

# **The Watershed Characterization and Modeling System (WCMS): An Overview**

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**Abstract.** Development of the Watershed Characterization and Modeling System (WCMS) has been a primary activity of the Natural Resource Analysis Center (NRAC) at West Virginia University (WVU). The initial objective in the early 1990's was to add advanced GIS tools and the necessary data to support watershed analysis to the ESRI GIS software for West Virginia watersheds. Over time the scope of WCMS has expanded to include connections to hydrologic modeling software such as HSPF and links to EQuIS and other databases. The primary issue affecting West Virginia watersheds – the cumulative impacts of coal mining – has driven the development of WCMS. Support for development of WCMS has included WVU resources and grants and contracts with state and federal agencies, consulting companies, and non-profit organizations.

Initially developed as an ESRI ArcInfo AML application, the introduction of ArcView as a PC application provided a cost effective platform for further development. Rewritten in ArcView 3.x, by 1999 WCMS was a basic tool used by permit writers in the West Virginia Department of Environmental Protection (WVDEP) Divisions of Water and Waste Management (DWWM) and Mining and Reclamation (DMR). Interactions with WVDEP staff continually lead to modifications and enhancements. The ArcView 3.x version of WCMS was packaged as a project with all data for WV included (about 7 GB). WVDEP, initially through the Program Enhancement Cooperative Agreement (PECA) with the U.S. Dept. of Interior, Office of Surface Mining (OSM), supported advances in the tools and transition for ArcView to an ArcGIS extension that appears as a toolbar in ArcMap. Links to the Hydrological Simulation Program – FORTRAN (HSPF) model and the EQuIS database of water quality data for West Virginia now support hydrologic and water quality modeling; development on these aspects is continuing.

This paper provides an overview of WCMS and discusses the application of WCMS to understanding the hydrology of relatively large watersheds. WVDEP staff currently use the ArcView version or the ArcMap toolbar for all anti-degradation related NPDES work in both DWWM and DMR. CHIA writers use the software to delineate watersheds and to get basic flow, loading, and area information. Links to digitized mine maps, water quality data, and a variety of other information maintained by WVDEP in GIS, Oracle, and other formats make true CHIA related modeling and analysis possible for WV watersheds.