



# WEST VIRGINIA WATERSHED ASSESSMENT PILOT PROJECT

Upper Mon Water Trail ©www.monriver.org

Monongahela End User/Stakeholder Workshop  
April 3, 2012

# Proposed Interactive Web Mapping Application

1. Intro to web mapping
2. Example screenshots of draft tool format
3. Potential use scenarios
4. Existing web mapping tool examples

# Interactive Web Maps

## Definition/ synonyms

- An **interactive web map** is an online map that allows users to view/search spatial data as well as manipulate the scale and display of data, and is often dynamically linked to a database containing routinely updated information.
- Generally interchangeable terms:
  - Web mapping application
  - Dynamic online mapping
  - Online map/data viewer
  - Decision support tool\*

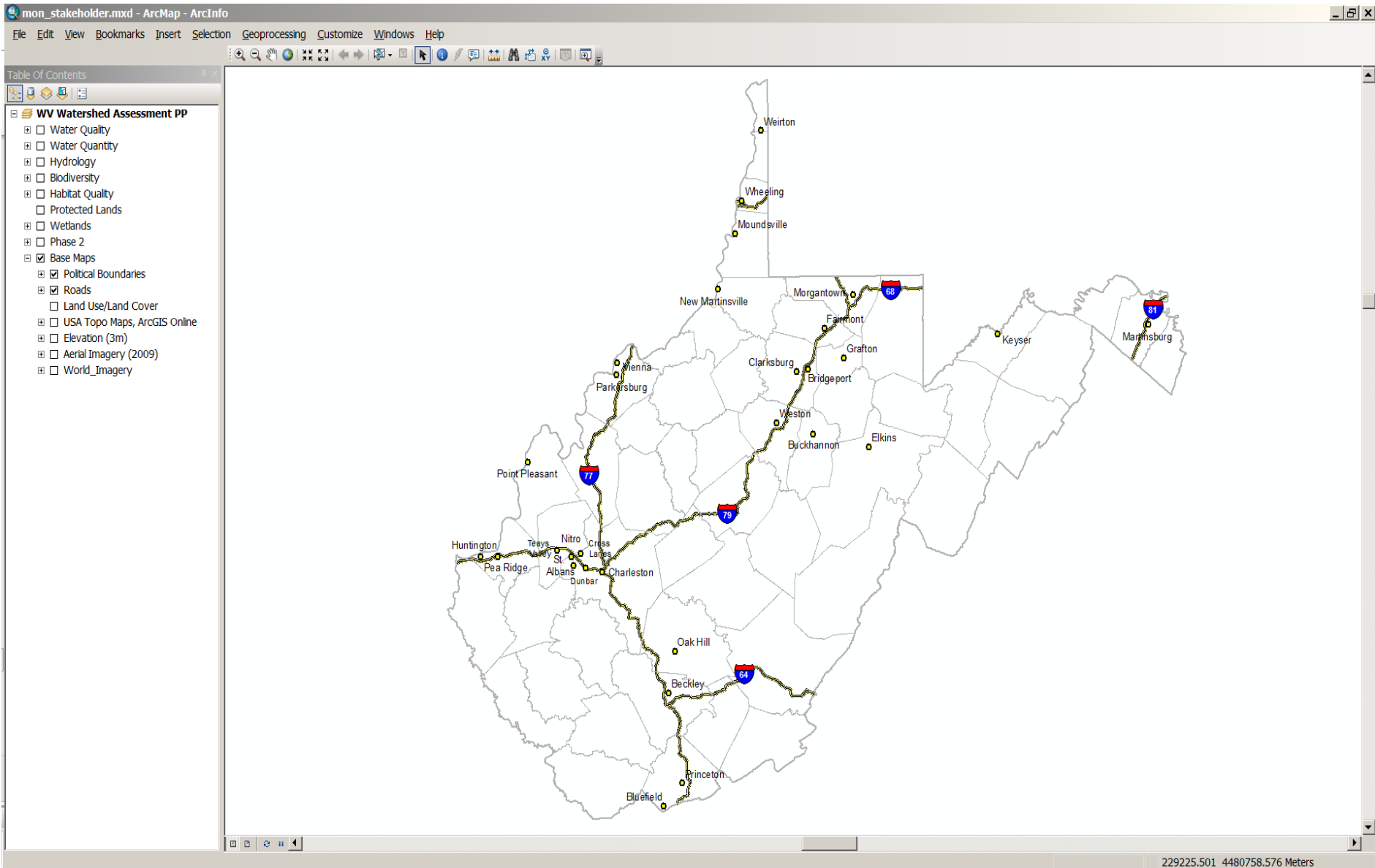
# Interactive Web Maps

Basic

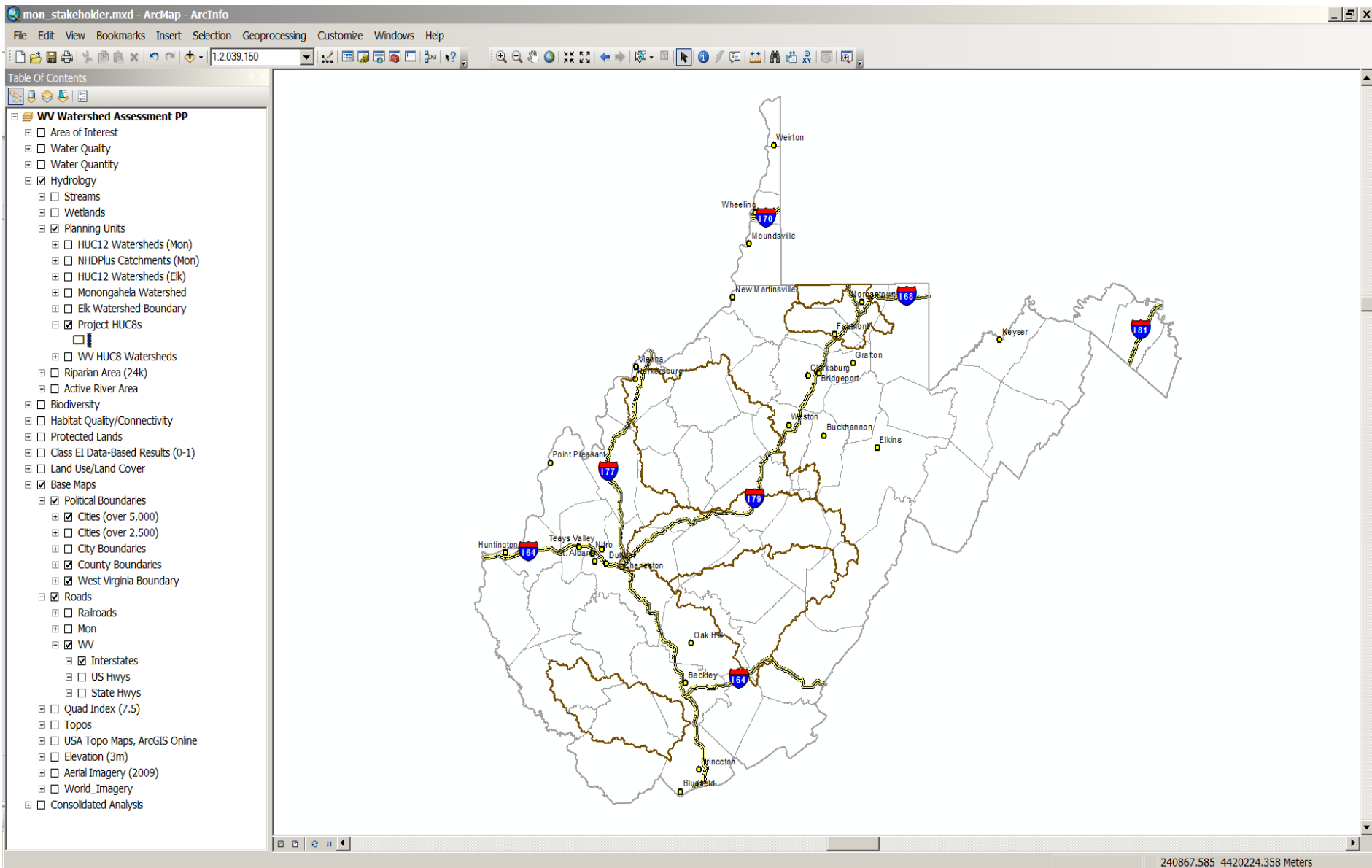
Principles/

Formats

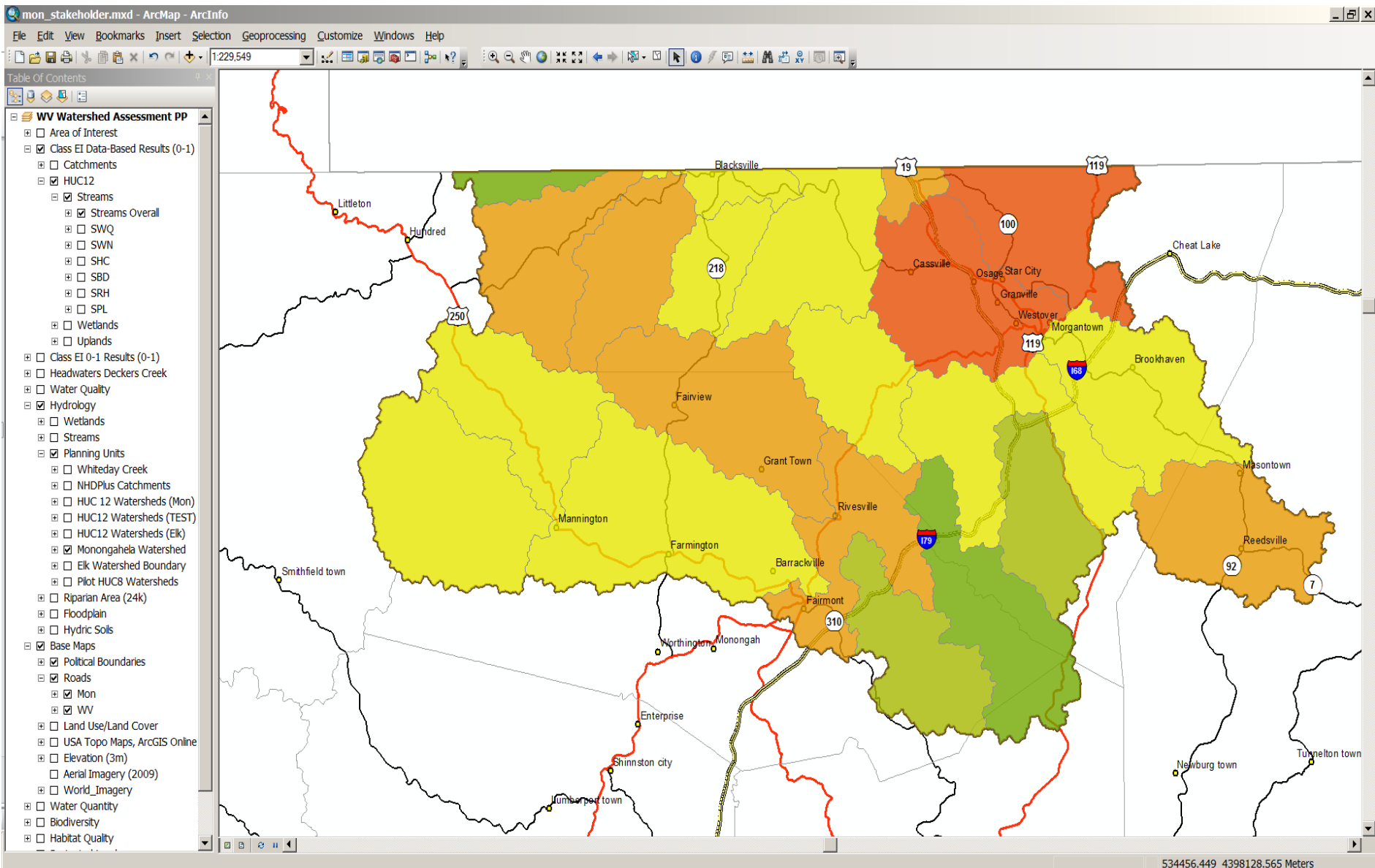
- Ability to zoom in/zoom out to area of interest and pan around map
- Ability to search for area of interest (such as by watershed, stream name, county or town)
- Base layers include: political boundaries, roads, hydrography, elevation, topographic maps, aerial imagery
- Ability to retrieve attribute information about map features (such as water quality sampling data from sample station points)
- **NOTE**: this is a GIS-based analysis and would still require field visits/verification



Example of default base map, with layer groups



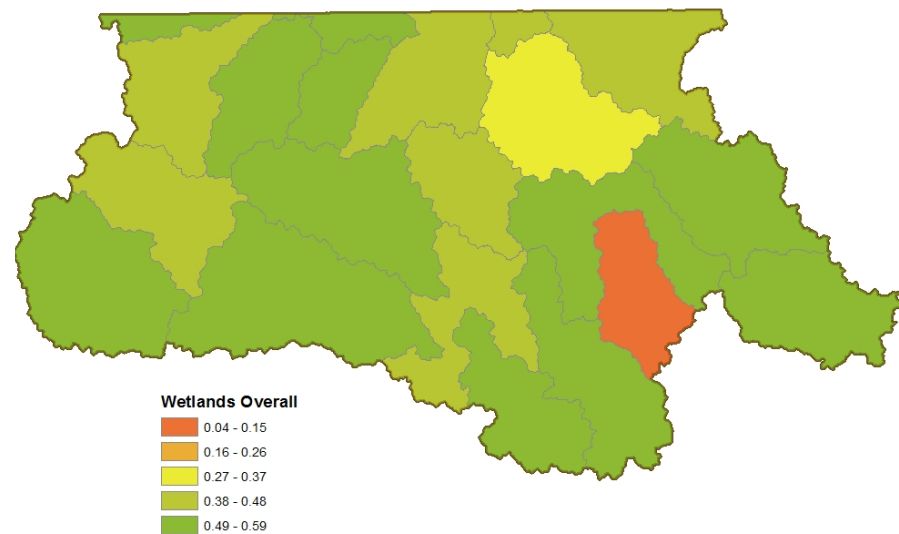
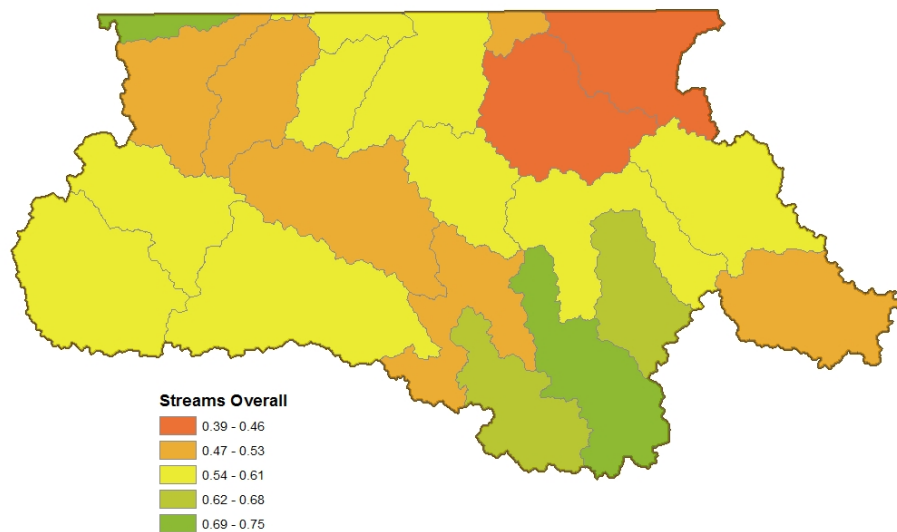
WV Watershed Assessment Pilot Project Initial HUC8s



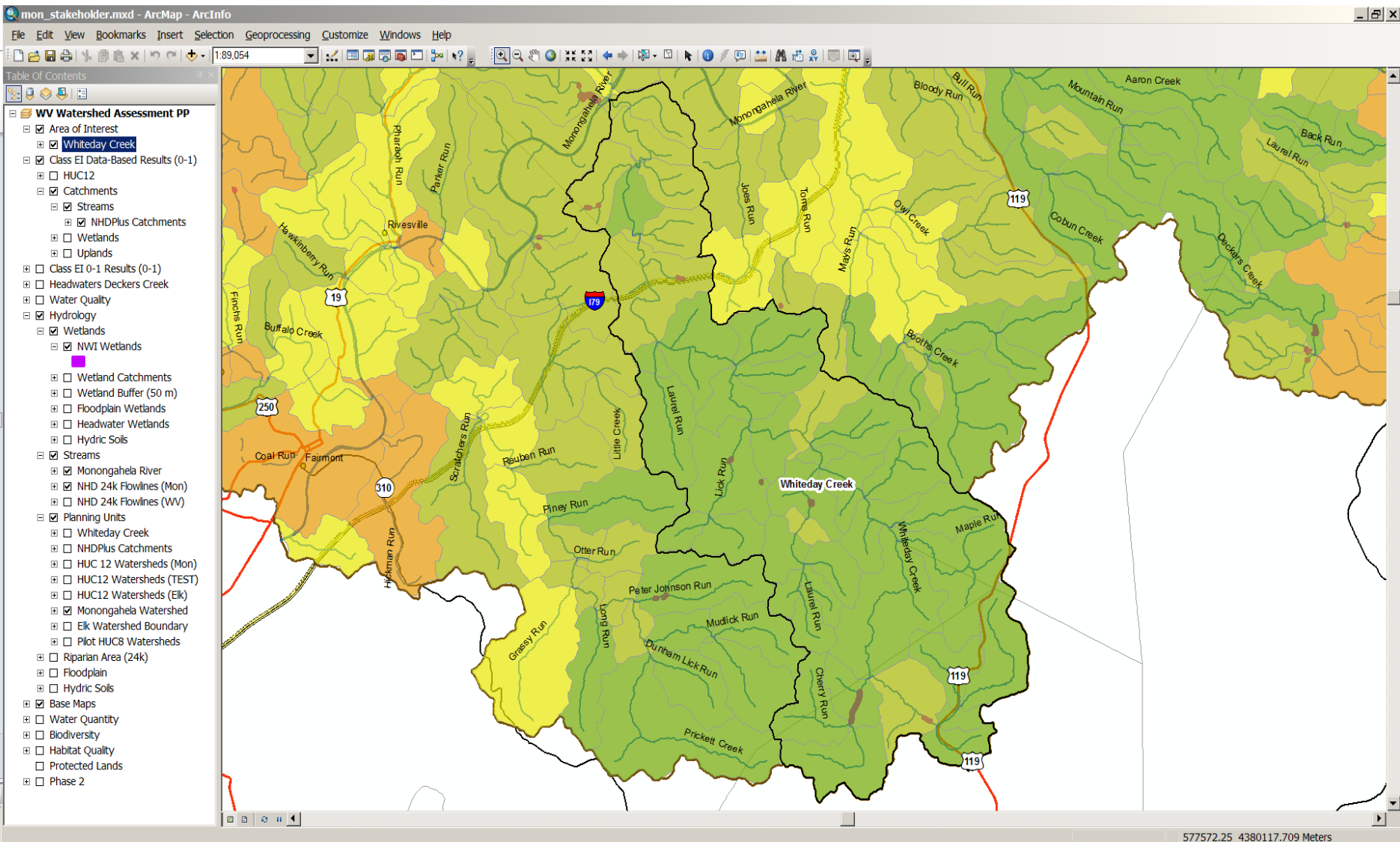
## Monongahela – HUC12 Level Streams Overall Results\*

(\*All results presented are **preliminary** and currently used for illustrative purposes only)

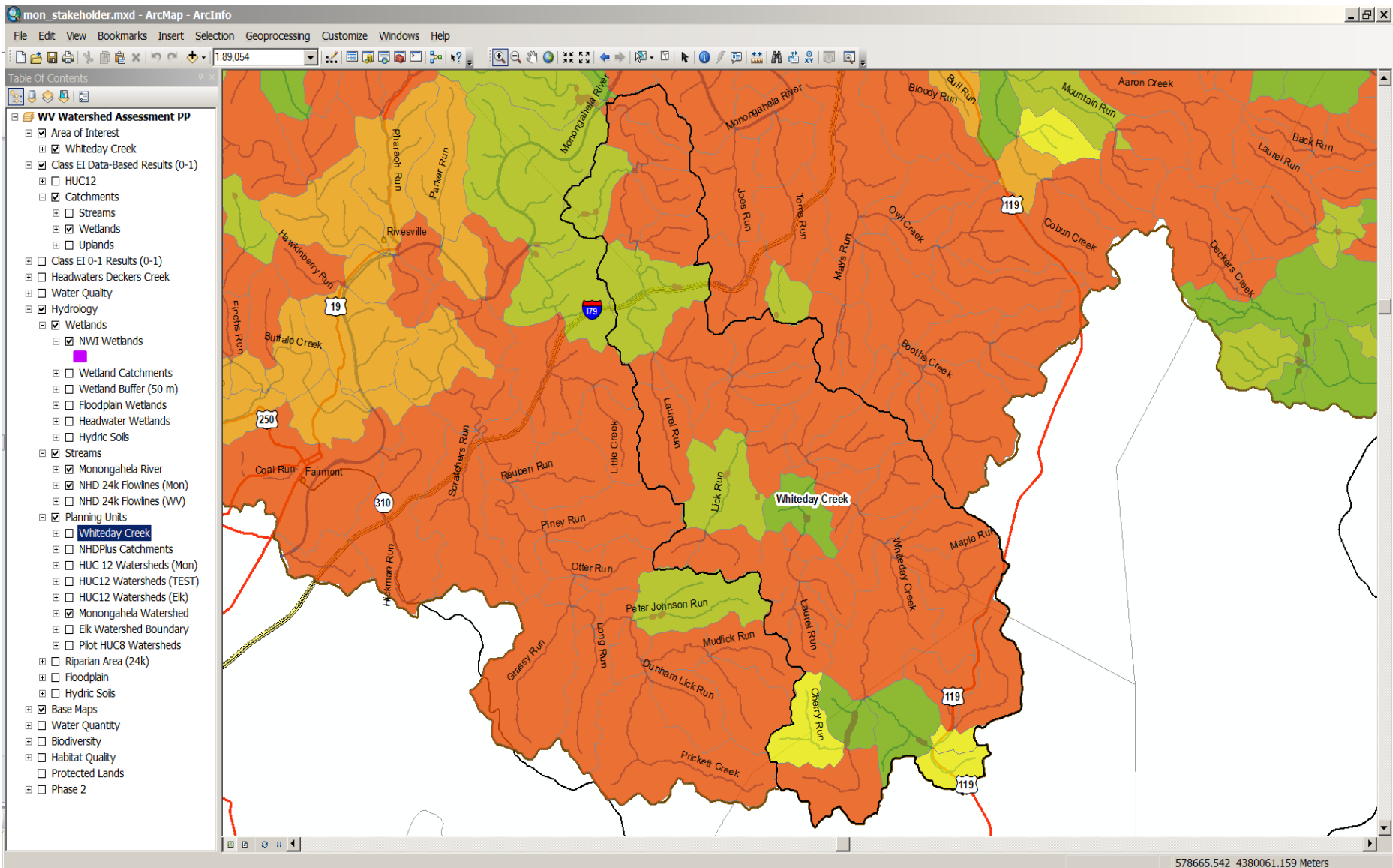
# A note on symbology...



