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## Watershed Boundary Dataset (WBD)

Watershed boundaries define the aerial extent of surface water drainage to a point. The intent of defining hydrologic units (HU) for the Watershed Boundary Dataset is to establish a base-line drainage boundary framework, accounting for all land and surface areas. The selection and delineation of hydrologic boundaries are determined solely upon science-based hydrologic principles, not favoring any administrative or special projects nor particular program or agency. At a minimum, they are being delineated and georeferenced to the USGS 1:24,000 scale topographic base map meeting National Map Accuracy Standards (NMAS). A hydrologic unit has a single flow outlet except in coastal or lakefront areas. As stated by the *Federal Standard for Delineation of Hydrologic Unit Boundaries*,


"A hydrologic unit is a drainage area delineated to nest in a multi-level, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, non-contributing, and diversions to form a drainage area with single or multiple outlet points. Hydrologic units are only synonymous with classic watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point."

The Watershed Boundary Dataset is being developed under the leadership of the [Subcommittee on Spatial Water Data](#), which is part of the [Advisory Committee on Water Information](#) (ACWI) and the [Federal Geographic Data Committee](#) (FGDC). The USDA Natural Resources Conservation Service (NRCS), along with many other federal agencies and national associations, have representatives on the Subcommittee on Spatial Water Data.



## Watershed Boundary Dataset Resources

These documents may require [Microsoft Word](#) or [Microsoft Excel](#).

 [Fact sheet](#) (Revised: 01/26/2006; Size: 40.5 KB)

Watershed Boundary Datasets can be obtained from the [Geospatial Data Gateway](#).

 [Federal Standards for Delineation of Hydrologic Unit Boundaries - FGDC Proposal, Version 2.0](#)  
(Revised: 10/01/2004; Size: 6.85 MB)

This document establishes interagency standards and guidelines for creating and delineating hydrologic unit boundaries, modifying existing hydrologic units, and establishing a national Watershed Boundary Dataset (WBD). This standard does not provide specifics for the development of the WBD, but it does provide guidance for developing data that will be incorporated into the WBD.

 [WBD National Technical and State Coordinators](#) (Revised: 08/02/2005; Size: 79.7 KB)

- [Status maps](#)
- [Overview and history](#)
- [FGDC compliant metadata](#)
- [Geospatial data tools](#)

*Last Modified: 11/09/2005*

## **Objectives**

Create national, consistent, seamless, and hierarchical watershed boundary dataset based on topographic and hydrologic features across the country.

Provide more detailed delineation (watershed and subwatershed) and in digital format for local use that is consistent with other national seamless databases.

## **Definitions**

Watershed - Hydrologic unit subdivision below Subbasin (formally Cataloging Unit) (8-digit) and represented with 10-digits. Normal size ranges from 40,000 to 250,000 acres.

Subwatershed - Hydrologic unit subdivision below Watershed (10-digit) and represented with 12-digits. Normal size ranges from 10,000 to 40,000 acres, with some as small as 3,000 acres.

# Hydrologic Unit Hierarchy

**1 Region**  
21 nationally

Pacific Northwest  
Hydrologic Region  
17



**2 Subregion**  
221 nationally



Lower Snake Subregion  
1706  
(35,200 sq. miles)

**3 Basin**  
378 nationally



Lower Snake Basin  
170601  
(11,800 sq. miles)

**4 Subbasin**  
2236 nationally  
700 sq. mi. avg.



Imnaha  
subbasin  
17060102  
855 sq. mi.

