

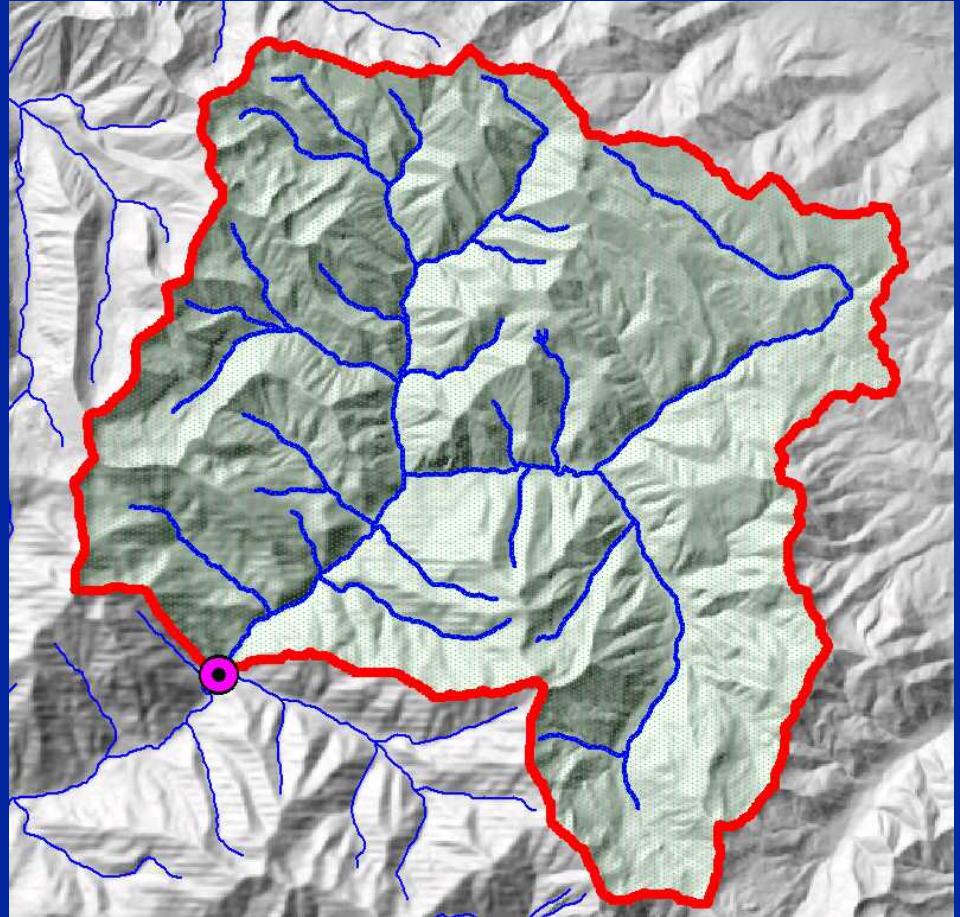
LECTURE #3

WATERSHED DELINEATION



INTRODUCTION TO DELINEATION

- Creating a boundary that represents the contributing area for a particular control point or outlet
- Used to define boundaries of the study area, and/or to divide the study area into sub-areas



WHY DELINEATE

- Delineated watersheds are required for HSPF modeling and for BASINS watershed characterization reports
- So we can characterize and investigate what is going on in one portion of the study area versus another.
- Delineation is part of the process known as watershed segmentation, i.e., dividing the watershed into discrete land and channel segments to analyze watershed behavior

DELINEATION METHODS

- DEM Based (Automatic Delineation)
 - Water flows downhill
 - Grid cell based approach
 - Boundaries created automatically by computer
- Manual Delineation
 - Drawing watersheds by clicking on the map
 - Requires underlying data for accuracy

BASINS DELINEATION TOOLS

- Automatic (DEM based) delineation
 - DEM and NED grids
- Manual delineation
 - From existing watershed boundaries and stream layers

BASINS DELINEATION TOOLS

Create themes required for setting up an HSPF model through BASINS/WinHSPF

- Streams
- Subbasins
- Outlets

MANUAL DELINEATION

- User delineates watersheds using mouse
- Allows user to define the entire area contributing to flow at an outlet based on knowledge of topography
- Underlying data required
 - Shapefile or grid DEM
- Optional data for accuracy
 - USGS Topographic Map
 - Other GIS Layers

MANUAL DELINEATION (CONT.)

