ABSTRACT

The Delaware River Basin Commission (DRBC) adopted the Special Protection Waters (SPW) program in 1992 to prevent degradation in the 197-mile non-tidal reach of the Delaware River and its tributaries where existing water quality is better than water quality standards. Under SPW, DRBC defines Existing Water Quality (EWQ) and monitors sites to ensure that established EWQ is being preserved. Data collected by DRBC, and other monitoring agencies, were used to define site-specific EWQ for locations within the non-tidal Delaware River and tributaries. DRBC recently performed an assessment to determine whether changes to EWQ have occurred between the definition period (2000-2004) and the assessment period (2009-2011) at 24 EWQ sites. For most water quality parameters at most locations, there was no degradation to EWQ and evidence of improved nutrient concentrations, demonstrating the importance and effectiveness of DRBC’s Special Protection Waters program.

METHODS

Monitoring Methods
- May through September sampling
- Conventional parameters (Alkalinity, Hardness, Chlorides, TDS, TSS, Turbidity)
- Nutrients (TP, Orthophosphate, TN, Ammonia, TKN, Nitrate+Nitrite)
- Bacteria (Fecal coliforms, Enterococcus, E. coli)
- Field parameters (DO, D0%, pH, Specific Conductance, Temperature)
- Discharge from USGS’s WWS data and use of StreamStats and BaSiF (Baseline Streamflow Estimator)
- All EPA or USGS methods, EPA-Approved QAPP
- QA sampling included Replicates, Field Blanks, and Sample Equipment Rinsates Blanks

Assessment Methods
5 quantitative plots were used in combination for assessment of within-site changes to each parameter between the EWQ and post-EWQ time periods:
1. Scatter Plot of Concentration vs. Stream Flow (cfs), EWQ vs. Post-EWQ (TOP LEFT)
2. Scatter Plot of Annual Concentration, 2000-2011 (TOP RIGHT)
3. Box Plot Comparison of EWQ vs. Post-EWQ Concentrations (LOWER LEFT)
4. Cumulative Distribution Function (CDF) Comparison of EWQ vs. Post-EWQ (MIDDLE RIGHT)
5. Kruskal-Wallis Statistical Test of Difference between EWQ and Post-EWQ (LOWER RIGHT)

*The decision whether “measurable change” has occurred is an overall qualitative judgement rather than solely reliant on direct quantitative tests. All plots, along with the statistical test, allow for a fairly accurate judgement of measurable change within a replicable decision process.

RESULTS

Example: Total Nitrogen as N (mg/L) at Martins Creek (Northampton County, PA):

CONCLUSIONS

88% of tests reveal no evidence of water quality degradation and actually may reveal some improvements in many areas.

Chlorides and Specific Conductance increased at almost all locations. These were not major increases, but statistically significant. It is likely that winter de-icing salt may be the cause behind these increases.

E. Coli concentrations increased from Nishisakawick Creek (Frenchtown) southward. Bacteria source tracking if trends continue.

Nitrogen (TN and N+M) increased in Pohatcong Creek. Sources are unknown.

Based upon these results combined with cumulative watershed modeling of multiple dischargers, Special Protection Waters rules appear to be effective in controlling nutrients. Many discharge permits were designed with stringent effluent limits using EWQ antidegradation targets.