WMS 7.0

Overview of the Watershed Modeling System

FHWA Licensing and Usage

- Developed at the Environmental Modeling Research Lab (EMRL) at BYU
- Distributed by EMS-I
- FHWA has licensed for all state DOTs
- Significant usage in the following states
  - Utah, California, Minnesota, Nevada, Arizona, New Mexico, New York, South Carolina, Pennsylvania, Delaware, Maine, Connecticut, Kentucky, Maryland
- NHI Course 135080

What is WMS?

- A Geographic Information System (GIS) for Hydrologic Design and Analysis
  - Not an extension of GIS
- Delineate Watersheds from Digital Elevation Models (DEMs)
- Uses other digital files for Land Use and Soil Type properties
- Graphical Interface to Hydrologic Programs

Model Interfaces

- Regional Regression Equations (NFF)
  - Updated to USGS's latest database
- HEC-1 (HMS)
- HEC-RAS (new in 7.0)
- Storm Drain (new in 7.0)
- TR-55, TR-20
- Rational
- Other culvert, stream channel, and detention basin design and analysis calculators

Demonstration

Steps

1) Obtain digital elevation data
2) Obtain other digital data
   - Aerial photgraph, land use, soil
3) Delineate watershed boundaries
4) Determine hydrologic modeling parameters from digital data sets
5) Perform/Review analysis

Data Acquisition Website

- Elevation
- Image
- Land cover
- Soil
- Other

http://emrl.byu.edu/gsda

geo-spatial data acquisition home - Microsoft Internet Explorer provided by CAEDM

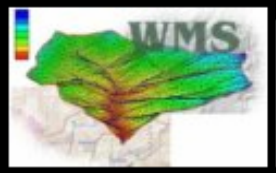
File Edit View Favorites Tools Help

Back Search Favorites Media

Address http://www.emrl.byu.edu/gsda/index1.html Go Links

gsda geoSPATIAL DATA ACQUISITION

gsda geospatial data acquisition

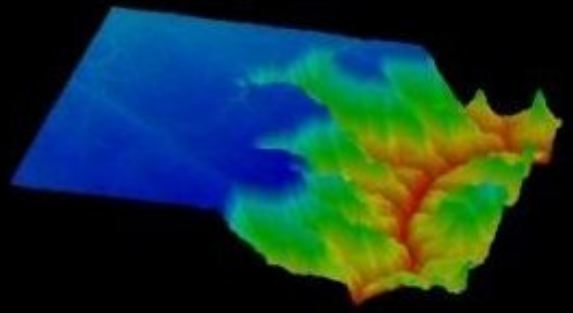


emrl Environmental Modeling Research Laboratory

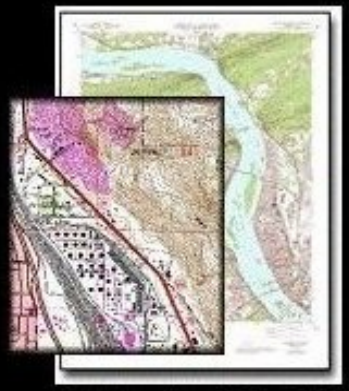
ems-i Environmental Modeling Systems, Inc.

New Additions to this Site

WMS is designed after the GIS standard for spatial data. Data of primary importance to WMS include DEMs, images, soil type and land use. Other data types such as TINs, hydrography, precipitation and stream stage can also be essential to a hydrologic model.



DEM



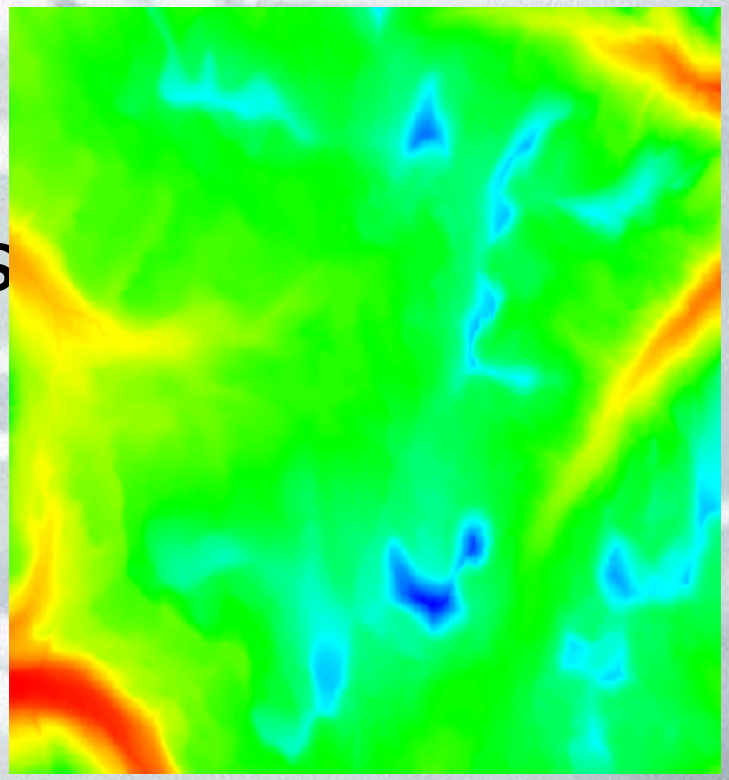
IMAGES

SOIL TYPE

Done Local intranet

Elevation Data

- Slopes
- Cross-sections
- Basin boundaries
- Flow paths



National Elevation Dataset

- 30 m / 10 m resolution
- Seamless
- Can download it quickly
- Geographic coordinates (NAD ’83)

Seamless Data Distribution System – Enhanced

http://seamless.usgs.gov

Obtaining DEM Data - Microsoft Internet Explorer provided by CAEDM
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://www.emrl.byu.edu/gsda/data_dem_obtain.html Go Links

Obtaining DEM Data

USGS science for a changing world

The USGS offers the following DEM data:

- **30 meter (and some 10 meter) data from the National Elevation Database**

  This NED data is accessed via the USGS Seamless Data Distribution System-Enhanced. The site offers NED data in the Gridfloat, BIL, ArcGRID, and TIFF formats.
  Advantages of the NED data are that you define a custom area to download, the DEM data is seamless, and the interface allows you to display various GIS layers to aid in the selection process.
  COST: None

- **1:250,000 scale (~90 meter) data**

  This DEM data is provided in the native *.dem format.
  COST: None

CLICK HERE **to obtain DEM data from the National Elevation Database**

CLICK HERE **to obtain 1:250K (~90m) DEM data from the USGS**

Need additional help obtaining a 30 meter NED DEM from the Seamless Data Distribution Center-Enhanced?

Done Local intranet

Seamless Data Distribution System-Enhanced - Microsoft Internet Explorer provided by CAEDM

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Address http://seamless.usgs.gov/ Go Links

USGS
science for a changing world

Seamless Data Distribution System

EROS Data Center ENHANCED

The Seamless Data Distribution System provides custom-generated digital products based on user specified geographic extents and user specified datasets. Seamless digital data is available to users in several optional formats for delivery via web downloads or CD media.(Web Requirements)

The Seamless Data Distribution System will provide data at the exact boundaries that you specify resulting in a more efficient delivery system and a more manageable dataset.

View and Order Data Sets

Data Set Information can be found at:

- National Elevation Dataset (NED)
- National Land Cover Dataset (NLCD) 1992
- Shuttle Radar Topography Mission (SRTM)

IMPORTANT NEWS

Announcements
(updated 06 Jan 2003)

Down Time
03/10/2003 7:30AM CDT - 03/10/2003 12:30PM CDT, Server Maintenance (No products will be processed)

http://www.usgs.gov/ Internet

USGS SDDS-E Raster Data Extraction Summary Page - Microsoft Internet Explorer

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Address http://edcw2ks36.cr.usgs.gov/Website/zipship/RequestSummary.jsp?areaList=45.71980384173335,45.66007888523127,-121.9002366 Go

The National Map Seamless Data Distribution System

SDDS-Enhanced Request Summary Page

Help!

Your data request consists of **1 product(s)**, broken into **1 individual piece(s)**. The data will be delivered through an **on-line download interface**. The 'Modify Data Request' button will allow you to specify different formats, products, or media. Clicking on the name of the Product will allow you to order the entire dataset from pre-mastered originals using the EROS Data Center Order pages. You may bookmark this page to return to this data request and download the same pieces.

Modify Data Request

Data Extraction Request Pieces:

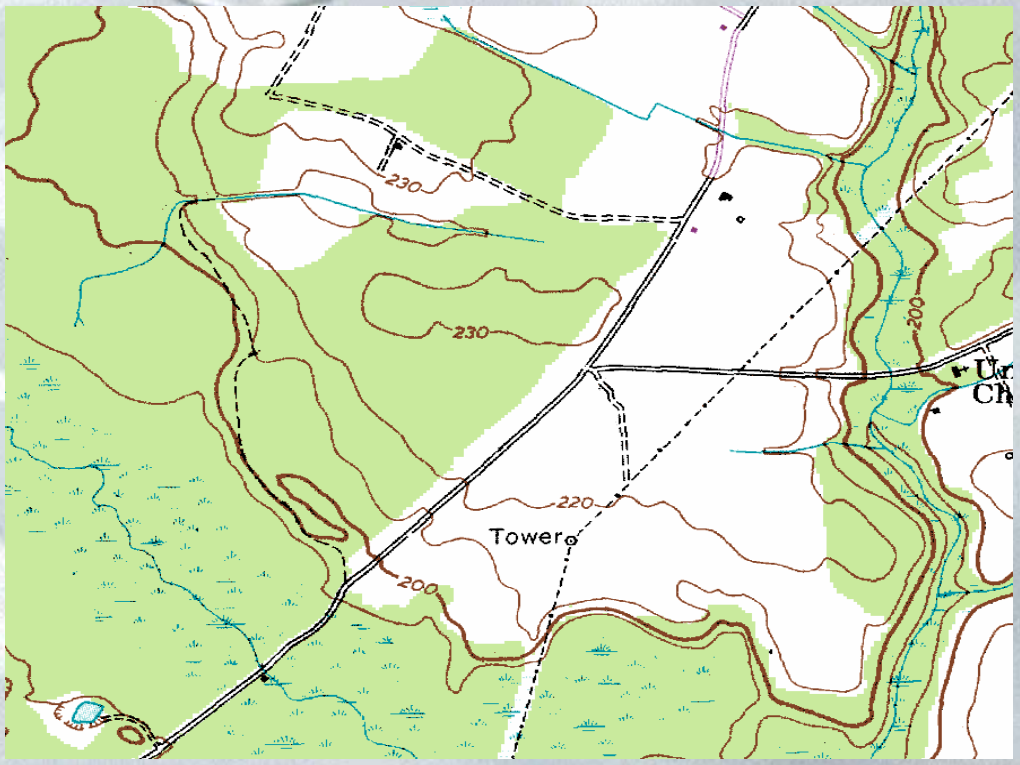
Product	Southwest (Bottom Left) Corner	Northeast (Top Right) Corner	Size (MB)	Link
1/3" NED - GridFloat format				
	45.660079 N, 121.972737 W	45.719804 N, 121.900237 W	2	Download

U.S. Department of the Interior || U.S. Geological Survey || EROS Data Center
URL: http://edcw2ks36.cr.usgs.gov/Website/zipship/RequestSummary.jsp
Maintainer:webmapping@usgs.gov || Comments and Suggestions
Last Modified: Fri 04 Apr 2003
Privacy Statement || Disclaimer || FOIA || Accessibility

Seamless D
File Edit V
Back
Address ht
USG
The Na
Move
Zoom
Select
Misc
Download
Define Area E
Coordinates

Images

- Physical features
- Elevation contours
- Presentation



MSN TerraServer

- File size is small = JPEG
- Can save a World File
- UTM Coordinates (NAD '83)

http://terraserver.homeadvisor.msn.com

Obtaining DRG Image Data - Microsoft Internet Explorer provided by CAEDM
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://www.emrl.byu.edu/gsda/data_image_obtain_drg.html
Go Links

Obtaining DRG Image Data

msn TerraServer

CLICK HERE **to obtain a DRG from MSN's Terraserver.**
Terraserver offers USGS Topos in several different resolutions.