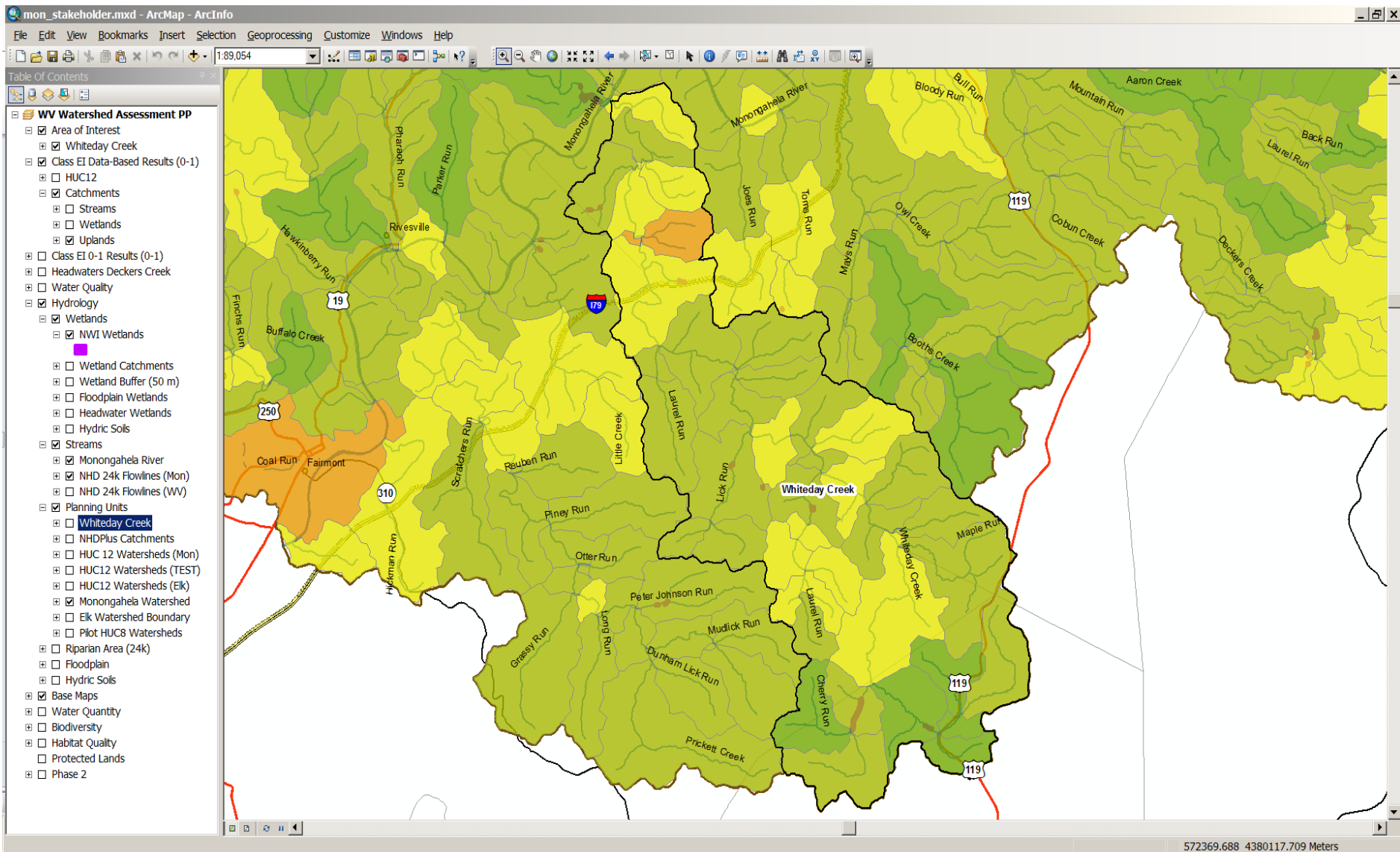




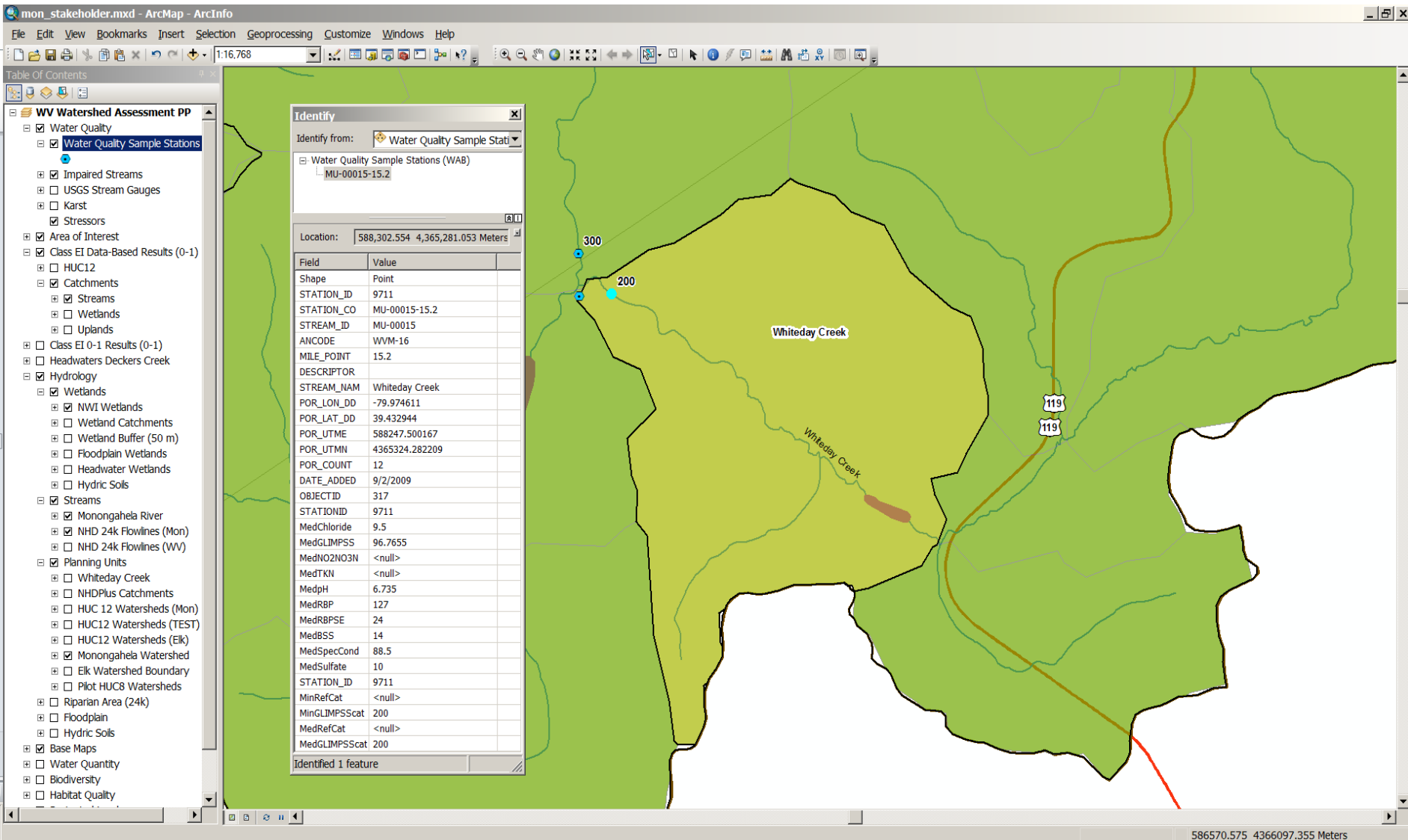
## Whiteday Creek – Catchment Level Streams Overall Results



## Whiteday Creek – Catchment Level Wetlands Overall Results



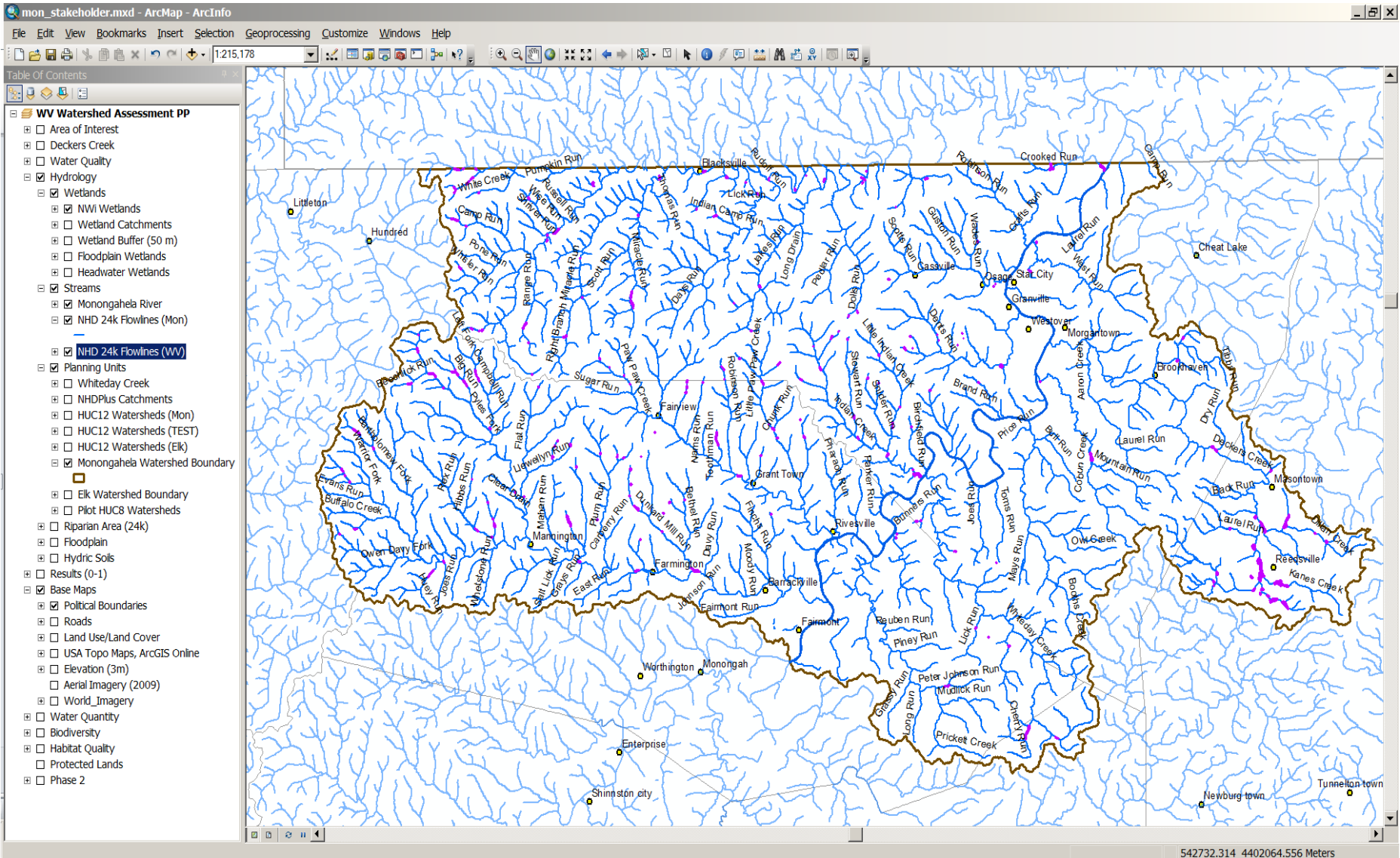
## Whitehead Creek – Catchment Level Uplands Overall Results



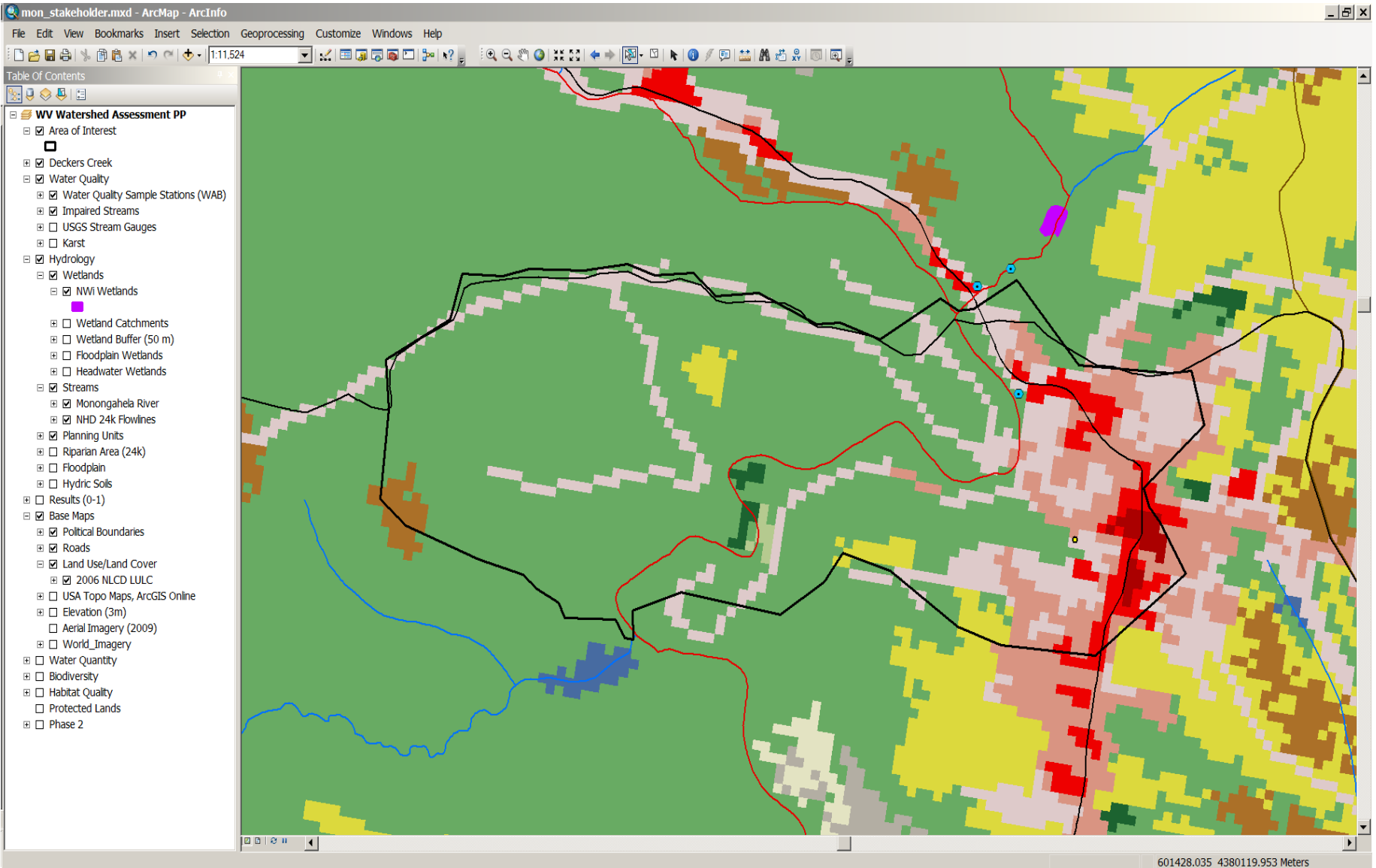
Whiteday Creek – Catchment Level  
Water Quality Sample (WAB) Attribute Information

# Base layers

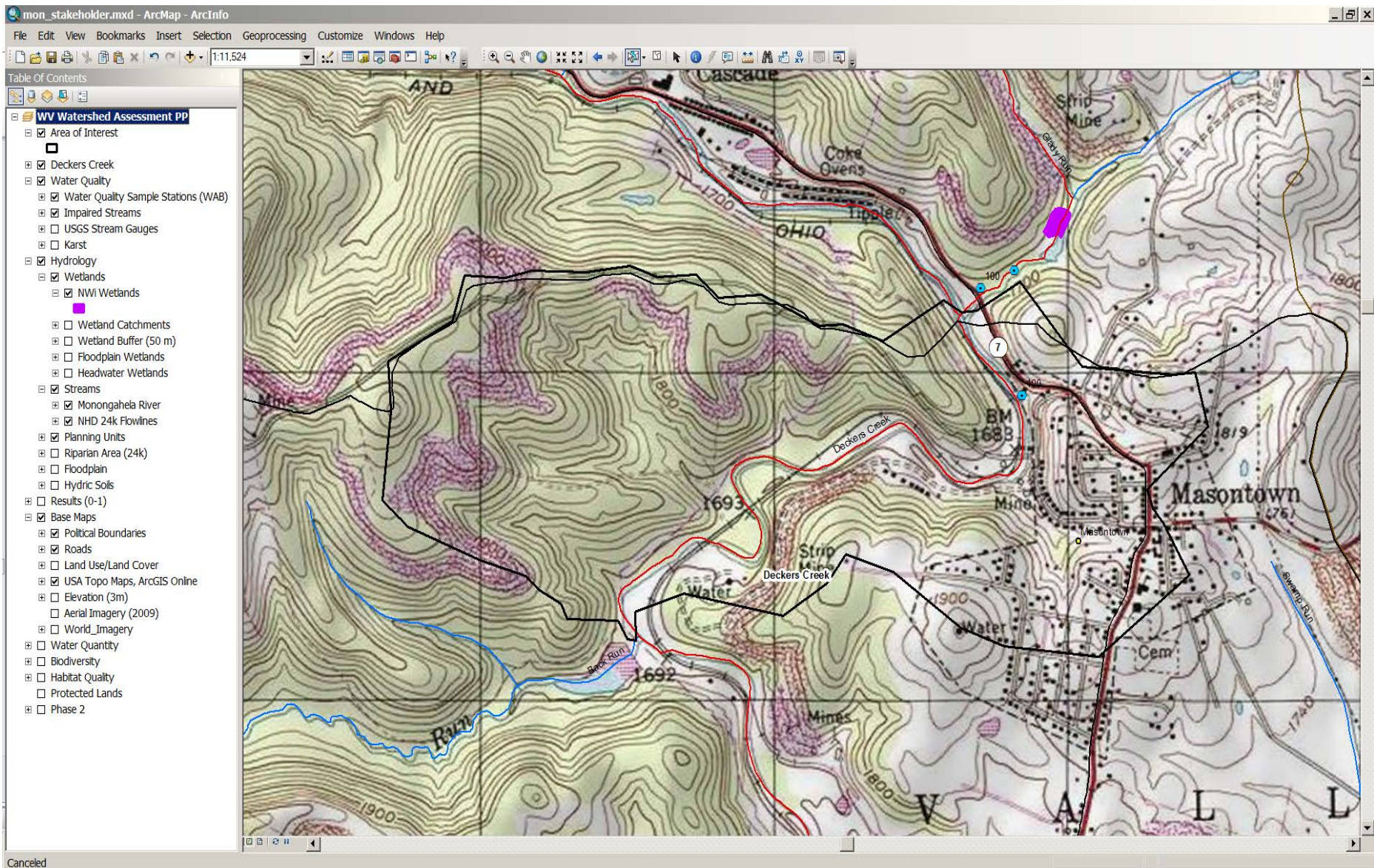
1. Political boundaries/Hydrography
2. Land use/land cover
3. Topographic maps
4. Aerial imagery



Monongahela- HUC12 Level  
 County/city data; NHD 24k flowlines, wetlands, watershed boundary

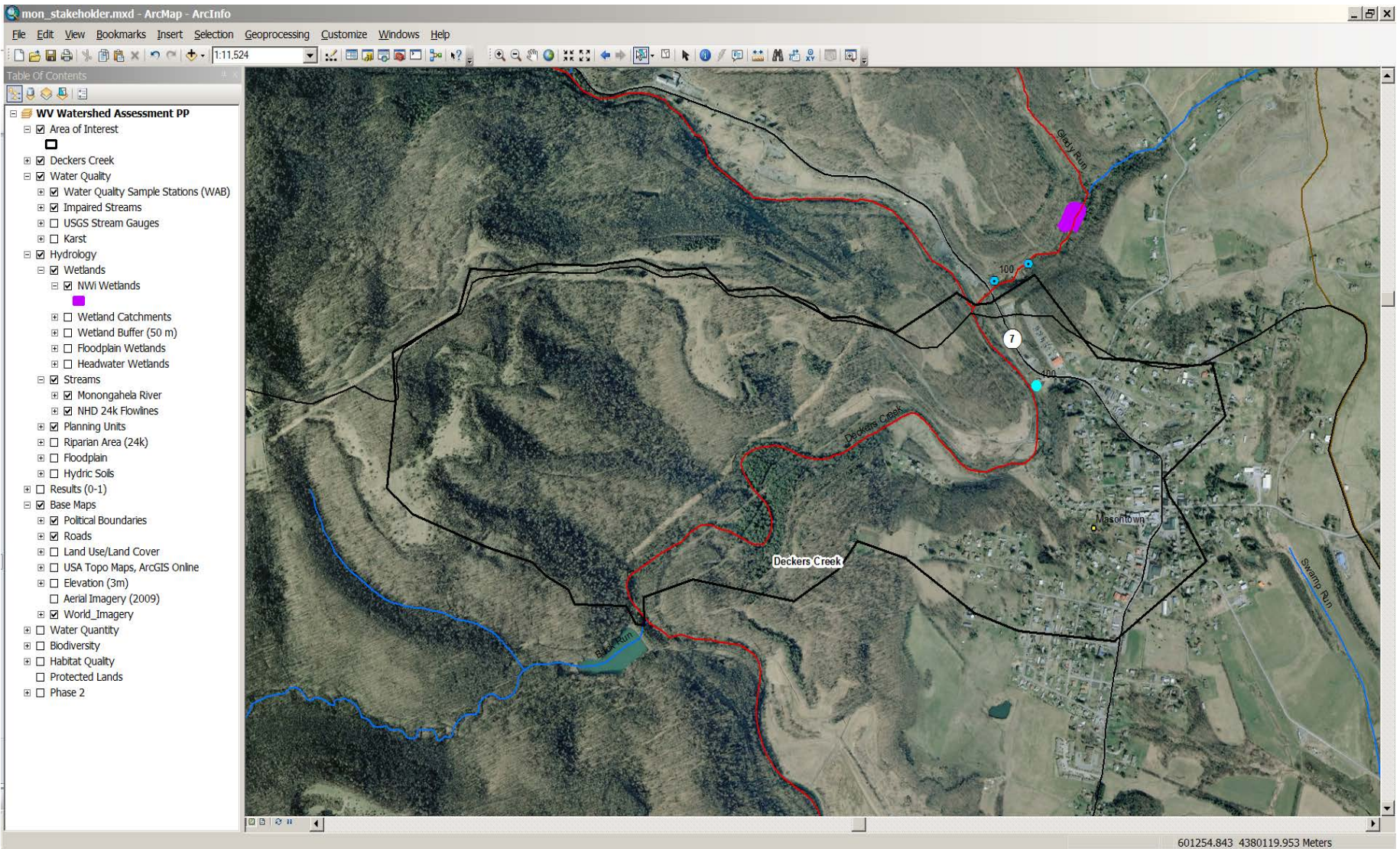


Deckers Creek – Catchment Level  
NLCD 2006 Land use/land cover



Deckers Creek – Catchment Level  
Topographic maps





Deckers Creek – Catchment Level  
Aerial imagery



Mon wetlands



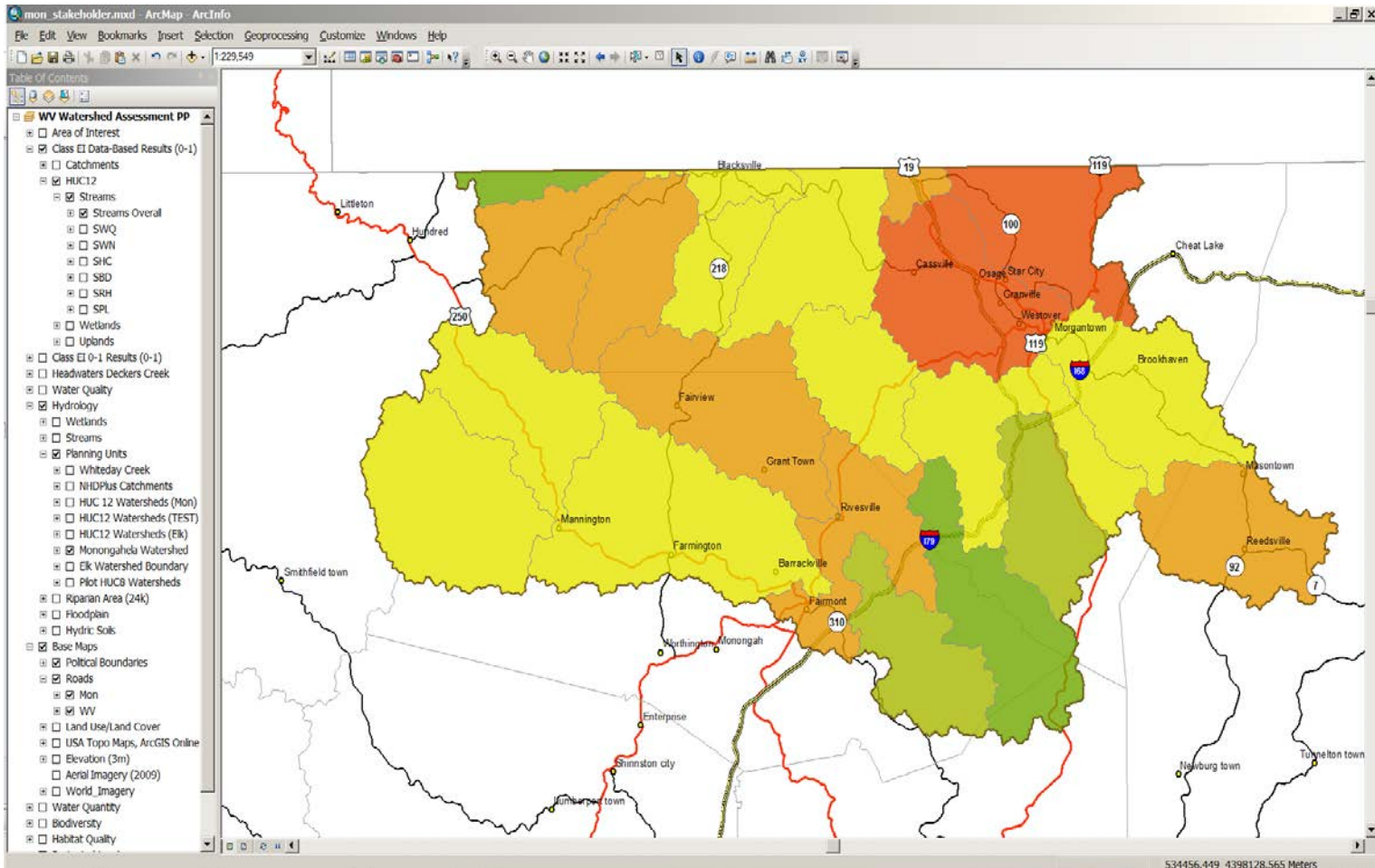
Dunkard Creek

COMMENTS/QUESTIONS?

