2022 Annual Water Resources Report

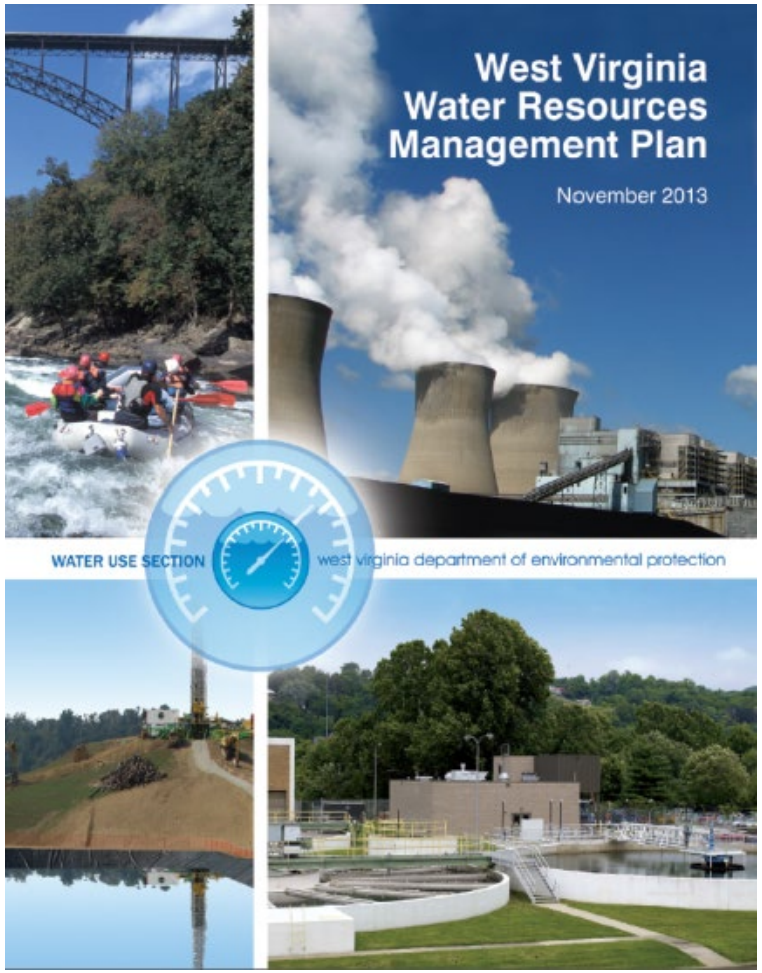
Joint Legislative Oversight Commission on State Water Resources

Prepared by the

West Virginia Department of Environmental Protection
Division of Water and Waste Management
Water Use Section

Water Resources Management Overview

- W.Va. Code §22-26 originally passed in 2004.
- Senate Bill 641 renamed it the Water Resources Protection and Management Act in 2008.
- The WVDEP Water Use Section was created in 2008 to accomplish the Act's requirements.
- The WV Water Resources Management Plan was submitted in 2013.
- The Plan was adopted as part of Senate Bill 373 in 2014.

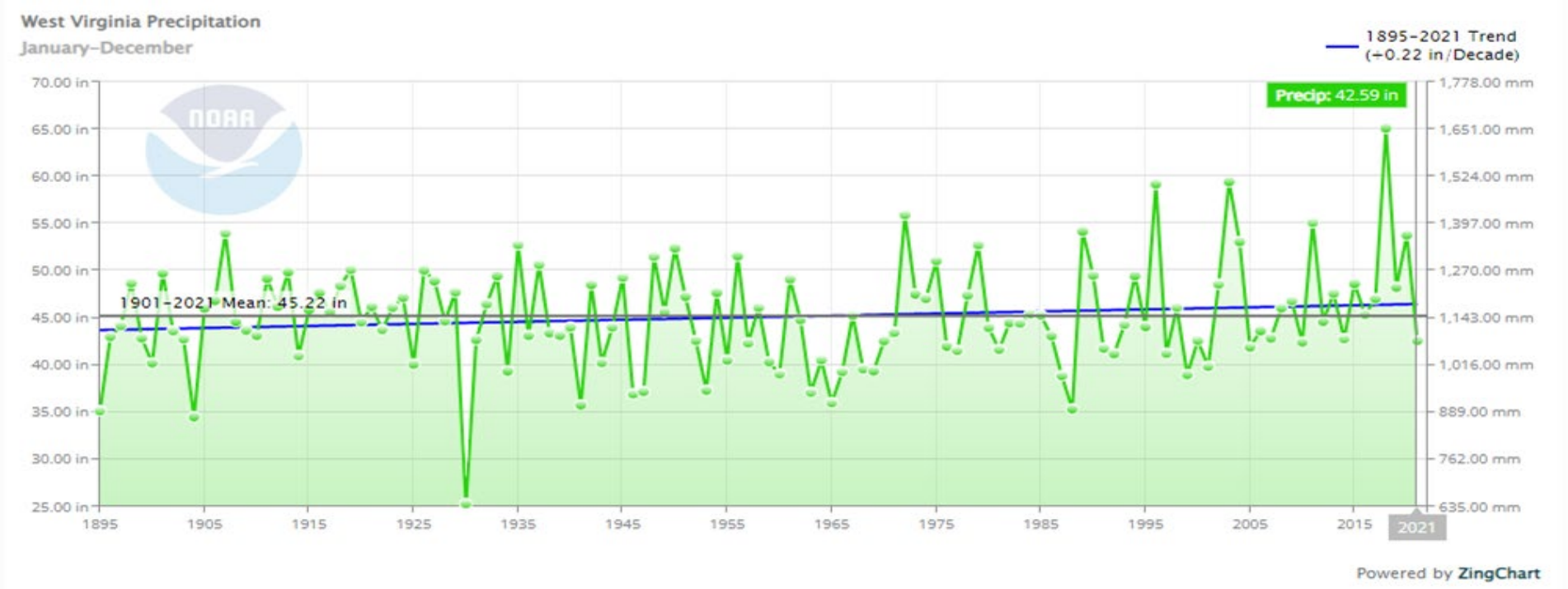


1895-2021 Water Resources Availability

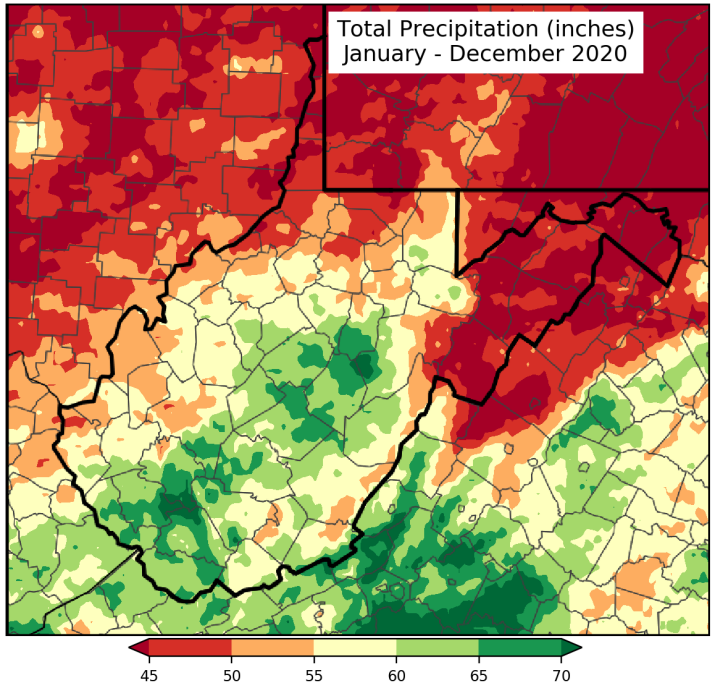
2019
average rainfall
w/dry periods 48”

2020
slightly higher
than average
rainfall
54”

2021
slightly lower than
average rainfall
43”

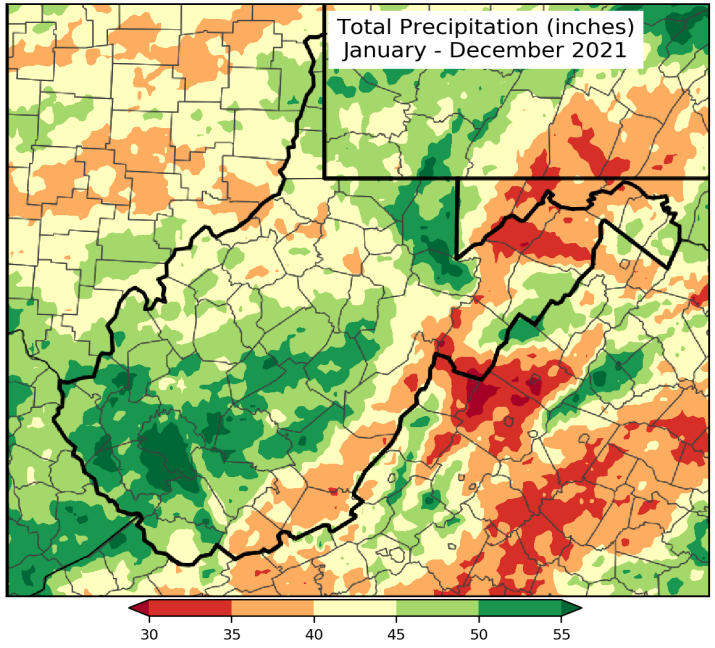


WV’s annual precipitation from 1895 – 2021 (from National Oceanic and Atmospheric Administration).

