HOW NEONICOTINOID PESTICIDES MAY BE HARMING BATS

CANADIAN WILDLIFE FEDERATION

CanadianWildlifeFederation.ca

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There are over 1,300 bat species worldwide, 19 of which call Canada home. Our bats are incredibly important, not only to the environment but to the economy too. When the sun goes down, bats get to work eating the annoying pests in our backyards. They're also extremely beneficial to the agricultural industry. In fact, bats save the agricultural industry in North America $3.7 billion every year.

Sadly, bats are in serious decline. Like humans, the success of their populations relies less on high birth rates and more on a high survival rate. Of the 19 species of bats in Canada, 13 give birth to just one pup per year. This makes every single life crucial to the growth of a population. In the last 10 years, millions of bats have perished and some of our most treasured bat species have been listed as Endangered, including the Tri-colored Bat, Northern Long-eared Bat and the Little Brown Bat.

▲ **Tri-colored Bat, one of three bat species listed as Endangered in Canada.**
PHOTO: SHERRI AND BROCK FENTON

Bats are generalist predators. Little Brown Myotis foraging.
PHOTO: SHERRI AND BROCK FENTON

◀ **Townsend's Big-eared Bat.**
COVER PHOTO: SHERRI AND BROCK FENTON

PHOTOS: GETTY IMAGES

THREATS

Bats face enormous threats, including habitat loss, white-nose syndrome, wind turbines and a new growing threat: neonicotinoid pesticides (neonics).

Habitat Loss: Many bats depend on riparian areas (riverbanks, lakeshores, etc.) for both water and insect foraging. The degradation of our waterways through pollution and the destruction of natural vegetation along stream, pond and lake edges affects many species of bats.

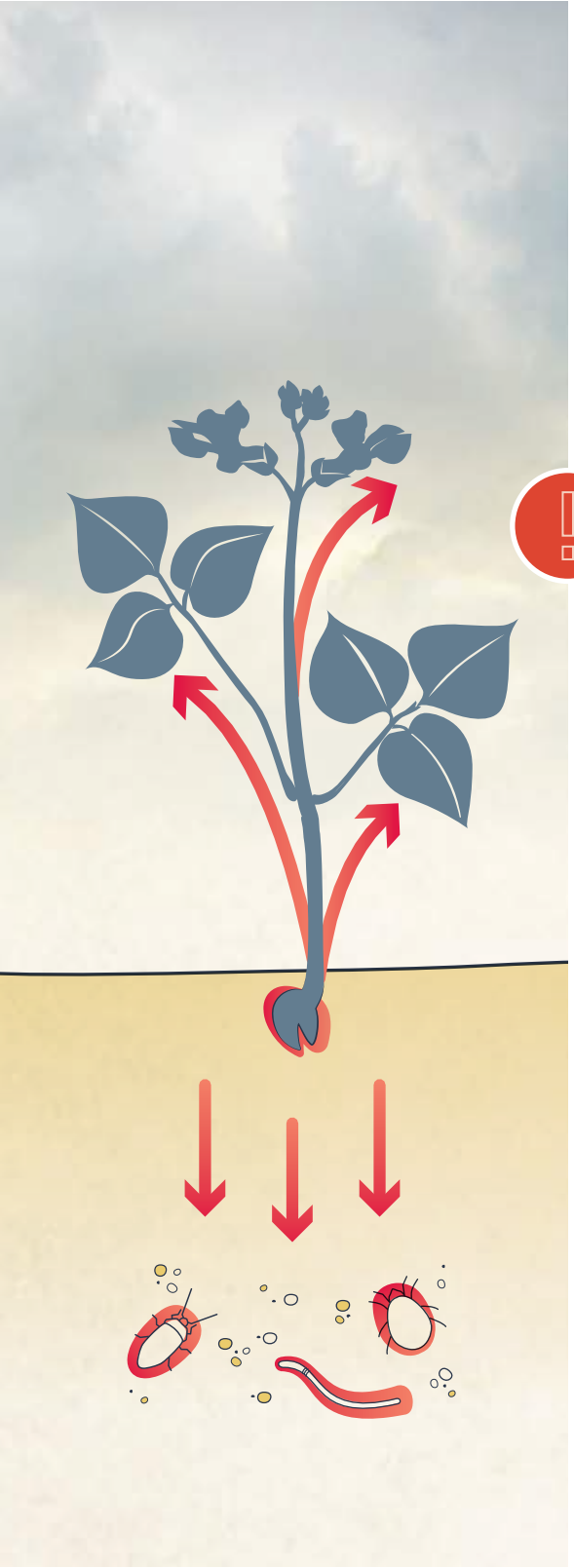
Deforestation affects bat species that rely on forests for roosting and foraging. In particular, the loss of old-growth forests threatens certain bats. Many of these species roost in older trees or snags (dead or dying trees). Forestry practices that create even-aged stands, such as clear-cutting, result in the loss of these very important roost sites.

