Chloride In Big Darby Creek Has Increased Three-Fold In Past 40 Years

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(PhysOrg.com) -- Chloride levels in central Ohio's Big Darby Creek were three times higher in 2007 than the levels recorded in the late 1960s, and have more than doubled since 1992, according to an analysis conducted at Ohio State University.

The increase in chloride has coincided with residential development in the Big Darby watershed, and could be caused by a combination of road salts draining into the creek and other effects of a growing human population in the area, researchers suggest.

The researchers are not sounding any alarms – the chloride remains far below harmful levels – but instead say that a sustained program of monitoring the river's water quality makes sense as traditionally agricultural land gives way to residential use.

The chloride detected in Big Darby Creek and its tributary, Little Darby Creek, does not appear to threaten freshwater life. The highest levels of chloride recorded in the study are well below the recommended upper limit of 250 parts per million established to protect life in freshwater streams and rivers, said Catherine Maxwell, a senior in earth sciences at Ohio State and coauthor of the study.

Portions of the Big Darby and Little Darby creeks are designated as state and national scenic rivers and are home to about a dozen endangered fish and mollusk species, according to the Ohio Environmental Protection Agency.

“Ecologically, the Big Darby is very diverse, which makes the quality of the water very important,” Maxwell said. “Recently there’s been development into the watershed, which should affect the chemistry of the stream. So it’s important to monitor that and quantify the data so it’s there for people to use.”

Maxwell also found that over the same 40-year time period, nitrate concentrations have remained relatively steady in both Big Darby and Little Darby creeks since they decreased dramatically from their maximum in 1965. This suggests that the impact of nearby agricultural land use on Big Darby water quality hasn’t changed much over the years, Maxwell said. The presence of nitrate in fresh water is generally associated with fertilizer use.

Maxwell presented her findings Oct. 7 at the Geological Society of America joint meeting in Houston.

Maxwell’s search for data on Big Darby water quality showed that measurements of certain compounds have been sporadic over the years. She found data from each decade since the 1960s, but most of it was conducted in a piecemeal way.

For her study, she took samples every two weeks from the Big Darby and Little Darby creeks throughout 2007, measuring levels of nitrate, chloride, sulfate and fluoride. The chloride levels stood out among the rest.

When compared to historic levels, the study showed chloride had increased in Big Darby Creek from a low of 20 parts per million in the late 1960s to a high of 80.7 parts per million in 2007. The maximum chloride level in Little Darby Creek reached 29 parts per million in 2007, up from 14 parts per million in the 1960s but down from a high of 40 parts per million in the 1980s.

Seasonal trends showed the chloride levels rose in Little Darby Creek during the winter, and in Big Darby Creek, higher concentrations of chloride were seen from winter into the following fall.

“This higher chloride concentration may be related to the continual leaching of winter-applied road salt from major highways draining into the creek,” Maxwell said.

Though the study does not specifically correlate residential development and chloride levels, earlier studies have shown similar trends in other states, said Berry Lyons, professor of earth sciences at Ohio State and Maxwell’s adviser on the project.

“This is a phenomenon seen over most of the northeastern United States in the last 20 to 40 years,” Lyons said. “Previous research has shown that an increase in chloride in Northeast and Mid-Atlantic states is related to the increased use of road salts over time. Others have shown that an increase in population is related to increased chloride in nearby streams.

“We can’t say where it’s coming from here, but based on what we know from other areas, we suspect that the growth of the Columbus metropolitan area with the subsequent increased use of road salt is probably having some impact.”

Provided by Ohio State University