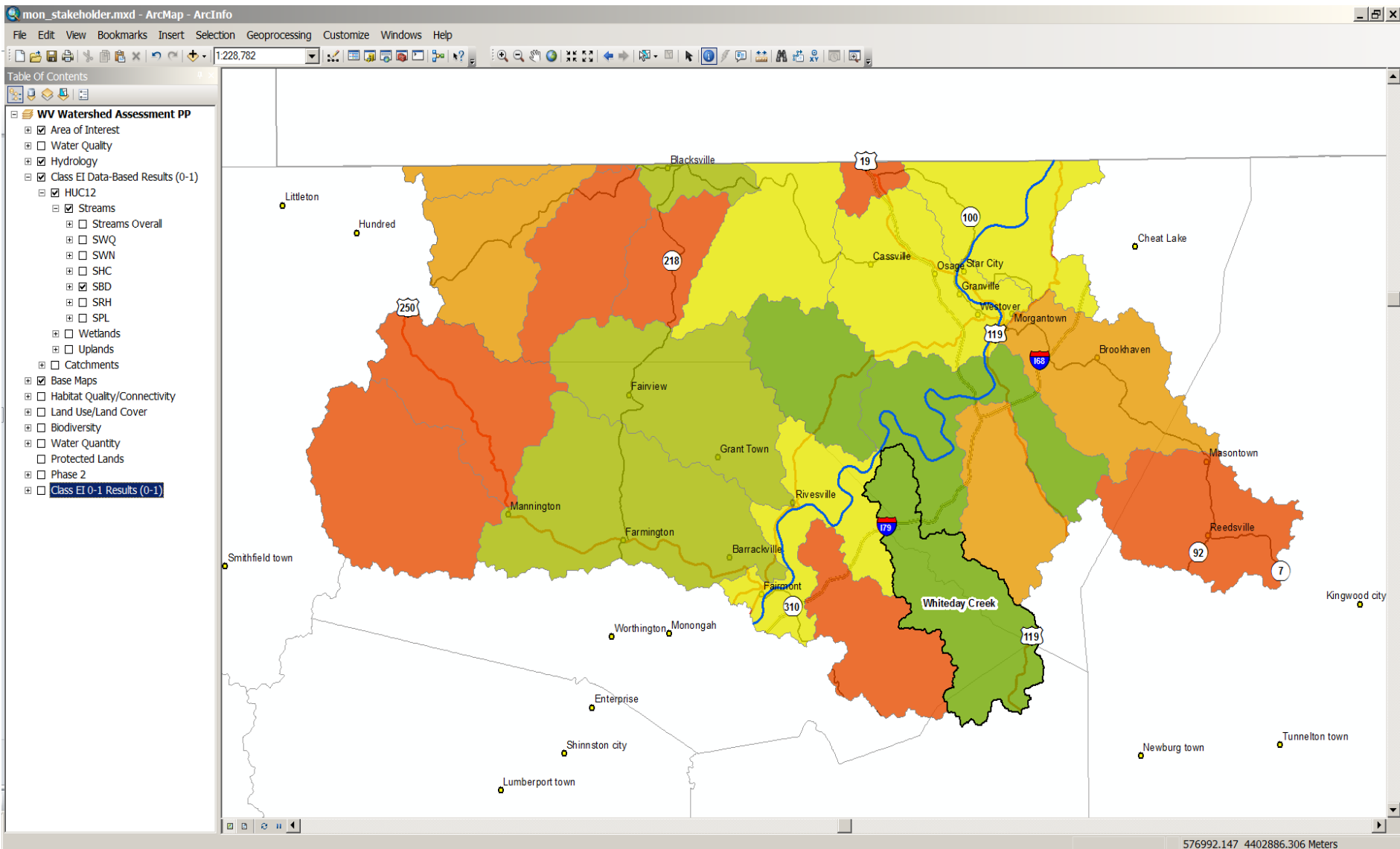
# Potential Use Scenarios

1. Streams/Riparian Protection – Biodiversity
2. Streams/Riparian Restoration – Water Quality
3. Wetlands Restoration – Wetland Habitat
4. Uplands Protection – Habitat Connectivity

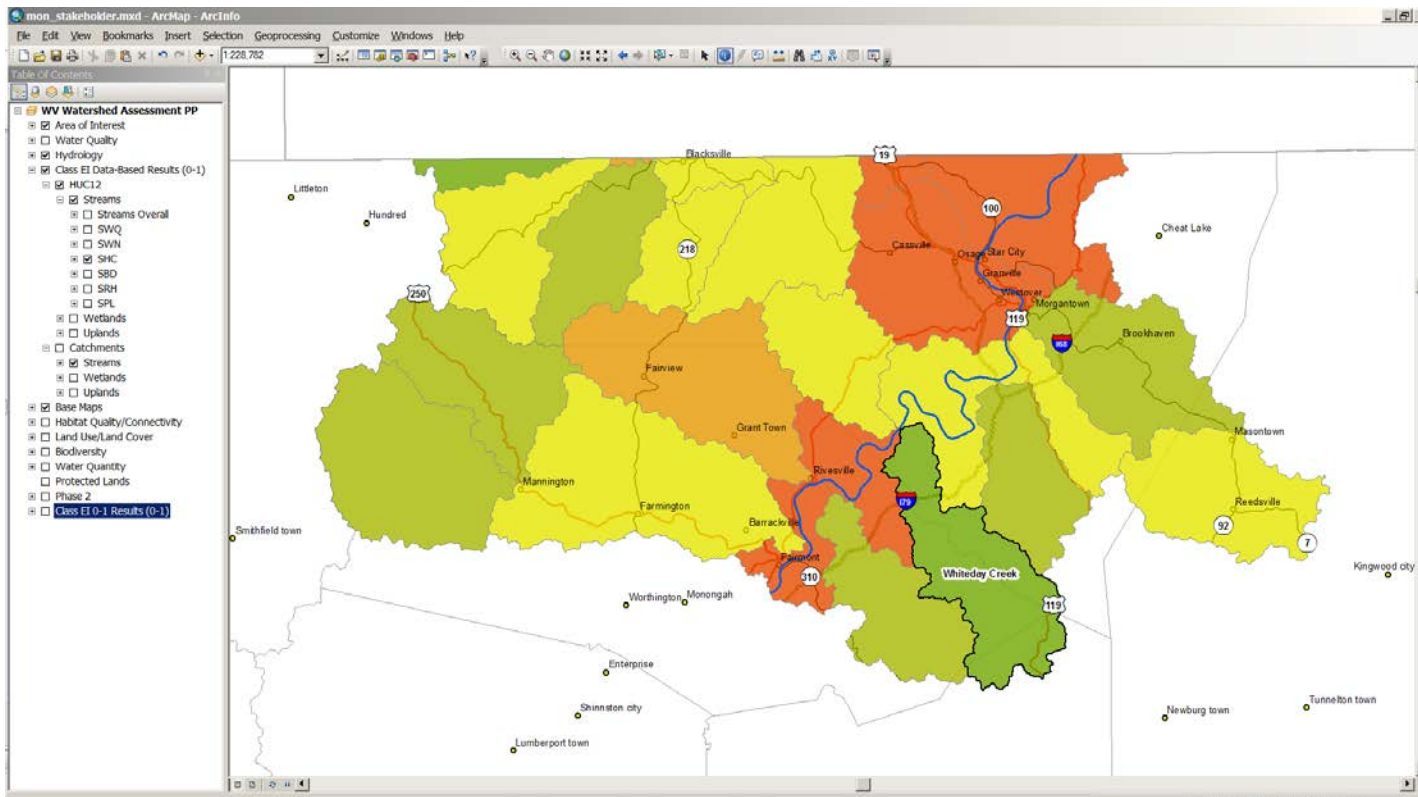
# Streams/Riparian Protection



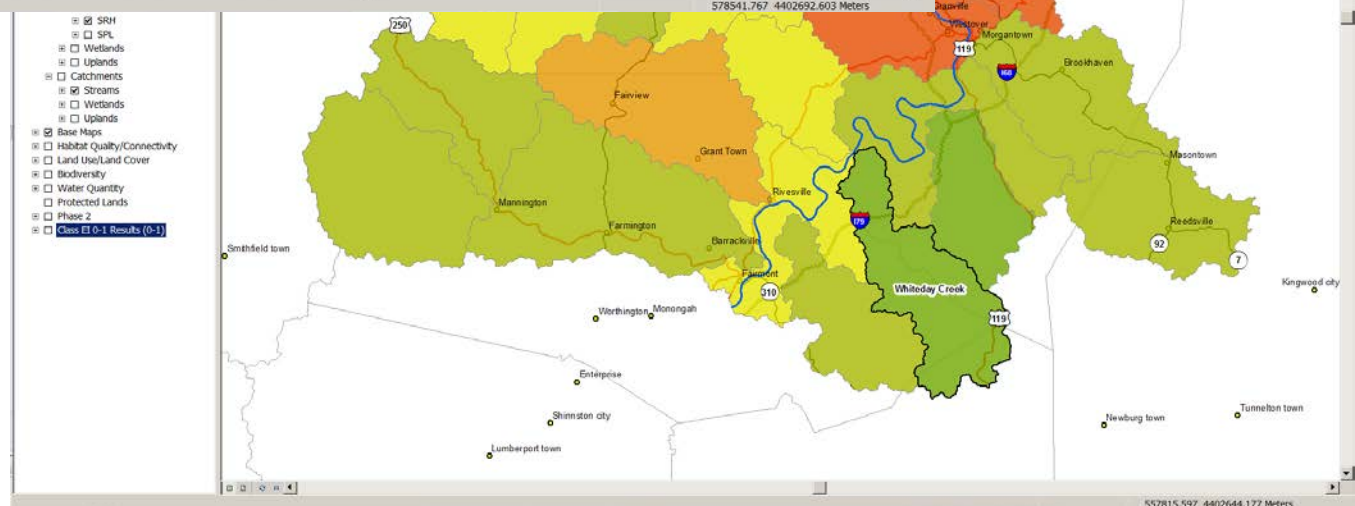
Monongahela – HUC12 Level  
Streams Overall Results



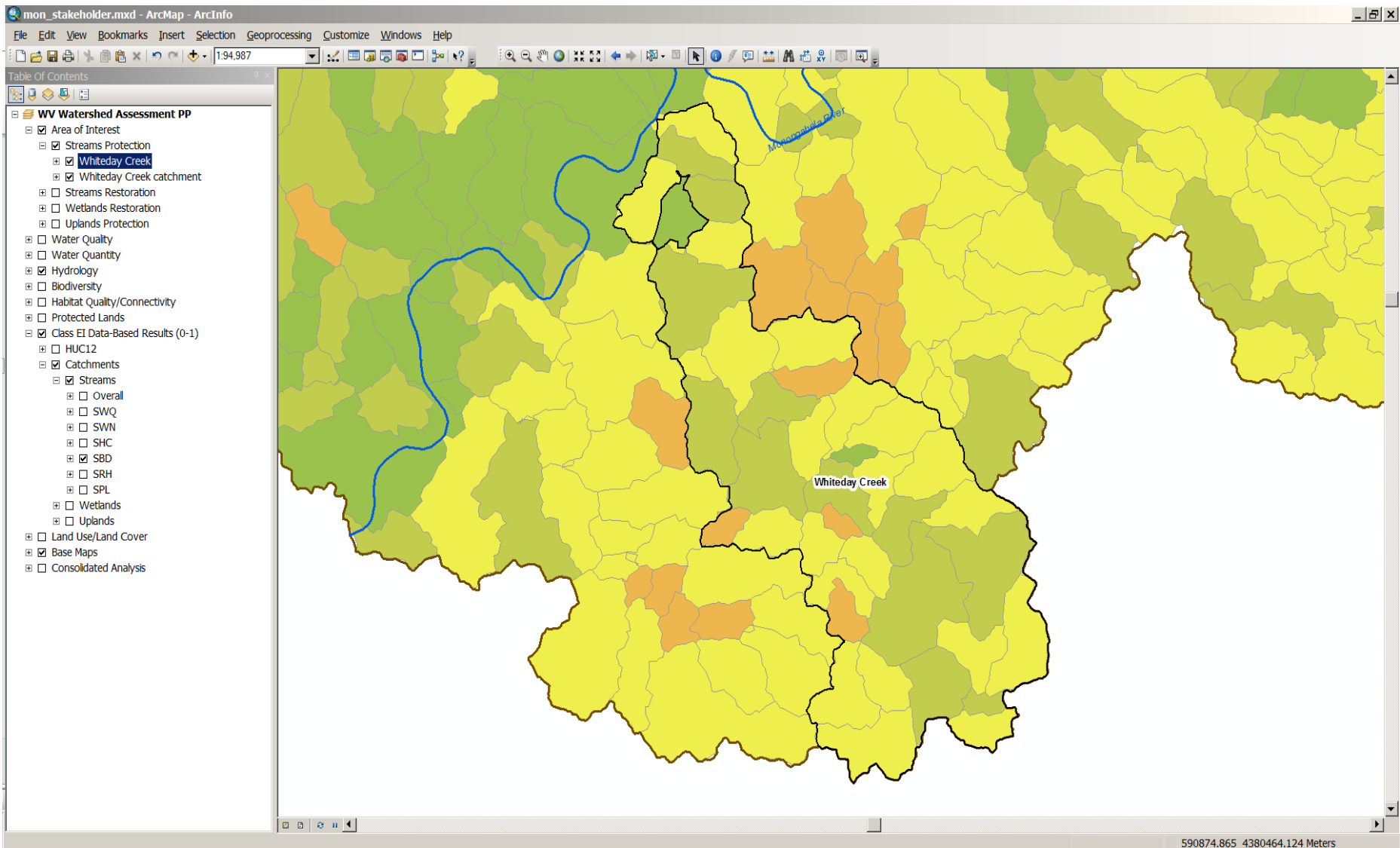
HUC12 Level - Streams Biodiversity Results  
 Whiteday Creek



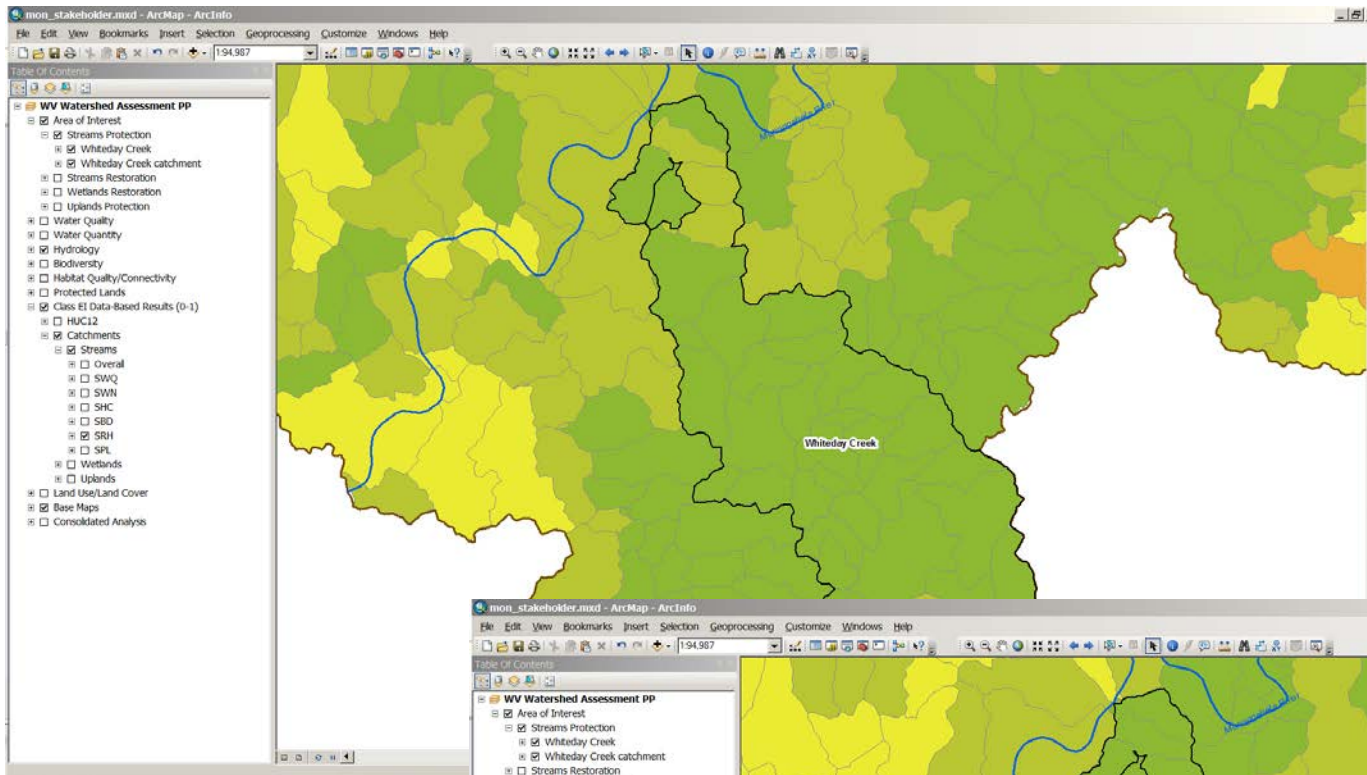
HUC12 Level  
Streams -  
Hydrologic  
Connectivity



