STREAM QUALITY ASSESSMENTS IN THE DEVELOPING COMMUNITY

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Abstract. As requirements for local municipalities under the Clean Water Act expand, it is important for the local municipalities to find less expensive, yet effective means to conduct stream, watershed, and stormwater management programs. In Georgia, the Georgia Environmental Protection Division (GaEPD) will be instituting a Phase II program which will include cities and counties which have a population of 50,000 - 100,000. This will mean that governments in transition from mostly agriculture to suburban areas may find themselves being required for the first time to apply for NPDES Stormwater Discharge Permits and initiate a new and potentially expensive compliance regimen.

In Cobb County, a growing urban area north west of Atlanta, Georgia, efforts have been made to utilize existing personnel, resources, and State/Federal funding to establish Stream Monitoring Program and develop activities to ensure compliance with its NPDES Stormwater Discharge Permit. Beginning with a Stream Monitoring Program, Cobb County has moved forward in developing a comprehensive water quality compliance program to address Georgia NPDES permitting requirements, reposit water quality documentation generated by other county agencies and citizens, and research more effective measures for gather and analyzing meaningful water quality data.

The remainder of this article covers the history of the Cobb County Stream Monitoring Program, its field and laboratory work, and the benefits of the Stream Monitoring Program to compliance with the Clean Water Act requirements. It is the contention of the Water Quality Section that a shift in emphasis on stream monitoring will result in a more accurate and useful presentation of the watershed water quality profile.

INTRODUCTION

In response to the Clean Water Act requirements of 1987, the Atlanta Regional Commission helped organize representatives from counties and cities around Atlanta to create the Atlanta Regional Commission Stormwater Management Task Force. In 1994, the Task Force agreed to share the cost of implementation of their NPDES stormwater discharge permits. Although not specified in the agreement, the Cobb County Water System (CCWS) Stormwater Division felt that a continuing stream monitoring program would be the best way to measure the effectiveness of their stormwater management program. In November of 1994, surface water monitoring was resumed, after a three year lapse, under the auspices of the CCWS Stormwater Division and the Central Laboratory as a component of the NPDES compliance program. The Stream Monitoring Program has adopted the NPDES sampling and analysis procedures and as such has provided necessary information for compliance without additional personnel, costly outside analytical laboratories, or levying of fees to cover incidental expenditures.

The information gathered provides trends in water quality over the short and long term. The former is useful in that monitoring has located acute problems and violations of County and State erosion and sedimentation control measures, and has also located leaks and spills from sanitary sewer lines and septic tank overflows. The latter is beneficial in determining chronic toxicity levels within the habitat.

The information is important for State agencies by providing them with the County's participation in pollutant loading in respective river basins. Cobb County uses the information to balance the point/non-point source limits. Also, the data indicates the effectiveness of the County's Erosion and Sedimentation Control Ordinances and their enforcement as well as plotting the general water quality under the NPDES.

The authors consider most significant the relevance of the Stream Monitoring Program to municipalities downstream. These municipalities have vested interest in how well Cobb County and other adjacent communities improve the quality of the watershed. They benefit from stream monitoring by participating in a program, thereby gaining valuable data to maintain the water quality already present and be alerted to degradation in the stream, and by requesting and reviewing the work done by those upstream and engaging in a dialogue to improve the overall water quality in the river basin.

HISTORIC OVERVIEW OF THE PROGRAM

Cobb County has a long history of monitoring streams and has done so in one capacity or another since the early seventies. At first this involved the collection and analysis of samples from package plants within the County. This included the influent, effluent, and a downstream site from the plant. In 1986, Central Laboratory Technician, Randy Alexander, began a more comprehensive approach, combining chemical analysis with detailed field descriptions.

Many municipalities will have a store of historical information greater than they may realize. Earlier documentation from the USDA (1921 report) and reports from the USEPA and the GaEPD in the 1960's have been and continue to be discovered. It is likely that studies of streams in the respective municipalities have been conducted. Requesting data from SOIL Conservation Service, U.S. Geological Survey, GaEPD, USEPA, and researching their own database for package plant monitoring will furnish the municipalities with a plethora of baseline information.

AREAS OF CONCERN

The rapid pace of development in Cobb County, especially the area north of Marietta, has created special concerns for water quality improvement and habitat amelioration. Follow up studies for both point and non-point source pollution are needed. Another concern is the stripping of riparian vegetation by utilities and public/private recreational facilities. Municipalities not yet facing accelerated growth have an opportunity to establish baseline data which will be useful in the preparation of the NPDES application.

Siltation. Part of the purpose of the Stream Monitoring Program is to evaluate the extent of siltation within the stream channel. The objective of the evaluation is to determine the two basic sources of siltation: erosion from stream banks or from exotic sources such as construction sites. The hypothesis for using siltation is that turbidity as an indicator for upstream erosion control failure must take into consideration the color of the turbidity. Exotic upland soils found in stream have been observed to be red to bright red while the silt found naturally in streams have been dull red to grayish brown; the later due to reduction. Of course, the plains and lowlands soils of Coastal Georgia will be more difficult to distinguish in this manner.

Stream Habitats. Research on habitats offer a baseline control upon which trends instream degradation and improvement are based. There is a wealth of stream habitat assessment information available. Two recently published manuals from the USGS and the GaEPD provide quantitative methods for analyzing or performing these assessments. The GaEPD manual is specifically aims at conditions unique to Georgia. The manuals are written sufficiently accessible so that a general knowledge of stream terminology should be adequate in making use of the documents. The assessments provide a temporal control to determine changes in diversity and sedimentation as being attributed to changes in water quality or physical changes in the stream habitat.

