



# WEST VIRGINIA WATERSHED ASSESSMENT PILOT PROJECT

Stakeholder Workshop: Tug Fork Watershed  
November 13, 2013

# Tug Fork River Watershed

1. Watershed Overview
2. Current Condition Results  
Streams, Wetlands, Uplands
3. Consolidated Analysis Results  
Threats, Opportunities
4. Web Map Tool Demo  
Potential Use Scenario

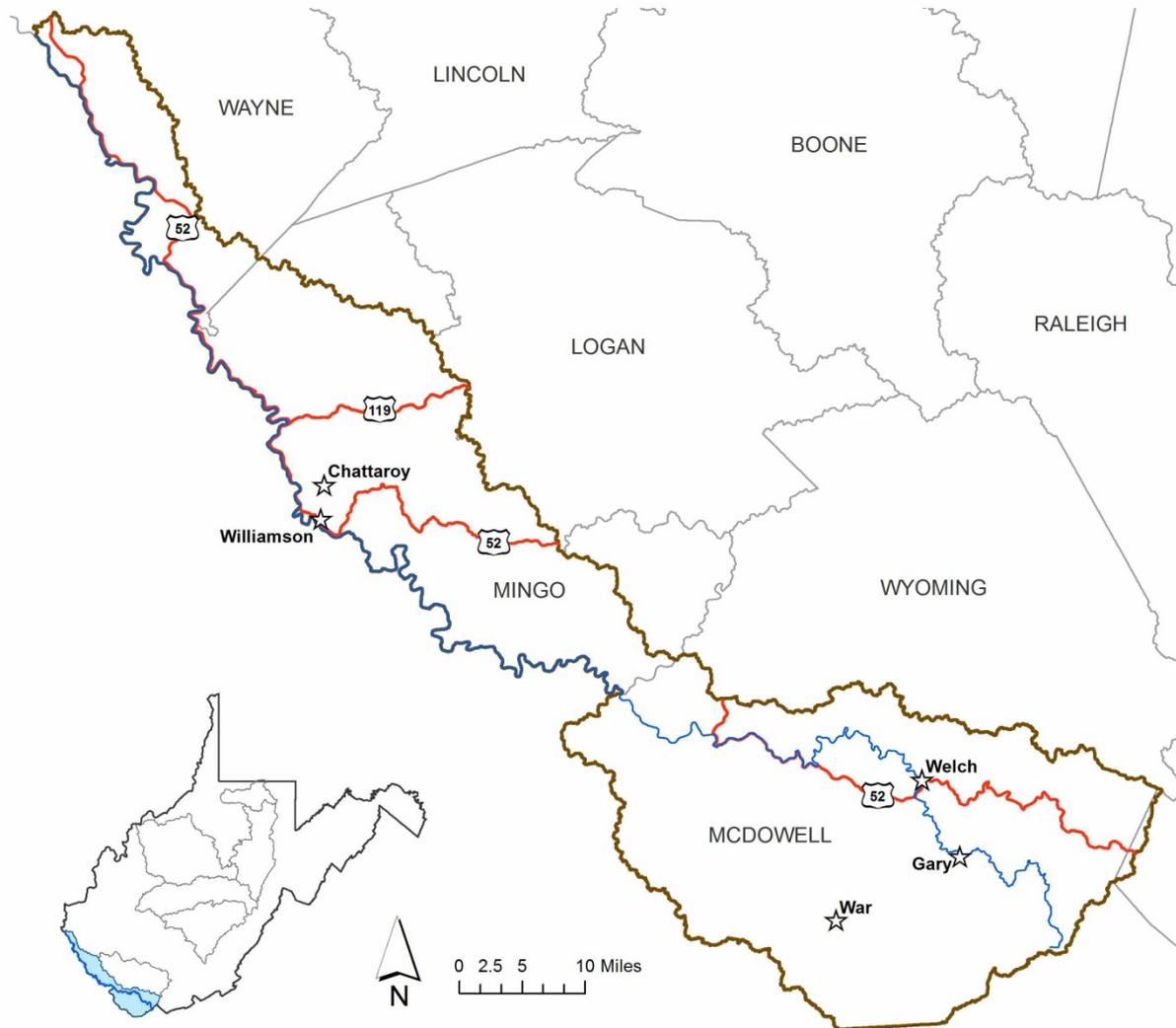
# Tug Fork River Watershed

Watershed  
Overview:

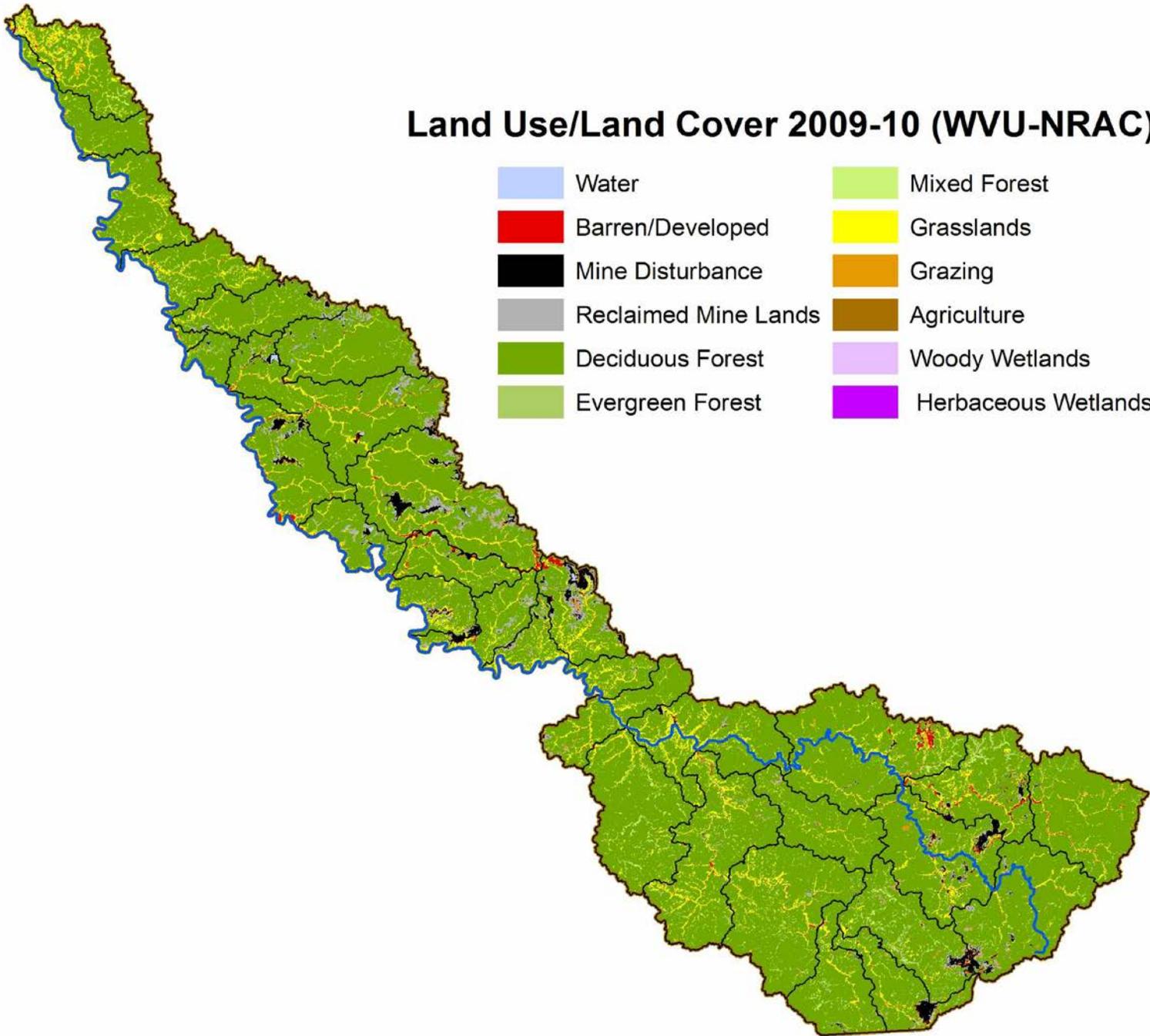
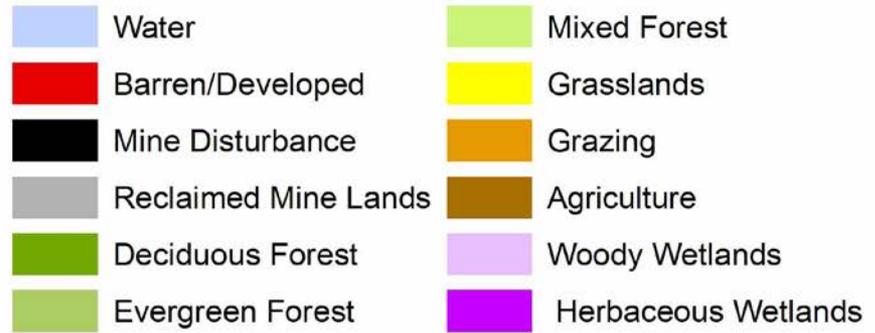
Counties

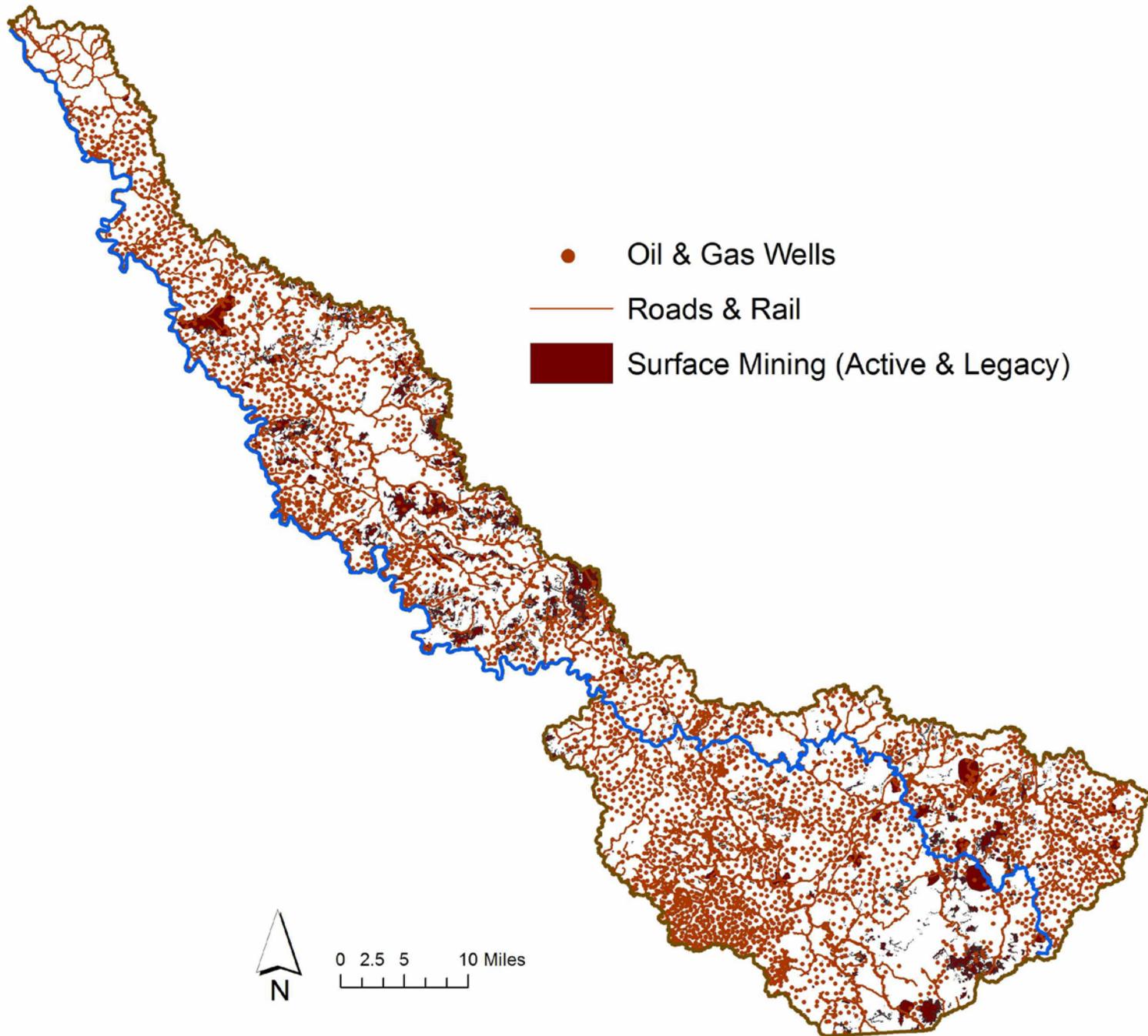
Towns

Major  
Roads

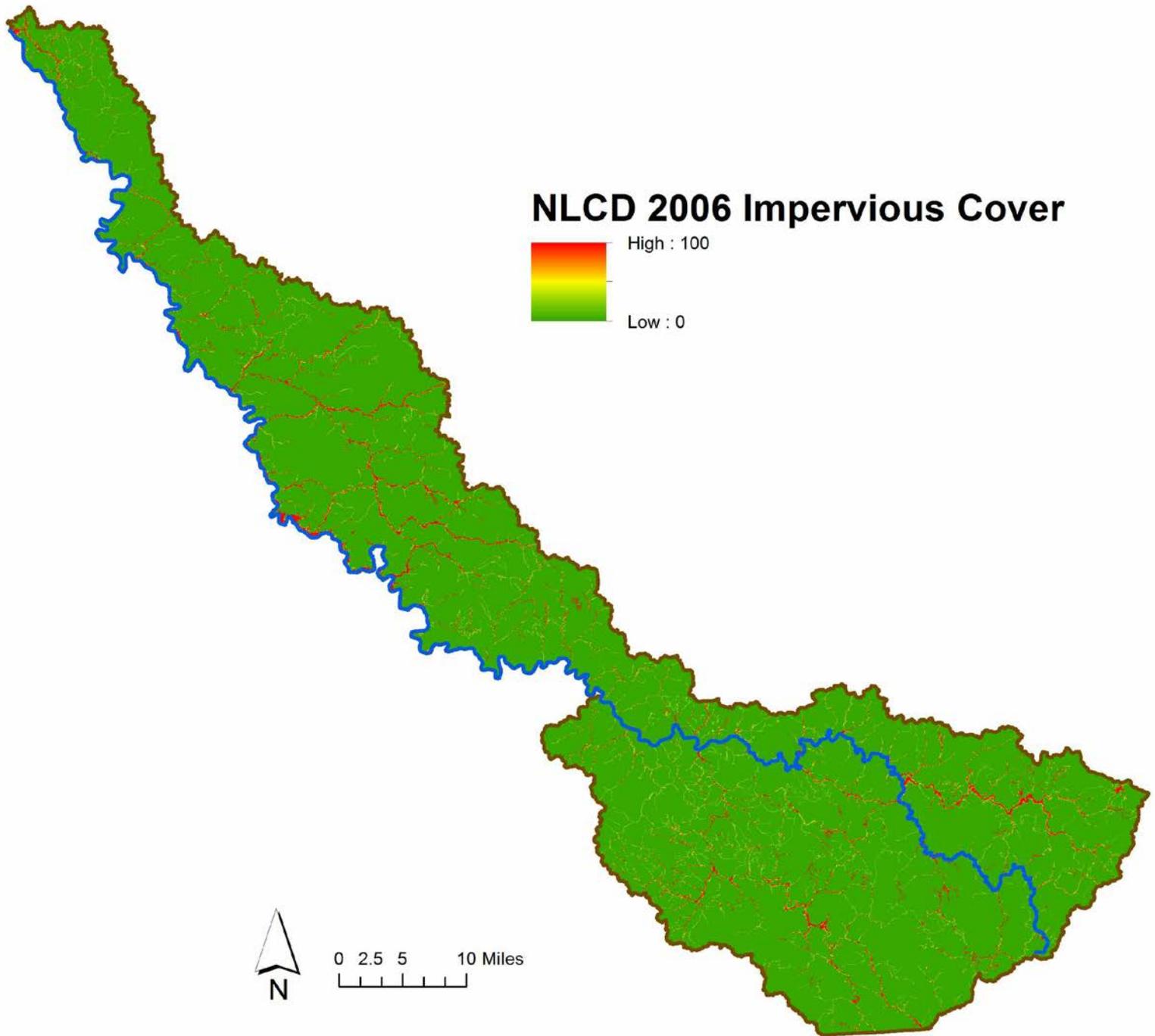
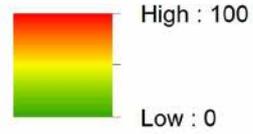


