

# Canaries and Trout: What's the Connection?

A long time ago, coal miners used to carry caged canaries to test the air. If the canary lived, the air was safe to breathe. The miners knew they could work safely. If the canary died, they knew they were in trouble. They used canaries as "indicators." Bad air in the mine hurt the birds before it would hurt the people. Biologists call these critters "indicator species."

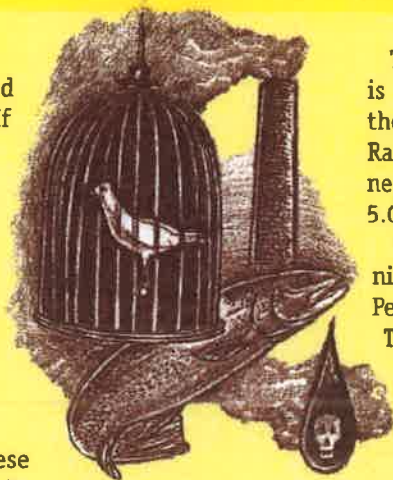
That means they are sensitive to changes in their habitat. Indicators "tell" us something is wrong.

Trout are good indicators of the health of our coldwater streams. They are very sensitive to changes in their habitat. The things trout eat are also good indicators. Stoneflies are very sensitive

to pollution. A minnow called a blacknose dace is also very sensitive. If biologists find these things in good numbers, they say that the water quality is good. When trout and the things they eat begin to disappear, something is wrong.

Some streams that should have trout, don't. We think the culprit is acid rain. Acid rain is formed when we burn things like coal. Oddly, that coal comes from mines where the canary was used long ago. Coal is very important. We use it to heat our homes and generate electricity. Coal is also used in making chemicals and things like blacktop for roads and playgrounds.

We call coal, oil, and natural gas fossil fuels. Fossil fuels contain the chemicals sulfur and nitrogen. Sulfur and nitrogen get in the air when we burn fossil fuels. They mix with water in the clouds far above the earth. That makes sulfuric acid and nitric acid. Rain, snow, sleet, hail, fog, dew, and frost then become more acidic when they touch the earth.



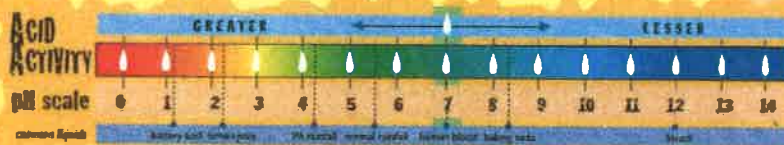
The term used to measure acidity is pH. Normal pH is 7.0. This means there is little acidity present. As the numbers drop toward zero, acidity increases. Rainbow trout need a pH of 6.0 or higher. Brown trout need a pH of 5.5 or higher. Brook trout need a pH of 5.0 or higher.

The acidity of the rain increases if large amounts of nitrogen and sulfur enter the atmosphere.

Pennsylvania's rainfall on many days is below pH 5.0.

That's lower than the pH needed even for a brook trout to survive. Luckily for the fish, many streams and the land they drain have things called buffers. A buffer cancels the effects of the acid.

That's like taking Alka-Seltzer when you have a stomach ache. The rocks and soil in the watershed act just like the Alka-Seltzer.



Many soils and the streams that drain the soils have no or little buffering. Many of them are in the western and northeastern parts of Pennsylvania. As the rain continues year after year, the pH in the streams becomes lower and lower. Trout populations become smaller and disappear. The "canaries" are gone.

Just like the miners, the United States Congress and industry paid attention to our "canaries" and put strict regulations in place to prevent more damage. In 1990, Congress made changes to the Clean Air Act that should reduce sulfur and nitrogen emissions. These changes came after many years of discussion about acid rain, its causes, and effects. Now that government and industry are doing their share, you should, too. You can do that by conserving electricity. Carpooling, walking, or riding your bike can also help. These things reduce how much oil or gasoline that we burn.

**Canaries and trout—they do have something in common!**



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