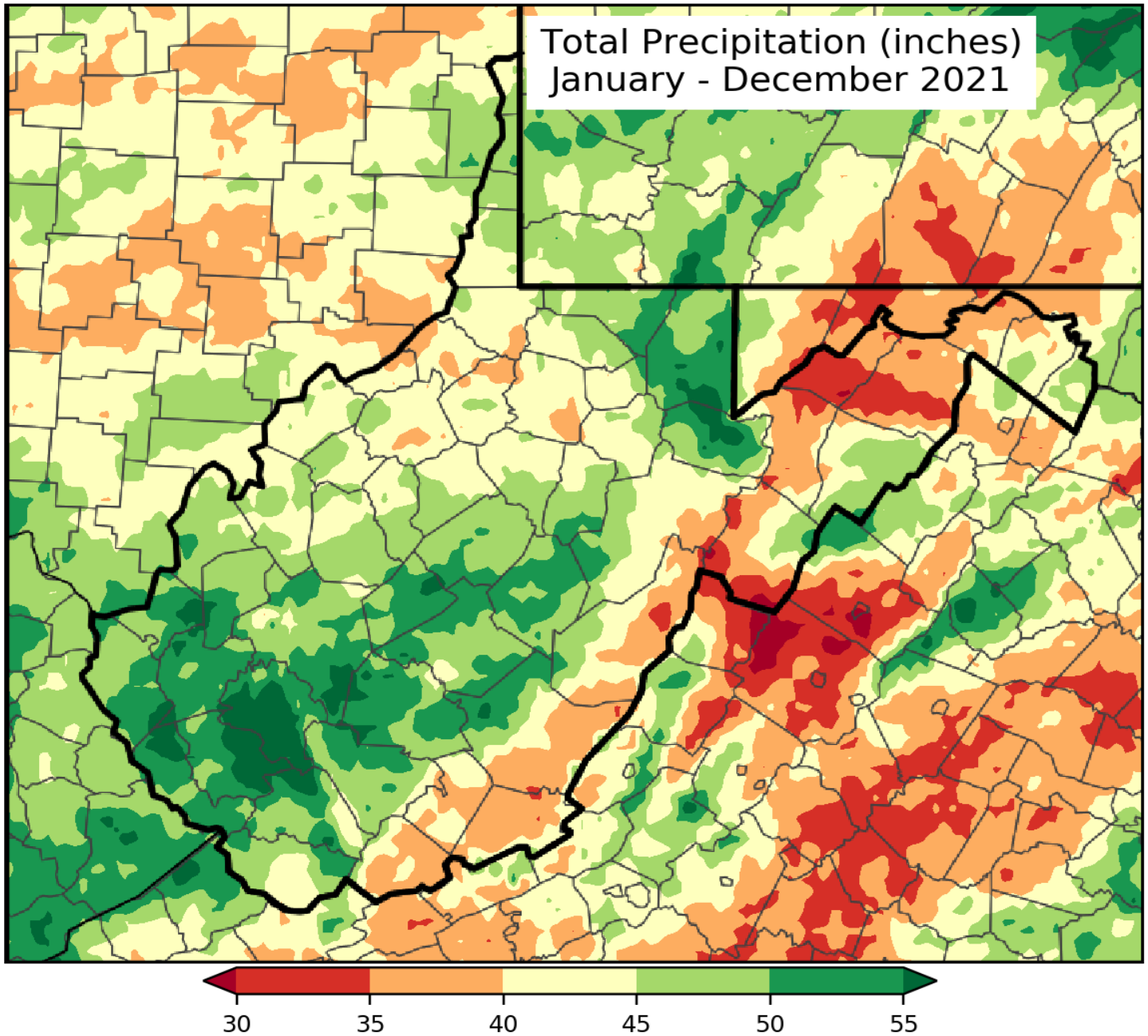


Total 2020 precipitation

Recent Water Resources Availability



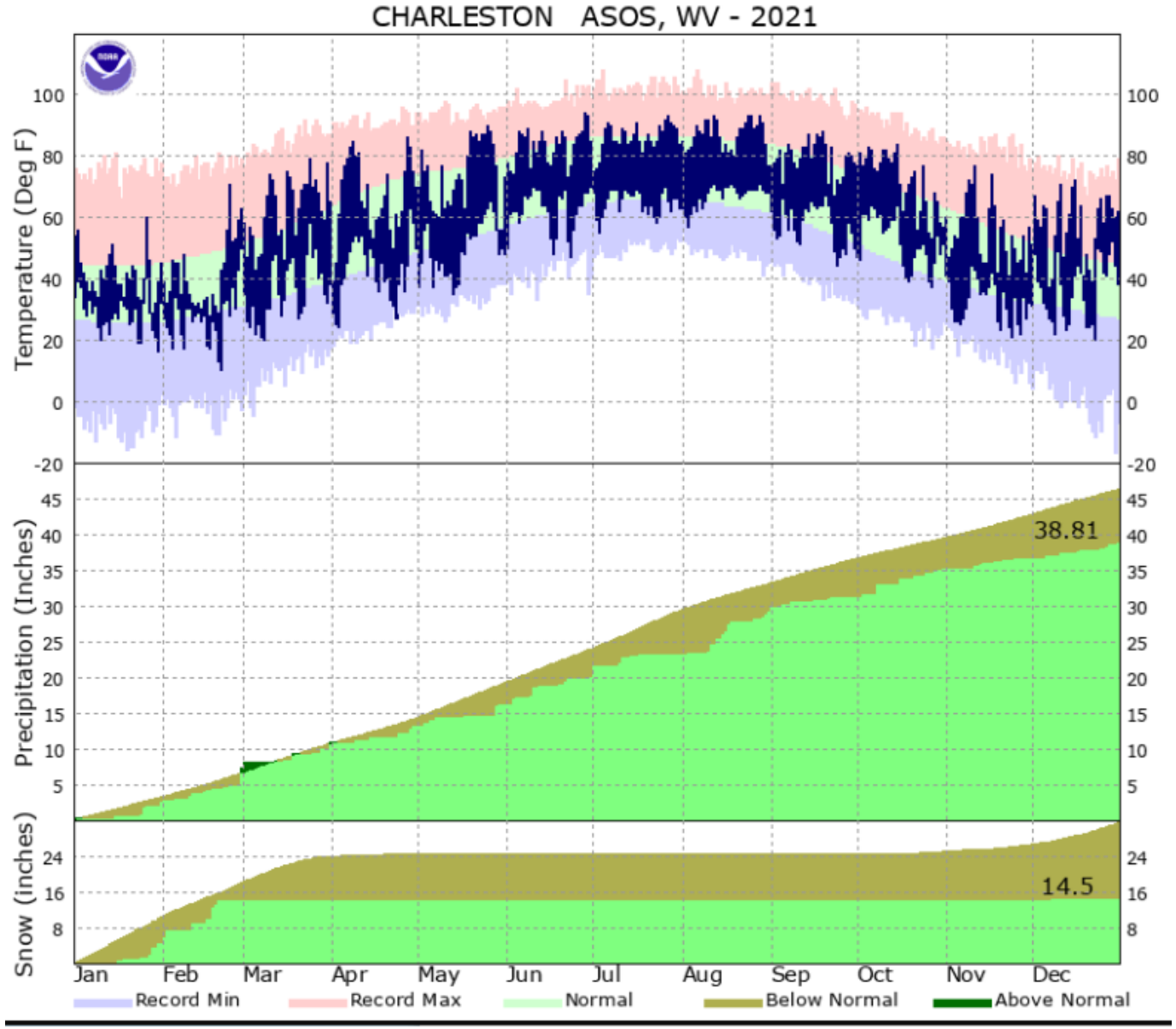
Total 2021 precipitation



Total 2021 precipitation (from National Weather Service)

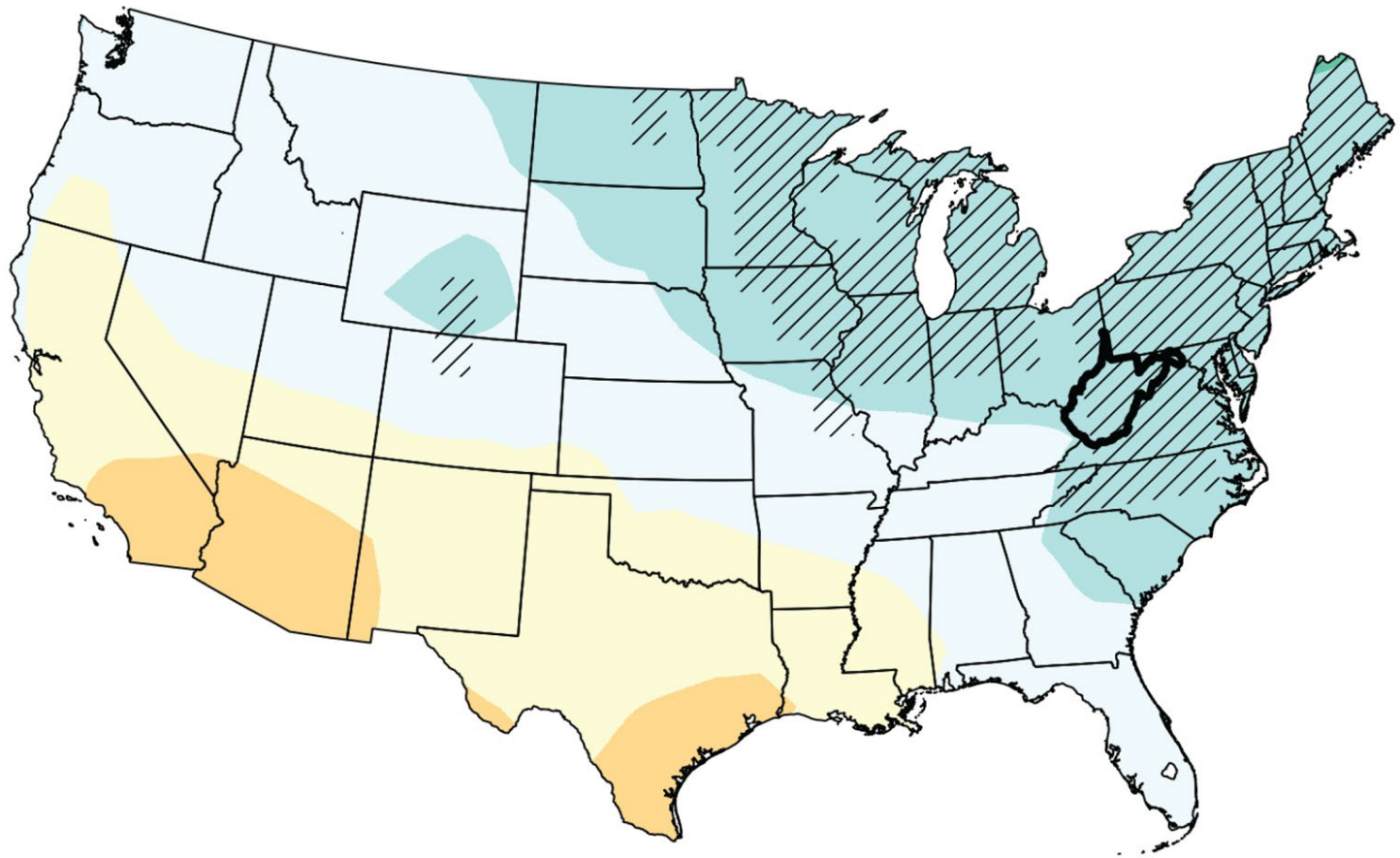
2021 Water Resources Availability

Charleston, WV 2021
only above “normal” precipitation line briefly in March



Climate data for Charleston, WV from January – December 2021 (from National Weather Service).