## Land Use/Land Cover 2009-10 (WVU-NRAC)





# NLCD 2006 Impervious Cover



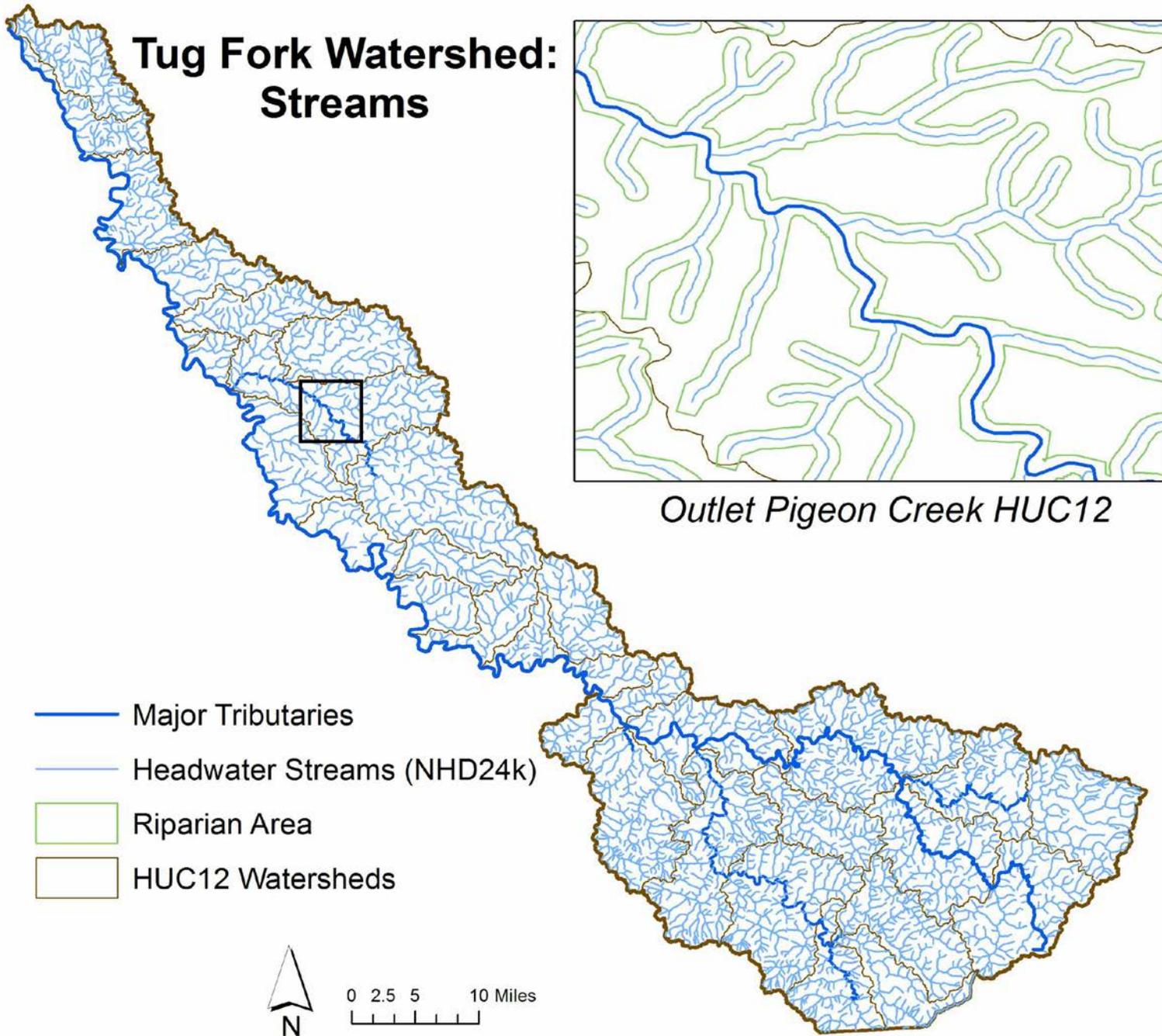
0 2.5 5 10 Miles

# Tug Fork Watershed: Streams



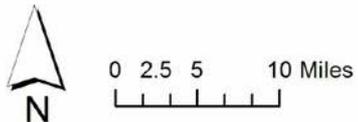
Panther WMA © wikipedia.com

# Tug Fork Watershed: Streams

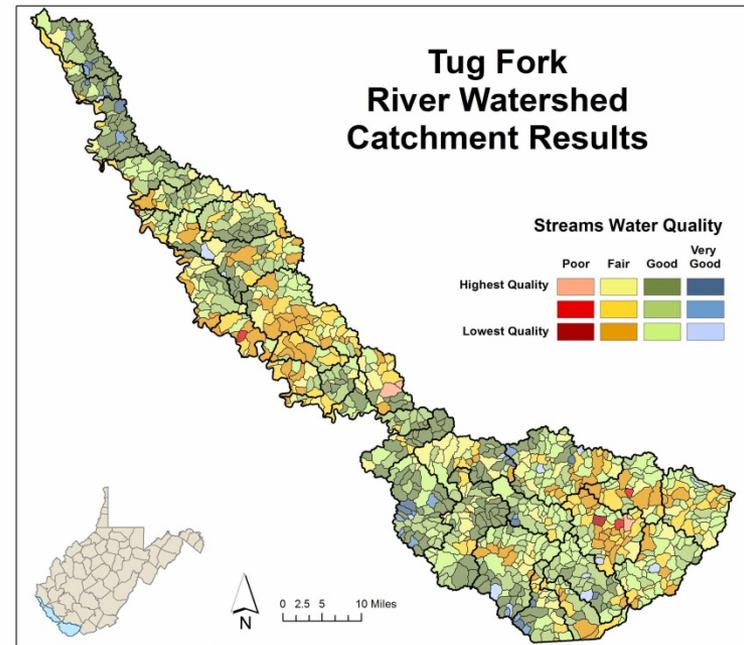
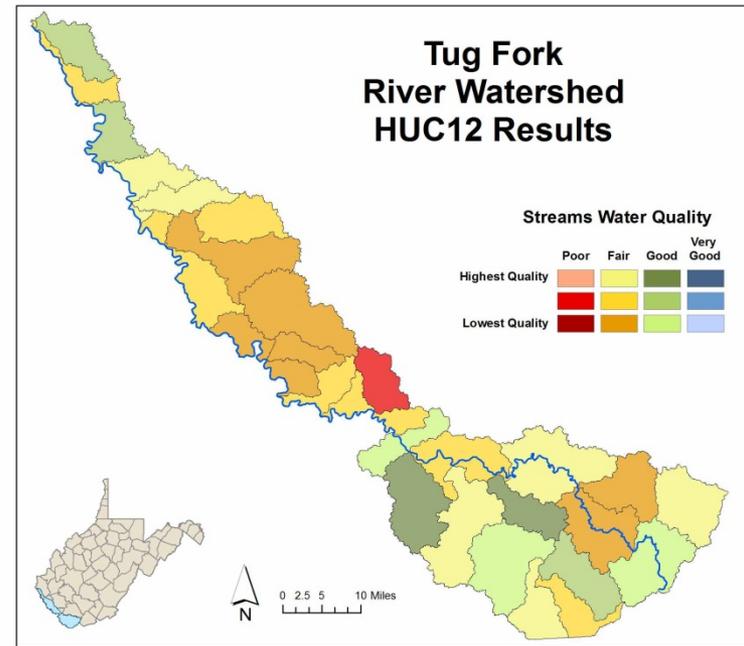
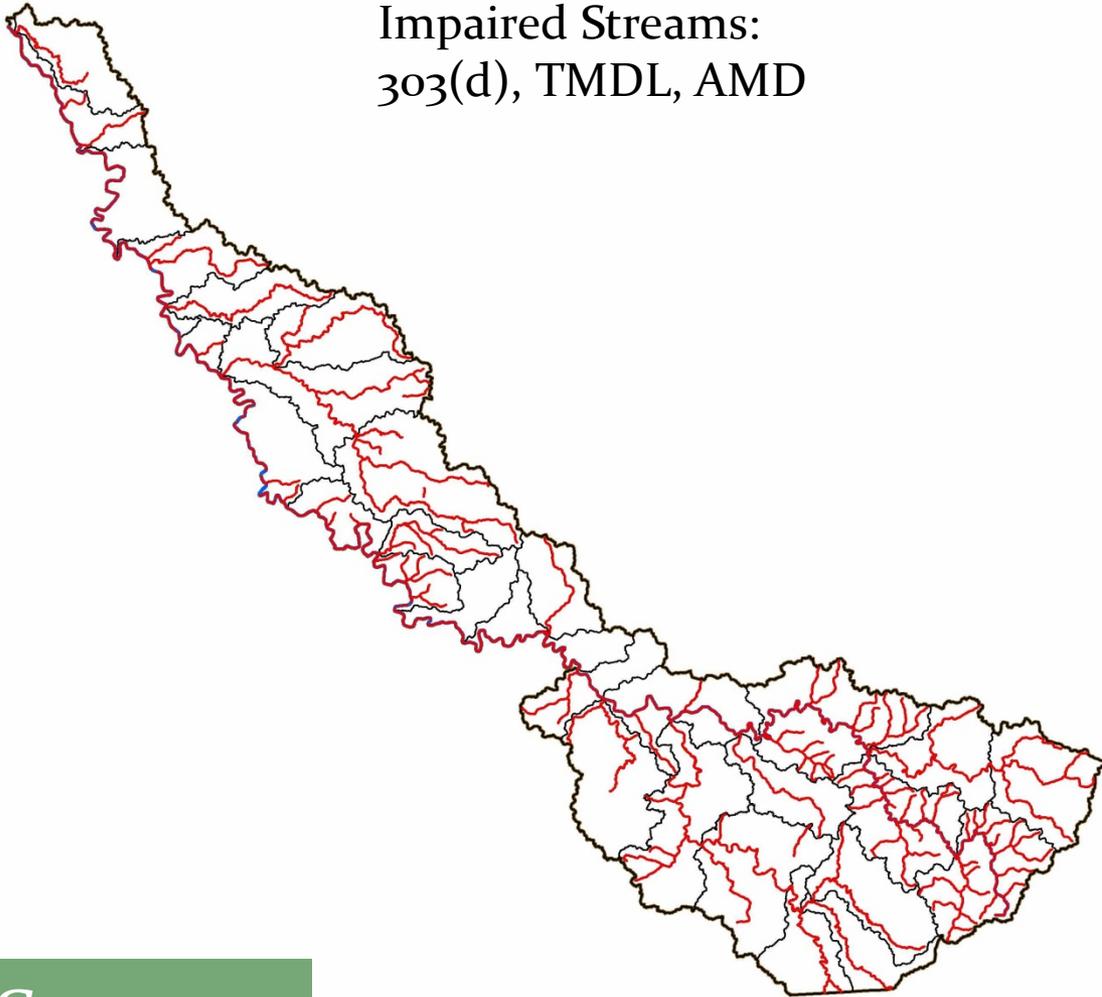


*Outlet Pigeon Creek HUC12*

- Major Tributaries
- Headwater Streams (NHD24k)
- Riparian Area
- HUC12 Watersheds

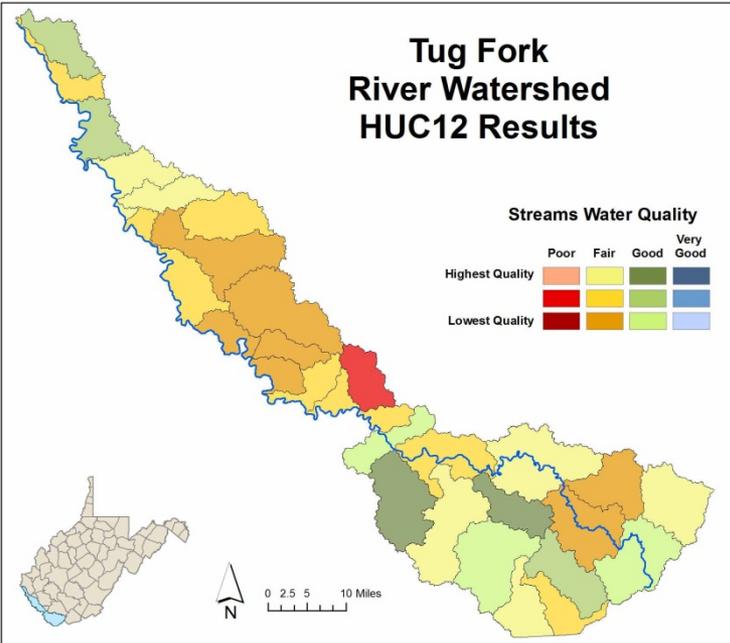


Impaired Streams:  
303(d), TMDL, AMD

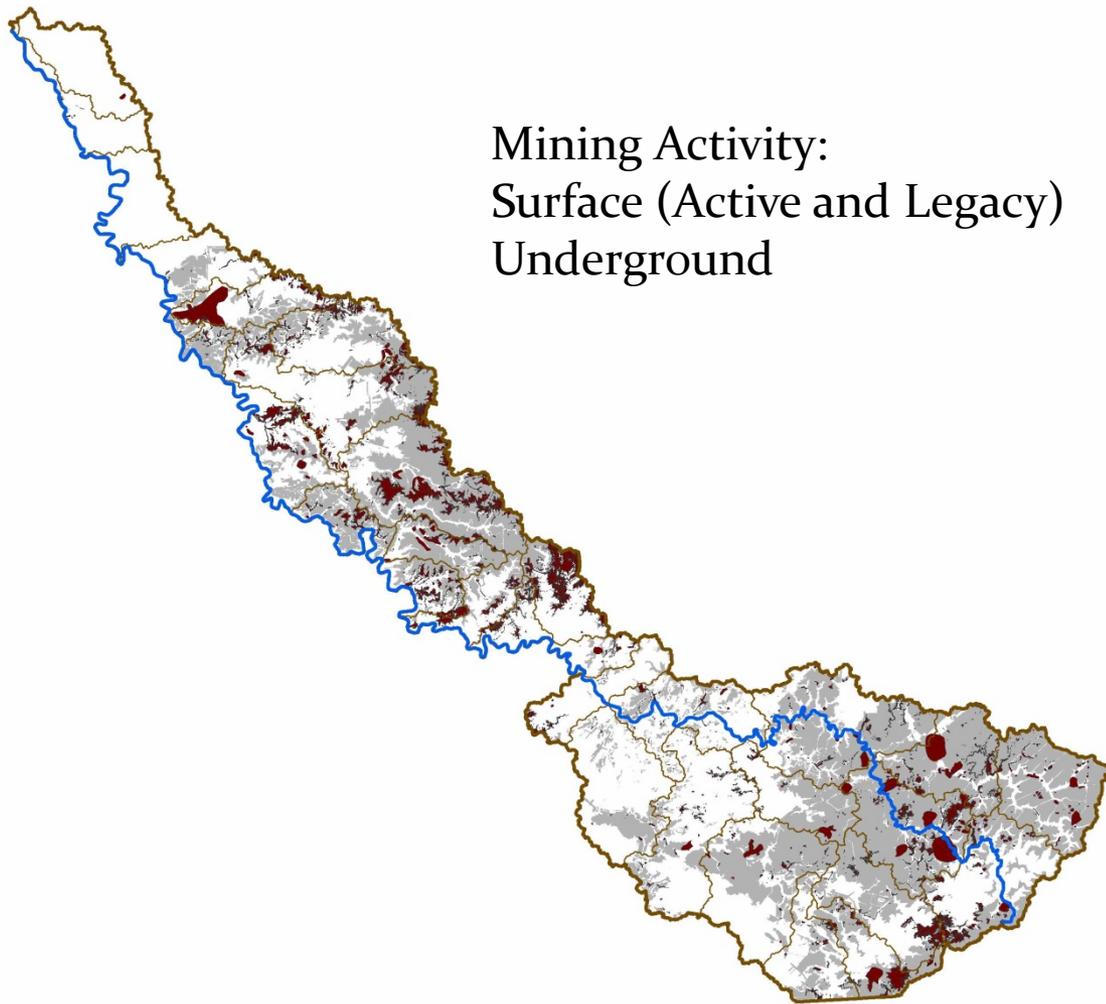


Streams  
Water  
Quality

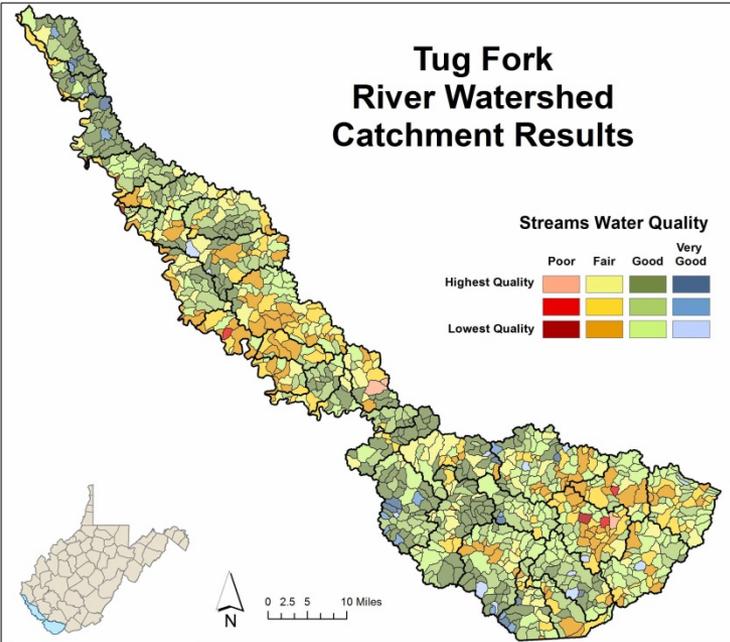
## Tug Fork River Watershed HUC12 Results



Mining Activity:  
Surface (Active and Legacy)  
Underground

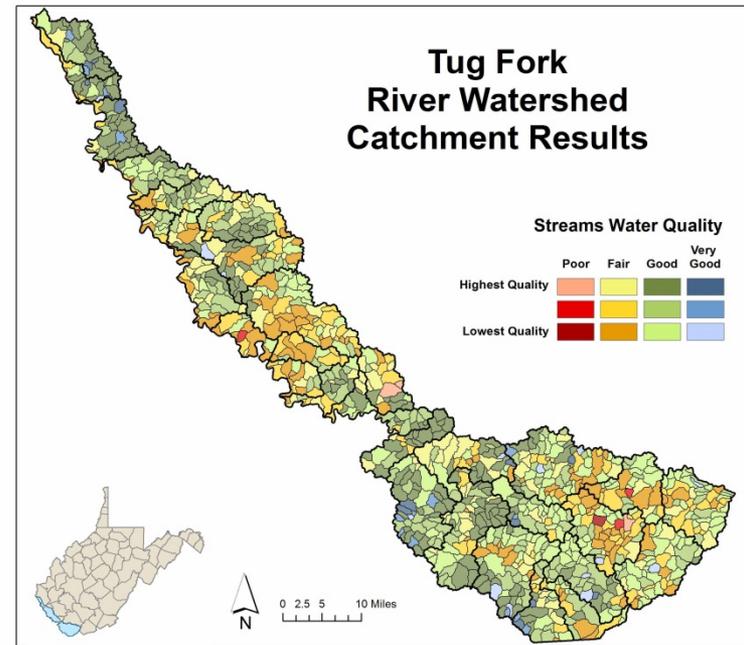
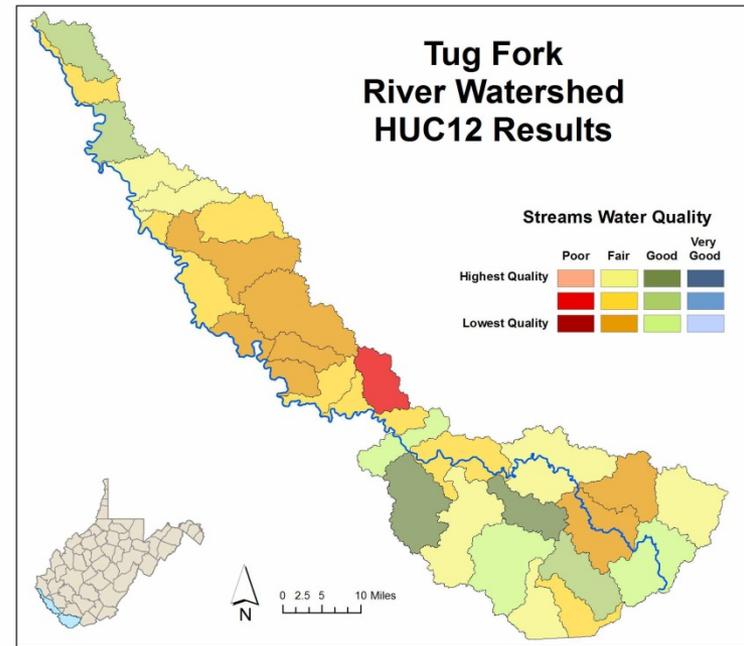
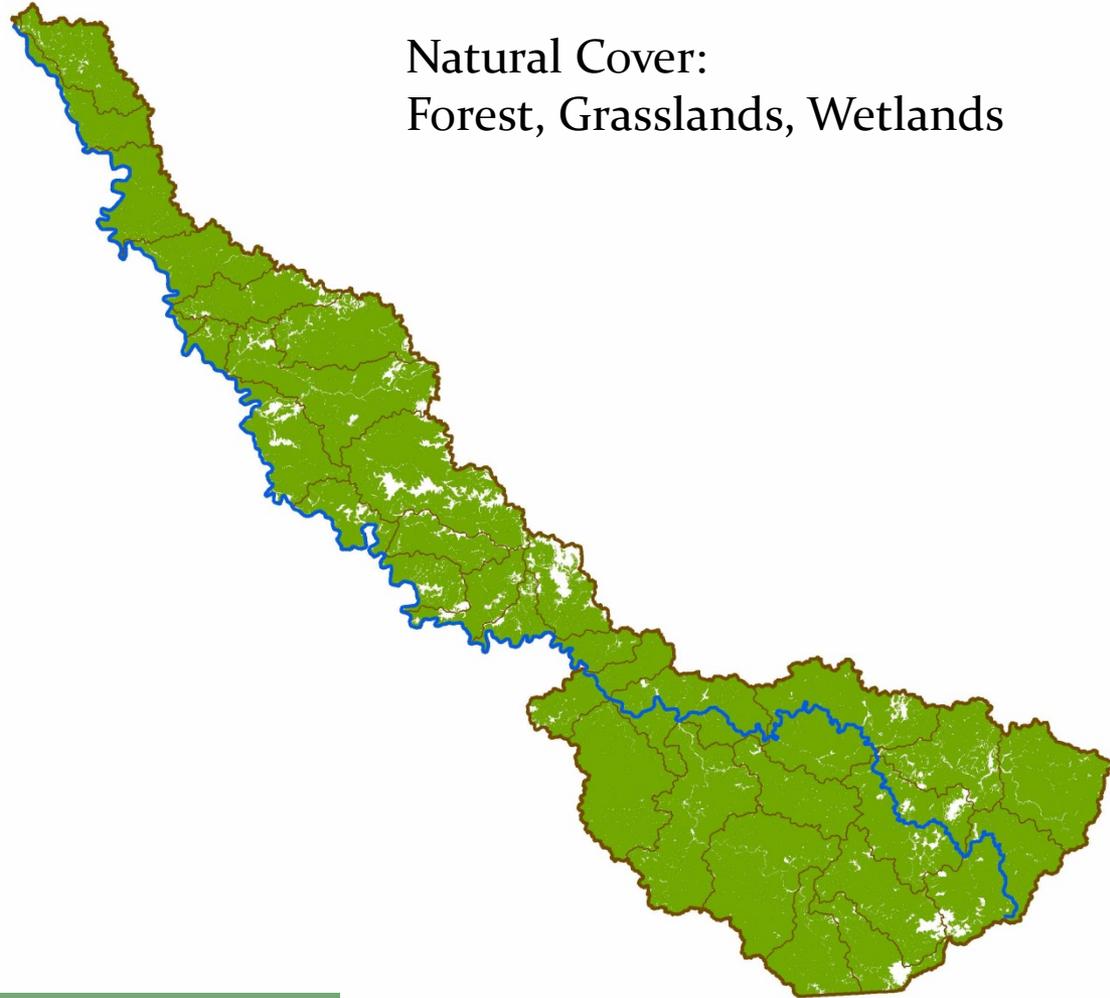


## Tug Fork River Watershed Catchment Results



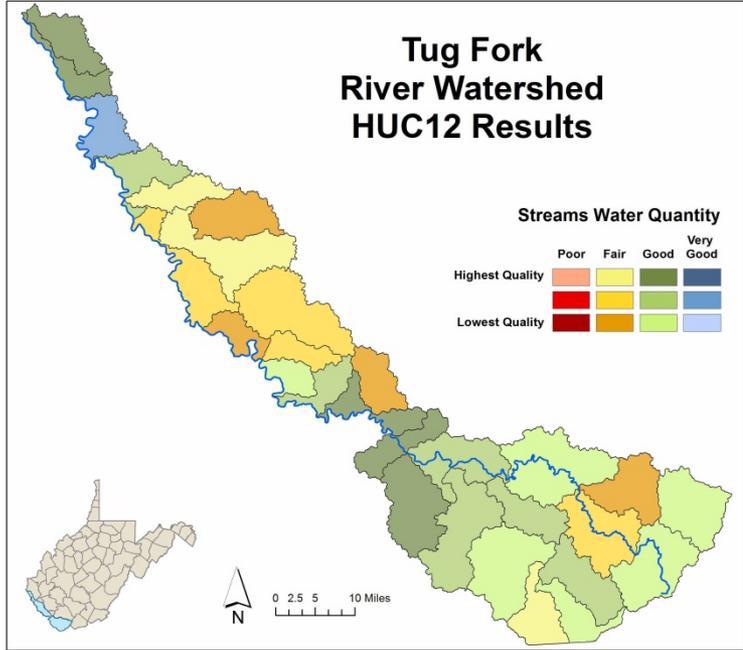
Streams  
Water  
Quality

Natural Cover:  
Forest, Grasslands, Wetlands

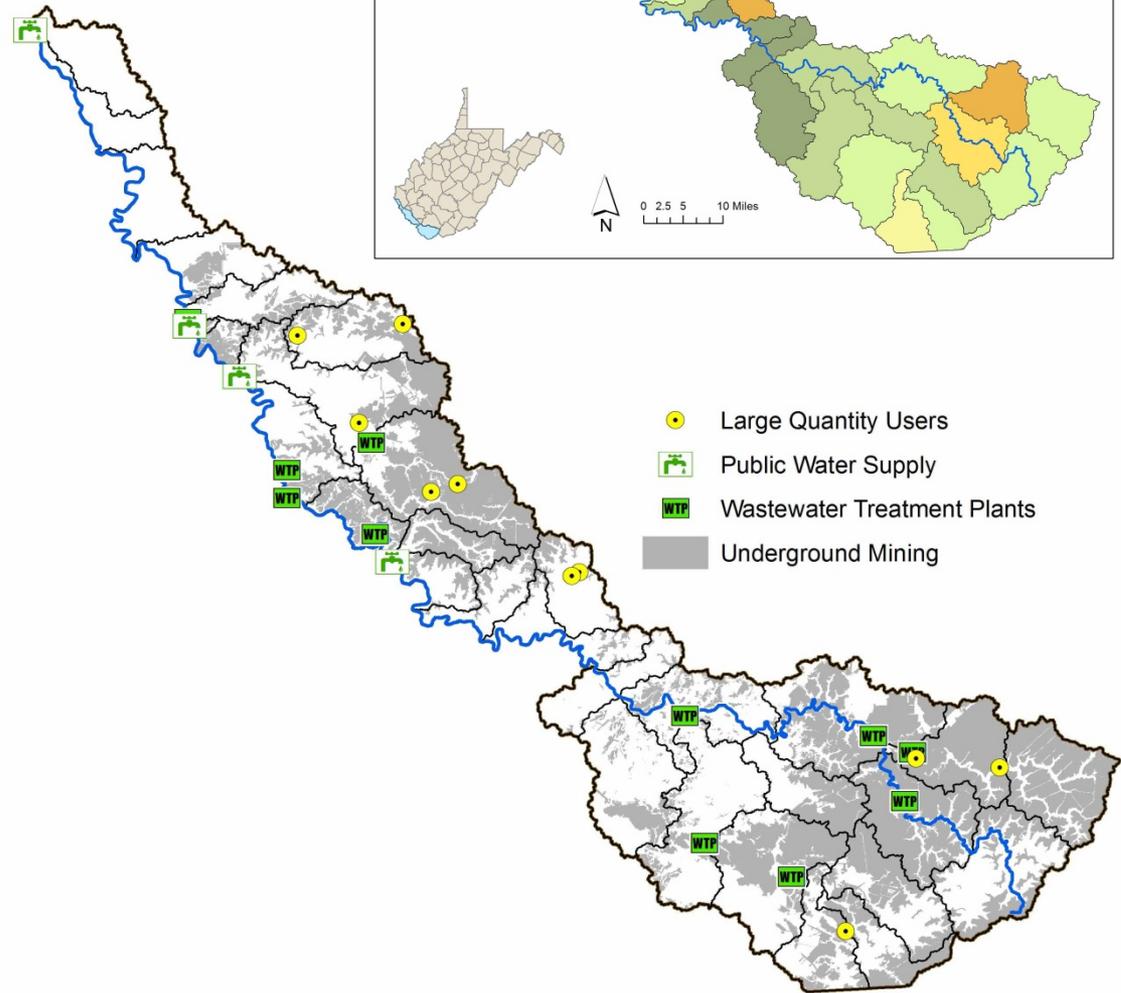
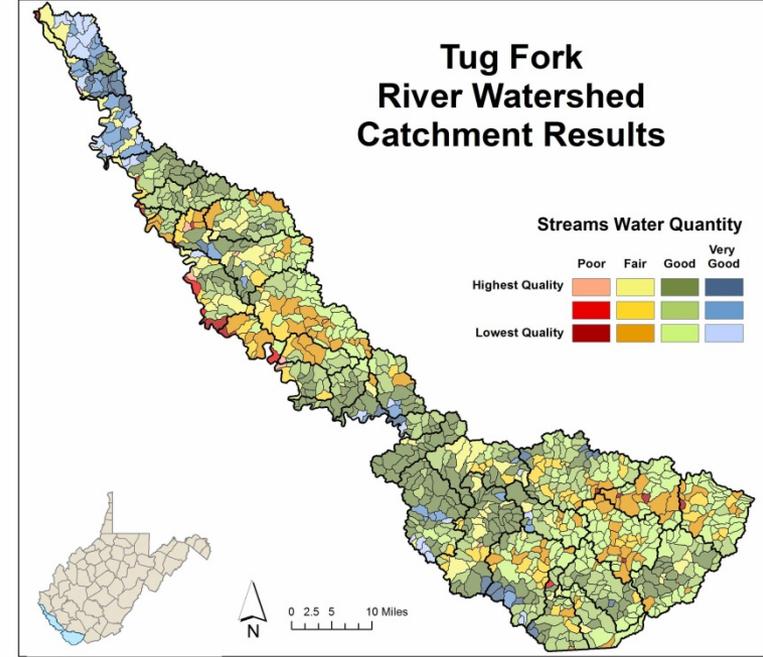