HUC12 Level  
Streams -  
Riparian Habitat

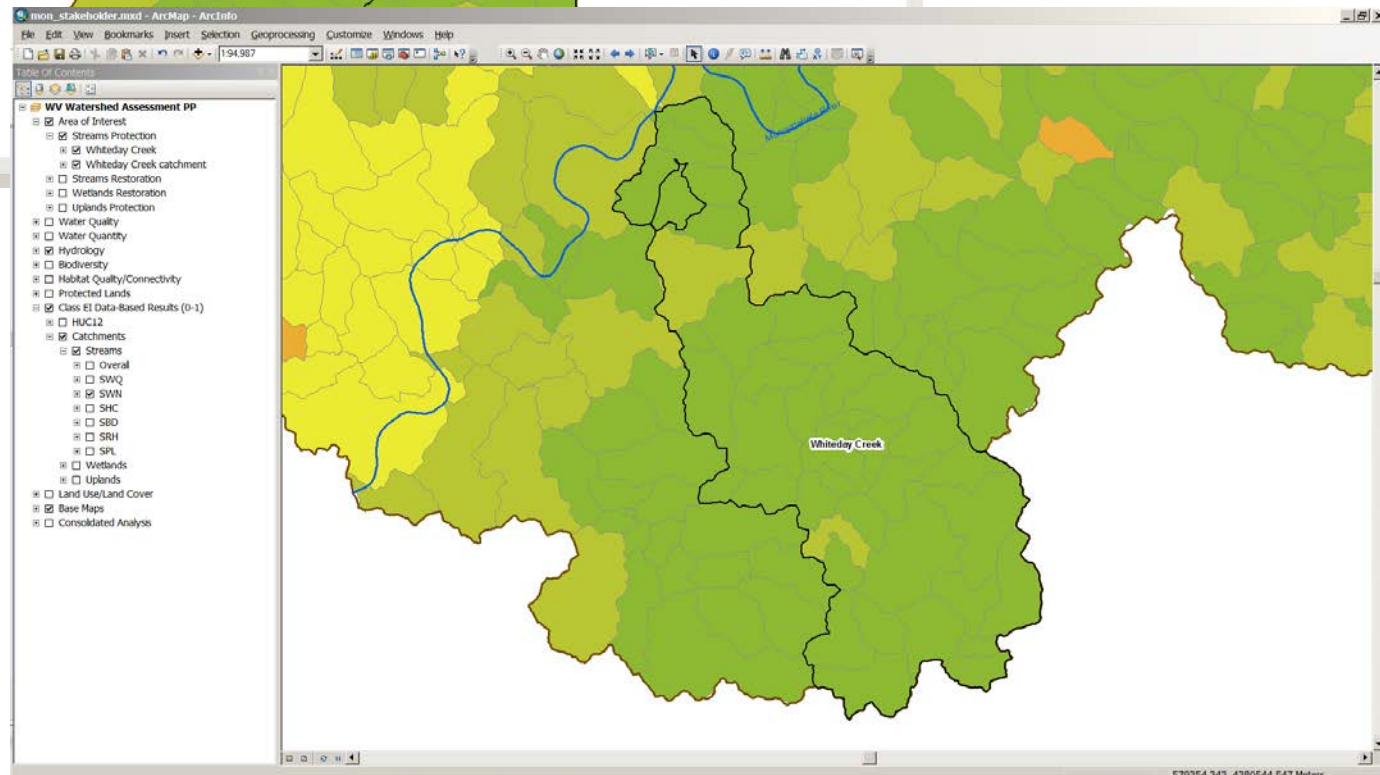


## Whiteday Creek – Catchment Level Streams Biodiversity

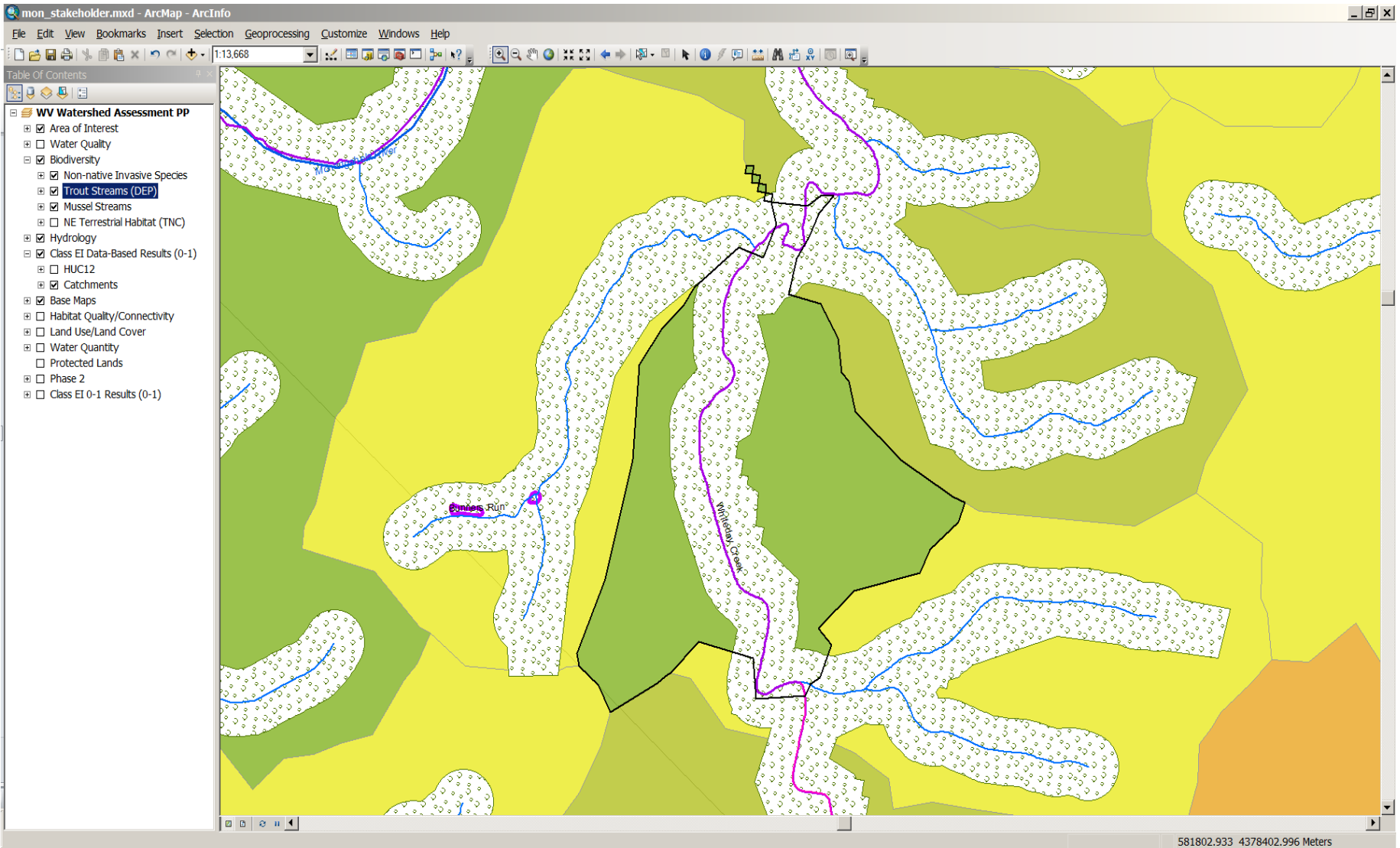


Whiteday Creek  
Catchment Level  
Streams  
Riparian Habitat

Whiteday Creek  
Catchment Level  
Streams  
Water Quantity

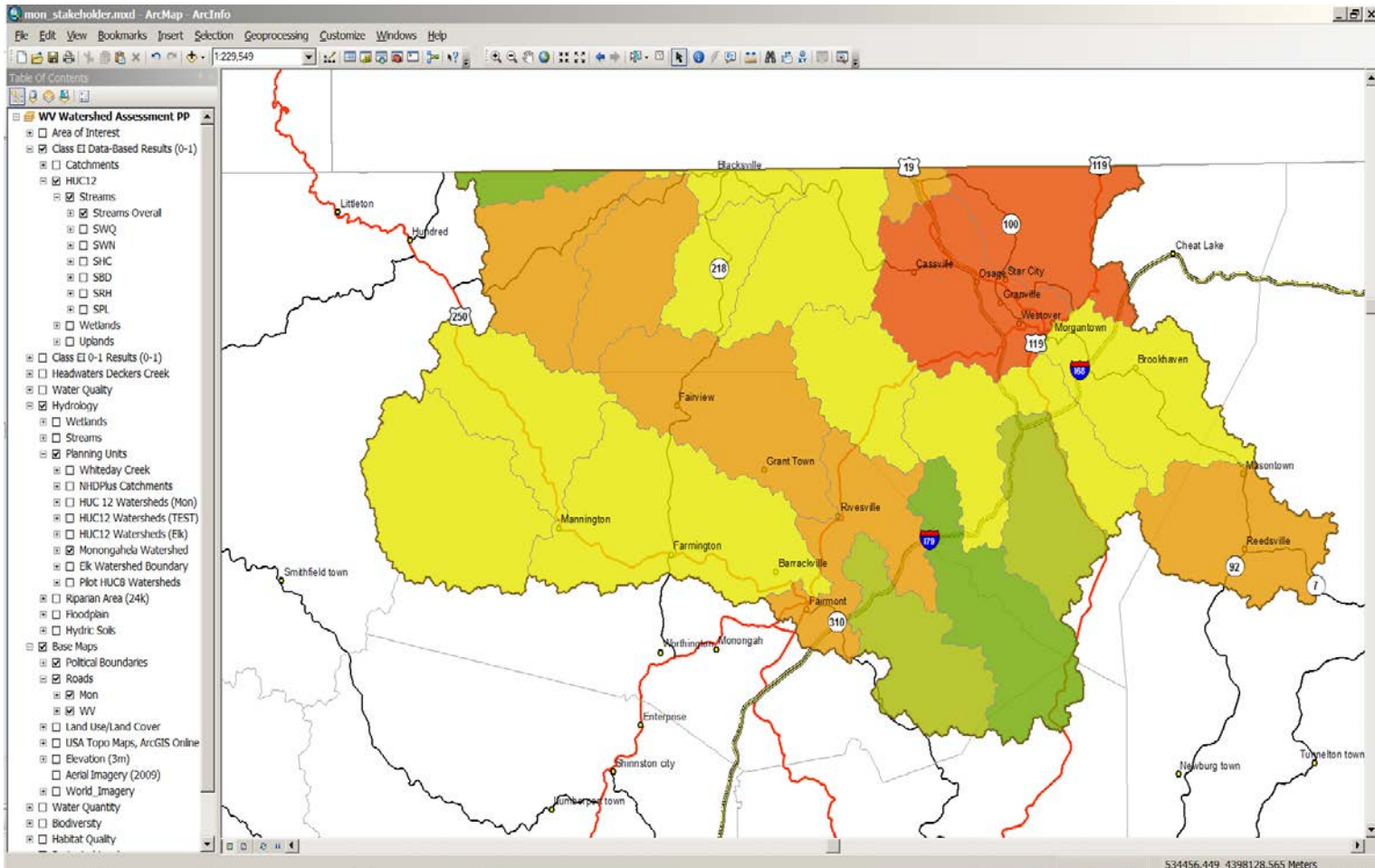






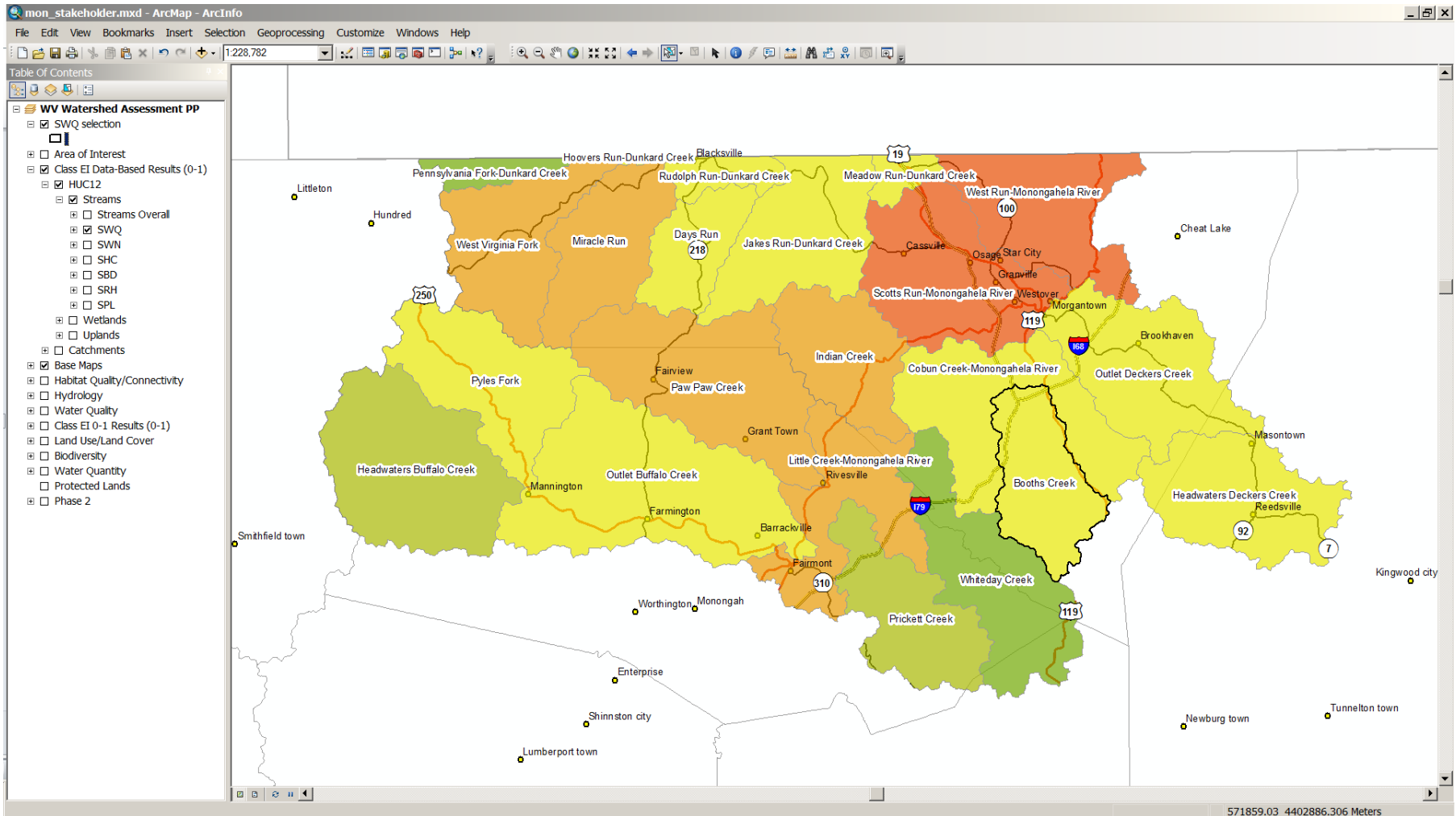
Whiteday Creek - Catchment Level  
Active River Area/Riparian Area; Mussel, trout streams (NNIS)

# Streams/Riparian Restoration

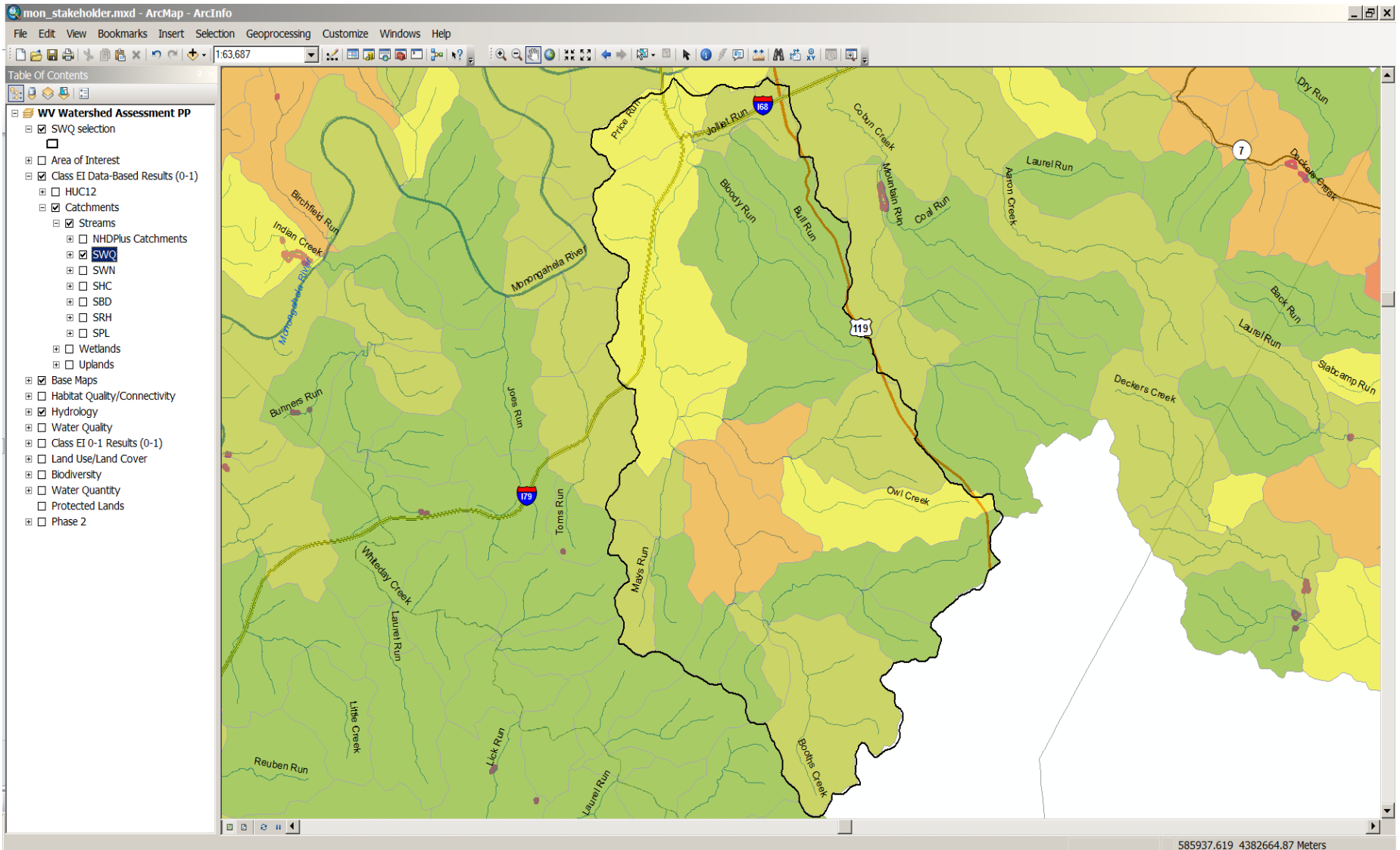


Monongahela – HUC12 Level  
Streams Overall Results

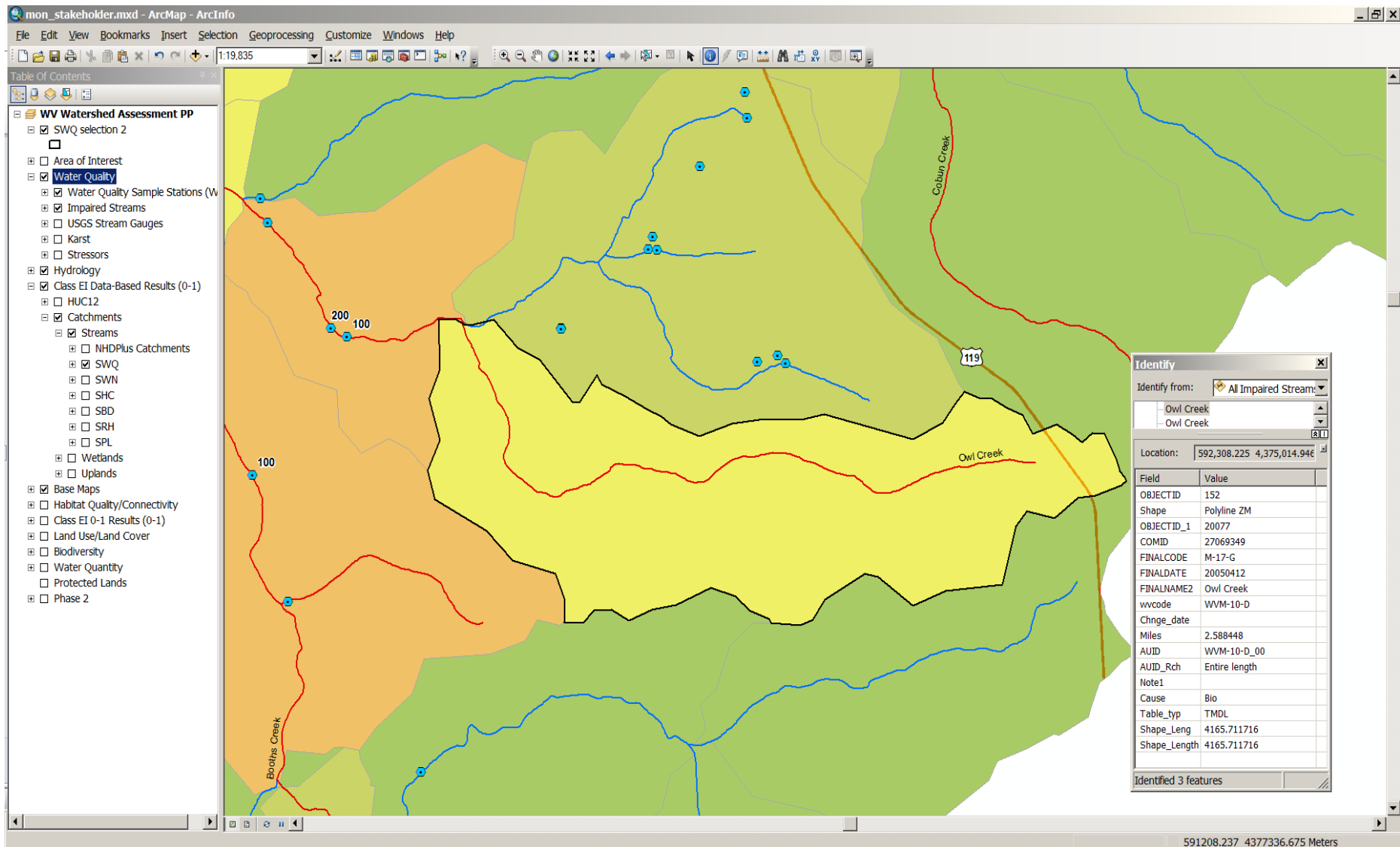
# Streams/Riparian Restoration



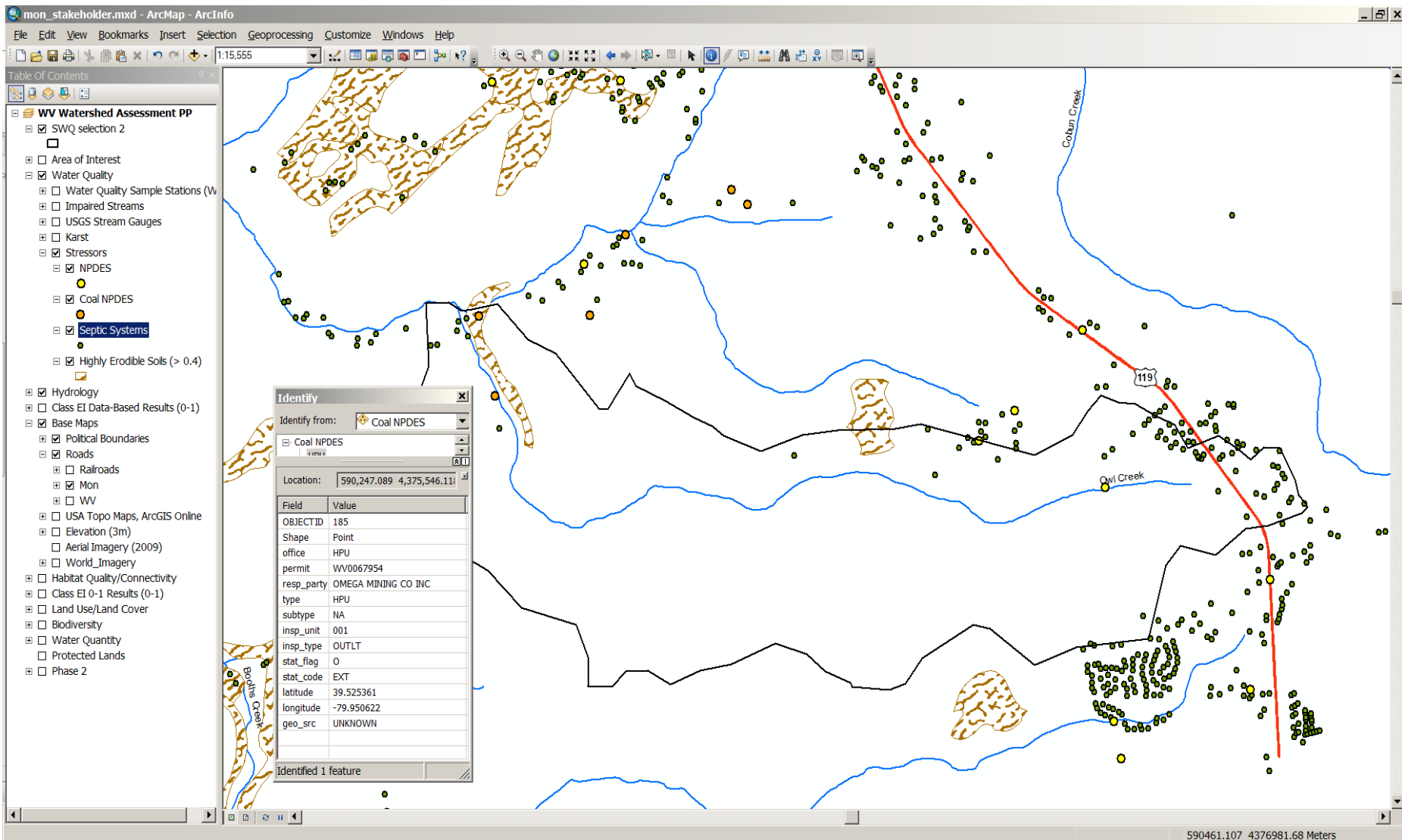
HUC12 Level- Streams Water Quality Index Results



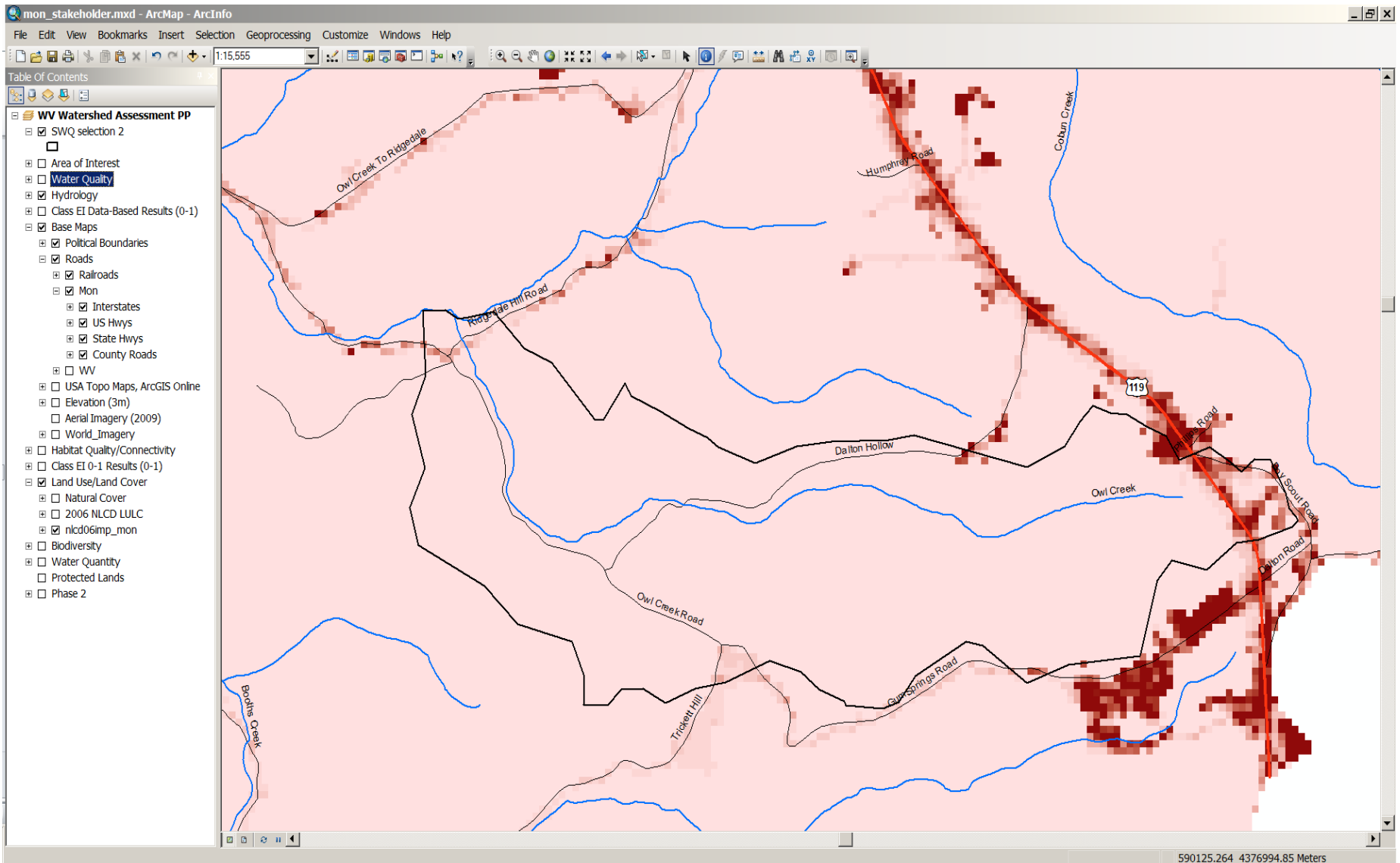
Booths Creek – Catchment Level  
Streams Water Quality Index Results



Booths Creek– Catchment Level  
Water Quality Sample (WAB) data; Impaired Streams attribute information

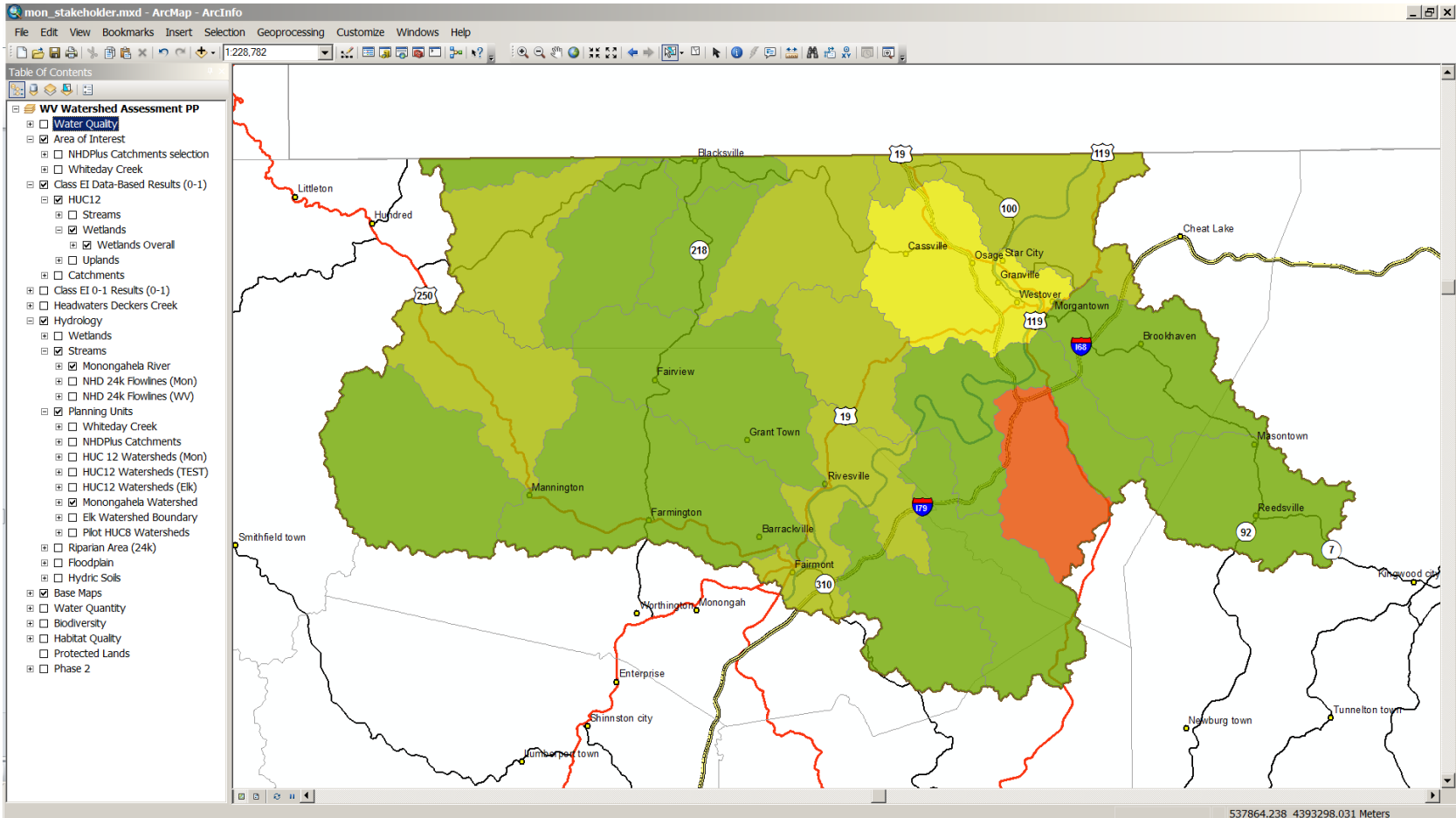


Booths Creek– Catchment Level  
 Highly erodible soils, potential septic systems,  
 NPDES, Coal NPDES w/ attribute information



