

CROSS-DISCIPLINARY CONNECTION

Liming Streams

In 1987, Dr. Ken Simmons tested some rainbow trout in the waters of north-central Massachusetts' Whetstone Brook. He placed the trout in cages in the brook so that their behavior and survival could be monitored. Three days later, they were dead. Acid rain had lowered the pH level of the water to a point at which the trout simply could not survive.

Acid rain begins with the fossil fuels that we burn to power our cars and factories. Those fuels release combustion products that contain sulfur and nitrogen that combine with the water vapor in the atmosphere and turn the vapor acidic. The pH level of normal rainwater is about 5.5, but levels as low as 4.3 have been recorded.

Acid rain lowers the brook's pH level, which significantly affects most of the organisms living in the brook. Some fish, such as the rainbow trout, simply die. Other species, such as Whetstone's brown trout, will not spawn in acidic waters.

In 1987, brown trout did not spawn in Whetstone Brook. The pH level of the brook averaged 5.97 that

year. The population of all the trout dropped significantly. In 1989, Dr. Simmons and other researchers instituted an experiment to decrease the acidity of the stream. They created a system to continuously add calcium carbonate, or limestone, in measured amounts to part of the brook. The limestone, which was ground into a powder, immediately reacted with the acid, which raised the pH level of the water.

The experiment lasted three years and managed to raise the average pH level of the stream from 5.97 to 6.54, which met the scientists' goal.



▲ Biologists studied trout to determine the effectiveness of liming Whetstone Brook to raise the pH.

At the same time, the concentration of aluminum ion, which is toxic to trout, in the limed area decreased, while it increased in untreated parts of the brook.

The success of the project was most convincingly demonstrated by the stream's residents. The population of brook trout increased; the mortality rate of brown trout decreased, and for the first time in years, fish actually began to move into the stream from its source, the Millers River. In 1991, Dr. Simmons again tested rainbow trout in the waters of the Whetstone. This time, they all survived.

"We clearly don't view it as a solution," says Dr. Simmons. "It's a band-aid approach, but we need data to make intelligent management decisions as to how useful or harmful liming could be. And I think that is the key thing this study has shown. It has provided us with information that we can use."

Questions

1. Describe two possible benefits of adding measured amounts of CaCO_3 , a base, to an acidified stream.
2. What elements are responsible for acid rain? How do they get into rainwater?