WEST VIRGINIA WATER RESOURCES MANAGEMENT PLAN

SUBMISSION TO THE JOINT LEGISLATIVE OVERSIGHT COMMISSION ON STATE WATER RESOURCES

West Virginia Department of Environmental Protection

December 9, 2013

By:
Brian A. Carr, P.G.
Program Manager
Water Use Section

Today's Agenda

- A Short History of the Water Resources Management Plan Development
- Interesting Water Facts
- Some Key Studies Performed
- Introduction of the New Water Use Web Page
- Filing of the WV Water Resources Management Plan
  - Future Pursuits and Recommendations
- Questions from the Commission

Plan History

The Water Resources Protection Act was originally passed on March 13, 2004.

In 2006 the first Large Quantity User Survey was completed.

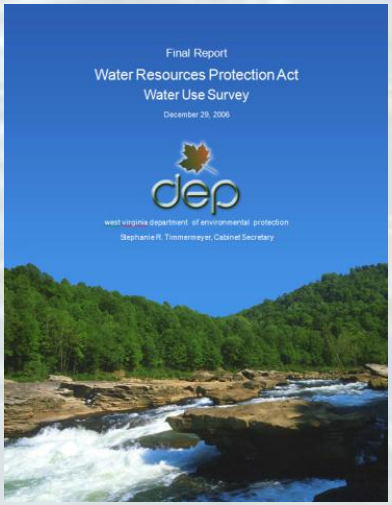
On March 8, 2008, Senate Bill 641 was passed amending the Act and renaming it the Water Resources Protection and Management Act.

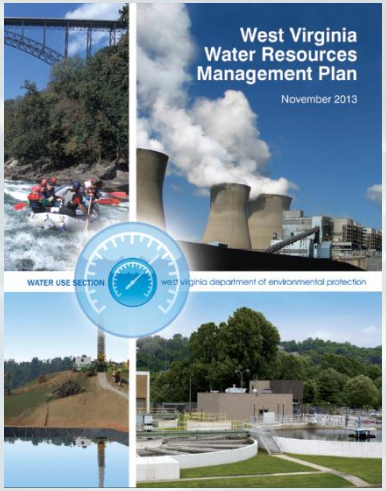
Requiring:

- **Continued LQU Surveys**
- **Annual reporting to the Commission**
- **Submission of a Water Resources Management Plan by November 30, 2013.**

Water Use Section created July 2008 to accomplish the additional requirements of the Act.

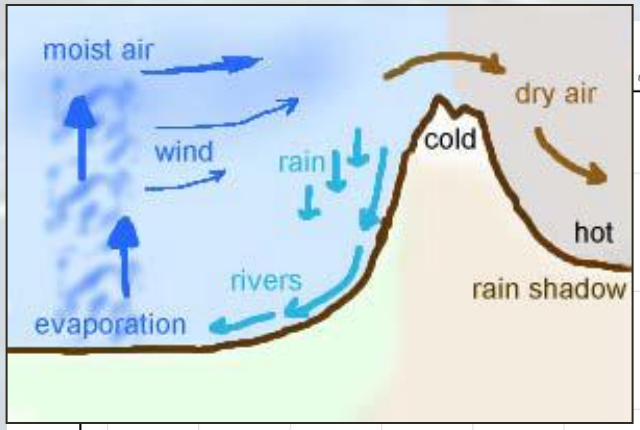
The West Virginia Water Resources Management Plan was submitted on November 22, 2013.





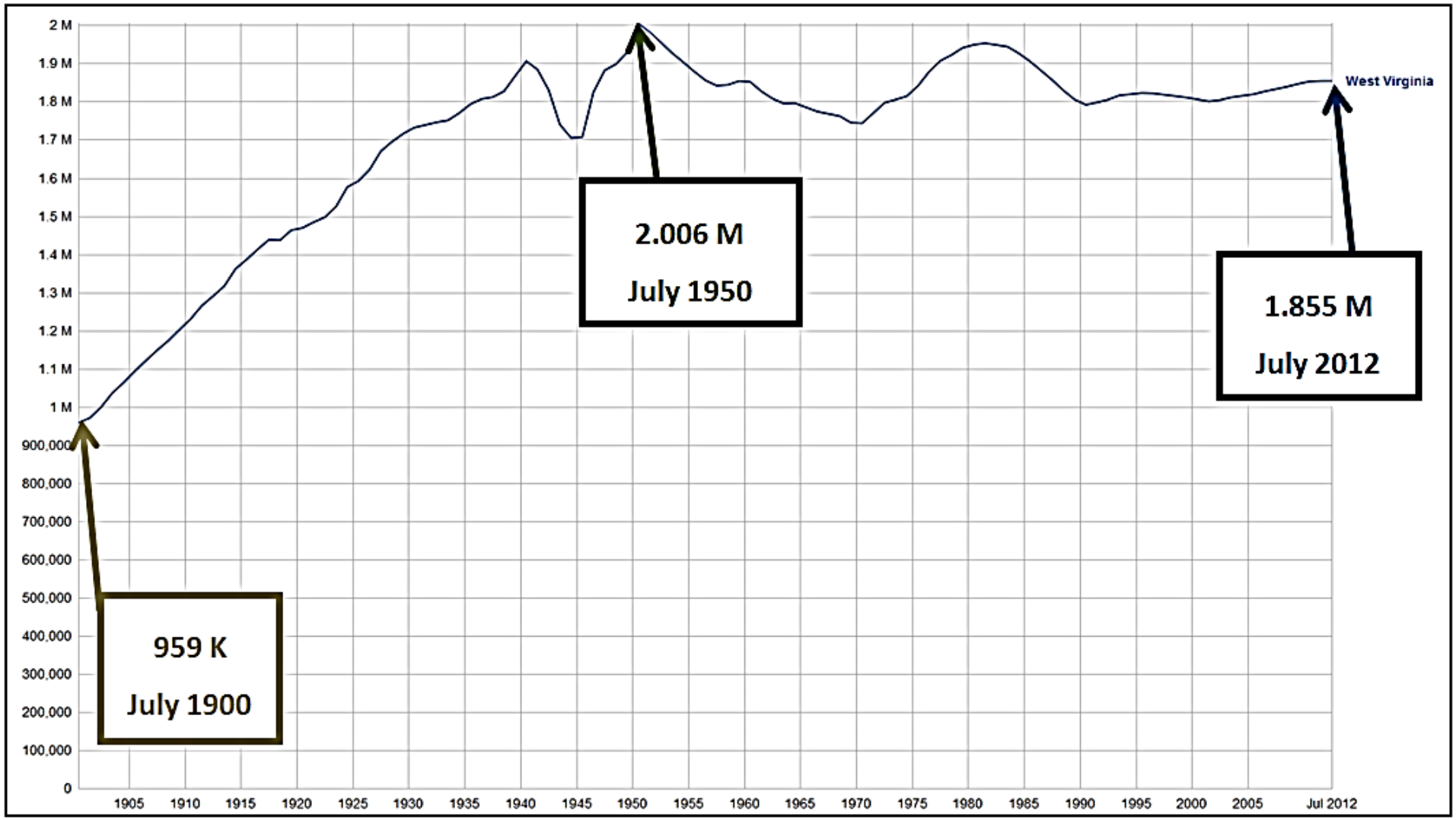
Water Facts

Annual Precipitation Map and the Rain Shadow

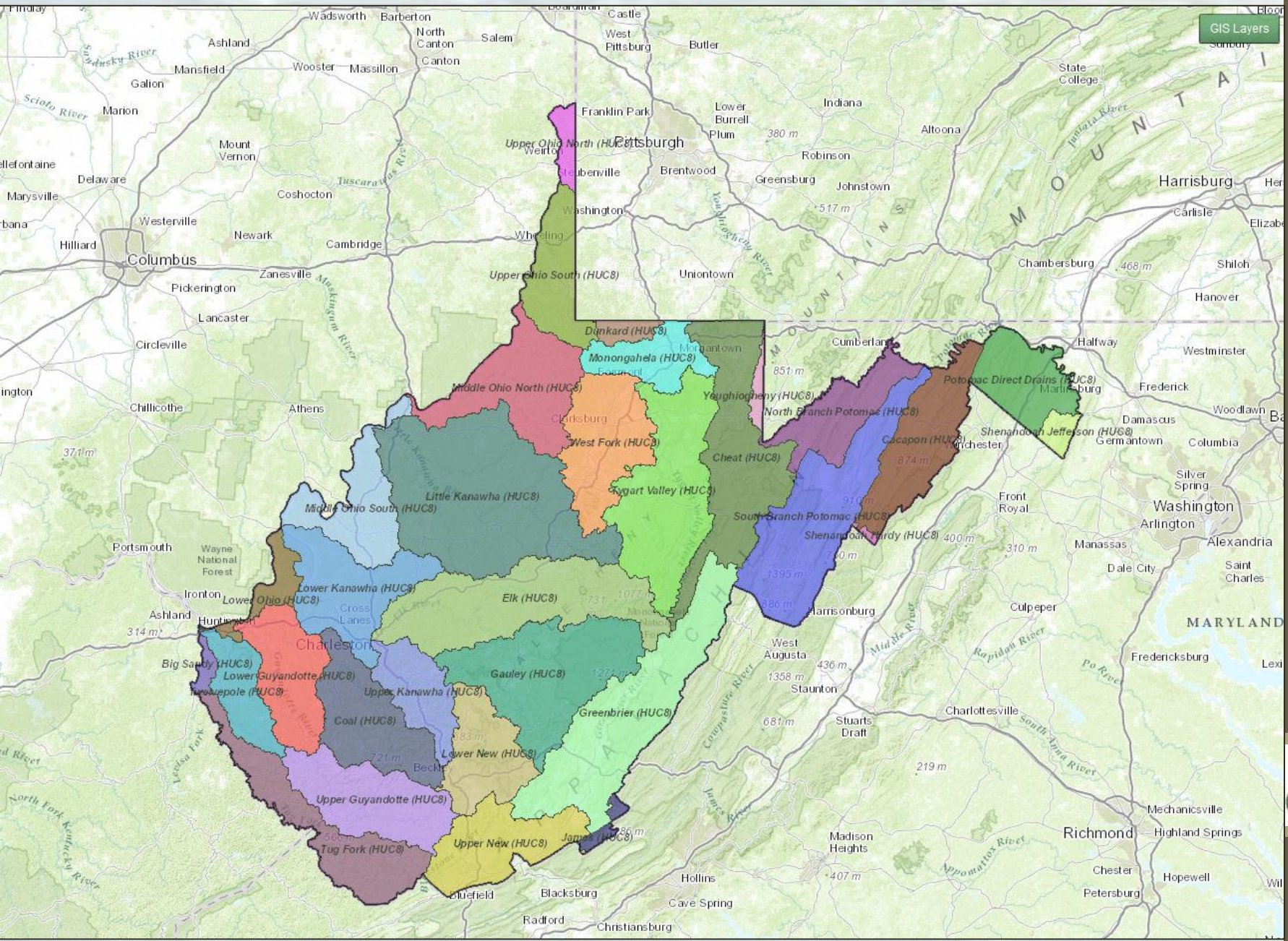


Water Facts

West Virginia Population1900 - 2012



HUC 8 Watershed Map



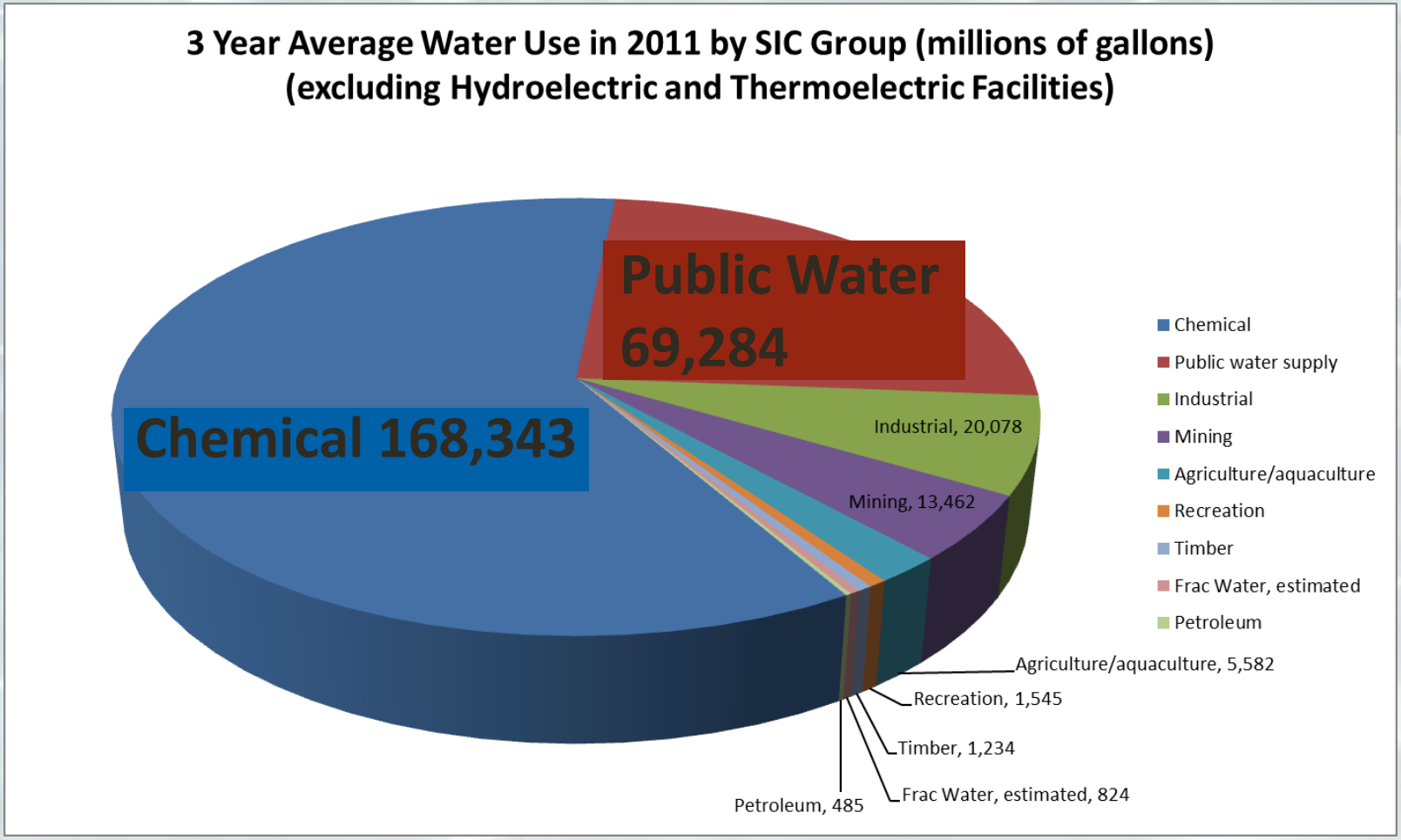
Water Facts

- 19.32 trillion gallons of precipitation – based on 44 in/year
- The record precipitation event in West Virginia is 19.5 inches of rain in two hours and 10 minutes at Rockport in July of 1889
- 1.07 trillion gallons – maximum storage of dams/lakes
- 388.7 billion gallons - normal storage of dams/lakes
- 1.48 trillion gallons –potential mine pool storage

Water Facts

- 1.2 trillion gallons - withdrawn by Large Quantity Users annually (excluding Hydroelectric users)
- ~6% or 72 billion gallons/year estimated consumptive use
- 54,961 – total stream miles statewide.
- ≥ 42 billion gallons per day - average additional available water from our rivers and streams.

LQU - Excluding Hydro and Thermoelectric Use.



Some key studies performed enabling data collection necessary for development of the Plan.

Annual Certification-Large Quantity Users

NOTE: NOT TO BE USED FOR FRAC WATER REPORTING

If you are a large quantity user, and are required to complete an annual user certification, please click the button below to be directed to the appropriate forms and instructions.

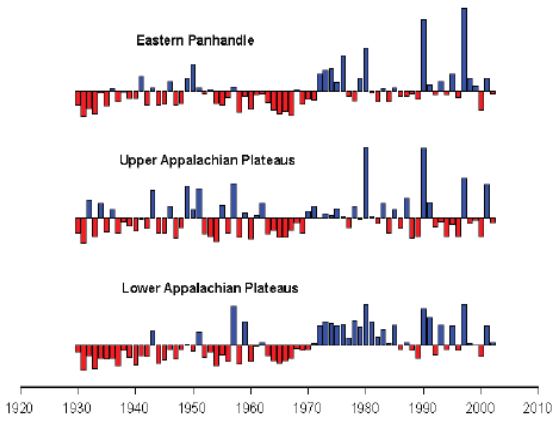
User Certification

Currently, any user who withdrawals more than 750,000 gallons per month.

USGS
science for a changing world

In cooperation with the West Virginia Department of Environmental Protection, Division of Water and Waste Management

Low-Flow Analysis and Selected Flow Statistics Representative of 1930–2002 for Streamflow-Gaging Stations In or Near West Virginia



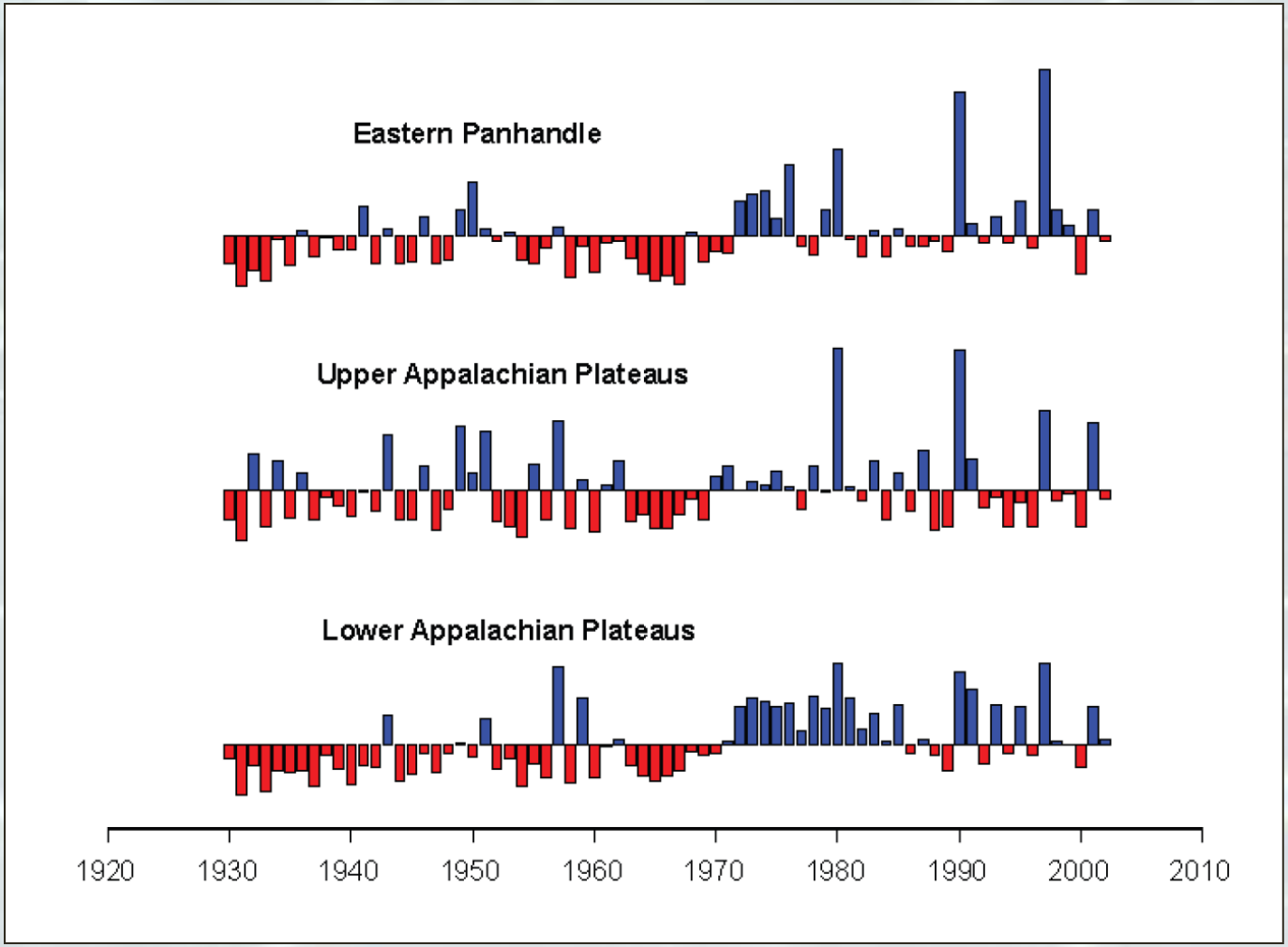
Scientific Investigations Report 2006–5002

U.S. Department of the Interior
U.S. Geological Survey

Stream flow statistics at gage locations on unregulated streams across the state were updated.

dep

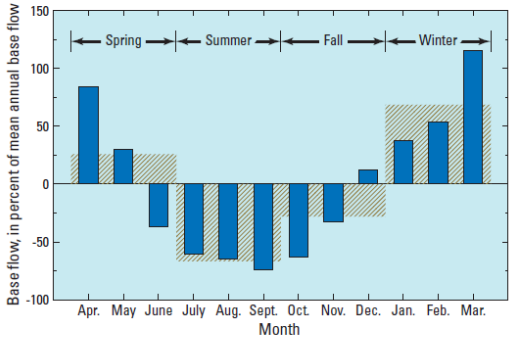
Flooding and Drought are discussed in detail in the Plan.



USGS
science for a changing world

Prepared in cooperation with the West Virginia Department of Environmental Protection, Division of Water and Waste Management

Comparison of Base Flows to Selected Streamflow Statistics Representative of 1930–2002 in West Virginia



Scientific Investigations Report 2012–5121

U.S. Department of the Interior
U.S. Geological Survey

A study to equate stream flow statistics to base flow of the streams to identify the inter-connection of surface and groundwater.

