WMS 8.0

Overview

The Watershed Modeling System (WMS) is a comprehensive graphical modeling environment for all phases of watershed hydrology and hydraulics. WMS includes powerful tools to automate modeling processes such as automated basin delineation, geometric parameter calculations, GIS overlay computations (CN, rainfall depth, roughness coefficients, etc.), cross-section extraction from terrain data, and many more! With the release of WMS 8, the software now supports hydrologic modeling with HEC-1 (HEC-HMS), TR-20, TR-55, Rational Method, NFF, MODRAT, OC Rational, and HSPF. Hydraulic models supported include HEC-RAS, SMPDBK, and CE QUAL W2. 2D integrated hydrology (including channel hydraulics and groundwater interaction) can now be modeled with GSSHA. All of this in a GIS-based data processing framework will make the task of watershed modeling and mapping easier than ever before.

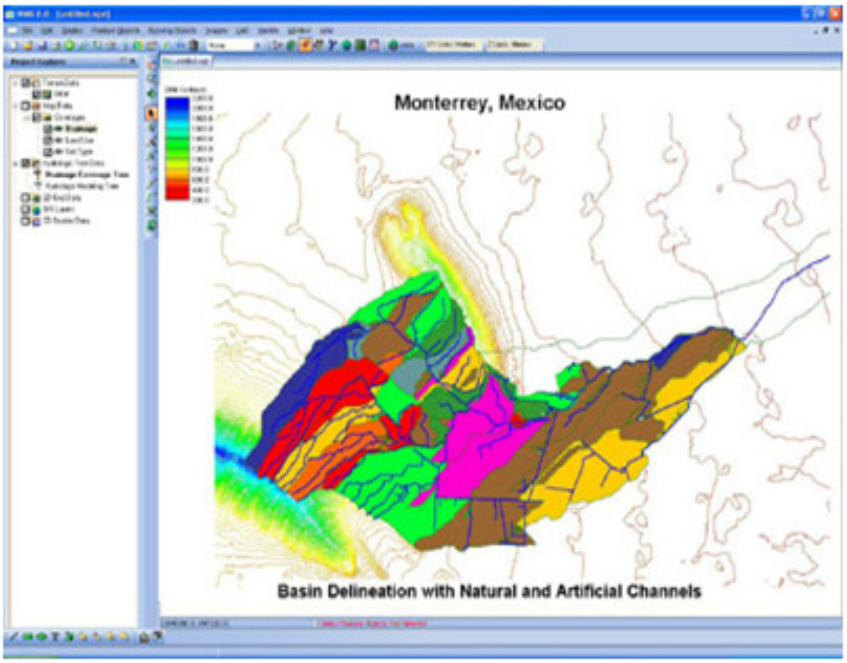
The program's modular design enables the user to select modules in custom combinations, allowing the user to choose only those hydrologic modeling capabilities that are required. Additional WMS modules can be purchased and added at any time. The software will dynamically link to these subsequent modules at run time—automatically adding additional modeling capability to the software.

Automated Watershed DeOverview

Using digital terrain data, WMS can automatically delineate a watershed and sub-basins. As part of the delineation process, basin data such as area, slope, mean elevation, maximum flow distance, and many other commonly-used hydrologic parameters are automatically computed. A new Delineation Wizard has been added to WMS to guide first-time or novice users of the software through the delineation process. However, many advanced features and options are included in WMS:

- Use DEMs (grids) or TINs for delineation. You can easily manipulate the elevation data in either type of dataset.
- Add any number of interior outlet points and let WMS subdivide the watershed automatically.

- Manipulate stream networks to represent man-made features or proposed changes in the watershed.
- Override derived basin boundaries to match your knowledge of the watershed.



As part of the delineation process, WMS finds all flow paths on the entire terrain model. This allows you to inspect flow patterns anywhere inside of outside your watershed. Further, the longest flow path in each sub-basin is stored for use with the Time of Concentration Calculator. No other system available will match the accuracy and flexibility of the delineation functions in WMS!

