Department of the Interior
United States Geological Survey

Prepared in cooperation with the Kentucky Geological Survey
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Water Resources Investigation
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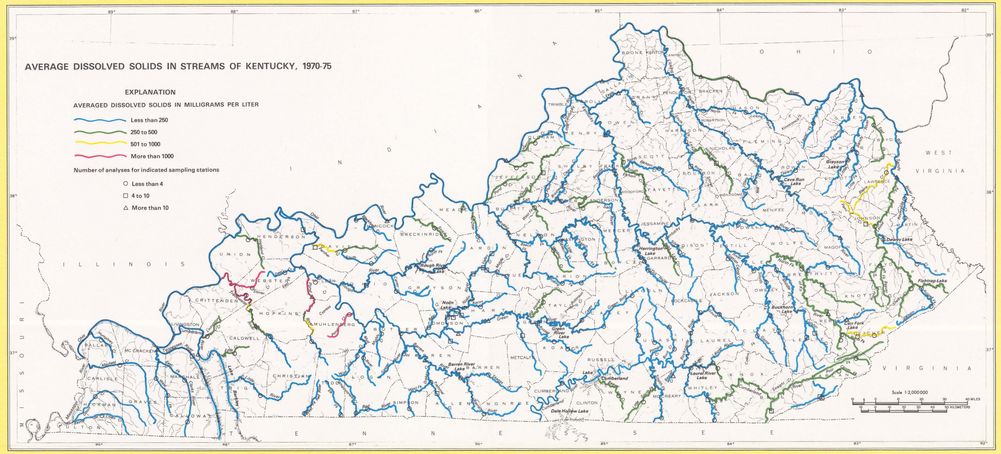

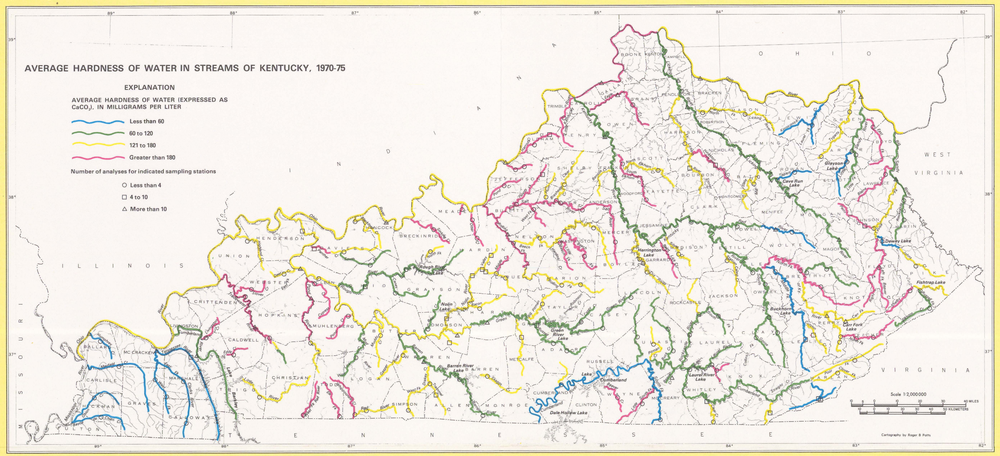

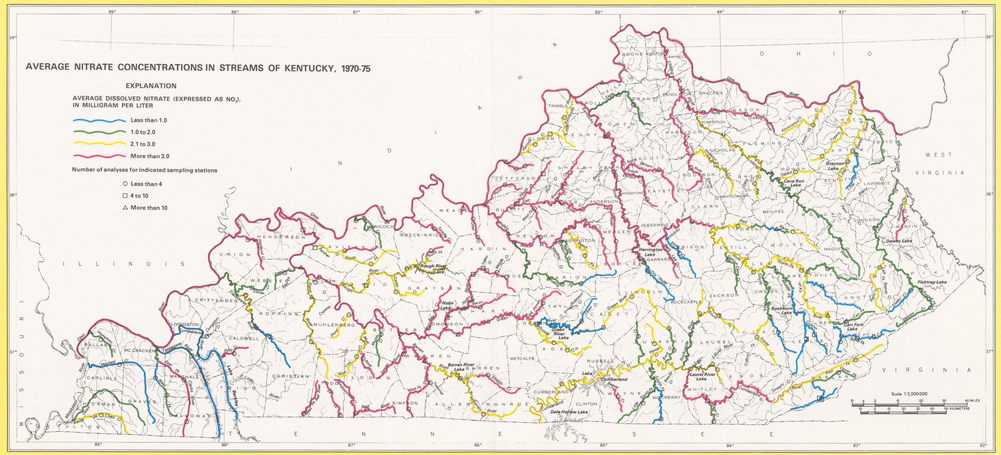

SELECTED CHEMICAL QUALITY CHARACTERISTICS IN STREAMS OF KENTUCKY, 1970-75

Compiled by John F. Santos

INTRODUCTION

Water-quality data from streams in Kentucky have been collected since 1949 by the Water Resources Division of the U.S. Geological Survey in cooperation with the Corps of Engineers, U.S. Army, Kentucky Department for Natural Resources and Environmental Protection, National Park Service of the U.S. Department of Interior, and U.S. Forest Service, U.S. Department of Agriculture. Since 1958, cooperation has been mainly with the Kentucky Geological Survey.