Need additional help obtaining an image from Terraserver?

PUBLIC SITES

CLICK HERE **to obtain a DRG from other public sites.**

Sometimes, the best way to locate GIS data from a public source, such as a state or county agency, is to consult an internet search engine. Go to a search engine website, such as www.google.com and enter the search criteria, such as "DRG Georgia."

GIS DATA DEPOT

Done
Local intranet

TerraServer V5.0 Homepage - Microsoft Internet Explorer provided by CAEDM

File Edit View Favorites Tools Help

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Address http://terraserver.homeadvisor.msn.com/ Go

Navigate

View: Aerial Photo

64 meter resolution

Map Size: Large

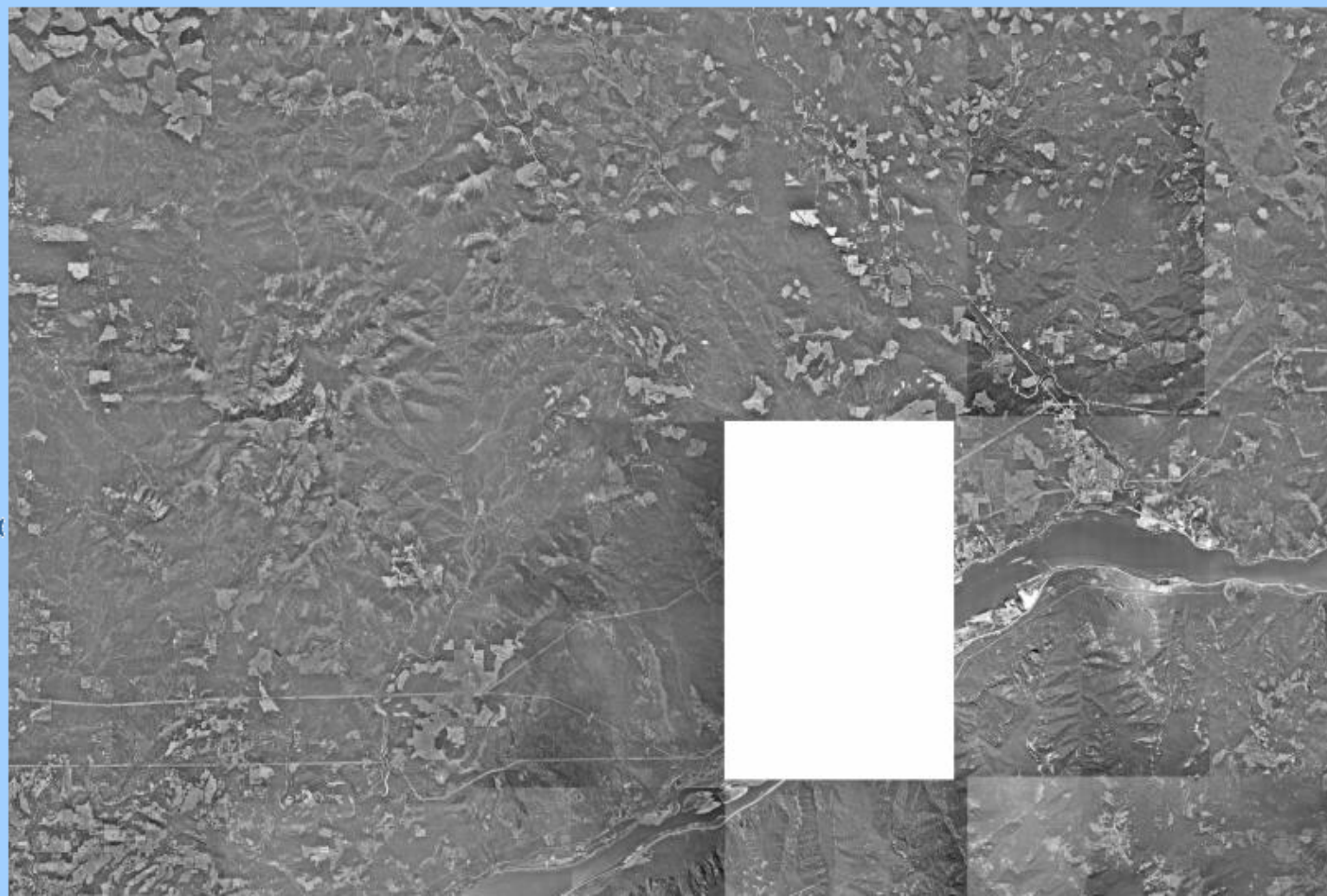
Advanced Find

Famous Places

Web Services

About

61 km E of Portland, Oregon, United States 31 Jul 1993 USGS



Related Links:

Other Imagery:

USGS Topo Map 01 Jul 1981

House and Home:

Homes for sale in 98610

Homes for sale in 98648

Schools, Crime and Demographics for 98610

Schools, Crime and Demographics for 98648

Land Use / Vegetation

- Infiltration
- Roughness
- Evaporation/Evapotranspiration
- Curve Number

EPA Basins

- Shapefile format
- Good U.S. coverage
- Contains both land use and soil data

EPA
ENVIRONMENTAL PROTECTION AGENCY

Obtaining Soil-Type Data - Microsoft Internet Explorer provided by CAEDM

File Edit View Favorites Tools Help

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Address http://emrl.byu.edu/gsda/data_soil_type_obtain.html Go Links

Obtaining Soil Type Data

EPA
ENVIRONMENTAL PROTECTION AGENCY

The EPA has divided the United States into hydrologic units and assigned each one a HUC (hydrologic unit code). In order to download land use data for an area, you first need to know its HUC.

CLICK HERE **to obtain the HUC number for your watershed.**
The EPA provides the "Locate Your Watershed" site to help users determine their region's HUC.

CLICK HERE **to obtain the land use data from the EPA HUC index.**
The EPA offers land use shapefiles.

Need additional help obtaining soil type data from the EPA?
Click here to go to the BASINS Metadata website.

USDA NRCS

CLICK HERE **to obtain soil type data from the NRCS (STATSGO format).**
The NRCS offers soil type ARC/INFO coverages by state.

CLICK HERE **to obtain soil type data from the NRCS (SSURGO format).**

Local intranet

EPA: Surf Your Watershed > Locate Your Watershed - Microsoft Internet Explorer provided by CAEDM

File Edit View Favorites Tools Help

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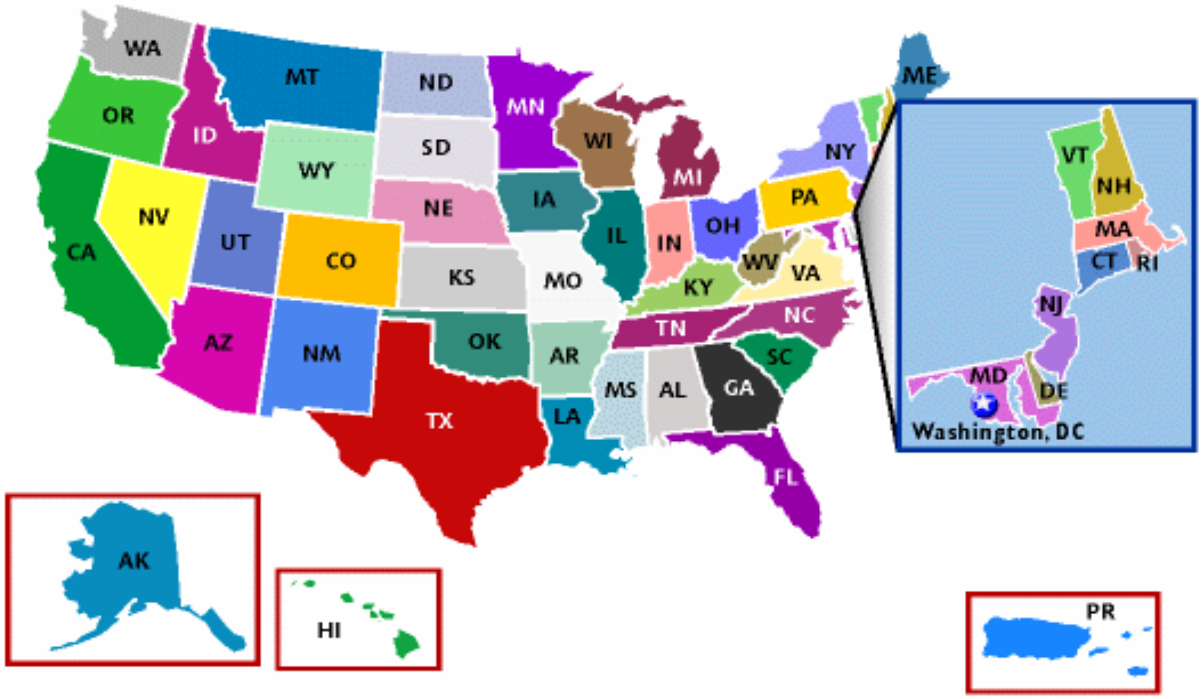
Address http://cfpub.epa.gov/surf/locate/map2.cfm Go Links

U.S. Environmental Protection Agency

Surf Your Watershed

About
Help
Locate Your Watershed
Add Information
Search Information
Watershed Atlas



Alabama | Alaska | Arkansas | Arizona | California | Colorado | Connecticut | Delaware | District of

