Pesticide Concentrations in Canajoharie Creek, New York 1994-96

USGS

Introduction

From 1994 through 1996, the U.S. Geological Survey conducted a study of pesticides in Canajoharie Creek as part of the National Water Quality Assessment (NAWQA) program in the Hudson River Basin. A primary objective of the NAWQA program is to describe the status and trends in the quality of representative parts of the Nation's surface-water resources and to provide a scientific understanding of the major natural and human factors that affect the quality of these resources. This fact sheet (1) presents results of pesticide analyses of samples collected from Canajoharie Creek, which drains a 155 km^2 watershed in central New York, that is 66 percent agricultural land, and (2) illustrates the importance of obtaining storm-runoff samples soon after pesticides are applied.

Canajoharie Creek was selected for study because (1) the percentage of agricultural land in the watershed is typical of that found within 20 km of the Mohawk River, the largest tributary to the Hudson River (fig. 1), and (2) the occurrence of certain pesticides in Canajoharie Creek is considered representative of pesticides found in other agricultural watersheds in the Mohawk River subbasin. (Wall and Phillips, 1996). ♦

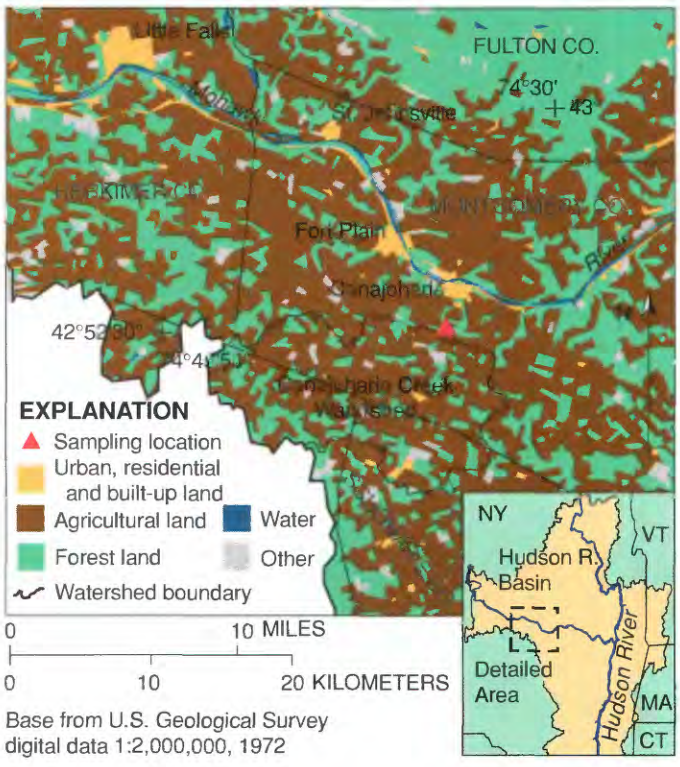

Figure 1. Land use and location of sampling site in Canajoharie Creek watershed, New York

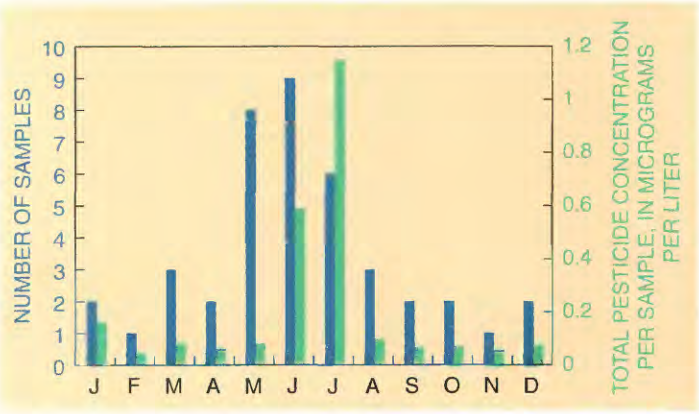

Figure 2. Monthly pesticide sampling statistics – March 1994 through March 1996. Total pesticide concentration per sample is calculated as the sum of all pesticide concentrations detected for a given month divided by the number of samples collected during that month.

Pesticide Sampling

Water samples collected from Canajoharie Creek were analyzed for 47 pesticides (both herbicides and insecticides); a complete list is given in Firda and others (1994). Herbicides are used to control weeds in agricultural fields as well as on lawns, commercial land, and other open areas in urban and residential settings; insecticides are used to control insects in agricultural and urban settings.