**5 Watershed**  
5-15 per  
subbasin

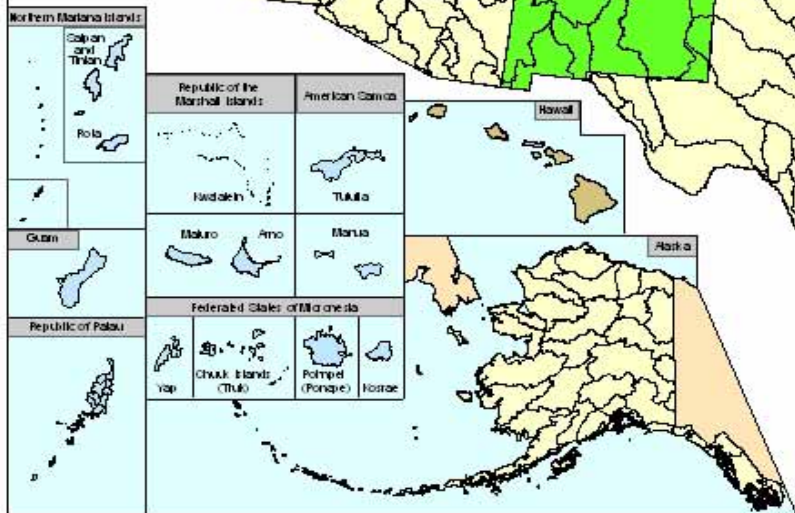
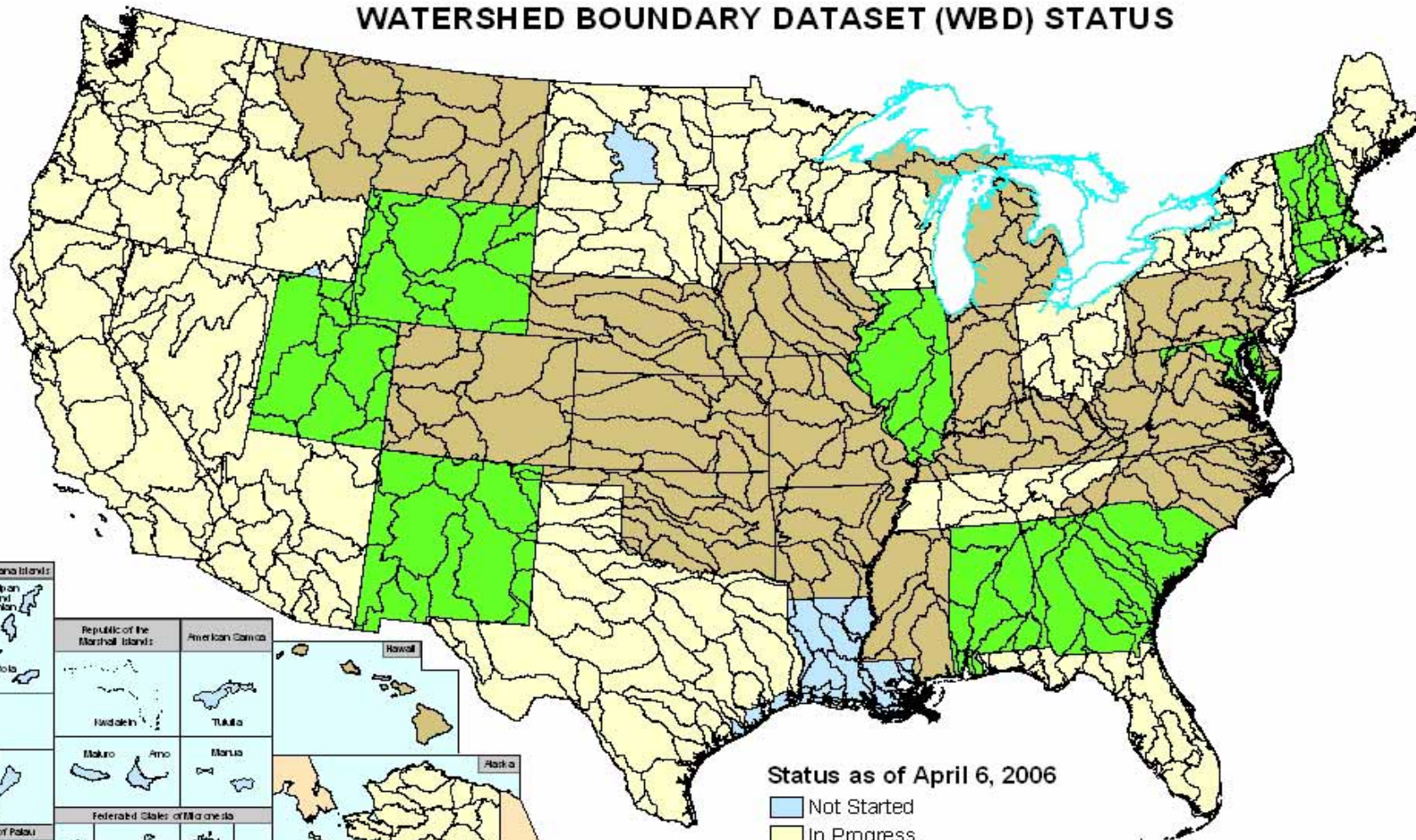


**6 Subwatershed**  
5-15 per watershed





# WATERSHED BOUNDARY DATASET (WBD) STATUS



### Status as of April 6, 2006

- Not Started
- In Progress
- Pending Certification
- Certified \*

\* Data are certified on a statewide basis (intrastate) until the time at which cross state (interstate) edge matching can be completed.

