



The Eastern newt (*Notophthalmus viridescens*) is an eastern U.S. salamander species that is highly susceptible to Bsal, based on laboratory studies. Photograph credit: Brad Glorioso, USGS

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Saving Salamanders: Vital to Ecosystem Health

By Marisa Lubeck

Amphibians—the big-eyed, swimming-crawling-jumping-climbing group of water and land animals that includes frogs, toads, salamanders and worm-like caecilians—are the world’s most endangered vertebrates.

One-third of the planet’s amphibian species are threatened with extinction. Now, these vulnerable creatures are facing a new foe: the *Batrachochytrium salamandrivorans* (Bsal) fungus, which is the source of an emerging amphibian disease that caused the die-off of wild European salamander populations.

The Bsal fungus has not yet appeared in U.S. salamander populations. However, scientists caution that without preventive measures, the fungus is likely to emerge via the international pet trade or through other human activities. From 2010 to 2014, over 750,000 salamanders were legally imported into the United States.

Salamanders control pests by eating insects like mosquitos and by becoming food for larger animals. Their moist, permeable skin makes salamanders vulnerable to drought and toxic substances, so they are exceptional indicators of ecosystem health. The health of important ecosystems, including forests and wetlands, contributes billions of dollars to the economy by supporting the fishing and timber industries and recreation.

“If we lose salamanders, we lose an important part of what keeps many of our forests and aquatic ecosystems vital, along with the benefits those ecosystems provide for the American people,” said Jason Goldberg, a U.S. Fish and Wildlife Service (USFWS) biologist.

The Salamander Situation

The Bsal fungus was identified in 2013 as the cause of mass wild salamander die-offs in the Netherlands and Belgium. Bsal likely originated in Asia and spread to wild European populations through the global import and export of salamanders.

The risk of Bsal is highest for the Pacific coast, the southern Appalachian Mountains, and the mid-Atlantic regions.

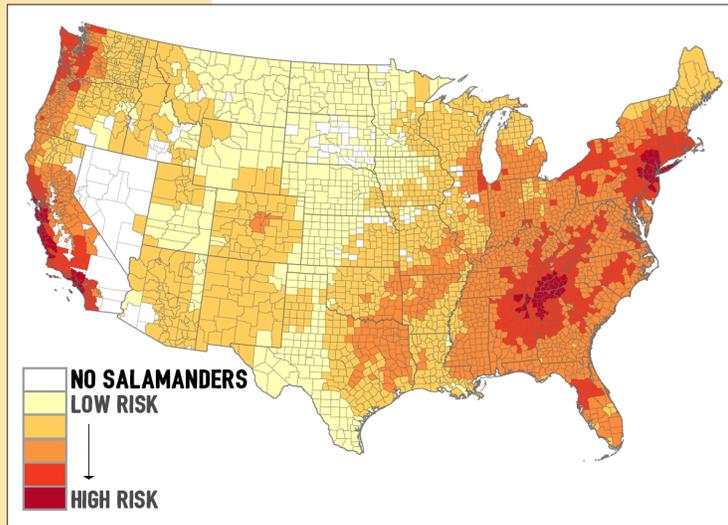
“Because of the devastating effect that we expect Bsal will have on native United States salamanders if introduced, there is an urgent need to ensure it does not establish,” Goldberg said.



The rough-skinned newt (*Taricha granulosa*) is a western U.S. species of salamander that is highly susceptible to Bsal, based on laboratory studies. Photograph credit: Teal Waterstrat, U.S. Fish and Wildlife Service

A Proactive Policy

In January 2016, the USFWS issued a rule that lists 201 species of salamanders from 20 genera as injurious wildlife under the



This map shows the total relative risk of Bsal by U.S. county. Credit: USGS, Katie Richgels et. al.

USGS NWHC scientists act as wildlife disease detectives, investigating the cause of death during die-offs and screening sick or dead animals for infectious diseases.

Disease Detectives and Rapid Responders

What if Bsal does arrive in the United States?

In 2015, the USGS Amphibian Research and Monitoring Initiative (ARMI) proactively led a workshop, developed a report, and helped establish a task force to coordinate a response to Bsal.

Furthermore, USGS NWHC scientists act as wildlife disease detectives, investigating the cause of death during die-offs and screening sick or dead animals for infectious diseases.

“The USGS research plays a much bigger role in helping understand disease and amphibian ecology that goes beyond its influence on the USFWS salamander rule,” Goldberg said. “Early detection can help ensure that decisive steps can be taken to attempt to quickly eradicate Bsal if it’s ever found in the United States.”

Based on the risk assessment, the ARMI and NWHC are conducting an intensive national Bsal survey.

Lacey Act. This rule prohibits the importation or interstate transport of the listed species and samples derived from them unless a permit is issued.

“The rule minimizes opportunities for Bsal to be introduced, established, and spread in the United States,” Goldberg said.

The USFWS used a Bsal risk assessment published by the U.S. Geological Survey (USGS) National Wildlife Health Center (NWHC) and the USGS Nonindigenous Aquatic Species (NAS) database to help inform its rule.

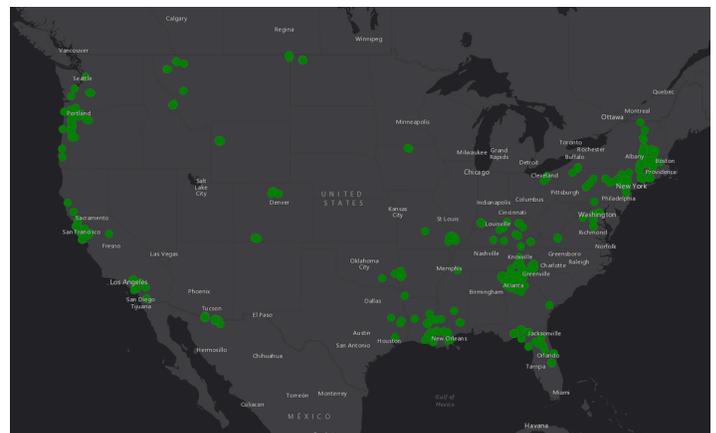
“The NAS site showed us that salamanders had been found outside of their native United States range,” Goldberg said. “That evidence was useful to our finding that Bsal could establish and spread in the country.”

By understanding the Bsal threat before a potential arrival, wildlife managers have a critical advantage in fighting the disease.

“ARMI has been doing most of the Bsal surveillance sampling on USFWS refuges, and the NWHC has been heavily involved in testing those samples,” Goldberg said.

Still, the Bsal threat raises numerous questions that have yet to be answered.

“Understanding which other species might be carriers, ensuring early detection of Bsal, should it arrive here, rapidly responding if a detection is found, and finding new ways to protect amphibians are all crucial efforts where the USGS can continue to play a key role,” Goldberg said.



This map shows the sites where Bsal surveillance sampling by the USGS Amphibian Research and Monitoring Initiative has been conducted. Credit: USGS

Contact:

Anne Kinsinger

Associate Director

Ecosystems Mission Area

Email: akinsinger@usgs.gov

Phone: 703-648-4051