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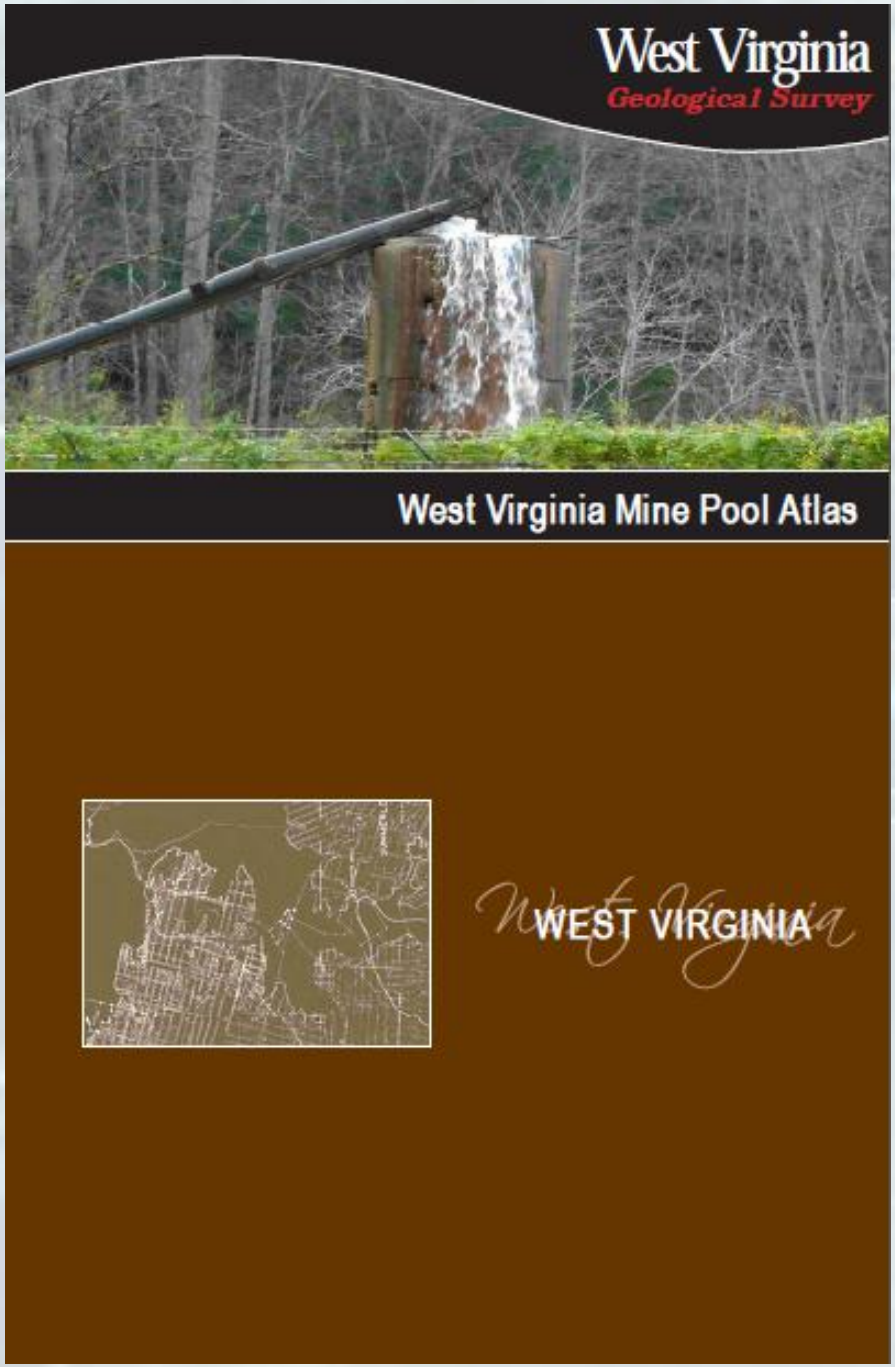
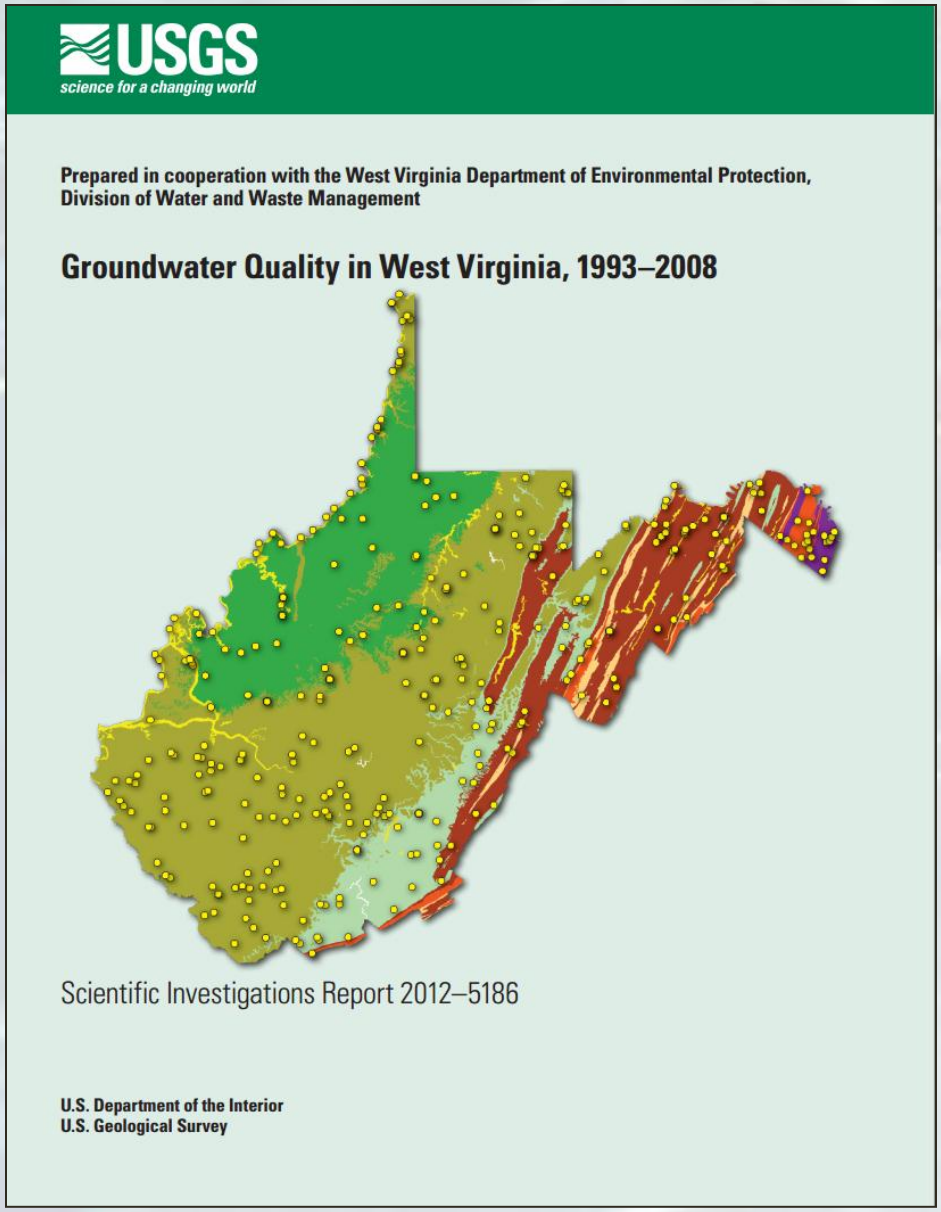
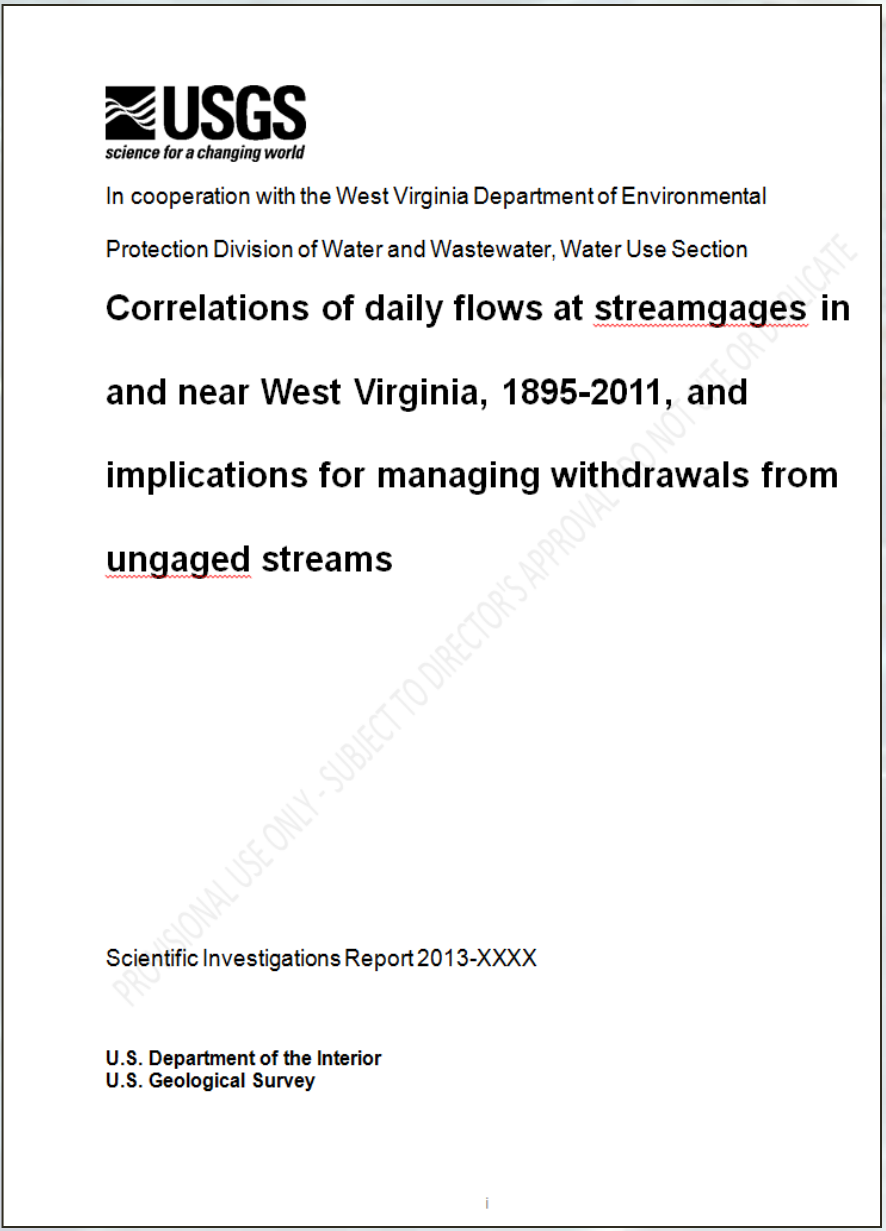


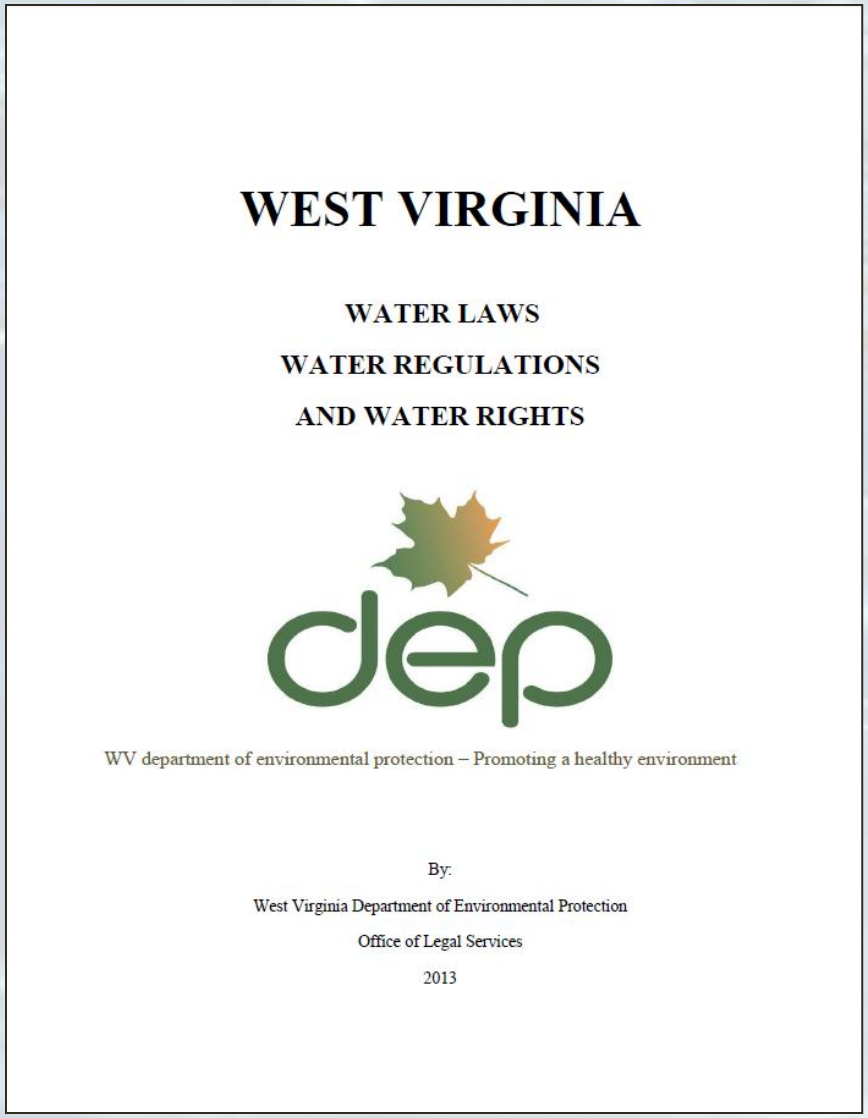
A mine pool atlas was produced by documenting the location and potential storage capacity of mapped mines in the state.



A study of the groundwater quality of selected wells across the state.



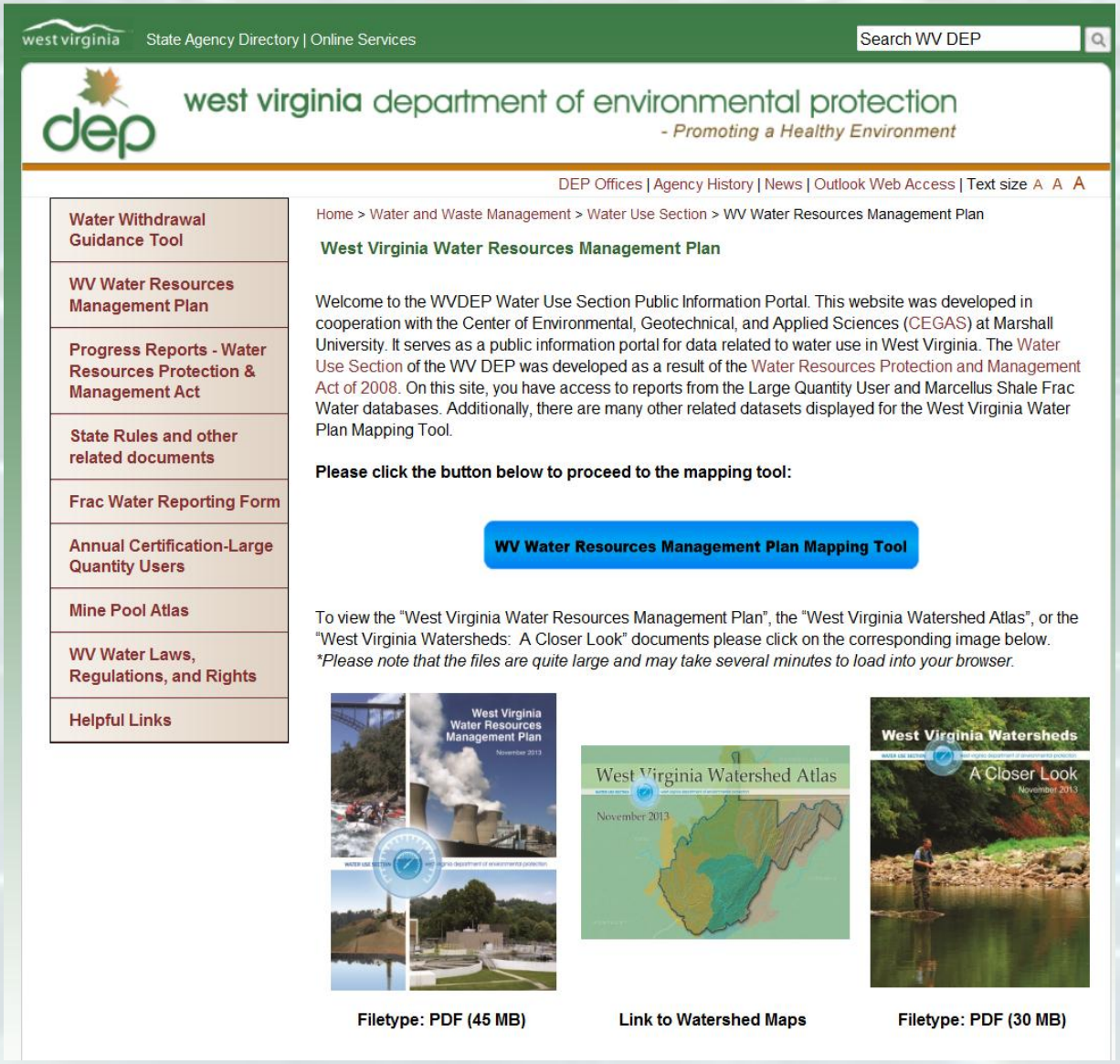
A new study (under final review) which will better predict flows on un-gaged streams. (improved WMP for Horizontal well industry)



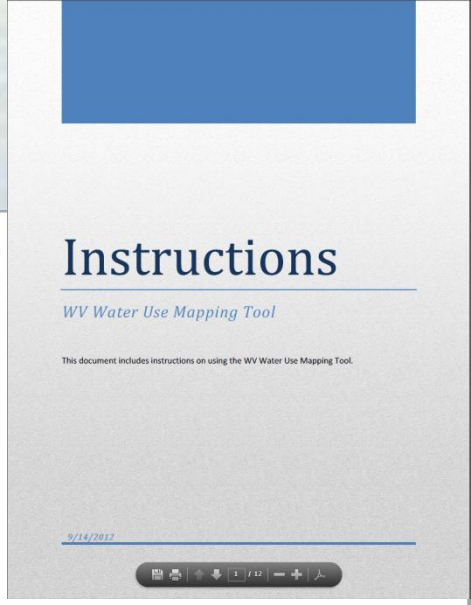
The DEP Office of Legal Services put together a collection of legal facts concerning ownership and regulation of the states waters.

WVWRMP Mapping Tool

Google search: wvwaterplan and click the Blue Button



Mapping Tool Instructions



I. Map Viewer Overview

The layout of the map viewer is shown below.

Map Viewer Overview

II. Navigation

This section describes how to navigate. Below is a picture of the navigation widget. It is found on the left side of the map viewer. It becomes transparent when the cursor is not hovering over a navigation control.

Navigation widget

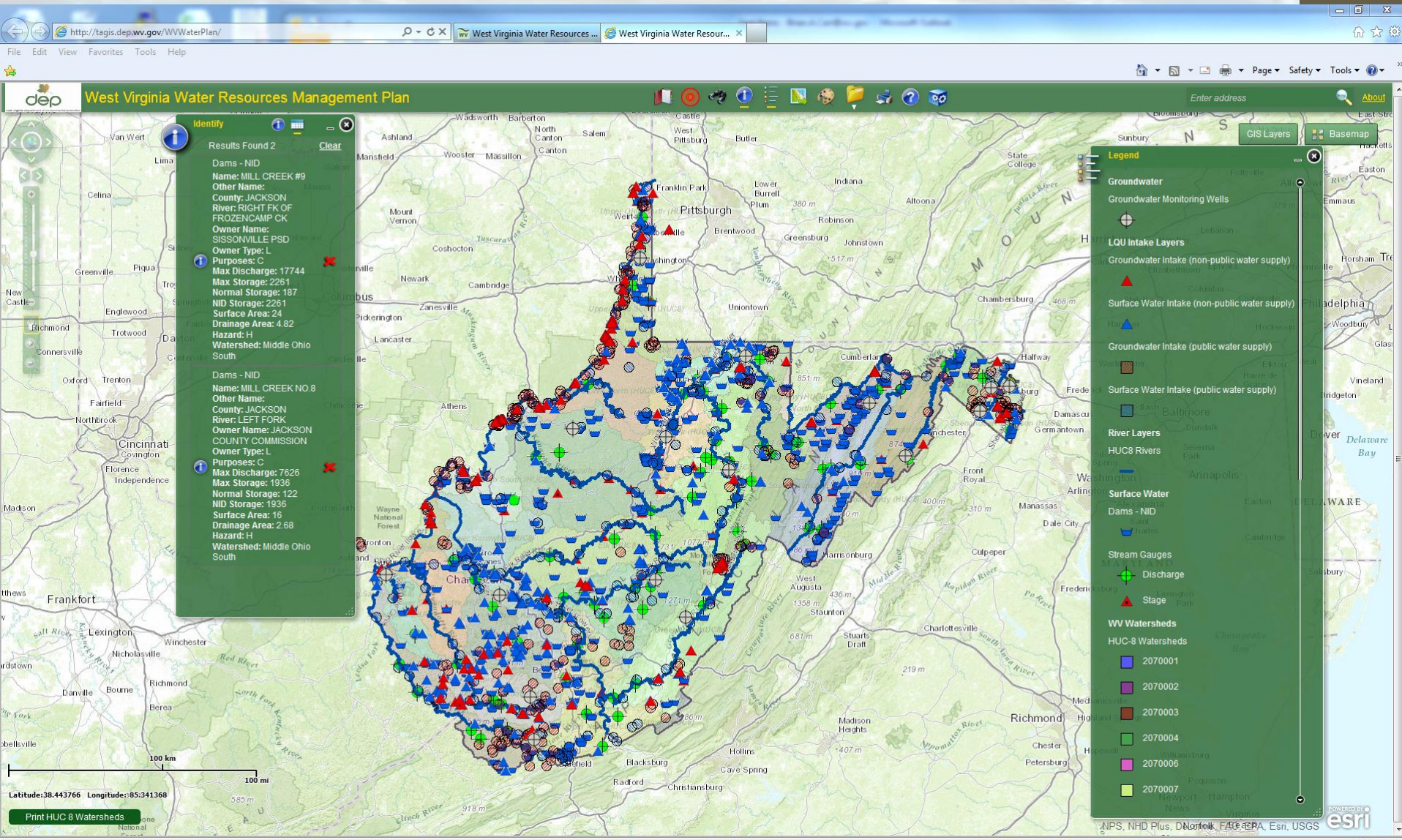
In addition to using the "Zoom slider" on the navigation widget, you can also roll the mouse wheel forward or backwards to zoom in or out respectively.