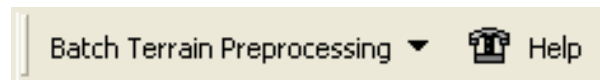


Source: U.S. Bureau of the Census 1998 1:100,000 TIGER Line Data and Field Personnel.

[http://ftp.fhv.nrcs.usda.gov/pub/wbd/status\\_maps/hucstatusstate.pdf](http://ftp.fhv.nrcs.usda.gov/pub/wbd/status_maps/hucstatusstate.pdf)

# Watershed Boundary Dataset Tools (WBD) Introduction

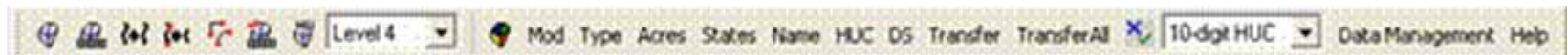
- The WBD Tools are a set of applications to assist in determining 10 and 12-digit hydrologic unit boundaries from digital elevation data and a stream layer if available
- Three toolbars are added to ArcMap
  - Batch Terrain Preprocessing Toolbar performs the initial analysis



- Draft Lines Definition toolbar – aggregates the draft catchment polygons

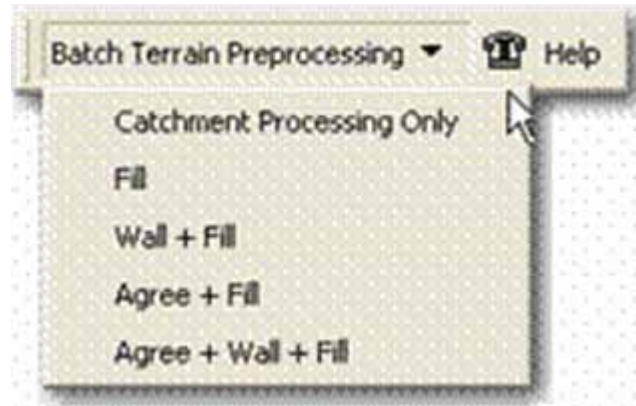


- Final Boundary Determination toolbar generates the final HU line and polygon feature classes



# Batch Terrain Preprocessing Toolbar

- Purpose is to perform initial analysis of the terrain and to prepare the dataset for further processing
- The derivative product will be draft catchments for 5<sup>th</sup>-level Watersheds and 6<sup>th</sup>-level Sub-watersheds catchments
- Batch Terrain Preprocessing Menu Options



# Batch Terrain Preprocessing Toolbar

- Selecting the most appropriate option is data dependent based on.
  - Nature of the project
  - The accuracy
  - The precision of the available data.

| <b>PROCESSING METHOD</b>    | <b>REQUIRED INPUT LAYERS</b>                            | <b>OPTIONAL LAYERS</b>           |
|-----------------------------|---|----------------------------------|
|                             |   |                                  |
| <b>Agree + Wall + Fill</b>  | DEM clipped to Buffered Wall Polygon                    | Inner Wall Feature (line)<br>24k |
|                             | NHD streams clipped to 8-digit boundary (24k)           |                                  |
|                             | Outer Wall Polygon (buffered 8-digit HUC boundary)      |                                  |
|                             | Breach Line (generated by user)                         |                                  |
|                             |   |                                  |
| <b>Agree + Fill</b>         | DEM clipped to Buffered Wall Polygon                    |                                  |
|                             | NHD streams clipped to 8-digit boundary (24k)           |                                  |
|                             |   |                                  |
| <b>Wall + Fill</b>          | DEM clipped to Buffered Wall Polygon                    | Inner Wall Feature (line)<br>24k |
|                             | Outer Wall Polygon (buffered 8-digit HUC boundary)      |                                  |
|                             | No Hydro layer or choose not to enforce hydro           |                                  |
|                             | Breach line (generated by user)                         |                                  |
|                             |   |                                  |
| <b>Fill</b>                 | DEM clipped to Buffered Wall Polygon                    |                                  |
|                             | No Hydro layer or choose not to enforce hydro           |                                  |
|                             |   |                                  |
| <b>Catchment Processing</b> | Flow Accumulation Grid clipped to Buffered Wall Polygon |                                  |
|                             | Flow Direction Grid clipped to Buffered Wall Polygon    |                                  |
|                             | DEM (optional) clipped to Buffered Wall Polygon         |                                  |
|                             |   |                                  |

