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Department of Agronomy

# Soil Science News & Views



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## Has The Nitrate-Nitrogen in Streams Draining Agricultural Watersheds in Kentucky Changed in the Last 18 Years?

Grant W. Thomas, Gerald R. Haszler and James D. Crutchfield

In 1971 and 1972, we sampled streams across Kentucky for nitrate-nitrogen ( $\text{NO}_3\text{-N}$ ) during the high-water flow months of January through June. The results were variable and showed a dominant effect of geology and lesser effects of both time and land use on the results. Since that time, use of fertilizer nitrogen (N) has nearly doubled in Kentucky and, further, there is a high degree of concern among the public that  $\text{NO}_3\text{-N}$  from fertilizer use may be contaminating streams. The US Environmental Protection Agency has set a maximum of 10 ppm  $\text{NO}_3\text{-N}$  in water as being safe for human consumption.

Because of that concern, we again began a monthly sampling of the same streams in December 1989 with the intention of determining what changes might have occurred since 1971-72. At the moment, we have completed five months of data which are shown in table 1. In no case are the values higher than the average of those found in 1971-72, and in three cases (Flat, Plum and Rose Creeks) the values are lower than they were 18 years ago when use of fertilizer N was lower. Cave Creek with a watershed that is practically 100% in horse pasture, is still the highest by far in  $\text{NO}_3\text{-N}$ , as it was 19 years ago. The Perry and Rose Creek watersheds that have the highest amount of row crops, (and arguably, the greatest fertilizer N use) show significant quantities of  $\text{NO}_3\text{-N}$ , but Rose creek is definitely lower than before and Perry creek has not changed.

One factor that has changed in the past 19 years is a new subdivision constructed along Perry creek which is served by a small sewer treatment plant. Water samples taken above and below the sewage outlet in Perry creek are shown in table 2. It is clear that sewage from the subdivision is making a measurable difference, particularly during low flow (December).

### Summary

Although our current data are preliminary, they show clearly that there has been no increase in  $\text{NO}_3\text{-N}$  in the same streams sampled 18 and 19 years ago. In three of the seven streams  $\text{NO}_3\text{-N}$  nitrate-nitrogen appears to have dropped. Cave Creek, which has virtually no row crops nor houses in its watershed still shows the highest  $\text{NO}_3\text{-N}$  of all seven streams sampled. The average of six streams studied by McHargue and Peter in 1921 in the Inner Bluegrass was 5.5 ppm of  $\text{NO}_3\text{-N}$ . The grand average of 1971, 1972 and 1989-90 data gathered thus far gives an average of 5.11 for Cave Creek. Obviously, geology is an important factor in the level of nutrients in streams.

Table 1. Nitrate-Nitrogen in Kentucky Streams in 1971-1972 and 1989-90.

Stream	County	1989	1990				1971	1972	Avg	Avg
		Dec	Jan	Feb	Mar	Apr			1971-72	1989-90
----- ppm NO <sub>3</sub> -N in water -----										
Cave Creek	Fayette	3.90	4.89	4.35	5.25	3.46	6.48	4.48	5.48	4.37
Flat Creek	Franklin	0.31	0.26	0.19	0.38	0.18	2.57	0.49	1.53	0.26
Plum Creek	Spencer	1.23	0.87	0.14	1.30	0.42	2.78	1.08	1.93	0.79
McGills Creek	Lincoln	0.61	1.02	0.67	0.99	2.61	1.54	0.48	1.01	0.78
W. Bays Fork	Allen	0.94	1.16	0.79	1.06	1.69	1.90	0.64	1.27	1.13
Rose Creek	Hopkins	0.05	1.83	1.50	2.75	0.80	5.79	2.74	4.27	1.39
Perry Creek	Graves	0.05	1.91	2.32	1.53	0.49	1.76	0.93	1.35	1.26

Table 2. Effect of sewage effluent on NO<sub>3</sub>-N Content of Perry Creek.

Month	Above Sewage Effluent	Below Sewage Effluent
----- ppm NO <sub>3</sub> -N -----		
Dec., 1989	0.05	8.80
Jan., 1990	1.91	--
Feb., 1990	2.32	2.39
Mar., 1990	1.53	2.33
Apr., 1990	0.49	2.85

  
 Extension Soils Specialist



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