III. View GIS Layers

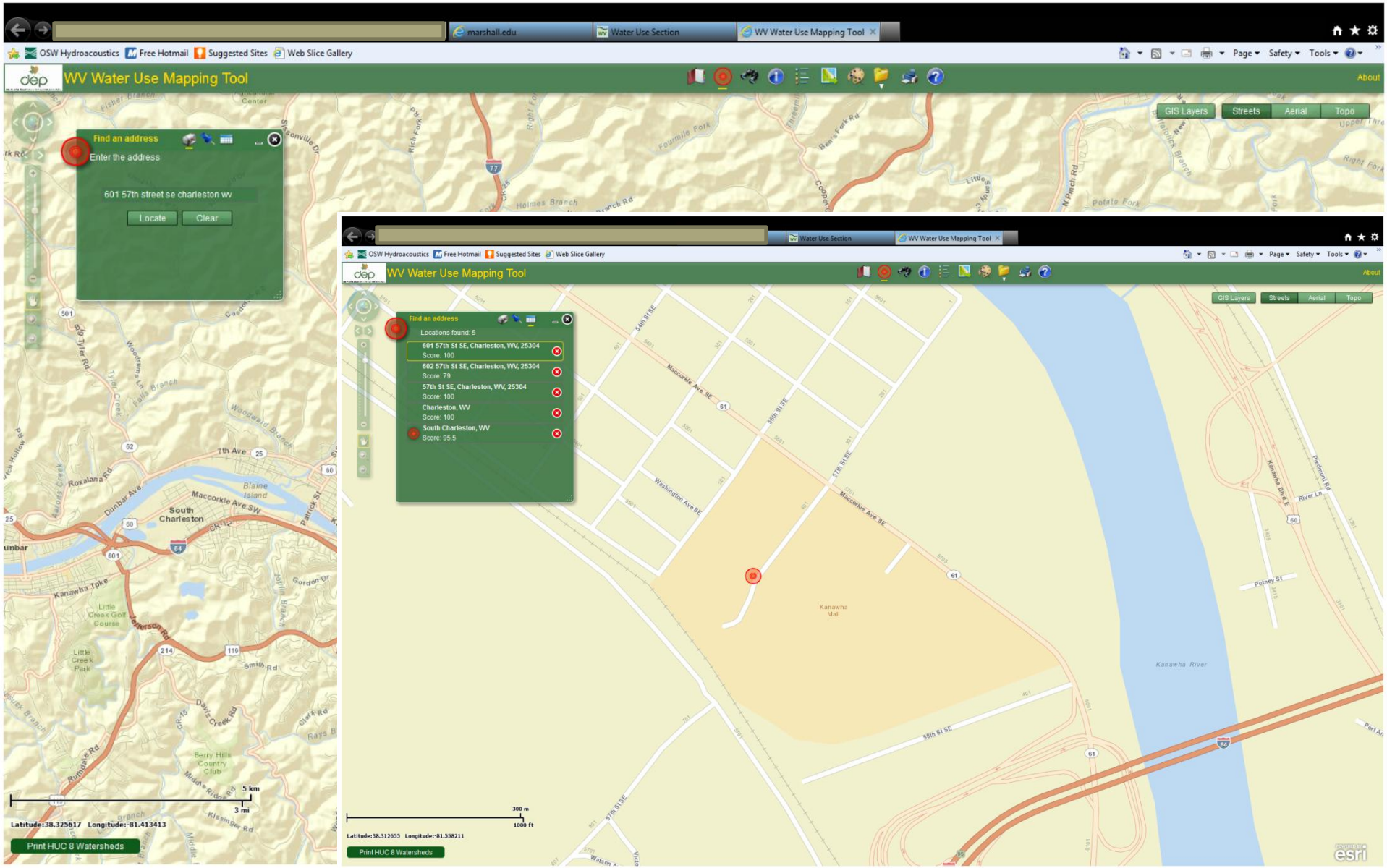
Switch between base layers by selecting one of the buttons labeled "Streets", "Aerial" or "Topo". Base layers are used in the viewer to display background imagery and street data.

Additional layers can be displayed in the viewer by selecting the "GIS Layers" button and then selecting the checkbox beside the layer to display. Note: not all layers will be displayed at all scales/zoom levels.

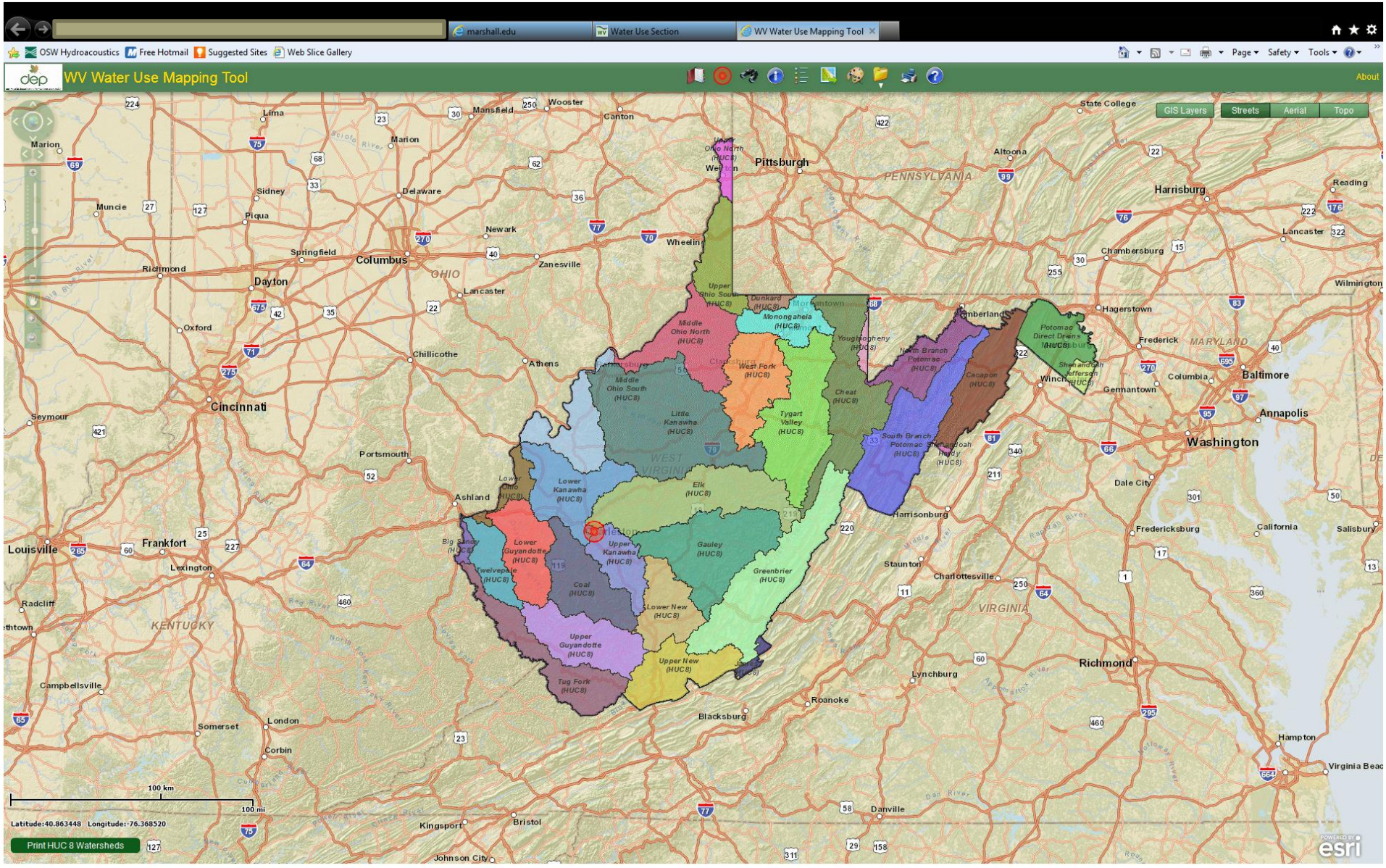
Water Data, DEM, Aerial Photography, Demographics & Links to much more



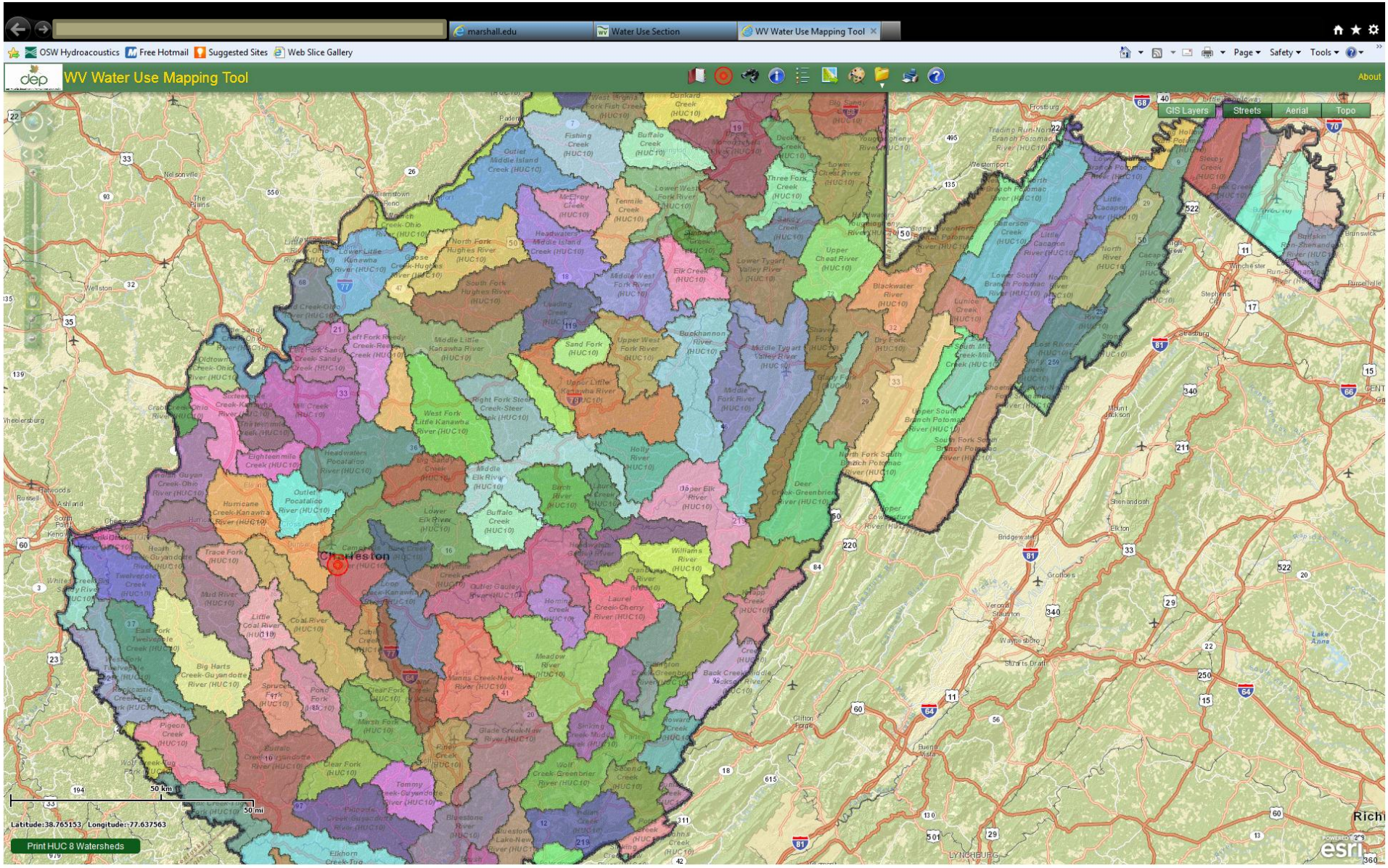
Locate Widget (address or Lat and Long)



