COMPREHENSIVE WATERSHED ASSESSMENT IN AN URBANIZING AREA—A STUDY DESIGN

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Abstract: As rural watersheds adjacent to metropolitan growth areas become urbanized, problems such as increased flooding, loss of habitat, water-quality impairment, erosion, and stream-channel instability often occur. Investigations of the hydrologic, hydraulic, and environmental effects of urbanization by comparing past, present, and predicted future conditions of watersheds near growing cities contribute to informed management decisions. As part of such a program, the U.S. Geological Survey, in cooperation with the City of Lincoln, Nebraska and the Lower Platte South Natural Resources District, is conducting an assessment of the present conditions of the Cardwell Branch Watershed. The 16 square-mile watershed is predominantly agricultural but is experiencing some urban development from Lincoln, a growing community of approximately 226,000 people.

The study includes several elements with the objective of evaluating the present "state" of the watershed. Geographic information system (GIS) data sets will be compiled to describe land use, topography, soils, land conservation treatments, natural resources, cultural features, and wildlife habitat. A distributed hydrologic model will be created for the watershed that will be used as a tool to determine existing flood characteristics and show the hydrologic effects of future land uses and management practices. Digital topographic data and field surveys will provide supporting information for a hydraulic model to determine the depth of flooding throughout the basin and to assess the geomorphic condition of the stream channels. These models will provide updated data to be incorporated into the Flood Insurance Rate Map for Lancaster County, Nebraska.

Water quality will be evaluated at a stream site at the lower end of the watershed that composites the various inputs throughout the basin. Aquatic habitat, plant, macroinvertebrate, and fish community indices will be determined from data collected in August 2003. Discrete water-chemistry samples will be collected 10 times in 2004, including at least one stormwater runoff event, and will be analyzed for pesticides, polycyclic aromatic hydrocarbons, nutrients, ions, *E. Coli*, biological and chemical oxygen demand, human wastewater indicators, arsenic, and suspended sediment. The stream's pH, dissolved oxygen, temperature, specific conductivity, and turbidity will be monitored continuously during the 2004 growing season.

The various elements of the study will be synthesized into a comprehensive watershed assessment that can be referenced in the future to identify the level of impairment for the effectiveness of management practices in the watershed.