- Operates on vector GIS data (shapefiles)
- Manual delineations are subsets of existing delineations (i.e., Cataloging Unit Boundary)
- Watersheds can be associated with RF1 or NHD reach files
- Can start with user-supplied subbasins

Manual Watershed Delineator

Manual Delineation

Subbasin Layer: W_branch

Delineate Subbasin Commit Cancel

Subbasin Parameters

Elevation Layer: DEM Elevation Model (02060006demg)

Calculate Subbasin Parameters

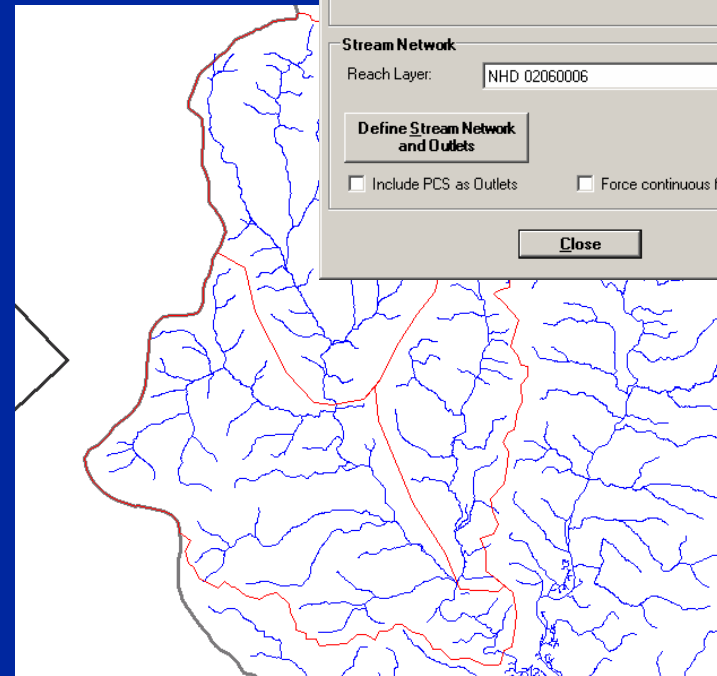