Streams  
Water  
Quality

## Tug Fork River Watershed HUC12 Results



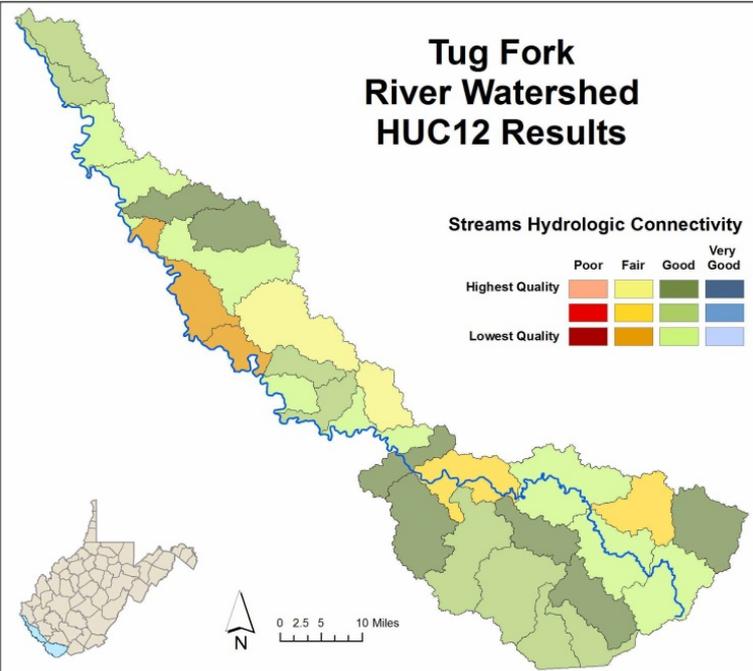
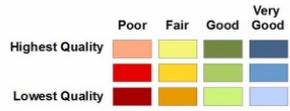
## Tug Fork River Watershed Catchment Results



Streams  
Water  
Quantity

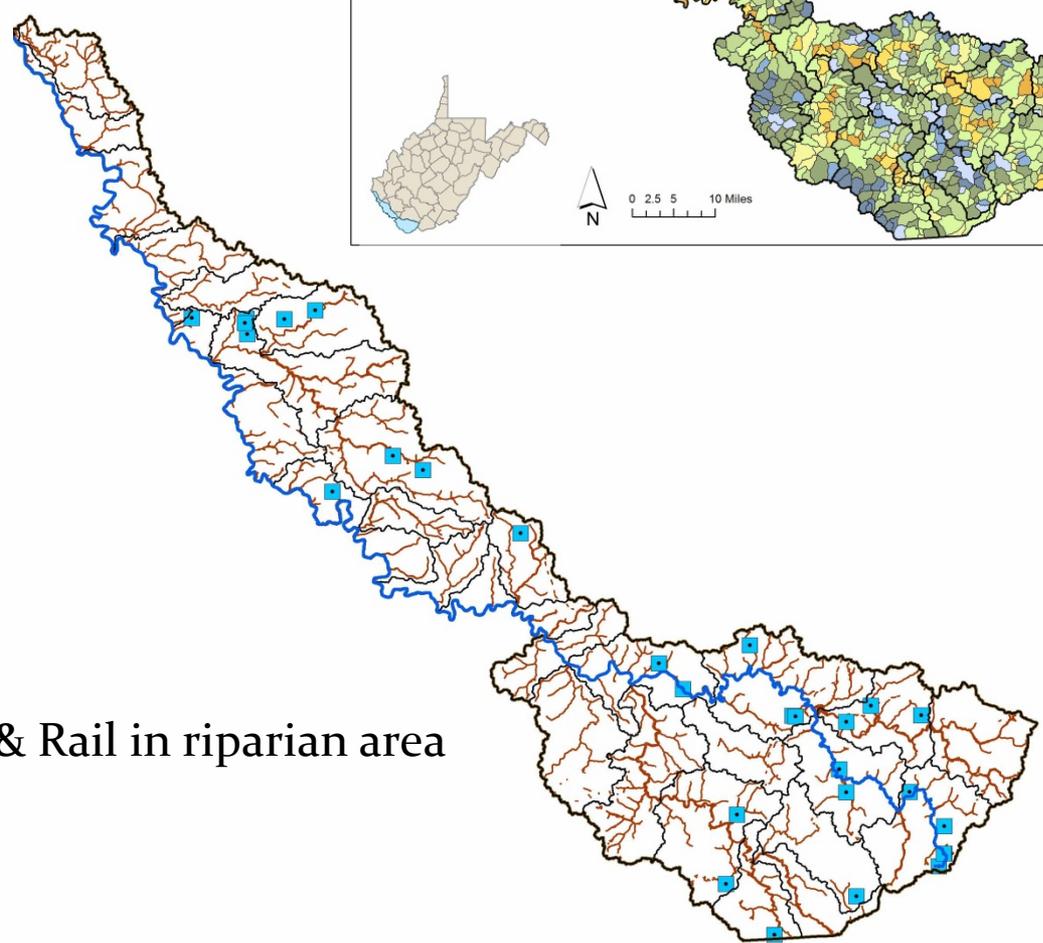
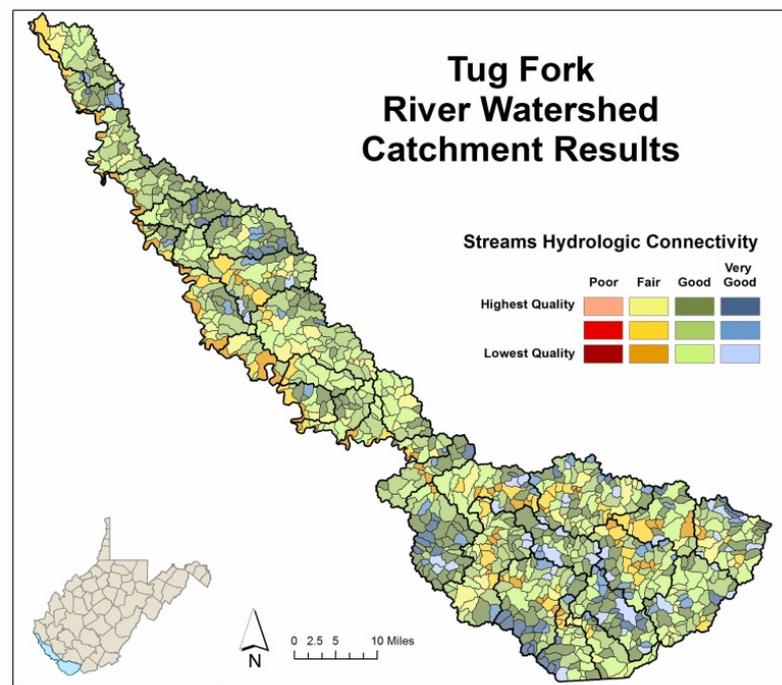
# Tug Fork River Watershed HUC12 Results

## Streams Hydrologic Connectivity



# Tug Fork River Watershed Catchment Results

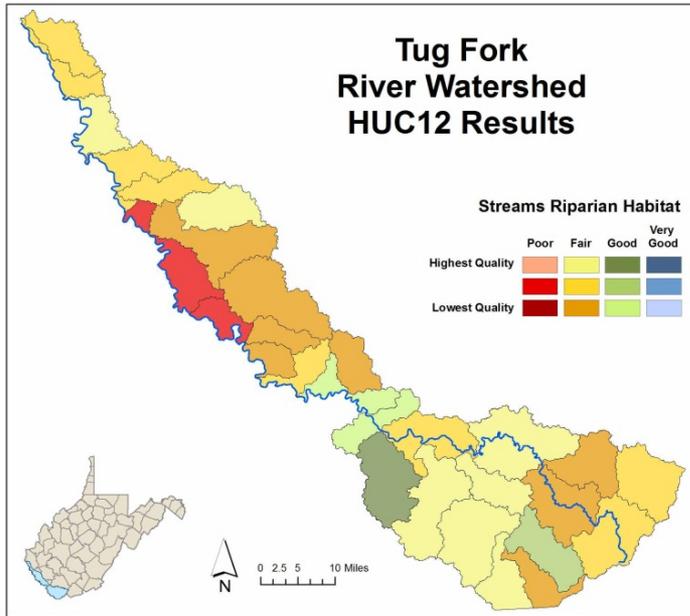
## Streams Hydrologic Connectivity



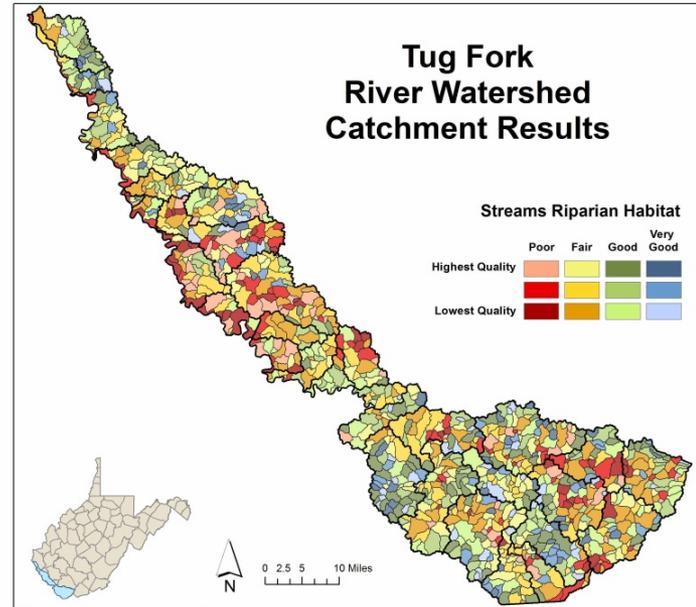
Dams  
Roads & Rail in riparian area

Streams  
Hydrologic  
Connectivity

# Tug Fork River Watershed HUC12 Results

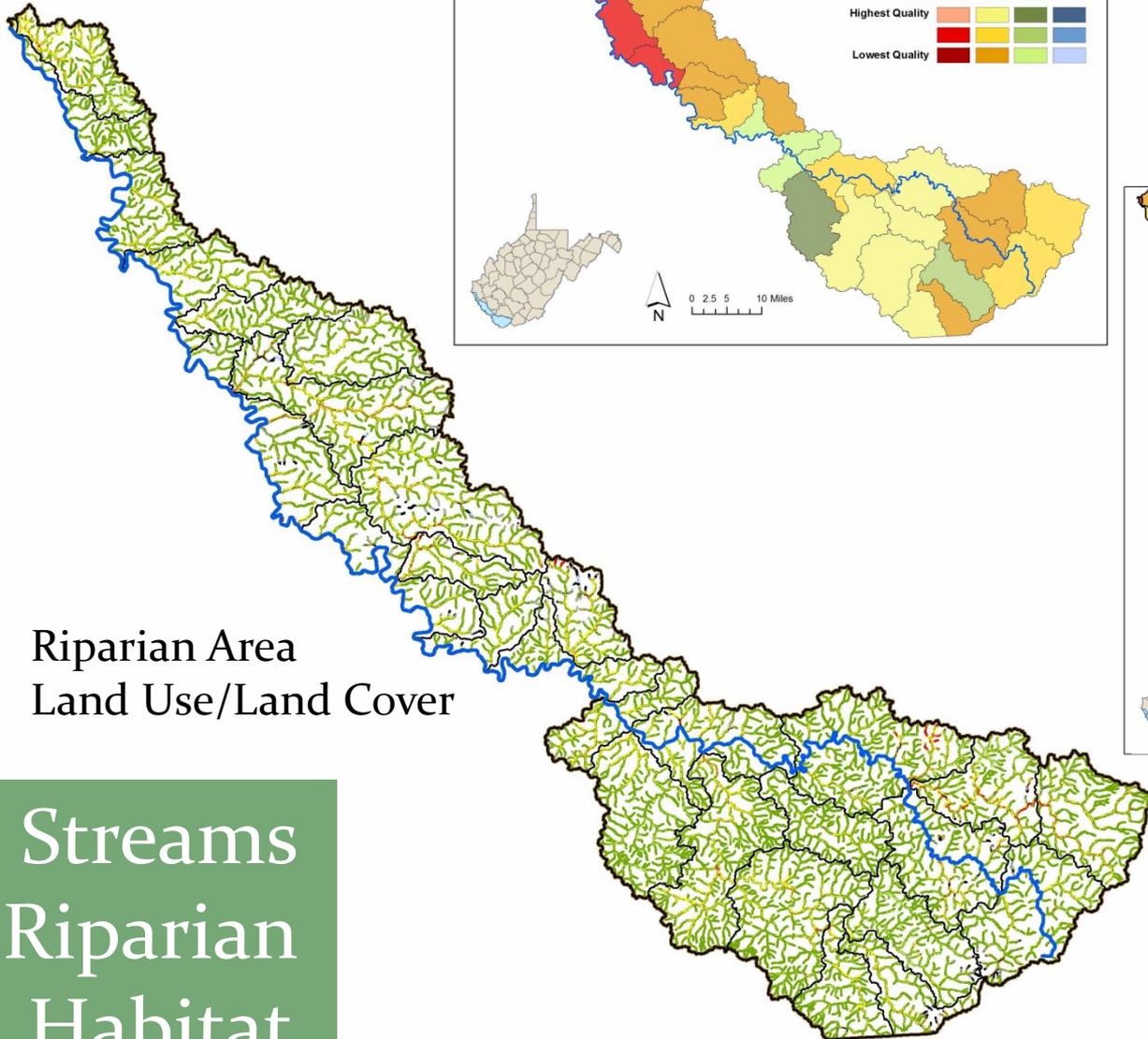


# Tug Fork River Watershed Catchment Results



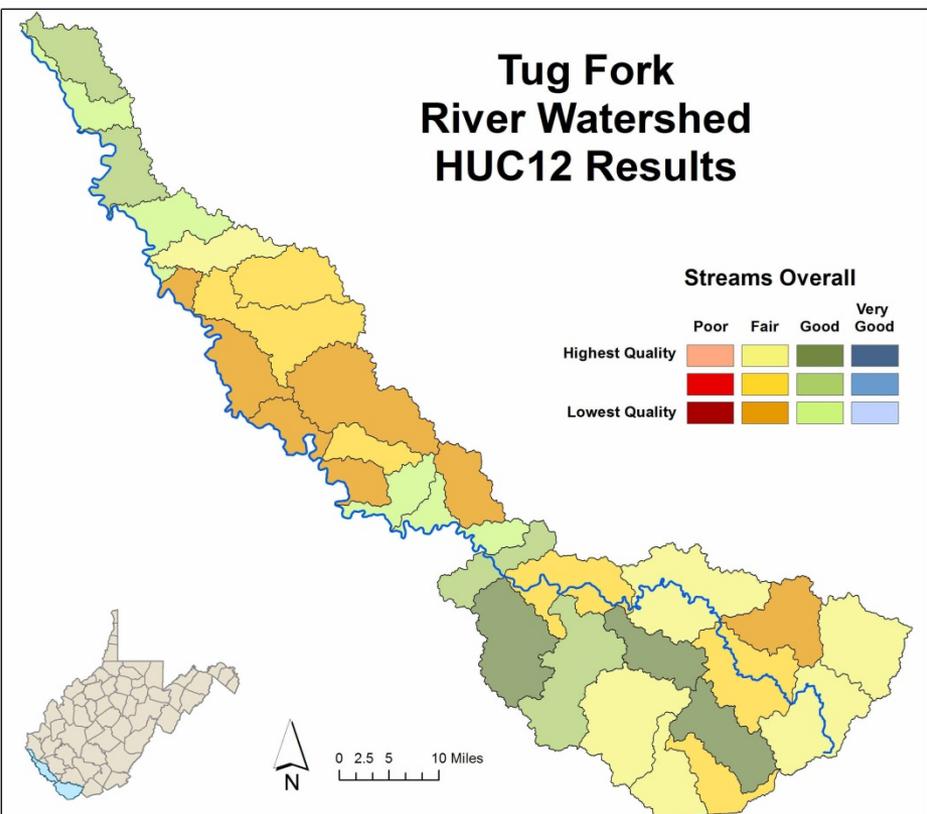
Riparian Area  
Land Use/Land Cover

Streams  
Riparian  
Habitat



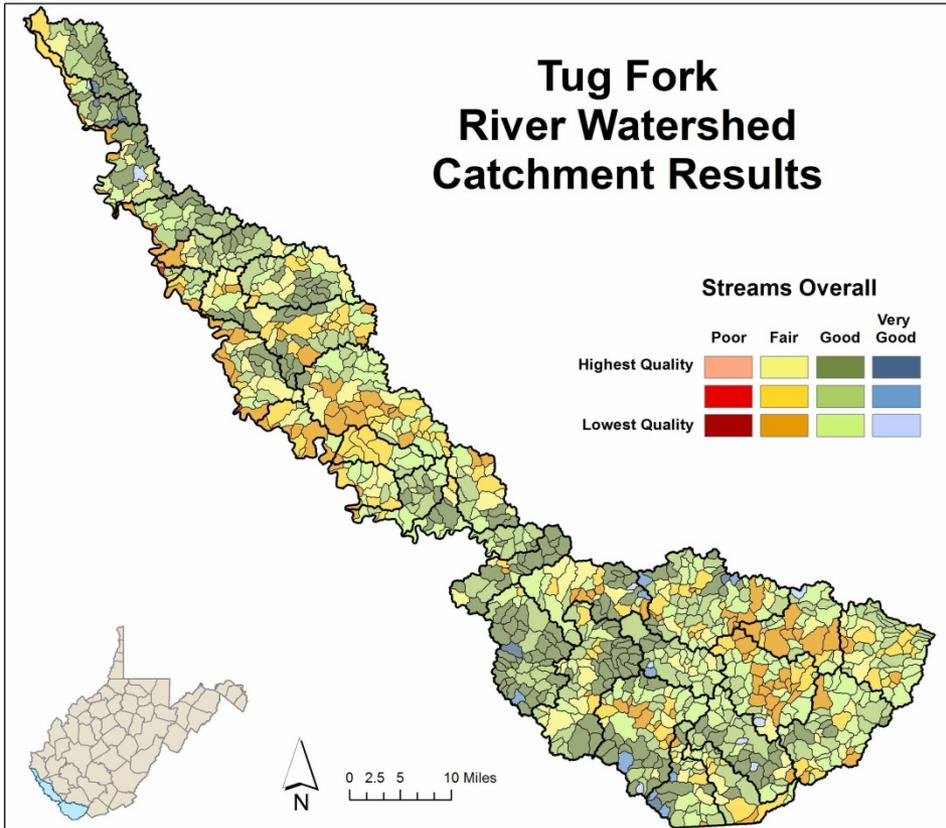
# Tug Fork River Watershed HUC12 Results

## Streams Overall



# Tug Fork River Watershed Catchment Results

## Streams Overall



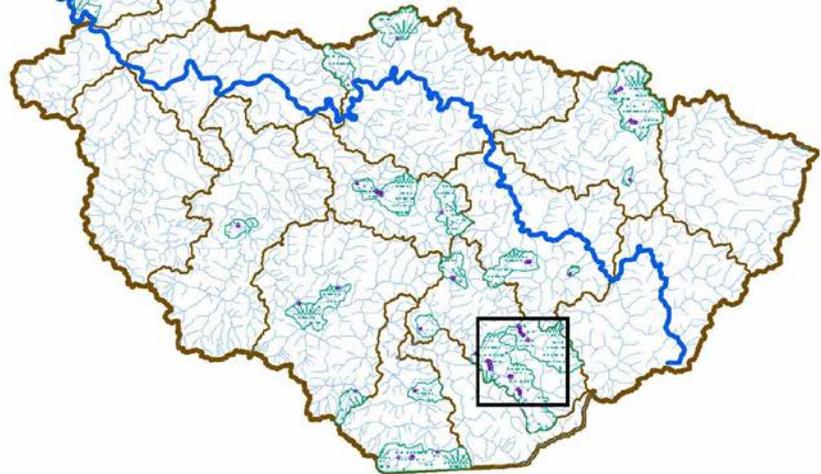
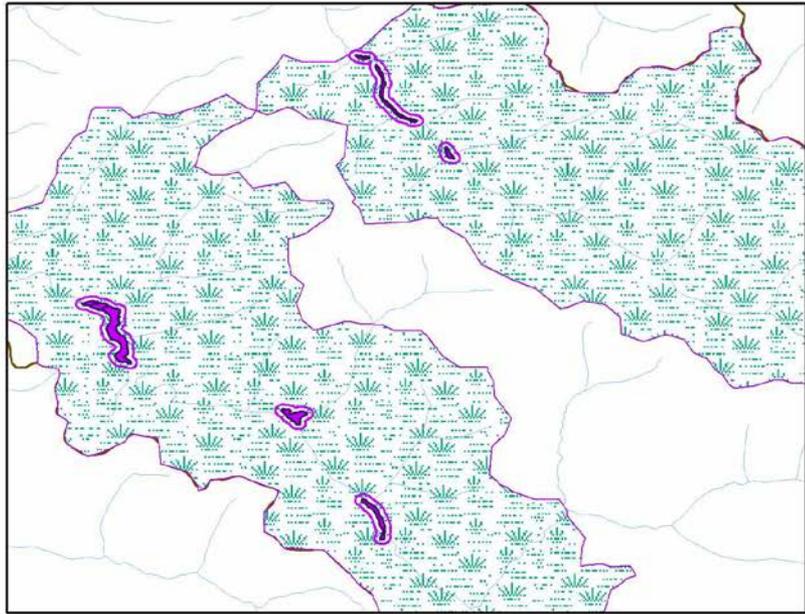
Streams  
Model  
Overall