Booths Creek – Catchment Level  
 NLCD 2006 Percent imperviousness; County roads

# Wetlands Restoration

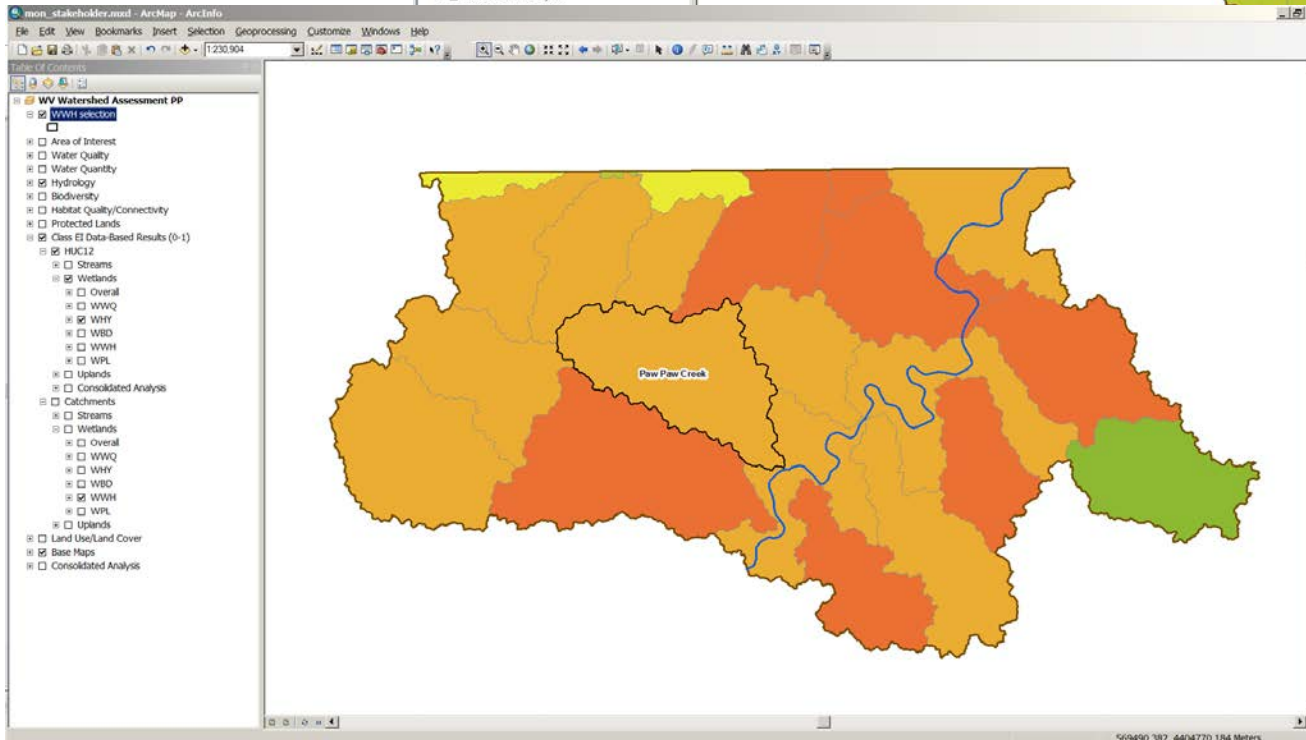
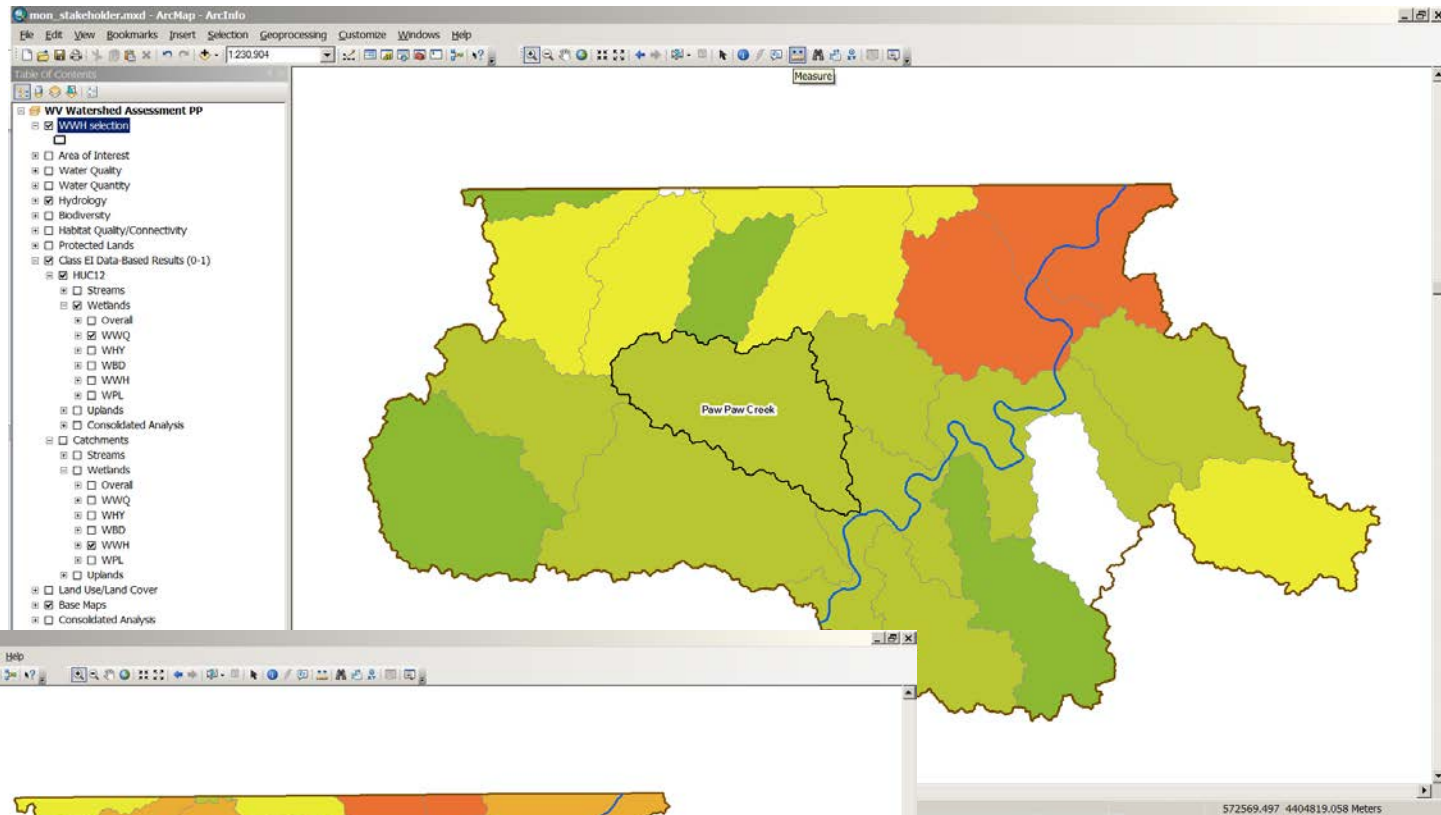


## Monongahela – HUC12 Level Wetlands Overall Results\*

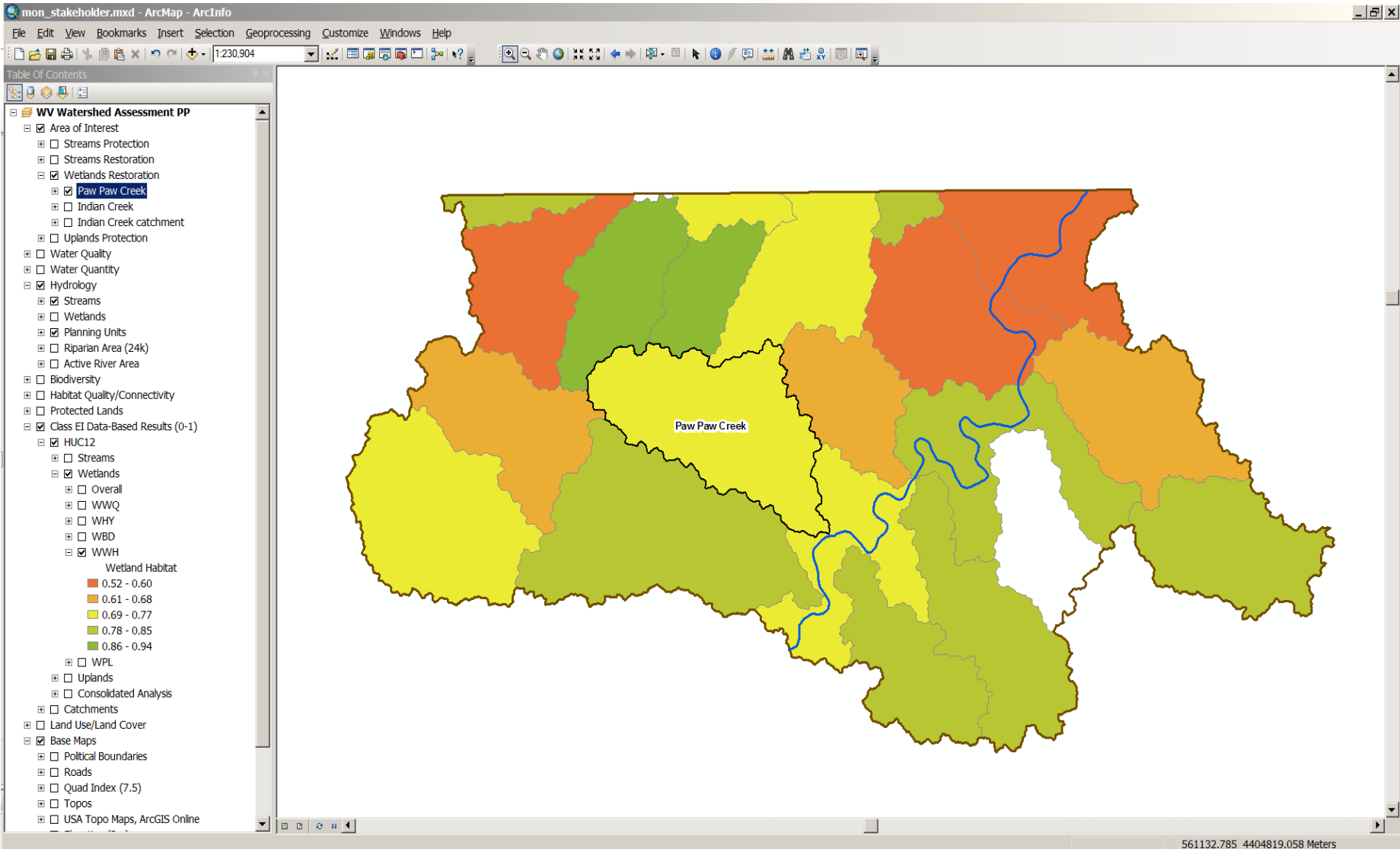
(\*All results presented are **preliminary** and currently used for illustrative purposes only)



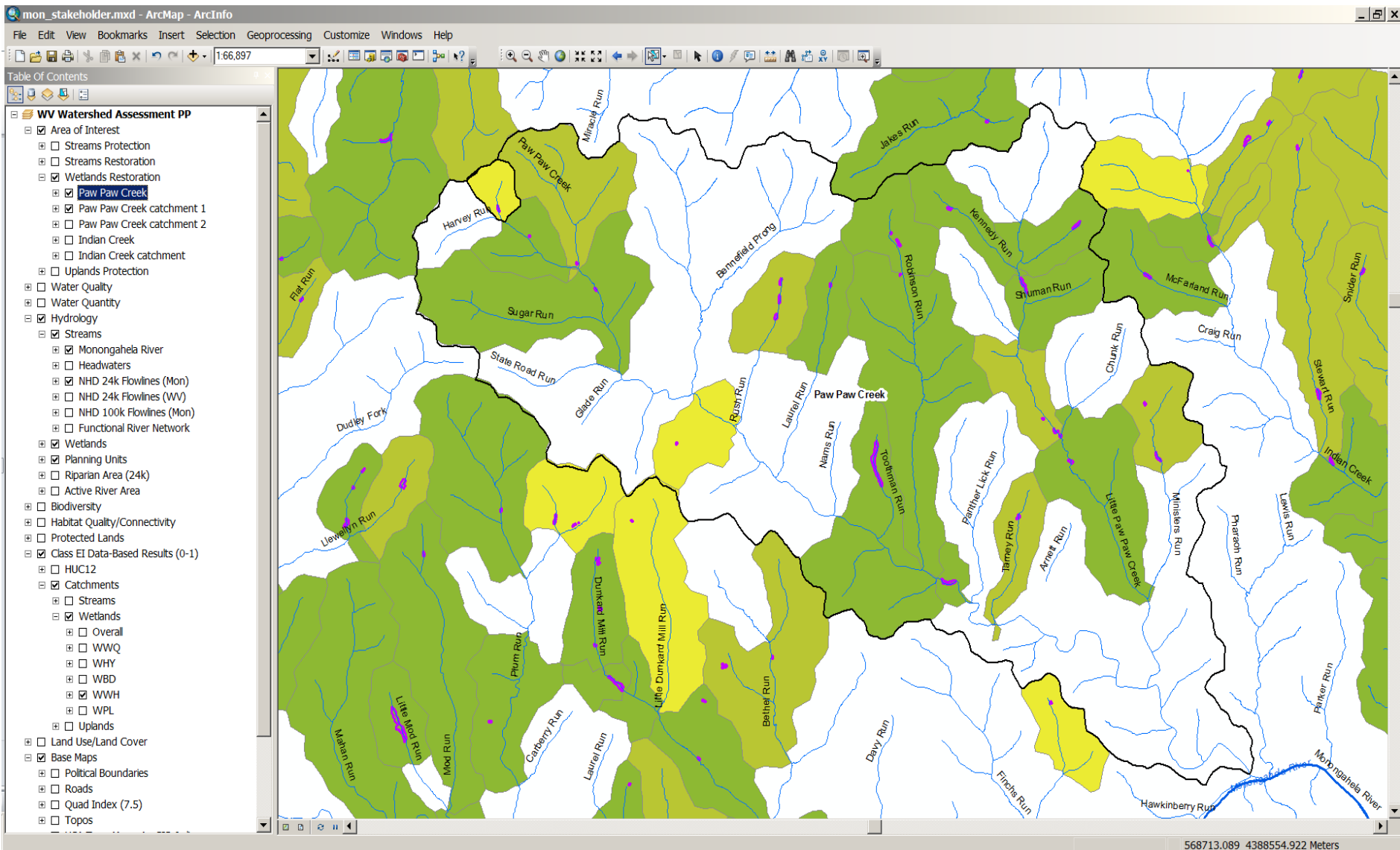
Wetlands  
HUC12 Level  
Water Quality



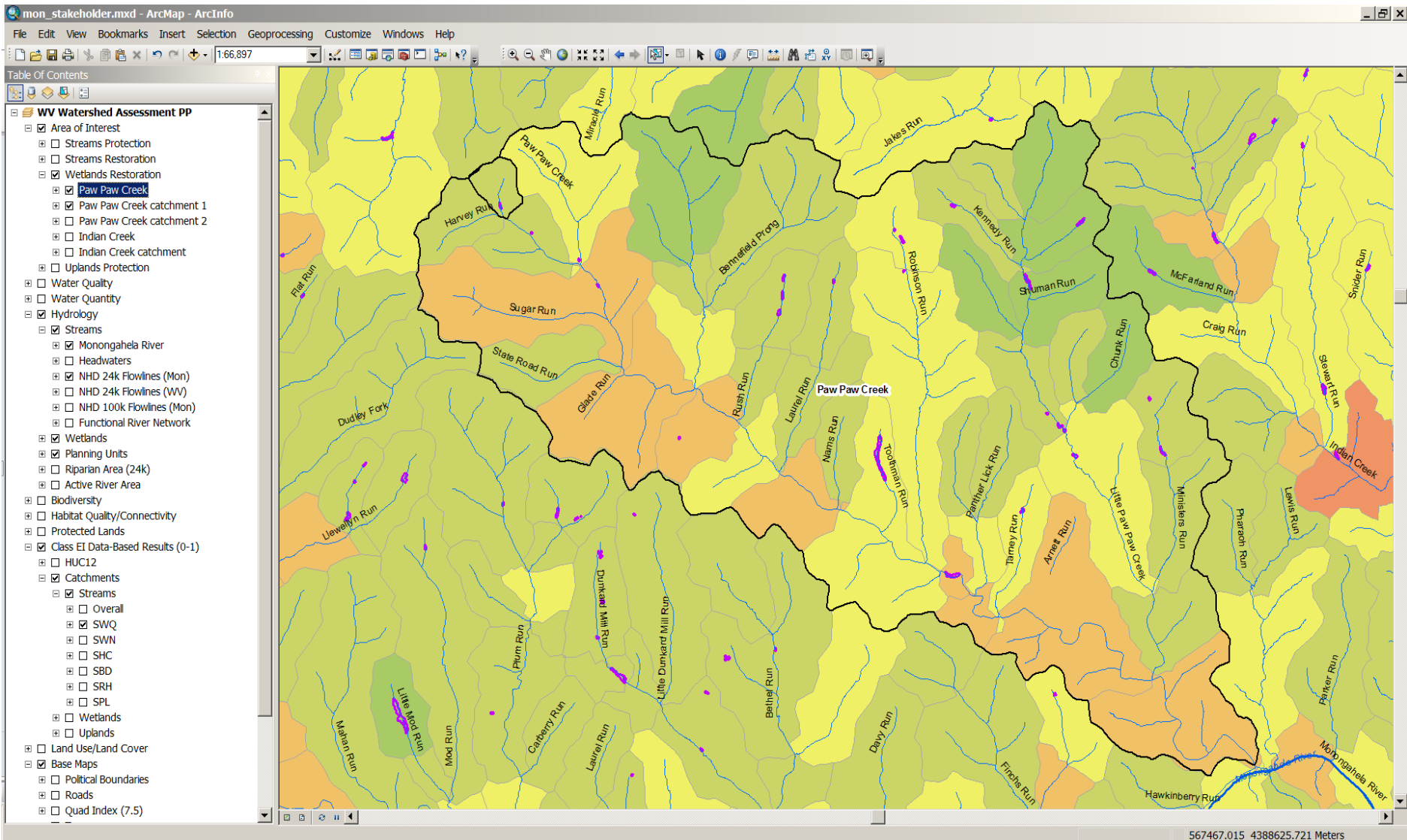
Wetlands  
HUC12 Level  
Hydrology



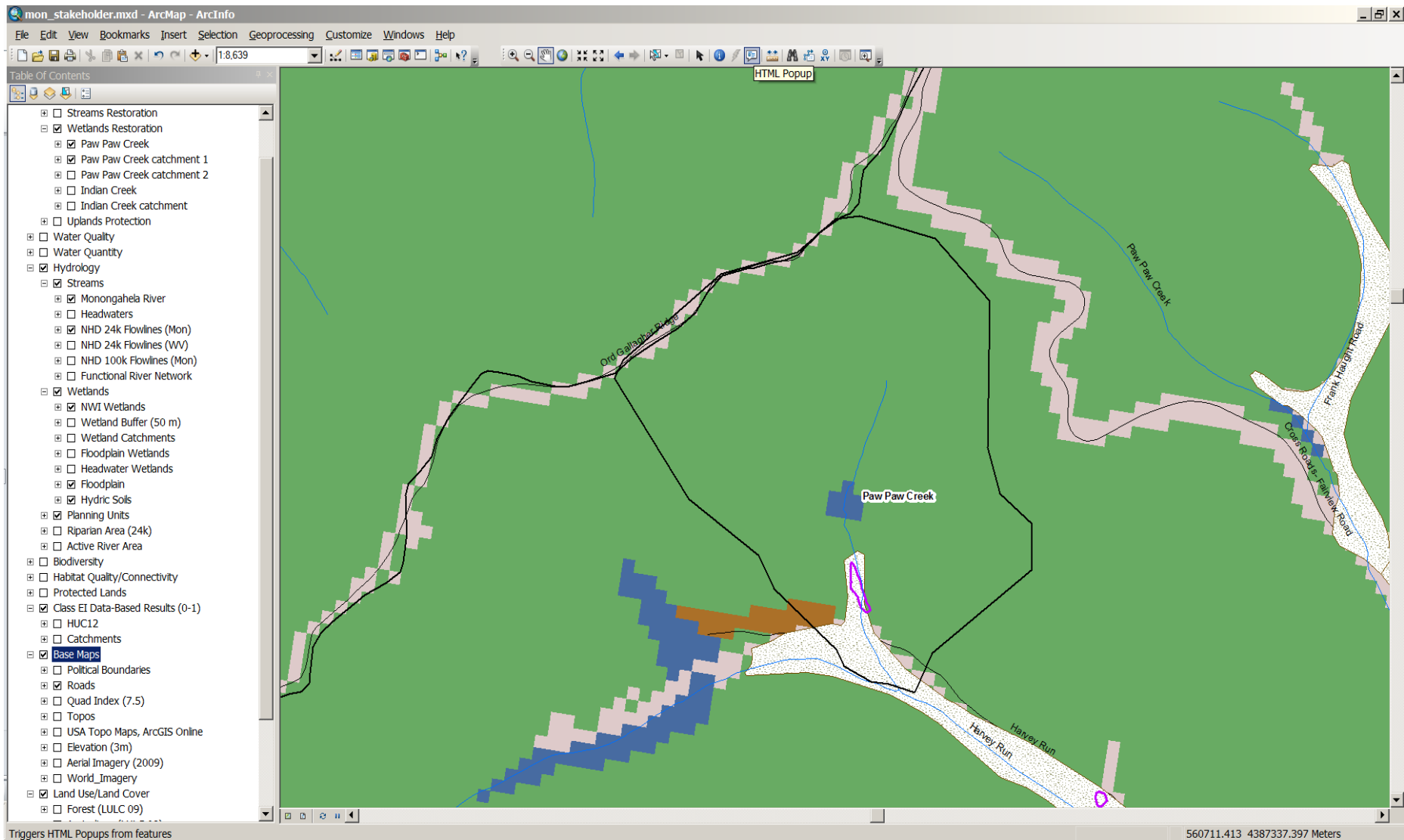
## Wetlands - HUC12 Level Wetland Habitat



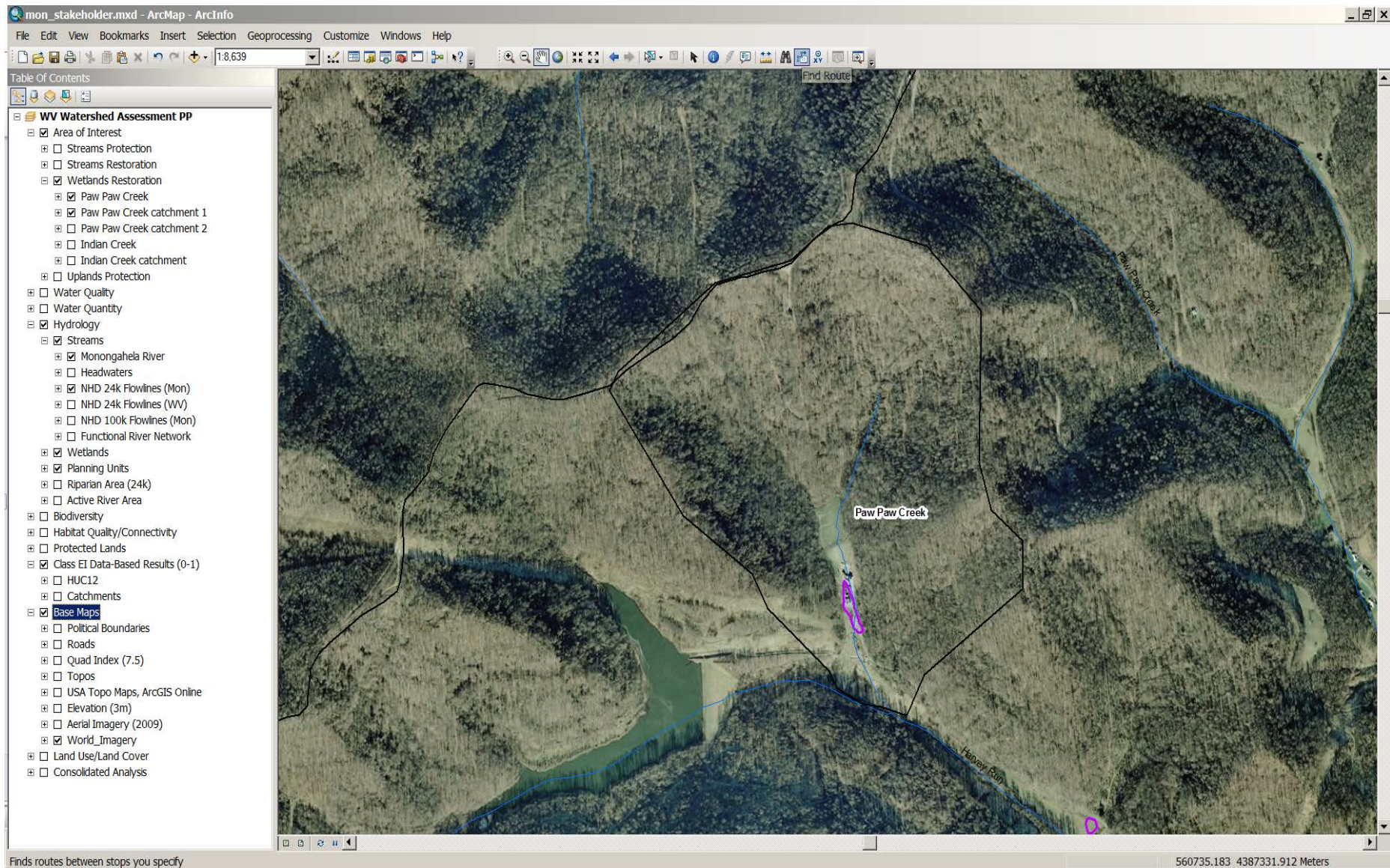
## Wetlands - Catchment Level Wetland Habitat Results