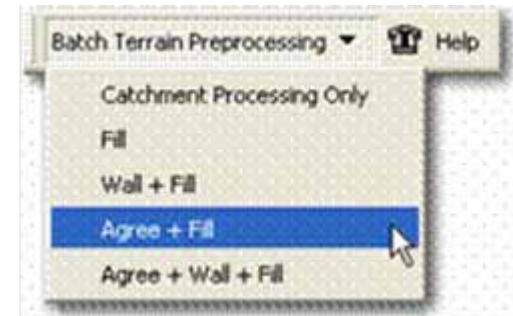


# Batch Terrain Preprocessing Toolbar

➤ AGREE + Fill best option for Louisiana

The AGREE + Fill batch option performs the following processes:

1. HillShade
2. DEM Reconditioning (AGREE)
3. Fill Sinks
4. Flow Direction
5. Flow Accumulation
6. Stream Definition
7. Stream Segmentation
8. Catchment Grid Delineation
9. Catchment Polygon Processing
10. Drainage Line Processing
11. Adjoint Catchment Processing
12. Drainage Point Processing



# AGREE + Fill Batch Option

- Data input windows

DEM AGREE, Fill Sinks, and Catchment Processing

DEM Preprocessing | Catchment Processing

DEM Reconditioning (AGREE)

Raw DEM [ ]

AGREE Stream [ ]

AGREE DEM [ AgreeDEM ]

Stream buffer (no of cells) [ 5 ]

Smooth drop/rise (DEM Z-unit) [ 10 ]

Sharp drop/rise (DEM Z-unit) [ 1000 ]

Fill Sinks

Sink Polygon [ Null ]

Hydro DEM [ Fill ]

Fill Threshold (DEM Z-unit) [ 10 ]

Fill All

OK Help Cancel

DEM AGREE, Fill Sinks, and Catchment Processing

DEM Preprocessing | Catchment Processing

Flow Direction Grid [ Fd ]

Flow Accumulation Grid [ Fac ]

Stream Definition

Stream Grid [ Str ]

Stream Threshold

Percent [ 1 ]

Number of cells [ 7000 ]

Link Grid [ Link ]

Catchment Grid [ Cat ]

Catchment [ Catchment ]

Drainage Line [ DrainageLine ]

Adjust Catchment [ AdjustCatchment ]

Drainage Point [ DrainagePoint ]