http://www.epa.gov/ Internet

EPA: Surf Your Watershed > Washington Information - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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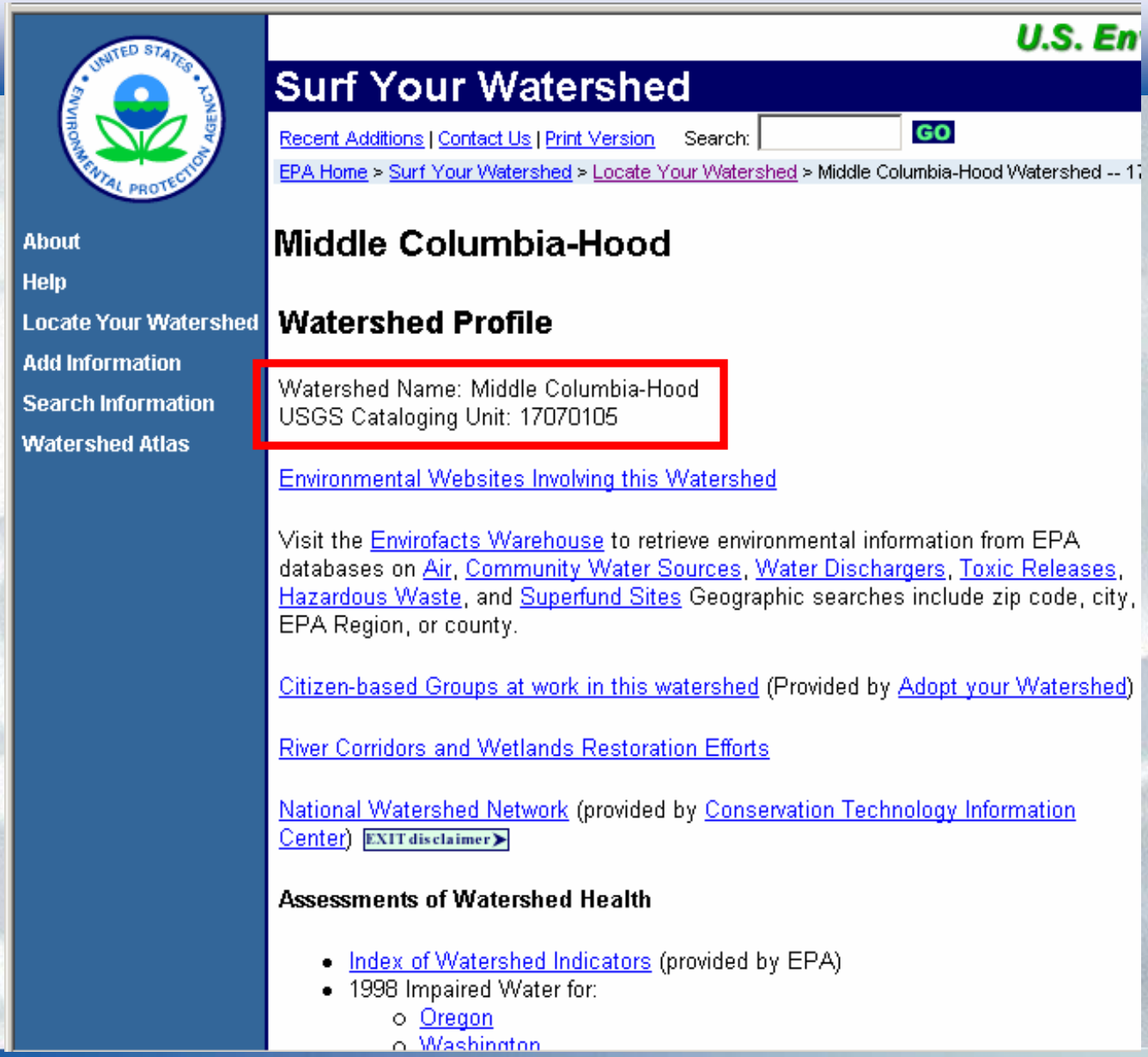
Address http://cfpub.epa.gov/surf/state.cfm?statepostal=WA

Links Customize Links Free Hotmail Windows Media Windows RealOne Player

Washington

Use the state map or Places Involving this State watershed links below to zoom in to find more information about your watershed.

State Profile


U.S. En
Surf Your Watershed
Recent Additions | Contact Us | Print Version
Search:
GO
EPA Home > Surf Your Watershed > Locate Your Watershed > Middle Columbia-Hood Watershed -- 17
About
Help
Locate Your Watershed
Add Information
Search Information
Watershed Atlas
Middle Columbia-Hood
Watershed Profile
Watershed Name: Middle Columbia-Hood
USGS Cataloging Unit: 17070105
Environmental Websites Involving this Watershed
Visit the Envirofacts Warehouse to retrieve environmental information from EPA databases on Air, Community Water Sources, Water Dischargers, Toxic Releases, Hazardous Waste, and Superfund Sites Geographic searches include zip code, city, EPA Region, or county.
Citizen-based Groups at work in this watershed (Provided by Adopt your Watershed)
River Corridors and Wetlands Restoration Efforts
National Watershed Network (provided by Conservation Technology Information Center) EXIT disclaimer
Assessments of Watershed Health
Index of Watershed Indicators (provided by EPA)
1998 Impaired Water for:
Oregon
Washington

Obtaining Soil-Type Data - Microsoft Internet Explorer provided by CAEDM

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Address http://emrl.byu.edu/gsda/data_soil_type_obtain.html Go Links

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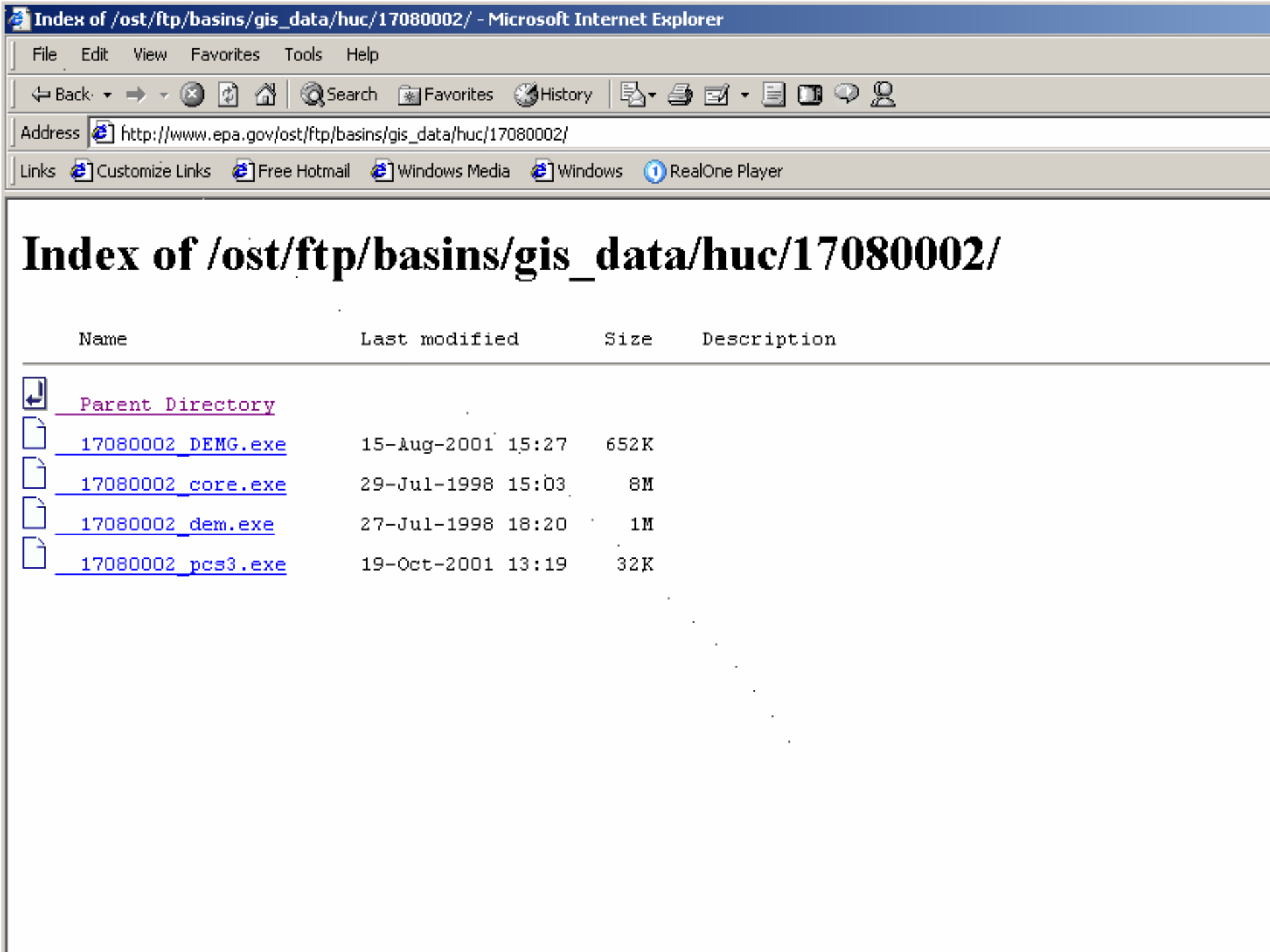
Local intranet

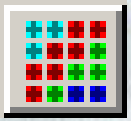

Index of /ost/ftp/basins/gis_data/huc/17080002/ - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://www.epa.gov/ost/ftp/basins/gis_data/huc/17080002/
Links Customize Links Free Hotmail Windows Media Windows RealOne Player
Index of /ost/ftp/basins/gis_data/huc/17080002/
Name Last modified Size Description
Parent Directory
17080002_DEMG.exe 15-Aug-2001 15:27 652K
17080002_core.exe 29-Jul-1998 15:03 8M
17080002_dem.exe 27-Jul-1998 18:20 1M
17080002_pcs3.exe 19-Oct-2001 13:19 32K

Demonstration

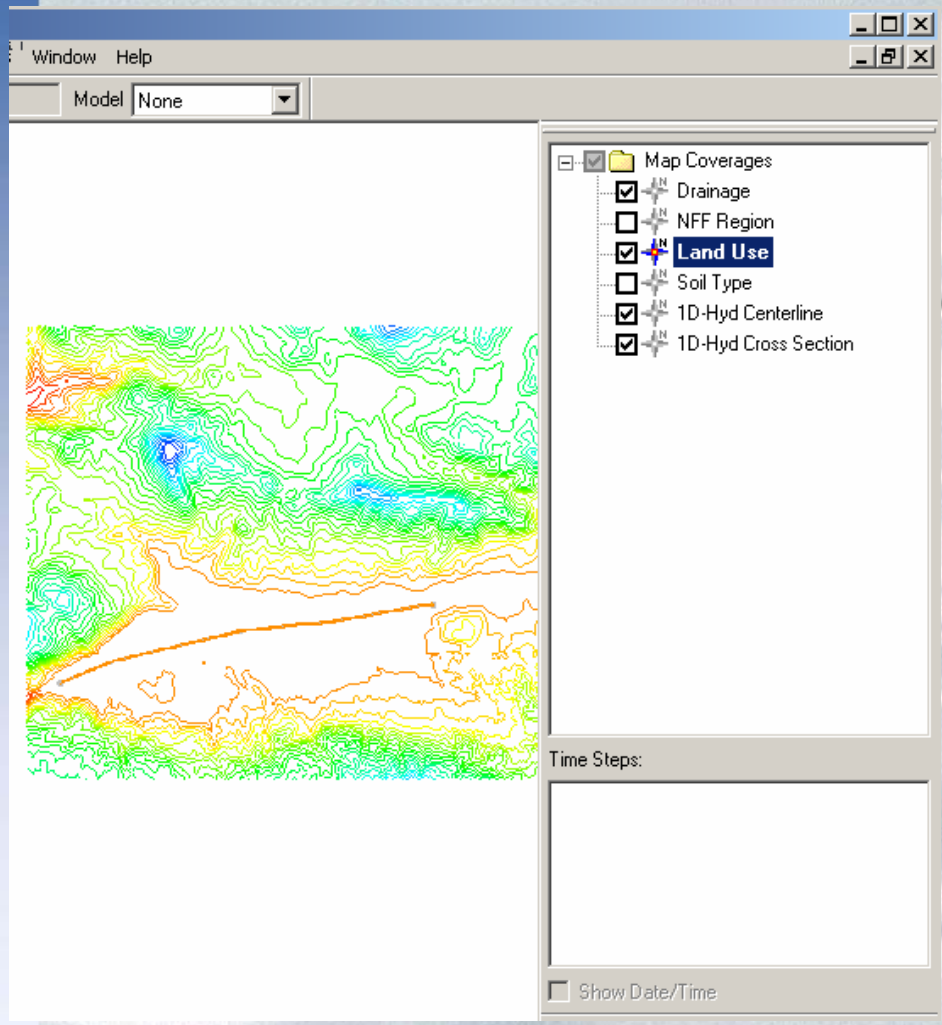
New Features Highlights

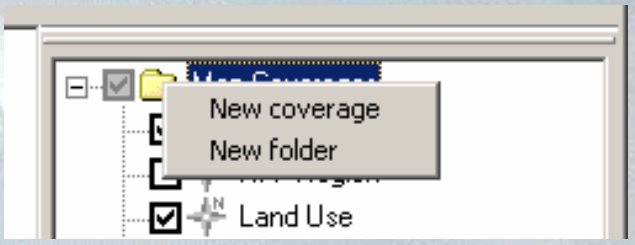
- Reorganization of TIN/DEM modules
  - Increased editing of TINs/DEMs for hydrologic and hydraulic modeling
- Data Tree data management
- GIS Module
  - Integration with or without ArcView GIS
- Update for NFF
- Storm Drain (HYDRA) interface
- HEC-RAS interface
- Uncertainty Analysis in modeling

