DISCUSSION

Below average rainfalls during 2007 led to below LTM annual flows at all sites for 2007. Due to the typical connection between nutrient loads and flow, this resulted in several constituents also being below the LTM, including TN, TON, TOC, and SS. DON also was well below the LTM at all sites except Conestoga. All other parameters followed geographic patterns based on location within the basin. The northern three sites, including Towanda, Lewisburg, and Danville, tended to display similar water quality results while the southern three, including Newport, Marietta, and Conestoga, tended to have similar results. Additionally, patterns could be discerned between mainstem and tributary to the mainstem sites. Specifically, TNOx and DNOx load values at Towanda, Danville, and Lewisburg were lower than LTM, while the southern three sites showed no differences. The opposite occurred for TNH_3 and DNH_3; both of these parameters were above LTMs during months of the year when the flow was below the LTM at Lewisburg.

TP loads remained relatively unchanged at the northern three sites as compared to the LTM, while loads at the southern three sites were below LTMs. DP and DOP were both higher for 2007 when compared to LTMs at Towanda, Danville, and Lewisburg, but lower than LTMs at Newport, Marietta, and Conestoga. This also occurred during the last several years at the northern three sites but was different this year in that there were no extreme precipitation events as had occurred in the past. Thus, the high levels remained in the absence of any single high flow event. Lower flows did have the anticipated effect in the southern sites at Newport and Marietta in that DP and DOP were below the LTM.

Although annual flow values were below the LTM at all sites, flows above the LTM occurred during January and March. This led to loads for all constituents being highest for winter. Additionally, flows were above LTM during April and December.

Several baseline comparisons were made with the 2007 yield values, including annual and seasonal yields which attempted to remove some of the effects of flow. Annual yields showed reductions when compared to the predicted values from the baselines at most sites, including reductions in TN and SS at all sites for all comparisons. 2007 yields of TP at Conestoga showed large reductions while Marietta TP yields showed more modest reductions when compared with the baseline data. Although TP yields were below the baselines developed from the early years of the dataset at Towanda and Danville, they were above the predicted values when compared to the baselines from the second half of the dataset. This also occurred at Newport for TN. The implication is that the rate that nutrient loads are being reduced may have peaked, and more recent reductions are not as large or, for some parameters, may have reversed.

Changes in trends from 2006 included five trends changing from significant to no trends due to 20 percent of the values being BMDL. This occurred for DNH_3 at all sites which changed from downward trends to no trends. Additionally, 2006 upward trends in DOP at Danville and Marietta changed to no trends in 2007. Trend changes from 2006 to 2007 also included SS at Lewisburg which changed from no trend due to BMDL in 2006 to a downward trend in 2007. This also occurred at Newport for DKN. 2007 trends were improving for TN, TON, TNH_3, TKN, DKN, and SS at all six sites. Towanda and Newport had degrading trends for DOP. Newport also had degrading trends for DNOx. There were no trends at Conestoga for DN, DON, TNOx, and DNOx while all other parameters were improving.

Since flow has such a dramatic influence on nutrient and SS loads, comparison of the current year's flow to other years of similar flow can be an indicator of improvements or degradations. At Towanda, 2007 flow can be compared with flows during the early 1990s. Comparisons made during March, June, September, and December, which had similar flows as compared to the equivalent 2007 months, imply that reductions have been attained regarding TN but

that both TP and DOP have increased. This increase occurred alongside of SS levels that either lowered or remained unchanged for the same time periods. This indicates that particulate phosphorus, which typically is attached to sediment particles, may not be the actual problem behind the TP increases. The vast increase in DOP may be enough to cause the increase in TP. Similar results were found at Danville.

There are two major implications from recent data. The data indicate that although reductions occurred during 2007 for most constituents at all sites, these reductions seem to be lower as compared to that of previous years. This indicates that the rate of reductions in the amounts of nutrient and suspended sediment loads delivered at some sites may have reached a peak in previous years. Thus, the current rate of reduction is lower than previous years for many constituents. This may be a direct result of management activities in that those activities that have had the most significant effects, have already made their contribution and subsequent activities may continue to result in smaller reductions.

The other implication from the 2007 data, as well as from the past several years, was that there had been a dramatic increase in dissolved phosphorus and more specifically in dissolved orthophosphate. This was apparent during the time period from 1998 - 2004, at all mainstem sites and Newport. In recent years it has become more apparent at Towanda and Danville. Coupled with reductions in particulate phosphorus as seen by comparing TP, DP, and DOP loads and with reductions in SS, these observations indicate that DOP may be the nutrient of most concern in need of additional attention and managerial consideration.