlife species. Would deer be comfortable heading into such a confined space? Would fisher — an animal whose image is quickly changing from an indicator of uninterrupted woodlands to an adapter who is more than willing to venture into the suburbs — be curious or bold enough to slink through a concrete passage?

The Concord Natural Resources Commission saw the need to answer questions like these, and in 2004 the Wildlife Passage Task Force was formed in order to monitor the tunnels and take measures that might increase the likelihood of their success. The group worked with MassHighway in the final stages of construction to coordinate plantings along the edge of the highway and to include a natural substrate on the floor of the tunnels. Native vegetation was planted and soil that had been removed from the project area was brought back in and laid down on the floor, providing more natural footing.

The group began focusing on how to monitor wildlife use of the underpasses. Some similar efforts had been done elsewhere using tracking plates, tracking beds, remotely triggered cameras, and live traps. Tracking seemed like it would be most reliable, but at the same time the group was wary of the amount of effort needed to do this on a volunteer basis. They decided that to monitor four tunnels effectively they would need a less time-intensive method. Camera traps seemed to be the solution.

Ron McAdow, co-chair of the group and Executive Director at Sudbury Valley Trustees (a regional land conservation trust in the area), had experience using motion-triggered cameras to photograph wildlife traffic. Since coming to SVT, where I work as the Assistant Director of Stewardship, Ron had lent his equipment to me for use on our conservation land in order to share photos with the public and to get an idea of what wildlife was using our land. Ron invited me to join the group to help work out a method to monitor the culverts with cameras.

My first visit to the tunnels was on a cold afternoon. Snow still covered the ground as construction was being finished on one of the larger tunnels. During the walk to



Photos © by Wildlife Passages Task Force

While it took considerable trial and error to work out the bugs, once the author got his equipment in order he captured a surprising variety of wildlife species on camera that were using the tunnels. Here we have a longtail weasel (top left), a cottontail rabbit and a fisher (left).

the structure it was clear how loud and intimidating it must be if you are an animal that needs to cross the highway on a regular basis. The experience was making me wonder how long it would take to see animals approach the tunnels, let alone use them regularly. As we neared the entrance, a set of tracks was clear in the snow. Here was some pretty encouraging news: entering a still unfinished structure was the perfect trail of a fisher!

This discovery made us anxious to get a camera in place to see what else might be using the structures. Ron and I knew that the cameras produced good results, but we also knew a lot could go wrong along the way. Batteries tend to run out at the most inconvenient times, electronics have a way of inexplicably failing, and pesky rodents have a fondness for chewing cables. Still, it seemed we could get good data from the cameras, not to mention some fun pictures. The cameras we had both used were typical color cameras with white flashes. We knew they tended to startle animals because we'd gotten numerous shots of wide eyes staring at the lens, and others of backs turned and running away! The last thing we wanted was to introduce a factor that would *discourage* animals from using the tunnels.

We decided to investigate cameras with infrared flashes. They would take black and white photos utilizing light that is below the spectrum of what is visible to humans

The author conducts an examination of a tracking bed to determine animal traffic. Tracking data was compared with photographed animals in the study to determine the level of success of the cameras.

and wildlife. I had recently begun building my own digital units with assorted electronics and relatively simple directions found on the internet. The cameras took great pictures, were much cheaper to build than buy, and didn't have the price of photo development attached. I decided to look in this direction and was excited to find directions for manipulating the same cameras to "see" in infrared. After some reading and fiddling, I soon had a camera that would only give off a very faint visible red glow for a "flash," yet would produce a clearly illuminated photo in complete darkness. I couldn't wait to get it in place to see if we could photograph our pioneering fisher.

Mixed with our curiosity, there was still some hesitation. We were concerned with the data we might miss collecting

with a camera alone. Luckily our group included three members who were very accomplished trackers. We decided to install a tracking bed in one of the tunnels. We pondered what material would give the best track for our trackers to read. Lacking anything definitive, we decided that a sifted version of the substrate in place would suffice. To our surprise the result was very good. The consistency was even and fine, and tracks registered quite clearly with good definition.

Unfortunately, a tracking bed was only possible in one of the tunnels due to dampness and flooding in the others. Tracking was possible *outside* of these tunnels however, and winter tracking was conducted all along both sides of the highway through the area. Roadkill was also monitored in hopes that we could glean some information from that data as well.

