

## Streamflow and Water-Quality Monitoring in Support of Watershed Model Development, Potomac River Basin:

A Cooperative Project between the U.S. Geological Survey and the Maryland Department of the Environment

**Problem.** The National Water-Quality Assessment (NAWQA) Program, Potomac River Basin study unit (1992-95), indicated that elevated concentrations of nitrogen and phosphorus in surface and ground water in the Potomac basin often result from human activities such as manure and fertilizer application. The monitoring program proposed here is designed to support development of a watershed model of the basin that may be used to assess the effects of point and nonpoint nutrient and sediment sources on water quality in the Potomac River.

**Objectives.** The U.S. Geological Survey (USGS) has responsibility for four objectives in an overall monitoring program designed to support the development and calibration of a watershed model for the Potomac River Basin: restart and operate two currently-inactive continuous stream-gaging stations; establish nine new water-quality monitoring stations; plan, coordinate, and oversee sample collection, using USGS and Maryland Department of the Environment (MDE) staff; and manage all data and plan and oversee quality assurance.

**Benefits.** Historical data, data collected by MDE at numerous sites, and data collected through this study will provide information necessary for the development and calibration of an HSPF (Hydrologic Simulation Program-FORTRAN) model of the Potomac River Basin, which in turn can be used as necessary input for a water-quality model to be developed by MDE.

**Approach and methods.** Candidate sites for monitoring (Table 1; Figure 1) were chosen based on existing information and modeling needs. Those sites without adequate historical water-quality data were then prioritized to arrive at proposed monitoring sites. Sites within the Coastal Plain were considered the highest priority. Integrator sites in subunits with none were give high priority, as were sites within any given subunit that could act as indicators of a particularly important land use. The nine highest-priority sites are chosen for the proposed monitoring effort; of these, one requires restart of an inactive gage and one requires a new gage. Automatic samplers will be installed at all feasible sites to collect storm samples; regular baseflow and high-flow samples will also be collected. Sample collection will be initiated by a rise in stream stage above a specified stage and will proceed at intervals based on flow increments at rated sites, or based on changes in stream stage. Sampling will proceed throughout the event, although not all samples may be analyzed for any given storm. Rather, samples will be selected for analysis on the basis of their timing relative to the rise, peak, and recession of the storm hydrograph. USGS will collect and analyze samples at a rate of approximately 24–36 samples per water year from each site. In addition, 2–4 samples per year will be required for quality assurance and quality control. Another 9 samples will be collected in order to calibrate the automatic sampler. This will result in 48–69 samples over an 18-month sampling period. All samples will be collected using NAWQA protocols and analyzed for nutrients at the National Water-Quality Laboratory (NWQL) in Denver; sediment analyses will be done at the USGS Iowa District Sediment Laboratory.

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Station ID	Station Name	Subunit	Site Type	Gage Reactivation	Area, km <sup>2</sup>	Major land use, in percentage of catchment area				
						Urban	Agriculture	Forest	Wetland	Water/Barren
01660920	Zekiah Swamp Run nr Newtown, MD	CP	Integrator	No	208	22.6	18.4	45.8	11.1	2.1
01644000	Goose Creek nr Leesburg, VA	PD	Integrator	No	856	4.7	54.7	40.2	0.1	0.2
01618000	Potomac River at Shepherdstown, WV	Main	Main	No	15,419	2.9	23.0	72.3	0.3	1.5
01658000	Mattawoman Creek nr Pomonkey, MD	CP	Urban	Yes	148	31.7	12.9	44.7	8.7	1.9
01653600	Piscataway Creek at Piscataway, MD	CP	Urban	No	93	55.1	10.8	27.6	5.2	1.2
01661050	St. Clement Creek nr Clements, MD	CP	Ag/Forest	No	47	18.3	29.4	47.2	5.0	0.2
01621410	Black's Run at Rt 726 at Harrisonburg, VA	GV	Urban	Yes <sup>1</sup>	29	70.2	17.1	8.4	<0.1	4.3
01610155	Sideling Hill Creek nr Bellegrove, MD	VR	Forest	No	268	0.9	21.5	76.1	0.3	1.1
01611500	Cacapon River nr Great Cacapon, WV	VR	Integrator	No	1,751	0.5	12.8	85.7	0.1	1.0

Table 1. Catchment characteristics for the nine priority monitoring sites.

<sup>1</sup> Black's Run is a new stream gage, not a reactivated gage.

