

III ANALYSIS AND RESULTS, continued

Overall Results by Year

This section provides a brief graphic look at year by year patterns for the overall data set. Later sections will present the results of statistical analysis of trends site by site for each parameter within the study watersheds.

Total phosphorus concentrations showed a striking change in median and mean concentrations between 1998 and 2004. Median concentrations decreased from a high of nearly 0.03 mg/l in 1998 to a low of 0.0065 mg/l (below detection limit) in 2001 and 2002, followed by increasing concentrations in 2003 and 2004. Mean concentrations were always distinctly higher than the median, but followed a similar pattern, as did the 75th, 90th and 99.5th percentiles. In 2002, more than 75% of the data fell below the detection limit for phosphorus. The highest value (11.2 mg/l, not shown on graph) was recorded in 2001.

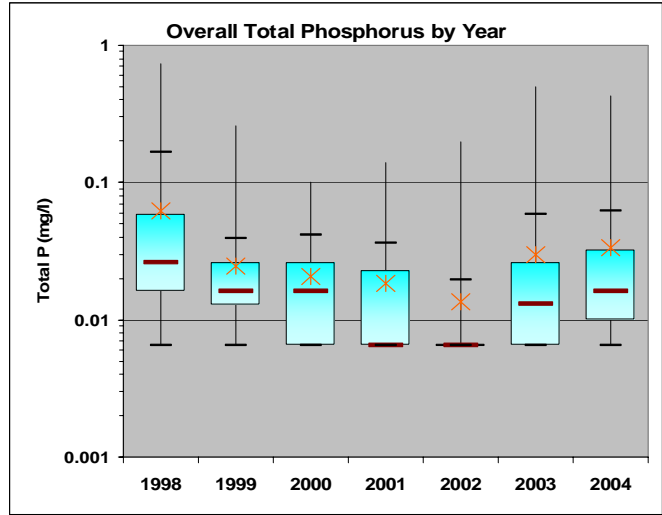


Figure 15. Total phosphorus by sampling year, all WVDA data.

As noted previously, the study period was marked by large hydrological changes. The first half of 1998, prior to the beginning of this study, was very wet, but by the time the study began the region was becoming dry and the second half of 1998 and much of 1999 was a period of extreme drought. Conditions improved between 2000 and 2002, leading into very wet conditions in 2003 and 2004. The median TP patterns shown in the graph suggest a lagging rather than rapid response of phosphorus median concentrations to these changing conditions.

Median ammonia-N concentrations varied between 0.069 and 0.095 mg/l from 1998 to 2002, then declined in 2003 and 2004 to 0.048 and 0.039 mg/l, respectively. The 75th percentile followed a similar pattern. The 90th percentile varied little between 1998 and 2003, with a modest decline in 2004. The 99.5th percentile increased sharply to nearly 3.0 mg/l in 2002 and remained above 1.0 mg/l through 2004. Mean concentrations were similar to medians through 2001, after which they were distinctly higher, reflecting an increase in the highest ammonia concentrations during the later years. The highest value (17.37 mg/l, not shown on graph) was recorded in 2002.

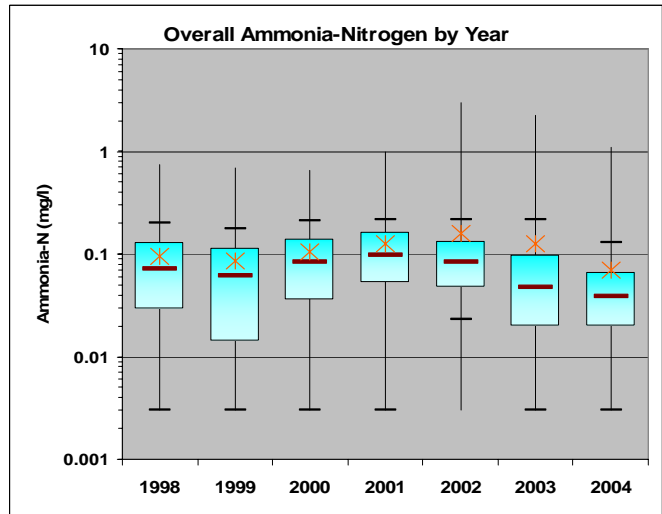


Figure 16. Ammonia-Nitrogen by sampling year, all WVDA data.