Shaded Relief

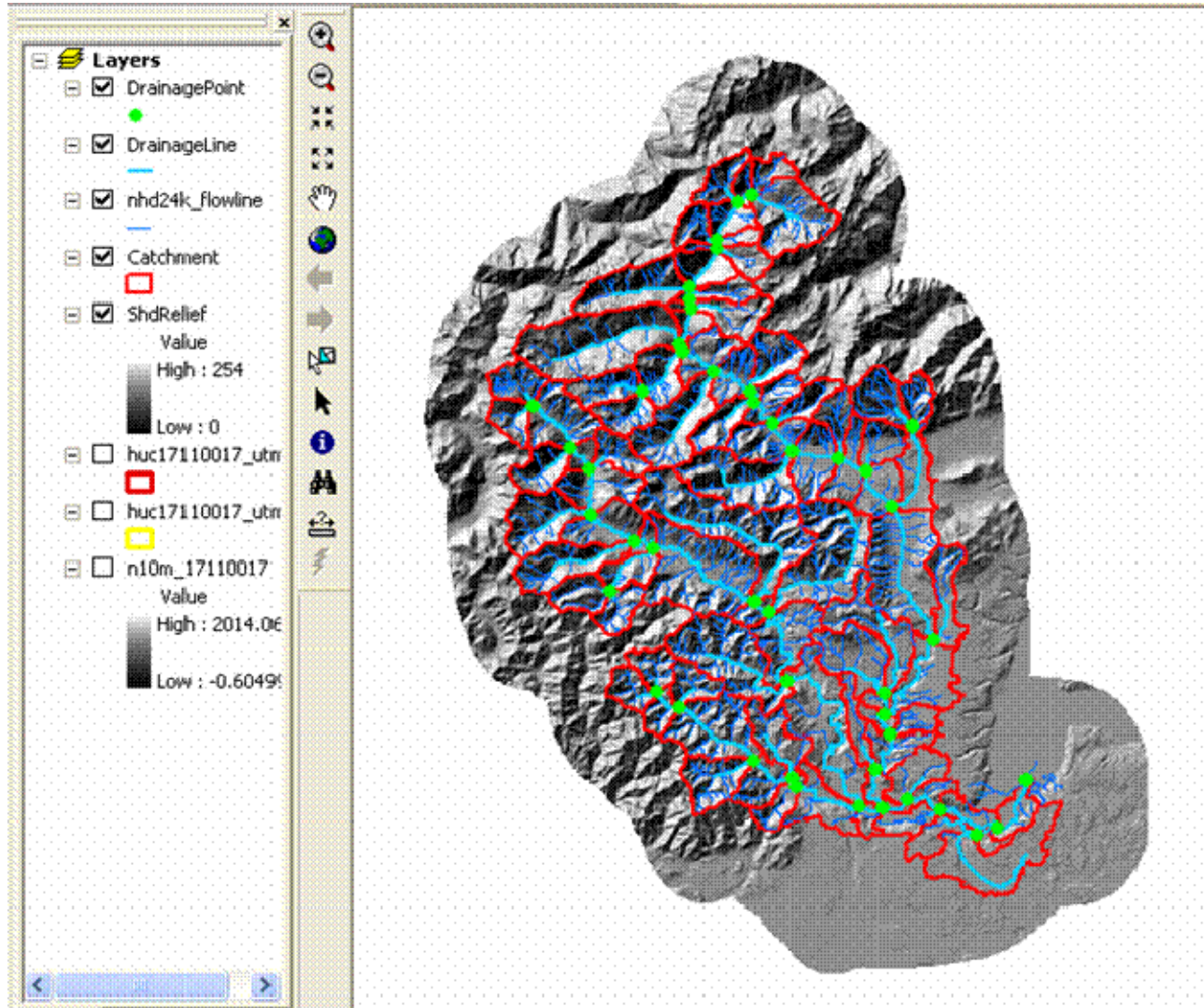
Hillshade [ ShdRelief ]

Azimuth [ 315 ]

Altitude [ 45 ]