Stream Network

Reach Layer: NHD 02060006

Define Stream Network and Outlets

Include PCS as Outlets Force continuous flow path

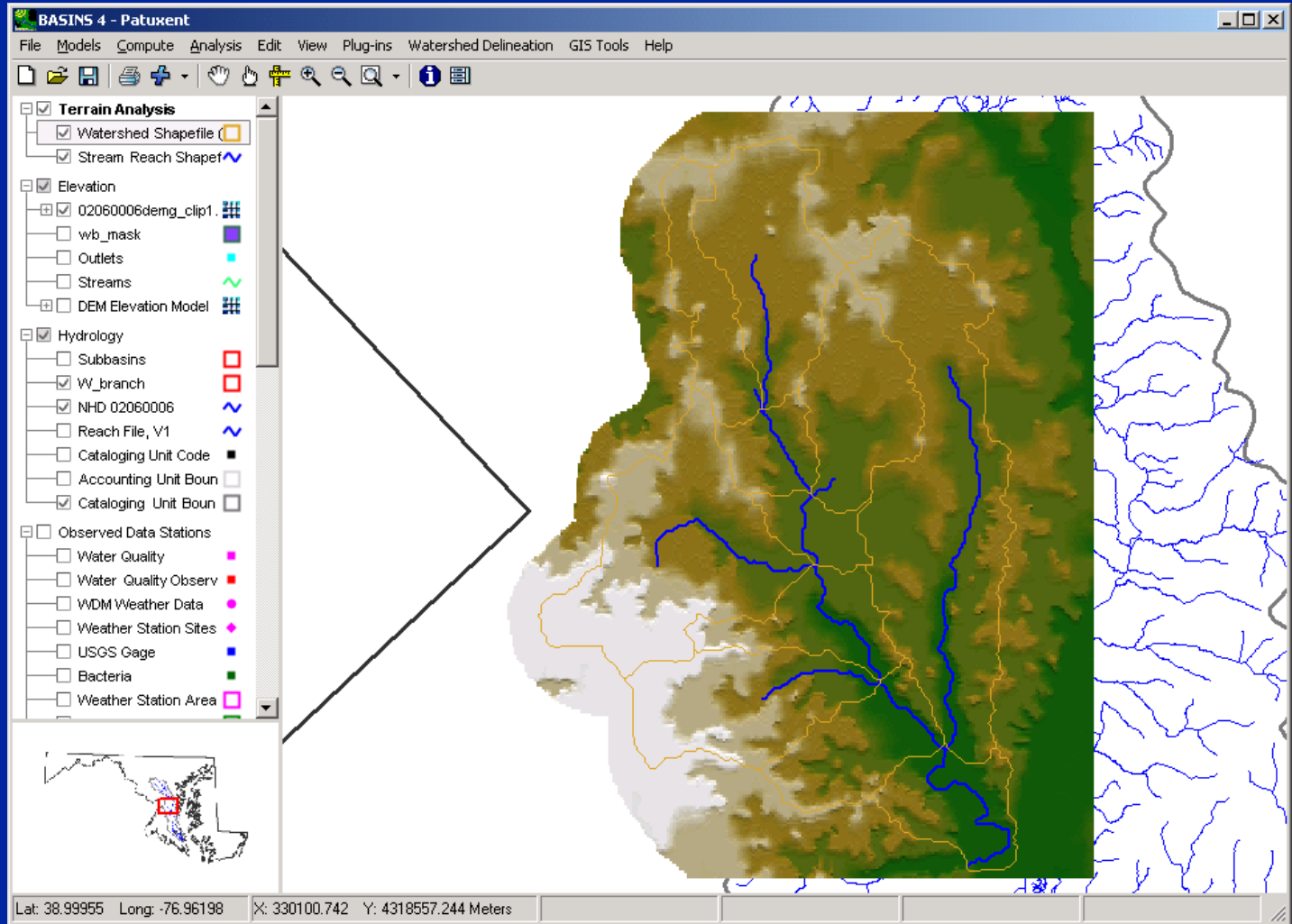
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MANUAL DELINEATION – FUNCTIONS

- Associate PCS point sources with subbasin outlet points
- Edit watershed boundaries
- Calculate subbasin slopes from DEMs
- Define stream network
- Create map layers required for setting up an HSPF model through BASINS