GIS Tools

WMS will allow you to take advantage of all types of GIS data available for hydrologic and hydraulic modeling. The GIS module of WMS 8 includes a complete set of tools for importing, creating, and manipulating GIS vector and raster data. ArcGIS/ArcView is not a required component of the WMS software! You will find that WMS can work with your GIS data effectively with or without ArcGIS. A few of the powerful tools in WMS include:

- Direct linkage with ESRI's ArcGIS – this lets you use the powerful data catalog tools of ArcGIS in conjunction with WMS.

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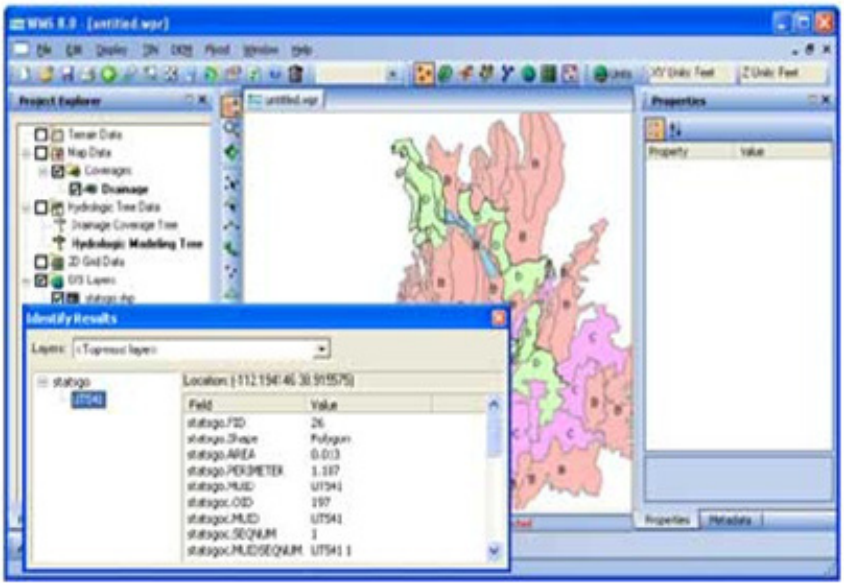
- Terrain data can be created, merged, and manipulated using grids, TINs, or contour lines.
- Data layers such as land use and soil type can be clipped to match your water-shed.
- Attribute tables can be joined and queried.
- Images (TIFF, JPEG) can be geo-referenced, joined, and clipped.
- Attributes from data layers can be assigned to your model using GIS overlay operations.
- New "data tree" interface allows you to turn on/off, change display, change coordinate systems, and review contents of each data layer quickly and easily.
- Coordinate System Conversions - Convert data between geographic and planar coordinate systems



Floodplain Modeling and Mapping

Whether you have used WMS to run a HEC-RAS model, a SMPDBRK model or obtained hydraulic analysis results elsewhere, the tools for floodplain delineation and mapping in WMS will create the results you need for your flood study. The powerful interpolation algorithms in WMS allow you to create flood extents and flood depth maps using digital terrain data and water surface elevation data points.

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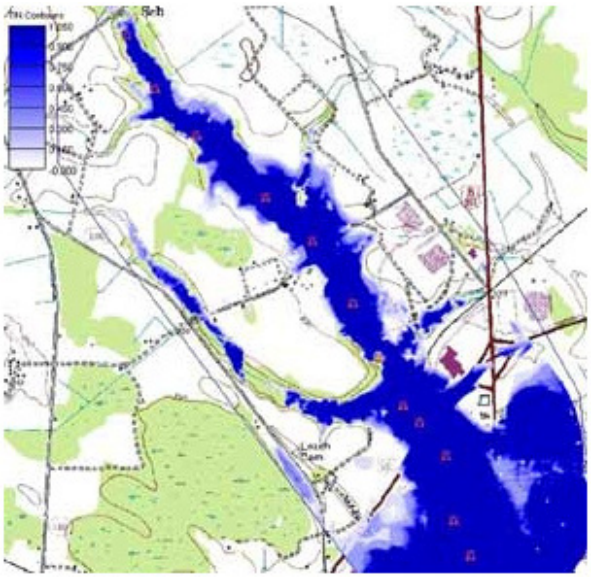
You can use the fast and easy channel hydraulics tools in WMS to create approximate (Zone A) maps. If you need a detailed analysis (Zone AE or AH), you will find the HEC-RAS interface and flood mapping tools are nicely integrated and intuitive in WMS.