Projected Change in Annual Precipitation

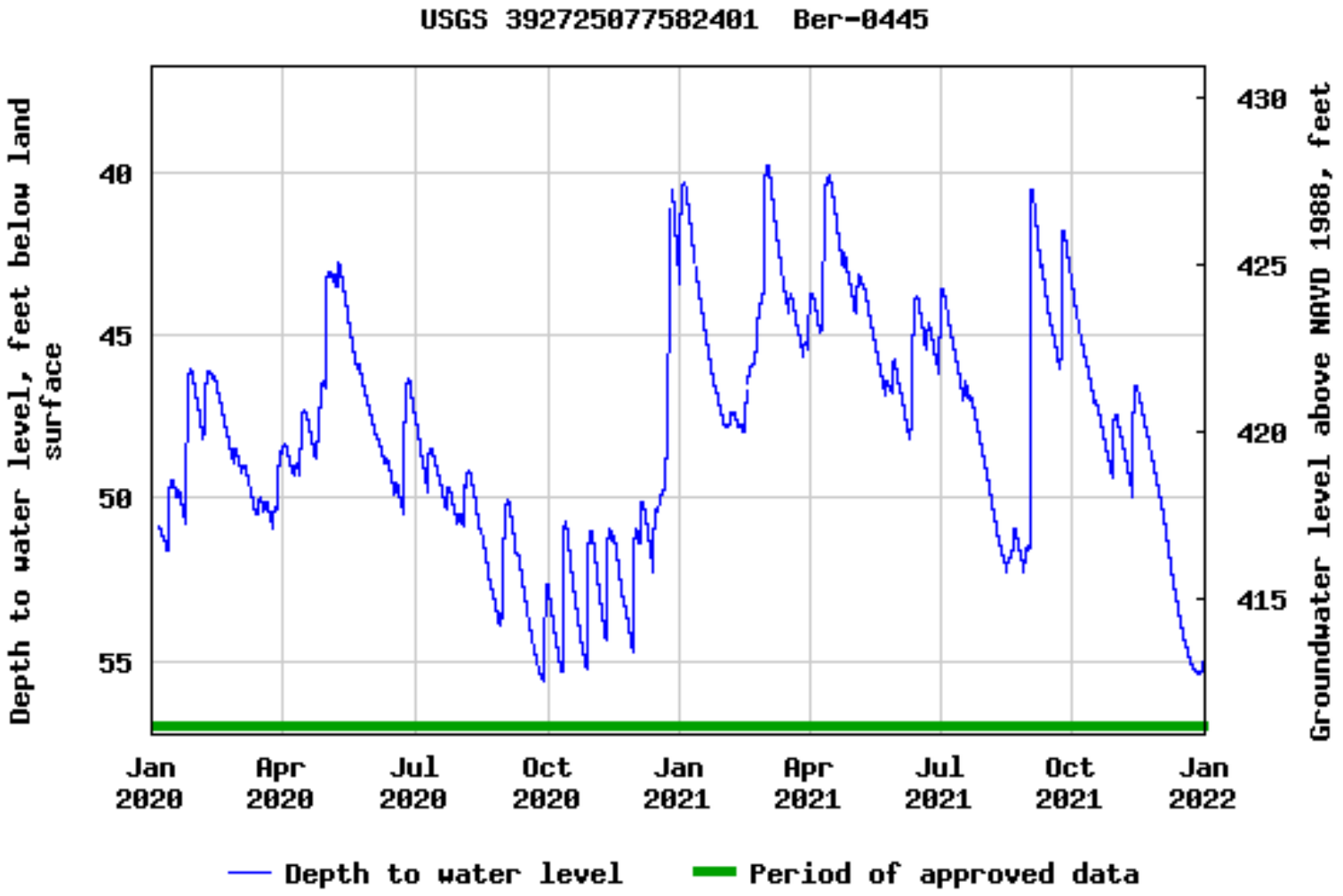


Change in Annual Precipitation (%)

(from National Oceanic and Atmospheric Administration)

2021 Water Resources Availability

Groundwater levels ranged from 40.16 (April) to 51.47 (December)

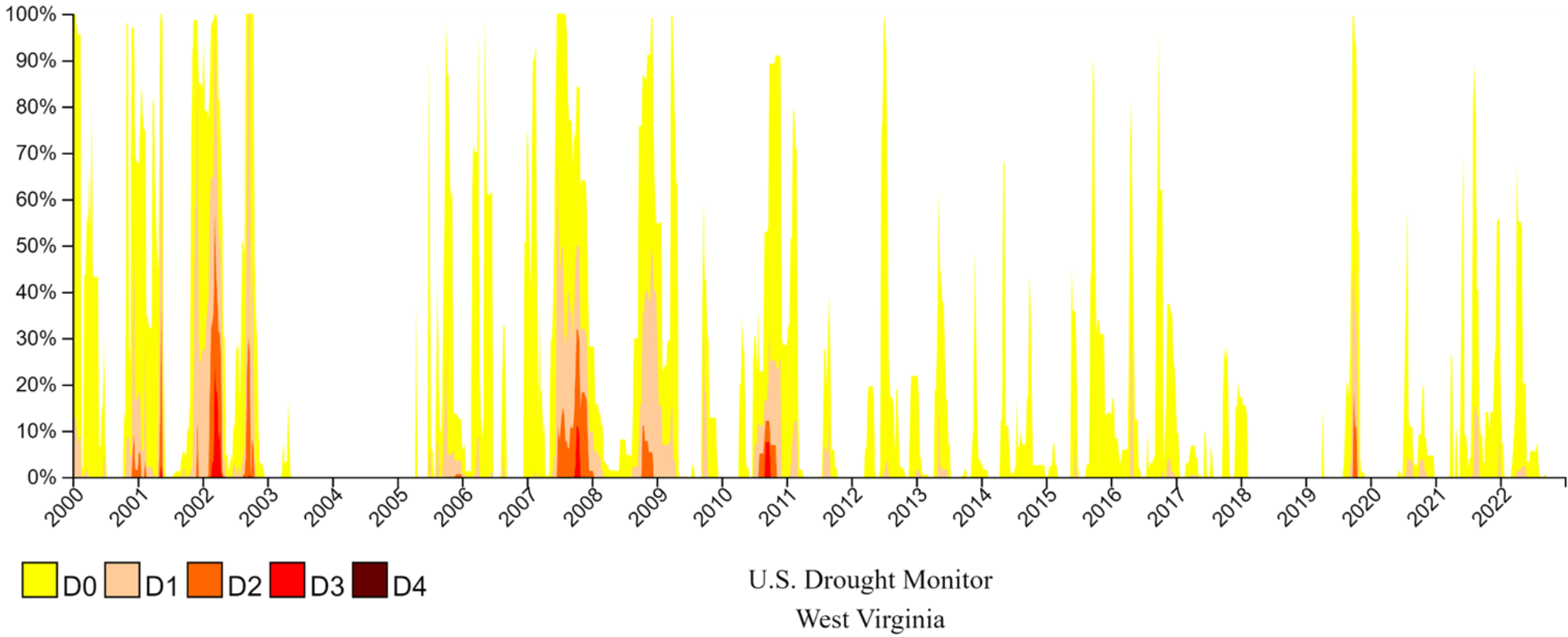


Groundwater levels Jan 2020-2022 in Martinsburg, WV (from USGS).

