Development and Land Use Change in the Central Potomac River Watershed

The Potomac River Watershed (HUC-6: 020700) drains 14,760 square miles across parts of West Virginia, Maryland, Virginia, Pennsylvania, and Washington DC. An estimated 6.1 million people live in the watershed. It drains into the Chesapeake Bay, the degrading environmental health of which has become an increasing concern in recent years. The Potomac River Watershed is distinguished by several characteristics including a wide variety and intensity of land use, and rapid population growth over the past few decades. I will consider four subwatershed regions in the central part of this area: Conococheague, Shenandoah, Middle Potomac, and Monocacy. These regions were selected for their development characteristics over time; they are not directly in the Washington DC metro area, but they are in suburbs that have expanded rapidly over the past few decades.

This project will explore how changes in population and land use development are linked to water runoff levels. I hypothesize that increased development and construction of impervious surfaces will increase the runoff intensity per unit of area. The subwatersheds and the HUC-10 regions in them have already been extracted from NHDPlus V2 and converted to one dataset. Other data sources:

- Digital Elevation Model—DEM from ArcGIS Online landscape services
- Stream Gage Data—USGS from waterdata.usgs.gov, extracted by state. The gage data will be intersected with the study area, and only points within the study area will be retained

This will be accomplished in the following manner:

- The NLCD land cover classifications will be generalized into categories such as forest, industrial, residential/commercial, and open field/agriculture. Changes in the relative areas of these categories through time will be compute for each of the four years available.
- Total impervious surface cover at each of the three years available will be computed for each of the 31 HUC-10 regions in the study area as well as for each of the four subwatersheds.
- The DEM will be used to delineate the area that drains to each gage. Flow data and precipitation data will be obtained for each stream gage, and a measure of flow to precipitation per unit area will be computed.
- These calculations of flow to precipitation per unit area will be compared with land cover and impervious surface cover change over time. These results will be presented spatially and graphically.