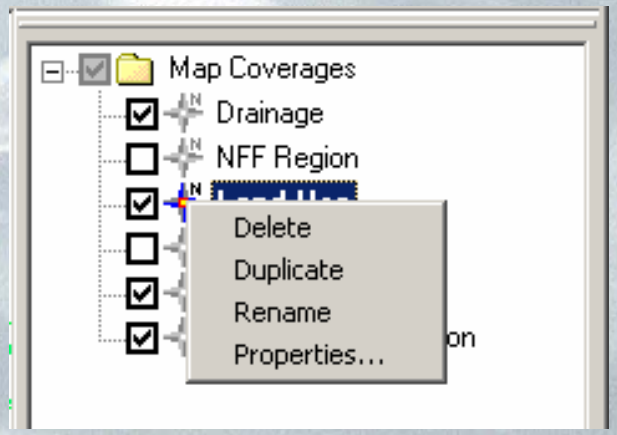
Terrain Data Module

- In previous versions we had TIN and DEM  Modules
- In 7.0 we have Terrain Data and Watershed Delineation Modules

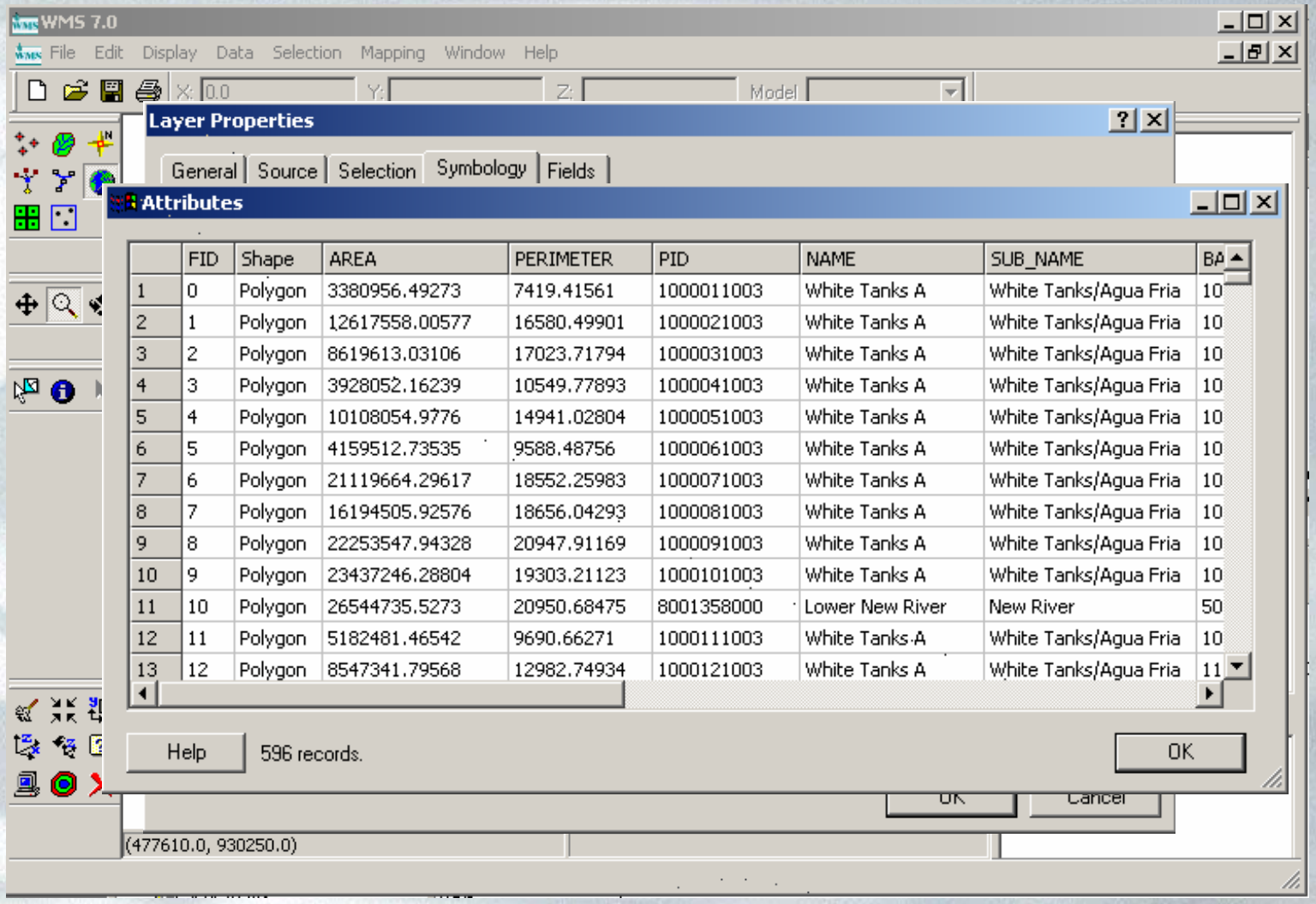
Data Tree Data Management





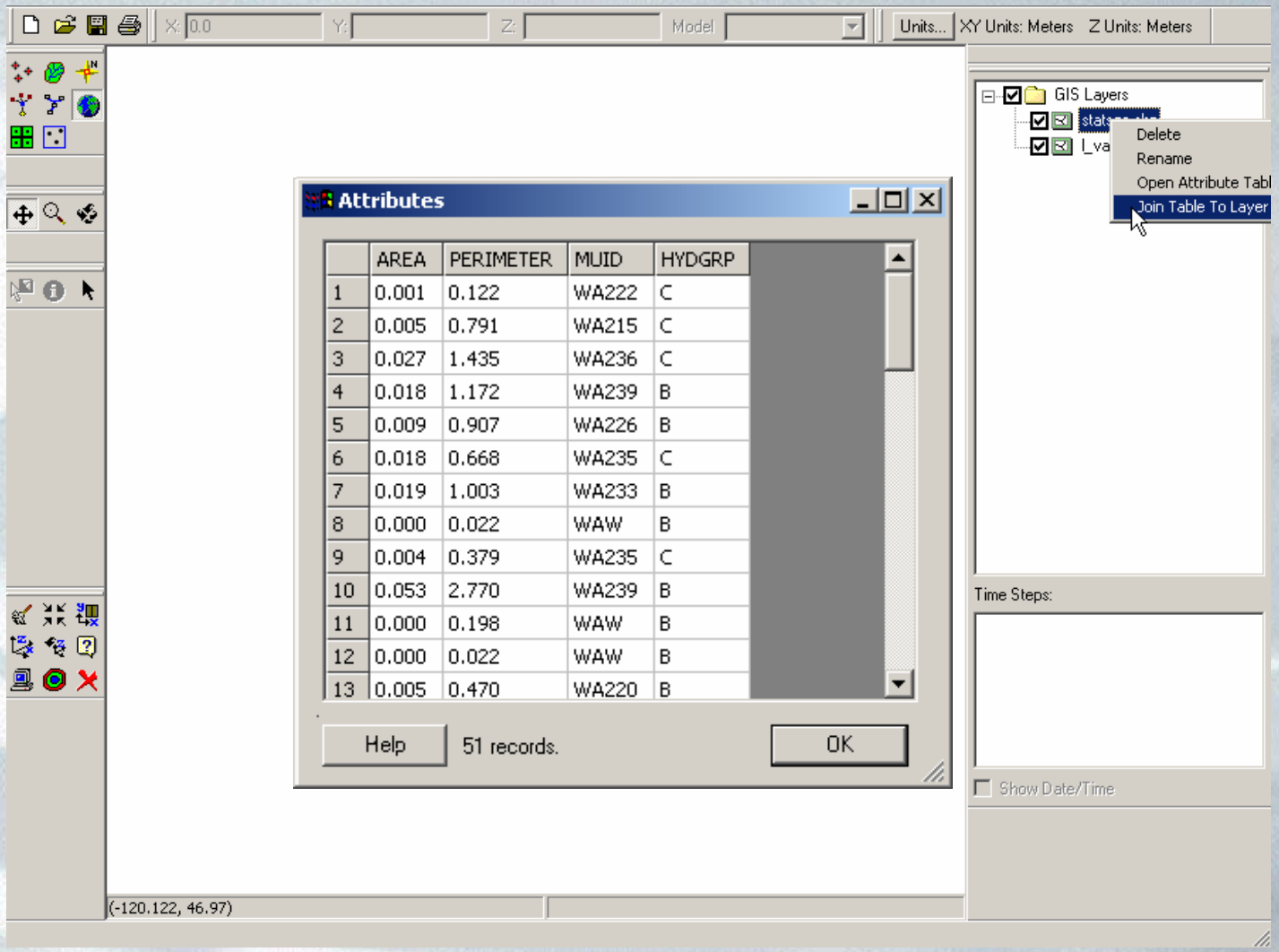


GIS Module - ArcObjects



	FID	Shape	AREA	PERIMETER	PID	NAME	SUB_NAME	BA
1	0	Polygon	3380956.49273	7419.41561	1000011003	White Tanks A	White Tanks/Agua Fria	10
2	1	Polygon	12617558.00577	16580.49901	1000021003	White Tanks A	White Tanks/Agua Fria	10
3	2	Polygon	8619613.03106	17023.71794	1000031003	White Tanks A	White Tanks/Agua Fria	10
4	3	Polygon	3928052.16239	10549.77893	1000041003	White Tanks A	White Tanks/Agua Fria	10
5	4	Polygon	10108054.9776	14941.02804	1000051003	White Tanks A	White Tanks/Agua Fria	10
6	5	Polygon	4159512.73535	9588.48756	1000061003	White Tanks A	White Tanks/Agua Fria	10
7	6	Polygon	21119664.29617	18552.25983	1000071003	White Tanks A	White Tanks/Agua Fria	10
8	7	Polygon	16194505.92576	18656.04293	1000081003	White Tanks A	White Tanks/Agua Fria	10
9	8	Polygon	22253547.94328	20947.91169	1000091003	White Tanks A	White Tanks/Agua Fria	10
10	9	Polygon	23437246.28804	19303.21123	1000101003	White Tanks A	White Tanks/Agua Fria	10
11	10	Polygon	26544735.5273	20950.68475	8001358000	Lower New River	New River	50
12	11	Polygon	5182481.46542	9690.66271	1000111003	White Tanks A	White Tanks/Agua Fria	10
13	12	Polygon	8547341.79568	12982.74934	1000121003	White Tanks A	White Tanks/Agua Fria	11

