

# Neonicotinoid concentrations found in bobcats, fishers, and river otters across North Dakota demonstrate unintended consequences of insecticide use.

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## WHAT'S THE PROBLEM?

A specific type of insecticide, called neonicotinoids (nē-ō-NIK-ə-tə-noidz), have displayed detrimental side effects to their intended purpose of protecting crops. Neonicotinoids, also known as neonics, are a class of neurotoxic insecticides that coat agricultural seeds and easily dissolve in water. When the seed contacts water, the neonics leave the seed's surface, entering the soil and our waterways.

In the race to make farming more efficient, neonics have risen in popularity. In North Dakota, 65% of land is planted with wheat, corn or soybeans. More than 90% of this crop ground is treated with neonics.

It has been shown that neonics have negative effects on insects, fish, amphibians, birds, and mammals. Little is known about how these agrochemicals can build up within species that did NOT directly ingest the treated seeds.

## LAND IN ND

**65%**   
of land area in North Dakota is cropland (corn, soybean, wheat)

**90%**   
of that cropland is treated with neonics

## WHAT WAS STUDIED?

Researchers, including Ecdysis Foundation, investigated how neonics accumulate in predatory mammals across North Dakota. The main species of focus were fishers, river otters, and bobcats. These species were selected because they have different dietary preferences.



**Fishers** are opportunistic predators, meaning they eat a wide variety of prey depending on availability.



**River otters** primarily consume fish.



**Bobcats** are strictly carnivores.

A total of 312 individual mammals were analyzed. Predators were lawfully acquired from hunters and trappers, then frozen before analyzing. Researchers examined:

1. Whether neonics were present in the spleens of these predators, and if so, at what concentrations.
2. Whether the presence and concentration of neonics varied by age, sex, distance from water, time of year, and species.

## WHAT DID ECDYSIS FOUNDATION DO?

In 2020, Ecdysis tested the spleens of these predators to determine whether they contained neonicotinoids and, if so, at what levels. Spleens have been found to retain neonics more consistently than other organs.

## WHAT DID RESEARCHERS FIND?

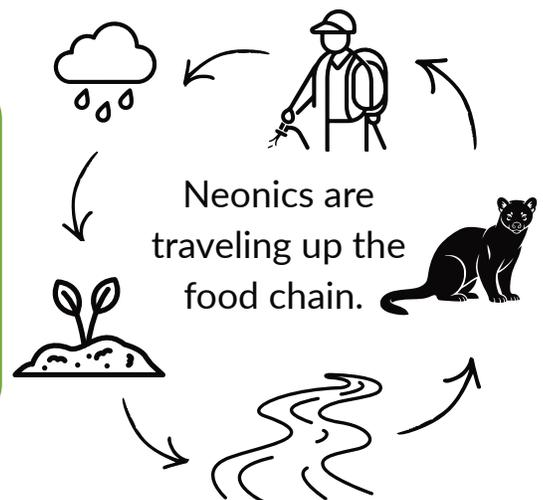
Neonics were detected in 15% of fishers, 35% of river otters, and 13% of bobcats. The higher detection rate in otters may be due to their increased exposure to neonic-contaminated water.

When examining neonic concentrations in the spleen, fishers (4.07 ng/g) had the highest average concentration, followed by river otters (3.33 ng/g) and bobcats (3.25 ng/g).

Researchers found age, sex and time of year were not significant predictors for neonic detection in fishers and bobcats. However, for river otters, the likelihood of neonic detection could be predicted based on the time of year and their distance to water. Higher water flow may dilute neonics, leading to reduced concentrations of neonics in river otters compared to fishers. Additionally, neonic concentrations in river otters peaked around July 1st, aligning with a prominent period when agricultural inputs are applied to fields.

## WHAT DID THE RESEARCH SHOW?

This research supports previous findings that neonics contaminate waterways and accumulate within higher-level predators. While these chemicals are intended to protect crops, their movement through soil, water, and food webs demonstrates broader ecological consequences. Neonic concentrations found in predators show neonics are traveling up the food chain.



## WHAT CAN FARMERS DO?

Other research by Ecdysis Foundation shows farmers have seen success alleviating pest pressure by implementing regenerative practices instead of relying on neonic-treated seeds. Increasing crop rotations, planting diverse cover crops, and maintaining living roots in the soil can promote beneficial insect populations and eliminate the need for neonic use.

## FOR MORE INFORMATION

Michel, E.S., Jensen, W.F., Bahnson, C. et al. Widespread exposure to neonicotinoid insecticide in bobcats (*Lynx rufus*), fishers (*Pekania pennanti*), and river otters (*Lontra canadensis*) in North Dakota, USA. *Ecotoxicology* 35, 36 (2026). <https://doi.org/10.1007/s10646-025-03020-5>

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