No obvious general relationship between ammonia and the large hydrological changes noted above is apparent. The largest interquartile range (24th to 75th percentile) occurred during the 1999 drought year. The two lowest medians occurred during the two wettest sampling years (2003 & 2004).

Median nitrate-N concentrations increased gradually over time from a low of 0.30 mg/l in 1998 to a high of 0.067 mg/l in 2004. The 25th and 75th percentiles followed a similar pattern. The 90th percentile peaked in 2002-2003, then fell slightly in 2004. The 99.5th percentile increased sharply to 3.70 mg/l in the drought year of 1999, and then ranged, roughly, between 2 and 3 mg/l thereafter. The highest value (11.2 mg/l, not shown on graph) was recorded in 2001.

The increasing trend in nitrate concentrations may represent an actual increase in the amount of nitrogen in the region, but might also be due to increased transport of nitrate caused by hydrological trends during the study period (page 8).

Median fecal coliform bacteria counts varied from year to year, with no obvious trends. The lowest median counts occurred in 2004 (34 cfu/100ml), followed by 1999 (45 cfu/100ml), 2000 (55 cfu/100ml), and 2002 (61 cfu/100ml). The highest median counts were seen in 2001 (102 cfu/100ml) and 2003 (87 cfu/100ml). All years except 1999 and 2004 had more than 10% of the counts above 400 cfu/100ml. The highest value (692,000 cfu/100 ml, not shown on graph) was recorded in 2003.

No obvious general relationship between fecal coliform bacteria and the large hydrological changes during the study period are apparent. The two lowest medians and 90th percentiles occurred during the drought year of 1999 and the relatively wet first half of 2004.

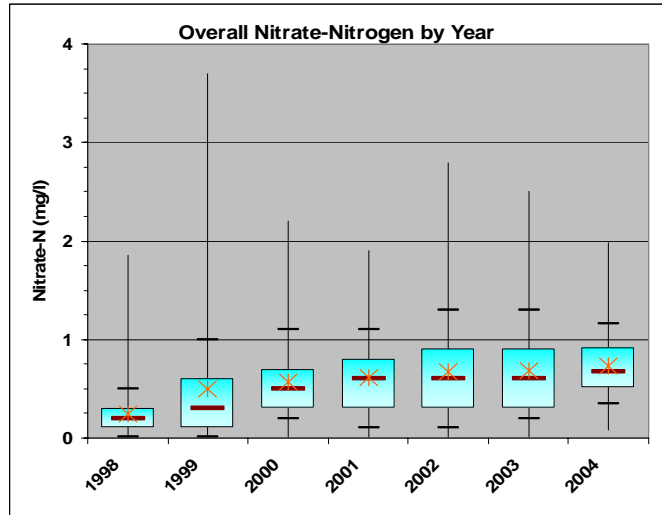


Figure 17. Nitrate-Nitrogen by sampling year, all WVDA data.

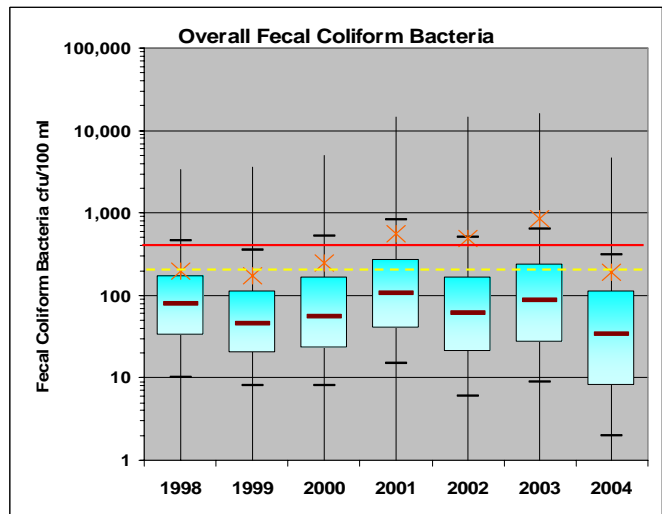


Figure 18. Fecal coliform bacteria by sampling year, all WVDA data.