AUTOMATIC DELINEATION



AUTOMATIC DELINEATION REQUIREMENTS

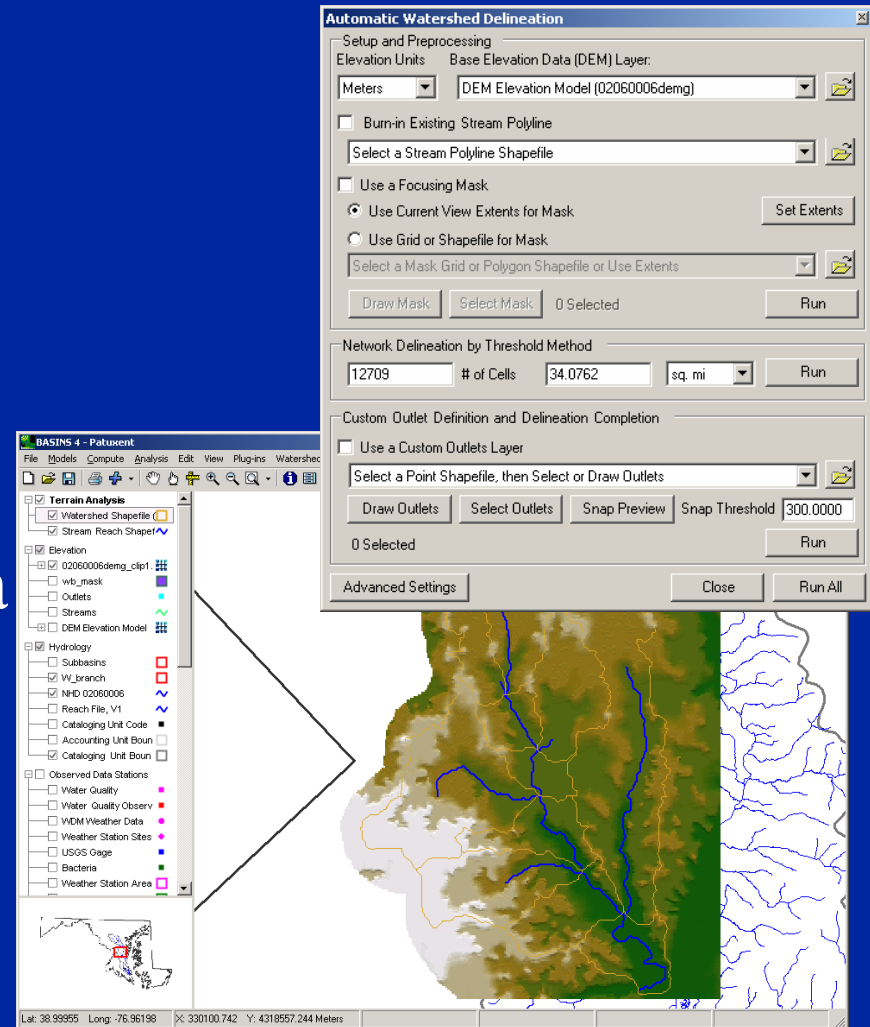
- DEM grid
- (Optional) pre-digitized stream network in shapefile format
 - Reach File, Version 1
 - National Hydrography Dataset (NHD)
 - User defined blue lines

AUTOMATIC DELINEATION (CONT.)

- Creates GIS layers required for setting up an HSPF model through BASINS
- Subwatersheds may be used for watershed analysis
 - BASINS watershed characterization reports

AUTOMATIC DELINEATION IN BASINS 4.0

- Based on TauDEM from USU
- Includes a tool to focus the area upon which BASINS will delineate



AUTOMATIC DELINEATION FEATURES

- Stream burn-in option
 - Define locations of stream networks by force
 - Solves some of the problems with inaccuracies of elevation data
 - Based on existing reach file
 - Reach file, version 1
 - National Hydrography Dataset (NHD)
 - User defined blue lines

AUTOMATIC DELINEATION FEATURES (CONT.)

- Stream definition
 - User may change minimum drainage area required to form the beginning of a stream
 - Determines size and number of subwatersheds
- Outlets layer
 - User may input a layer of watershed outlets, used to specify desired outlet locations

ANALYSIS AND MODELING USING DELINEATED WATERSHEDS

- BASINS watershed characterization reports
 - Landuse distribution
 - Point sources
 - Water quality data
 - Population and Sewerage by Census Tract
 - 303(d) Listed Segments
 - Point Source Discharge Concentrations and Loadings
- Watershed modeling (single or several subwatersheds)

DELINEATION TECHNIQUES FOR HSPF

- Size and number of watersheds must be consistent with objectives of your study
 - Define enough watersheds to capture site specific variability and simulate routing
 - Avoid unnecessary watersheds – parameters must be defined for each watershed
- Outlets of HSPF watersheds should potentially correspond with:
 - Stream confluences (pour points)
 - Gage or sampling locations for HSPF calibration
 - Specific locations at which you wish to view output of HSPF
 - Significant changes in channel characteristics