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 GIS layers 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 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 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