Canajoharie Creek was sampled at one location (fig. 1) weekly or monthly for pesticides from March 1994 through March 1996. It was sampled eight times from June 7-11, 1996 during the first storm runoff after pesticide application. The creek was sampled twice during the previous two years (July 1, 1994 and June 3, 1995) under similar runoff conditions. ♦

Results of Pesticide Sampling

Results from the 2 years of sampling are summarized in figure 2 and table 1. Most samples were collected during May, June, and July, when pesticides commonly are applied to agricultural fields. As expected, the total pesticide concentration per sample was highest during June and July; it was higher in July than in all other months because a sample collected on July 1, 1994, contained higher concentrations of atrazine†, deethylatrazine (a breakdown product of atrazine), metolachlor, and simazine than any other sample collected during the 2-year period. Except for EPTC, the

†Use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Table 1. Concentrations of pesticides in water samples from Canajoharie Creek, New York
[µg/L - micrograms per liter, na - data not available]

Pesticide	Detection limit (µg/L)	MCL/HA[1] (µg/L)	March 1994 -March 1996				June 7-11, 1996			
			Number of samples	Percentage of samples with detection	Concentration (µ/gL) Median of detections	Maximum	Number of samples	Percentage of samples with detection	Concentration (µ/gL) Median of detections	Maximum
Atrazine	0.001	3 / 3	40	100	0.040	4.3	8	100	3.2	20
Metolachlor	0.002	na / 70	40	100	0.019	1.3	8	100	0.535	3.1
Deethylatrazine	0.002	na / na	40	97.5	0.015	0.22	8	100	0.036	0.10
Cyanazine	0.004	na / 1	41	46.3	0.022	2.1	8	100	0.400	0.85
Diazinon	0.002	na / 0.6	34	32.4	0.009	0.035	8	0	–	–
Metribuzin	0.004	na / 100	41	4.9	0.027	0.033	8	0	–	–
Simazine	0.005	4 / 4	41	4.9	0.013	0.018	8	75.0	0.028	0.12
EPTC	0.002	na / na	40	2.5	0.004	0.004	8	0	–	–
Pendimethalin	0.004	na / na	41	2.4	0.035	0.035	8	87.5	0.026	0.061
Alachlor	0.002	2 / na	41	2.4	0.002	0.002	8	100	0.020	0.048
Carbaryl	0.003	na / 700	41	0	–	–	8	12.5	0.008	0.008

[1]**MCL** - Maximum permissible level of a contaminant in water which is delivered to any user of a public water system;
HA - Concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure.

maximum concentrations of all pesticides, between March 1994 and March 1996, occurred during periods of storm runoff in June or July.

Samples collected in June 1996 contained the highest observed concentrations of atrazine, metolachlor, simazine, pendimethalin, alachlor, and carbaryl (table 1) to date. Only two samples collected during the 2-year period before June 1996 contained a pesticide concentration above any health advisory level or maximum contaminant level (MCL) (table 1) established by the U.S. Environmental Protection Agency (1996). Five storm runoff samples collected over 9.5 hours on June 10, 1996, exceeded the MCL for atrazine. The absence of metribuzin and EPTC in samples collected on June 10 was not surprising in that these pesticides had been detected in only three samples in previous years. The absence of diazinon in the June 1996 samples could reflect the time of year at which it is applied, 55 percent of the detections (6 samples) were during April and May, and (or) a change in diazinon use in the watershed (73 percent of detections were in 1994).

The calculated atrazine load (mass of atrazine passing the sampling location) during a 14-hour period on June 10, 1996 was 1.0 kilogram, a disproportionate amount compared to a load of 0.028 kilograms during a 60 day low-flow period the previous year (June 12 to August 11, 1995). The number of samples collected from March 1994 through March 1996 was insufficient for an accurate estimation of annual pesticide loads, but the 14-hour load on June 10, 1996 probably represented a significant part of the total annual load for 1996. ♦

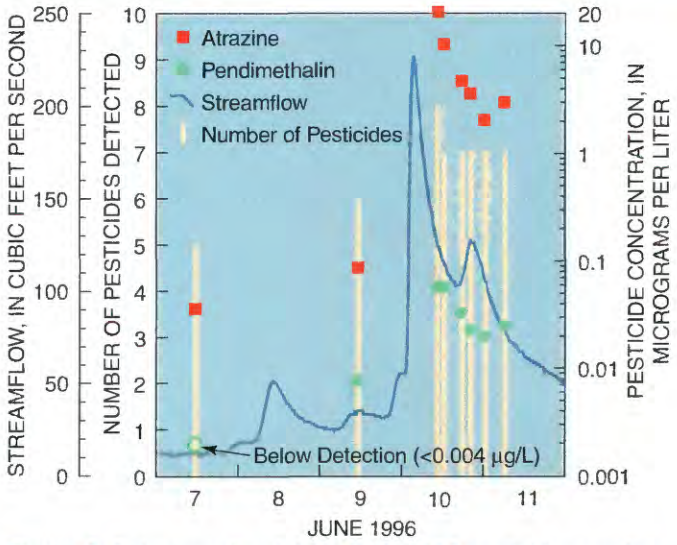

Figure 3. Select results of June 7-11, 1996 pesticide sampling

– Gary R. Wall and Patrick J. Phillips

References Cited

Firda, G. D., Lumia, R., Murray, P. M., and Freeman, W. O., 1994, U.S. Geological Survey Water Resources Data, Volume 1, NY-94-1, 488 p.

U.S. Environmental Protection Agency, 1996, Drinking Water Regulations and Health Advisories: Environmental Protection Agency, 822-B-96-002, 10 p.

Wall, G. R. and Phillips, P. J., 1996, Pesticides in Surface Waters of the Hudson River Basin, New York and Adjacent States. U.S. Geological Survey Fact Sheet, FS-238-96, 4p. ♦

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This fact sheet and related information can be found on the World Wide Web at: *http://ny.usgs.gov*