OK Help Cancel

# Results of Preprocessing Toolbar



# Draft Lines Definition Toolbar

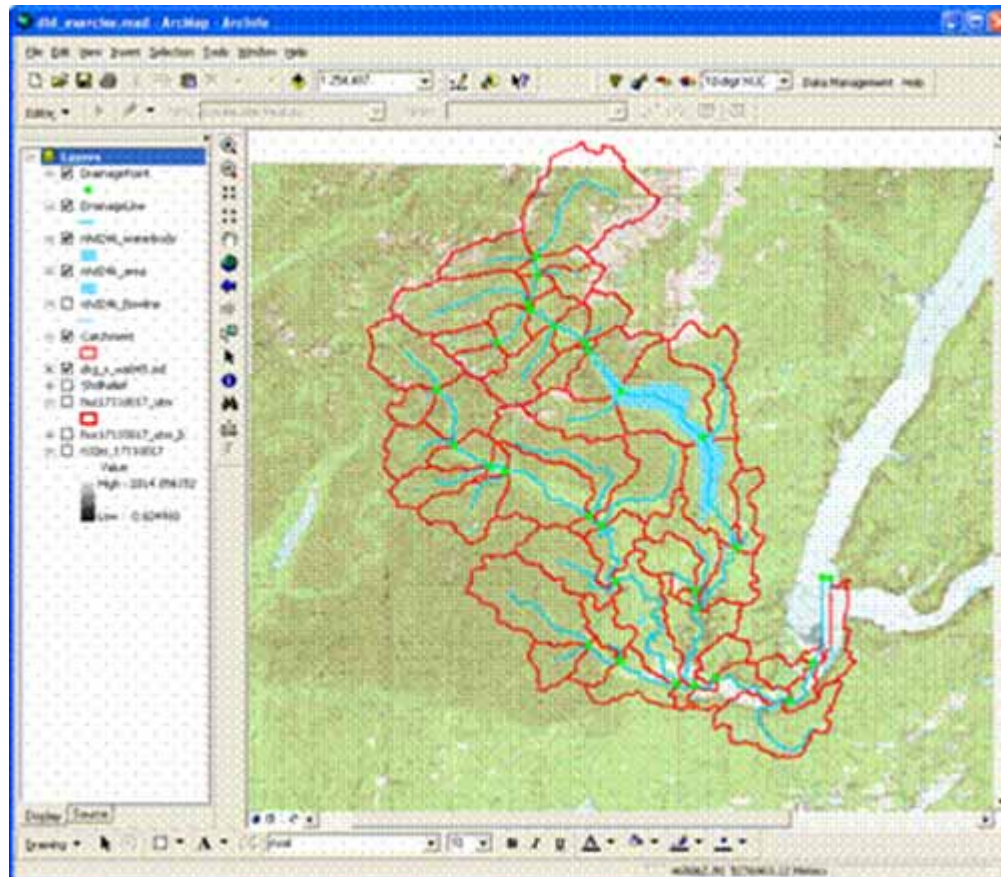
- The Draft Lines Definition Toolbar is used to create preliminary 10 and 12-digit hydrologic units derived from the catchment layer created in the Batch Terrain Preprocessing Toolbar





# Draft Lines Definition Toolbar

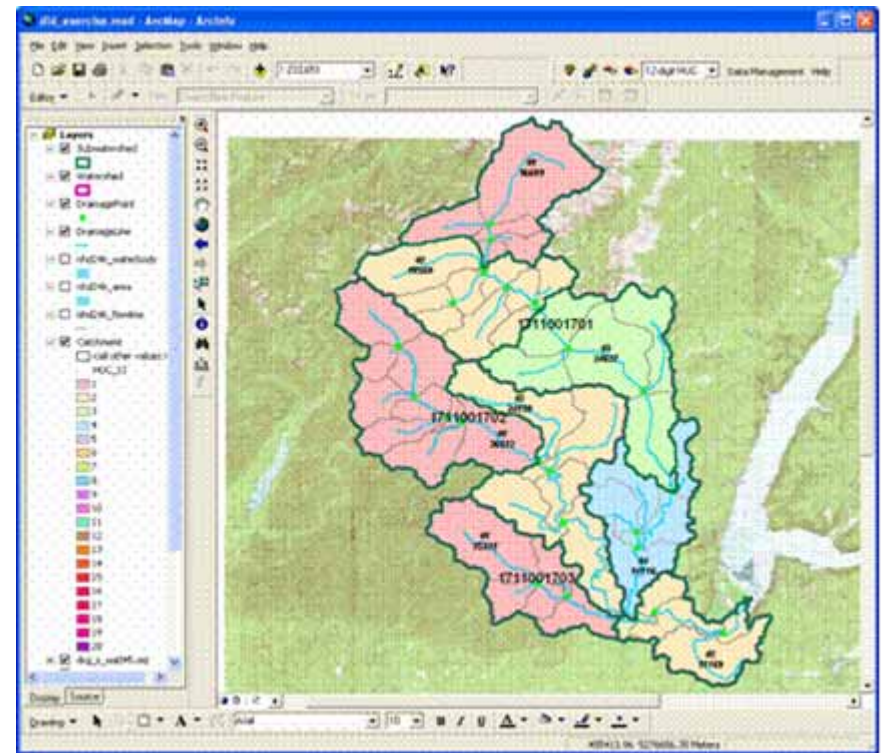
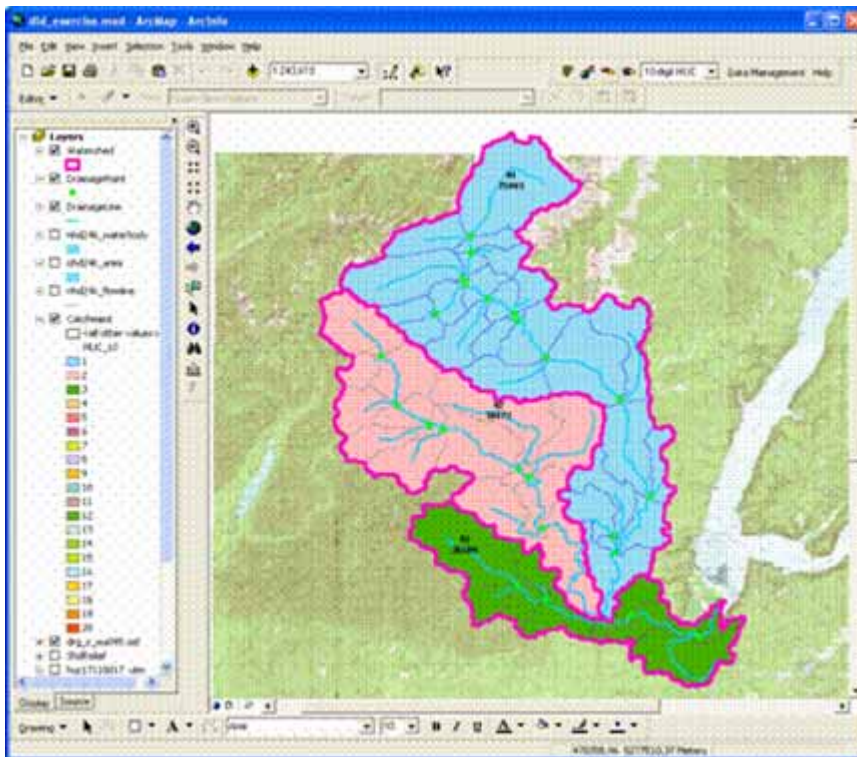
- This toolbar allows the user to take the catchments created in the previous toolbar