Starting in December of 2005, we began using both the camera and tracking bed to collect data inside the tunnels. We were instantly impressed by the usage of the tunnels, recording tracks of raccoon, deer, red fox, coyote, rabbit, small rodents, and yes — people — all in the first month! Meanwhile, results weren't so impressive in front of the camera: all we had were a lot of empty photos and the rear end of what looked to be a vole. I suspected that the animals were walking by the camera too quickly for it to photograph them, but since the tracking data was in a different tunnel than the camera there was no way to be sure.

We decided it best to move the camera over to the same tunnel as the tracking bed, placing it over the bed in hopes of matching up tracks with photos. After three January days with temperatures hovering around freezing, we read the tracks and collected the camera. The tracks yielded two red foxes, three people, two domestic dogs, a raccoon, a mink and perhaps most surprisingly, a frog! Our hopes were raised, but then quickly dashed after we found only pictures of an empty tunnel when we reviewed the camera's contents.

It was clear now that animals were evading the camera. Presumably they were moving along quickly in an intimidating new place. We needed a way to increase the time in which the camera had to react. I built an angled bracket that would

mount on the wall of the tunnel to aim the camera down the length of the structure. The first efforts had been aimed directly across the tunnel and clearly didn't allow the camera enough of a time window to take a hurrying animal's portrait. Now, the animal could take a few steps between the passive motion detector registering its presence and the camera taking a picture, and it could be captured in pixels before it disappeared from view.

The next set of tracking data showed us two raccoons, a small rodent, three domestic cats, and two people. This time the camera caught both of the raccoons, two of the cats, and one of the people. While it still missed some visitors, it also provided more valuable and precise information than tracks alone could offer. It showed, for instance, that the two cats were different animals: one all black, the other black and white. The raccoon, on the other hand, happened to be missing its tail. It was very clearly the same raccoon in both photos, as opposed to two individuals. That was something we wouldn't have known from just tracks.

Monitoring continued and it became apparent that while we were getting some very nice photos, there were still many animals going undetected. The work was also intensive, requiring two visits weekly to read and clear the tracks. While we were rewarded with great photographs (like one of a curious weasel with its head stretched up at attention), it was clear that this approach wasn't going to work for us over time. We decided to experiment with a store-bought recreational model of an infrared digital camera. The camera was inexpensive, but the results were not good at all. The batteries were numerous and couldn't be of the rechargeable type, the camera was not much faster than the one I had put together, and, worst of all, the infrared illumination came out looking like a flashlight beam against the opposite wall of the tunnel.

It was back to tinkering with the home-made unit. Results gradually improved, but months were passing between iterations of the design and week-long tests. Finally, a year after installing a camera for the first time, there it was: our first clear photograph of a fisher using the tunnel where we had first seen the tracks in the snow! Still though, our tracking bed was

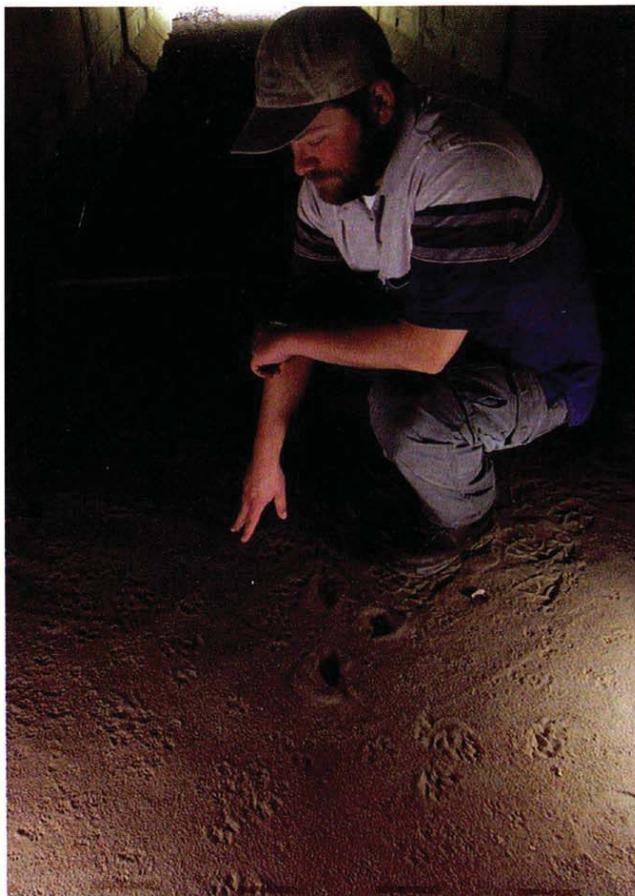
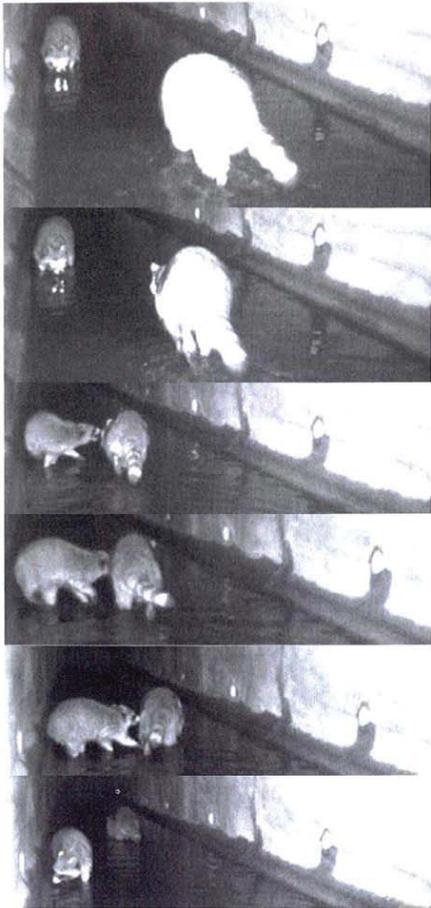