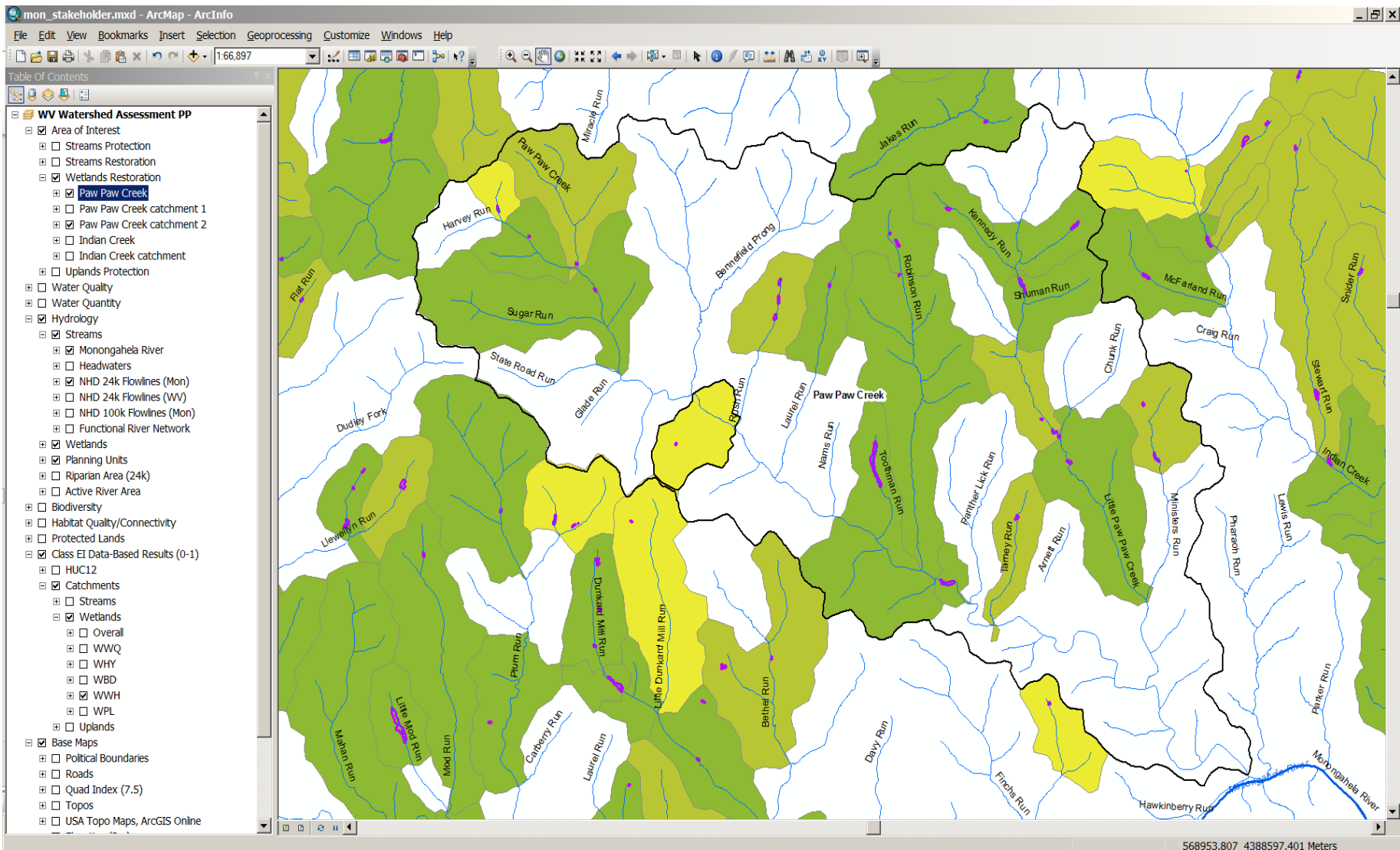
Streams - Catchment Level  
Water Quality Results



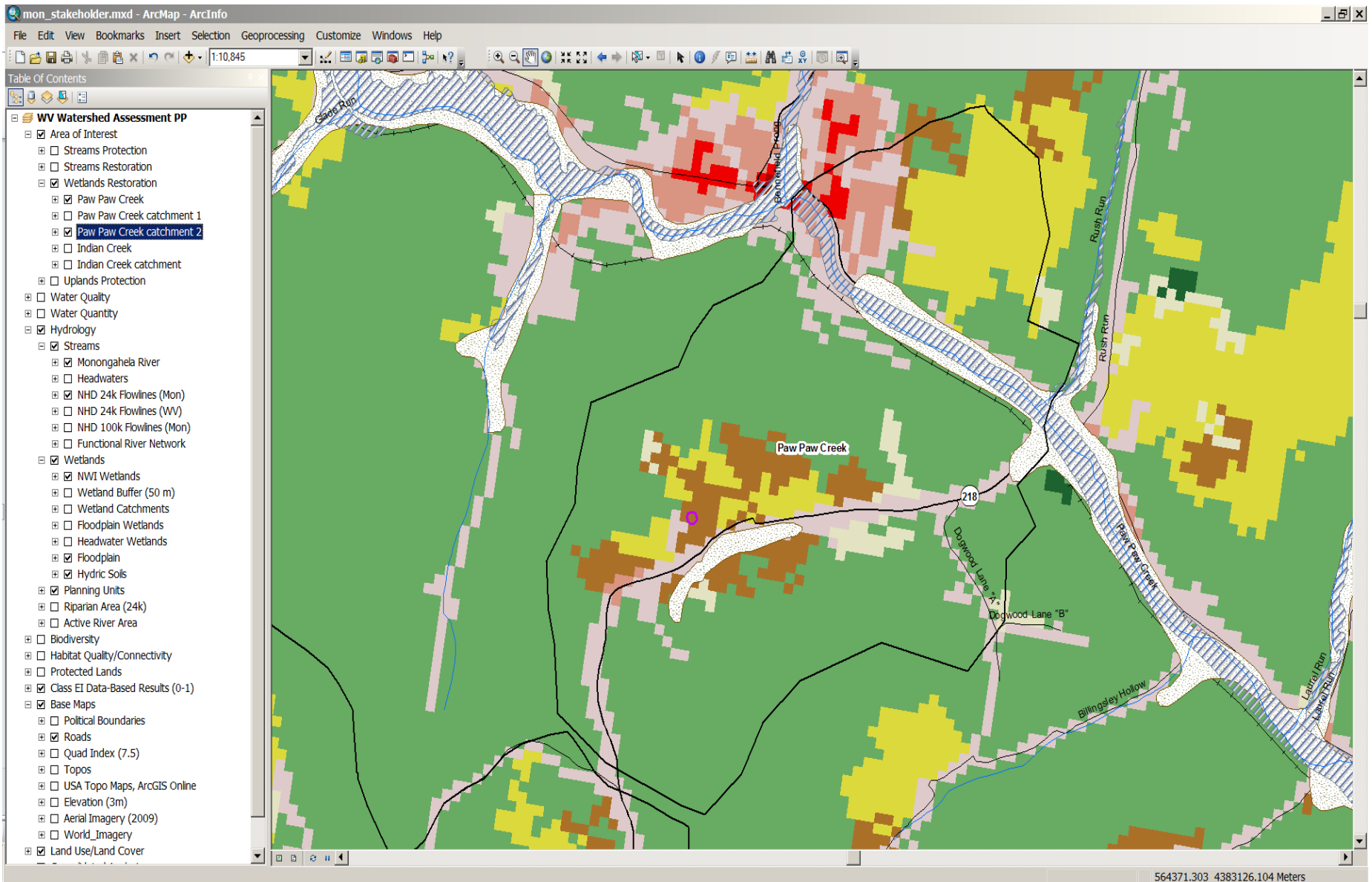
Wetlands Catchment Level – Roads, LULC, Hydric soils, (Floodplain)



Wetlands Catchment Level – Aerial Imagery

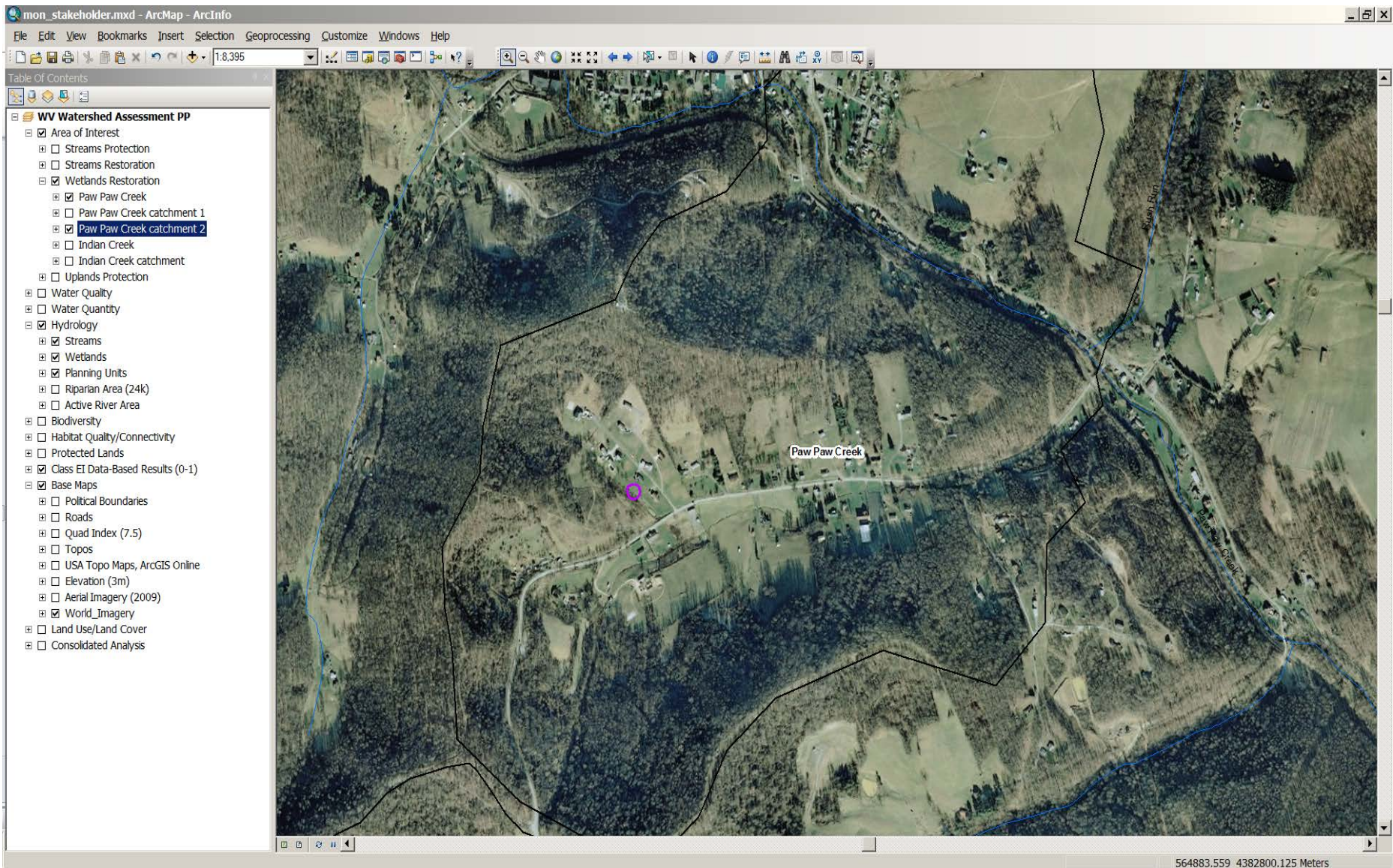


## Wetlands - Catchment Level Wetland Habitat Results



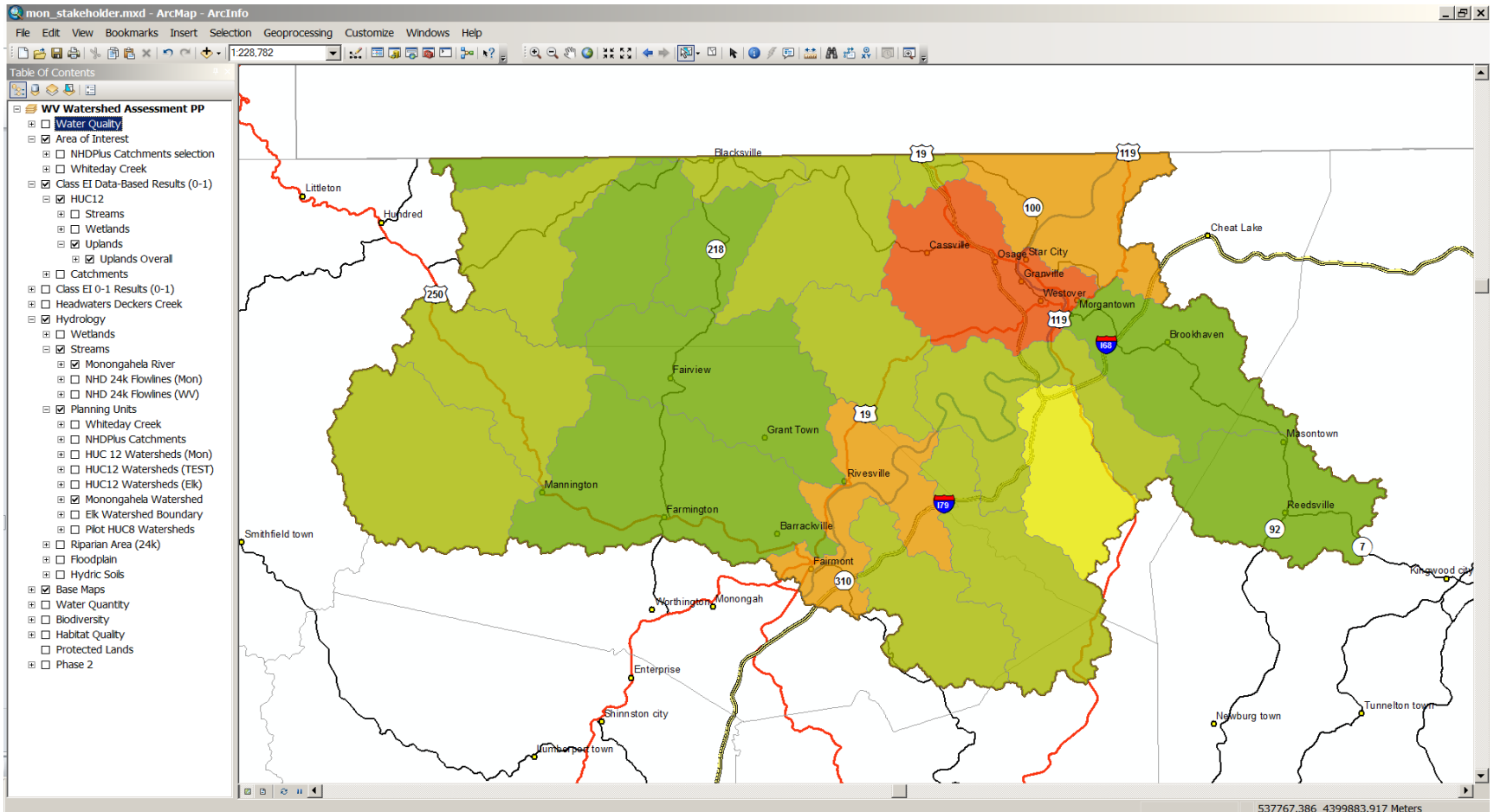
Wetlands Catchment Level – Roads, LULC, Hydric soils, Floodplain





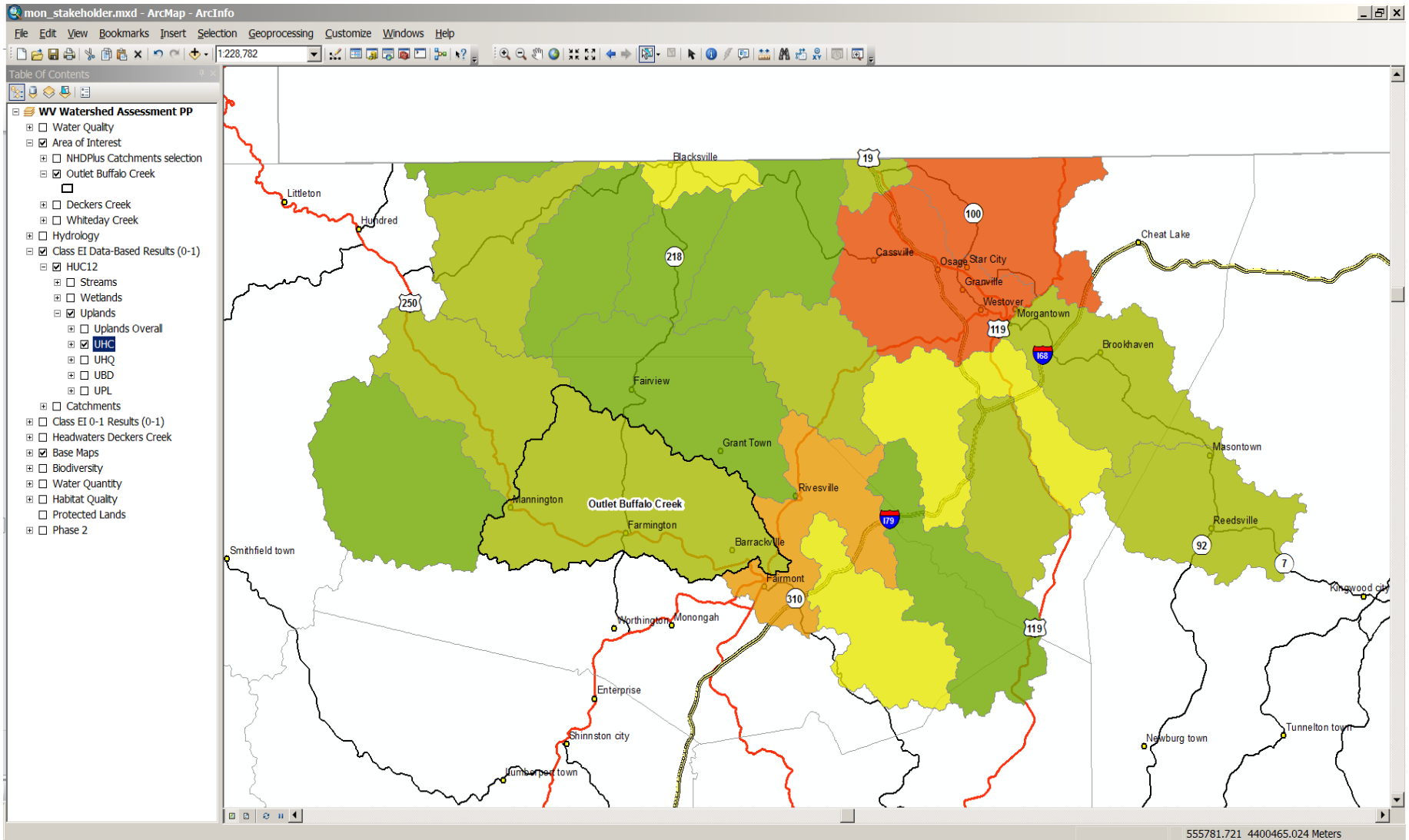
Wetlands Catchment Level – Aerial Imagery

# Uplands Protection

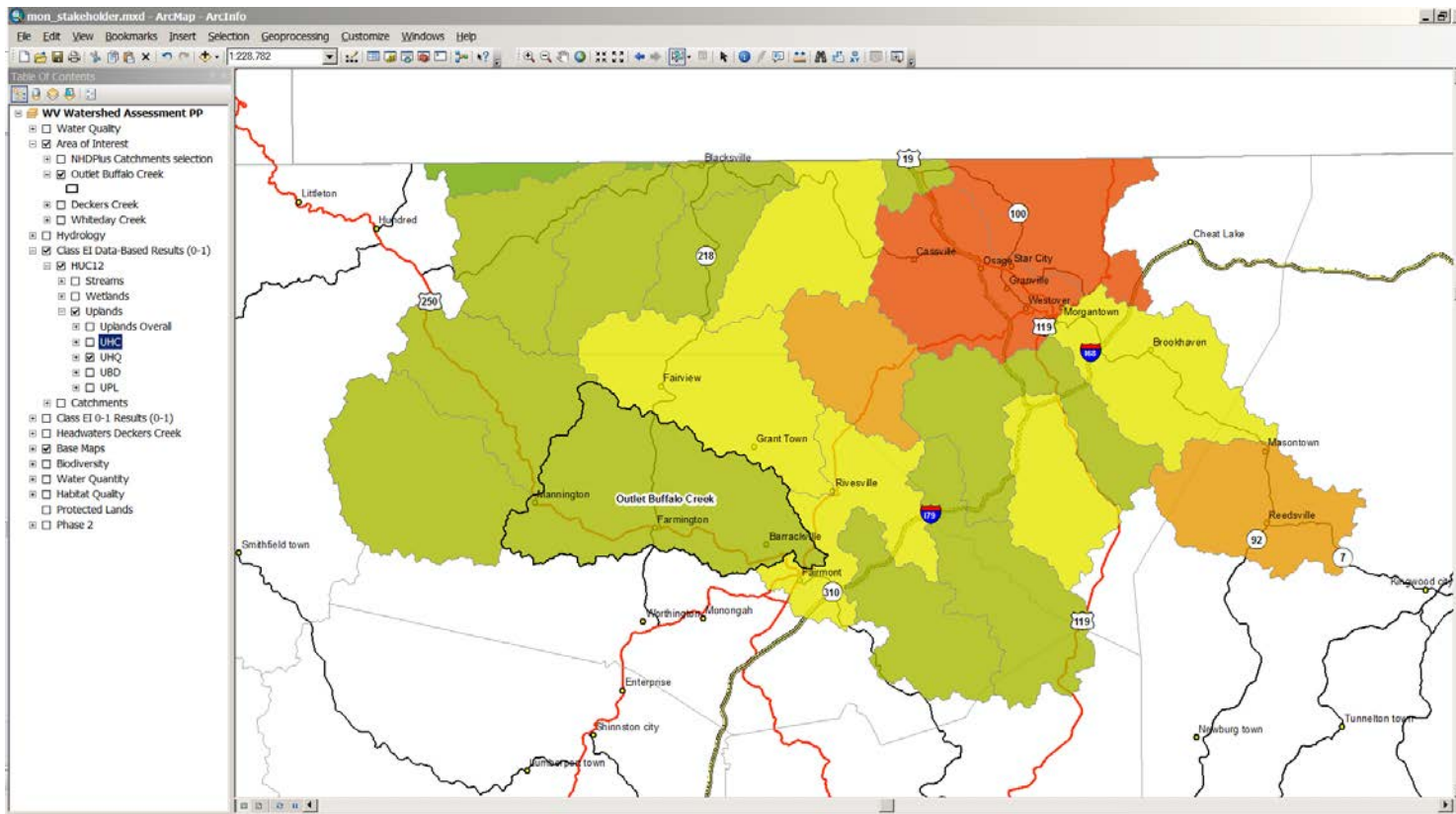


## Monongahela – HUC12 Level Uplands Overall Results\*

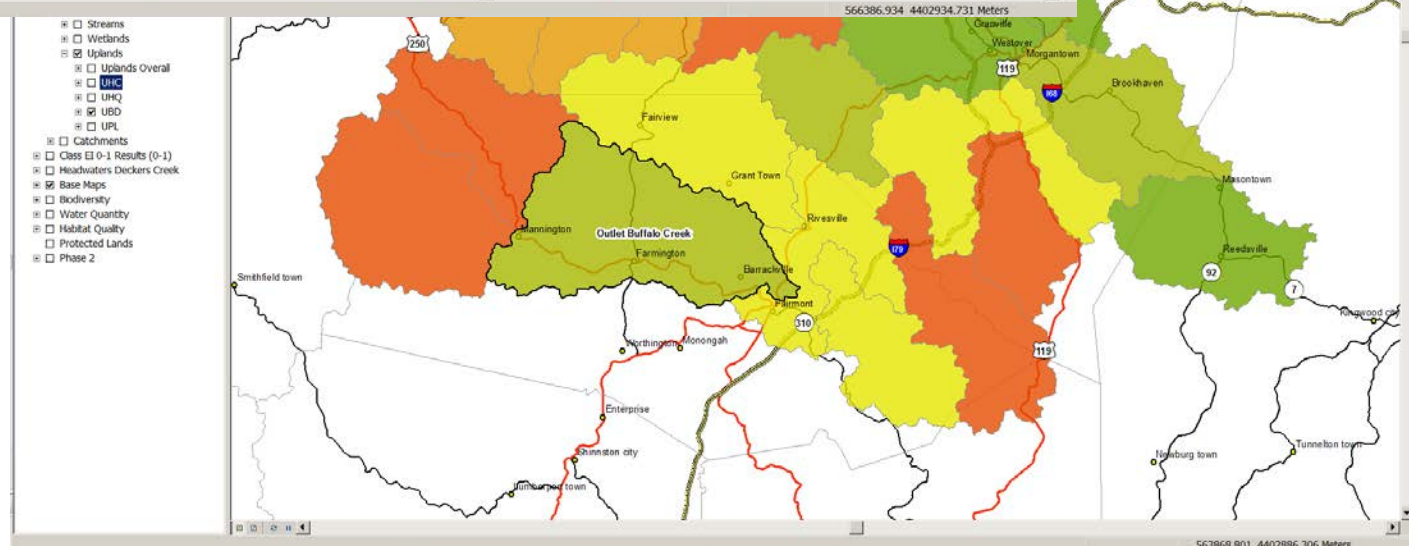
(\*All results presented are **preliminary** and currently used for illustrative purposes only)



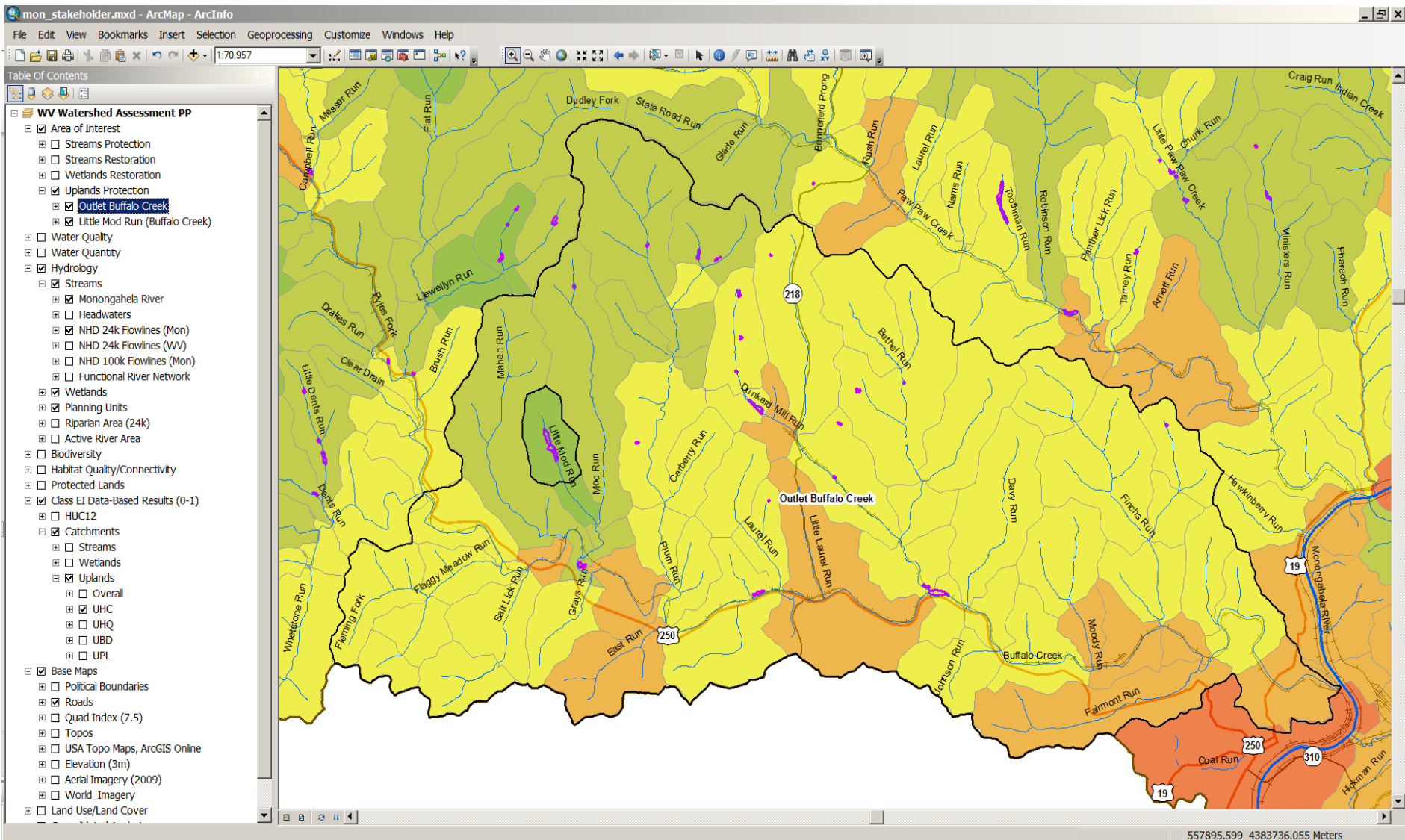
Monongahela – HUC<sub>12</sub> Level  
Uplands Habitat Connectivity Results