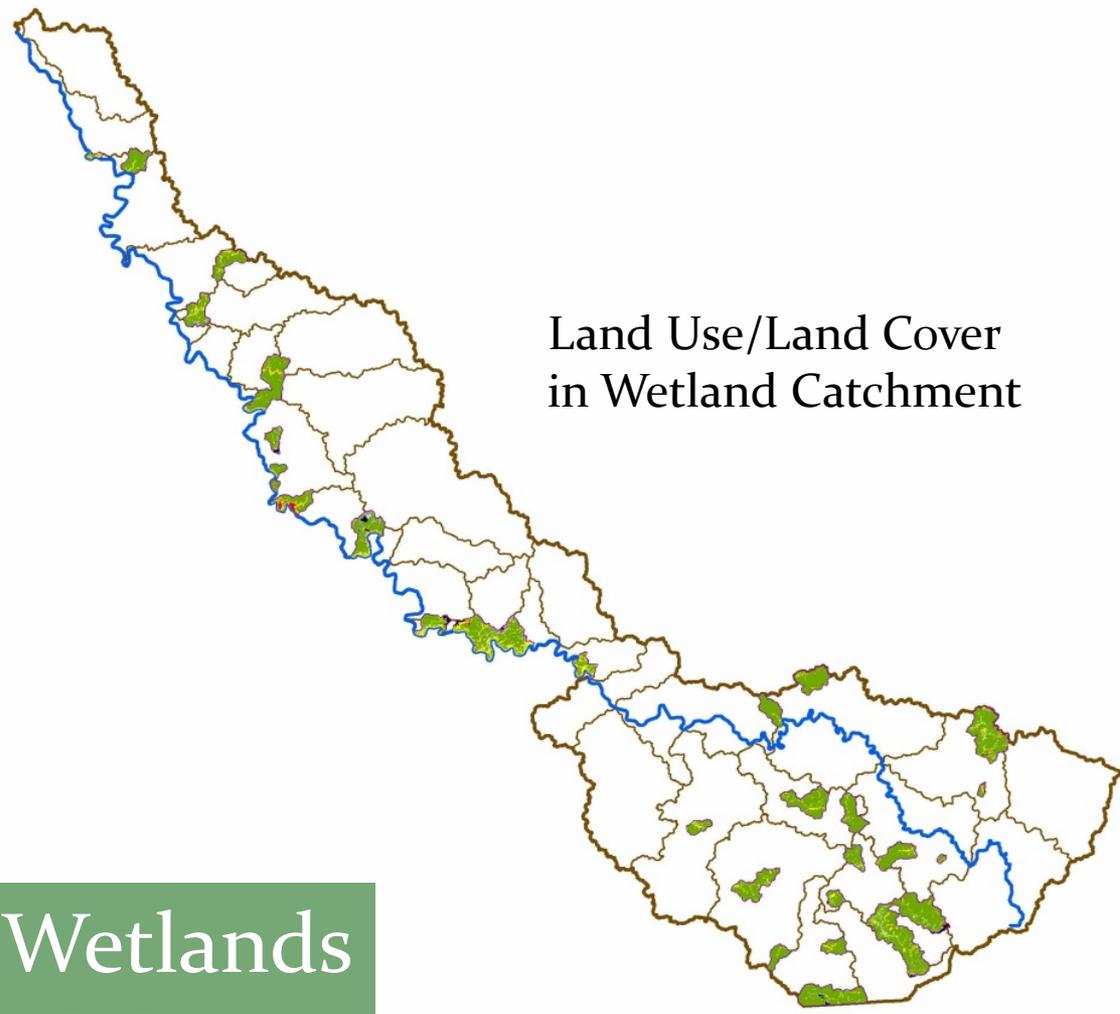
# Tug Fork Watershed: Wetlands



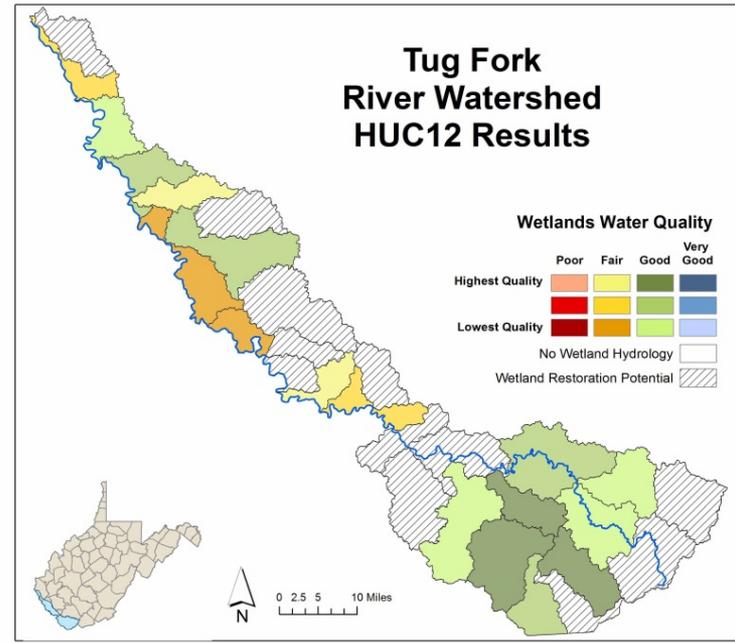
# Tug Fork Watershed: Wetlands

- NHD24k Streams
- Wetland Buffer (150 ft)
- NWI Wetlands
- ▨ Wetland Catchment
- HUC 12 Watersheds

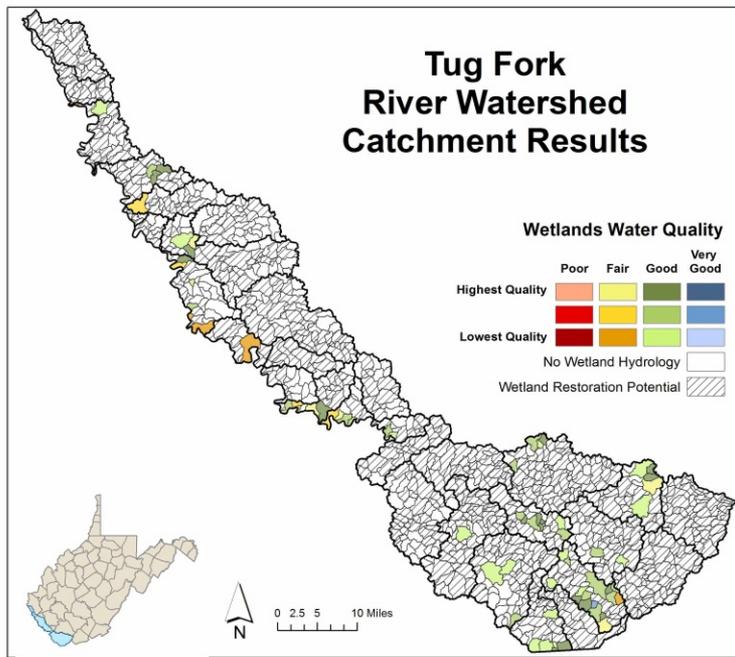




Land Use/Land Cover  
in Wetland Catchment



Tug Fork  
River Watershed  
HUC12 Results

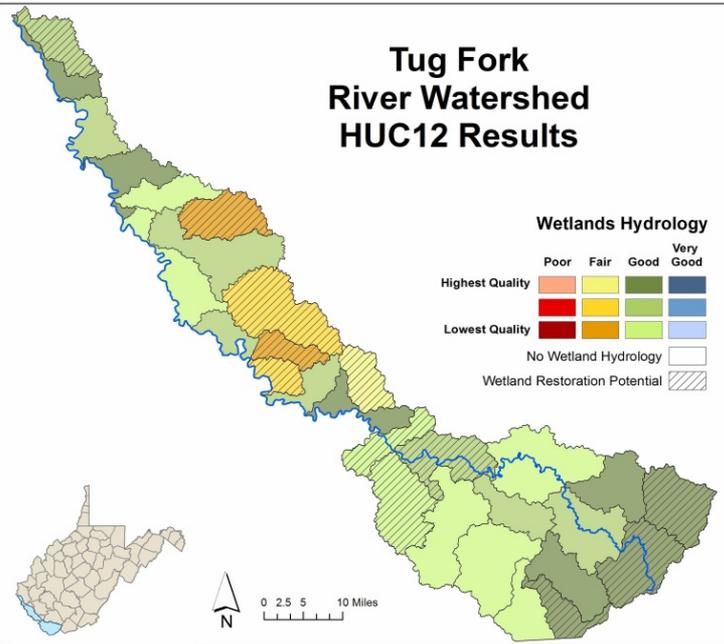


Tug Fork  
River Watershed  
Catchment Results

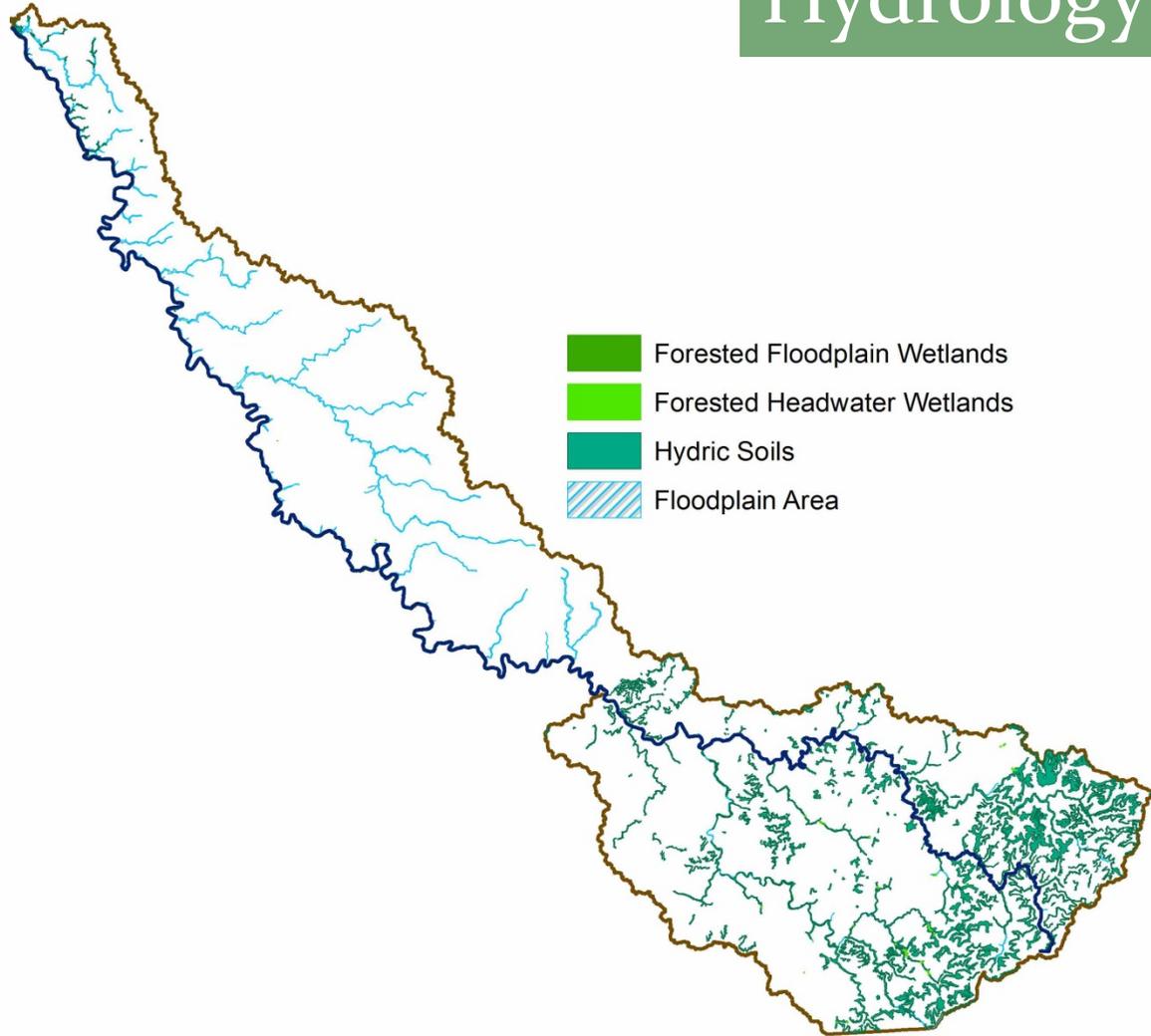
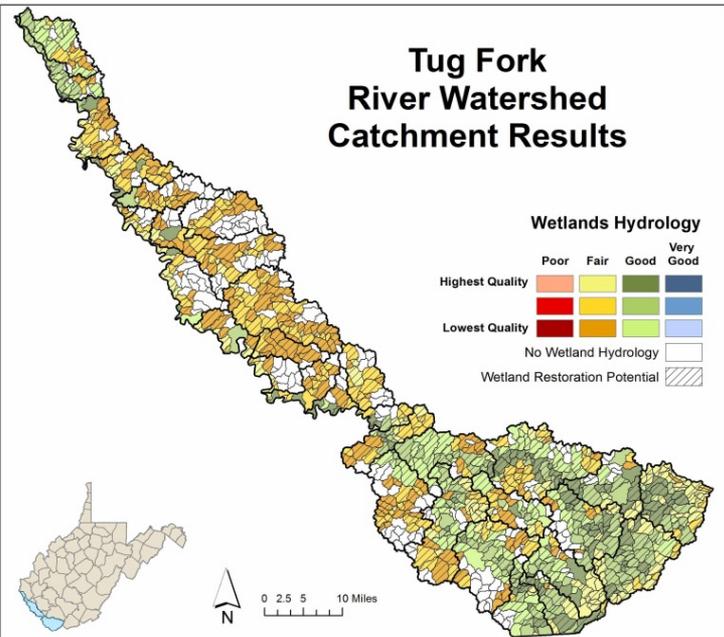
Wetlands  
Water  
Quality

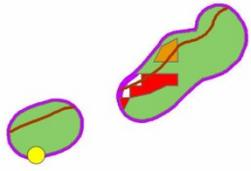
# Wetlands Hydrology

## Tug Fork River Watershed HUC12 Results

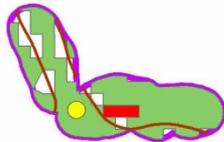


## Tug Fork River Watershed Catchment Results

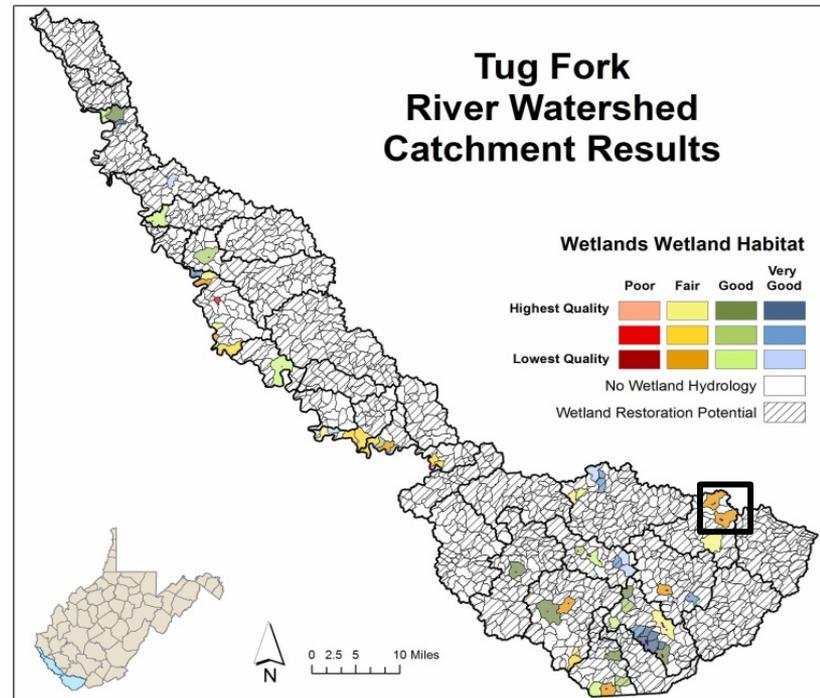
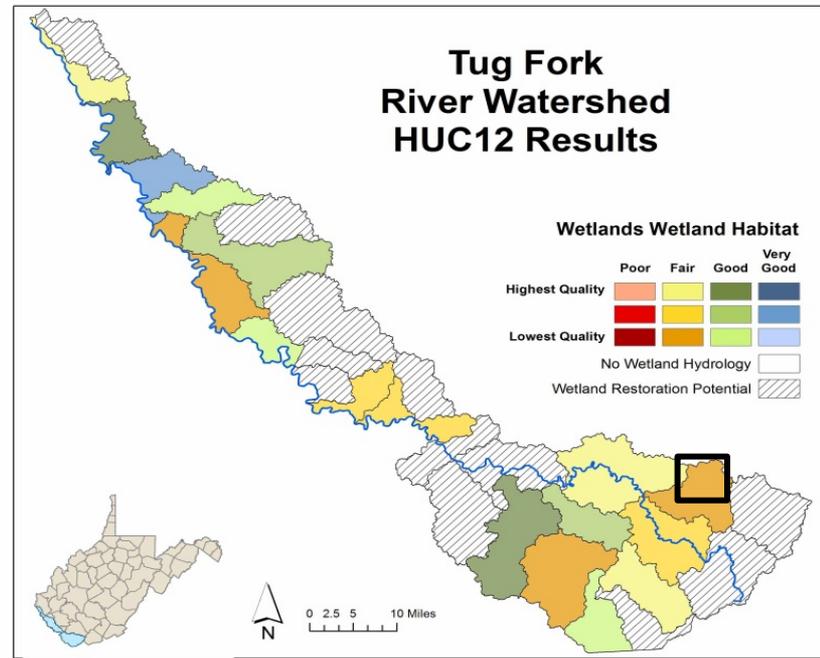




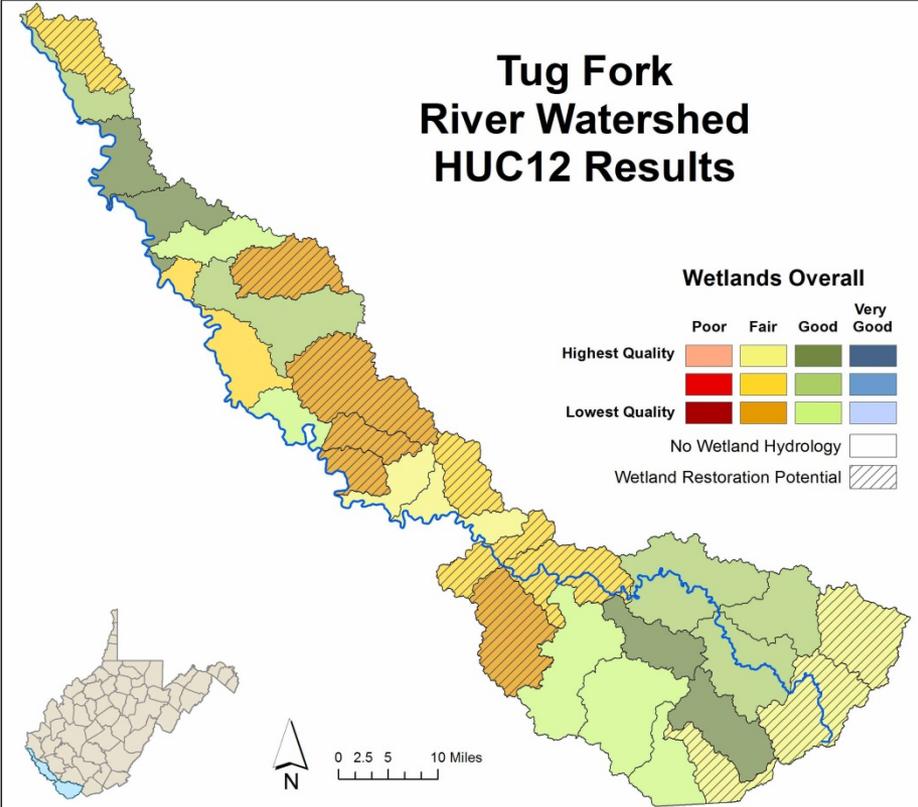
- Wells in Wetland Buffer
- Roads & Rail in Wetland Buffer
- Ag/Grazing in Wetland Buffer
- Development in Wetland Buffer
- Natural Cover in Wetland Buffer



