Road losses add up, taxing amphibians and other animals

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Dead frogs and other roadkill line Lindberg Road in West Lafayette, Ind., that traverses a wetland known as Celery Bog in this 2005 photo. Research shows that frogs and other amphibians are particularly hard hit by road-related death; it may be a contributing factor to their worldwide decline, says Purdue researcher Andrew DeWoody. Credit: Purdue University photo/Andrew DeWoody

When frogs hit the road, many croak. Researchers found more than 65 animal species killed along a short stretch of roads in a Midwestern county. Nearly 95 percent of the total dead were frogs and other amphibians, suggesting that road-related death, or road-kill, possibly contributes to their worldwide decline, a trend that has concerned and puzzled scientists for decades.

The Purdue University study found that habitat along roadsides heavily influences road-kill. More than 75 percent of the carcasses originated alongside a one-mile stretch of road that traverses a wildlife-friendly

wetland known as Celery Bog in West Lafayette, Ind.

"On hot summer nights when it rains, there are literally thousands of frogs out there," said Andrew DeWoody, a Purdue researcher who led the study in Tippecanoe County, home to the university.

During the 17-month study, researchers found 10,500 dead animals along 11 miles of roads. Of those, 7,600 were frogs of unidentifiable species and another 1,700 were bullfrogs, said DeWoody, an associate professor of forestry and natural resources.

"In addition to indirect costs of habitat fragmentation, roads have direct costs in terms of animals' lives," he said.

Several steps can be taken to help reduce road-kill, said Dave Glista, study co-author and a Purdue master's graduate who began the study as part of his since-completed thesis measuring roads' environmental impact. For one, development planning should take into account an area's wildlife value. Second, structures to mitigate, limit and prevent road-kill should be explored whenever possible, he said. Options include underpasses, viaducts and overpasses to allow wildlife safe passage, and special fences to keep animals off roads.

"We need to avoid, minimize and mitigate," said Glista, now a scientist with the Indiana Department of Transportation. "As a biologist, I do think we should avoid building roads in wetlands and other wildlife-rich areas. Mitigation structures are worth the cost, as is any measure we can take to minimize our impact on the overall environment."

Scientists estimate that one-third of amphibian species are threatened, and hundreds of species have gone extinct in the past two decades alone. Road-kill adds to numerous factors already implicated in amphibian declines, DeWoody said. These include habitat loss and degradation,

disease, pollution, competition from introduced exotic species, and threats posed by climate change.

Frogs, toads and salamanders are all amphibians, a class of four-legged animals known for their moist, scale-free skin. Most species begin life as gilled, water-dwelling creatures before undergoing a dramatic metamorphosis to become four-legged, air-breathing adults, walking or hopping about on land. They serve vital roles in many ecosystems, as consumers of various animals like insects and as a food source for carnivores. To maintain healthy ecosystems, it is vital to limit amphibian losses, DeWoody said.

The study, published online in the latest issue of the journal *Herpetological Conservation and Biology*, significantly underestimated the number of animals killed because many specimens were scavenged, degraded beyond recognition or moved, DeWoody said. About five times more animals died than could be recorded, he estimated.

The dead included 142 road-killed eastern tiger salamanders, a finding DeWoody said was troubling.

"The absolute number might not look that large, but most of these individuals were mature, up to 10 years old," DeWoody said. "Many of them were gravid, or females bearing eggs on an annual trip to breeding grounds where they often lay 500 to 1,000 eggs. This could make a potentially big difference for the population."

Researchers also found 74 dead northern leopard frogs, a species of special conservation concern in Indiana.

To survive, most amphibians require habitats with running or standing fresh water, in which they lay eggs and begin life. This makes them vulnerable to water pollution and land-use changes like drainage or

waterway disruption. Habitats like wetlands and rainforests are in decline worldwide, DeWoody said.

In addition to the toll on frogs and other amphibians, roadways put a wide variety of other animals at risk, he said. Road-killed animals identified in the study included:

-- 79 opossums, the most common mammal;

-- 36 chimney swifts, most common bird;

-- 35 common garter snakes, most common reptile;

-- 43 raccoons; and

-- 4 white-tailed deer.

Glista said he was surprised to find relatively few deer, but he speculated that more may have been hit and were either able to run away or were removed from the roadway.

"We think of deer as being one of the animals more commonly killed on the road, but they actually make up a tiny percentage of the total," he said. "I think that helps put the impact in perspective."

Most road-kill was found along Lindberg Road, which passes through Celery Bog Nature Area in West Lafayette, Ind. Along a one-kilometer (0.6-mile) section, an average of eight amphibians were killed each day, DeWoody said.

Funded by the Joint Transportation Research Program, a partnership of the Indiana Department of Transportation and Purdue, the study focused on road-killed vertebrates, or animals with backbones.

Glista said it took some "backbone" to slowly drive a specially marked vehicle and stop for data samples along four sections of roads in Tippecanoe County twice weekly. During the 496 trips, he said he had close calls with motorists, but always remained careful.

"I didn't want to become one of my own data points," he said.

Source: Purdue University