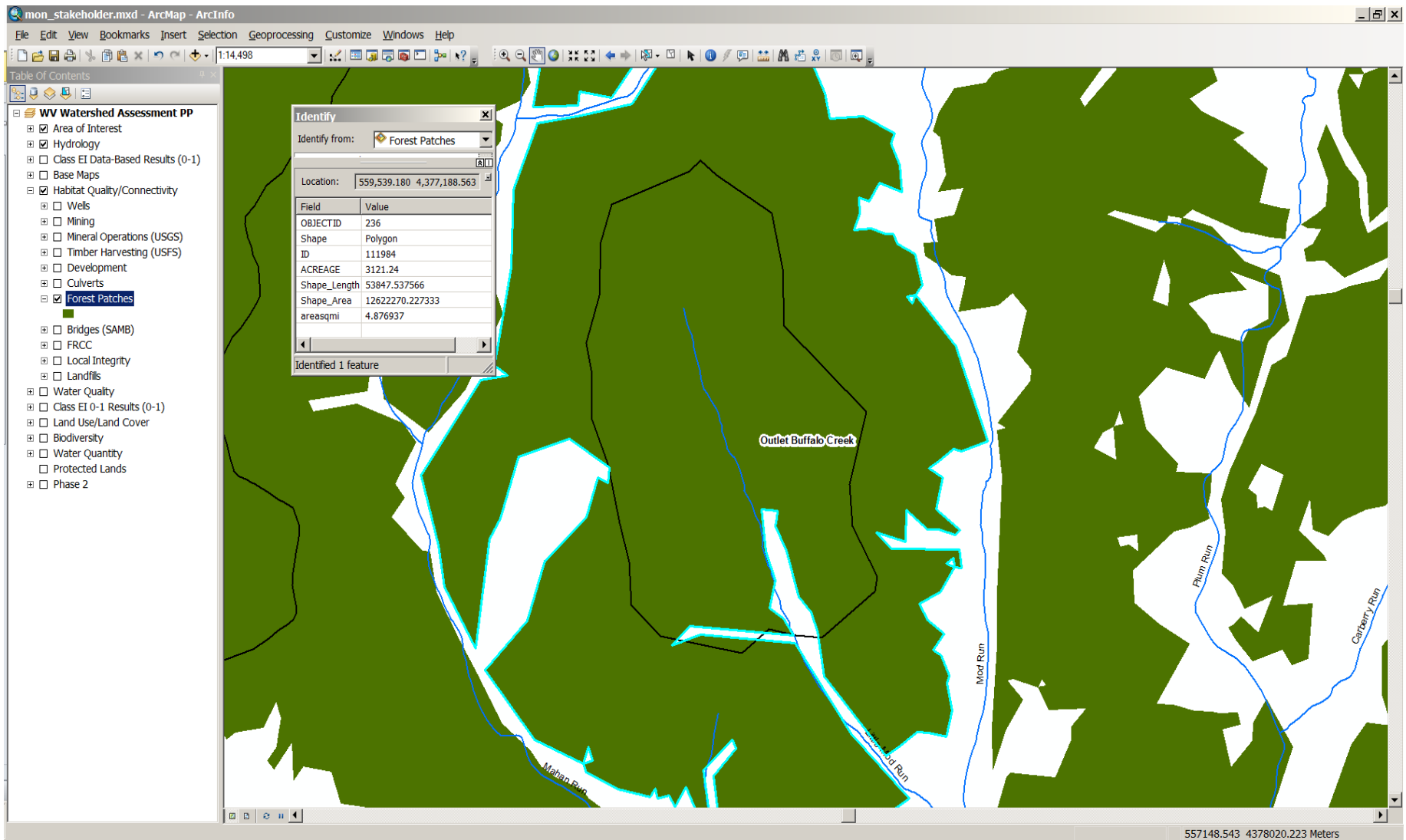
Uplands  
HUC12 Level  
Habitat Quality



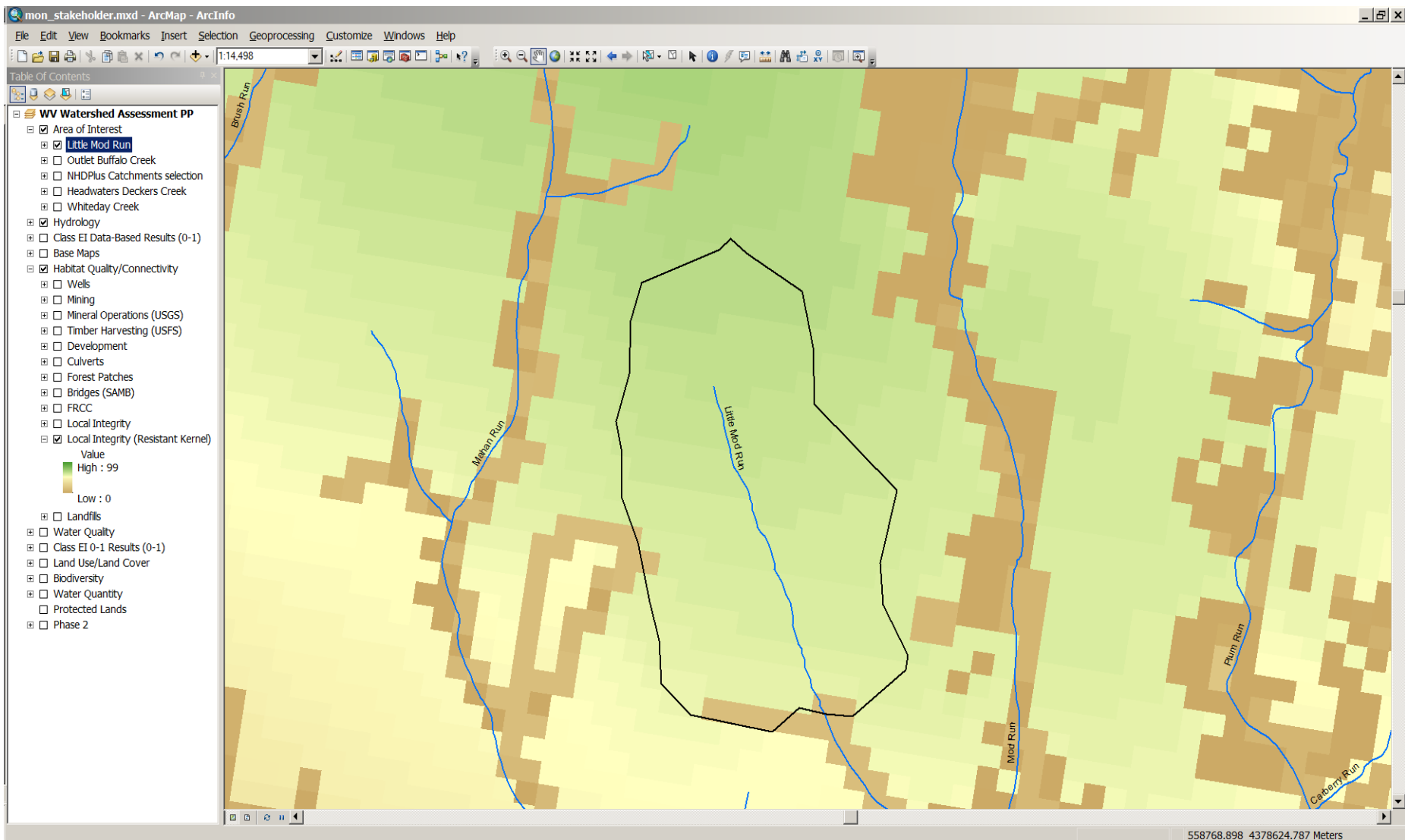
Uplands  
HUC12 Level  
Biodiversity



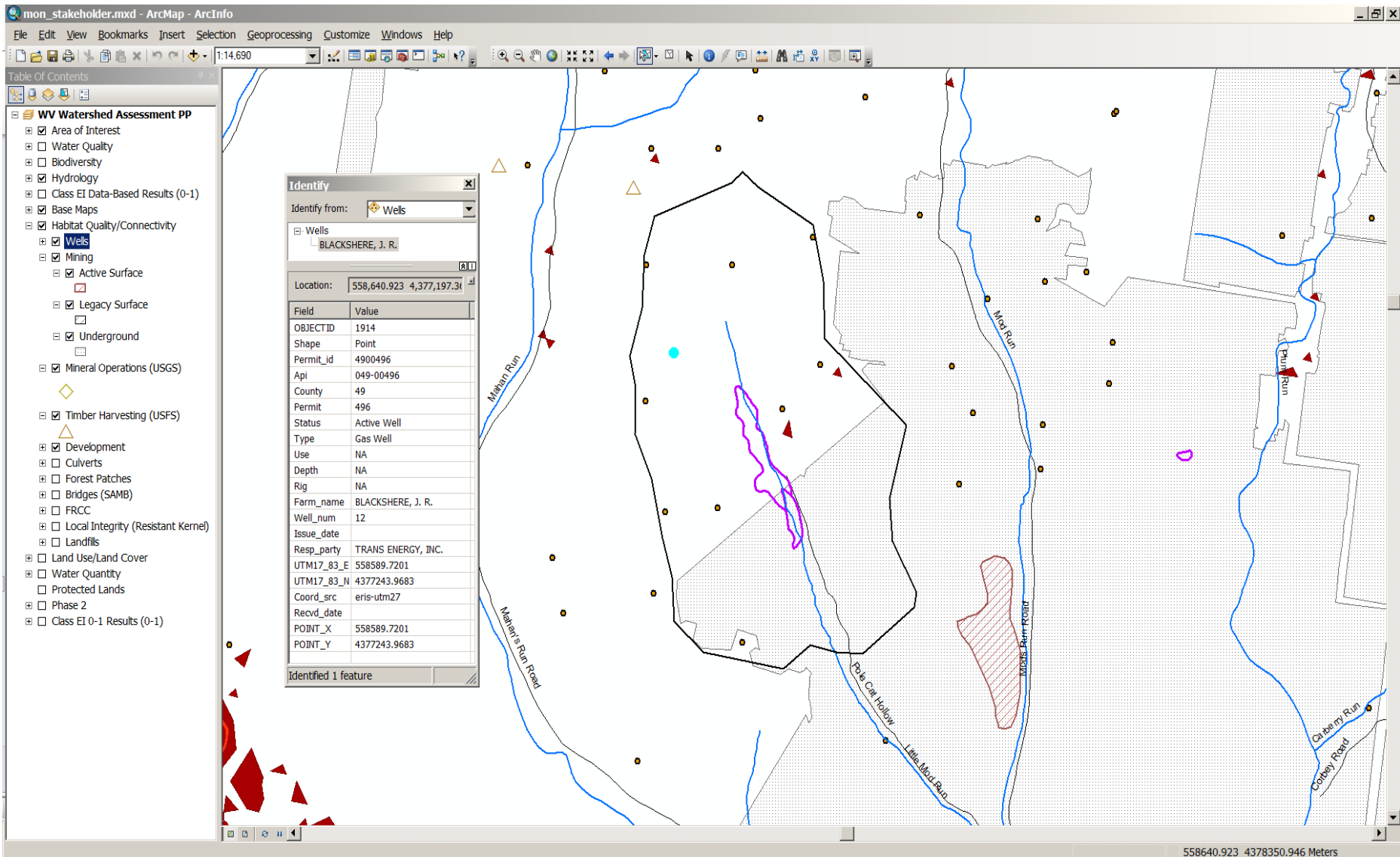
## Outlet Buffalo Creek – Catchment Level Habitat Connectivity Results



Uplands Habitat Connectivity Metrics dataset  
(Forest Patches, with attribute information including area)



Uplands Habitat Connectivity Metrics dataset  
(TNC Local Integrity)



Uplands Habitat Connectivity Metrics datasets  
 (Mining, Wells w/ attribute information, Development, Roads/Rail  
 Mineral Operations, Timber Harvesting)





Mon wetland complex Reedsville, WV

COMMENTS/QUESTIONS?

# Web Mapping Tool Examples

1. WV DEP Mining Data Explorer Tool
2. TNC Two Hearted Watershed Conservation Data Viewer







# WV DEP Interactive Web Maps (GIS Server)

WVDEP GIS Server - Windows Internet Explorer

http://gis.dep.wv.gov/index.html

West Virginia DEP  
Technical Applications and GIS Unit

### Flash Interactive Mapping Applications

-  [Mining Data Explorer](#)
-  [Water Withdraw Tool](#)
-  [Open Dump Cleanup Projects](#)
-  [Resource Extraction Viewer](#)
-  [7Q10 Flow Estimates](#)
-  [Flow distance above public water supplies](#)

### Legacy Mapping Applications

- Enviromap Explorer
- Landfill Closure Projects
- Oil & Gas Well Search

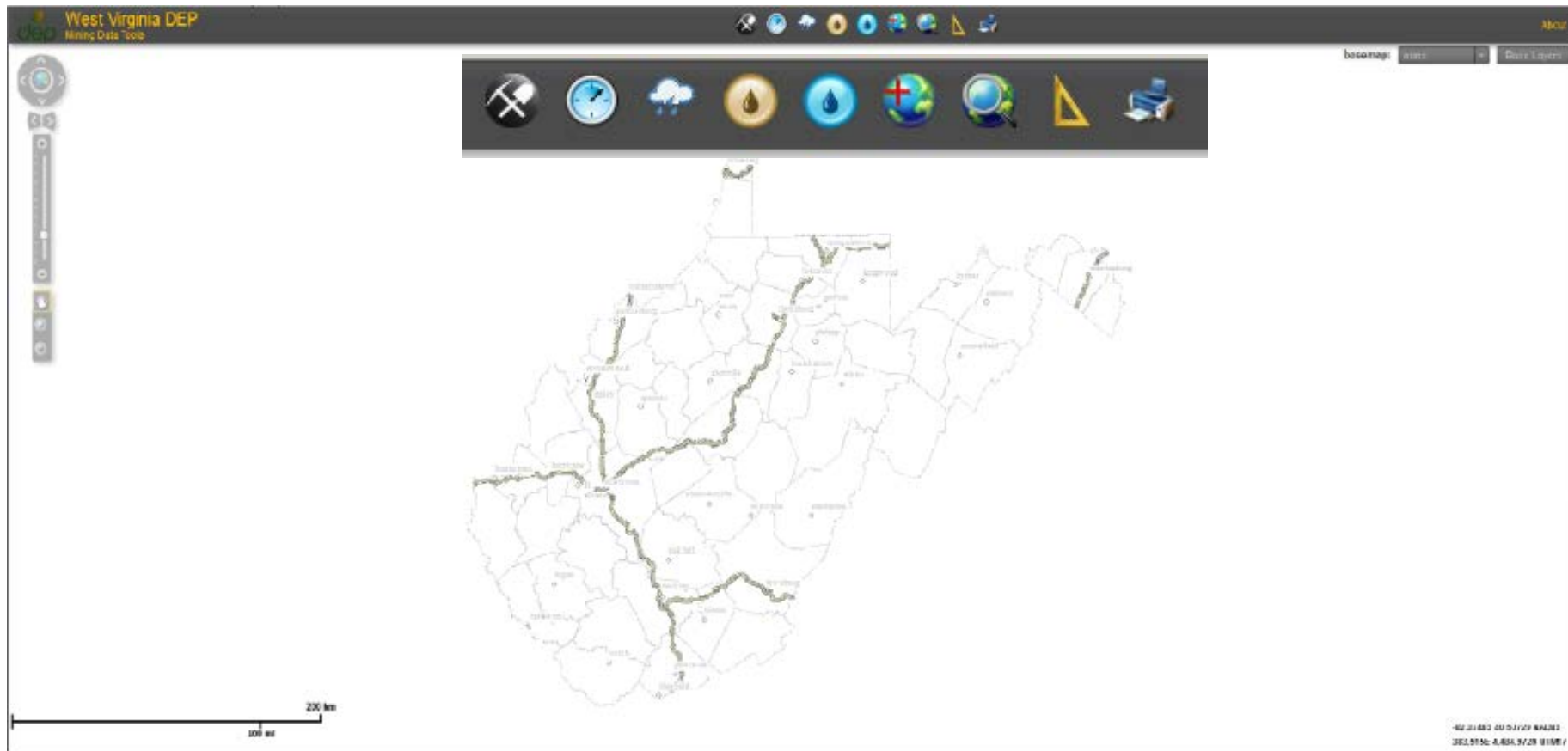
### Map Services

- Rest Interface-- ArcGIS Server 1
- [Rest Interface-- ArcGIS Server 2](#)

Internet | Protected Mode: On 125%

<http://gis.dep.wv.gov/index.html>

# WV DEP Mining Data Tool



<http://tagis.dep.wv.gov/mining/>

WVDEP Internet Mapping - Windows Internet Explorer

http://tags.dep.wv.gov/mining/

West Virginia DEP  
Mining Data Tools

basemap: none Base Layers

**Mining Layers**

Permit Search Identify Layers Legend

- spoil fills
- refuse fills
- permit bdy
- underground mining
- mining limits

Layer transparency:

Done Internet | Protected Mode: On 125%

-84.59117 40.77680 NAD83  
196.930E 4,520,187N UTM17

Mining Layers – Permit Boundary; Underground mining

WVDEP Internet Mapping - Windows Internet Explorer

http://tags.dep.wv.gov/mining/

West Virginia DEP  
Mining Data Tools

basemap: none Base Layers

### Mining Layers

Permit Search Identify Layers Legend

- spoil fills
- refuse fills
- permit bdy
- underground mining
- mining limits

Layer transparency:

Drawing Layers...

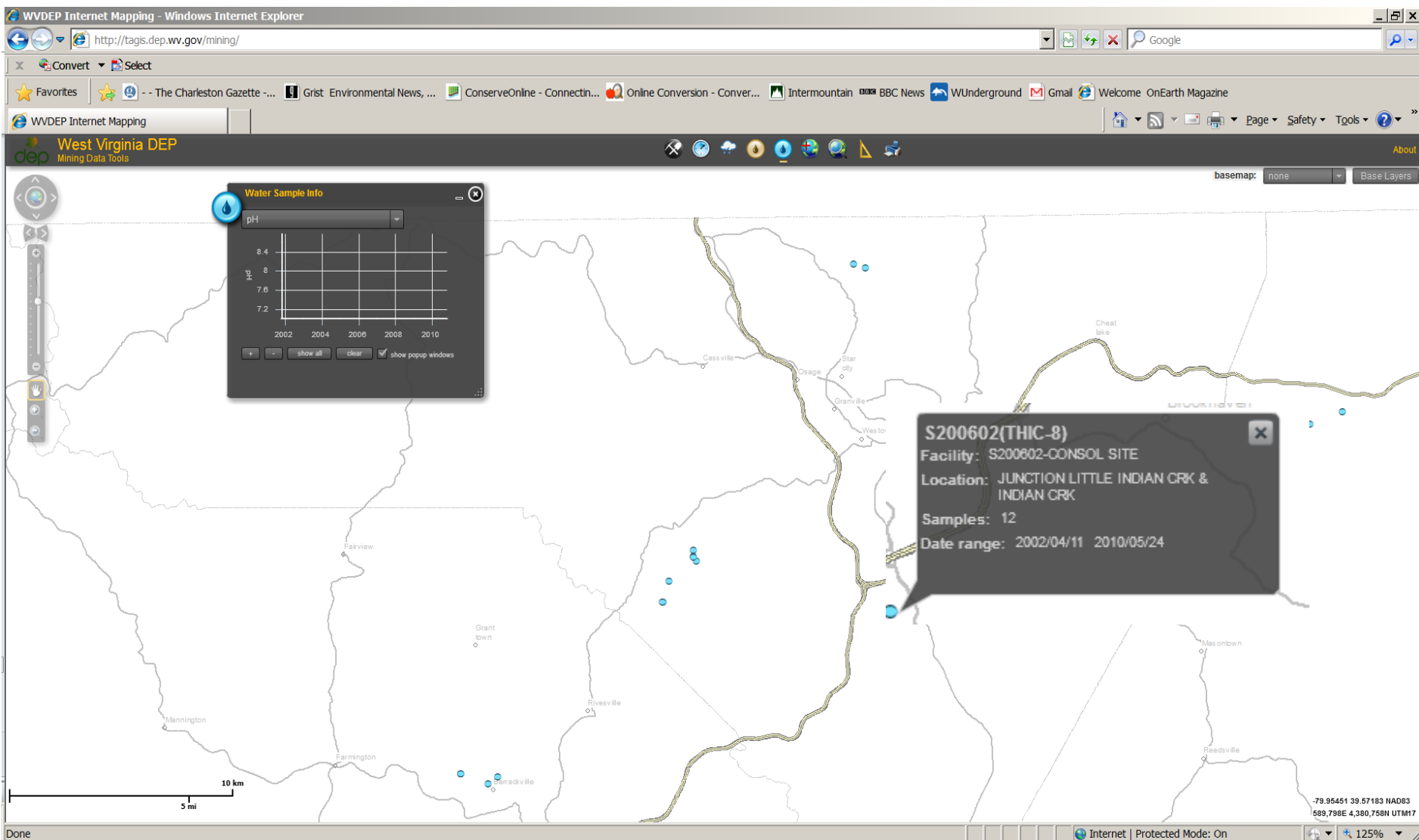
100 mi

-84.59117 40.77680 NAD83  
196.930E 4,520,187N UTM17

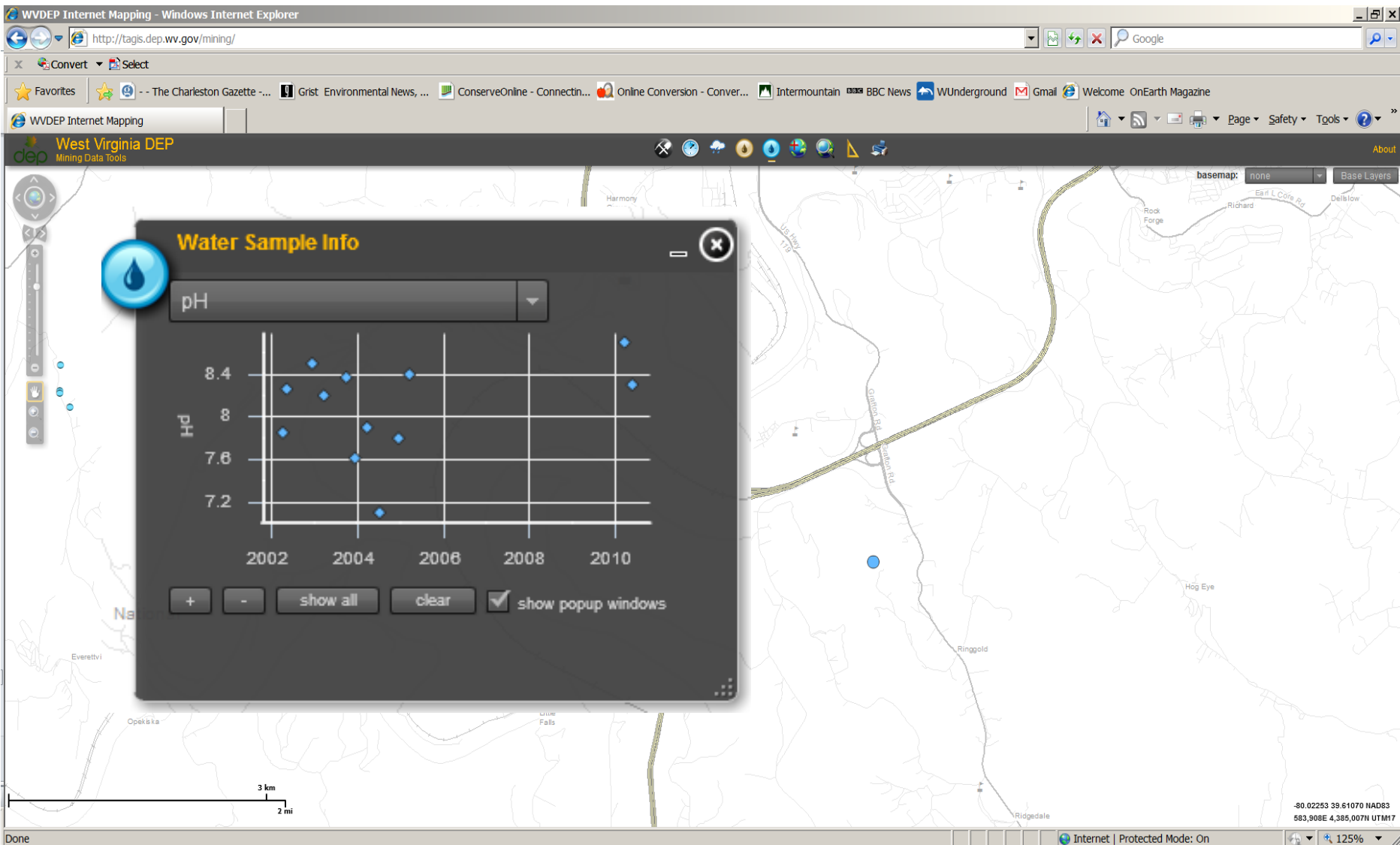
Internet | Protected Mode: On 125%

The image shows a screenshot of a web-based mapping application. The browser window is titled 'WVDEP Internet Mapping - Windows Internet Explorer' and the address bar shows 'http://tags.dep.wv.gov/mining/'. The page header includes the West Virginia DEP logo and 'Mining Data Tools'. A 'Mining Layers' panel is open on the left, showing a list of layers with checkboxes. The 'permit bdy' and 'underground mining' layers are checked. Below the list is a 'Layer transparency' slider and a 'Drawing Layers...' section. The main map area displays a map of West Virginia with purple shaded regions representing mining permit boundaries and underground mining areas. A toolbar with various icons is visible above the map. At the bottom right, there is a coordinate display showing UTM coordinates and a scale bar indicating 100 miles. The browser status bar at the very bottom shows 'Internet | Protected Mode: On' and a zoom level of 125%.