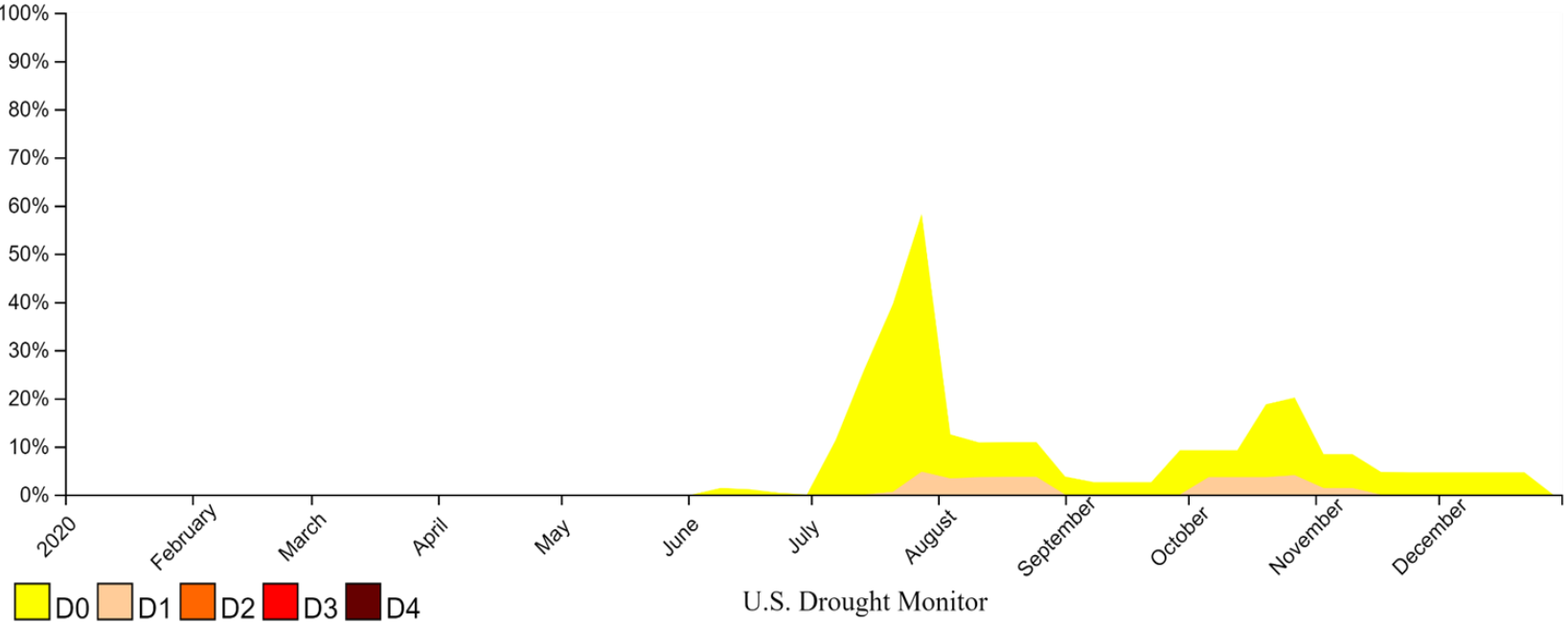
2000-2022 Water Resources Availability

Some periods of drought in 2021

(darker colors indicate higher level of drought)



Drought conditions in WV since 2000 (from US Drought Monitor).



Dryness Categories

D0 Abnormally Dry—used for areas showing dryness but not yet in drought, or for areas recovering from drought.

Drought Intensity Categories

D1 Moderate Drought

D2 Severe Drought

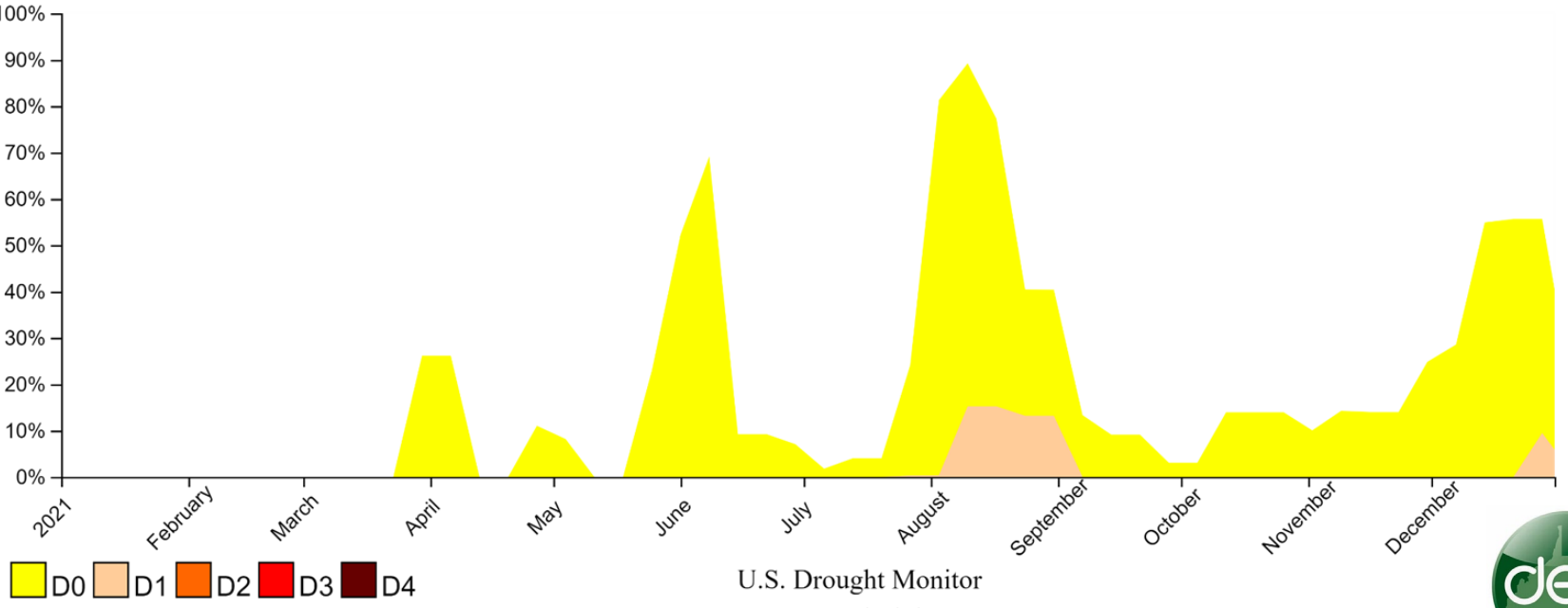
D3 Extreme Drought

D4 Exceptional Drought

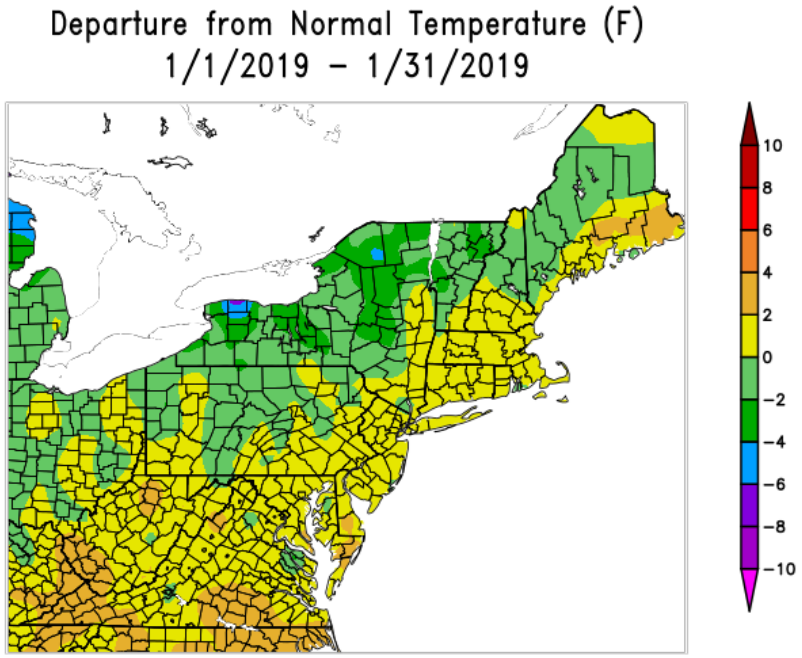
U.S. Drought Monitor
West Virginia

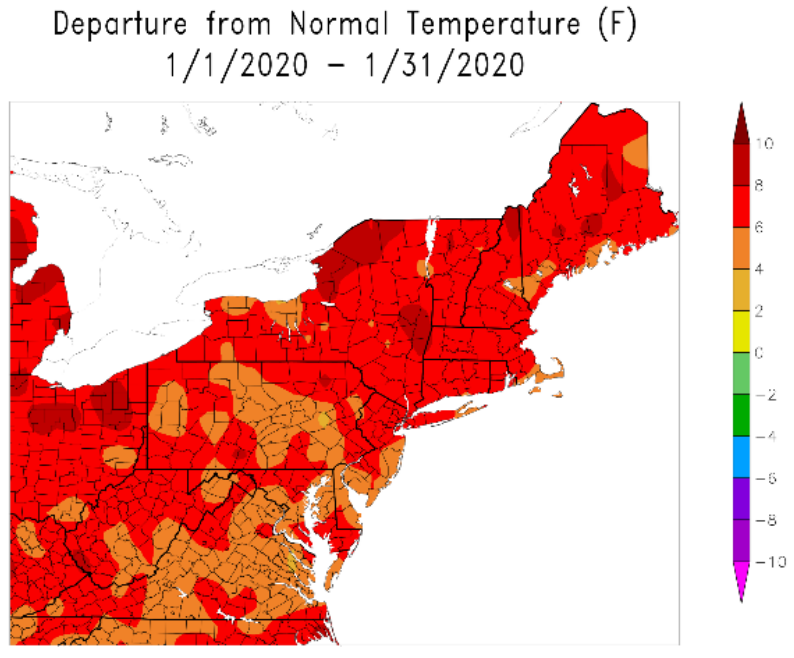
2020-2021 Drought Conditions

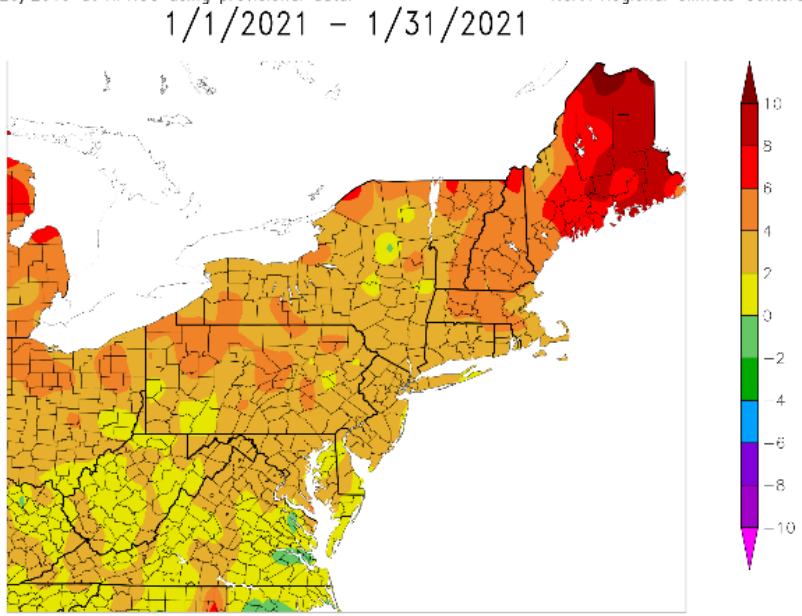
(from US Drought Monitor)