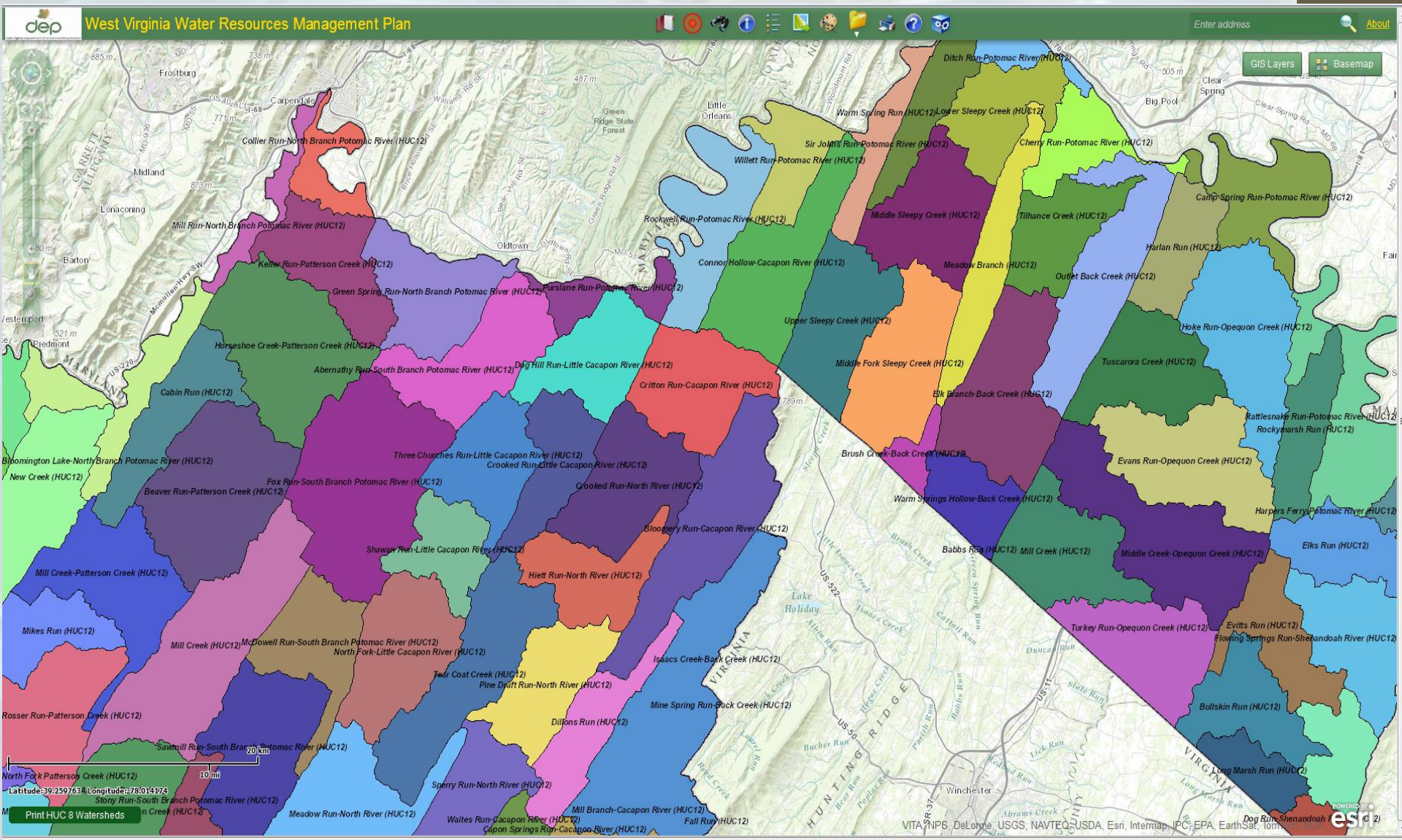
HUC 8 Watersheds



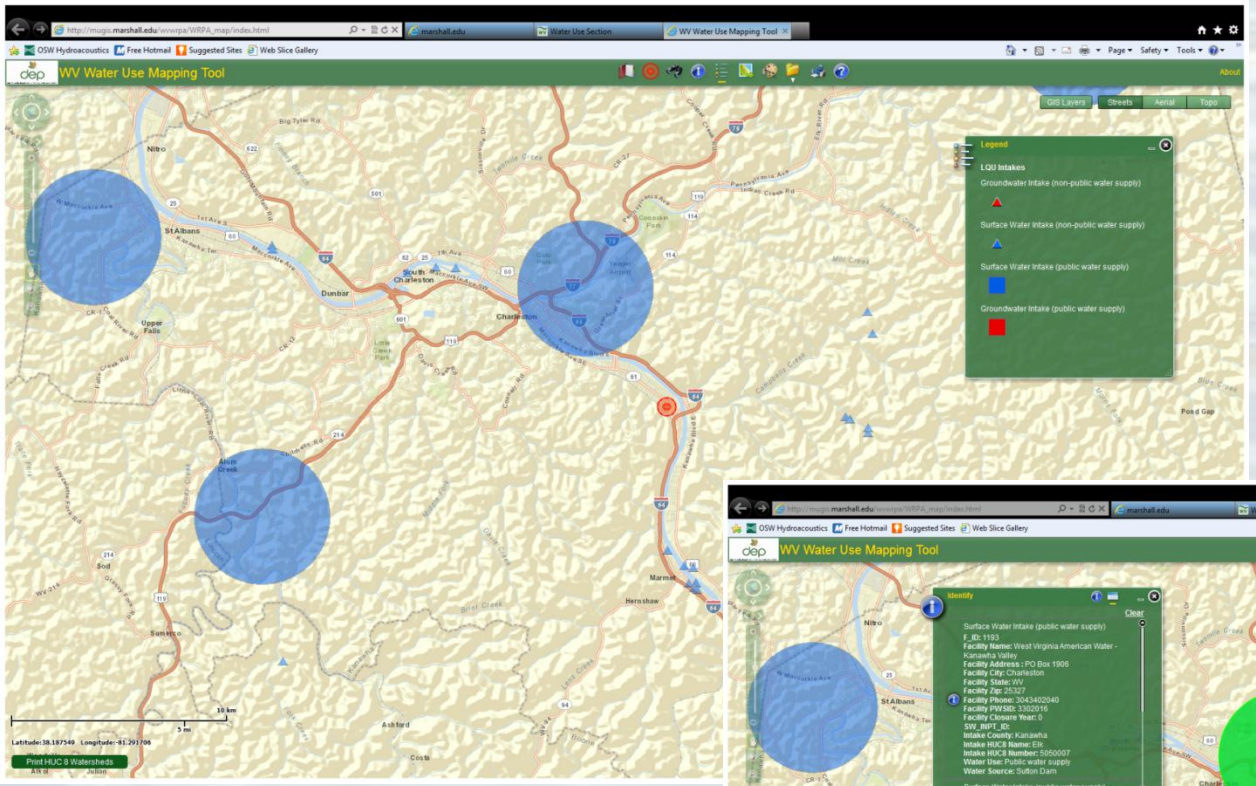
HUC 10 Watersheds

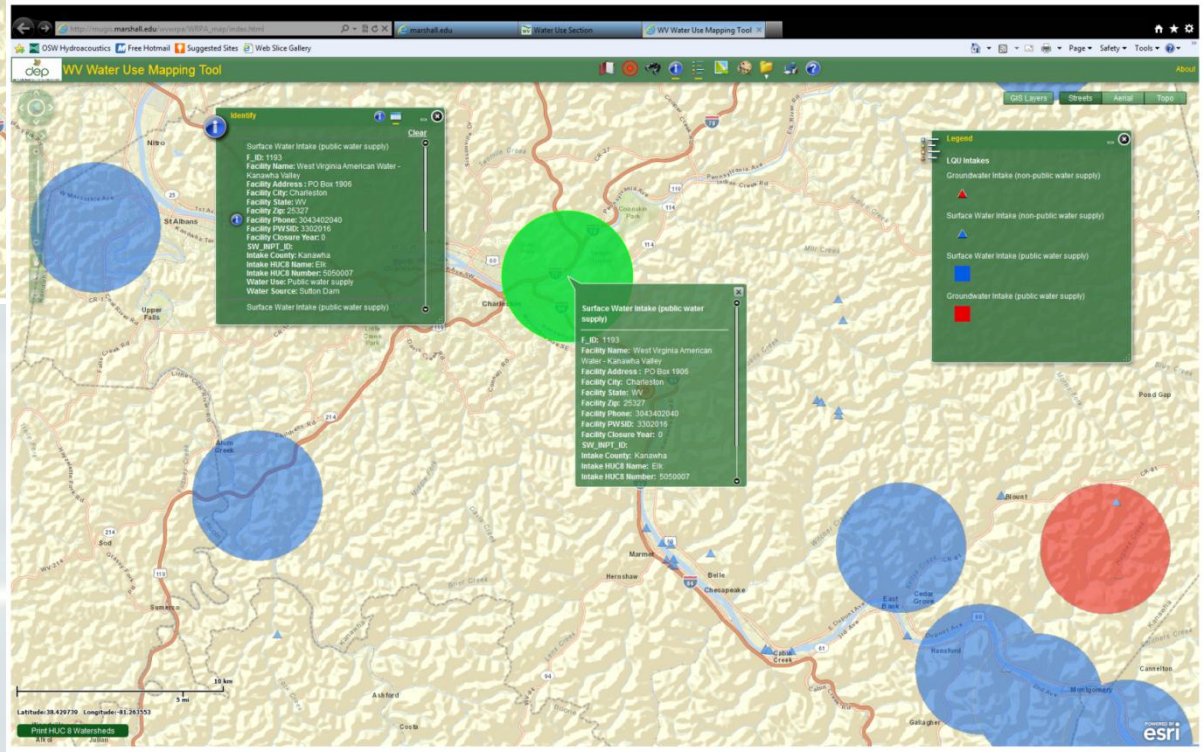


HUC 12 Watersheds

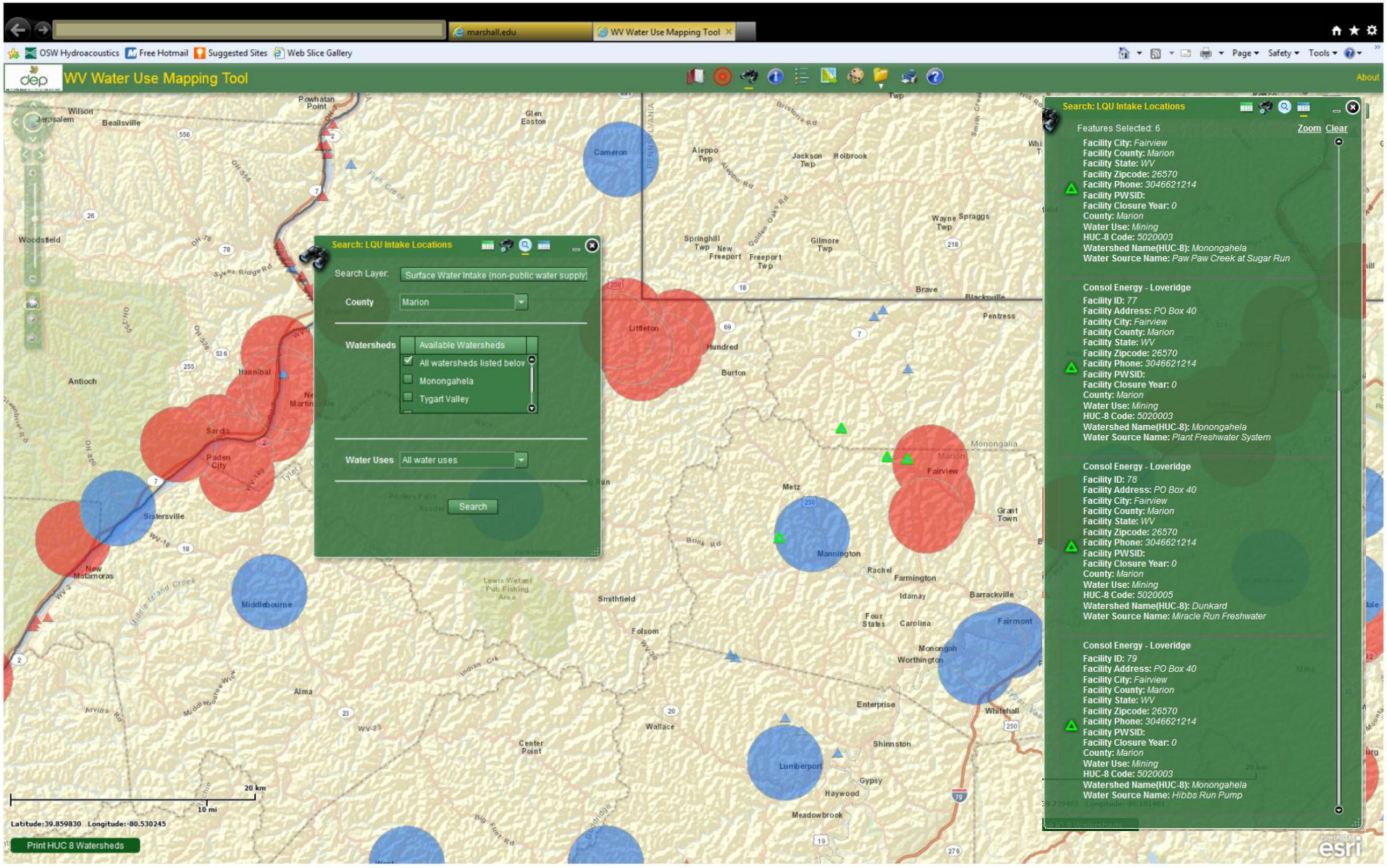


LQU Locations

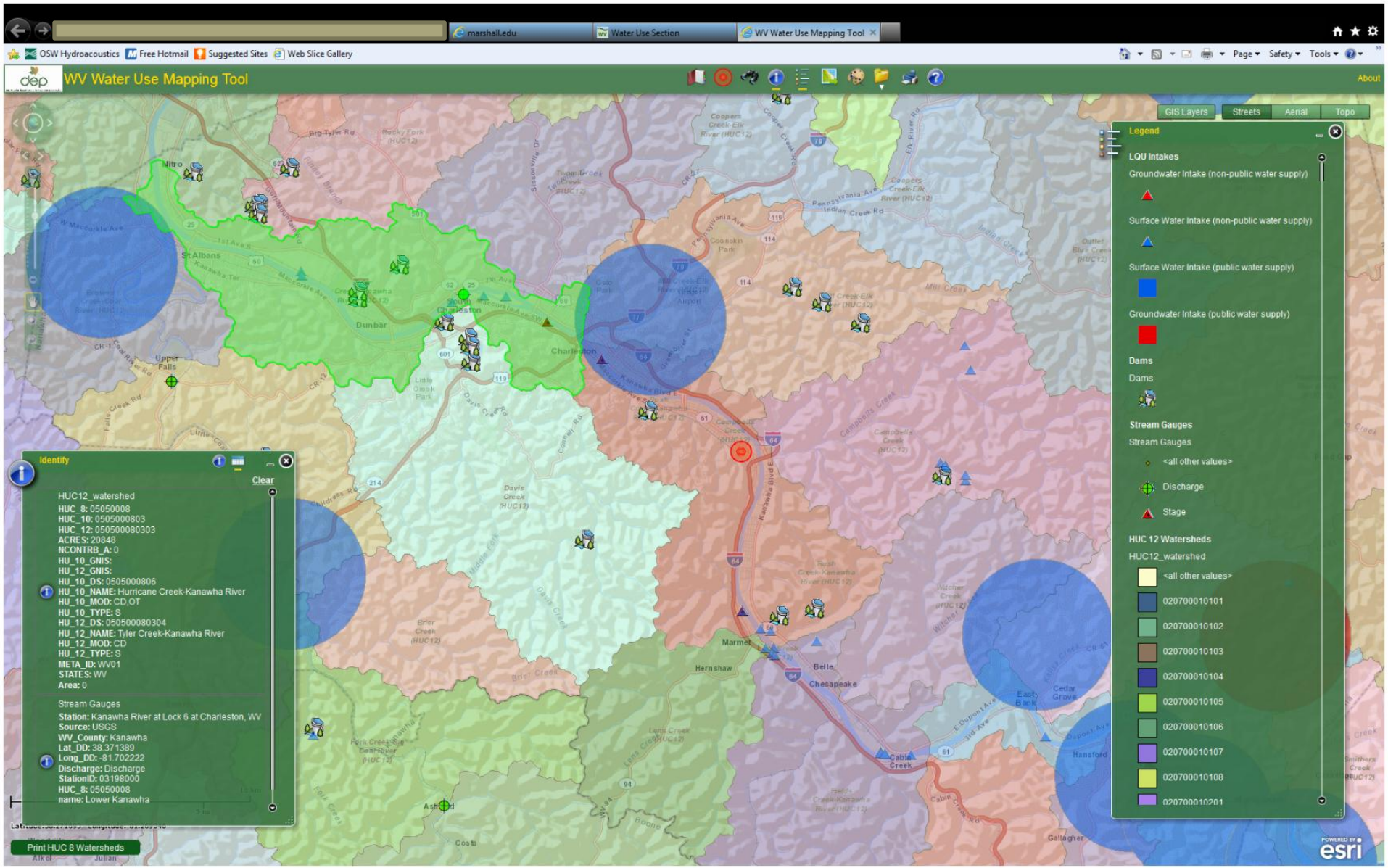




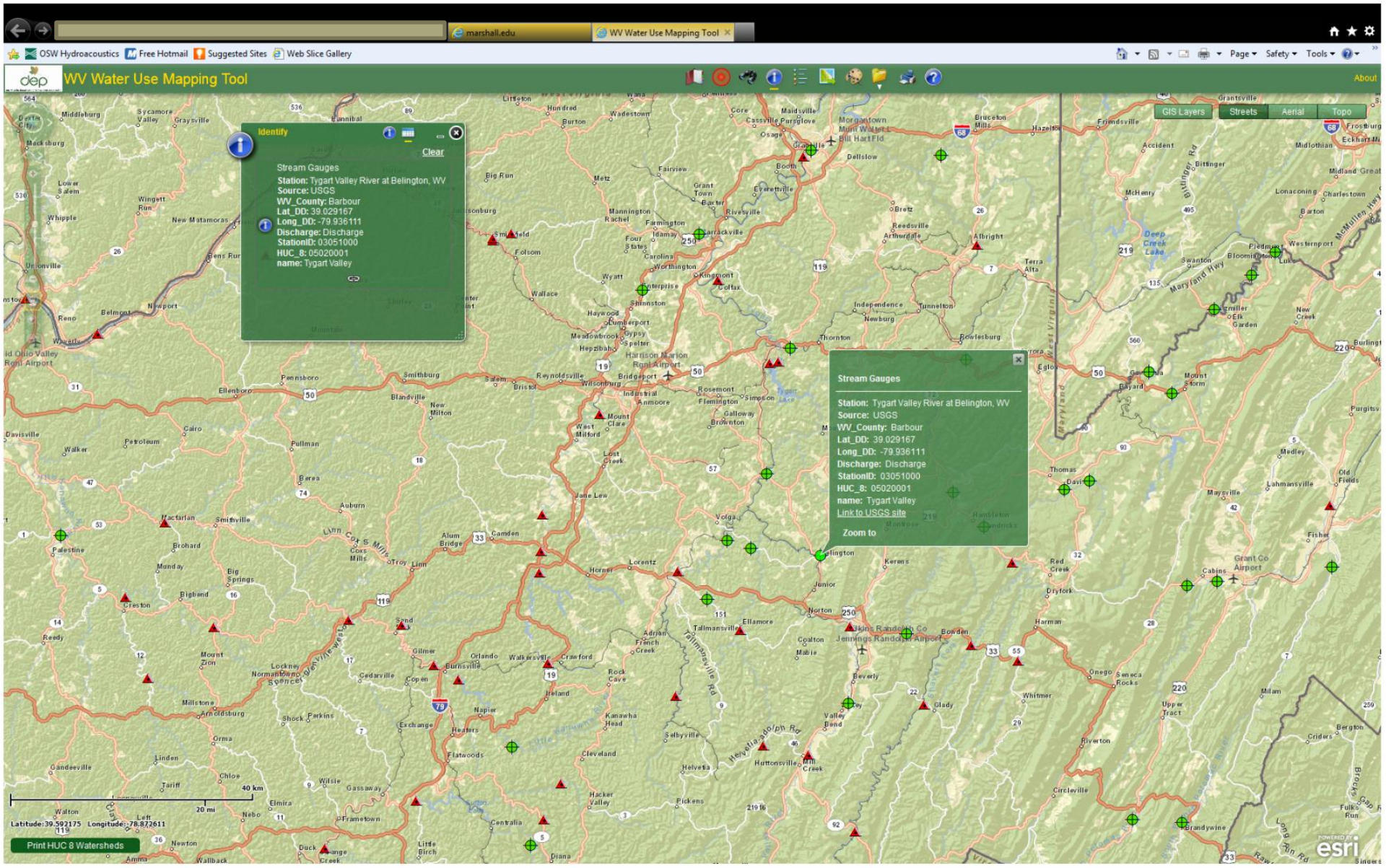
LQU Search Widget



Overlap multiple GIS Layers



Stream Gauge Layers



USGS Stream Gauge Link

marshall.edu | WV Water Use Mapping Tool | USGS Current Conditions fo...

OSW Hydroacoustics | Free Hotmail | Suggested Sites | Web Slice Gallery

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Search USGS

National Water Information System: Web Interface

USGS Water Resources (Cooperator Access)

Data Category: Surface Water | Geographic Area: United States | GO

News - updated September 2012

USGS 03051000 TYGART VALLEY RIVER AT BELINGTON, WV

PROVISIONAL DATA SUBJECT TO REVISION

Available data for this site | Time-series: Daily data | GO

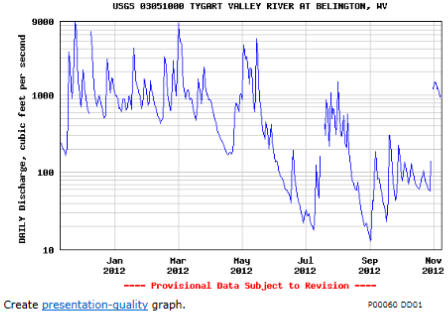
LOCATION.--Lat 39°01'45", long 79°56'10",
referenced to North American Datum of 1927, Barbour County, WV, Hydrologic Unit 05020001,
on left bank opposite mouth of Mill Creek, 0.2 mi downstream from highway bridge at Belington,
and at mile 62.4.
DRAINAGE AREA.--406 mi^2, excluding that of Mill Creek.
PERIOD OF RECORD.--June 1907 to current year (daily discharge and peaks).
Prior to October 1960, published as Tygart River at Belington.
REVISED RECORDS.--WSP 953: 1933(M), 1941(M). WSP 1335: 1912, 1914-15, 1916(M),
1921-22(M), 1925(M), 1928, 1933. WSP 1385: 1909(M), 1913-15(M), 1917-18, 1924(M),
1928(M), 1932, 1934, 1936, 1938-39, 1948-49. WDR WV-97-1: Drainage area. WDR-US-2009: 1926(M).
GAGE.--Water-stage recorder with satellite telemeter. Datum of gage is 1,679.62 ft above NAVD 88
(1,680.35 ft above NGVD 29, 1,679.49 ft above COE 12). Prior to Apr. 25, 1939, nonrecording gage
at site 0.2 mi upstream at same datum.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 1888, reached a stage of 21.7 ft,
from floodmarks at former site, discharge, 21,200 ft3/s.
This gaging station is maintained in cooperation with:
U.S. Army Corps of Engineers, Pittsburgh District
State of West Virginia

This station managed by the Charleston Field Office.

Available Parameters	Period of Record	Output format	Days (365)	
All 1 Available Parameters for this site		Graph		
00060 Discharge(Mean)	1907-06-05 2012-11-07	Graph w/ stats	-- or --	GO
		Graph w/ meas	Begin date 2011-11-08	
		Table		
		Tab-separated	End date 2012-11-07	

Summary of all available data for this site
Instantaneous-data availability statement

Discharge, cubic feet per second

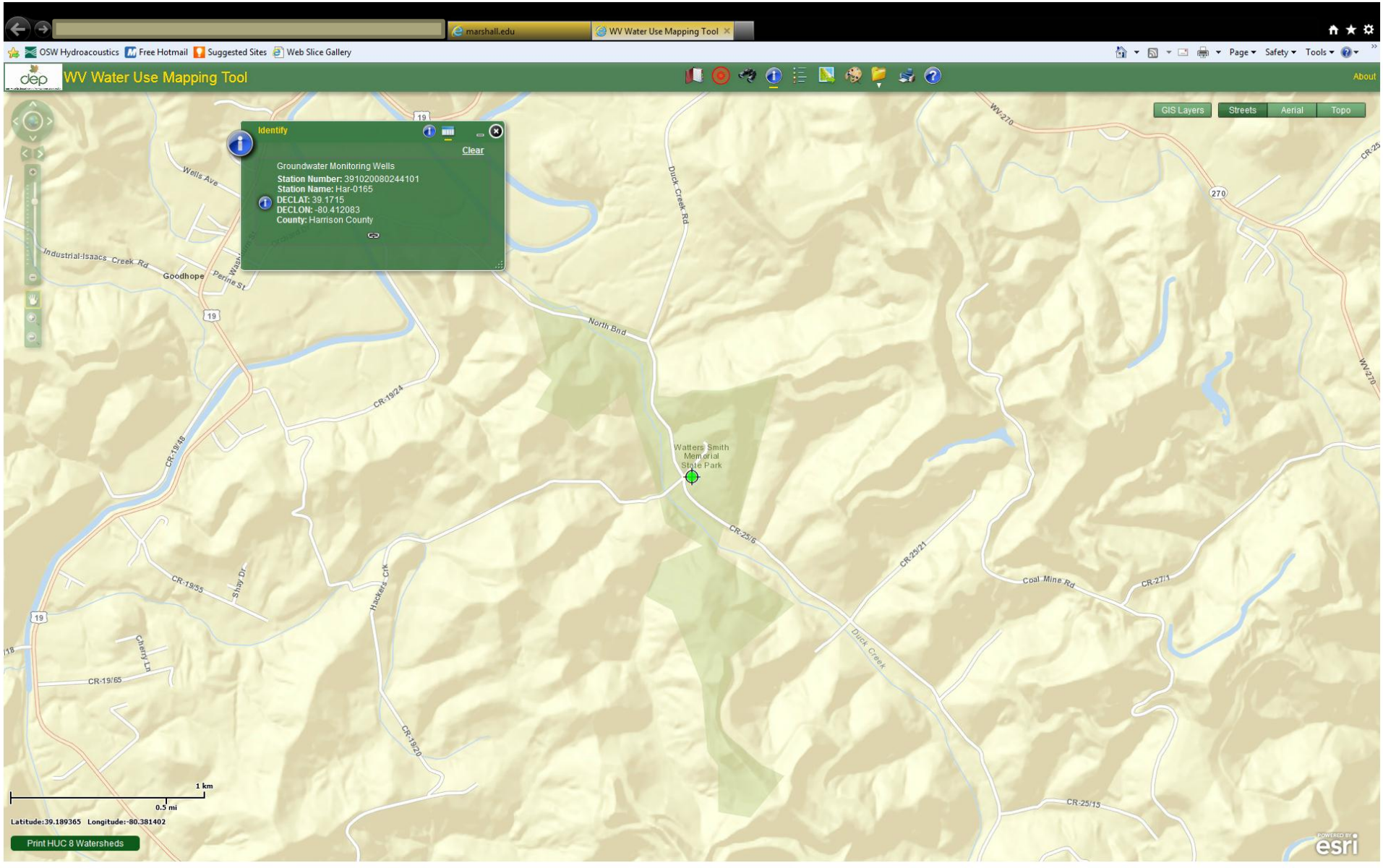


Create presentation-quality graph. P00060 DD01

Questions about sites/data?
Feedback on this web site

Data Tips
Explanation of terms

GW Well Layer



USGS GW Well Link

marshall.edu | WV Water Use Mapping Tool | USGS -- Water Resources of...

OSW Hydroacoustics | Free Hotmail | Suggested Sites | Web Slice Gallery

USGS science for a changing world

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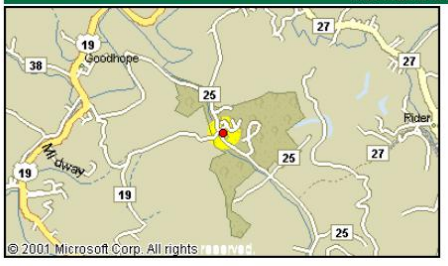
Groundwater Watch — Latest News...

Site Number: 391020080244101 - Har-0165



Groundwater Watch Help Page

DESCRIPTION:
Latitude 39°10'17.4", Longitude 80°24'43.5" NAD83
Harrison County, West Virginia, Hydrologic Unit 05020002
Well depth: 218. feet
Hole depth: 218. feet
Land surface altitude: 1,048.42feet above NAVD88.
Well completed in "Pennsylvanian aquifers" (N300PNSLVN) national aquifer.
Well completed in "Conemaugh Formation" (321CNMG) local aquifer

AVAILABLE DATA FROM NWISWeb:

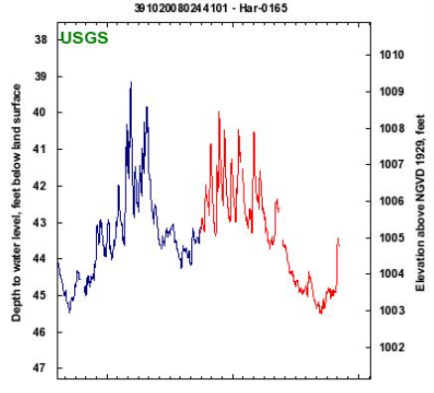
	2008-10-07	2012-07-22
Current / Historical Observations		
Daily Data		
Field groundwater-level measurements		
Field/Lab water-quality samples		

Additional Data Sources		Begin Date	End Date	Count
Annual Water-Data Report (pdf)	**offsite**	2009	2010	2
Groundwater Watch	**offsite**	2008	2012	1281

OPERATION:
Record for this site is maintained by the USGS West Virginia Water Science Center
Email questions about this site to West Virginia Water Science Center Water-Data Inquiries

Daily Groundwater Data

Most recent Provisional daily data value: 43.65 on 11/07/12



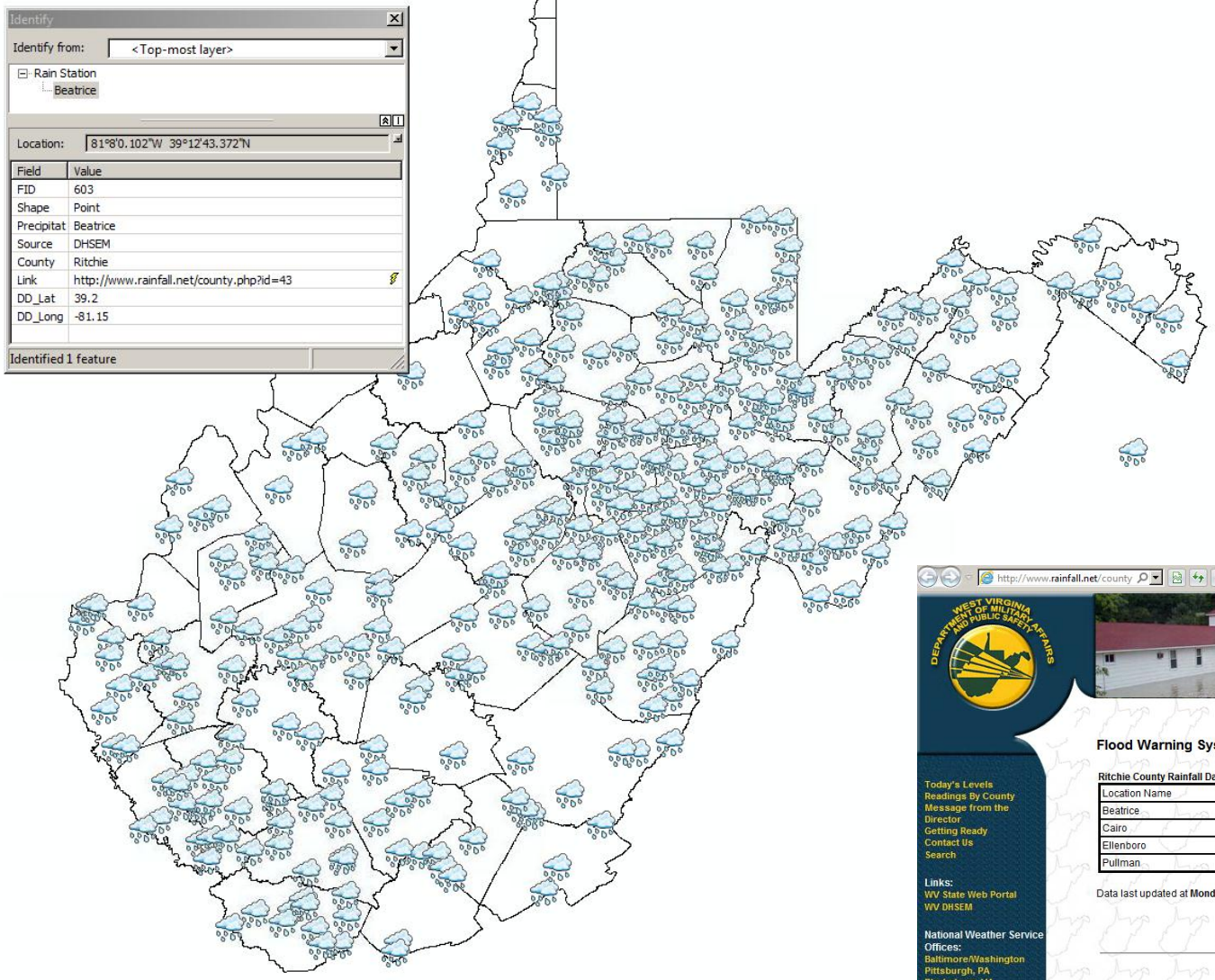
Summary for Period of Continuous Record
Depth to water level, feet below land surface
Approved Daily Values Data Used in Analysis

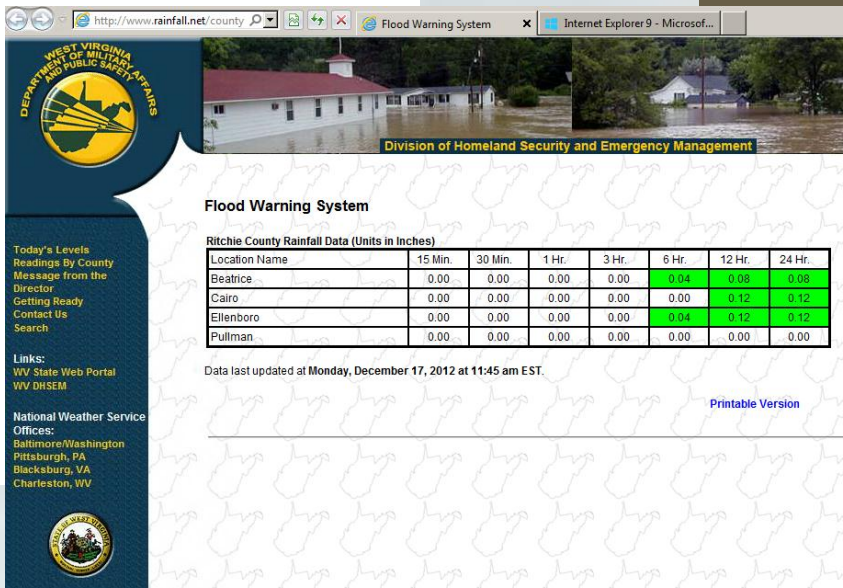
Begin Date	End Date	Days	% Complete
10/07/08	09/30/11	986	90