This report summarizes selected water-quality data from more than 100 streams with drainage areas in excess of 100 square miles (259 square kilometers). The data were collected from 1970-75 and are published by the U.S. Geological Survey in a series of annual reports (Water Resources Data for Kentucky, part 2, 1970, 1971, 1972-73, 1974; Water Resources Data for Kentucky Water Year 1975). The report is intended to provide water users with state-wide maps of certain water-quality characteristics. Because the maps are based on average values obtained from three or more samples at each site, care should be exercised in using the data for specific applications.

CHEMICAL QUALITY OF WATER

The chemicals in water are derived from several sources. For example, falling rain dissolves and absorbs chemicals and gases from the atmosphere, and upon contact with the earth, the water continues to dissolve substances on its way to a stream. People add to the chemical load in streams by activities such as domestic and industrial waste disposal, mining, highway construction, and agricultural practices.

In some areas, ground water may contribute a significant part of the streamflow. Ground water is generally characterized by concentrations of dissolved solids higher than those of surface water. For example, ground water in much of Kentucky occurs where limestone is the principal formation and the solution of calcium carbonate increases its dissolved-solids concentration.

Dissolved Solids

Dissolved solids are a measure of the amount of chemicals contained in water. Although the U.S. Environmental Protection Agency (1976) does not recommend a maximum limit for dissolved solids concentration in domestic water supplies, water having a dissolved solids concentration greater than 1,000 milligrams per liter (mg/l) may have an unpleasant taste.

Most of Kentucky's streams have an average dissolved solids concentration of less than 250 mg/l. Most streams containing average dissolved solids concentrations greater than 250 mg/l drain areas where mining activity has or is taking place. In some isolated cases high dissolved solids can be attributed to municipal or industrial waste disposal. The range in the average dissolved solids concentrations was from 51 to 2,720 mg/l. Figure 1 shows the average dissolved solids concentration in streams of Kentucky.

Hardness

Water that forms curds with soap is said to be "hard water." Hardness can be caused by many chemicals, but generally the principal ones in water calcium and magnesium.

The U.S. Geological Survey, (Durfor and Becker, 1964) classifies hardness of water as follows:

Hardness as $CaCO_3$ (mg/l)	Classification
0 - 60	Soft
61 - 120	Moderately hard
121 - 180	Hard
181 +	Very hard

The range of the average hardness was from 22 to 1,700 mg/l. Although there is no general trend throughout the State, most of the streams range from "moderately hard" to "hard." The average hardness of water in streams of Kentucky is shown in figure 2. In Kentucky streams, calcium is more abundant than magnesium.

Nitrate

Nitrate is the end product of the oxidation of organic nitrogen compounds. It can occur naturally in streams, in untreated and treated effluent from industrial and municipal wastes, and in some minerals. Nitrate is a plant nutrient and is partly responsible for algal blooms in lakes and streams. Nitrate (as nitrate) in concentrations in water greater than 45 mg/l is reported to be harmful to infants (Walton, 1951). As recommended by the U.S. Environmental Protection Agency (1976), the maximum limit of nitrate-nitrogen in domestic water supplies is 10 mg/l (45 mg/l as nitrate). None of the Kentucky streams included in this study exceeded the recommended maximum. Average nitrate (as nitrate) concentrations ranged from 0 to 17 mg/l, although most of the samples did not exceed 10 mg/l. Figure 3 shows the average nitrate (as nitrate) concentration in streams of Kentucky.

SELECTED REFERENCES

Durfor, C.N. and Becker, Edith, 1964, Public water supplies of the 100 largest cities in the United States, 1962: U.S. Geological Survey Water-Supply Paper 1812, 364 p.

National Academy of Sciences and National Academy of Engineering, 1974, Water quality criteria 1972: U.S. Government Printing Office, p. 594.

U.S. Environmental Protection Agency, 1975, National interim primary drinking water regulations: Federal Register, v. 40, no. 248, p. 59566-59588.

_____1976, Quality Criteria for water, 256 p.

U.S. Geological Survey, 1970, Water resources data for Kentucky, pt. 2, water quality records, 173 p.

_____ 1971, Water resources data for Kentucky, pt. 2, water quality records, 138 p.

_____ 1972-73, Water resources data for Kentucky, pt. 2, water quality records, 217 p.

_____, 1974, Water resources data for Kentucky, pt. 2, water quality records, 126 p.

_____ 1975, Water resources for Kentucky water year 1975, U.S. Geological Survey water-data rept., KY-75-1.

Walton, G., 1951, Survey of literature relating to infant methemoglobinemia due to nitrate contaminated water: American Journal of Public Health, v. 41, p. 986-996.

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