Watershed GIS: A valuable tool for addressing surface water regulations

By CASEY TIFFT

The clock is ticking. Scores of municipal employees dealing with environmental compliance are scrambling to address a number of surface water regulatory requirements that are now knocking at—and soon will be barging through—their doors.

Municipal separate storm sewer systems located in urban centers throughout the nation have begun preparing for the yet-to-be-defined NPDES Phase II permitting requirements due in March 2003.

In the trenches, these regulatory requirements compete for municipal employees' attention along with the demands of local citizenry to address their top water quality and quantity issues. When examining these concurrent needs, many municipalities have yet to adopt a holistic approach to addressing surface water issues within their communities.

A watershed geographic information system, either alone or coupled with surface water modeling, is an excellent tool for proactively storing, presenting and assessing spatial data related to surface water decision-making.

With much of our government information geo-referenced, a GIS can house data from an endless number of sources—local, state, regional and national. This spatially linked data can then be overlaid to integrate the myriad of factors within a watershed affecting its hydrology, as well as the quality and quantity of its water resources and land areas.

Beyond the spatially linked data, the GIS can also provide a link to other forms of complementary information related to the data such as documents, site photos and date of construction.

Before many municipalities embrace the need for establishing a watershed GIS, it is key that they gain an understanding of the multitude of applications that it can provide for addressing a community's infrastructure and information management challenges.

All about the watershed

In larger cities, the burden of assessing the local applicability, liability and prescribed course of action for regulatory compliance and citizenry demands may be shared among a sizable environmental services or public works staff. For many lesser populated counties and municipalities, however, it is often up to a few or even a single individual to handle the challenge of deciding or making recommendations to governing officials on how to proceed regarding surface water issues.

In both instances, the importance of concurrently accessing all available data is essential. Starting with clear delineations of watershed boundaries—which often lie beyond the geographic boarders of a county or municipality—a watershed GIS can cross reference various data and provide an exceptional presentation to decision-makers. Based on the overlaid data sets presented, a visualization of specific geographic areas and their respective features allows for the identification and prioritization of stormwater management and related issues.

In regards to municipal stormwater management, a common use for GIS is establishing inventories for conveyance and best management practices throughout a region, such as a watershed. For municipalities, such inventories provide locations of system components and outfalls, and elaborate on their capacity and condition.

A GIS-based inventory can also enhance the scheduling and tracking of system maintenance activities. Such inventories also allow for the expedited identification of suspect conveyance or BMPs when water quality or water quantity problems surface. Such problems, however, are often indicators of greater challenges—typically involving regulatory requirements—that municipalities are or will soon be facing.

NPDES II

NPDES Phase II communities are obligated to apply for a general permit—typically through an NOI—by March 10, 2003. Compliance requirements include directing attention to six minimum control measures, and establishing measurable objectives and demonstrated effort and results over time to improve stormwater discharge quality to the maximum extent practicable. A watershed GIS proves to be an excellent tool for facilitating compliance with all of these requirements.

The six minimum control measures for NPDES Phase II fall into four principal areas: public education and involvement, construction and post-construction runoff management, detection and elimination of illicit discharges, and pollution prevention during municipal operations.

Regarding public education and outreach, a number of communities around the nation have utilized a type of watershed GIS as a means of educating and involving the public in issues affecting their watershed. The Internet serves as an easily accessible location for this type of presentation and also allows for the further sharing of links to complementary information.

Monitoring compliance among potential stormwater contaminant sources is facilitated by a watershed GIS. Regarding construction and post-construction sites, a watershed GIS can assist in tracking permits so that inspector visits can be favorably scheduled by sector and all associated data, including on-site BMPs, can be inventoried.

A watershed GIS can also serve as an illicit discharge detective, when it is used to compare precipitation with outflows, particularly during dry periods. Government sites and activities can be inventoried and, like construction sites and activities, can similarly be scheduled for compliance inspections and monitored for use of pollution prevention practices.

As a repository for watershed related information, a watershed GIS can assist in the development of NPDES Phase II measurable objectives and the development of reports on progress. By assessing the initial data for each of the six minimum control measures, municipalities can set reasonable goals for what they will accomplish in improving stormwater discharge quality to the maximum extent practicable.

A watershed GIS's ability to integrate data on past and current conditions allows users to perform a variety of comparative analysis on those sets of data. Data outputs from the watershed GIS, such as the number and sites of illicit discharges detected and eliminated, extent of area treated/covered by BMPs, and the number of hits to the watershed GIS website, can then be displayed in maps and/or tables to document progress for annual permit compliance reporting.

Citizenry demands

Beyond the public participation required under NPDES Phase II, a watershed GIS can provide municipalities with an instrument for sharing with the public a visualization of current and future needs and scenarios for the community. This supports a comprehensive approach of including public participation and their buy-in as part of municipal decision-making.

Moreover, a watershed GIS can aid in the organization and prioritization of needs for greater BMPs for water quality or capital improvements to protect against flooding, while at the same time be responsive to public inquiries for information such as flood zone locations.

The establishment of a watershed GIS seems to be an essential step for many communities as we progress into the 21st Century. Though the up-front costs may seem somewhat daunting, the broad application more than merits the expense. Looking to meet common information needs among municipal departments is one way of reducing the cost impact to a single department. Outsourcing for both development and maintenance can also substantially reduce associated costs.

However, considering the long-term savings in time and enhanced information for decision-making, a watershed GIS can pay for itself. With an infinite future ahead of us, a watershed GIS can provide a robust set of capabilities to solve surface water issues now and further down the pipe.

Casey Tifft is a GIS specialist with Applied Technology & Management Inc. in Gainesville.

Florida Specifier
Practical Information For Environmental Professionals
June 2002