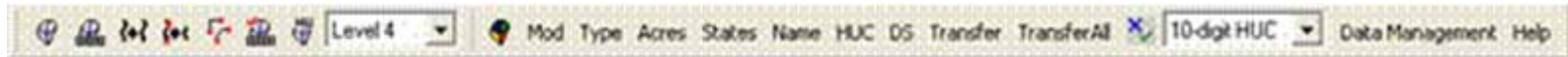
# Draft Lines Definition Toolbar

- Create preliminary watersheds and sub-watershed

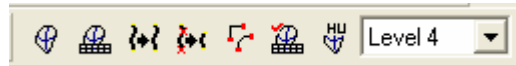


# Final Boundary Determination Toolbar

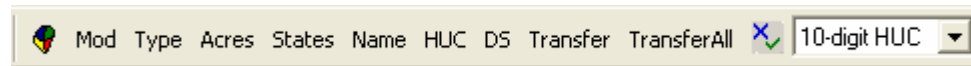
- The Final Boundary Determination toolbar generates the final hydrologic unit line and polygon feature classes with WBD attribution requirements



- The toolbar is divided into two sections:  
Hydrologic Unit Line Tools

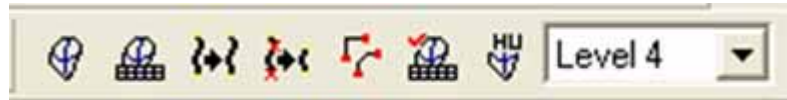


## Hydrologic Unit Polygon Tools



# Hydrologic Unit Line Tools

- This toolbar allows the user to edit the hydrologic unit lines and attributes



- The buttons on this toolbar allows the user to edit, smooth, and attribute the lines according to the WBD Guidelines

# Hydrologic Unit Polygon Tools

- This toolbar allows the user to convert the hydrologic unit lines to polygons and attribute the polygons



- The button on the left converts lines to polygons
- Buttons “MO” through “DS” populate the attribute table according to the WBD Guidelines
- The “Transfer” and Transfer All” buttons moves attributes from an existing WBD dataset to the one that is being worked on
- The “X” check button QA/QC the attribute table formatting against the WBD Guidelines

Opportunities for a WBD partnership?

National Cartography & Geospatial Center

<http://www.ncgc.nrcs.usda.gov>

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