Daily Data Options

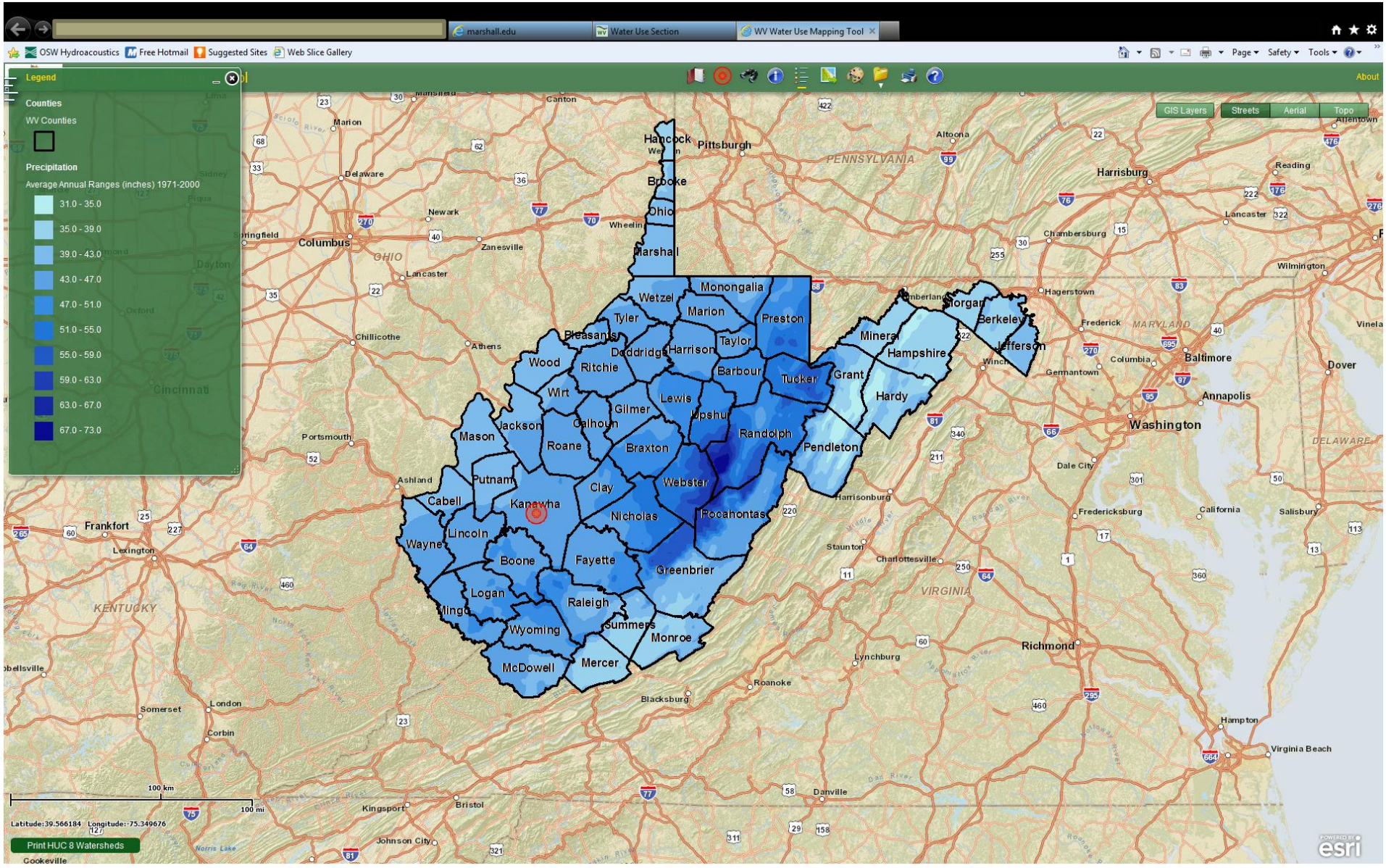
- View latest data from NWISWeb
- View data in calendar format
- Download data in text format
- View daily medians

Precipitation Sites

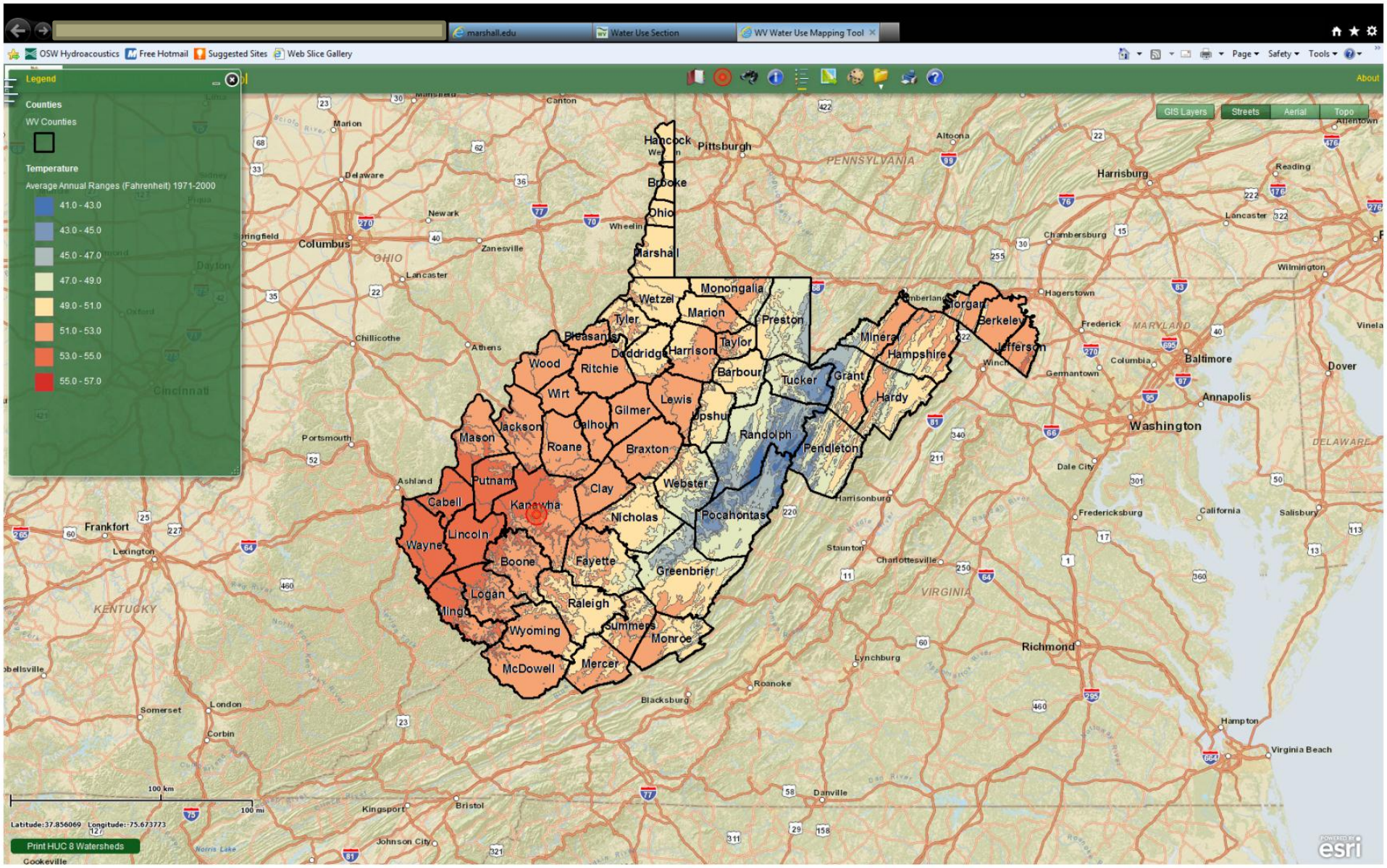




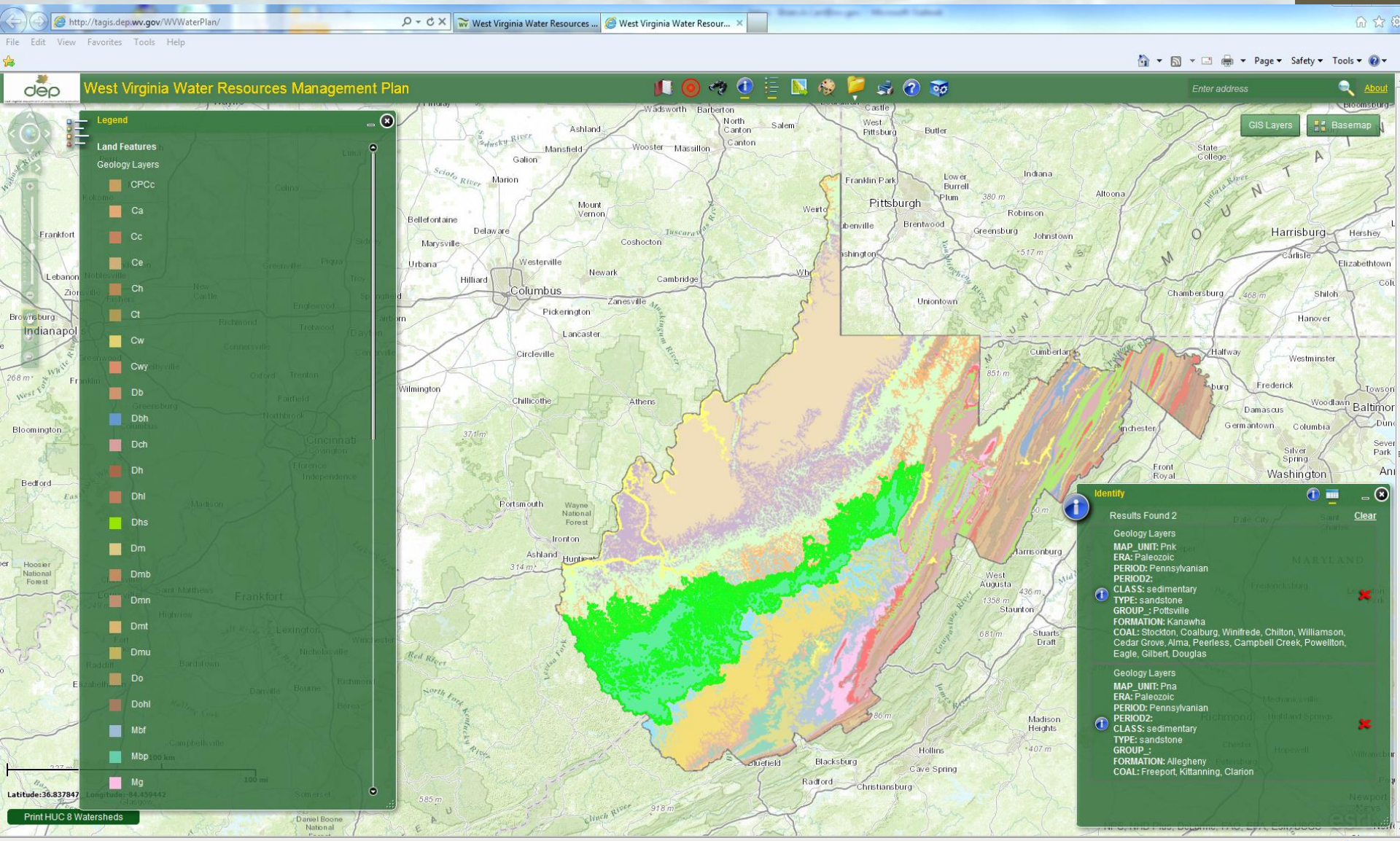
GIS Layers – Annual Precipitation



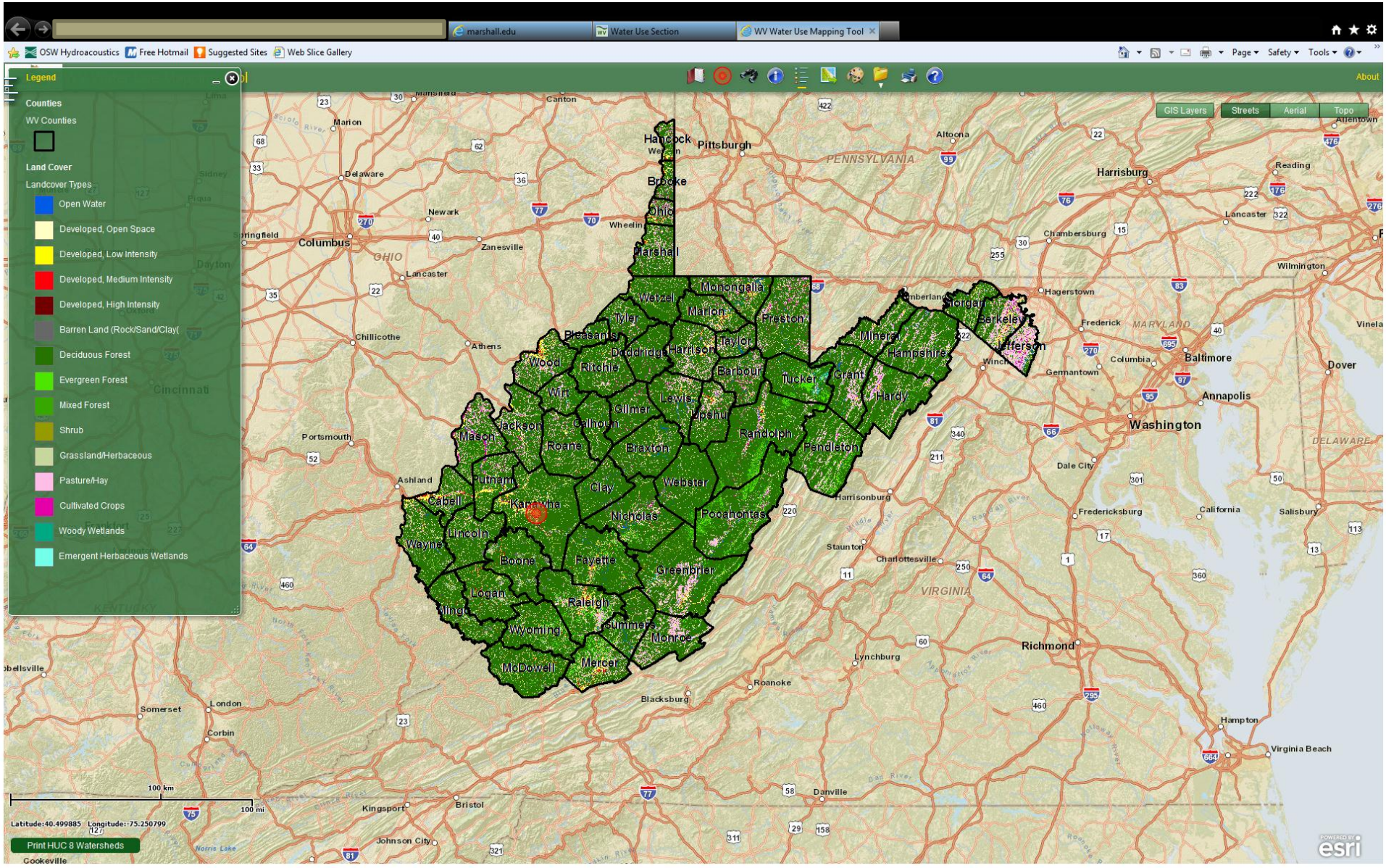
GIS Layers – Annual Temperature



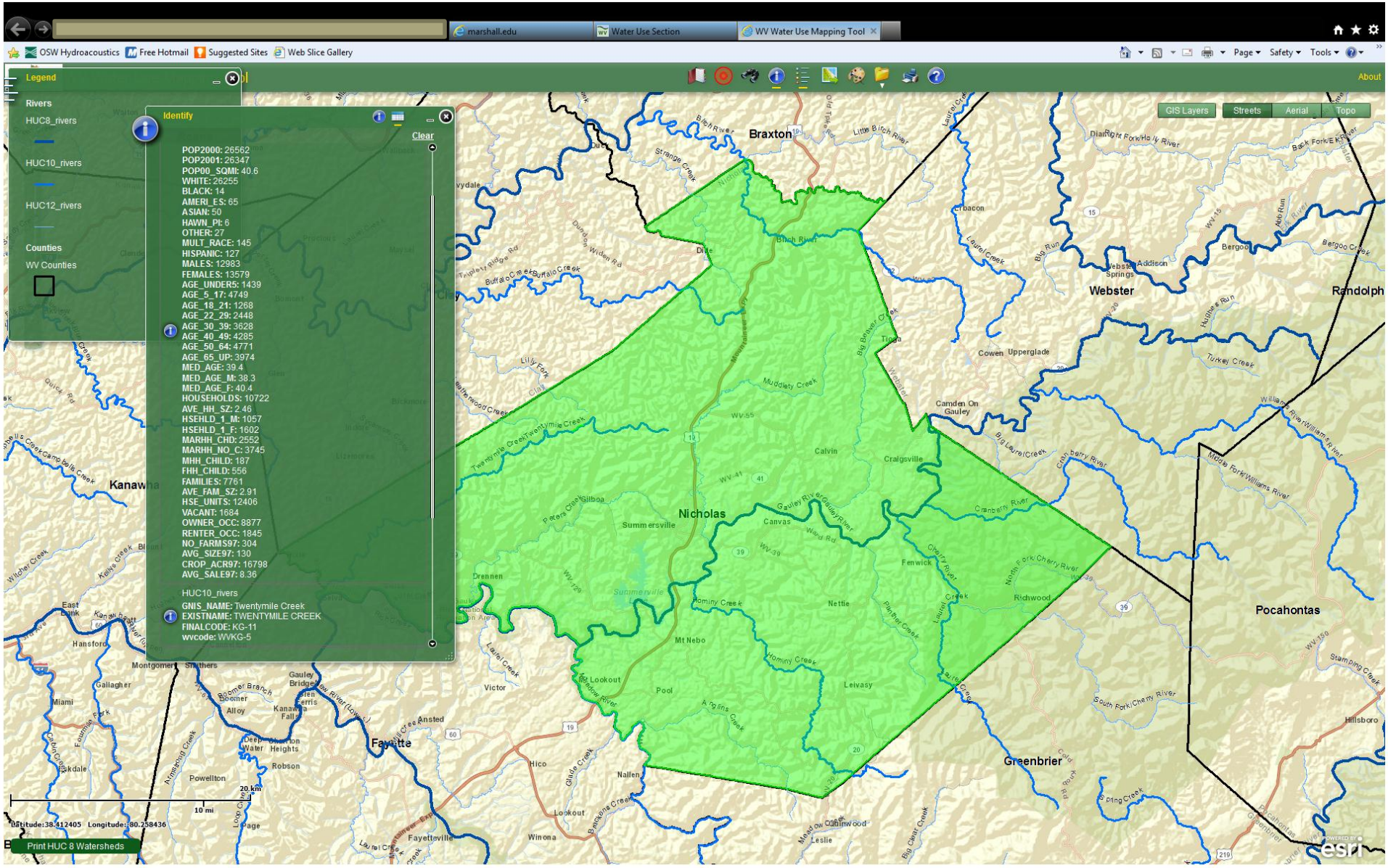
GIS Layers – Surface Bedrock



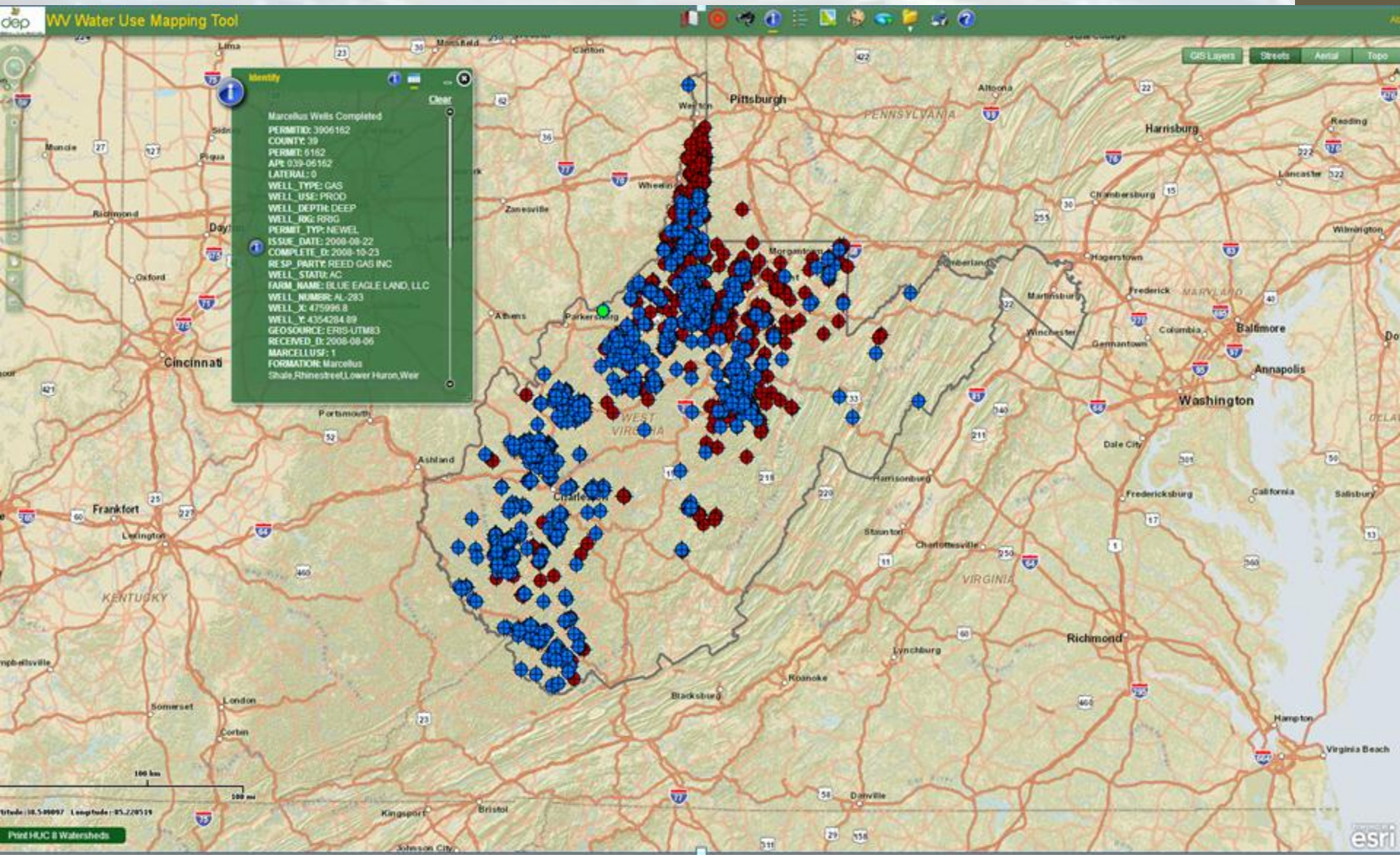
GIS Layers - Landcover



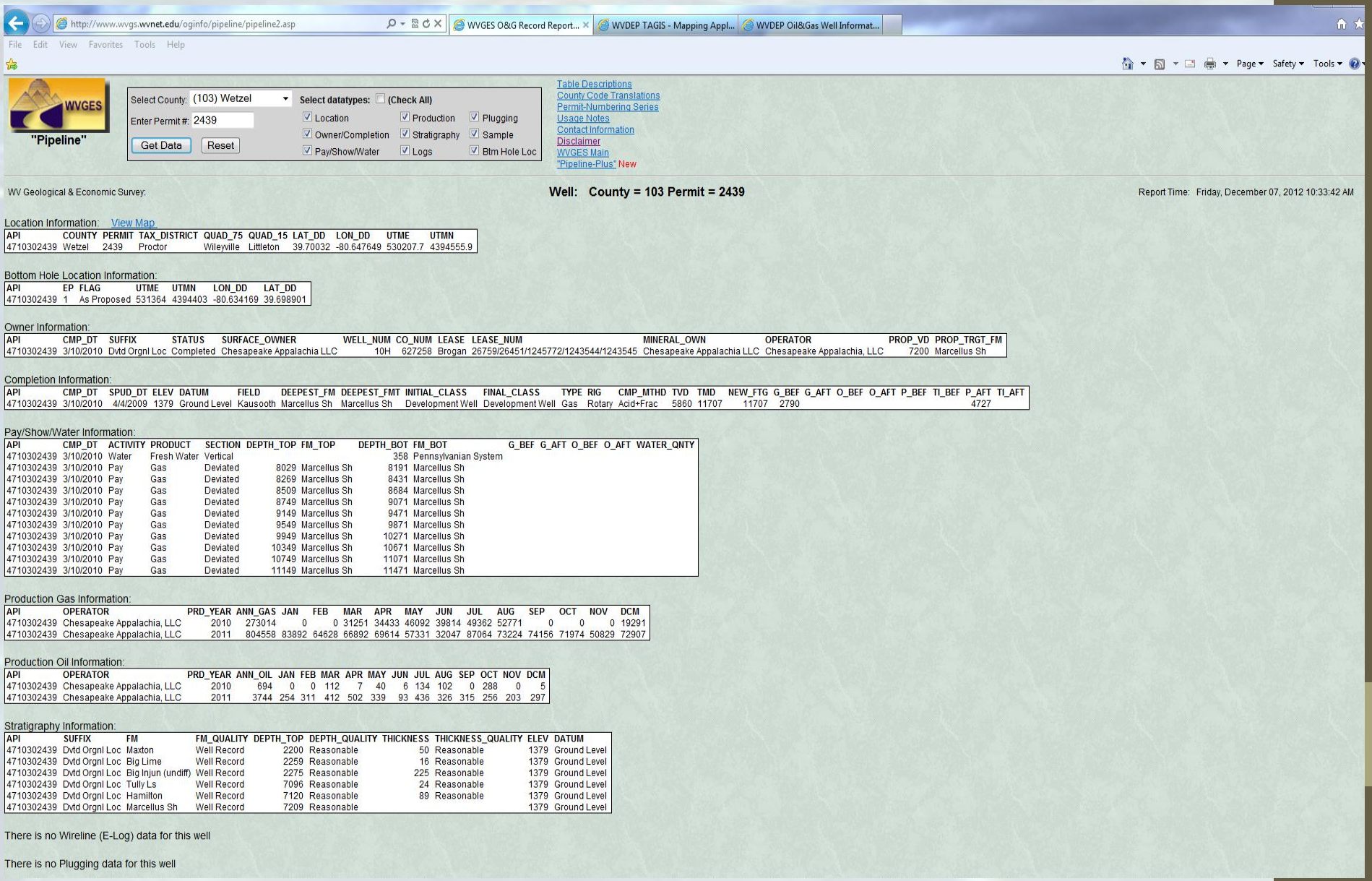
GIS Layers – 2010 Census Data



GIS Layers - Marcellus Wells



Link to WVGES O&G Well Pipeline



http://www.wvgs.wvnet.edu/oginfo/pipeline/pipeline2.asp

WVGES O&G Record Report... | WVDEP TAGIS - Mapping Appl... | WVDEP Oil&Gas Well Informat...

