

A maximum of 1.6 pounds a.i. per acre per year is recommended on soil with less than 30 percent plant residue remaining on the surface. Most non-cropland uses of atrazine are no longer recommended under the label. This label change was effective with all products shipped for use after August 1, 1992.

As a result of these two voluntary label changes, the maximum application rate for atrazine on corn and sorghum has essentially been reduced by 50 percent since the 1989-90 studies were conducted. However, no information is available to determine if atrazine was always applied at the maximum recommended rate. There is reason to believe, however, that there has been a substantial reduction in the per acre application rate of atrazine since the 1989-90 regional studies of atrazine in streams. Further, assuming there has been no substantial increase in the acres planted in corn and sorghum in the 1989-94 time period, there should have been a substantial overall reduction in the use of atrazine. This could be reflected in an overall reduction in atrazine concentrations in Midwestern streams. The 50 sites sampled in 1989 and 1990 provide a good data set from which to determine if there has been a measurable decrease in atrazine concentrations.

Conversely, the use of other herbicides, such as cyanazine has increased since 1989. According to data from the U.S. Department of Agriculture (USDA), the estimated use of cyanazine on corn and sorghum increased from 20.7 million pounds a.i. per year in 1989 to 26.7 million pounds a.i. per year in 1992 (Gianessi, 1992; USDA, 1990, 1991, 1992), an increase of more than 25 percent. Data from these sources also indicate that the use of metolachlor has increased since 1989. The 1989-90 data set would also provide a baseline from which to determine if the concentrations of these herbicides in Midwestern streams have changed.

### **Nitrate in Area Affected by 1993 Flood**

The Mississippi - Missouri River flood of 1993 occurred throughout the western one-half of the area encompassed by the 1989-90 herbicide studies. It is unlikely that the 1993 flood will have any affect on concentrations of herbicides in the flood-affected streams in 1994, because herbicides are transported to streams primarily by overland runoff during a 1 to 2 month period following application rather than by ground-water baseflow. However, the 1993 flood may have an effect on nitrate concentrations in some Midwestern streams in 1994. In a study of the Raccoon River in Iowa, Lucey and Goolsby (1993) showed that during years of below-normal precipitation there appeared to be an accumulation of nitrate in the soil and unsaturated zone, and during subsequent years of above-normal precipitation some of this stored nitrate was leached into streams. This resulted in low nitrate concentrations in the Raccoon River during dry years and high concentrations during wet years. Similar observations have been made in other studies of nitrate in Midwestern streams and the Mississippi River (Goolsby and Battaglin, 1993; Goolsby and others, 1993). In most of the streams studied, nitrate concentrations increased as streamflow increased during winter and spring. Also, the highest nitrate concentrations in the Mississippi River during 1991-93 were measured during periods when streamflow was high. These results suggest that stream basins affected by abnormally high rainfall in 1993 could have higher concentrations of nitrate in 1994 than in 1989-90 if soil moisture content remains high and streamflow is above-normal. If streamflows in the spring and summer of 1994 are similar to or lower than in 1989-90, nitrate concentrations could be similar to those measured during the 1989-90 studies. A comparison of nitrate data collected in 1994 with data from these same streams in 1989-90 would provide a basis for determining if this is indeed true. The 1993 flood probably flushed a considerable amount of nitrate out of the soil, unsaturated zone, and ground water, but