METHODS

Initial scan for the NPDES routine water quality parameters, metals, the 129 priority pollutants, and incidental tests such as conductivity and chlorides are recommended when beginning a stream monitoring program. POTW's (or WRF's) must perform these tests as part of their permit compliance. Cobb County has narrowed the scope of its metals scan to include only cadmium, zinc, copper, and lead. This general limitation does not preclude conducting a periodic routine scan for all metals. Calcium and magnesium are also run in order to determine hardness. Hardness can also be determined by titration. All methods used in water analysis can be found in Standard Methods for the Analysis of Water and Wastewater, 19th Edition. This reference is found in every certified water/wastewater laboratory. An atomic absorption graphite furnace is utilized by Cobb County Central Laboratory for metals analysis.

TMI: Trend Monitoring Index. The Cobb County program utilizes the Trend Monitoring Index or TMI for its Stream Monitoring Program and compliance with its NPDES permit. It offers a more quantitative method for evaluating water quality and utilizes a wider variety of parameters offering a more comprehensive analysis of water quality than does the present GaEPD water use classification system. The parameters included are the classical pollution and, together with the instream standards, cover many of the threats to water quality. One component if the TMI is omitted by Cobb County. At the present time the County does not possess the financial resources to monitor organics on a routine basis. Organics are prohibitively expensive either in the investment of in-house equipment or for outside contracting. In lieu of organics analysis, bio-assessments are employed. A good TMI rating therefore may not totally exclude the possibility of chemical contamination of the surface waters. Chemical runoff from lawn chemicals such as pesticides and herbicides would be the most likely candidate for such contamination.

While this index is not a true scientific measure, it does provide a means of transmitting complex scientific data into a form that is easier for the general public to interpret.

Bio-assessments provide one a more complete perspective of temporal impact of water and habitat quality on the biota. By assessing diversity of aquatic communities in comparison to a standard reference, one can isolate causes of fluctuation within the community. Fluctuations can then be assigned to habitat degradation, classical parameters, or can suggest the necessity of an organics scan. Quantitative methods for biological assessment are available from the USGS and the GaEPD. Adherence to one of these methods is advisable in order to facilitate the distribution of meaningful data.

COMPLIANCE WITH CLEAN WATER ACT

The compliance issues regarding the Stream Monitoring Program apply to the measurements of chemical and physical pollutant loadings and the effectiveness of best management

practices (BMP) within each watershed. At present, the NPDES specifically directs sampling of non-point source pollution to collective discharge points. These discharge points are outfall pipes of 36 inches or greater in diameter. The difficulty of this approach is that there are over 900 discharge points in Cobb, and staff is only capable of sampling each site once every three years. Additionally, the number of sites increase as new sub-divisions are built. There is a benefit to conducting a discharge point sampling program. Chronic pollution problems can be isolated quickly. However, since most of the sampling is conducted in established residential areas, chronic pollution is difficult to detect. Generally, most of the pollutants found come from seasonal landscaping operations, causing short term problems of algae and phenols. Logging data on seasonal oil and antifreeze change in highly unlikely. Shifting to a watershed approach, through stream monitoring, 900 sites sampled over a three year period become approximately 120 sites sampled quarterly. The watershed sampling sites are planned to increase over the next reporting year to 150. By sampling quarterly, the Water Quality Section staff has discovered erosion and sedimentation control violations and commercial spills which would have gone unnoticed during the discharge point sampling program.

The NPDES requires sampling from detention ponds to determine which type of design best handles loading of certain pollutants. Sampling influent/effluent points can indicate what tested pollutants are treated by detention, while stream monitoring conducts habitat assessments to include not only how well detention works at removing tested pollutants, it also denotes biological treatment from wetland species, and identify the potential presence of untested pollutants. Such pollutants can often be new compounds which remain unseen by screening methods, while very evident in the degradation of aquatic species.

CONCLUSION

Since the mid seventies, Cobb County has been eliminating domestic point source pollution. Old and inadequate municipal treatment plants have been taken out of service and the smaller package plants and oxidation ponds have been retired. The Cobb County Water System routes almost all the domestic waste in the county to large modern facilities. This has caused a corresponding increase in water quality throughout the county. As the county was upgrading and improving its sewer system, however, it was also becoming more developed.

Until the recent past, most of the efforts in water quality monitoring have dealt with controlling and evaluating the impact of domestic discharges. The efforts to eliminate domestic point source discharges mainly involved the upgrade of the infra-structure whereby many inefficient and ineffective POTW's were consolidated in centralized facilities which are strictly monitored by GaEPD. Stormwater and urban chemical runoff have only recently been addressed. Unlike point source pollution, a major problem in dealing with non-point source pollution is the complex nature of source. Stream monitoring provides a means by which one can evaluate the condition of a watershed by combining various methodologies into a workable unit without over burdening the financial resources of the acting agency.

The areas of concern mentioned above are not unique to Cobb County. These are general issues that all municipalities must face when planning for growth and increased development. This is not to say that municipalities should restrict development per se, but to control development in an environmentally responsible manner.

The methods used by Cobb County have not placed undue burden on the development community, but has provided creative alternatives within the development to protect streams. Indices, taxonomic keys, chemical analysis of the stream habitat are available through the USGS and GaEPD.

Most of the equipment necessary for ambient water quality is available in water and wastewater laboratories. Laboratory personnel familiar with analyzing water and wastewater need only augment their knowledge with above activities in order to conduct a beginning program. The authors recommend that municipalities begin with chemical analysis, and add various components such as biological and habitat assessment as one gains familiarity with these activities. Universities and government agencies are willing to offer valuable assistance and information concerning these areas. Water Quality Section staff welcomes any opportunity to discuss the possibilities of beginning a Stream Monitoring Program with interested parties

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