Photo © by Lydia Rogers



Photos © by Wildlife Passages Task Force

Raccoons don't mind getting their feet wet. Sequence is from top to bottom.

telling us that we were missing animals. We felt like we needed to try something new. We had heard of graduate work at the University of Massachusetts on a large underpass in Vermont. The researchers there were also doing remote photography and were having pretty good luck with a different camera.

The resolution of this camera's photos was extremely low and the illumination didn't have a very long range. This led to low detail. This was a function of the camera's strongpoint though—it was fast, very fast. The camera would turn on in less than one tenth of a second and could take up to 5 frames per second, resulting in a sequence of photos that could even

show behavior. Given our situation, the weak points weren't much of an issue: the animals were only a few feet away and we were in a concrete box culvert where there was little chance of light diffusing too much. The low power consumption turned out to be great, too. We could now leave the camera out for more than a month at a time without visiting it!

We were now photographing enough animals that we were confident we could use the technology to see what was in the other tunnels. We purchased additional cameras, and with the increased capability were able to see species that we hadn't yet recorded. One week a beaver diligently made its way back and forth through one of the riverside culverts so many times that it was clear it was hard at work doing what beavers do. Another time, as I scrolled through a new batch of photos, I was surprised to see a snake sliding along the wall of one of the culverts. The animal's body was apparently warmed sufficiently by the sun that it was able to trigger the infrared detector as it passed in the cool, shady tunnel.

We were also able to discern some patterns. Much to our surprise, the most heavily and widely used of the structures was also the smallest. The tiny 3' by 4' culvert (so small that we placed the camera at the end because we didn't want to crawl through every time we needed to collect the photos) turned out to accommodate every species except for the white-tailed deer which we had begun to see in the larger tunnels.

It's in the small tunnel that we also saw the most interesting behavior. A family of at least six raccoons crossed together. The adolescent kits snapped at each other as they waddled away from the camera. At least one fisher had included the underpass in its home range; utilizing it for hunting. The animal always headed north early in the night and returned south carrying prey later on. We've recorded fishers as they carried gray squirrels, rabbits, what appeared to be an opossum, and even a skunk. The story of the fisher and the skunk seemed to be told especially clearly. The skunk headed north in the night in one set of photographs. A subsequent set, taken only fifteen minutes later, showed a fisher heading back south with a skunk near its own size in its jaws!

Photos © by Wildlife Passages Task Force



Two fishers meet as they head in opposite directions in the smallest of the tunnels. This structure has proven highly effective even at just 3' high by 4' wide.

We've seen track and photographic evidence of mice that entered seep holes in the culvert's walls. This was followed by photos of a weasel as it inspected all of the seep holes as it headed through the underpass. Photographs showed a raccoon as it approached the wall and sniffed intently. Then it rubbed its hindquarters against the spot as it walked away. Later in the month a fisher came by headed in the same direction. With a gray squirrel in tow, it leaned over and rubbed the very same spot! Both animals were apparently scent marking their presence.