File Edit View Favorites Tools Help

Page Safety Tools

WVGES "Pipeline"

Select County: (103) Wetzel Enter Permit #: 2439 Get Data Reset

Select datatypes: (Check All)

Location | Production | Plugging
Owner/Completion | Stratigraphy | Sample
Pay/Show/Water | Logs | Btm Hole Loc

Table Descriptions
County Code Translations
Permit-Numbering Series
Usage Notes
Contact Information
Disclaimer
WVGES Main
"Pipeline-Plus" New

WV Geological & Economic Survey:

Well: County = 103 Permit = 2439

Report Time: Friday, December 07, 2012 10:33:42 AM

Location Information: View Map

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LON_DD	UTME	UTMN
4710302439	Wetzel	2439	Proctor	Wileyville	Littleton	39.70032	-80.647649	530207.7	4394555.9

Bottom Hole Location Information:

API	EP	FLAG	UTME	UTMN	LON_DD	LAT_DD
4710302439	1	As Proposed	531364	4394403	-80.634169	39.698901

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR	PROP_VD	PROP_TRGT_FM
4710302439	3/10/2010	Dvtd Orgnl Loc	Completed	Chesapeake Appalachia LLC	10H	627258	Brogan	26759/26451/1245772/1243544/1243545	Chesapeake Appalachia LLC	Chesapeake Appalachia, LLC	7200	Marcellus Sh

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD	NEW_FTG	G_BEF	G_AFT	O_BEF	O_AFT	P_BEF	TI_BEF	P_AFT	TI_AFT
4710302439	3/10/2010	4/4/2009	1379	Ground Level	Kausooth	Marcellus Sh	Marcellus Sh	Development Well	Development Well	Gas	Rotary	Acid+Frac	5860	11707	11707	2790						4727	

Pay/Show/Water Information:

API	CMP_DT	ACTIVITY	PRODUCT	SECTION	DEPTH_TOP	FM_TOP	DEPTH_BOT	FM_BOT	G_BEF	G_AFT	O_BEF	O_AFT	WATER_QNTY
4710302439	3/10/2010	Water	Fresh Water	Vertical			358	Pennsylvanian System					
4710302439	3/10/2010	Pay	Gas	Deviated	8029	Marcellus Sh	8191	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	8269	Marcellus Sh	8431	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	8509	Marcellus Sh	8684	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	8749	Marcellus Sh	9071	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	9149	Marcellus Sh	9471	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	9549	Marcellus Sh	9871	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	9949	Marcellus Sh	10271	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	10349	Marcellus Sh	10671	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	10749	Marcellus Sh	11071	Marcellus Sh					
4710302439	3/10/2010	Pay	Gas	Deviated	11149	Marcellus Sh	11471	Marcellus Sh					

Production Gas Information:

API	OPERATOR	PRD_YEAR	ANN_GAS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DCM
4710302439	Chesapeake Appalachia, LLC	2010	273014	0	0	31251	34433	46092	39814	49362	52771	0	0	0	19291
4710302439	Chesapeake Appalachia, LLC	2011	804558	83892	64628	66892	69614	57331	32047	87064	73224	74156	71974	50829	72907

Production Oil Information:

API	OPERATOR	PRD_YEAR	ANN_OIL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DCM
4710302439	Chesapeake Appalachia, LLC	2010	694	0	0	112	7	40	6	134	102	0	288	0	5
4710302439	Chesapeake Appalachia, LLC	2011	3744	254	311	412	502	339	93	436	326	315	256	203	297

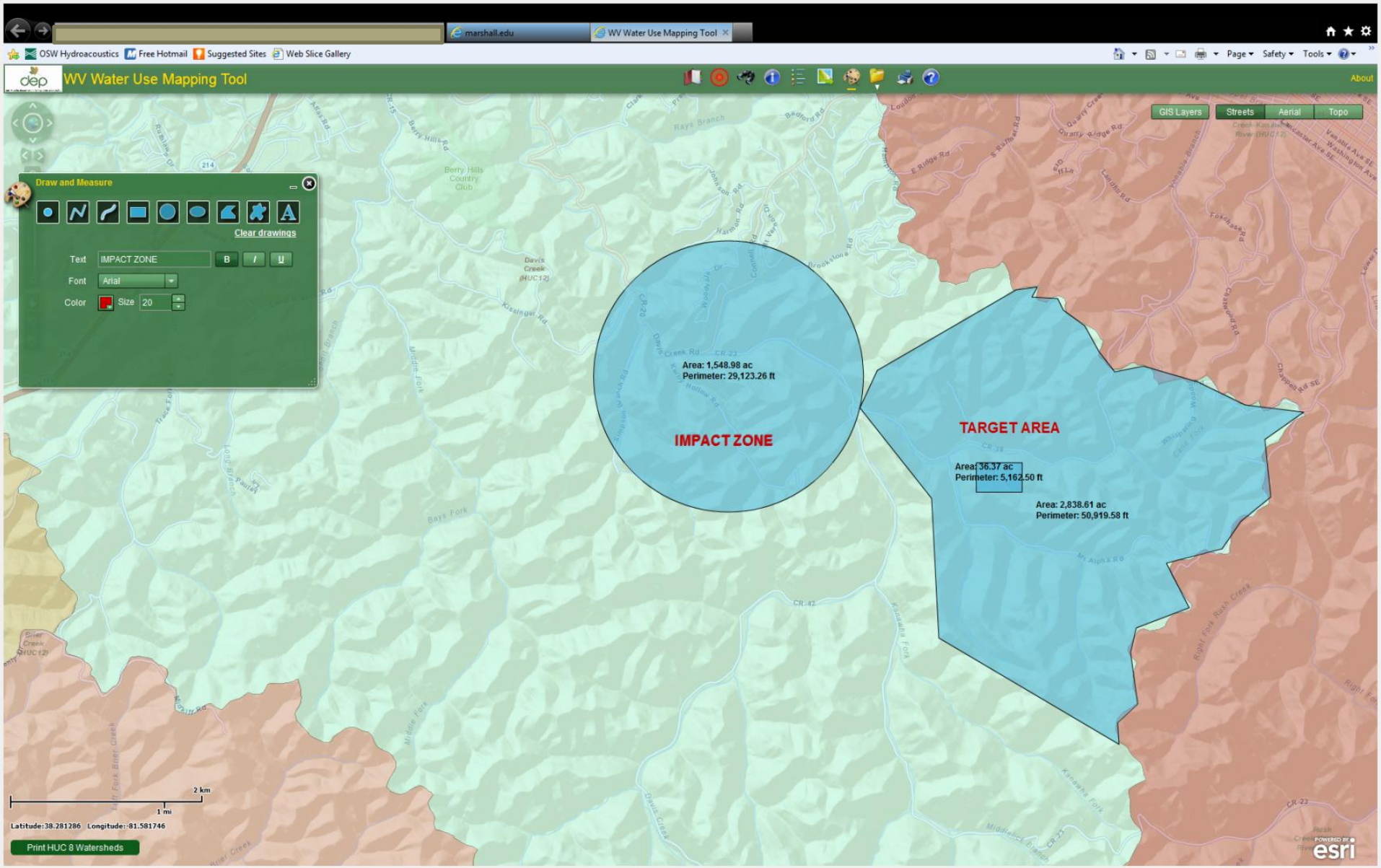
Stratigraphy Information:

API	SUFFIX	FM	FM_QUALITY	DEPTH_TOP	DEPTH_QUALITY	THICKNESS	THICKNESS_QUALITY	ELEV	DATUM
4710302439	Dvtd Orgnl Loc	Maxton	Well Record	2200	Reasonable	50	Reasonable	1379	Ground Level
4710302439	Dvtd Orgnl Loc	Big Lime	Well Record	2259	Reasonable	16	Reasonable	1379	Ground Level
4710302439	Dvtd Orgnl Loc	Big Injun (undiff)	Well Record	2275	Reasonable	225	Reasonable	1379	Ground Level
4710302439	Dvtd Orgnl Loc	Tully Ls	Well Record	7096	Reasonable	24	Reasonable	1379	Ground Level
4710302439	Dvtd Orgnl Loc	Hamilton	Well Record	7120	Reasonable	89	Reasonable	1379	Ground Level
4710302439	Dvtd Orgnl Loc	Marcellus Sh	Well Record	7209	Reasonable			1379	Ground Level

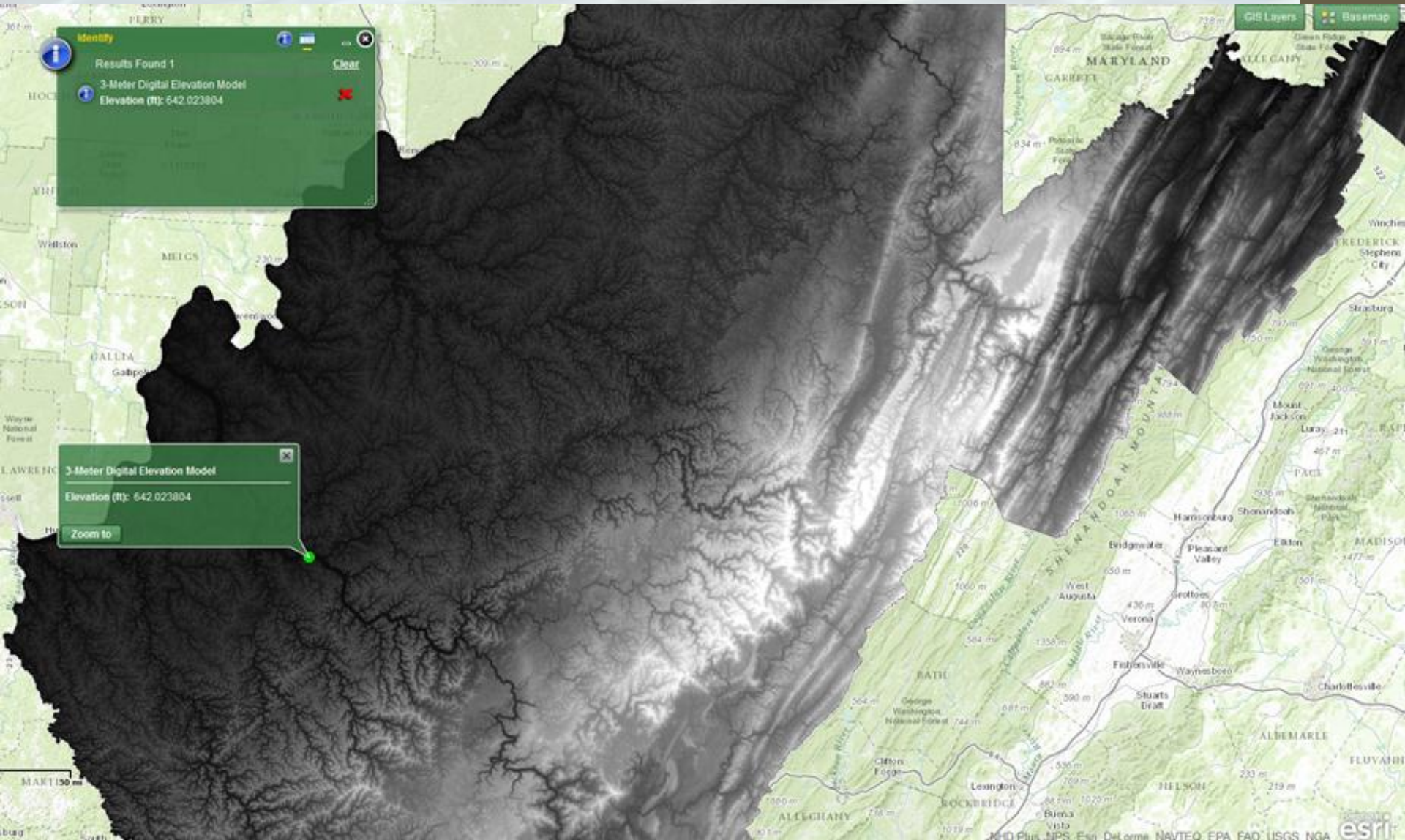
There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

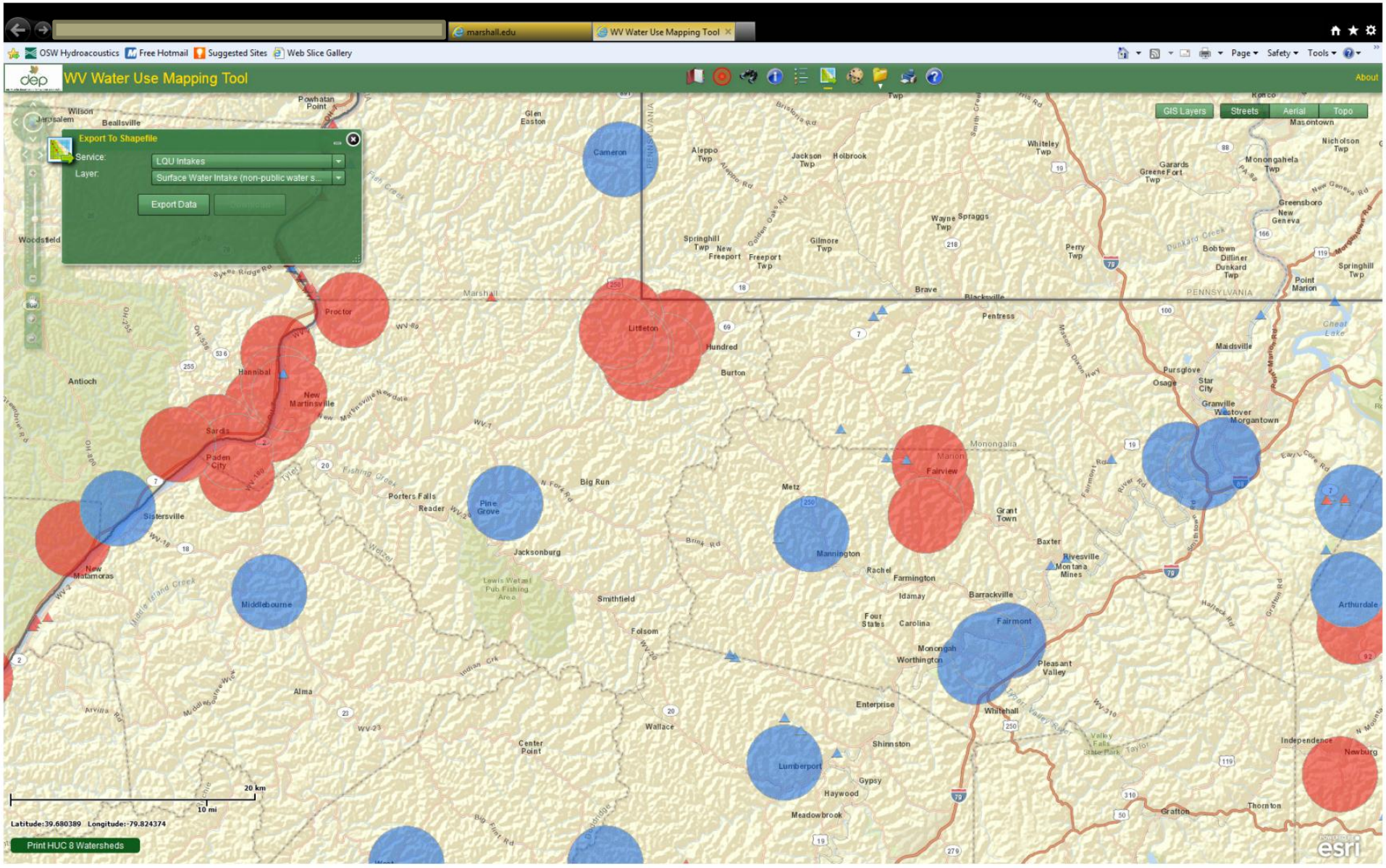
Draw Tool


marshall.edu
WV Water Use Mapping Tool
OSW Hydroacoustics
Free Hotmail
Suggested Sites
Web Slice Gallery
WV Water Use Mapping Tool
About
GIS Layers
Streets
Aerial
Topo
Draw and Measure
Clear drawings
Text
IMPACT ZONE
Font
Arial
Color
Size
20
Area: 1,548.98 ac
Perimeter: 29,123.26 ft
IMPACT ZONE
TARGET AREA
Area: 36.37 ac
Perimeter: 5,162.50 ft
Area: 2,838.61 ac
Perimeter: 50,919.58 ft
2 km
1 mi
Latitude:38.281286 Longitude:-81.581746
Print HUC 8 Watersheds
esri