Bats require roosts that have the right microclimate and are safe from predators and other disturbances. During the summer, bats like to roost in large trees, but human activities over the past 100 years have made large trees scarce. Bats have adapted to this situation by roosting in barns and attics. However, modern building methods often prevent access to bats and barns are being torn down, reducing suitable roosts for bats.

PHOTOS: GETTY IMAGES; U.S. FISH AND WILDLIFE SERVICE

Wind Turbines: Every year, it is estimated that over 47,000 bats are killed by wind turbines here in Canada. Migratory bat species are hardest hit by wind turbines: the Hoary Bat, the Silver-haired Bat and the Eastern Red Bat. The Endangered Little Brown Bat and common Big Brown Bat are also at risk. Many of these bats are struck by wind turbine blades, but others are killed due to barotrauma — bats have not developed the same lung capacity for flight as birds. When bats fly too close to a wind turbine, pressure can cause blood vessels in the lungs to burst, resulting in internal bleeding and death.

White-nose Syndrome: White-nose syndrome is a disease caused by the fungus *Pseudogymnoascus destructans*. This fungus grows on the exposed skin of bats as they hibernate during the winter in caves and mines. The cool temperatures of these hibernating sites allows the fungus to grow and spread throughout the site and on the bats themselves. The disease shows up as a fuzzy white substance on their ears, wings and muzzles. However, this isn't the only damage this fungus causes. Internally, the bat's muscle tissues and blood vessels are affected. Sadly, bats end up dying as a result of two things: dehydration because they lose water and electrolytes from their wings, and starvation because they wake up from hibernation more frequently and end up using their fat reserves, which can't be replaced as flying insects are not available during the winter.



NEONICS ARE ABSORBED BY THE ENTIRE PLANT AND SEEP INTO THE SOIL, REMAINING FOR YEARS.

THE NEW THREAT: NEONICS

What are Neonics?

Neonicotinoids were introduced in the 1990s because many insects were becoming resistant to common pesticides. These new pesticides — "neonics" — were a group of insecticides that were chemically related to nicotine and were known to be toxic to insects.

Today, five of these insecticides, including *Thiacloprid*, *Clothianidin*, *Acetamiprid*, *Imidacloprid* and *Thiamethoxam*, are approved for use here in Canada. They are being used on crops like wheat, soy, peas, beans, fruits and vegetables. They are applied to the plant as seed coatings, soil solutions or as sprays on the leaves and stems. They remain active in the plant for many months and in the soil for up to several years.

HOW DO NEONICS AFFECT BATS?

Neonics could be impacting our beloved bats in numerous ways:

- Depleting insect populations — the bat's source of food
- Poisoning bats that eat affected insects
- Lowering the immune system of bats and making them vulnerable to disease

DEPLETION OF FOOD RESOURCES

In a single night, a bat can eat its own body weight in insects. While bats might need to eat a lot of insects to survive, they're not overly picky. They'll happily eat a wide range of insects and will switch to different prey depending on what's available. For example, scientists made a dietary analysis of the Little Brown Bat and found nearly 600 distinct insect species!