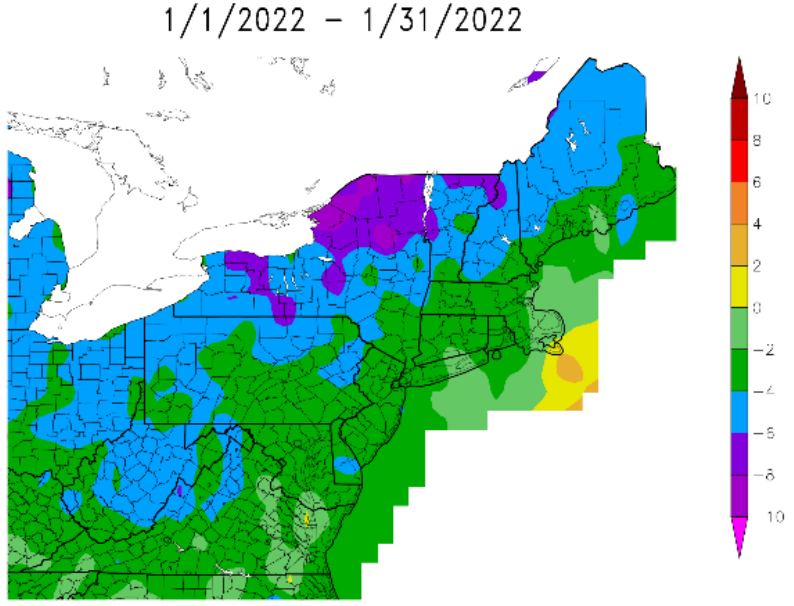


U.S. Drought Monitor
West Virginia









Departure from normal temperatures in January from 2019-2022 (from Northeast Regional Climate Center).

Large Quantity User (LQU) Total Withdrawals

WVDEP Water Use Category	LQUs	Total 2021 Withdrawal (Gallons)	Category %	% Change from 2020
Agriculture/aquaculture	12	8,453,267,673	1.32%	-11.66%
Chemical	12	142,025,333,594	22.14%	27.51%
Industrial	18	15,478,774,963	2.41%	-61.43%
Mining	63	11,380,977,450	1.77%	15.00%
Oil & gas	17	3,603,079,370	0.56%	23.25%
Petroleum	1	290,570,264	0.05%	-1.84%
Public water supply	174	60,485,128,163	9.43%	5.55%
Recreation	20	935,428,884	0.15%	-22.68%
Thermoelectric (coal)	9	398,031,543,142	62.04%	9.50%
Timber	3	910,633,110	0.14%	-4.85%
TOTAL	**329**	**641,594,736,613**	**100.00%**	**7.44%**
Hydroelectric	11	236,309,036,343,208		

2021 water withdrawals (WD) from the LQU database

LQU Withdrawal Types

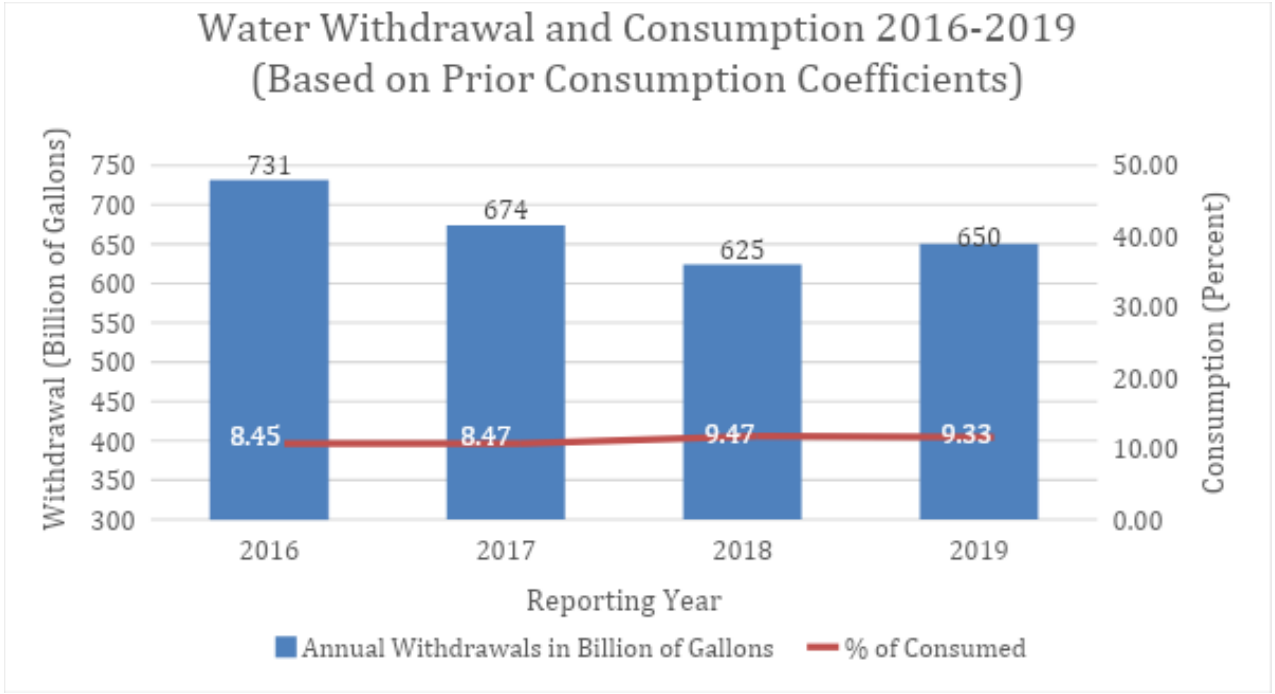
WVDEP Water Use Category	Surface Water (SW) Withdrawal (Gallons)	Category % of SW	Groundwater (GW) Withdrawal (Gallons)	Category % of GW
Agriculture/aquaculture	8,285,775,273	1.35%	167,492,400	0.59%
Chemical	133,072,309,878	21.70%	8,953,023,716	31.43%
Industrial	14,715,006,101	2.40%	763,768,862	2.68%
Mining	6,067,888,154	0.99%	5,313,089,296	18.65%
Oil & gas	3,585,815,732	0.58%	17,263,638	0.06%
Petroleum	6,305,762	0.00%	284,264,502	1.00%
Public water supply	48,273,294,295	7.87%	12,211,833,868	**42.86%**
Recreation	606,002,621	0.10%	329,426,263	1.16%
Thermoelectric (coal)	397,592,885,681	**64.85%**	438,657,461	1.54%
Timber	899,646,595	0.15%	10,986,515	0.04%
SUB TOTAL	613,104,930,092	100.00%	28,489,806,521	100.00%
Breakdown % of Total Withdrawal	**613,104,930,092**	**95.56%**	**28,489,806,521**	**4.44%**
Hydroelectric	236,309,036,343,208		0	

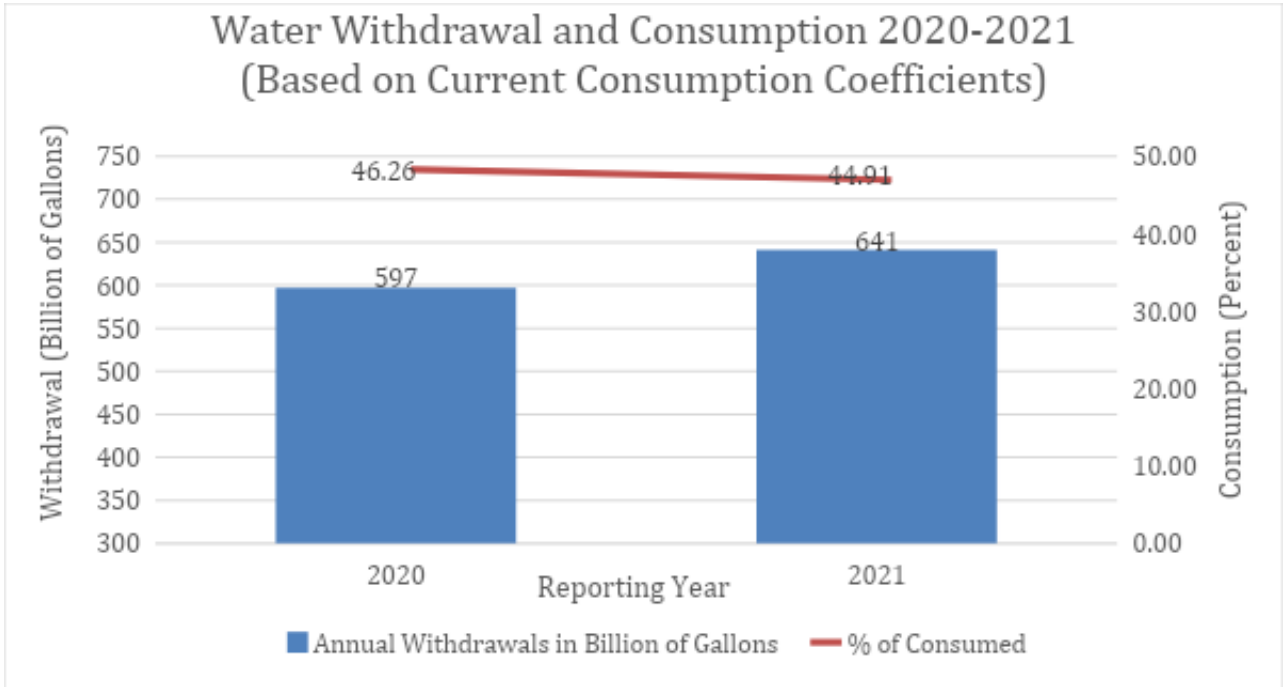
2021 Surface and groundwater withdrawal data