GIS Module – Shapefile data

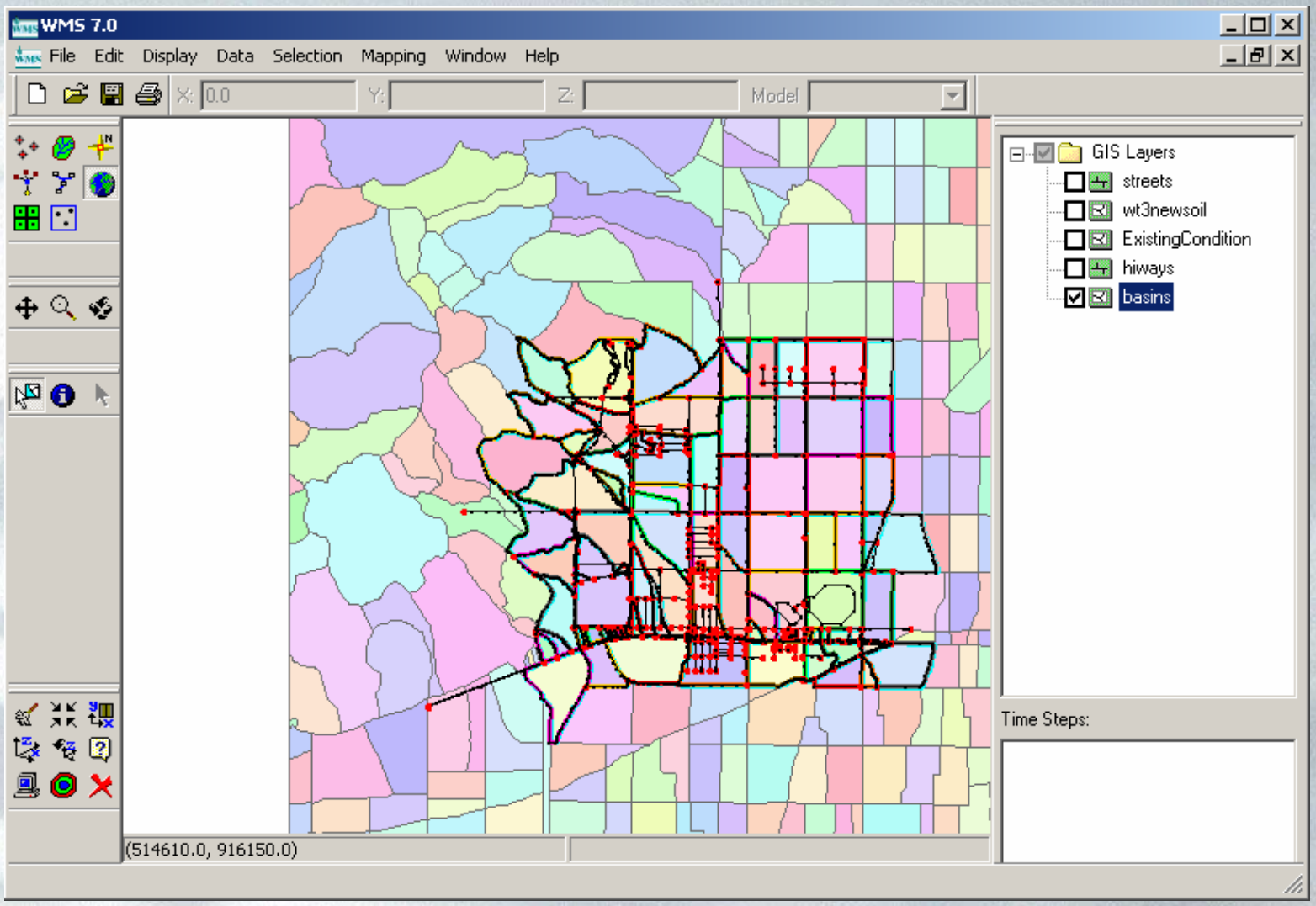


Attributes

	AREA	PERIMETER	MUID	HYDGRP
1	0.001	0.122	WA222	C
2	0.005	0.791	WA215	C
3	0.027	1.435	WA236	C
4	0.018	1.172	WA239	B
5	0.009	0.907	WA226	B
6	0.018	0.668	WA235	C
7	0.019	1.003	WA233	B
8	0.000	0.022	WAW	B
9	0.004	0.379	WA235	C
10	0.053	2.770	WA239	B
11	0.000	0.198	WAW	B
12	0.000	0.022	WAW	B
13	0.005	0.470	WA220	B

Help 51 records. OK

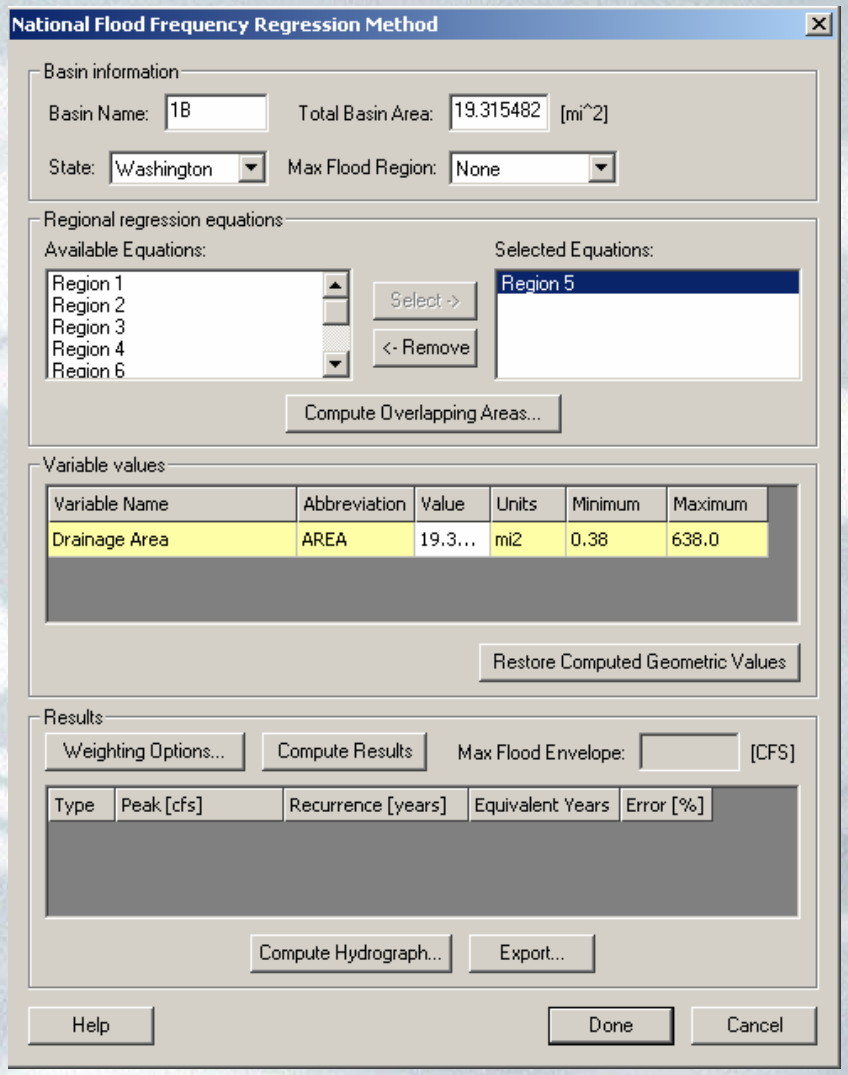
Mapping GIS Layers



Updated NFF

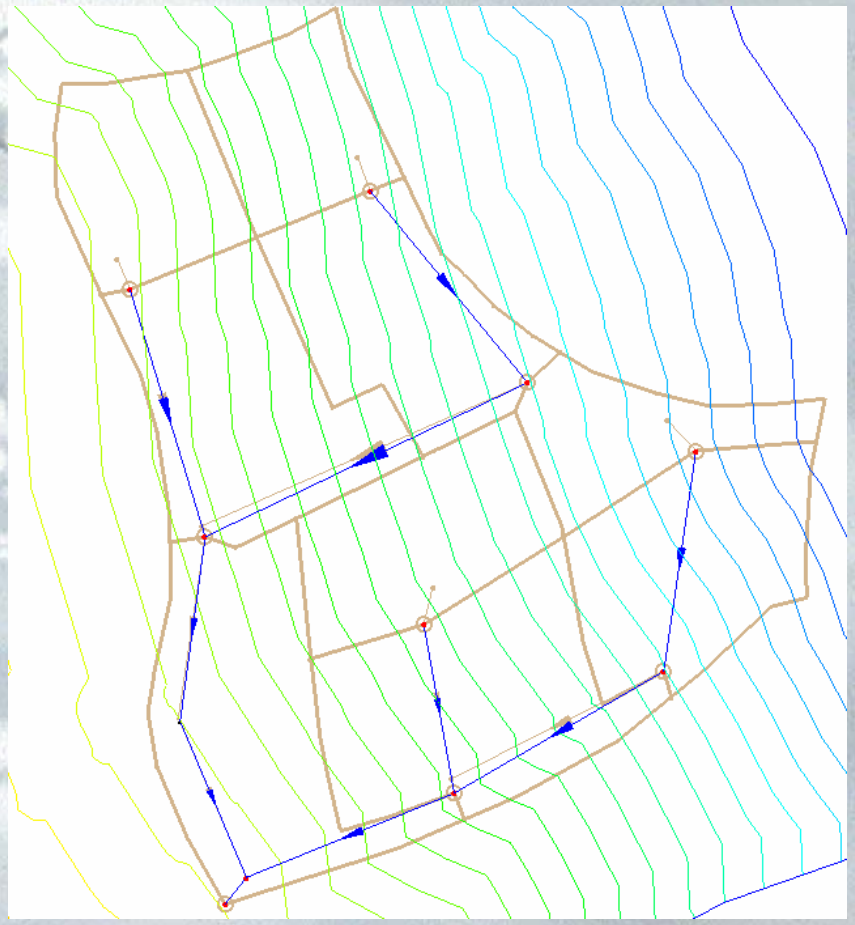
- USGS developed new database and Windows application with updated state equations
- WMS now links directly to the same database as NFF
  - Will be easier to maintain future updates
- Same basic interface
  - A new NFF region coverage can be added

Updated NFF


National Flood Frequency Regression Method
Basin information
Basin Name: 1B
Total Basin Area: 19.315482 [mi^2]
State: Washington
Max Flood Region: None
Regional regression equations
Available Equations:
Region 1
Region 2
Region 3
Region 4
Region 6
Select ->
<- Remove
Selected Equations:
Region 5
Compute Overlapping Areas...
Variable values
Variable Name
Abbreviation
Value
Units
Minimum
Maximum
Drainage Area
AREA
19.3...
mi2
0.38
638.0
Restore Computed Geometric Values
Results
Weighting Options...
Compute Results
Max Flood Envelope:
[CFS]
Type
Peak [cfs]
Recurrence [years]
Equivalent Years
Error [%]
Compute Hydrograph...
Export...
Help
Done
Cancel