Unfortunately, their prey is in decline. Insect abundance has declined in many areas around the world. And while agricultural intensification is mostly to blame, the use of neonics is certainly not helping. In fact, it's making the situation worse. When bats can't find insects to eat, they stop foraging altogether and wait for better conditions. This is harmful for these small mammals because they need to eat their fill to keep their energy up. Moreover, their echolocation system limits the size range of insects available to them.

A Mayfly, of the order Ephemeroptera. One of the many aquatic insect species in the bat diet and sensitive to neonicotinoid pesticides.

PHOTO: CWF REFLECTIONS OF NATURE PHOTO CLUB/ DAVID GALLAGHER

A cucumber beetle, one of the many agricultural pests that bats feed on.

PHOTO: CWF REFLECTIONS OF NATURE PHOTO CLUB/ FRANK RODIN

POISONING FROM EATING CONTAMINATED INSECTS

Bats truly are a farmer's ally as they eat plenty of agricultural pests. The key pest species and crops where bat predation might occur include: June Beetles (grasses, cereals, sugar beet, soybeans and potatoes), Wireworms (most crops), Leafhoppers and Plant Hoppers (rice, potatoes, grapes, almond, citrus and row crops), Corn Rootworms/Spotted Cucumber Beetles (corn, spinach, cucurbits), Stinkbugs (fruit trees, corn, cereals and vegetables), Cutworms (most crops), Tortrix moths (fruit and nut trees), and Snout Moths (nut and fruit trees, cranberries).

Bats will also happily eat aquatic insects. For example, the Little Brown Bat is known to hunt regularly for its prey over water. In both agricultural and aquatic settings, bats will forage for insects by hunting mid-flight and also by gleaning from surfaces (including plant and water surfaces).

The problem occurs when neonics permeate the very insects that bats enjoy eating. Neonics are highly water-soluble and aquatic insect larvae are incredibly sensitive to these lethal pesticides. They can kill larvae, reduce the growth of affected insects, make it difficult for insects to move around and inhibit their ability to feed. When agricultural pests are sprayed with neonics, they can be exposed to a sub-lethal amount of the pesticides or the substance can coat their wings, hairs or scales. In turn, when bats eat the poisoned insects, they can be poisoned too. Exposure to neonics may have consequences for these flying mammals because it can impair their ability to use echolocation and perform intricate flying manoeuvers to catch their prey.

▲ **Agricultural intensification is associated with increased use of pesticides and decreased insect abundance.**
PHOTO: GETTY IMAGES

Bats are exposed to pesticides by consuming pesticide residues on their prey.
PHOTO: SHERRI AND BROCK FENTON

LOWERED IMMUNE SYSTEM

Researchers are learning that neonics can harm bats soon after bats consume affected insects, but they've also discovered that bats can actually retain neonics in their systems over time. One researcher detected neonics in bat tissue from two specimens collected during winter in the northeastern United States. This is very worrying news.

During hibernation, bats lower their immune systems, making them more vulnerable to disease. And in the last decade alone, approximately 12 million bats in Canada and the United States have died from white-nose syndrome. Researchers are learning that insecticides like neonics can predispose bat populations to white-nose syndrome by further lowering the immune systems of exposed animals. Moreover, neonics like *Imidacloprid*, *Thiamethoxam* and *Thiacloprid* have been shown to disrupt torpor either by affecting the thyroid or prostaglandin systems. When a bat isn't able to go into and stay in torpor (reducing its body temperature and metabolic rate over the winter), its health is easily compromised.

Neonics are a new threat to bats, in addition to the threats we've known about for a while. More research is needed to understand how this new threat impacts bats and what can be done to reduce the threat. We also need to rethink how we are producing our food and build environmental sustainability into agricultural systems. Bats are important allies to food production and keeping them safe from impacts of modern farming practices will also benefit farmers.

Natural habitat on farmland provides important foraging opportunities for bats.
PHOTO: GETTY IMAGES

Northern Long-eared Myotis foraging.
PHOTO: SHERRI AND BROCK FENTON