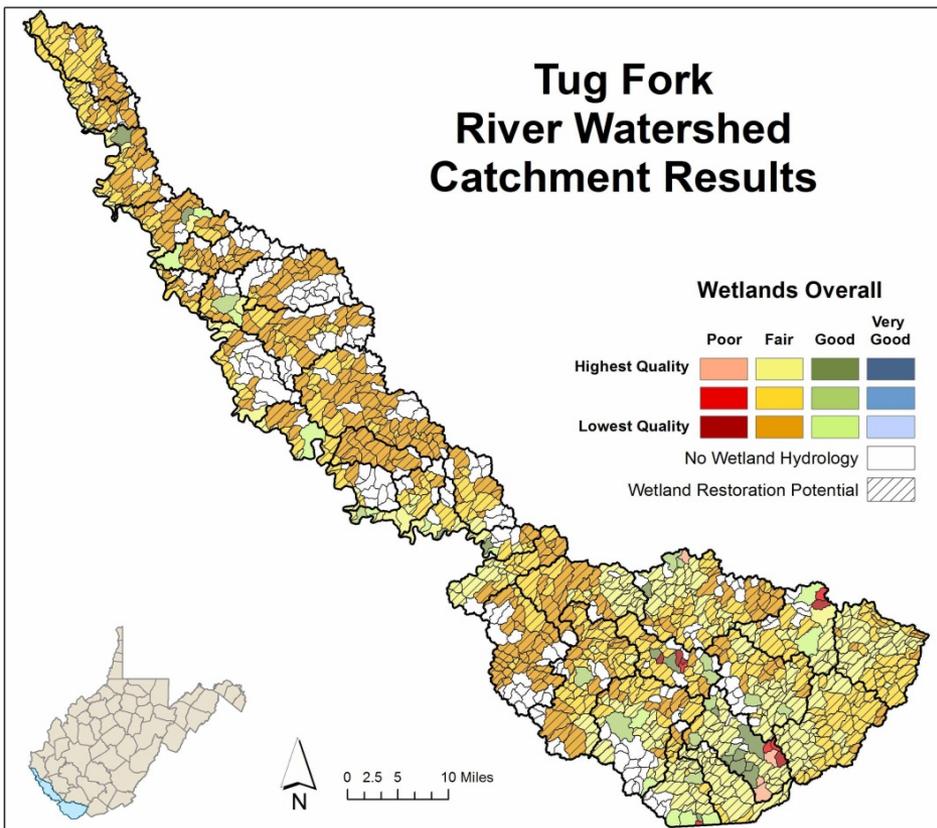
# Wetlands Wetland Habitat



# Tug Fork River Watershed HUC12 Results



# Tug Fork River Watershed Catchment Results

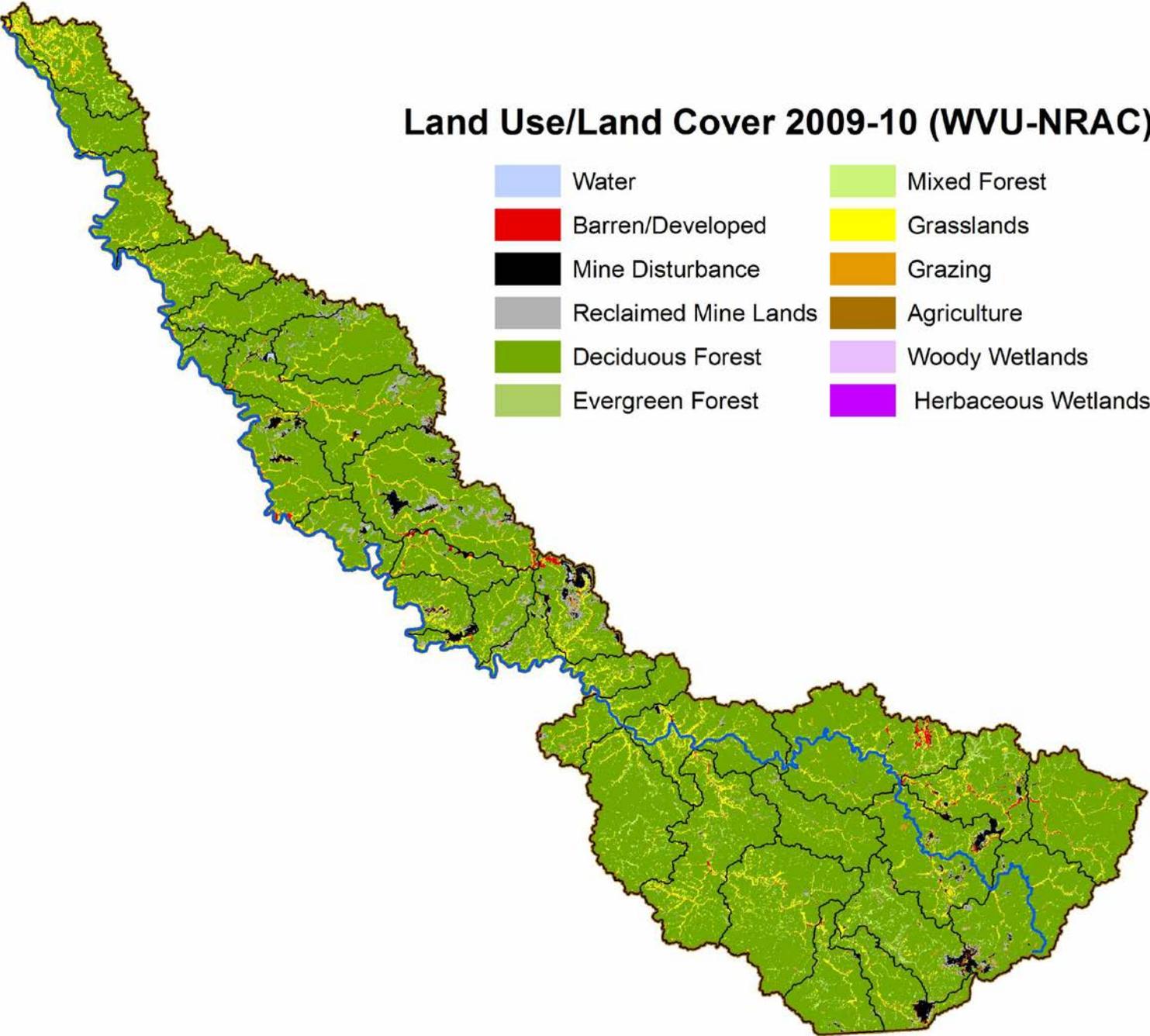


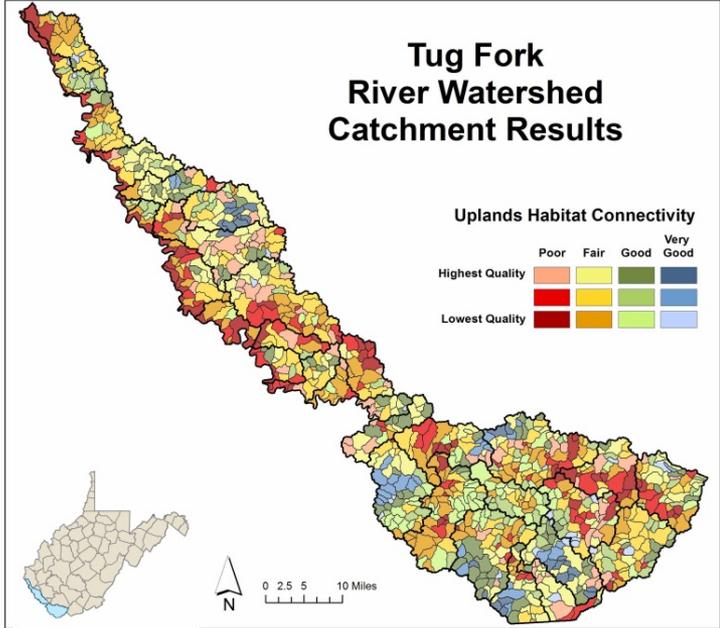
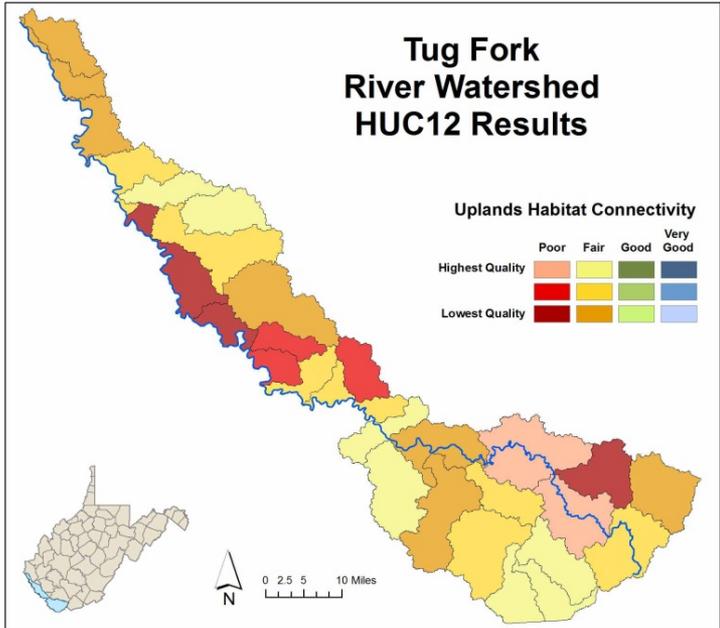
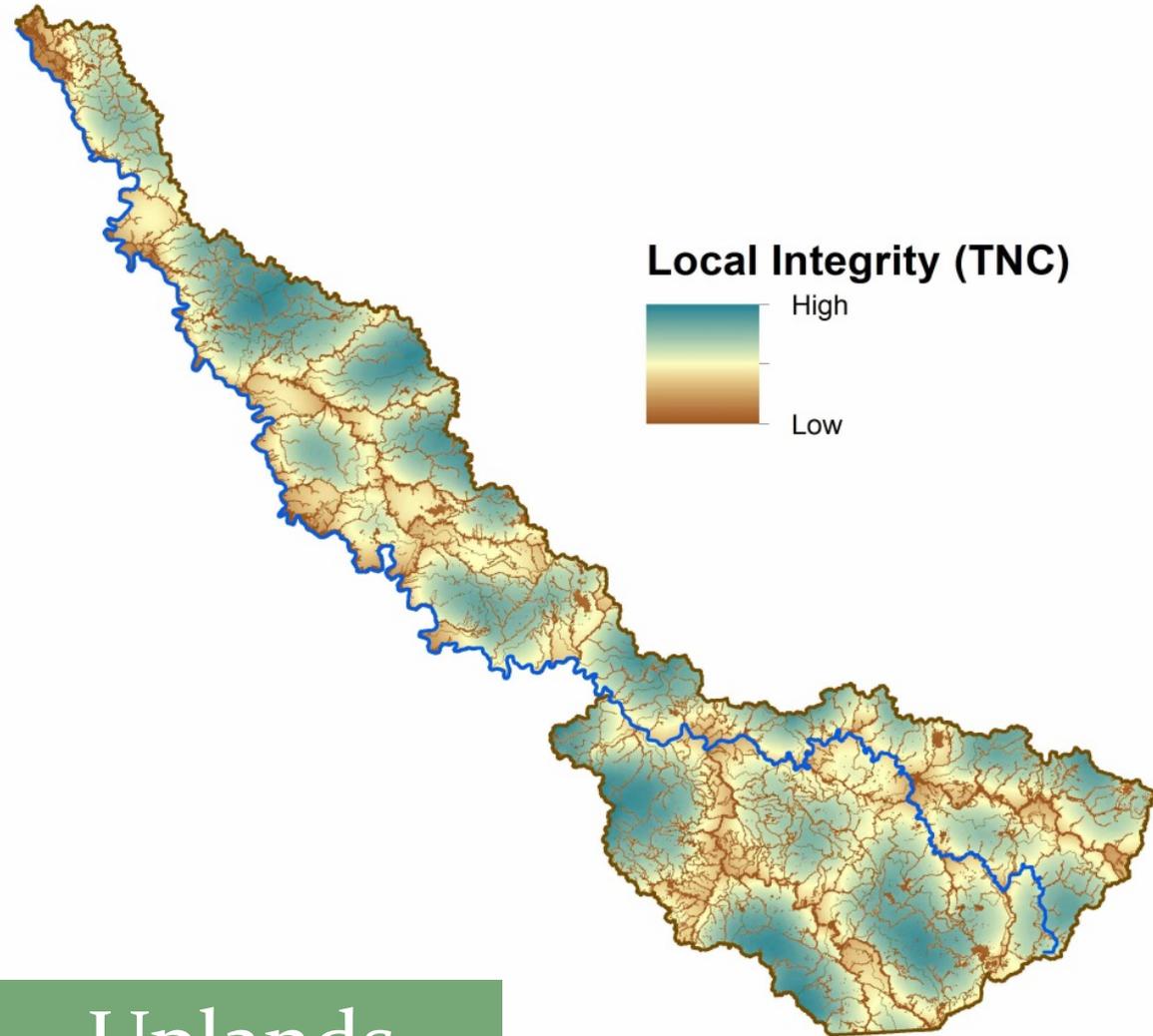
Wetlands Model Overall

# Tug Fork Watershed: Uplands

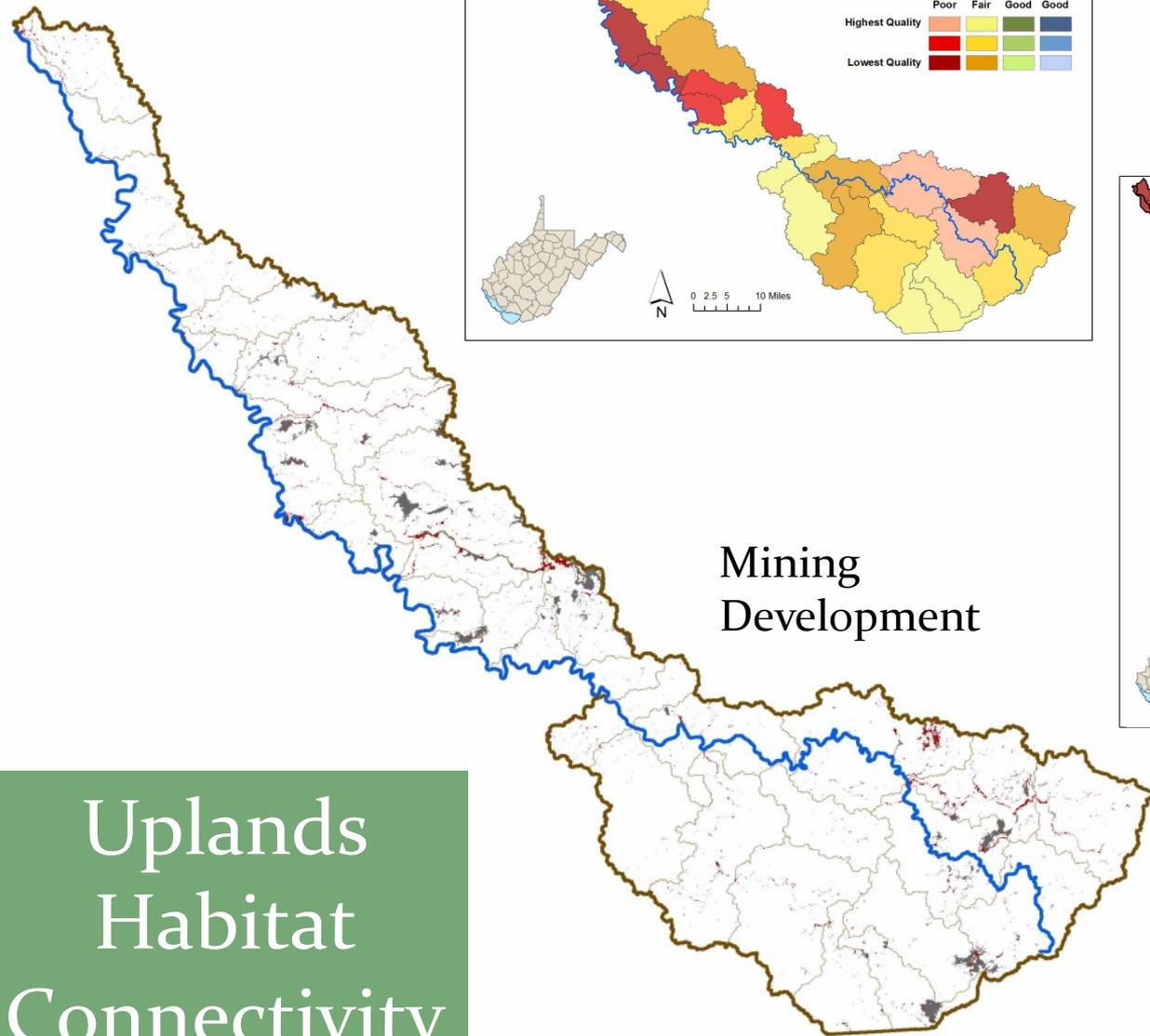


# Land Use/Land Cover 2009-10 (WVU-NRAC)

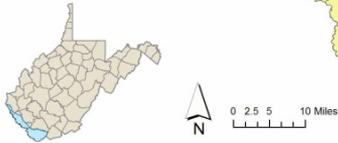




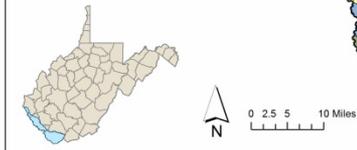
Uplands  
Habitat  
Connectivity



### Tug Fork River Watershed HUC12 Results

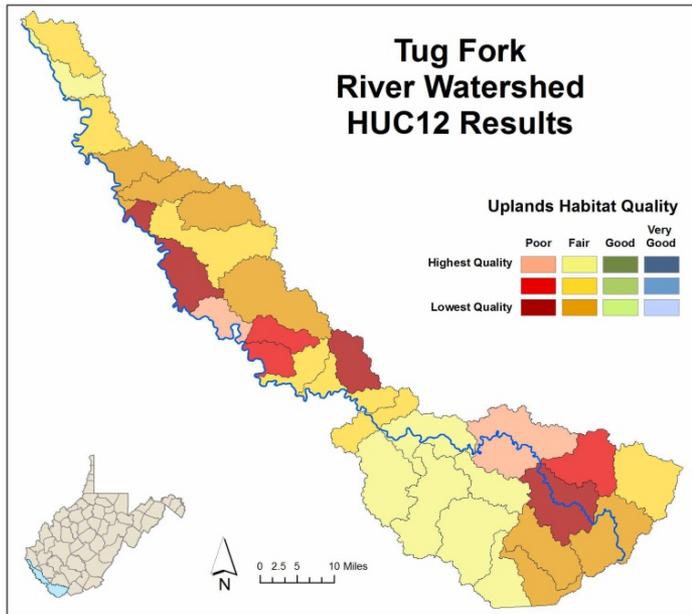


### Tug Fork River Watershed Catchment Results

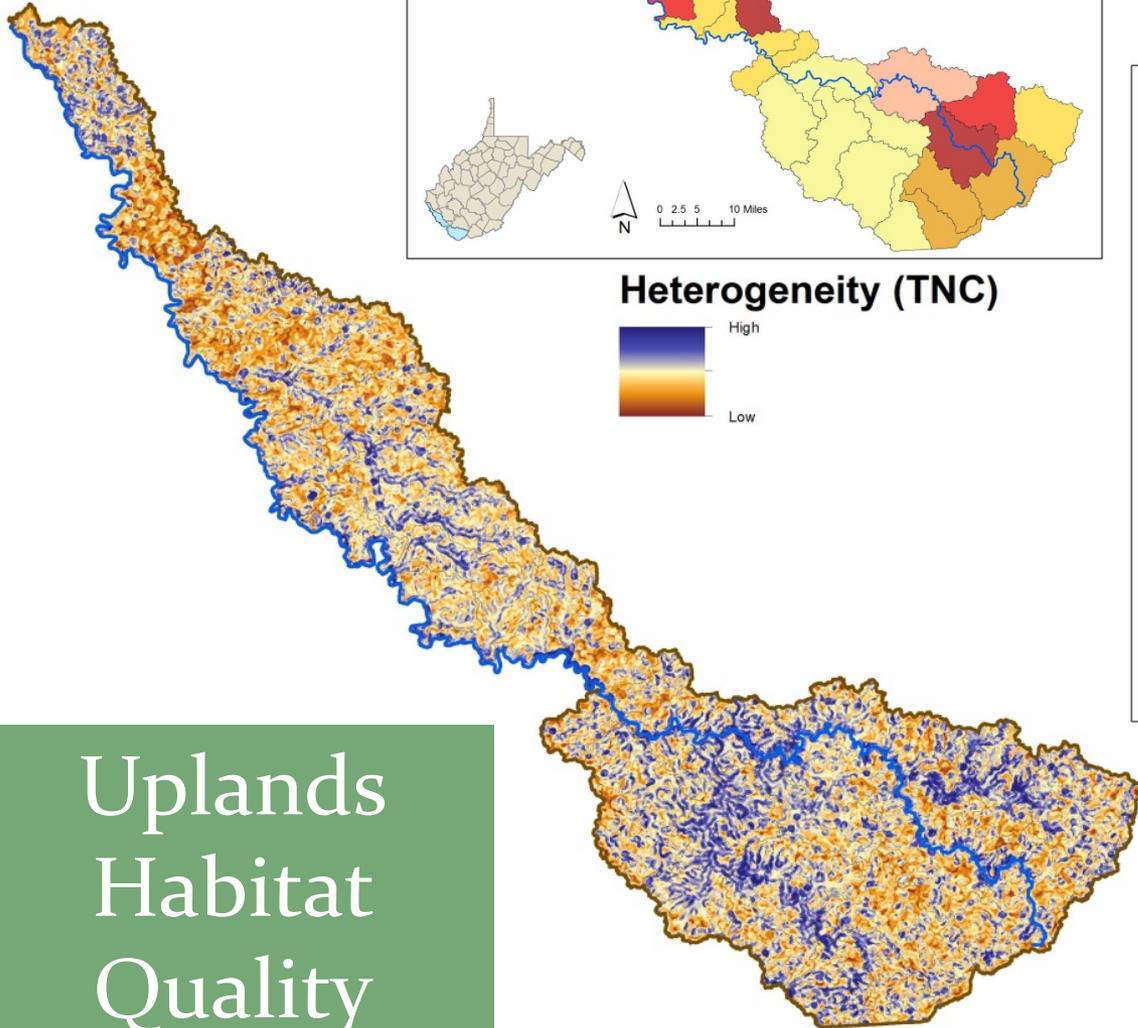


Uplands  
Habitat  
Connectivity

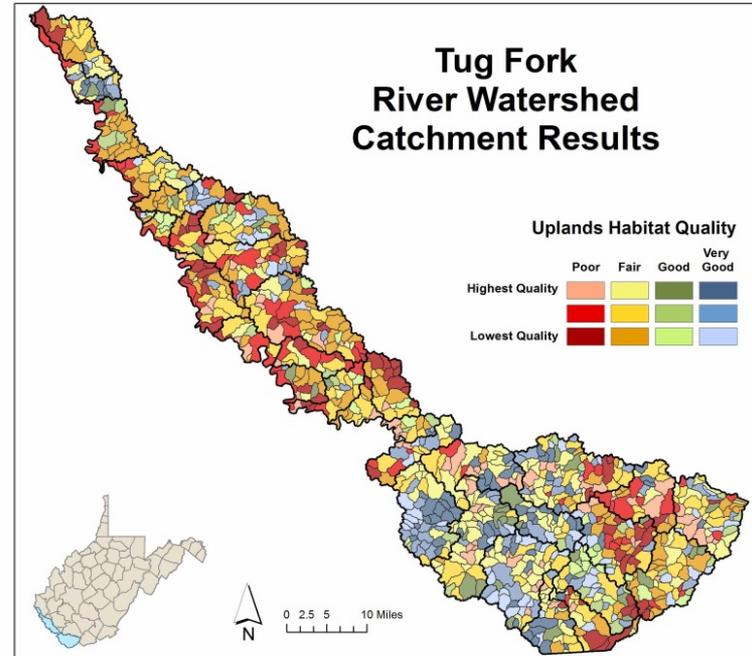
# Tug Fork River Watershed HUC12 Results