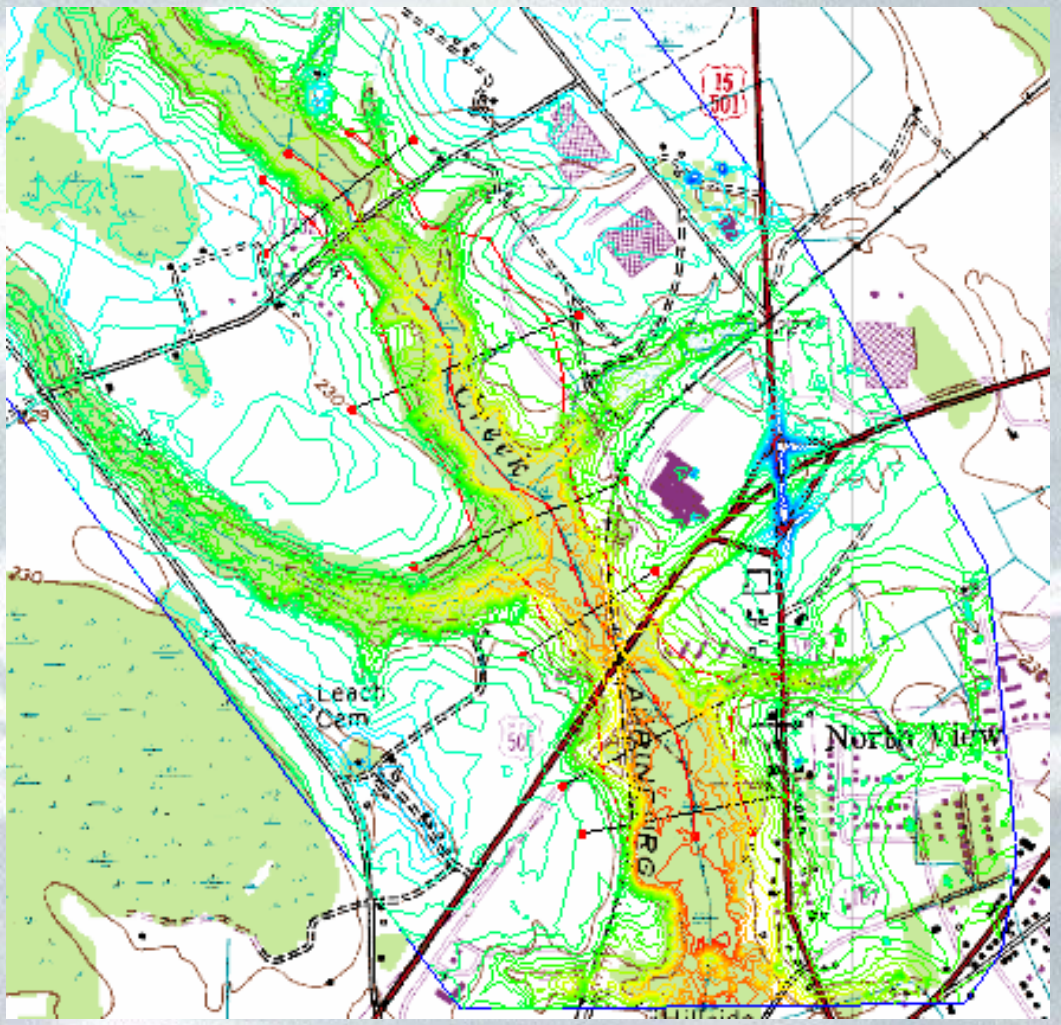
Storm Drain

- Based on HYDRA
- Storm drain inlets
  - Drainage coverage
- Manholes
  - Storm drain coverage
- Supports rational and hydrographic analysis