2021 Consumptive Use

WVDEP Water Use Category	2021 Total Gallons Withdrawal	Consumptive Coefficient	2021 Calculated Gallons Consumed	Category % of Consumed
Agriculture/aquaculture	8,453,267,673	0.03	253,598,030	0.09%
Chemical	142,025,333,594	0.12	17,043,040,031	5.91%
Industrial	15,478,774,963	0.59	9,132,477,228	3.17%
Mining	11,380,977,450	0.48	5,462,869,176	1.90%
Oil & Gas	3,603,079,370	1	3,603,079,370	1.25%
Petroleum	290,570,264	0.16	46,491,242	0.02%
Public water supply	60,485,128,163	0.15	9,072,769,224	3.15%
Recreation	935,428,884	0.41	383,525,842	0.13%
Thermoelectric (coal)	398,031,543,142	0.61	242,799,241,317	84.26%
Timber	910,633,110	0.39	355,146,913	0.12%
TOTAL	**641,594,736,613**		**288,152,238,374**	**100.00%**
Hydroelectric	236,309,036,343,208			

Current consumption coefficients applied to 2021 withdrawal data

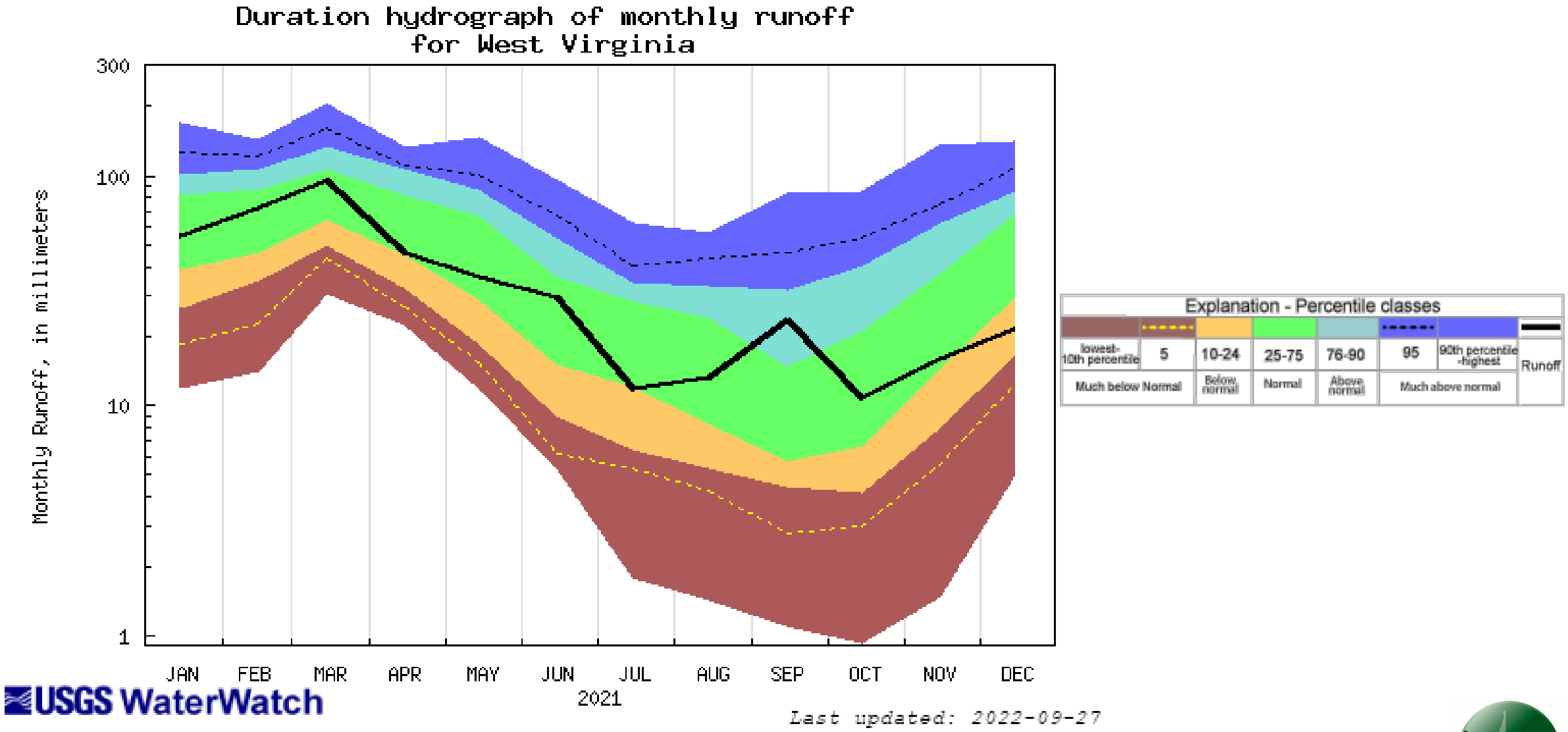

Water Withdrawal and Consumption 2016-2019
(Based on Prior Consumption Coefficients)
Withdrawal (Billion of Gallons)
750
700
650
600
550
500
450
400
350
300
731
674
625
650
8.45
8.47
9.47
9.33
50.00
40.00
30.00
20.00
10.00
0.00
Consumption (Percent)
2016
2017
2018
2019
Reporting Year
Annual Withdrawals in Billion of Gallons
% of Consumed


Water Withdrawal and Consumption 2020-2021
(Based on Current Consumption Coefficients)
Withdrawal (Billion of Gallons)
750
700
650
600
550
500
450
400
350
300
46.26
44.91
597
641
50.00
40.00
30.00
20.00
10.00
0.00
Consumption (Percent)
2020
2021
Reporting Year
Annual Withdrawals in Billion of Gallons
% of Consumed

Seasonal Withdrawal Trends

2021 trends in total withdrawal from the LQU database (WVDEP)

Seasonal Precipitation Trends



WV 2021 monthly hydrograph. Note logarithmic scale (from USGS).

Water Management Plans

The Water Use Section reviews all WMPs required for Oil & Gas industry in WV.

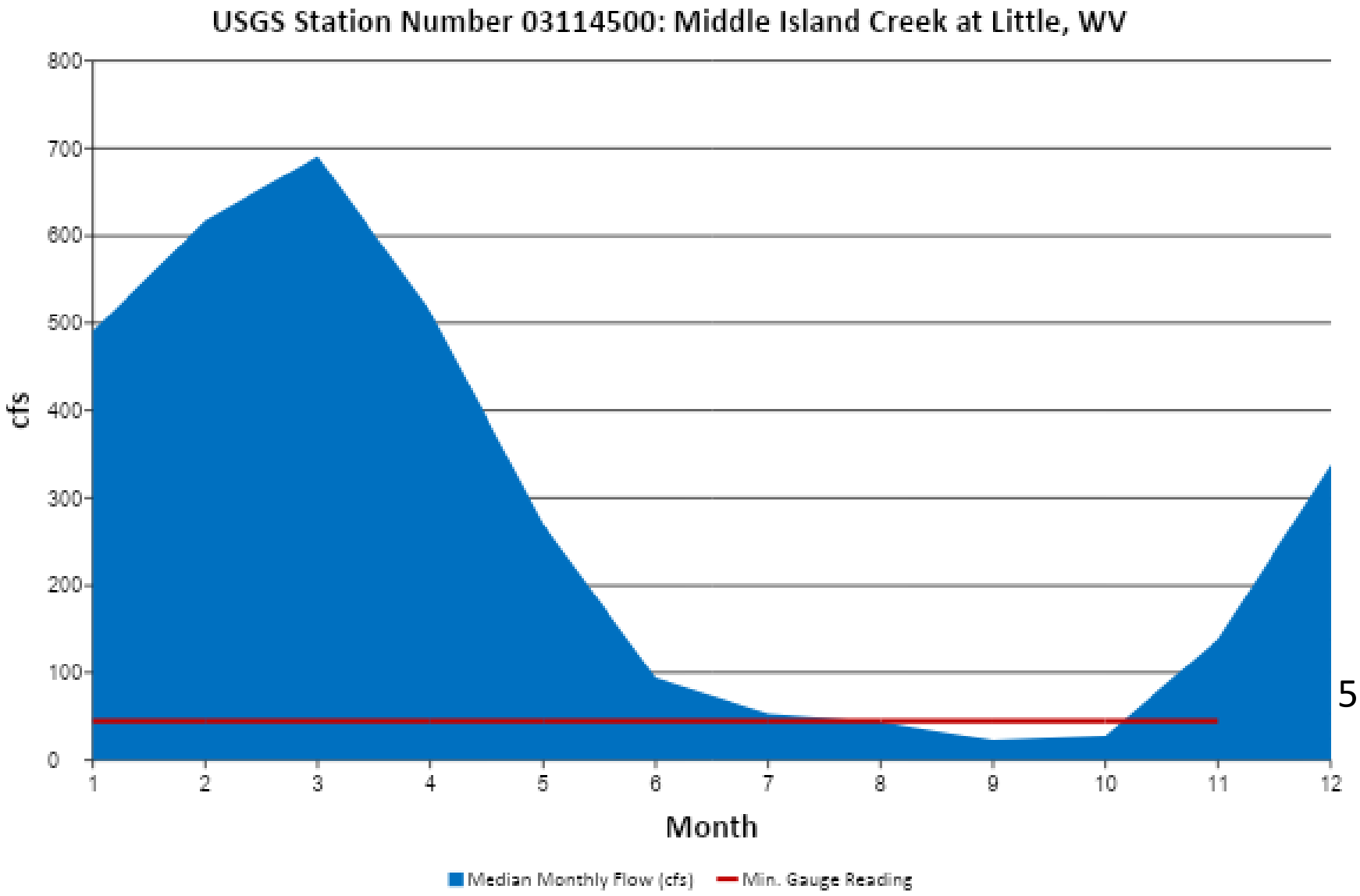
Each proposed water source is evaluated

- Surface water
- Ground water
- Purchased water
- Recycled water

Thresholds for withdrawal are set at the 75th percentile.

The use of recycled frac water is always encouraged.