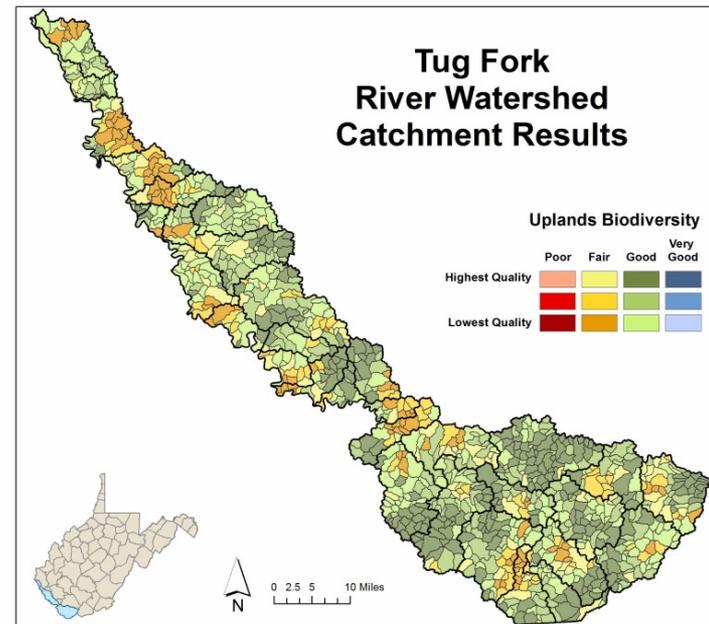
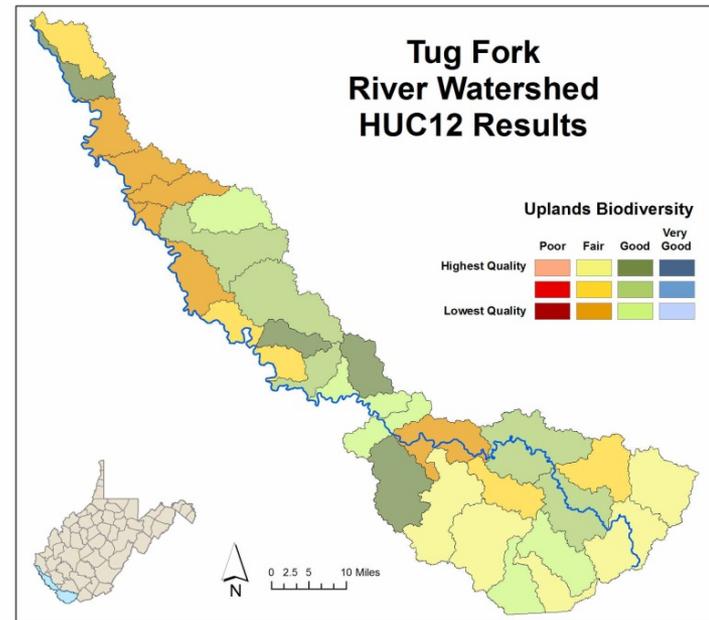
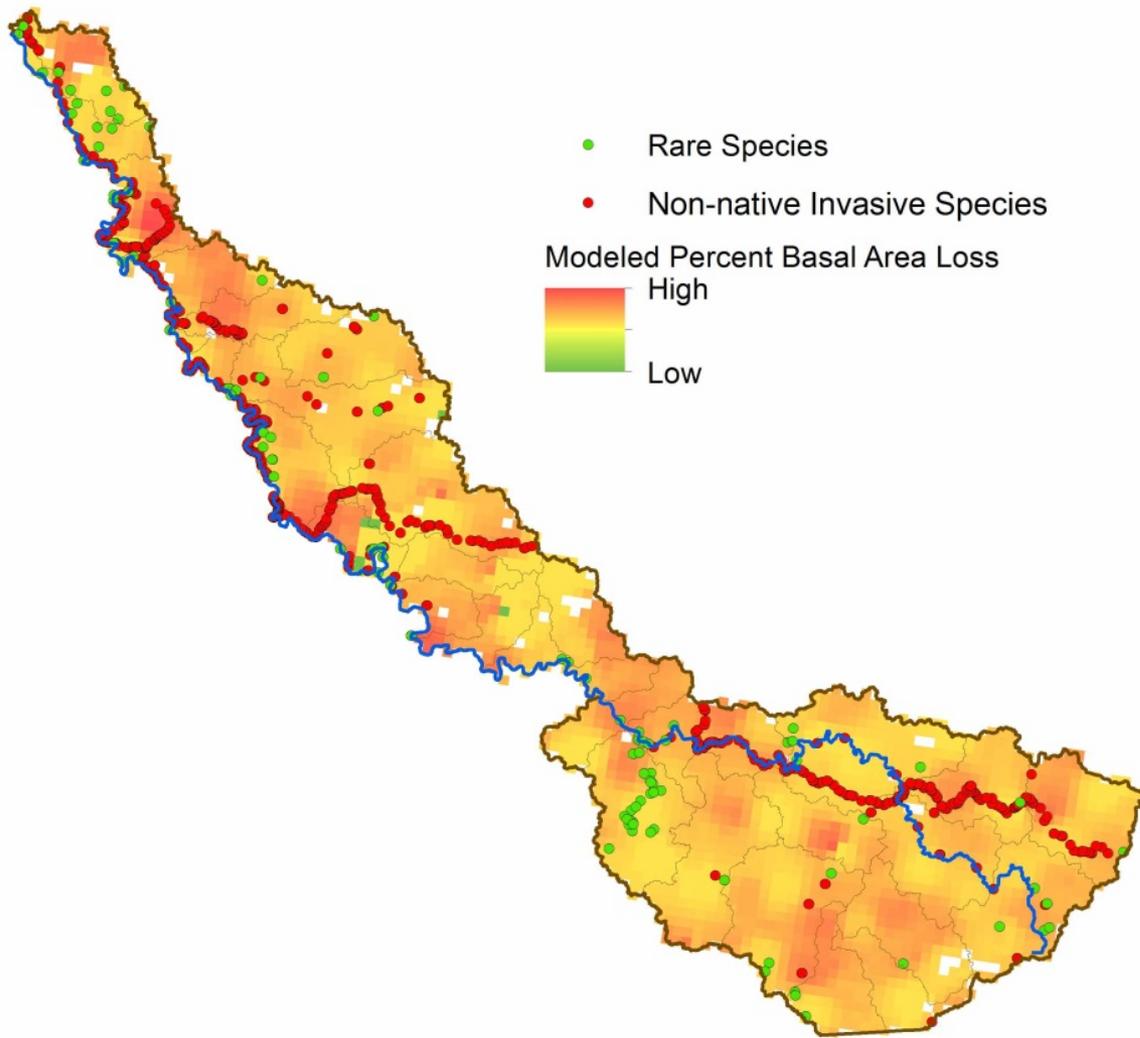
# Heterogeneity (TNC)



# Tug Fork River Watershed Catchment Results



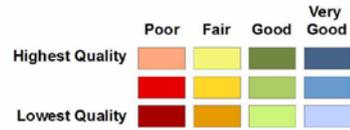
Uplands  
Habitat  
Quality



Uplands Biodiversity

# Tug Fork River Watershed HUC12 Results

## Uplands Overall



0 2.5 5 10 Miles

# Tug Fork River Watershed Catchment Results

## Uplands Overall



0 2.5 5 10 Miles

Uplands Model Overall

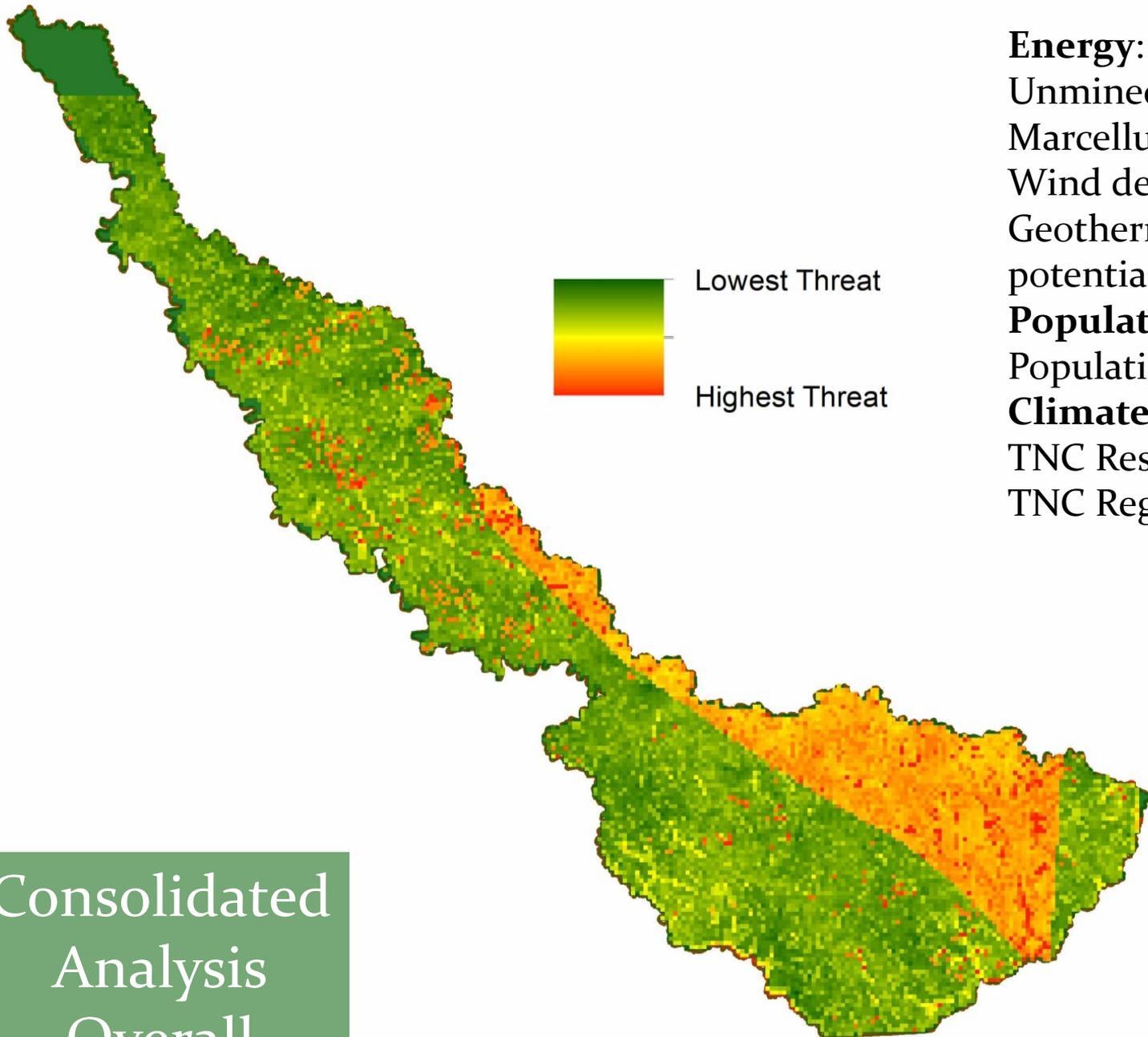


COMMENTS/QUESTIONS?

# Tug Fork Watershed: Consolidated Analysis



Tug Fork WMA © trailsrus.com



**Energy:**

- Unmined coal
- Marcellus shale thickness
- Wind development potential
- Geothermal development potential

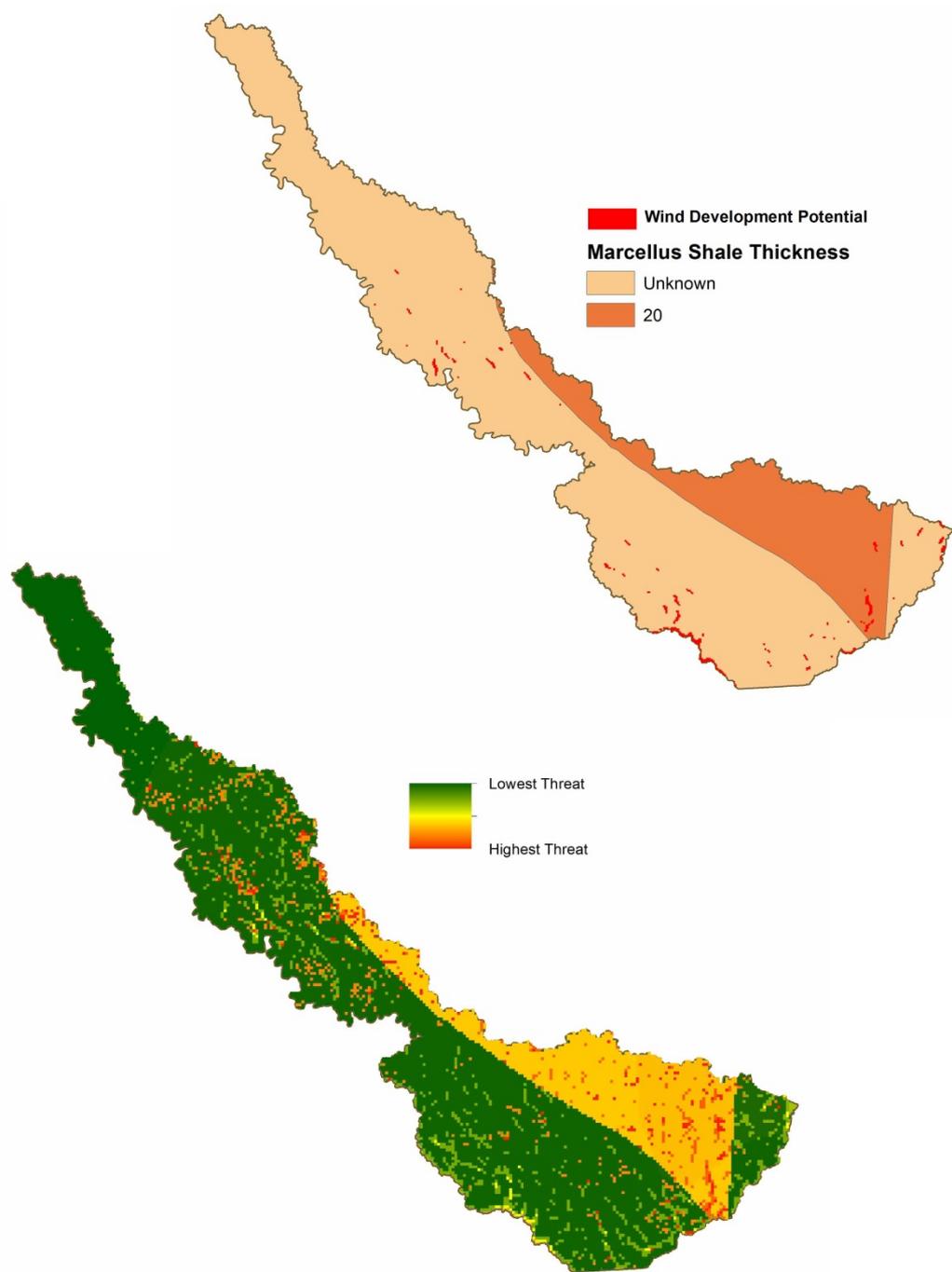
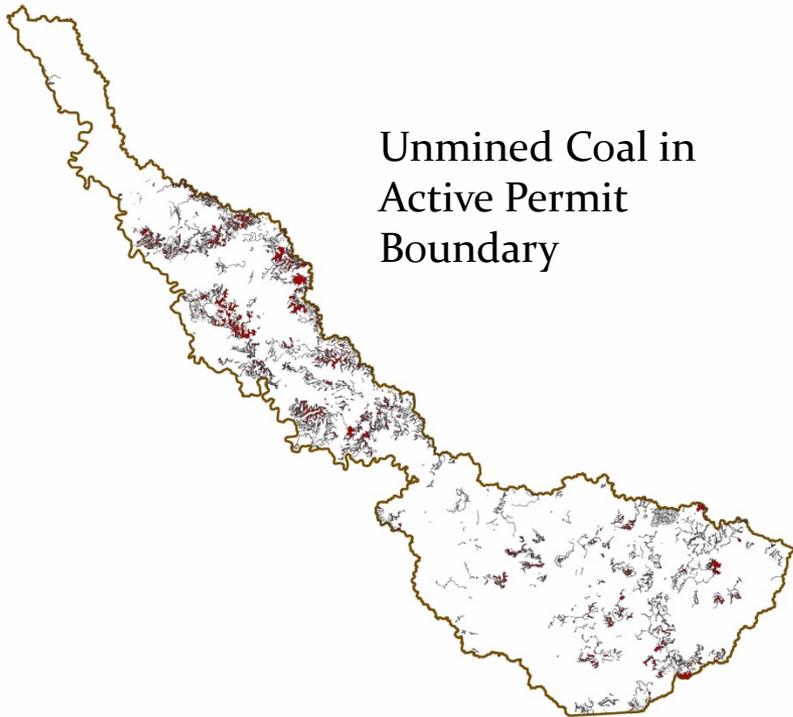
**Population/Development:**

- Population projections

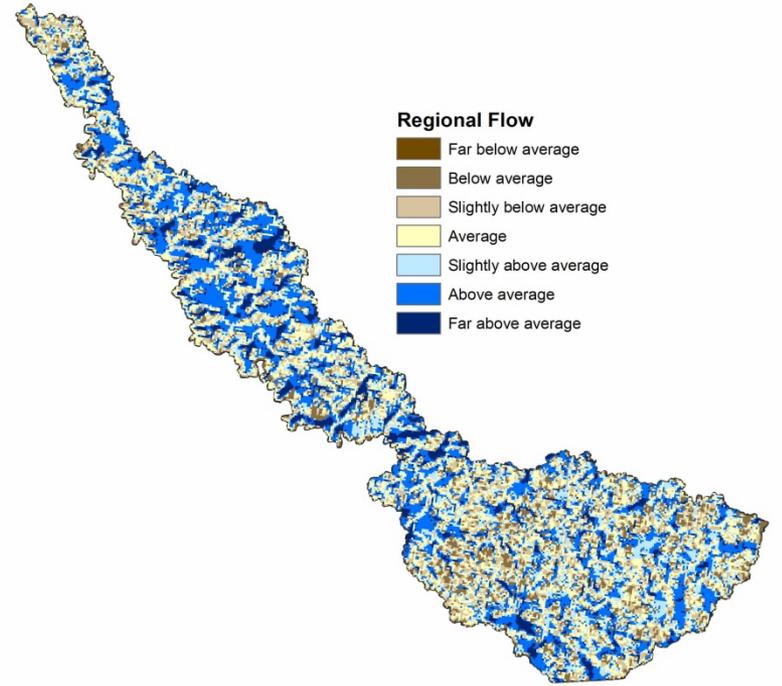
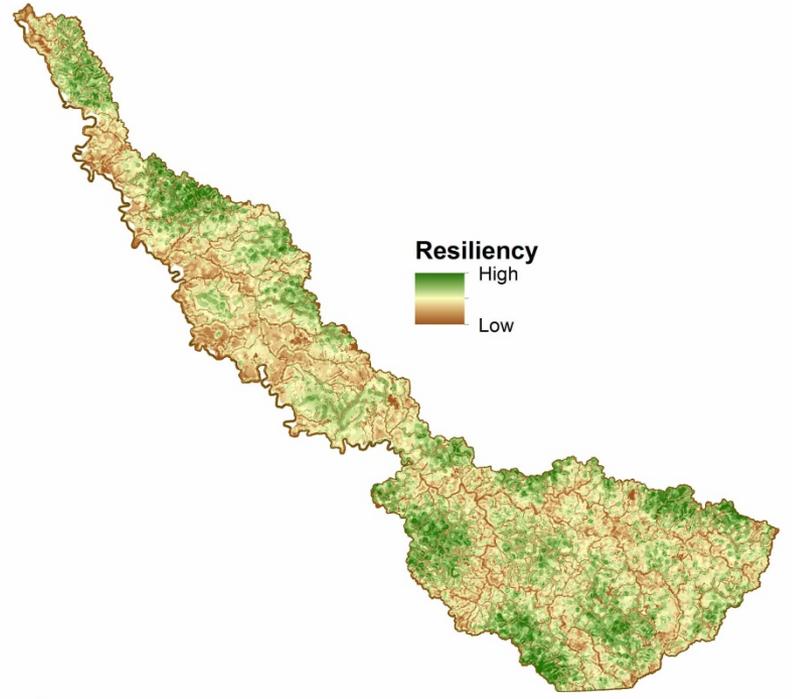
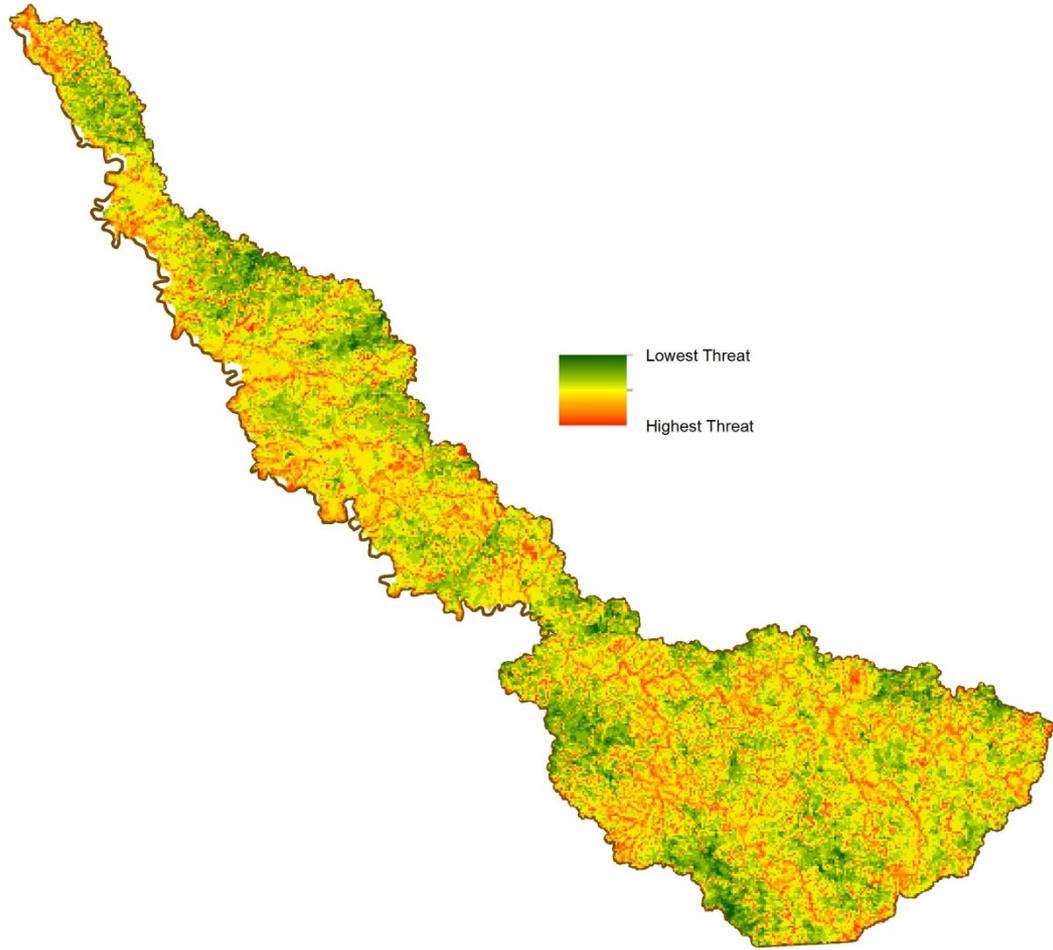
**Climate Change:**