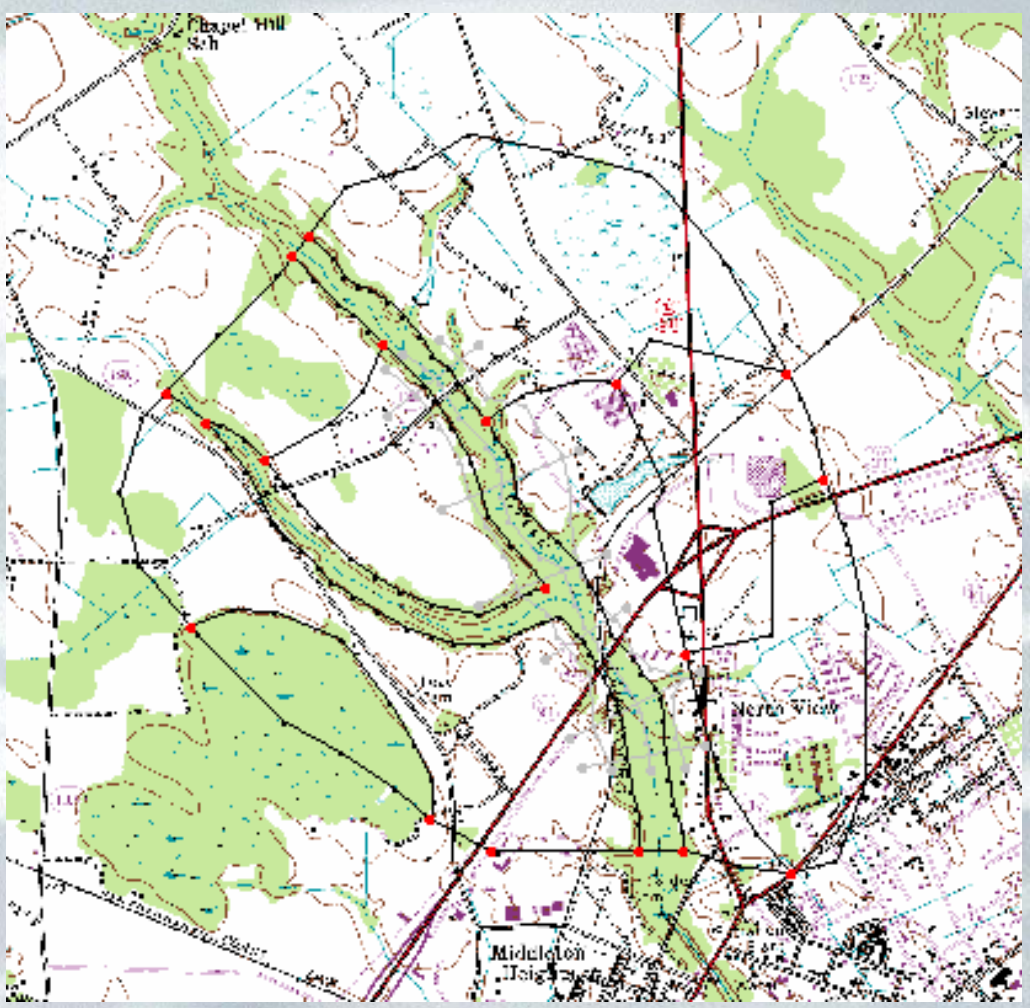


HEC-RAS Model Support

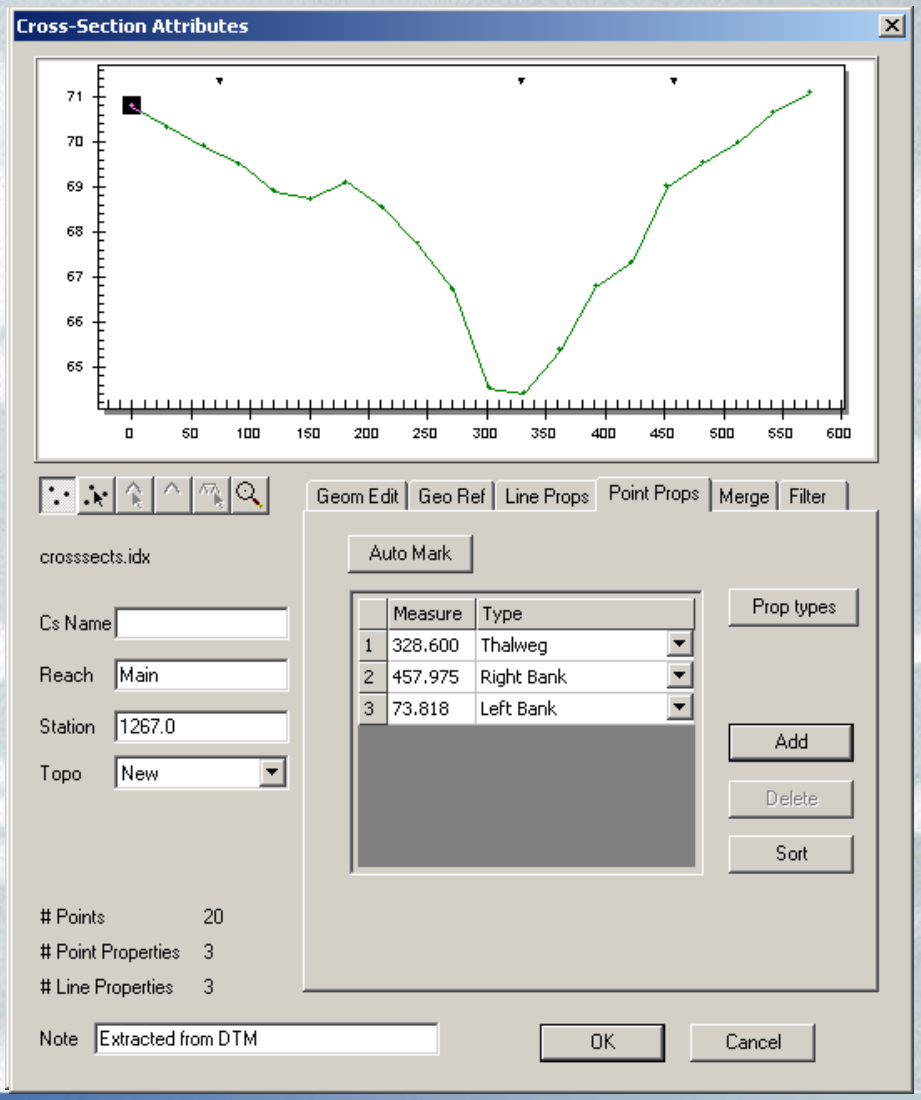
HEC-RAS Model Support



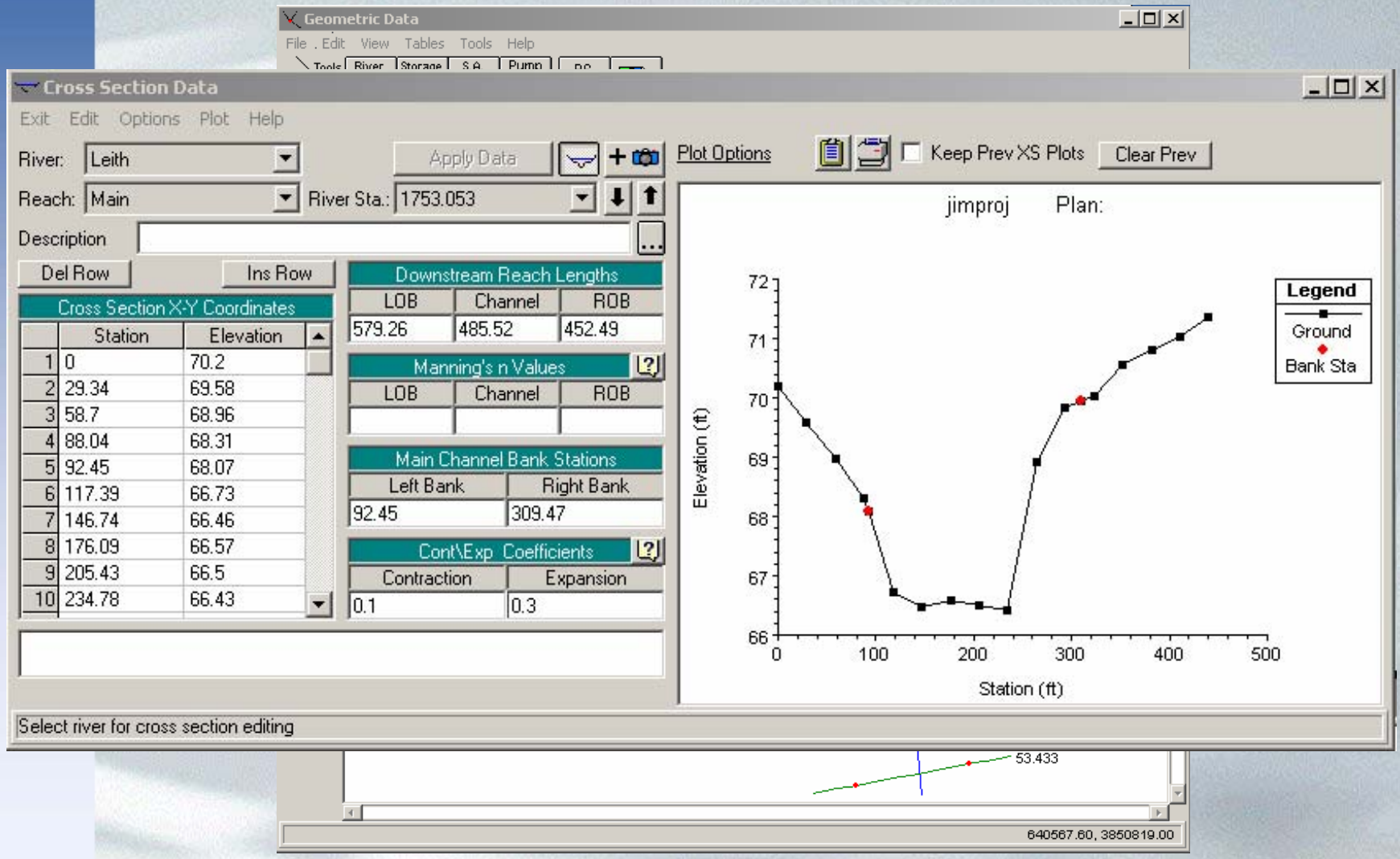
Material Boundaries



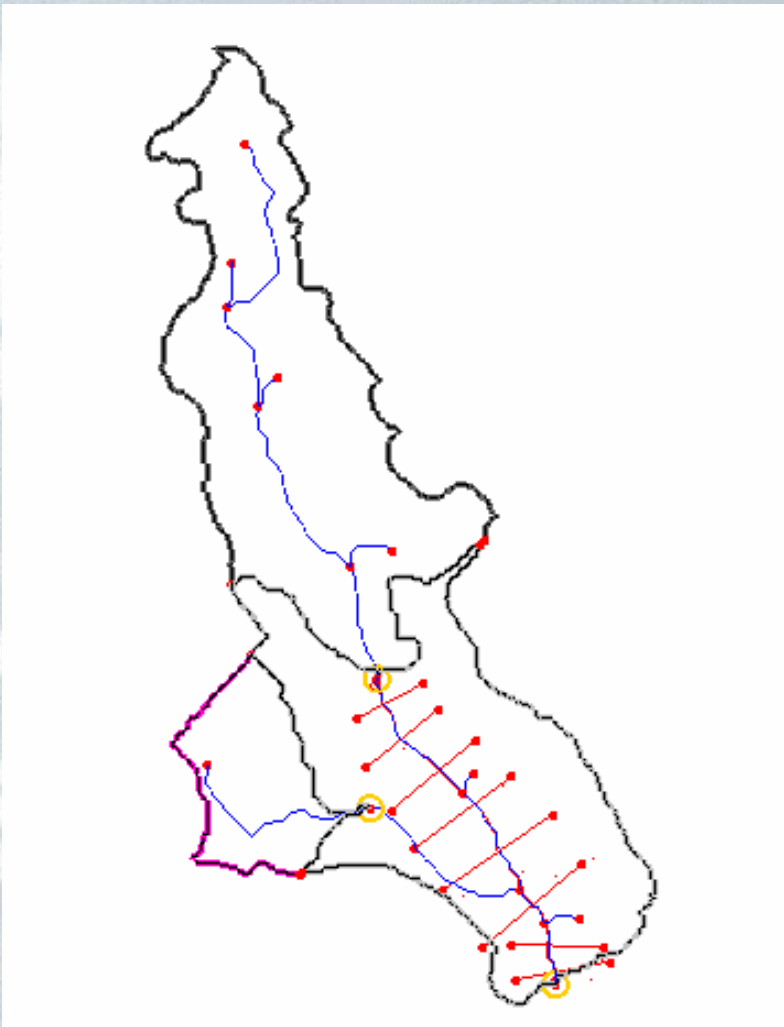
Cross Section Editor



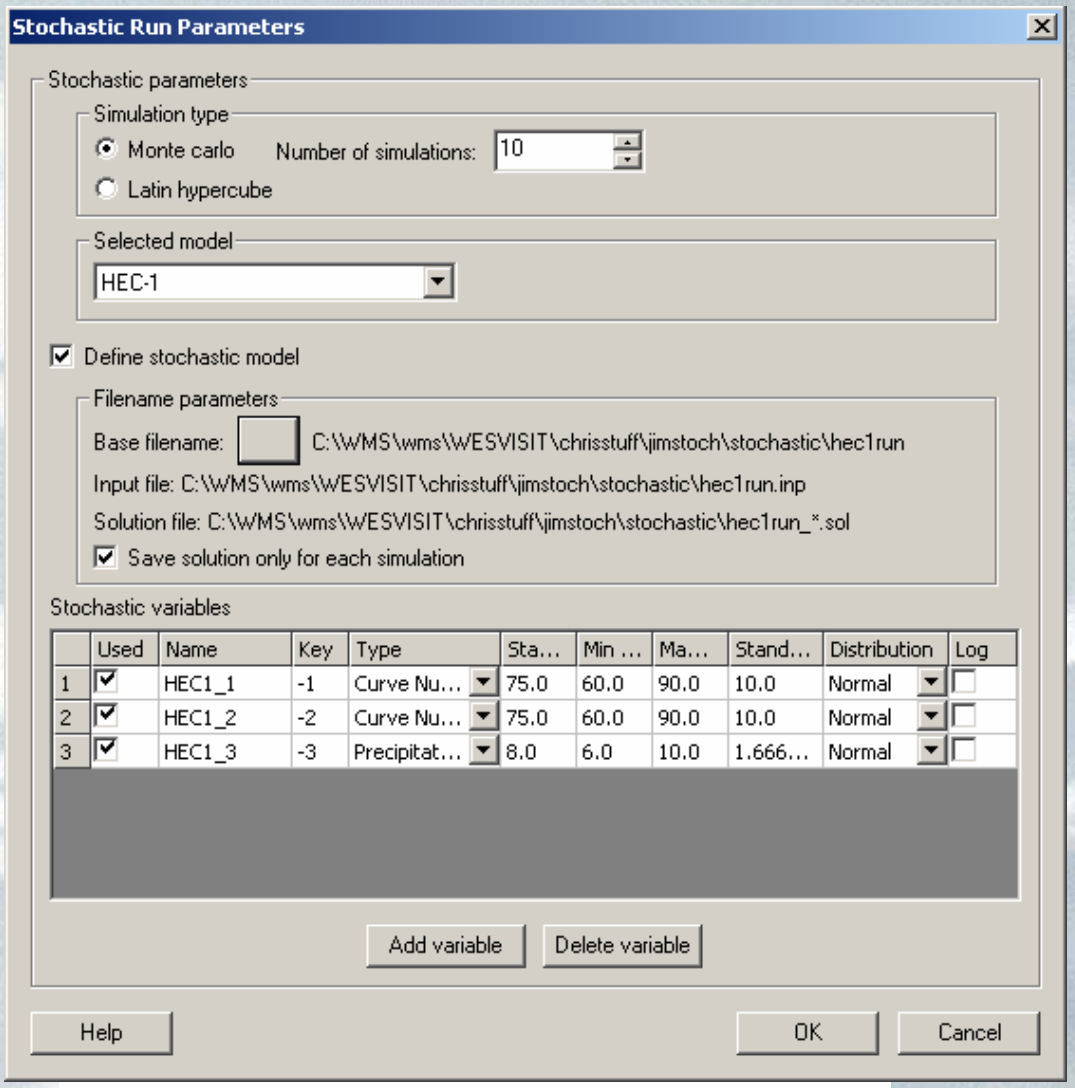
Export to HEC-RAS