We've also seen glimpses into interesting stories at the other structures

as well. Along with May flowers, April showers brought us rising water in the Sudbury River this year. The river swelled so much it flowed through the tunnels. When it finally receded enough for us to fetch our camera, which, I'm glad to say, was mounted near the ceiling, we looked through photos of deer beginning to wade through knee deep water. Subsequent photos show deer wading through shoulder deep water. Finally, photos taken at the time of high water show a remarkable image of a deer swimming upstream through the underpass, with only its head and shoulders above water.

Photos © by Wildlife Passages Task Force



This fisher often used a tunnel as part of its regular routine, heading north in the early evening and returning south later on, often with prey. Here it appears to be dragging an opossum (note naked tail), which could be a fisher kill or roadkill.



Photo © by Bill Byrne

In the early fall with the abundance of young red fox about, we captured an inquisitive new resident of Concord bursting through the tunnel and coming to an abrupt halt at the beginning of our tracking bed; the fox's legs and toes spread out to stop it just before it arrived at this unfamiliar fine soil in front of it.

Little did we know almost two years ago, when we began monitoring these structures, that we'd witness behavioral stories like these. The best story thus far, though, is that we've been able to answer with a resounding "yes" the question of whether these box culverts will allow the passage of local wildlife species across a busy highway. The list of animals photographed includes: red fox, coyote, white-tailed deer, opossum, skunk, woodchuck, mink, otter, beaver, muskrat, weasel, fisher, mice, chipmunk, gray squirrel, duck, robin, snake and snapping turtle. We found that all of the species recorded in the winter roadside tracking also used the tunnels. We also found no species outside of this set as road-kill. Both facts are evidence of the effectiveness of the tunnels.

While most people might assume deer would be unwilling to enter a dark tunnel, in fact they did not take long at all to begin availing themselves of the new passages. The camera caught the one below swimming upstream through a riverside underpass after heavy April rains.



Photo © by Wildlife Passages Task Force

As we proceed with the research, we plan to continue monitoring the underpasses, though probably less intensively over time. We will look closely at the data we've collected and see what more we can learn. We will also return to the early questions of what we can do to further increase the structures' suitability to welcome wildlife passage. This includes talking with people about how important it is that they avoid using the tunnels for themselves, because it is widely believed that human presence can deter the use of the structures by wildlife. We look forward to communicating just how useful these relatively inexpensive

Wild canids, perhaps the most intelligent and wary of the species that made use of the tunnels, were represented by the red fox (below) and coyote (right). Note that the coyote, photographed as it made its way under 4 lanes of traffic, appears well aware of the camera.



Photo © by Wildlife Passages Task Force

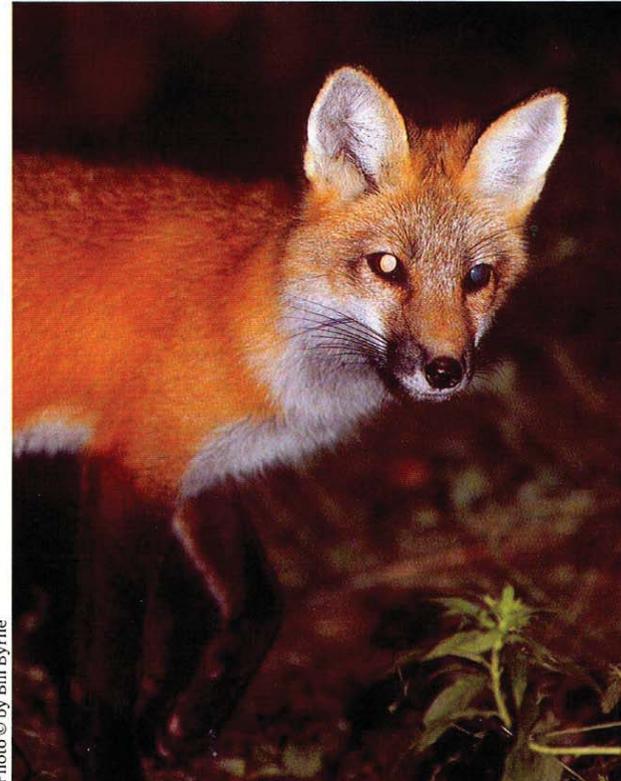


Photo © by Bill Byrne

structures can be for wildlife in our state. We hope that what we learn and what we share will lead to more structures like these being put under our roadways as part of future construction projects, giving our wild neighbors an option to pass underneath as we busily drive above. 🐾

Dan Stimson is the Assistant Director of Stewardship at Sudbury Valley Trustees, a regional land trust dedicated to the protection of wildlife habitat and the natural resources of the area west of Boston. To view additional photographs from the underpasses visit their website at: www.svtweb.org