- TNC Resiliency model
- TNC Regional Flow model

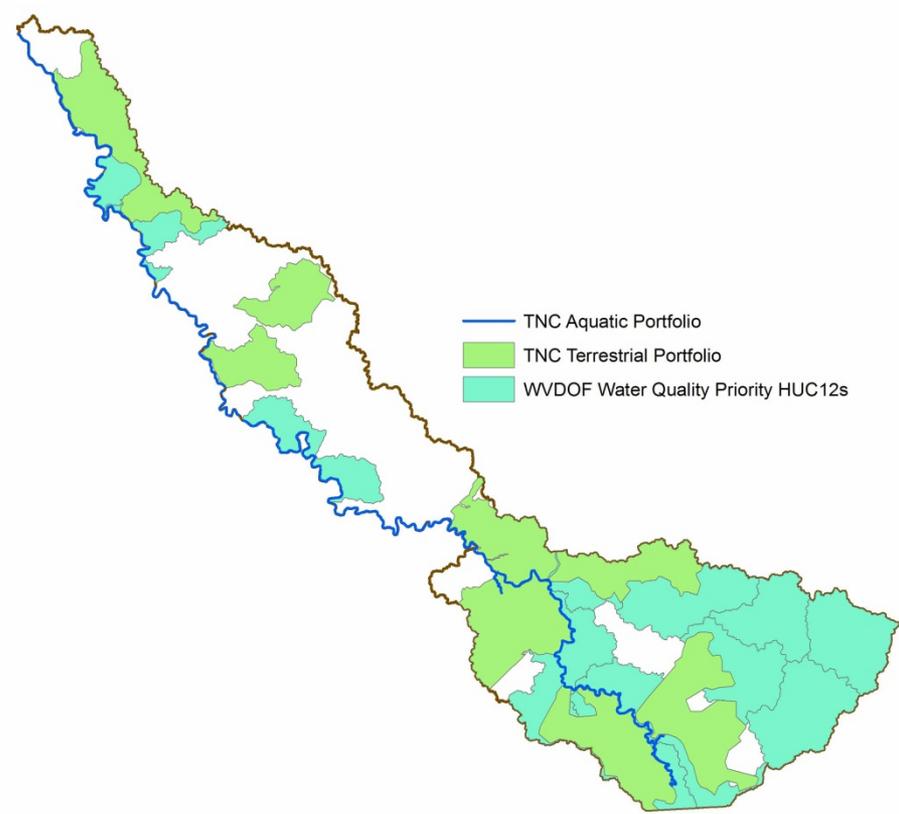
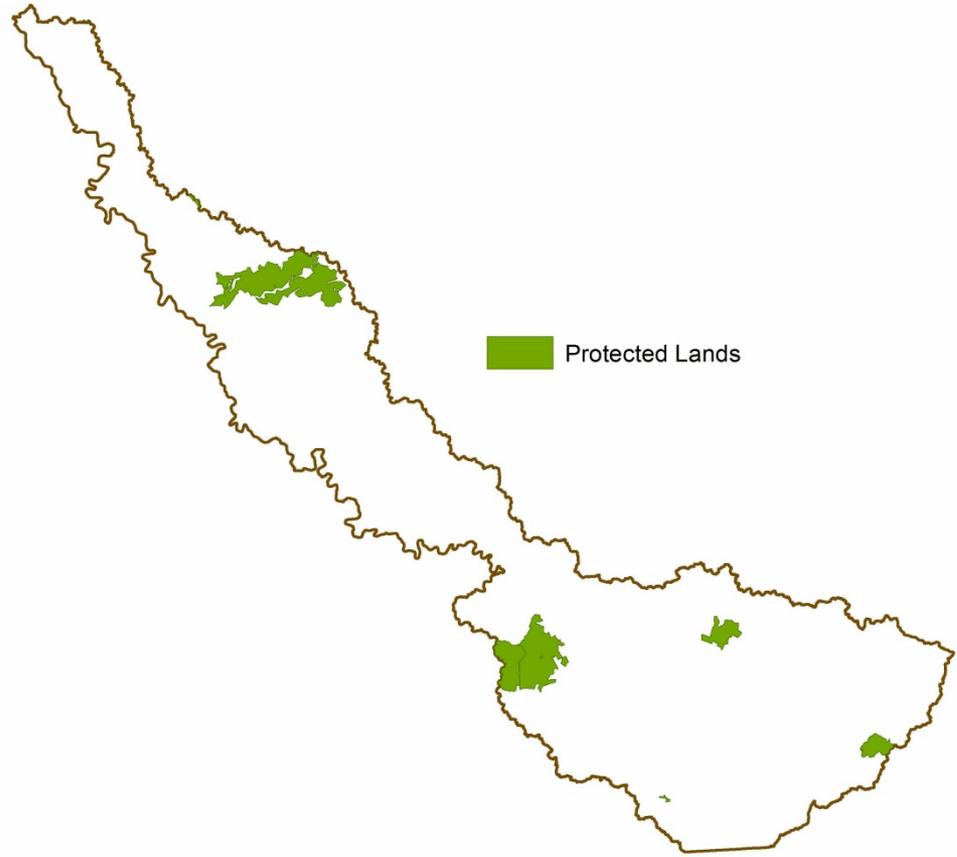
Consolidated  
Analysis  
Overall



Consolidated  
Analysis  
Energy



# Consolidated Analysis Climate Change



Consolidated  
Analysis  
Opportunities

# Web Map Tool Demo



# Web Map Base Layers

1. Aerial imagery
2. Hydrography
3. Political boundaries/street maps
4. Topographic maps
5. Elevation/Shaded relief

# West Virginia Watershed Assessment Pilot Project

Change Transparency Change Basemap

## Table of Contents - Hide

- Results
- Supporting Data
- ▶ Elk Results
- ▶ Monongahela Results

### West Virginia Watershed Assessment Pilot Project

Welcome to the West Virginia Watershed Assessment Pilot Project (WWWAPP) interactive web map, designed to help decision-makers and stakeholders prioritize watershed areas for protection and restoration activities.

Detailed information about the methodology and analysis that produced the watershed assessment results can be found [at this link](#).

Funding for the project was provided by the US Environmental Protection Agency (USEPA) and the West Virginia Department of Environmental Protection (WVDEP).

Data provided in the web map and/or incorporated into the analysis came from a variety of national and state sources. The Nature Conservancy (TNC) does not warrant or guarantee the accuracy of the data or the resulting analysis on this website. Changes may have occurred since the data layers were initially compiled and published. TNC and any additional data providers shall not be held liable for improper or incorrect use of the data contained herein. The web map presents the results of a GIS analysis and is intended solely as a prioritization and information-gathering tool, and should not replace field verification and site visits.

By clicking on I AGREE, I certify that I have read and will conform to the data access and use constraints as described above.

I Agree



Legend - Hide

- Very Good (dark blue)
- Good (green)
- Fair (yellow)
- Poor (red)

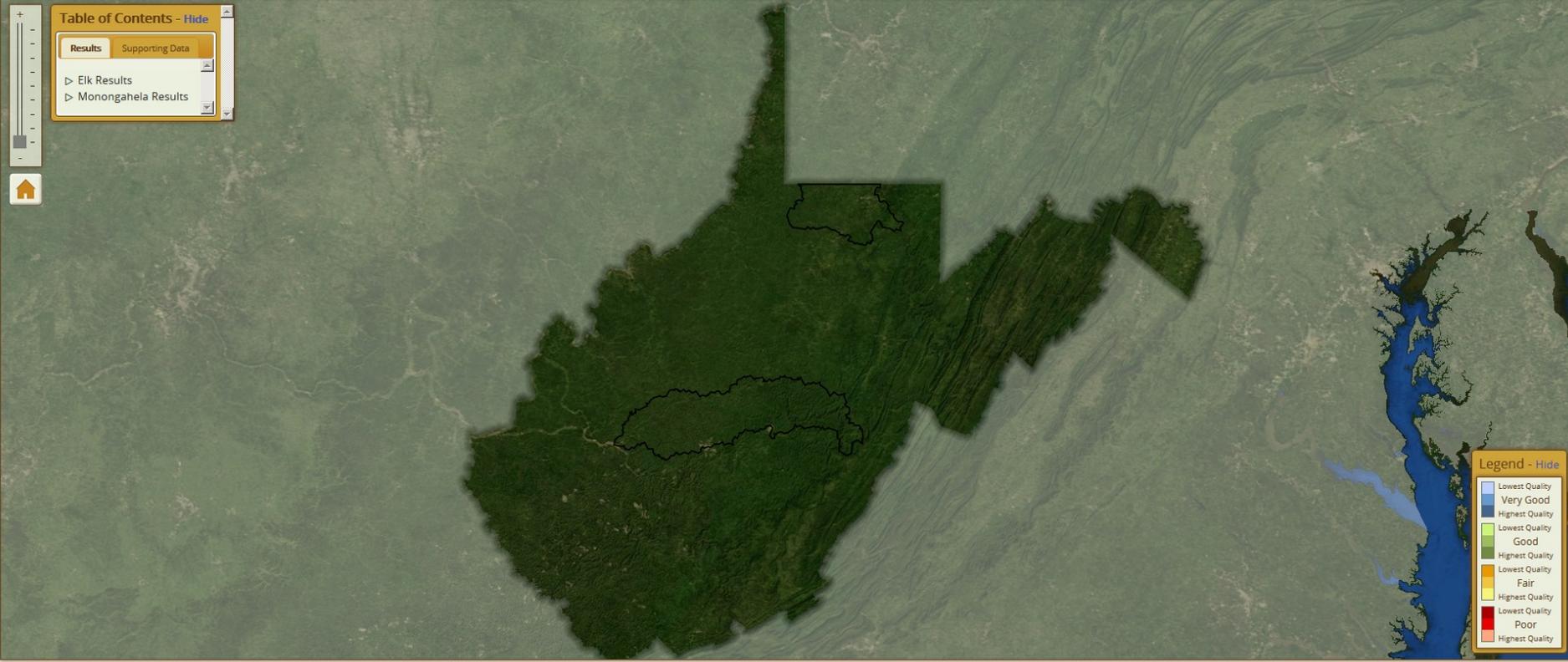
Lowest Quality Highest Quality

# West Virginia Watershed Assessment Pilot Project

Change Transparency Change Basemap

Table of Contents - Hide

Results	Supporting Data
▶ Elk Results	
▶ Monongahela Results	



Legend - Hide

Lowest Quality	Very Good
Highest Quality	Highest Quality
Lowest Quality	Good
Highest Quality	Highest Quality
Lowest Quality	Fair
Highest Quality	Lowest Quality
Poor	Poor
Highest Quality	Highest Quality

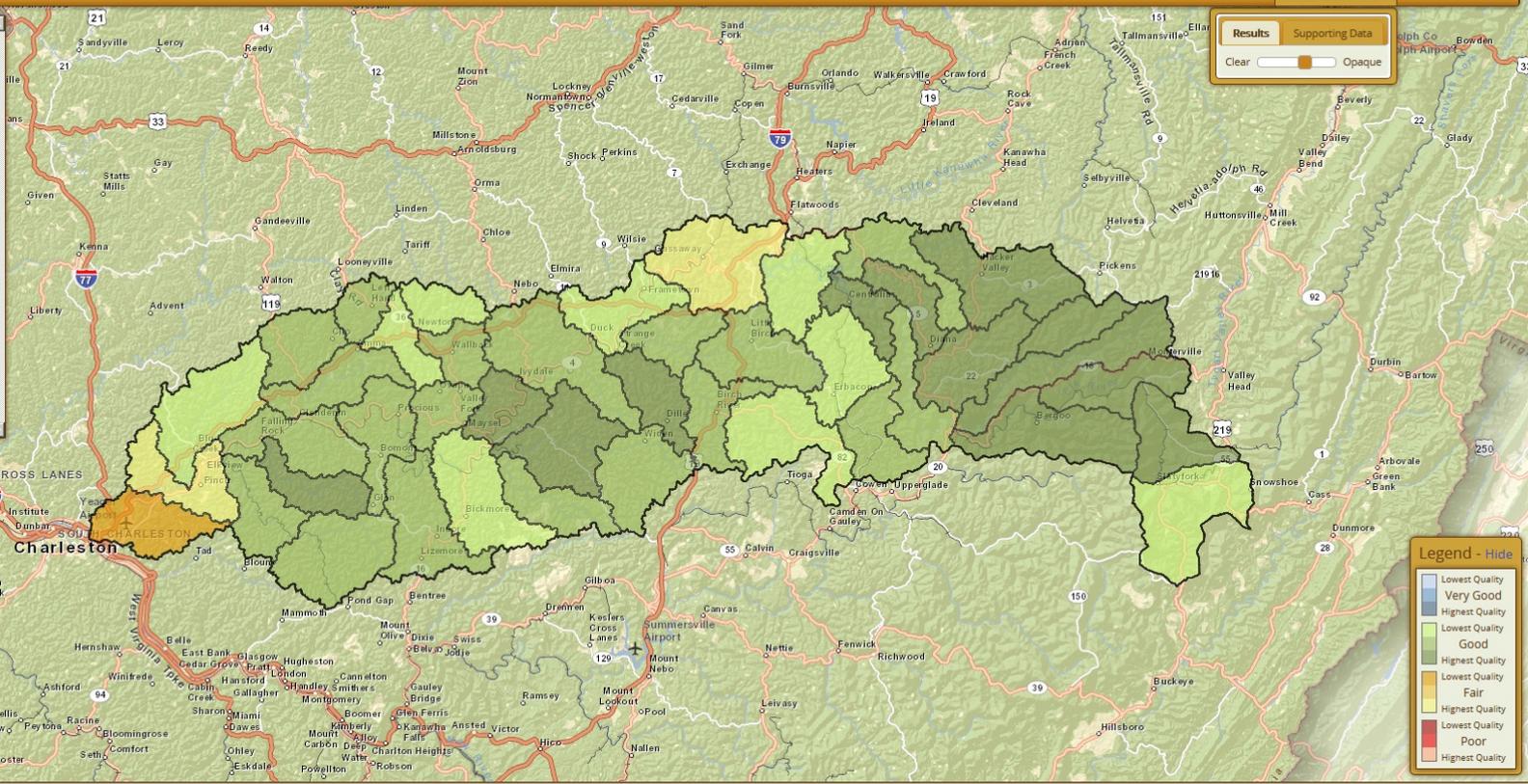
# West Virginia Watershed Assessment Pilot Project

Change Transparency Change Basemap

Table of Contents - Hide

- Results Supporting Data
- Elk Results
- HUC12 Level
  - HUC12s Zoom
- Streams
  - Overall Zoom
- Water Quality
- Water Quantity
- Hydrologic Connectivity
- Biodiversity
- Riparian Habitat
- Wetlands
- Uplands
- Catchment Level
- Monongahela Results

Results Supporting Data  
Clear [Slider] Opaque



Legend - Hide

- Lowest Quality
- Very Good
- Highest Quality
- Lowest Quality
- Good
- Highest Quality
- Fair
- Highest Quality
- Lowest Quality
- Poor
- Highest Quality

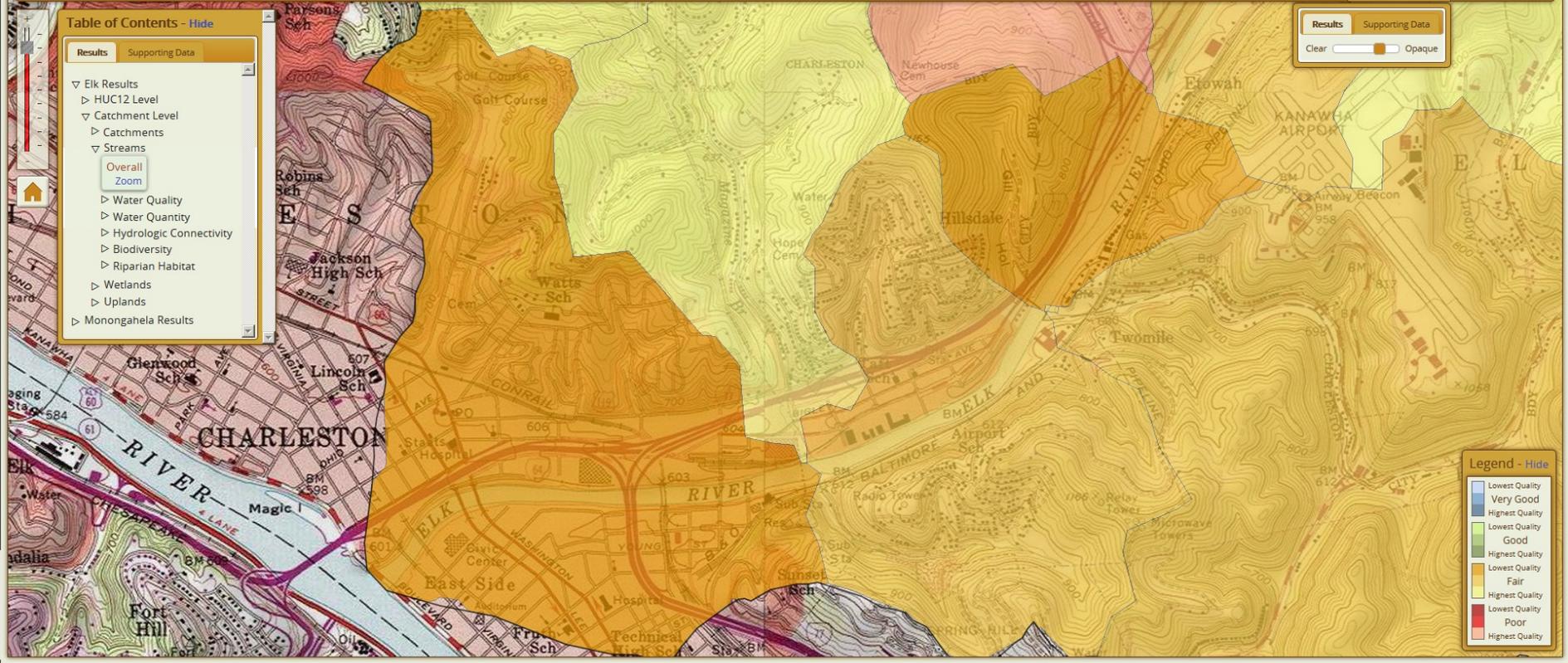
# West Virginia Watershed Assessment Pilot Project

Change Transparency Change Basemap

Table of Contents - Hide

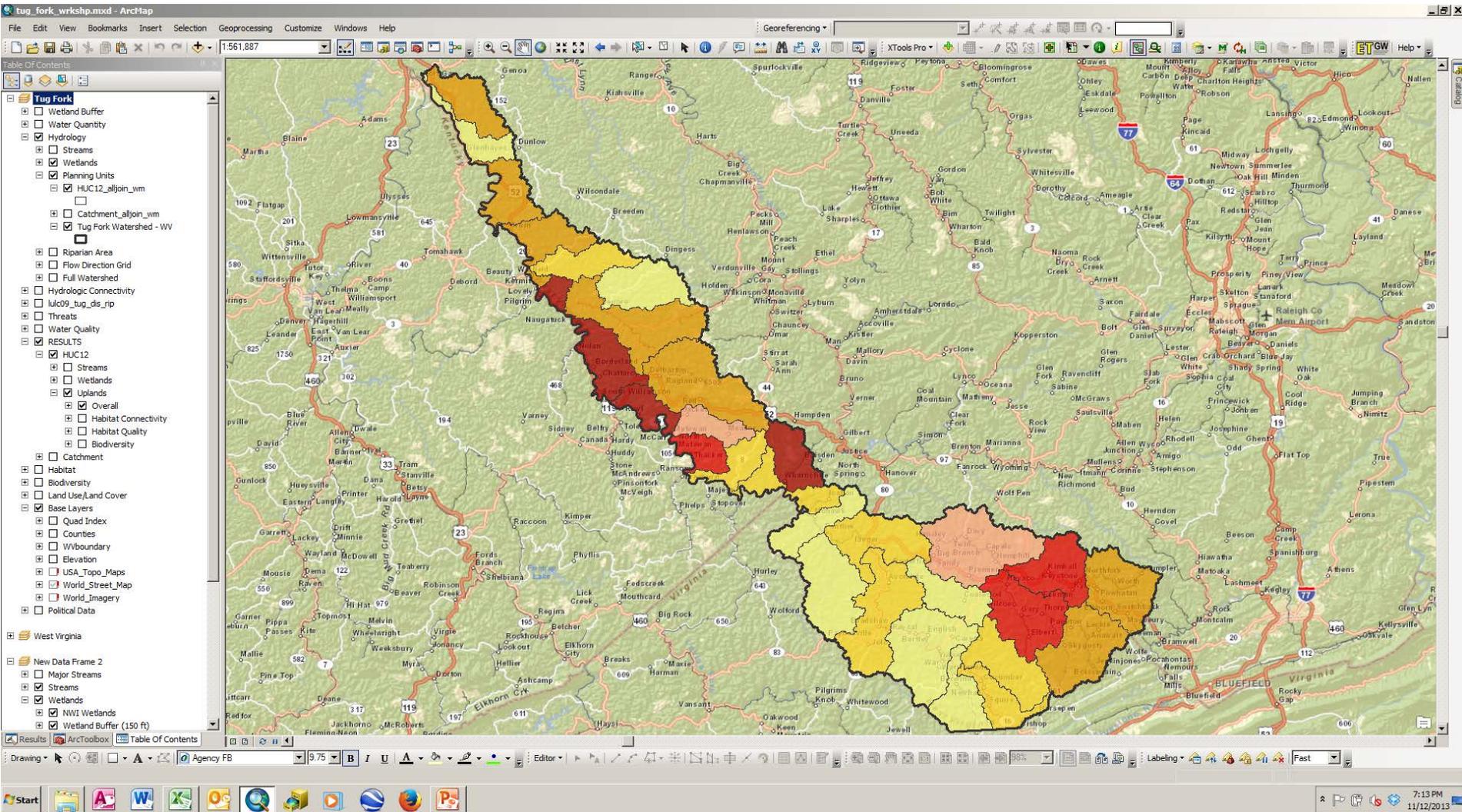
- Results
- Supporting Data
- Elk Results
  - HUC12 Level
  - Catchment Level
    - Catchments
    - Streams
  - Overall
    - Zoom
    - Water Quality
    - Water Quantity
    - Hydrologic Connectivity
    - Biodiversity
    - Riparian Habitat
    - Wetlands
    - Uplands
    - Monongahela Results