Establishing Limits



52.59 cfs

WHEELING CREEK AT ELM GROVE, WV

IMPORTANT Legacy real-time page

https://waterdata.usgs.gov/wv/nwis/current/?type=flow

Monitoring location 03112000 is associated with a STREAM in OHIO COUNTY, WEST VIRGINIA. Current conditions of DISCHARGE, GAGE HEIGHT, and PRECIPITATION are available. Water data back to 1940 are available online.

7 days 30 days 1 year

Change time span | Retrieve data

107 > 49.23
Can withdraw

Streamflow, ft³/s

107 ft3/s Nov 23, 2022 02:15:00 PM EST

Daily Streamflow, ft³/s for Wed Nov 23 2022 based on 82 years of data.

Latest Value	Lowest Value (1964)	25th Percentile	Median	75th Percentile	Mean	Highest Value (2012)
107	1.8	45	116	211	206	3560

The operator is reminded that 24-48 hours prior to withdrawing (or purchasing) water, DEP must be notified by email at DEP.water.use@wv.gov. Signage requirements must be satisfied within 24 hours of activating this Water Management Plan.

- Big Wheeling Creek @ Hogg

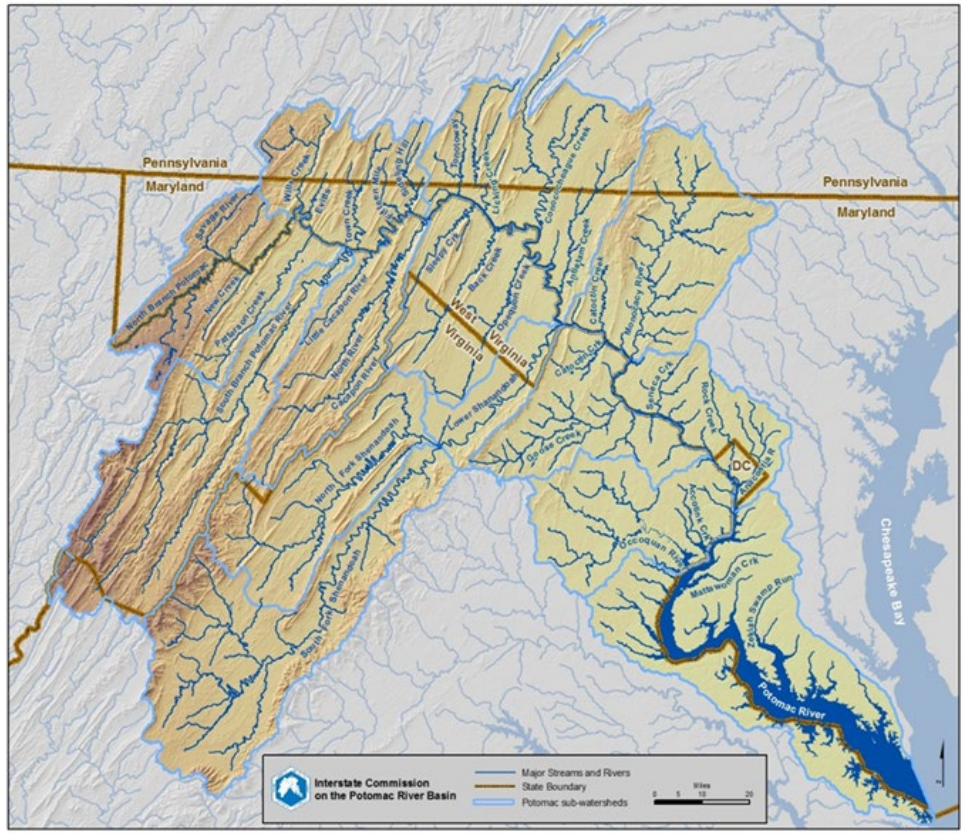
Type:	Stream/River
County:	Marshall
Owner:	Don Hogg
Intake Latitude:	39.984529
Intake Longitude:	-80.634106
HUC-8 Code:	5030106
Drainage Area (sq miles):	201.69
Regulated Stream:	NO
PWS Within 1 Mile:	NO

Gauged Stream:	YES
Ref Gauge ID:	3112000
Ref Gauge Name:	WHEELING CREEK AT ELM GROVE, WV
Minimum Gauge Reading (cfs):	49.23
Minimum Passby (cfs):	27.28
Endangered Species:	NO
Mussel Stream:	YES
Maximum Pump Rate (gpm):	5040

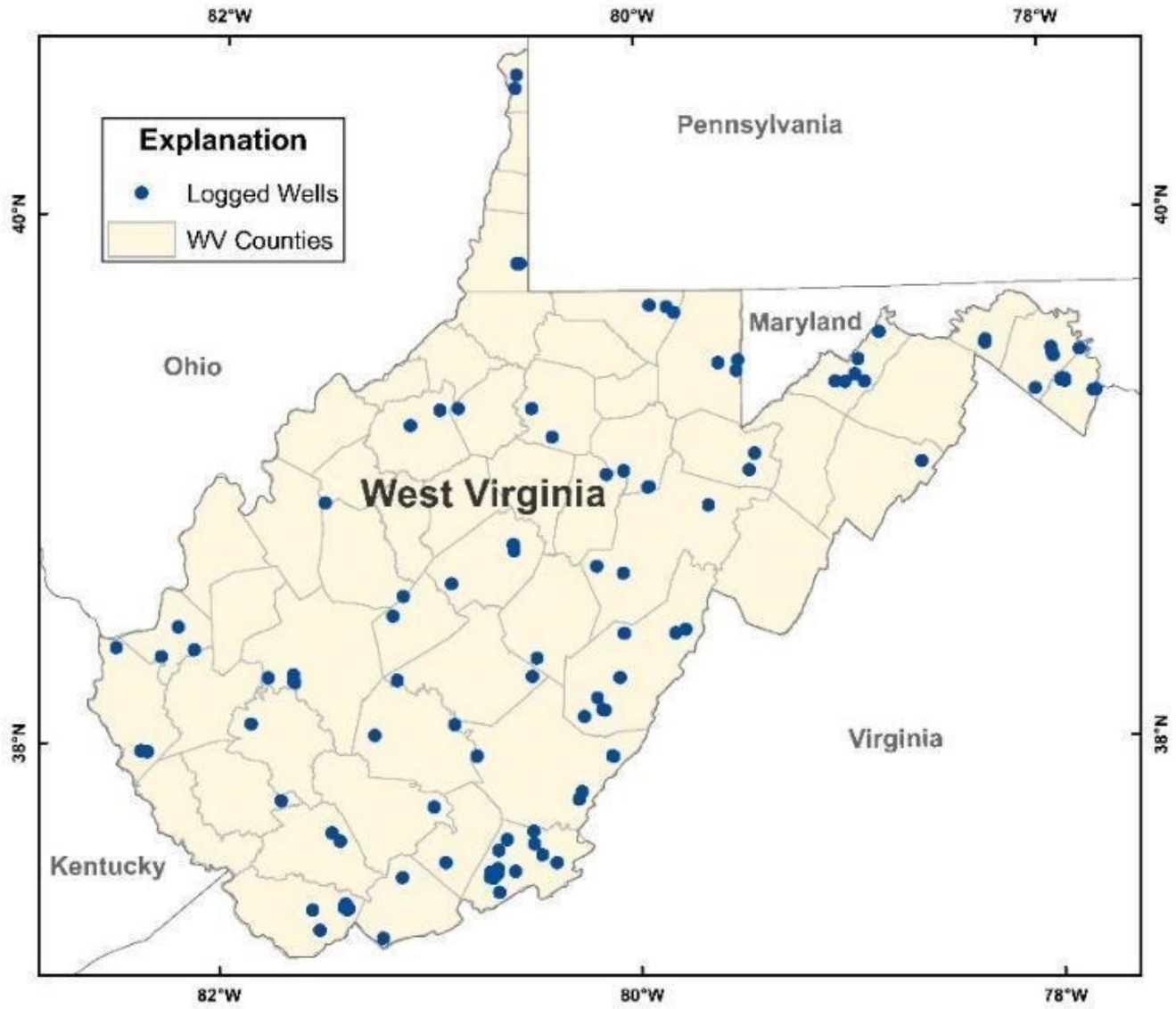
Comments:

Water Resources Research Continues

- Geophysical Groundwater Well Logging
- Abandoned Underground Coal Mine Aquifers
- Water Stress and Critical Planning Areas
- Data Tools