Mining Layers – Permit Boundary; Underground mining



Water sample data attribute info  
with stream name, etc



Water sample data graph, trend over time



WVDEP Internet Mapping - Windows Internet Explorer

http://tags.dep.wv.gov/mining/

Convert Select

Favorites -- The Charleston Gazette - ... Grist Environmental News, ... ConserveOnline - Connect... Online Conversion - Conver... Intermountain BBC News WUnderground Gmail Welcome OnEarth Magazine

WVDEP Internet Mapping

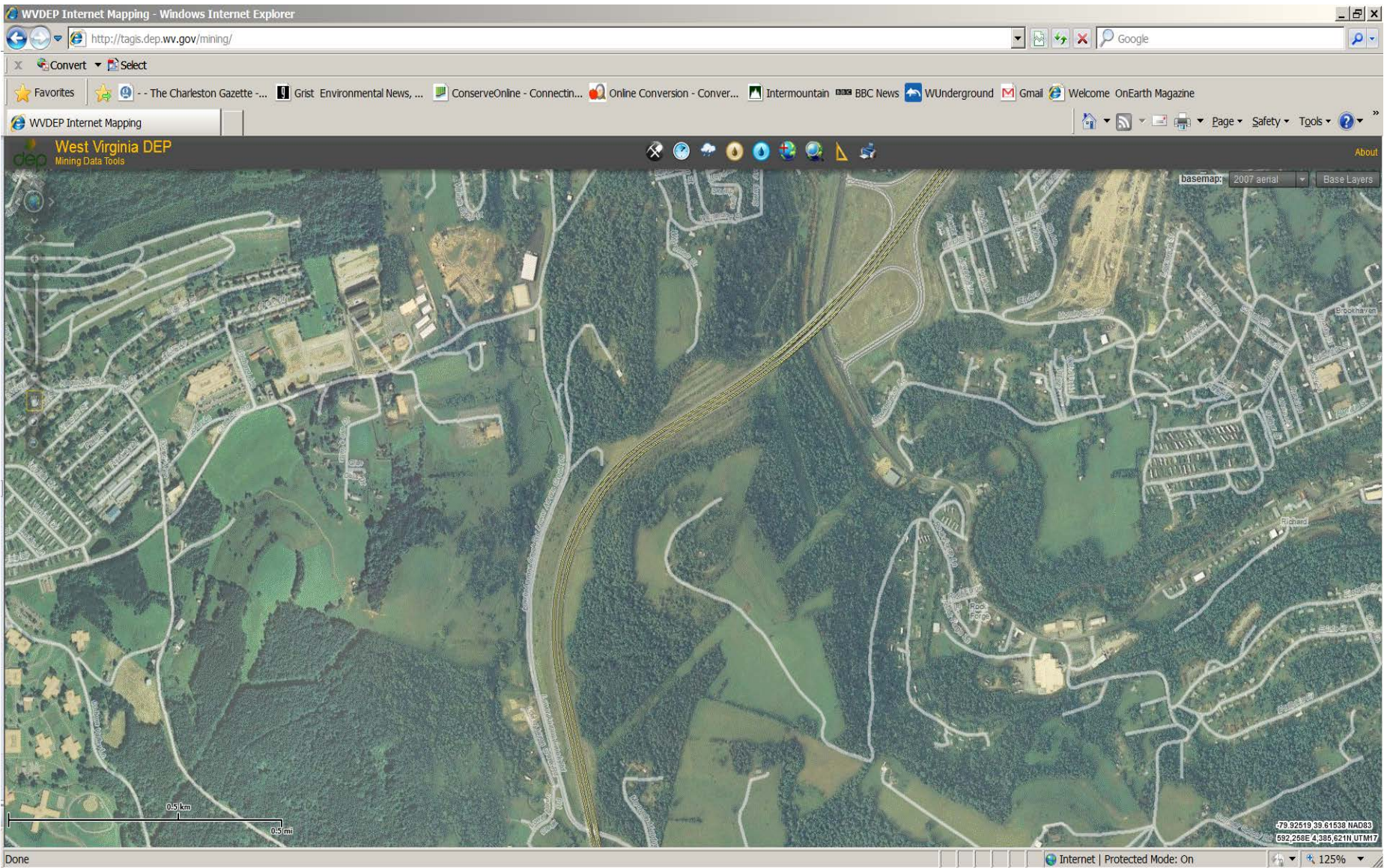
West Virginia DEP  
Mining Data Tools

basemap: none Base Layers

79.98507 39.60782 NAD83  
587,128E 4,384,723N UTM17

Done Internet | Protected Mode: On 125%

Base layer – Hydrology (Streams, wetlands, watersheds)



Base layer – Aerial imagery (2007)

# TNC Interactive Conservation Maps

The screenshot shows a web browser window displaying the TNC Interactive Conservation Maps website. The browser's address bar shows the URL [http://maps.tnc.org/web\\_maps.html](http://maps.tnc.org/web_maps.html). The website features the TNC logo and a navigation menu with links for HOME, GIS DATA, MAPS, and ABOUT. The main heading is "Interactive Conservation Maps", followed by a brief description: "Click on a map to explore an interactive, web-based map viewer created by Nature Conservancy staff around the world. Maps will open in a new window." Below this, there are six map thumbnails arranged in two rows. The first row includes: "The Nature Conservancy's Core Data (public)" with a "+ View Description" link; "The Nature Conservancy's Core Data (internal)" with a red "TNC Staff Only (login w/ email account)" overlay and a "+ View Description" link; and "Two-Hearted River Watershed Conservation" with a "+ View Description" link. The second row includes: a satellite map of a coastal area; "Visit a Preserve Experience Station with the Conservancy" with a map of the United States and a text box; and another map of a watershed area. To the right of the map thumbnails is a section titled "Want your own interactive web map?" which provides information on how to create and publish maps, including links to a comparison of web map options and a spreadsheet format. At the bottom of the browser window, the status bar shows "Local intranet | Protected Mode: Off" and a zoom level of "125%".

Conservation Maps - The Nature Conservancy - Windows Internet Explorer  
http://maps.tnc.org/web\_maps.html  
tnc web map

Convert Select  
Favorites -- The Charleston Gazette - ... Grist Environmental News, ... ConserveOnline - Connect... Online Conversion - Conver... Intermountain BBC News WUnderground Gmail Welcome OnEarth Magazine  
Conservation Maps - The Nature Conser... Page Safety Tgols

The Nature Conservancy  
Protecting nature. Preserving life.™

**TNC MAPS** HOME GIS DATA **MAPS** ABOUT

## Interactive Conservation Maps

Click on a map to explore an interactive, web-based map viewer created by Nature Conservancy staff around the world. Maps will open in a new window.

**The Nature Conservancy's Core Data (public)**  
+ View Description

**TNC Staff Only**  
(login w/ email account)

**The Nature Conservancy's Core Data (internal)**  
+ View Description

**Two-Hearted River Watershed Conservation**  
+ View Description

**Visit a Preserve Experience Station with the Conservancy**

**The Nature Conservancy**  
Great Lakes Program

### Want your own interactive web map?

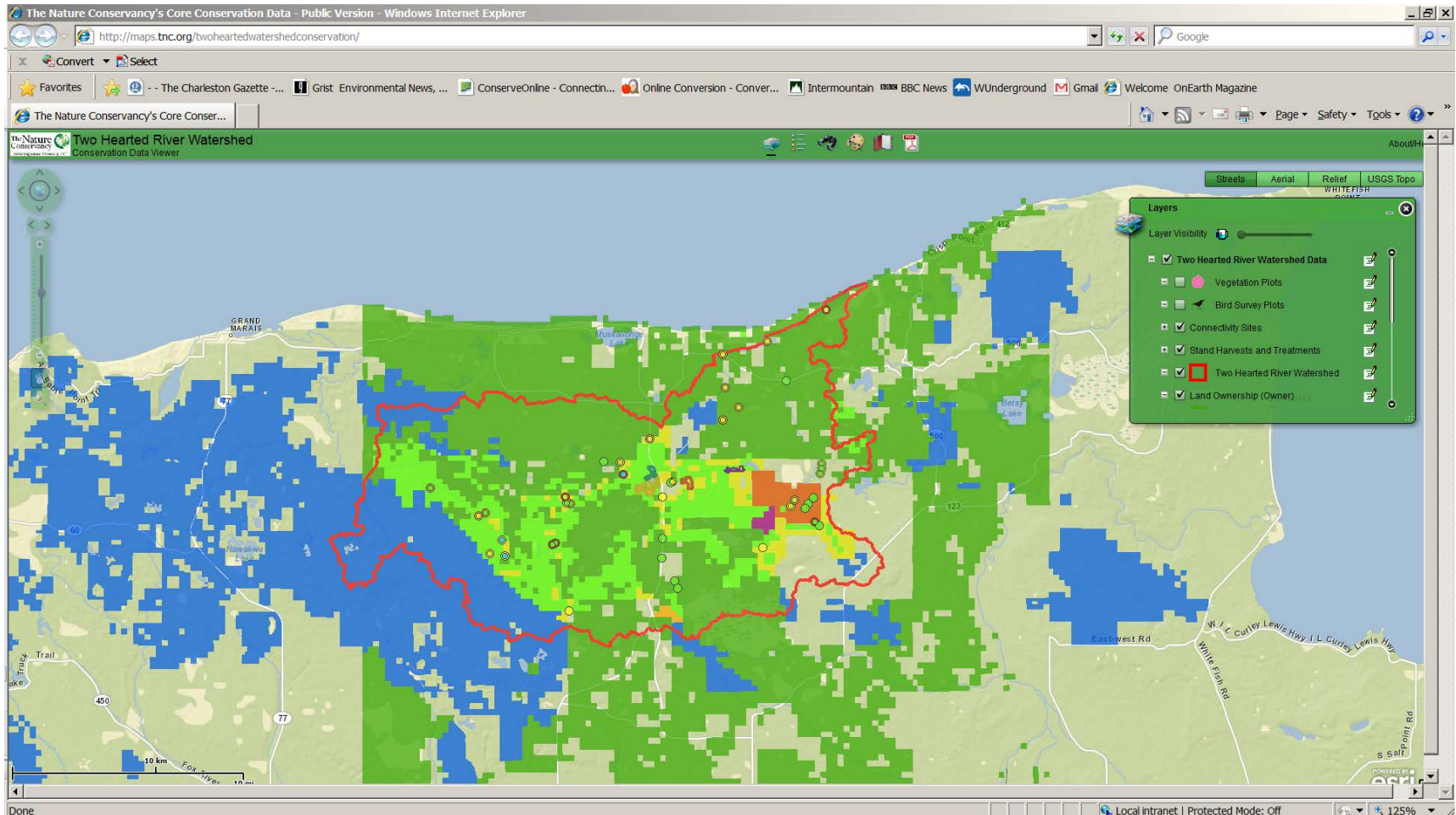
If you are interested in creating your own map and publishing it online, check out a [comparison of several web map options](#) to do so (or view the [same comparison in a spreadsheet format](#)). For additional information (including detailed guidance on using ArcGIS Server), please see our [help](#).

Staff of The Nature Conservancy can contact the [Conservation Data & Information Systems Team](#) for assistance.

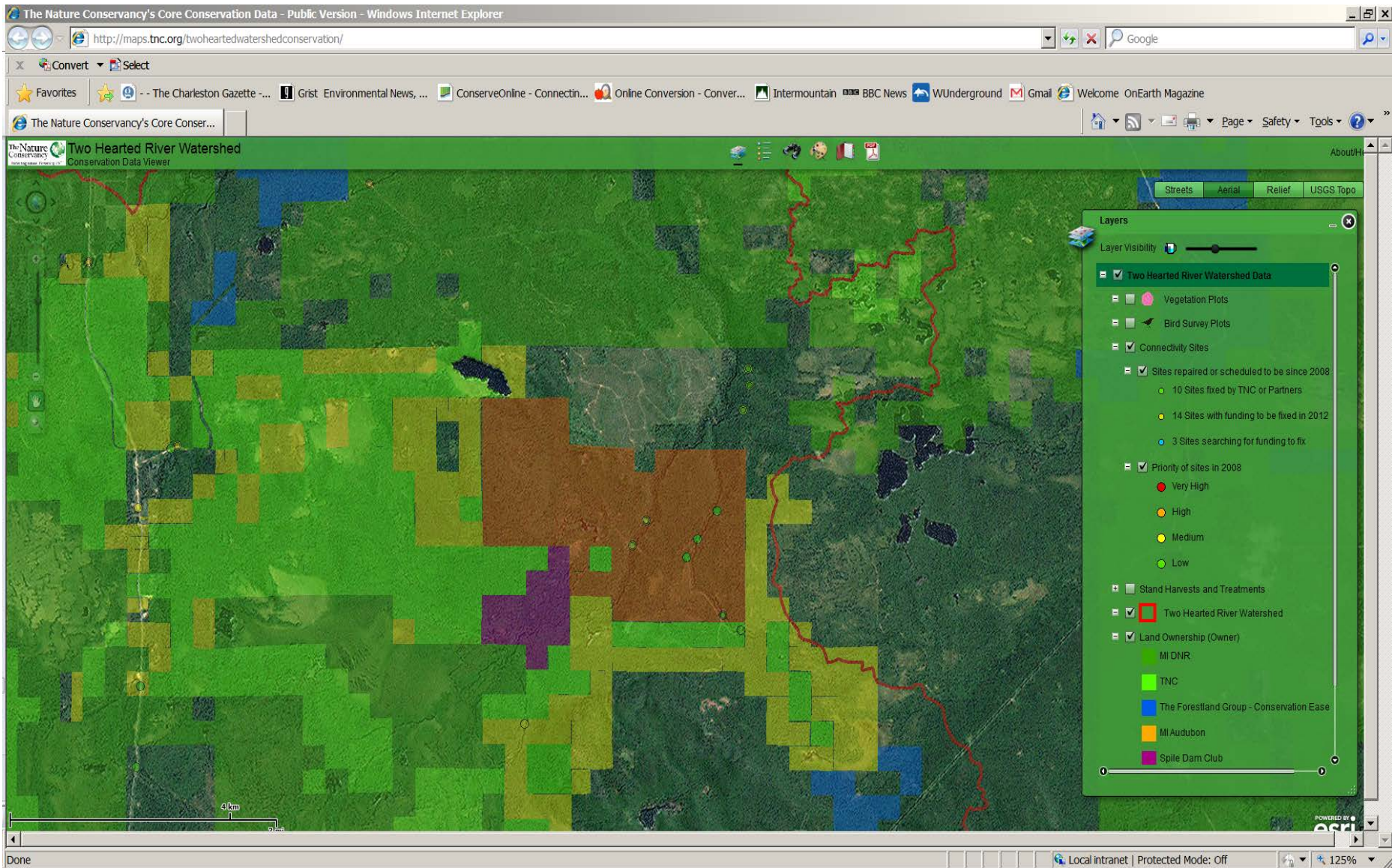
Local intranet | Protected Mode: Off 125%

[http://maps.tnc.org/web\\_maps.html](http://maps.tnc.org/web_maps.html)

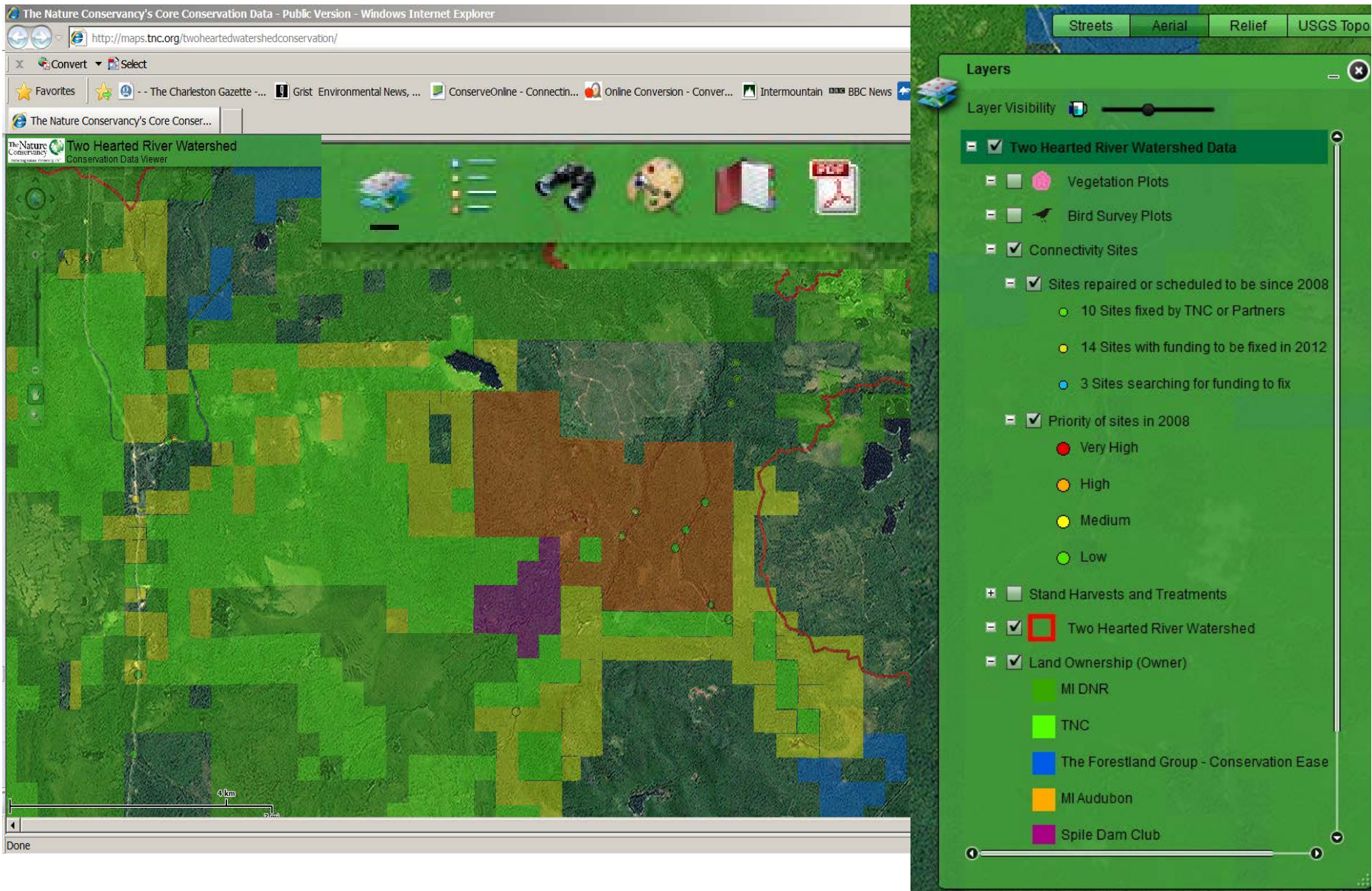
# TNC Two Hearted River Watershed Conservation Map



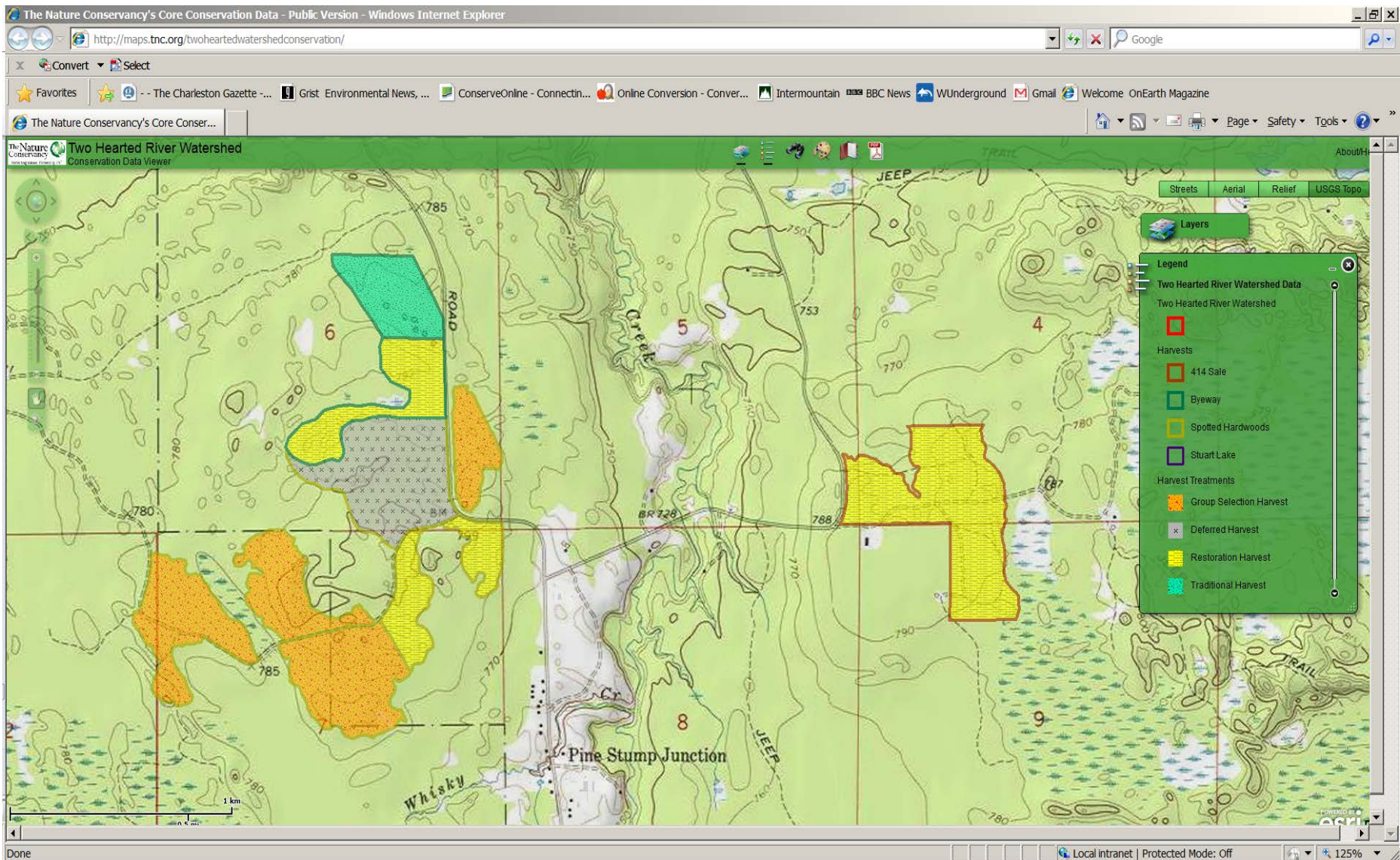
<http://maps.tnc.org/twoheartedwatershedconservation/>



Aerial imagery base layer; expanded Layers contents w/symbology definition



Aerial imagery base layer; expanded Layers contents w/symbology definition



Topographic maps base layer; Legend box for Stand Harvests and Treatment data

The Nature Conservancy's Core Conservation Data - Public Version - Windows Internet Explorer

http://maps.tnc.org/twoheartedwatershedconservation/

Convert Select

Favorites - - The Charleston Gazette - - Grist Environmental News, ... ConserveOnline - Connectin... Online Conversion - Conver... Intermountain BBC News WUnderground Gmail Welcome OnEarth Magazine

The Nature Conservancy's Core Conser...

The Nature Conservancy Two Hearted River Watershed Conservation Data Viewer

Streets Aerial Relief USGS Topo

Layers

Layer Visibility

- Two Hearted River Watershed Data
  - Vegetation Plots
  - Bird Survey Plots
  - Connectivity Sites
    - Sites repaired or scheduled to be since 2008
      - 10 Sites fixed by TNC or Partners
      - 14 Sites with funding to be fixed in 2012 and 20
      - 3 Sites searching for funding to fix
    - Priority of sites in 2008
      - Very High
      - High
      - Medium
      - Low
  - Stand Harvests and Treatments
  - Two Hearted River Watershed
  - Land Ownership (Owner)

Search

Search Layer: Connectivity Sites

Search Connectivity by Site:

Search Clear

4 km

Done Local intranet | Protected Mode: Off 125%

Relief map base layer; Search box with Connectivity Sites displayed



# Questions to Consider

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- What do you envision your primary uses of the tool may be?
- What functionality is desired for you to get the most from the tool? (e.g. view data, ability to search, get attribute information, etc)
- What would be the most important feature of the tool for you? The least important?



Mon River at Friendship Hill ©photos.igougo.com

COMMENTS/QUESTIONS?