Results Supporting Data  
Clear   Opaque

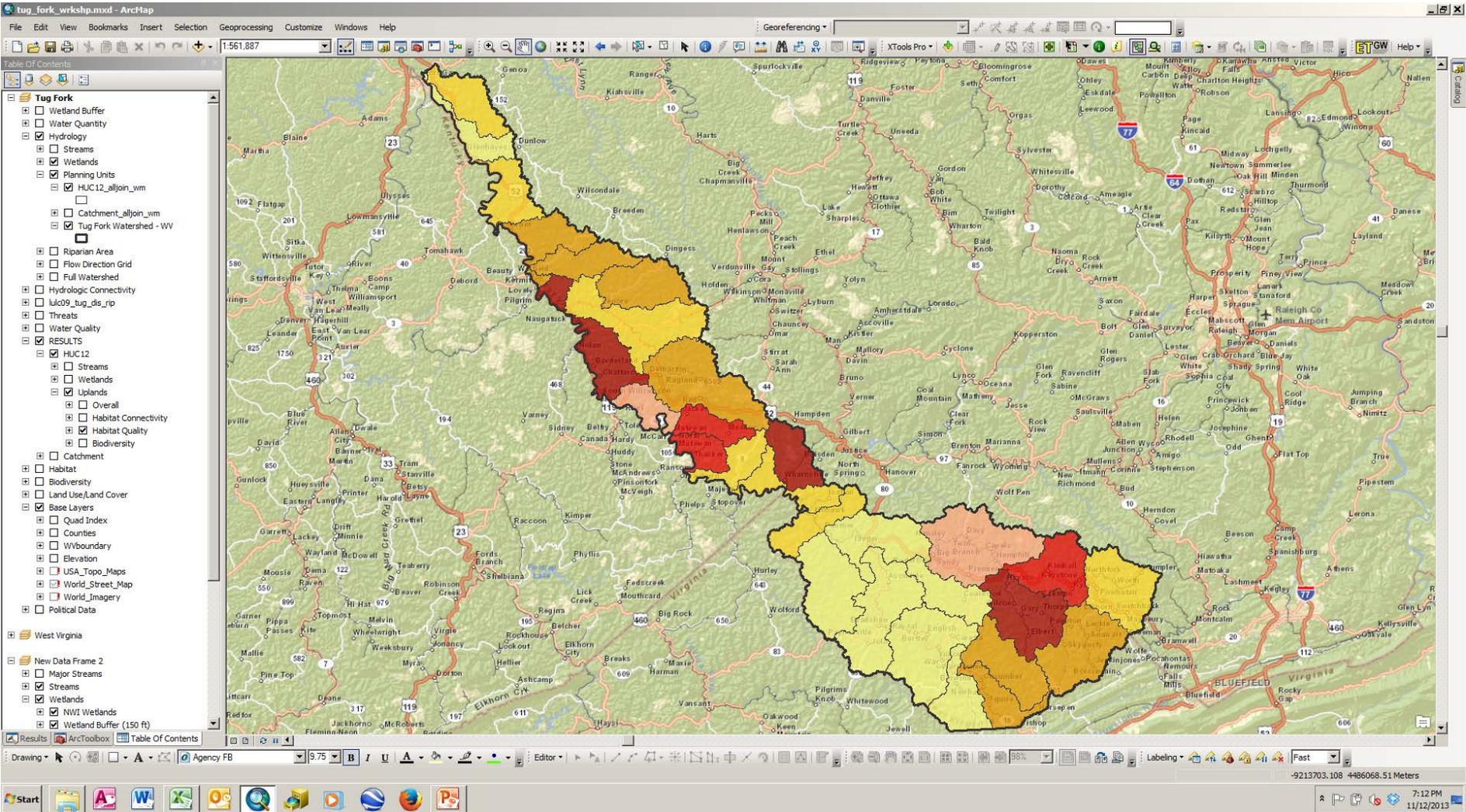


# Potential Use Scenario

Tug Fork River Watershed  
Uplands Restoration



Tug Fork – HUC12 Level Uplands Overall Results



Tug Fork – HUC12 Level  
Uplands Habitat Quality Results

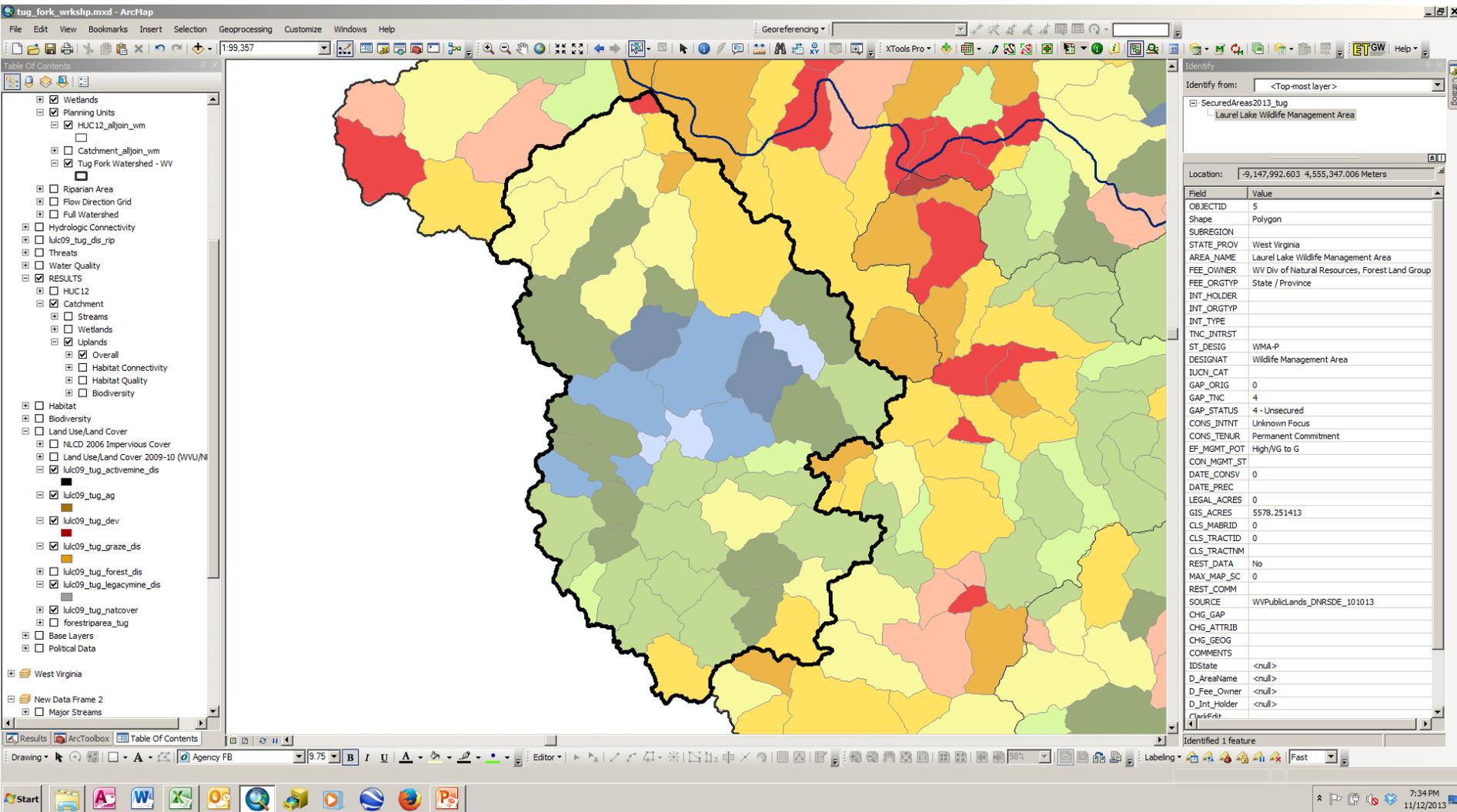


The screenshot shows the ArcMap interface with the following components:

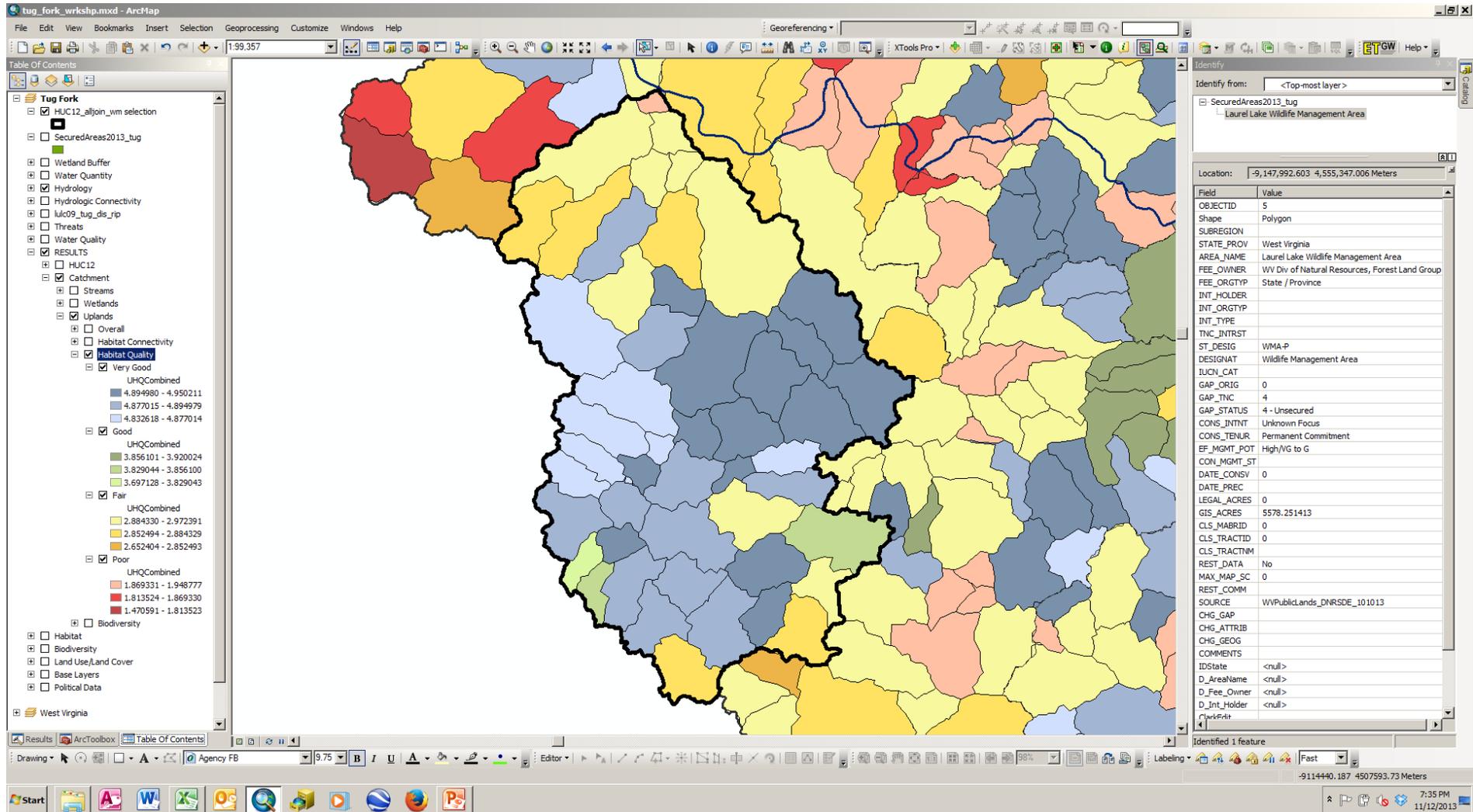
- Table of Contents:** Lists layers such as 'SecuredAreas2013\_bug', 'Wetland Buffer', 'Water Quantity', 'Hydrology', 'Streams', 'Wetlands', 'Planning Units', 'HUC12\_alljoin\_wm', 'Catchment\_alljoin\_wm', 'Tug Fork Watershed - WV', 'Riparian Area', 'Flow Direction Grid', 'Full Watershed', 'Hydrologic Connectivity', 'HUC09\_tug\_dis\_rip', 'Threats', 'Water Quality', 'RESULTS', 'HUC12', 'Streams', 'Wetlands', 'Uplands', 'Overall', 'Habitat Connectivity', 'Habitat Quality', 'Biodiversity', 'Catchment', 'Habitat', 'Biodiversity', 'Land Use/Land Cover', 'Base Layers', 'Quad Index', 'Counties', 'WBoundary', 'Elevation', 'USA\_Topo\_Maps', 'World\_Street\_Map', 'Political Data', 'West Virginia', 'New Data Frame 2', 'Major Streams', 'Streams', and 'Wetlands'.
- Main Map Area:** Displays a topographic map of the Tug Fork watershed in West Virginia, with various land use and protection layers overlaid. A central area is highlighted in red and orange.
- Metadata Window (Right):** Shows the 'Identify' tool results for a selected feature. The 'Location' is -9,147,992.603 4,555,347.006 Meters. The 'Field' and 'Value' table is as follows:

Field	Value
OBJECTID	5
Shape	Polygon
SUBREGION	
STATE_PROV	West Virginia
AREA_NAME	Laurel Lake Wildlife Management Area
FEE_OWNER	WV Div of Natural Resources, Forest Land Group
FEE_ORGTYP	State / Province
INT HOLDER	
INT_ORGTYP	
INT_TYPE	
TNC_INTRST	
ST_DESIG	WMA-P
DESIGNAT	Wildlife Management Area
IUCN_CAT	
GAP_ORIG	0
GAP_TNC	4
GAP_STATUS	4 - Unsecured
CONS_INTMT	Unknown Focus
CONS_TENUR	Permanent Commitment
EF_MGMT_ST	High/VG to G
CON_MGMT_PT	
DATE_CONSV	0
DATE_PREC	
LEGAL_ACRES	0
GIS_ACRES	5578.251413
CLS_MABRID	0
CLS_TRACTID	0
CLS_TRACTNM	
REST_DATA	No
MAX_MAP_SC	0
REST_COMM	
SOURCE	WVPublicLands_DNRSDE_101013
CHG_GAP	
CHG_ATTRIB	
CHG_GEOG	
COMMENTS	
IDState	<null>
D_AreaName	<null>
D_Fee_Owner	<null>
D_Int_Holder	<null>
CHGPRH	

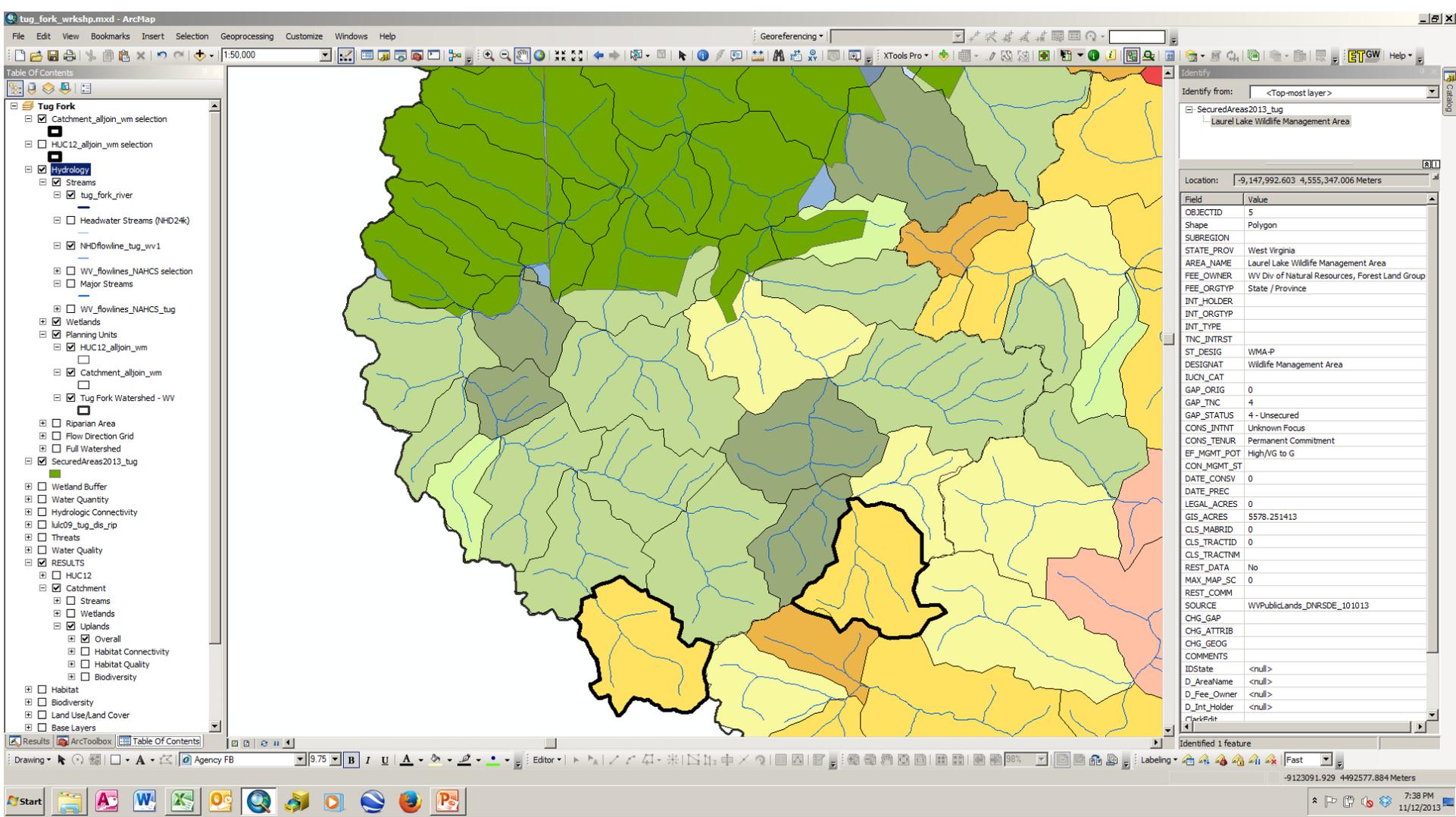
## Tug Fork – HUC12 Level Uplands Overall Results, Protected Lands



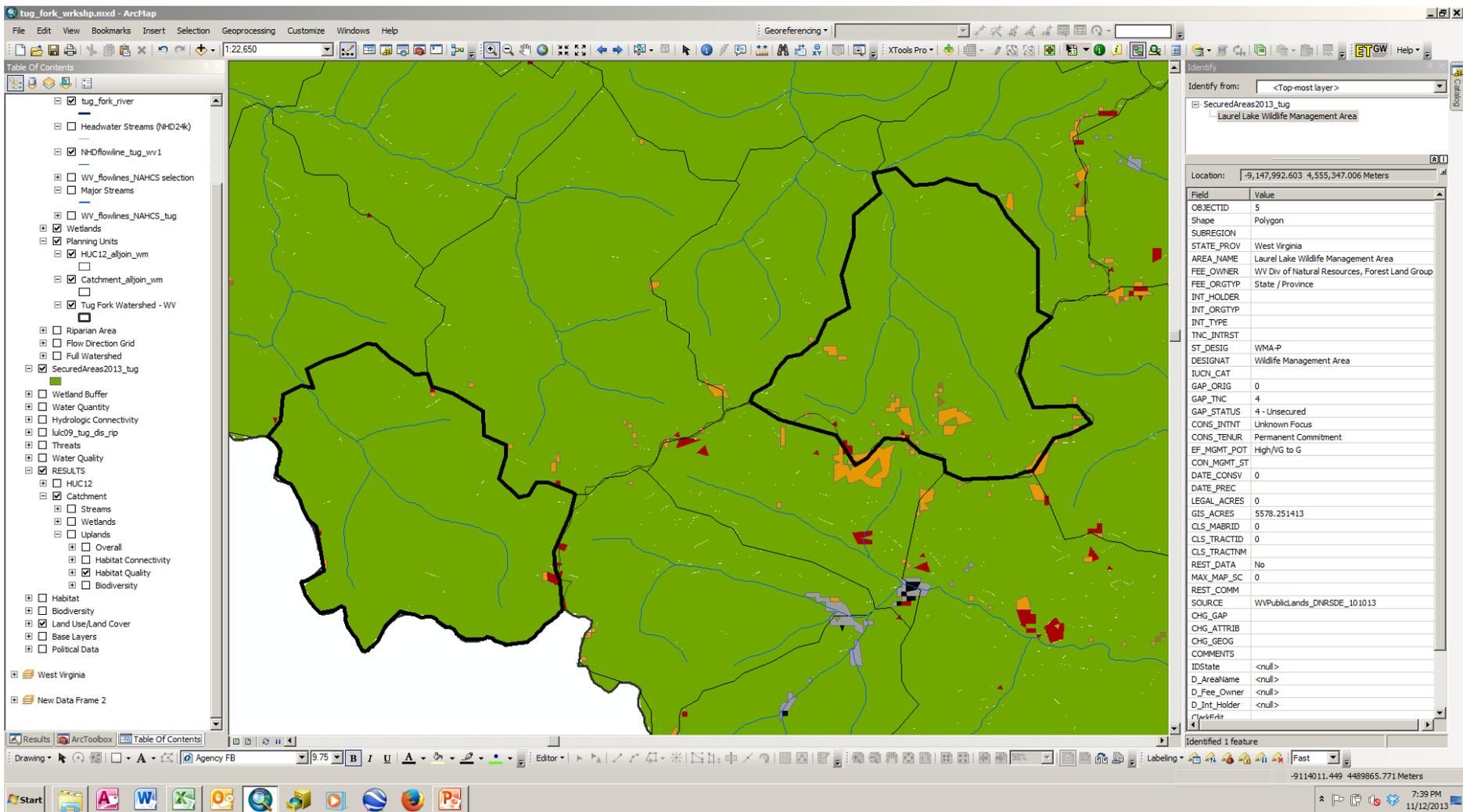
Panther Creek – Catchment Level Uplands Overall Results



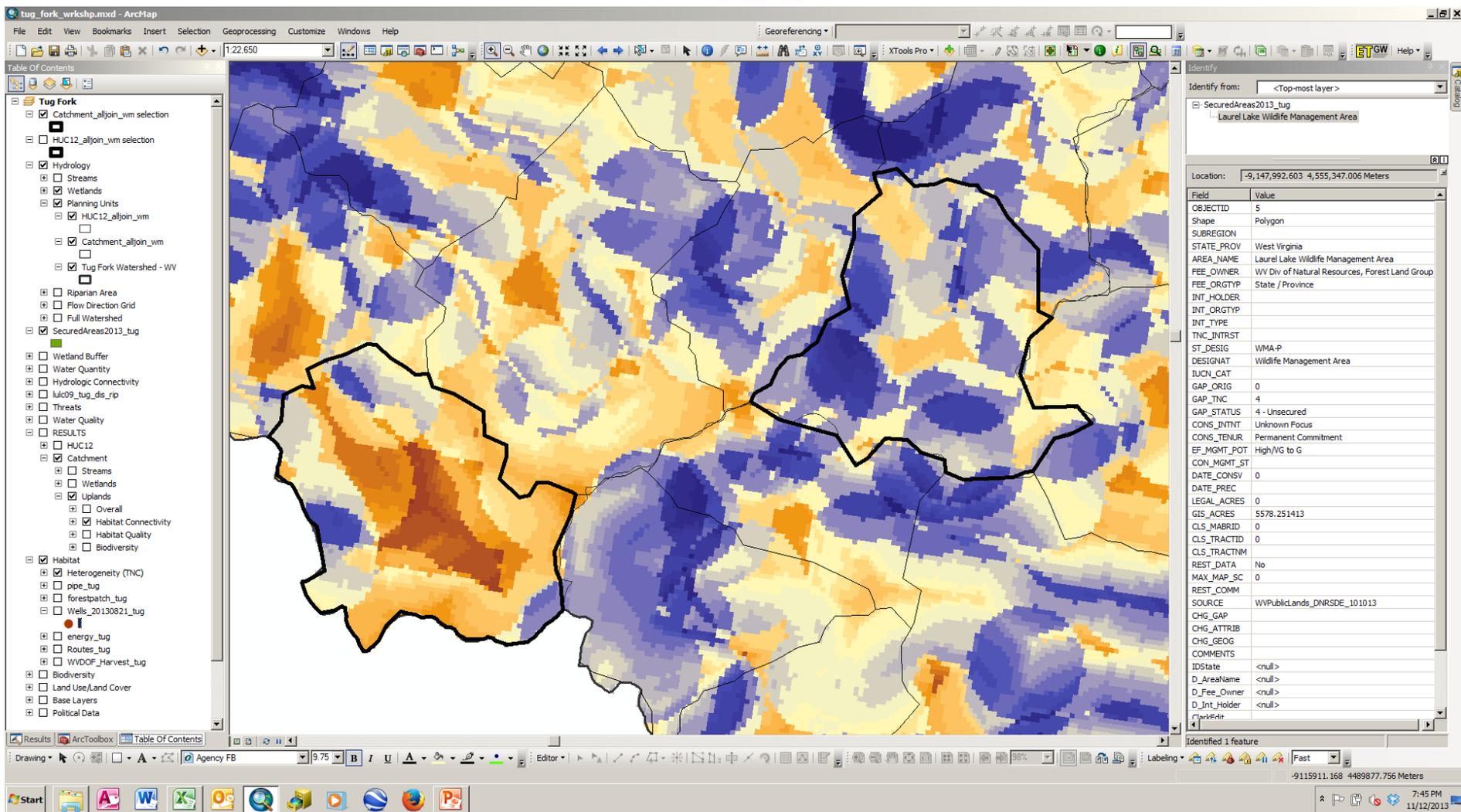
Panther Creek – Catchment Level  
Habitat Quality Results



Panther Creek– Catchment Level  
Uplands Overall Results, Protected Lands, Stream Network



Panther Creek – Catchment Level  
WVU-NRAC LULC 2009-10, Stream Network



Panther Creek – Catchment Level Heterogeneity



COMMENTS/QUESTIONS?