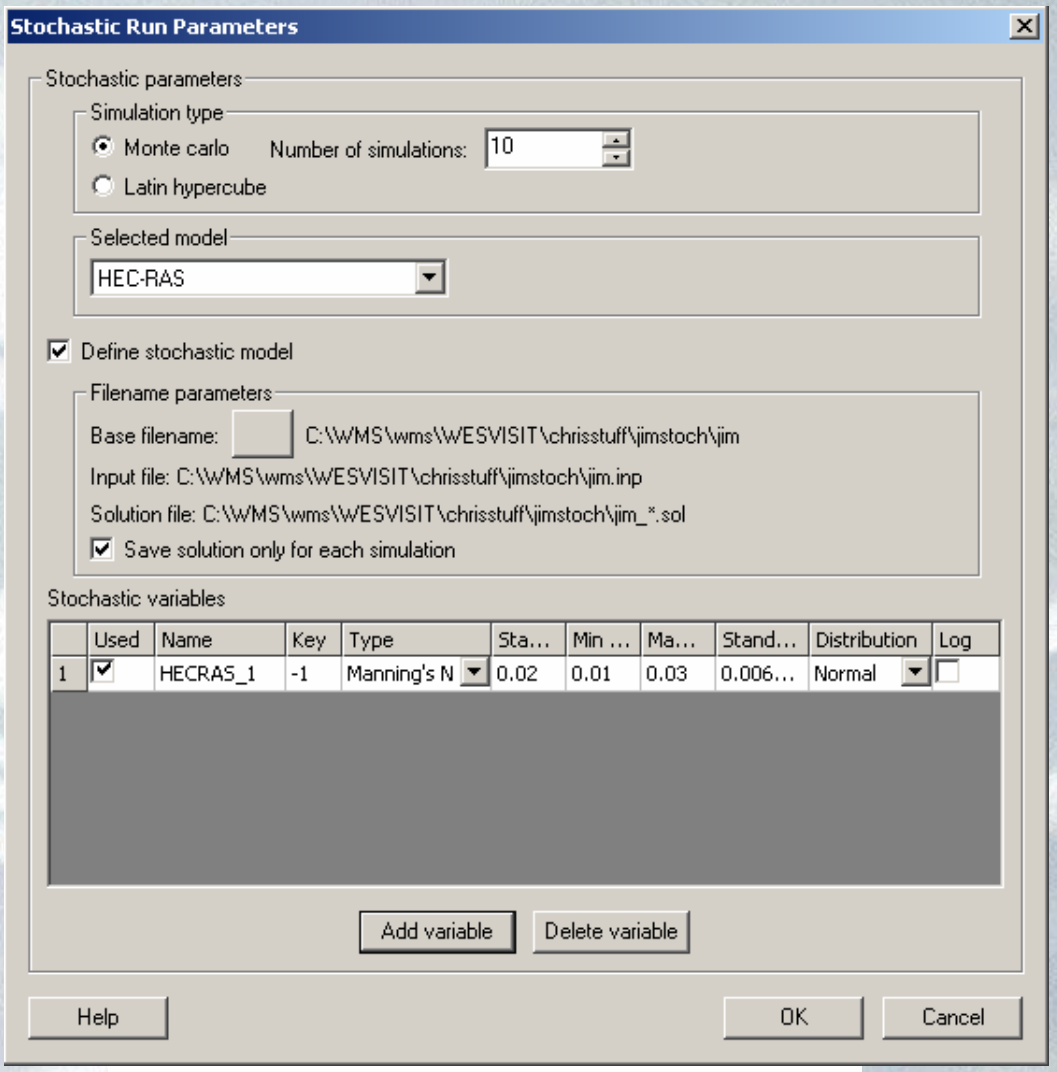
Model Linkage



HEC-1 Model Uncertainty



HEC-RAS Model Uncertainty



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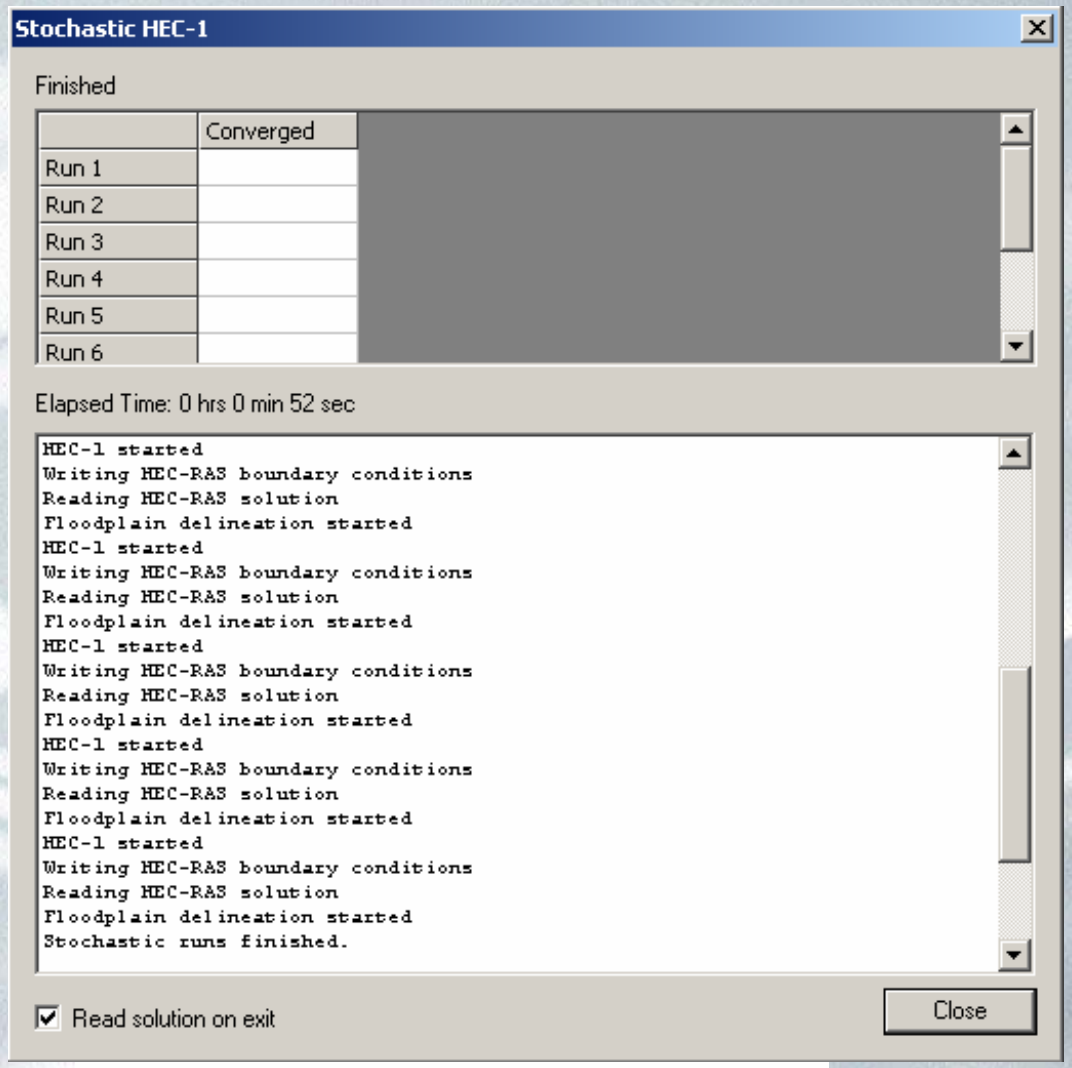
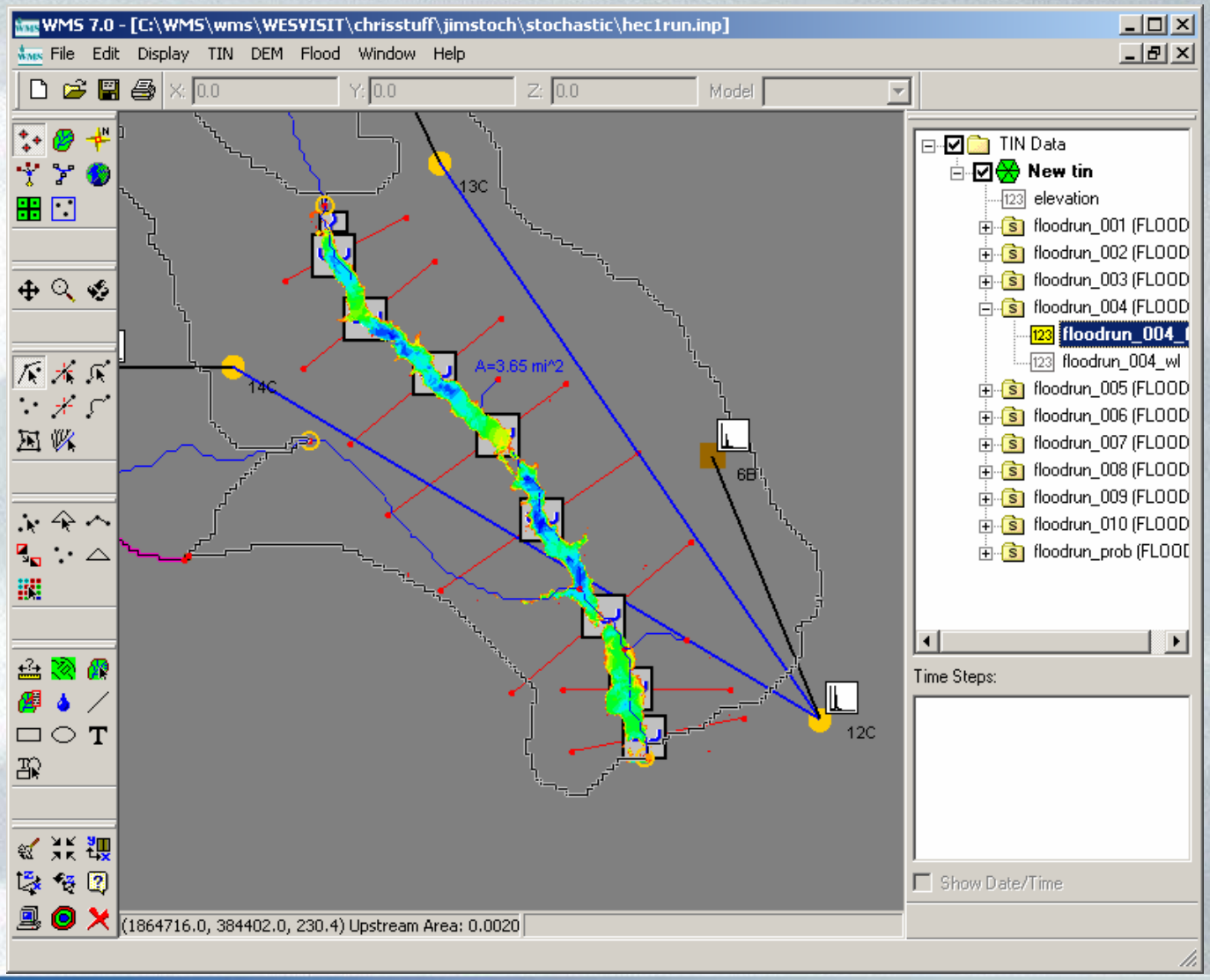
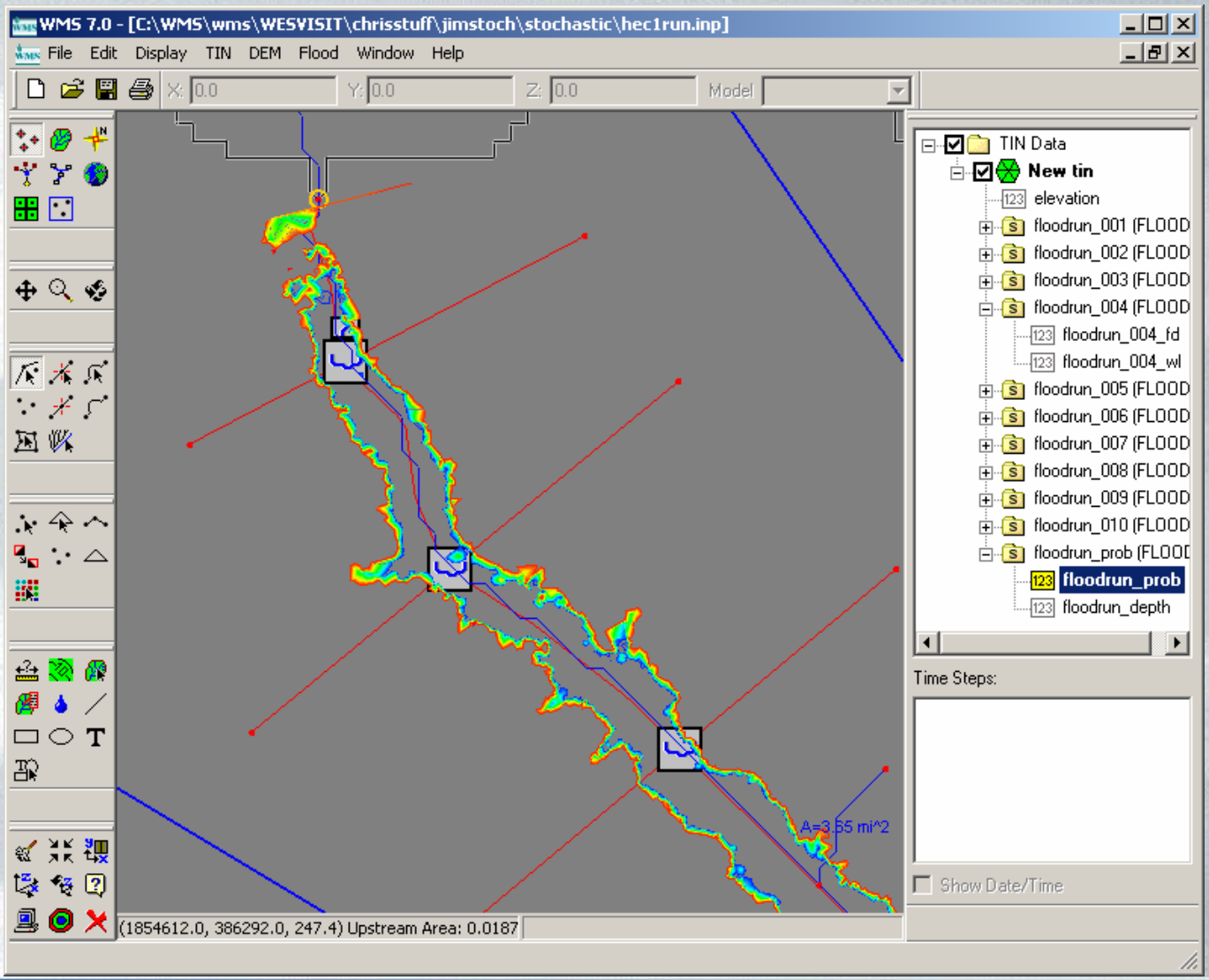


Floodplain Delineation



Probabilistic Floodplain



Questions?