The full process of flood modeling and mapping has been integrated into a seamless process in WMS. Perform a simulation with any hydrologic model (HEC-1 or HMS, TR-20, TR-55, Rational Method, MODRAT, NFF) and link the peak flow or complete hydrograph to a HEC-RAS model of the river channel in your watershed. Complete the set up of HEC-RAS with cross-section cutting, area attribute mapping (roughness values assigned by polygons), and automated assignment of thalweg and bank locations and downstream distances. Once a HEC-RAS simulation is completed, you can import the W.S.E. results directly from the HEC-RAS project files and use them to determine the flooding extents and depths on the terrain model in WMS.

The input required for a SMPDBK model is a stream centerline, cross sections, and information regarding the storage and failure of the dam being modeled. WMS saves the model data to a properly formatted input file for SMPDBK and then launches the executable. The executable is the same version distributed by the NWS.



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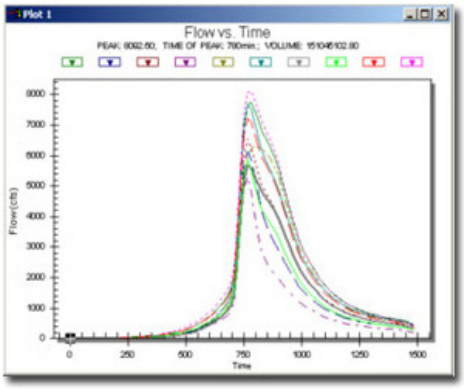
Stochastic Modeling

Uncertainty in modeling parameters can now be analyzed using the automated stochastic modeling tools in WMS. These tools simplify and automate the process of varying certain parameters (such as CN or roughness) in a model, creating a model input file, and running the simulation over and over again. Some applications of this technology are:

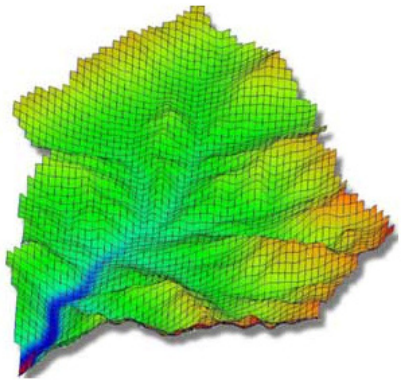
- Use HEC-1 with CN randomization to create probabilistic hydrograph results.
- Use HEC-RAS with roughness randomization to create probabilistic water surface elevation results.
- Link HEC-1 and HEC-RAS in series with randomization to create probabilistic floodplain maps



2D (Distributed) Hydrology

After many years of research and development, a 2D surface/groundwater hydrologic model is now available in WMS! The GSSHA model is the perfect solution for studies which require analysis of 2D surface flow and groundwater/surface water interaction. The model uses a 2D finite-difference grid to analyze surface runoff, 1D channel hydraulics, and groundwater interaction in a comprehensive hydrologic cycle model. Water quality and sediment transport processes may also be modeled with GSSHA. The model is capable of single event or long term rainfall simulation; radar rainfall data is supported in either case.

Typical applications of this model are:



- Flood forecasting (depth and velocity over entire 2D domain)
- Thunderstorm (localized rainfall) flood analysis
- Surface ponding and infiltration analysis
- Groundwater/surface water interaction modeling

Data Compatibility

Obtaining and formatting digital data is often the most time-consuming task in watershed modeling. The WMS development team has been hard at work ensuring that WMS is compatible with as many file formats as possible. Further, they have dedicated a website to learning about and obtaining GIS data to use with WMS. Please visit the link below to learn about where to download free data, how to use it, and other informaiton.

Some of the more popular data formats supported by WMS are:

- USGS DEMs – download and use any format of DEM from the USGS.
- USGS NED data – seamless elevation data can be downloaded and read into WMS.
- ArcGIS Raster (ASCII format) – read elevation or attribute data in gridded format from ArcGIS.
- ESRI Shape files – read all shapes and attributes into WMS.
- DXF and DWG CAD files – WMS now supports the latest versions of DXF and DWG.
- TIFF, JPEG images – images along with geo-referencing information can be read by WMS.