

# LINES OF DEMARCATION

Floodplain mapping in an urban area

By Anthony Charlton



The flooded intersection of North Avenue and Route 83, Elmhurst, Ill., in 1987.

What once was the predominantly agricultural landscape of DuPage County, Ill., now is home to mega corporations such as McDonald's, Sara Lee and Navistar. The county has grown dramatically over the past half-century, with a 600% increase in population from 1950 to 2002. While economically desirable, this rapid urbanization, combined with largely unregulated development during the 1980s, has had a profound impact on many of DuPage County's streams and rivers.

Prior to the formation of the DuPage

County Stormwater Management (DPCSM) program, massive flooding in 1987 caused \$150 million in damages throughout the county, equivalent to more than \$308 million today. Prompted in part by this extreme flood event, DuPage County established the program to mitigate future flood damages along the county's waterways.

Once established, DPCSM also assumed responsibility for managing and maintaining the floodplain models and maps of all regulated stream reaches throughout the county that were developed by the Federal

Emergency Management Agency (FEMA) in the late 1970s. These flood insurance rate maps (FIRMs) depicted the 100-year floodplains for DuPage County. With the rapid urbanization that occurred throughout the county, however, these maps quickly became outdated and inaccurate. Accurate maps are important because property owners, regulators and developers use them to reduce and prevent future flood damages. As a result, DPCSM undertook the task of creating new maps to reflect the changes in land use, topography and modeling technology since the

development of the original maps.

## Methodology

The new floodplain maps were developed using the county's watershed planning models rather than traditional techniques used by FEMA. The county's methodology uses the Hydrologic Simulation Program FORTTRAN model to determine the hydrology, the Full Equations model to perform the hydraulics and determine flood elevations, and a statistical computer program called Peak to Volume Statistics (PVSTATS) to determine the 100-year and other frequency flood elevations.

For modeling purposes, FEMA traditionally used the Water Resource Council's Bulletin technique, but the county chose to use the PVSTATS model instead because of problems incurred by the Bulletin technique. Many of these problems stemmed from the technique's assumptions that there are no significant changes in a watershed affecting its hydrology over the period of analysis, that control structures do not regulate or modify flows, and that a consistent climatic record exists. Contrary to this, the rapid urbanization of DuPage County's extremely flat topography severely affected the hydrology for the period of analysis. In addition, there are a number of control structures on the streams, which cause many backwater situations and severe flow regulation.

DuPage County's methodology, however, allows for the use of continuous simulation data. Because flow information can be extracted for every cross-section throughout the county for the past 60 years, DPCSM could develop accurate recurrence intervals for each of the cross-sections in the model. This improved continuity leads to a more accurate floodplain map.

In the mid-1990s, the Illinois Department of Natural Resources Office of Water Resources (IOWR) and FEMA requested that DPCSM perform a comparison analysis

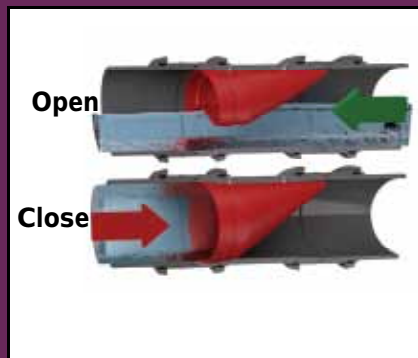
between the traditional method and the method used by DuPage County for the Ginger Creek and Upper Salt Creek watersheds. Completed in 1996, this study confirmed that the county's procedures produced reasonable results and could manage situations that other techniques traditionally had difficulty handling. Shortly thereafter, Ginger Creek became the first watershed remapped

using the county's method to receive approval from IOWR. This pilot project solidified IOWR and FEMA's approval of the county's methodology.

## Partnership With FEMA

After receiving approval for its methodology, FEMA allowed DuPage County to maintain its regulatory floodplain maps under the condition that

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A floodplain map depicting areas of DuPage County

the county provide them to FEMA for insurance purposes. In 1999, DPCSM entered into a Cooperating Technical Community (CTC) agreement with FEMA to re-delineate the existing floodplains on the county's 2-ft topographic maps. DuPage County became only the second CTC of this kind with FEMA nationwide.

In 2003, DPCSM completed the conversion of FEMA's existing FIRMs to digital flood insurance rate maps (DFIRMs) for the entire county. This process included the transfer of all current regulatory flood elevation information to a new base map and the re-delineation of the floodplain boundaries. The DFIRMs also included the two watersheds mapped using the county's hydraulic modeling and floodplain mapping methodology from the pilot project. FEMA approved this new countywide map for regulatory purposes in July 2004, and it became effective for flood insurances purposes later that year.

**Today**

Due to DPCSM's past successes and continued commitment to producing updated flood hazard maps, DuPage County received \$2.05 million in funding under FEMA's Fiscal Year 2008 Map Maintenance Initiative. This grant money supports activities that aim to provide a more accurate study of current floodplains in DuPage County, including engineering studies, floodplain mapping and community coordination activities conducted in collaboration with FEMA and the Illinois State Water Survey. Ultimately, DPCSM will determine new floodplain elevations and create revised floodplain maps countywide. Currently, DPCSM, in partnership with local municipalities, has floodplain mapping proposed for 25 of the 59 watersheds in the county. **SWS**

**Anthony Charlton, P.E., is director of DuPage County Stormwater Management. Charlton can be reached at [anthony.charlton@dupageco.org](mailto:anthony.charlton@dupageco.org).**

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