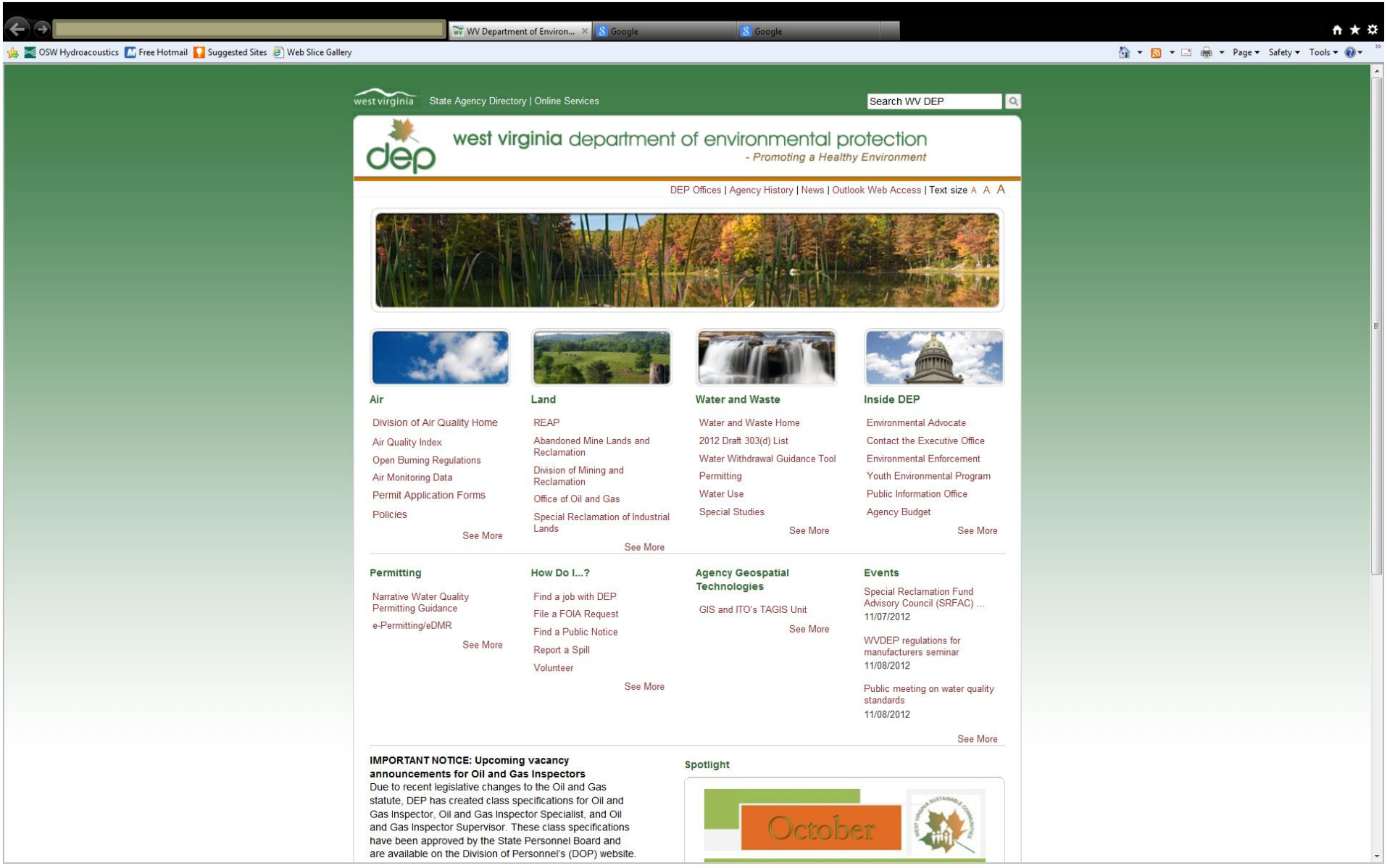
3 Meter Digital Elevation Model



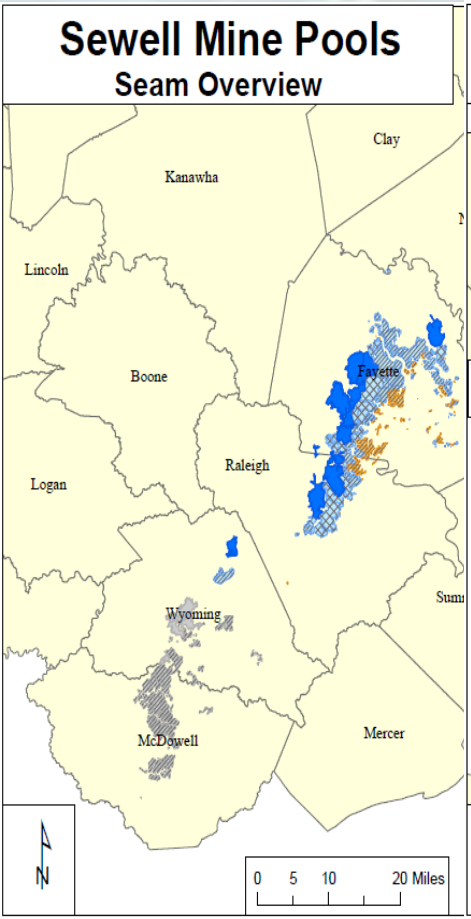
Export/Print

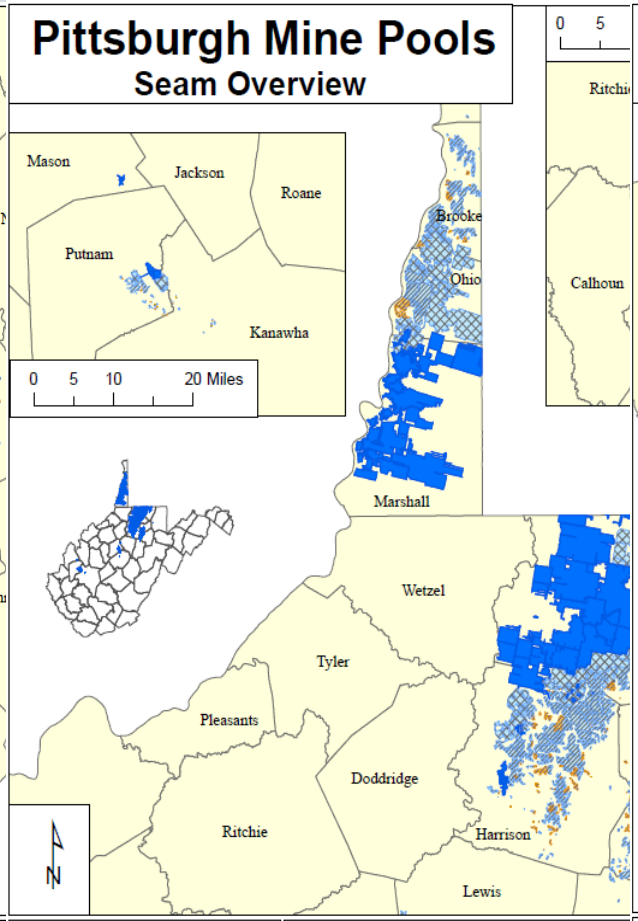


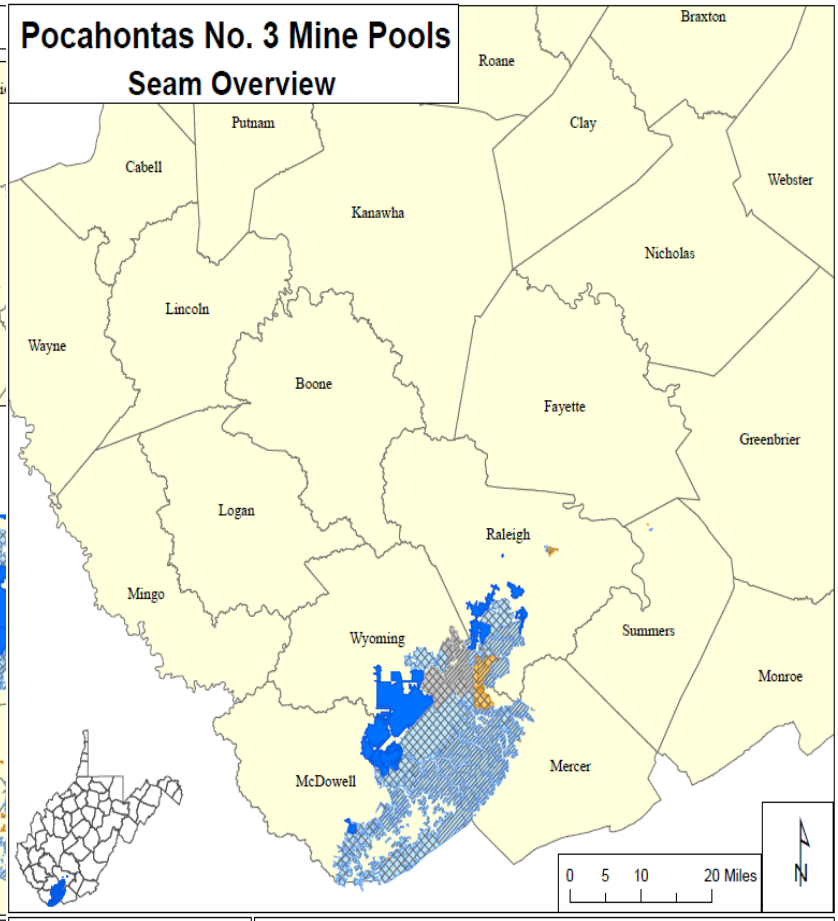
Web Site Links



Mine Pool Atlas Link







Legend

Position

- Above Drainage
- Near Drainage
- Below Drainage

Potential Extent of Flooding

- Undetermined
- Flooded areas unlikely
- Partially flooded
- Totally flooded

Sewell M

No. of Mines	
Mean coal thickness (feet)	
Min. foot print area (acres)	
Max. foot print area (acres)	
Mean foot print area (acres)	
Median foot print area (acres)	
Total foot print area (acres)	
Estimated void volume (acre feet)	
Max. potential storage (million gallons)	

Legend

Position

- Above Drainage
- Near Drainage
- Below Drainage

Potential Extent of Flooding

- Undetermined
- Flooded areas unlikely
- Partially flooded
- Totally flooded

Pittsburgh Mine F

	Undetermined
No. of Mines	0
Mean coal thickness (feet)	0.00
Min. foot print area (acres)	0.00
Max. foot print area (acres)	0.00
Mean foot print area (acres)	0.00
Median foot print area (acres)	0.00
Total foot print area (acres)	0.00
Estimated void volume (acre feet)	0.00
Max. potential storage (million gallons)	0.00

Legend

Position

- Above Drainage
- Near Drainage
- Below Drainage

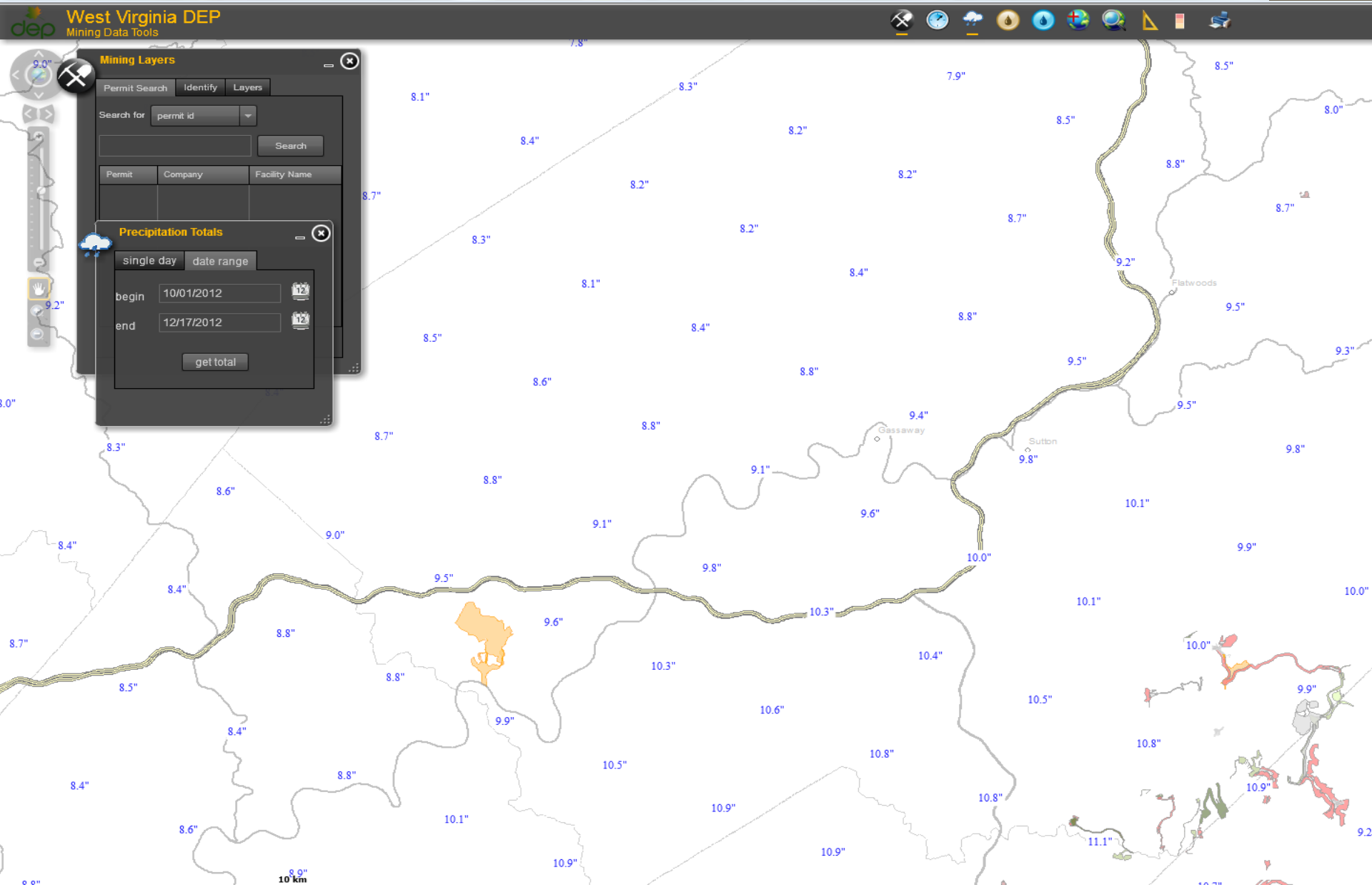
Potential Extent of Flooding

- Undetermined
- Flooded areas unlikely
- Partially flooded
- Totally flooded

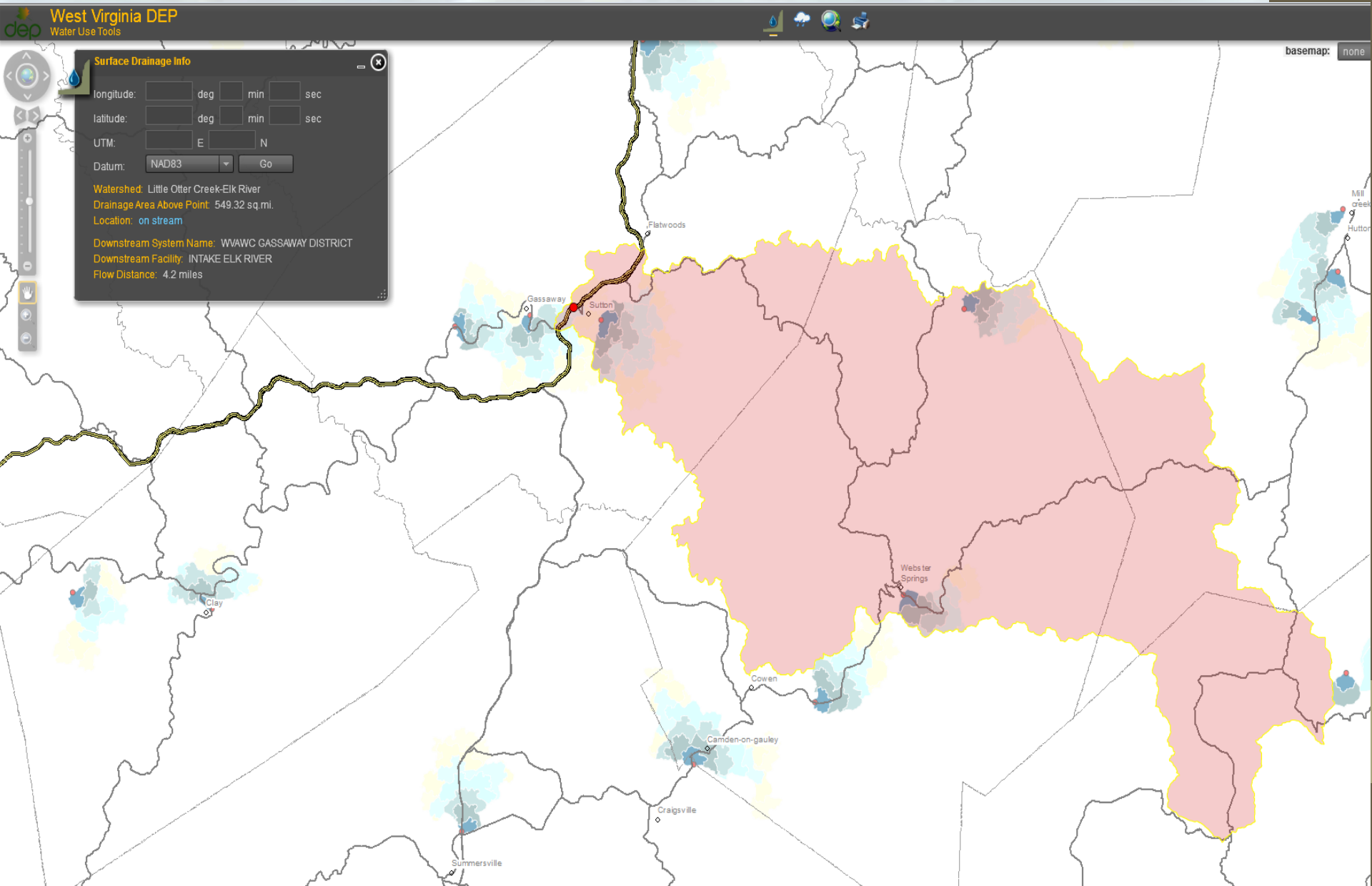
Pocahontas No. 3 Mine Pool Statistics

	Undetermined	Potentially flooded areas unlikely	Potentially partially flooded	Potentially totally flooded
No. of Mines	19	56	211	13
Mean coal thickness (feet)	3.63	4.27	4.72	4.10
Min. foot print area (acres)	1.00	0.02	0.03	23.38
Max. foot print area (acres)	7,469.50	4,312.28	24,666.84	21,361.85
Mean foot print area (acres)	990.66	142.19	771.26	3,350.77
Median foot print area (acres)	174.18	0.73	168.10	1,247.45
Total foot print area (acres)	18,822.60	7,962.37	162,736.63	43,560.05
Estimated void volume (acre feet)	37,037.88	13,978.94	396,114.19	98,167.56
Max. potential storage (million gallons)	12,070.64	4,555.74	129,093.61	31,992.81

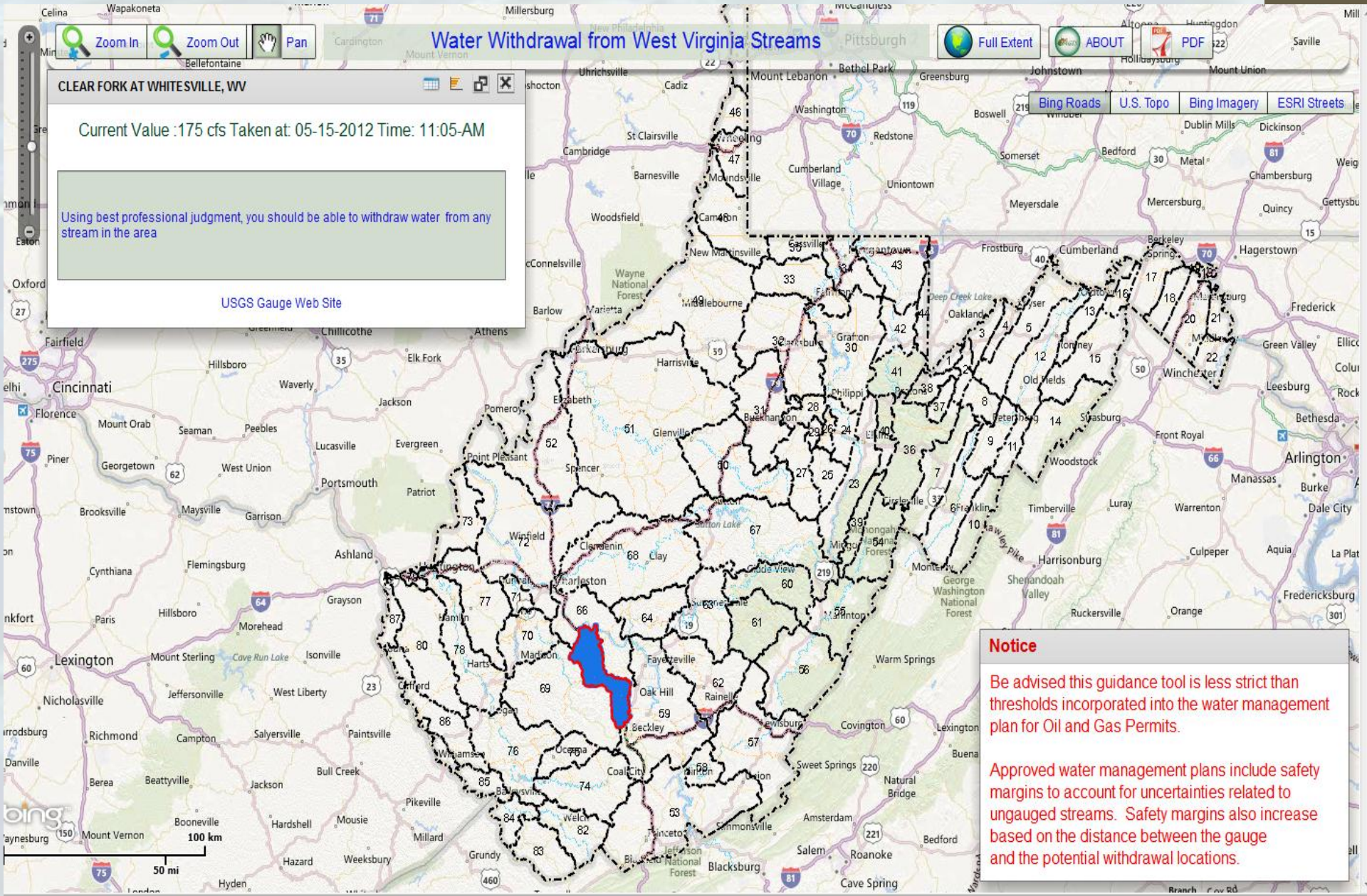
Precipitation - Total Over Date Range



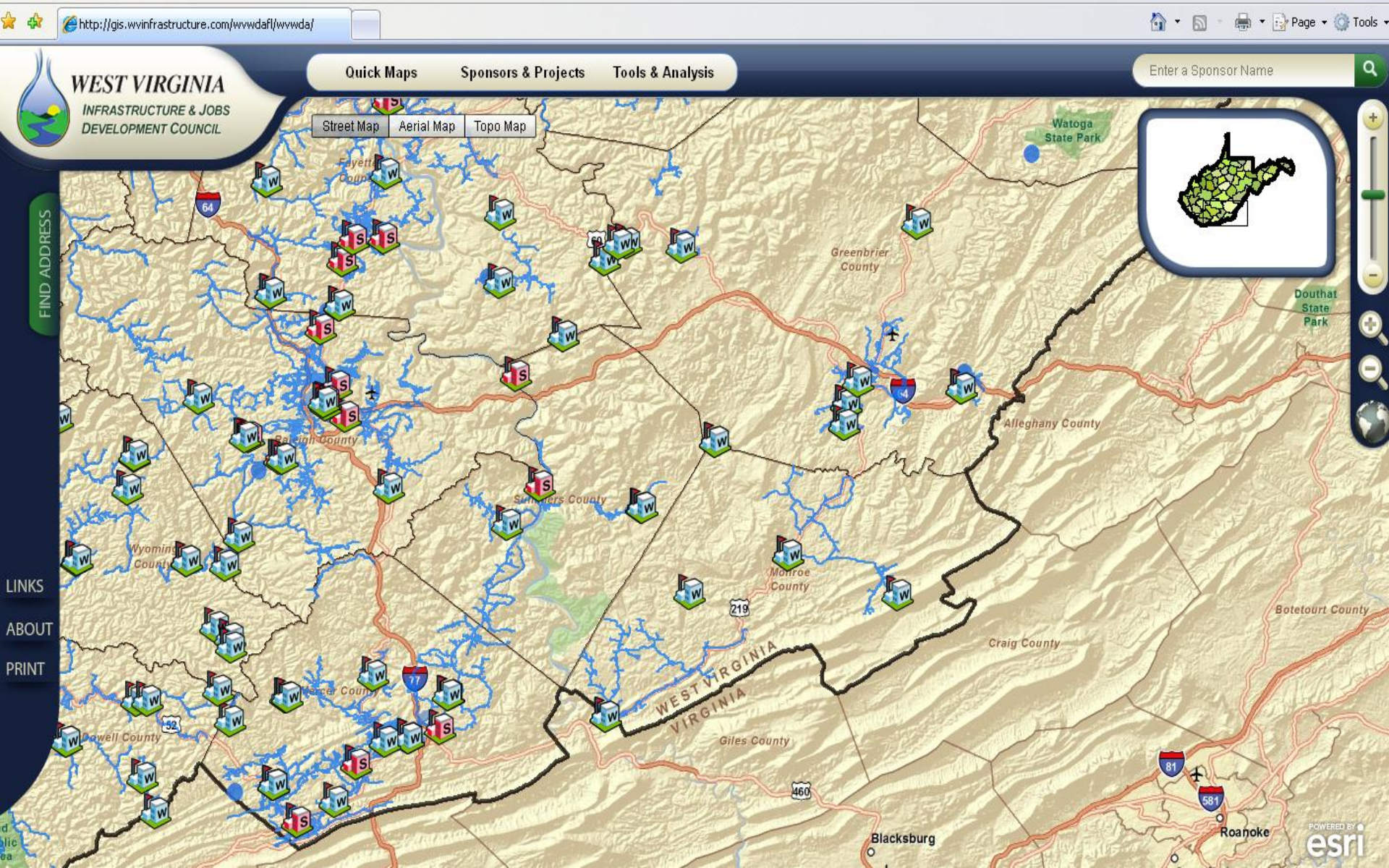
Basin Size Widget



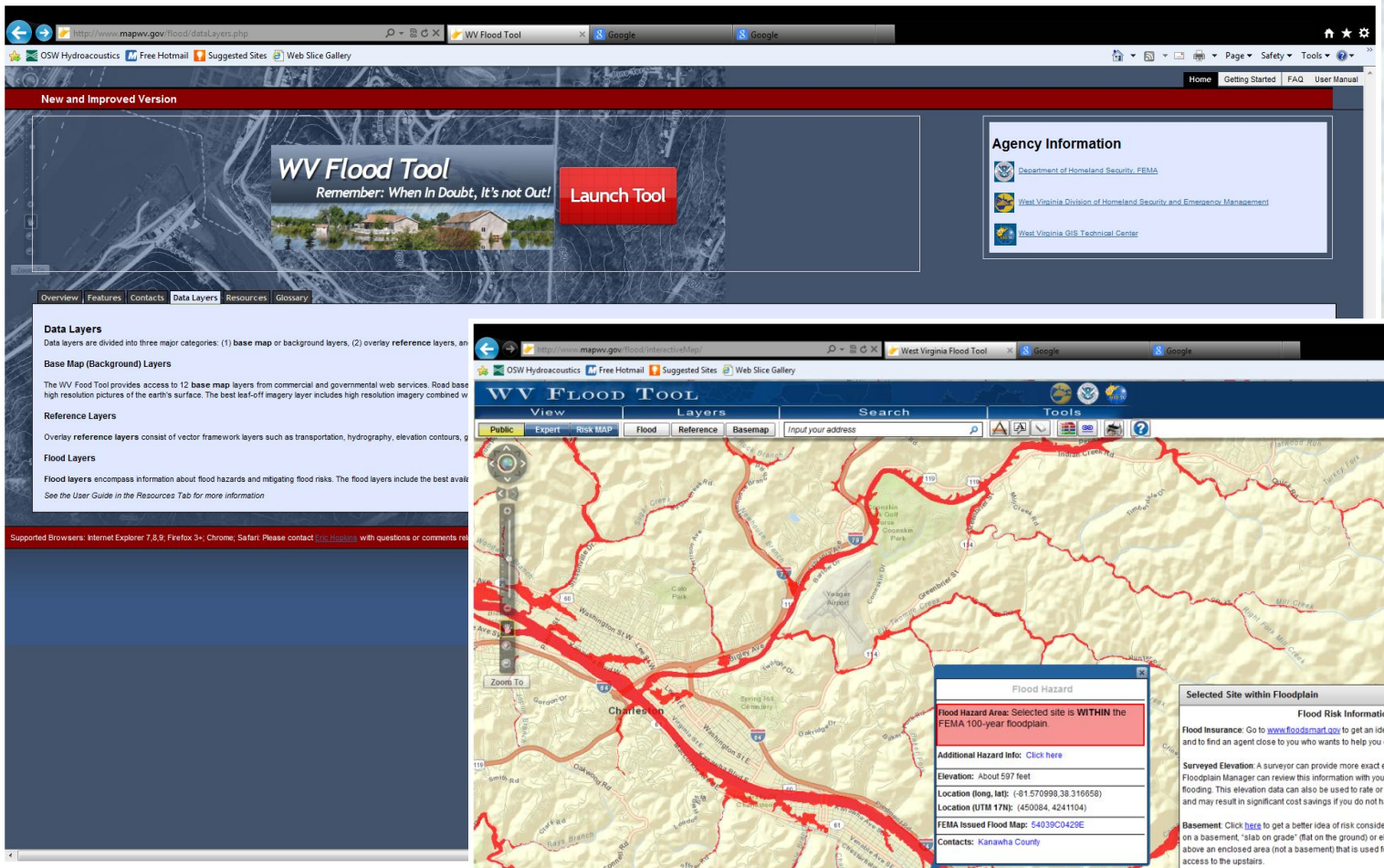
Water Withdrawal Tool

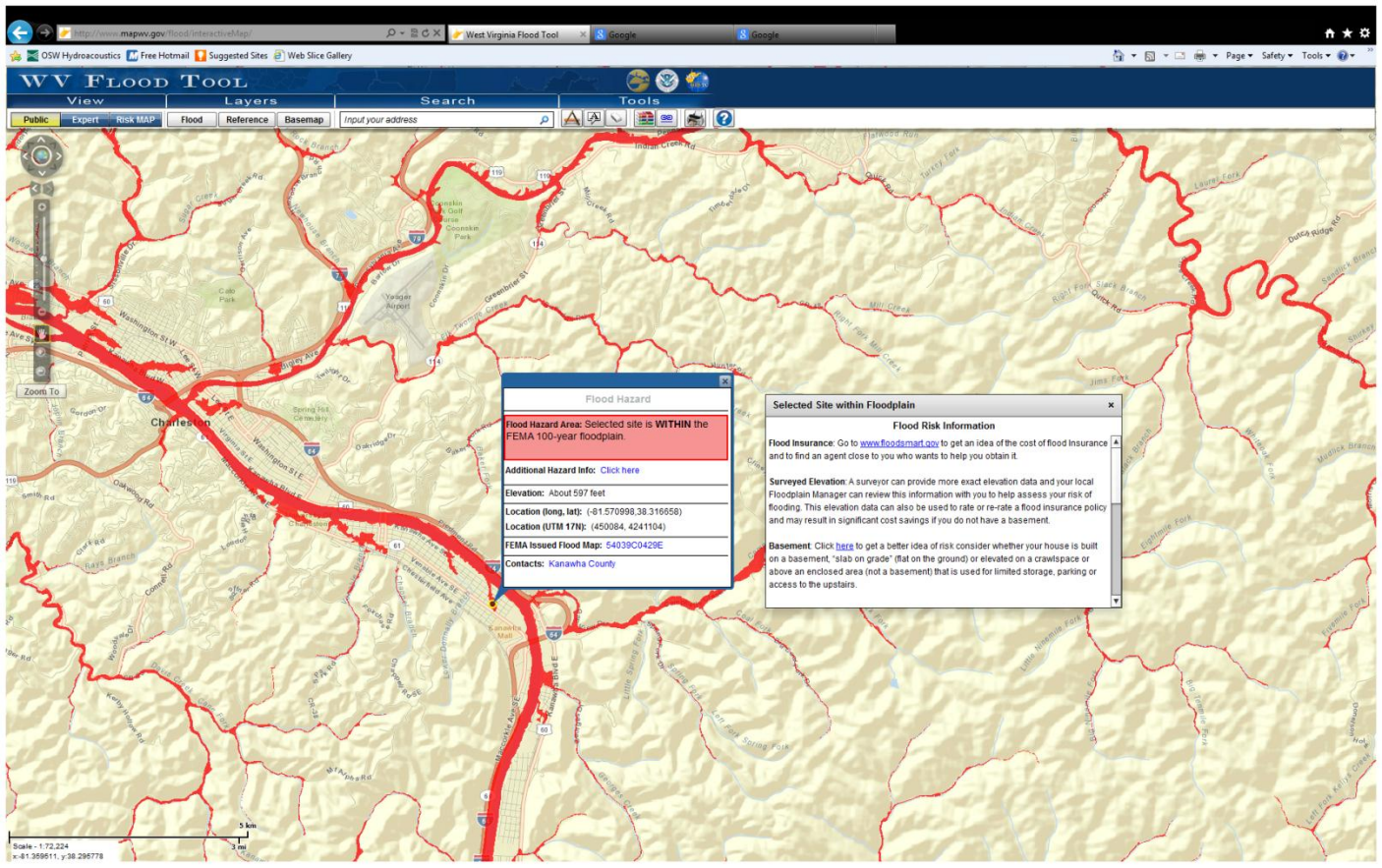


WV Infrastructure and Jobs Development Council GIS Site

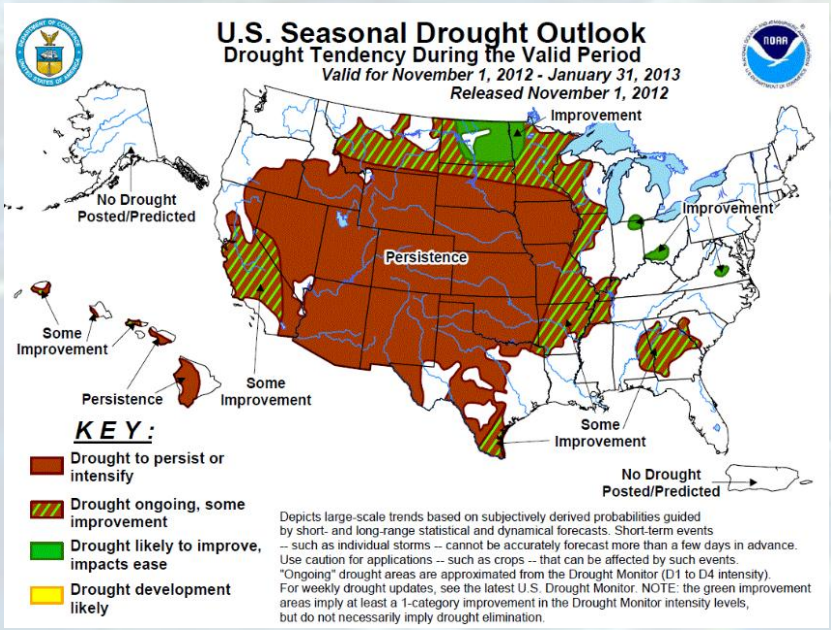


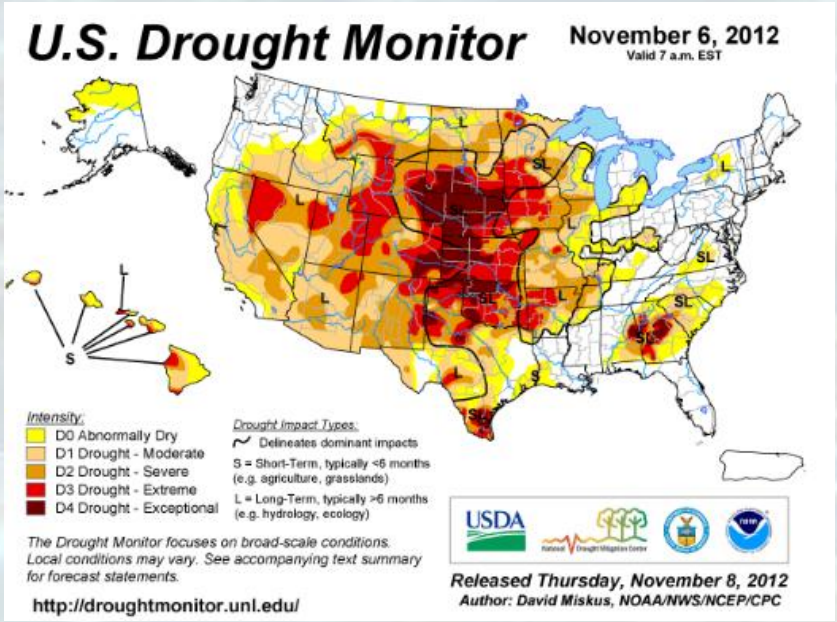
WV Flood Tool Site

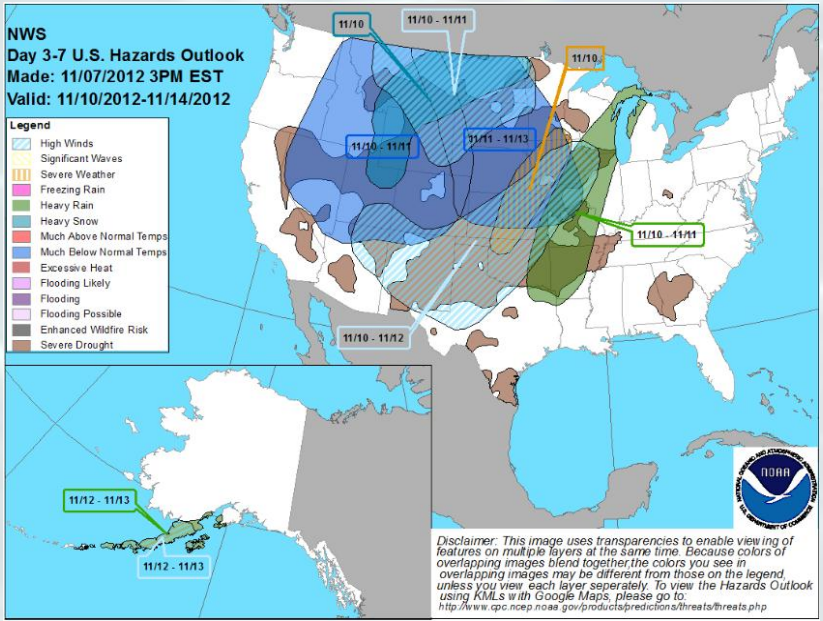


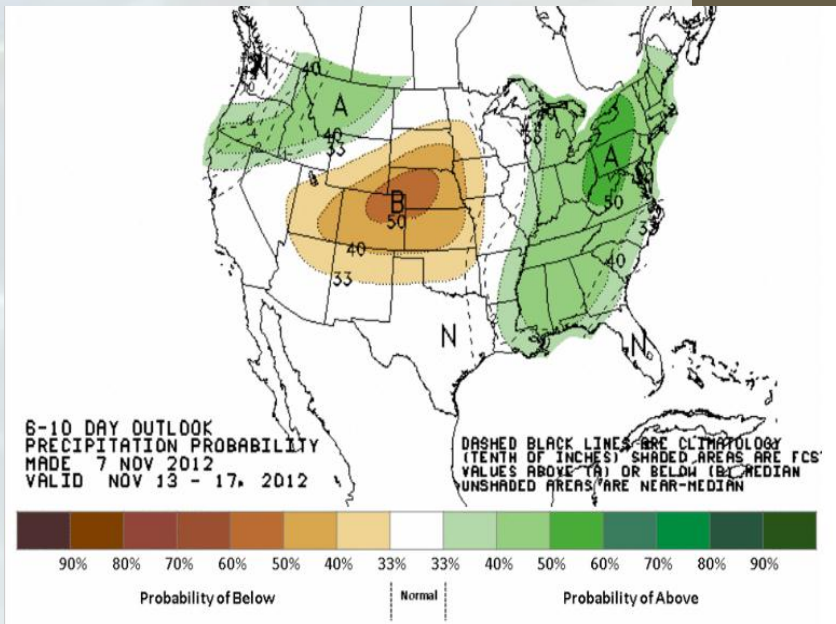


Drought Monitoring Sites

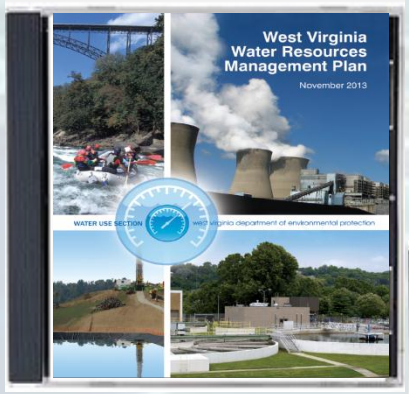


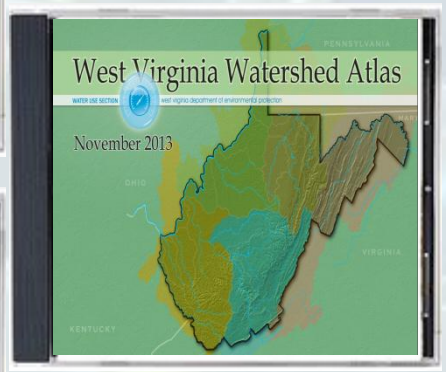


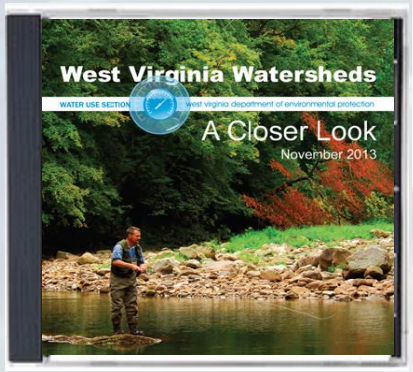




The WVWRMP and Companion Reports were Submitted November 22, 2013

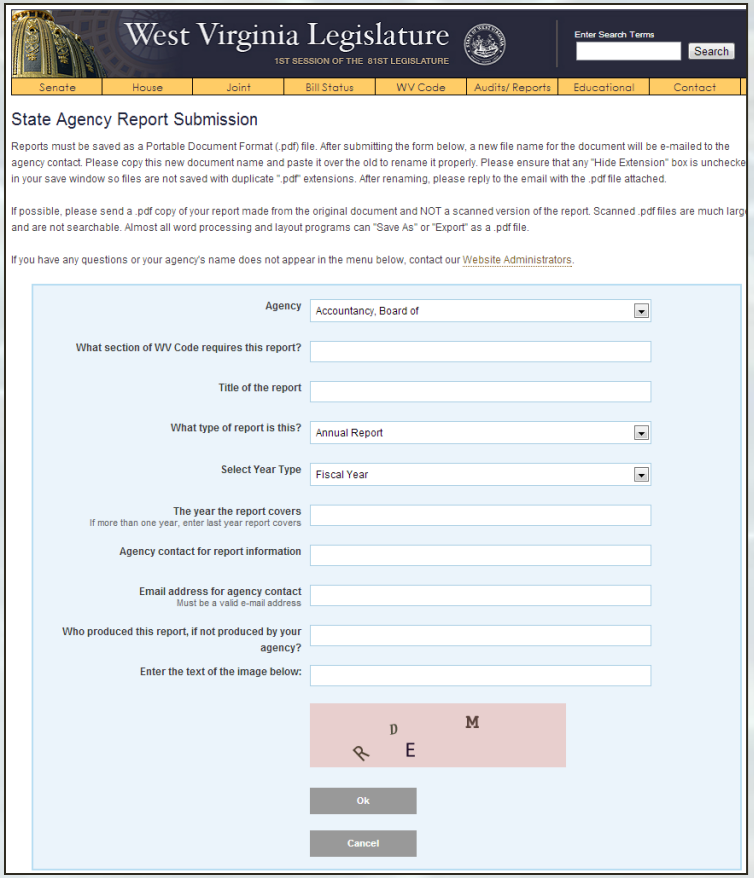






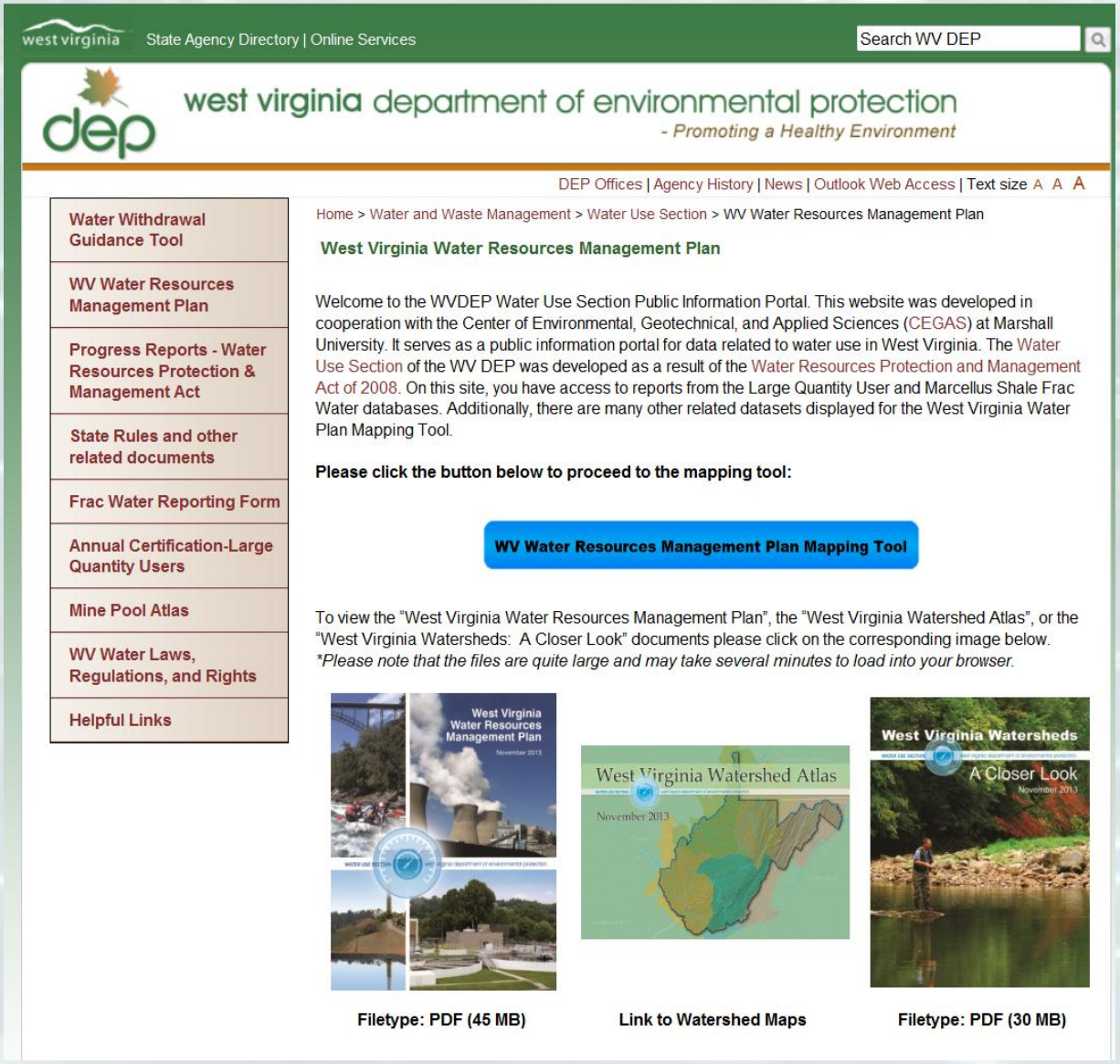
A set of 3 CD's were hand delivered to the Senate and House Chairs of this Commission

The Plan was posted on the Legislative State Agency Report Submission site.



WVWRMP Mapping Tool

Google search: wvwaterplan and click the Blue Button



Example Future Pursuits

- Develop a guidance document describing the appropriate procedures for protection against spread of invasive species and other best management practices relative to water withdrawals.
- Gather water quality data for mine pool waters in order to improve the Mine Pool Atlas and better identify the resource's potential for use by new and existing industry.
- Better identify the state's groundwater by improved data collection methods, ongoing USGS studies, and computer modeling.
- Identify regional water resource issues based on the five defined water regions of the state.

Example Future Pursuits

- Host an Annual Statewide Water Resources Conference in different locations across the state. The principal objectives of the conference will be:

- Publish online reports in order to update data contained within the Plan.

- Continue to enhance the water withdrawal tool by incorporating the results of scientific studies and continuing stream flow data collection at partial record stations.

Recommendations

- **The Commission should consider amending the statutory definition of "large quantity user" at W. Va. Code § 22-26-2(i).**
- **The Commission should consider amending the statutory survey and registration requirements of the Act to eliminate variances.**
- **The Commission should consider assisting in efforts to continue funding stream gages and amending the Act to require notification if a funding partner becomes unable to contribute.**
- **The Commission should consider whether the state should acquire Light Detection and Ranging (LIDAR) coverage for the 70% of the state that has not yet been so mapped.**
- **The Commission should encourage continued collaboration among all affected agencies to improve data collection regarding the state's water resources.**

Thank You

WV department of environmental protection

-Promoting a healthy environment

dep

QUESTIONS ?

WV department of environmental protection

-Promoting a healthy environment

dep