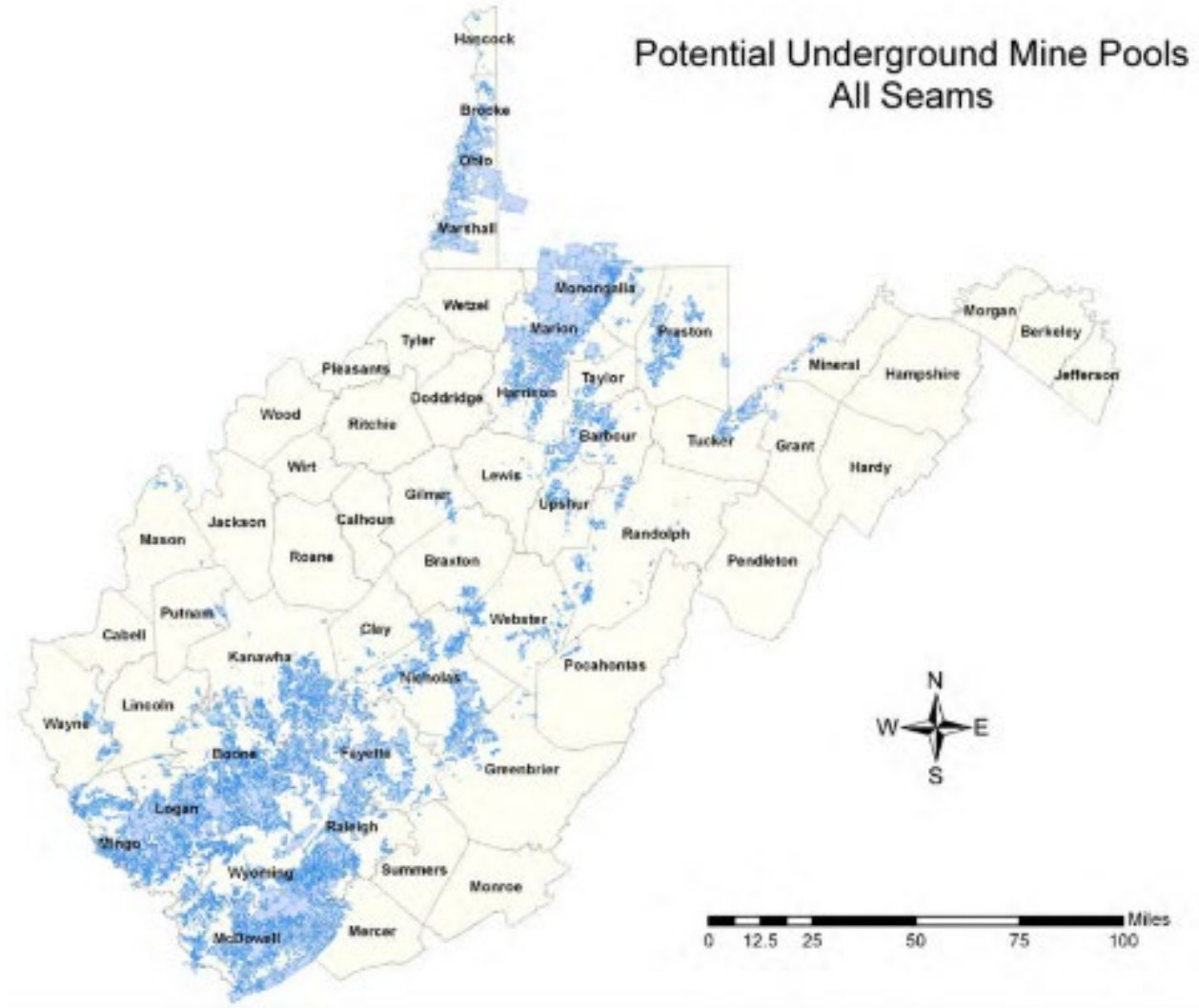


Geophysical Groundwater Well Logging



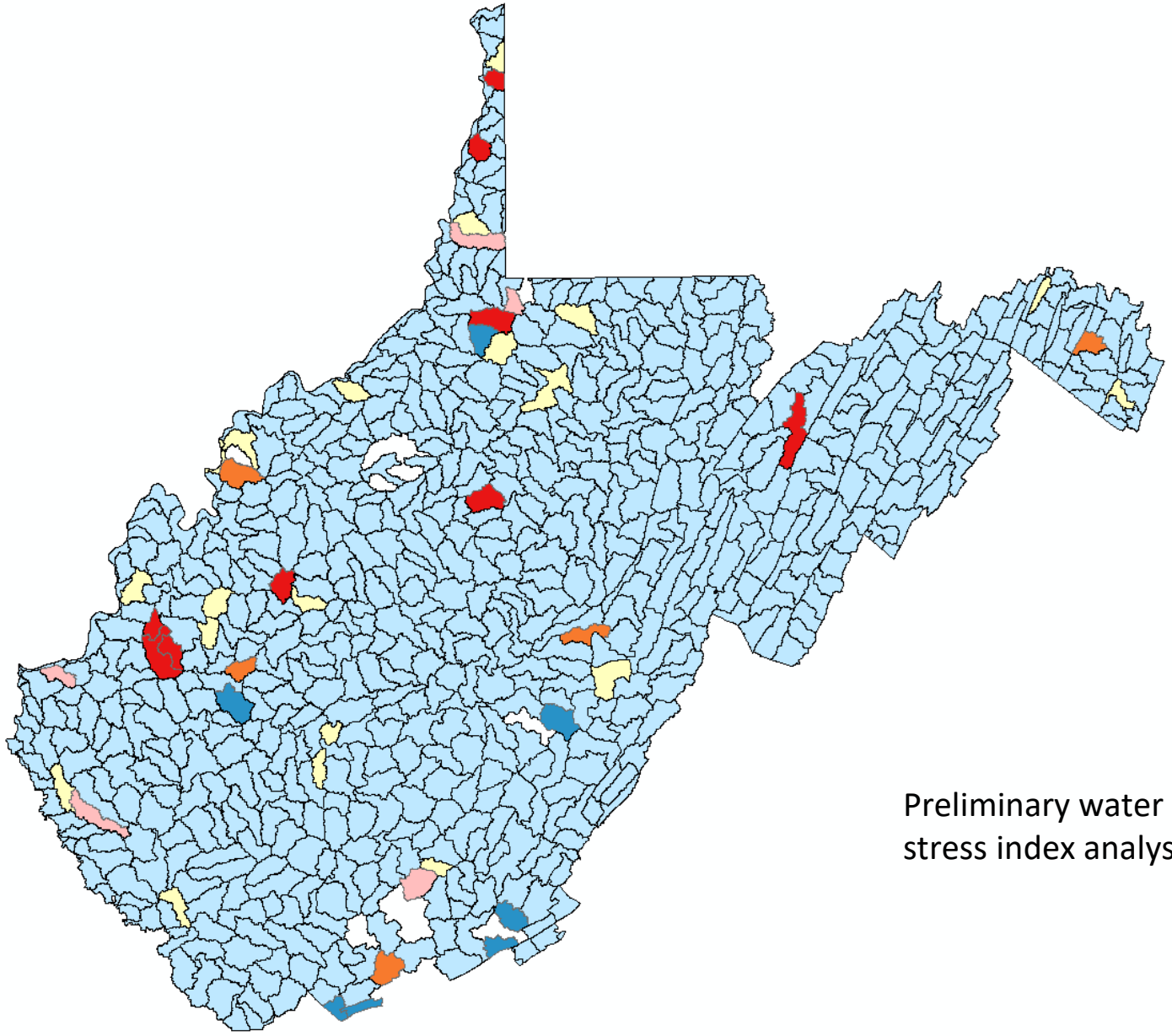
Location of USGS-WVDEP borehole geophysics well logs 2015-2019 (USGS).

Abandoned Underground Coal Mine Aquifers



Estimated extent of Abandoned Underground Coal Mine Aquifers (WVGES & WVDEP).

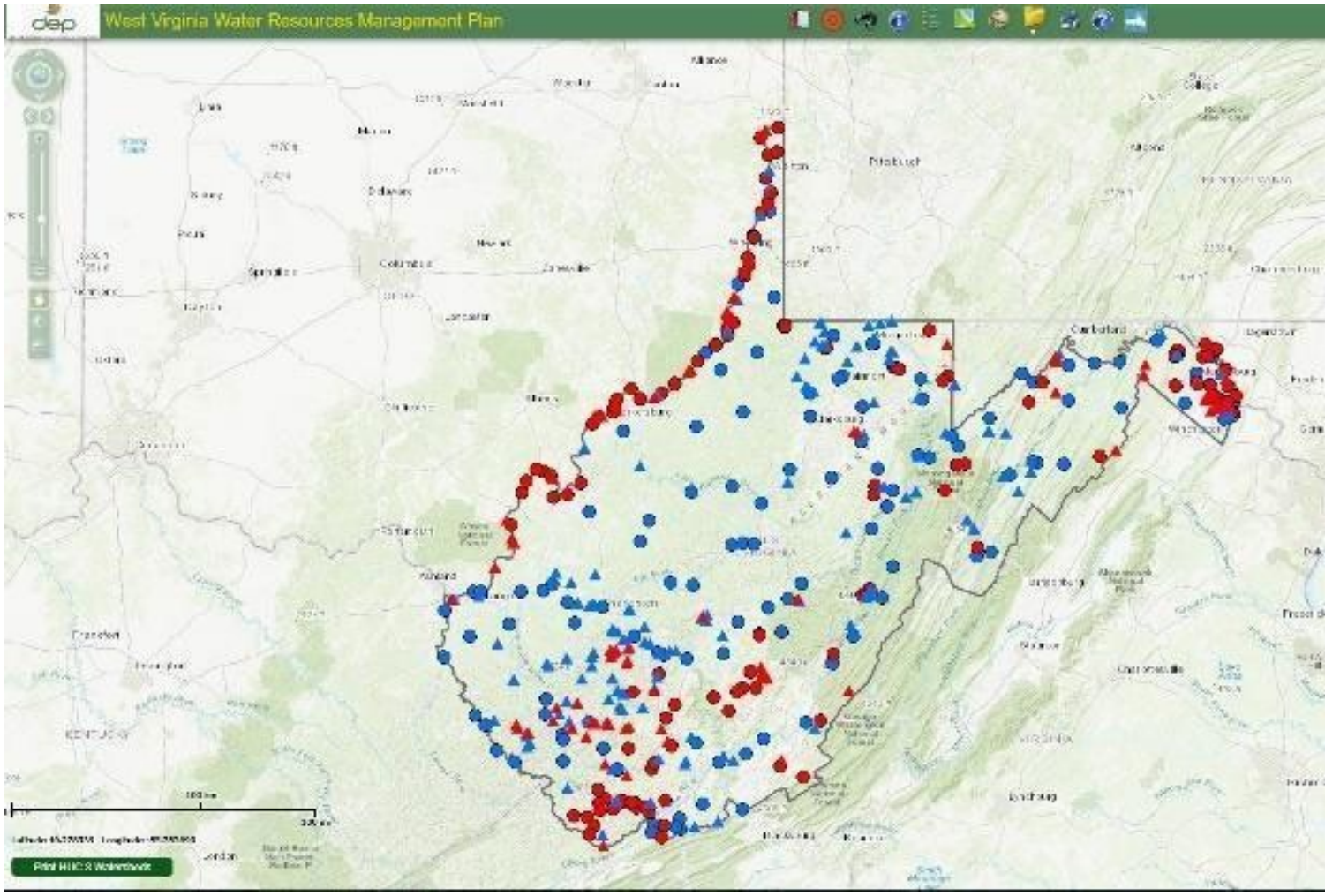
Water Stress and Critical Planning Areas



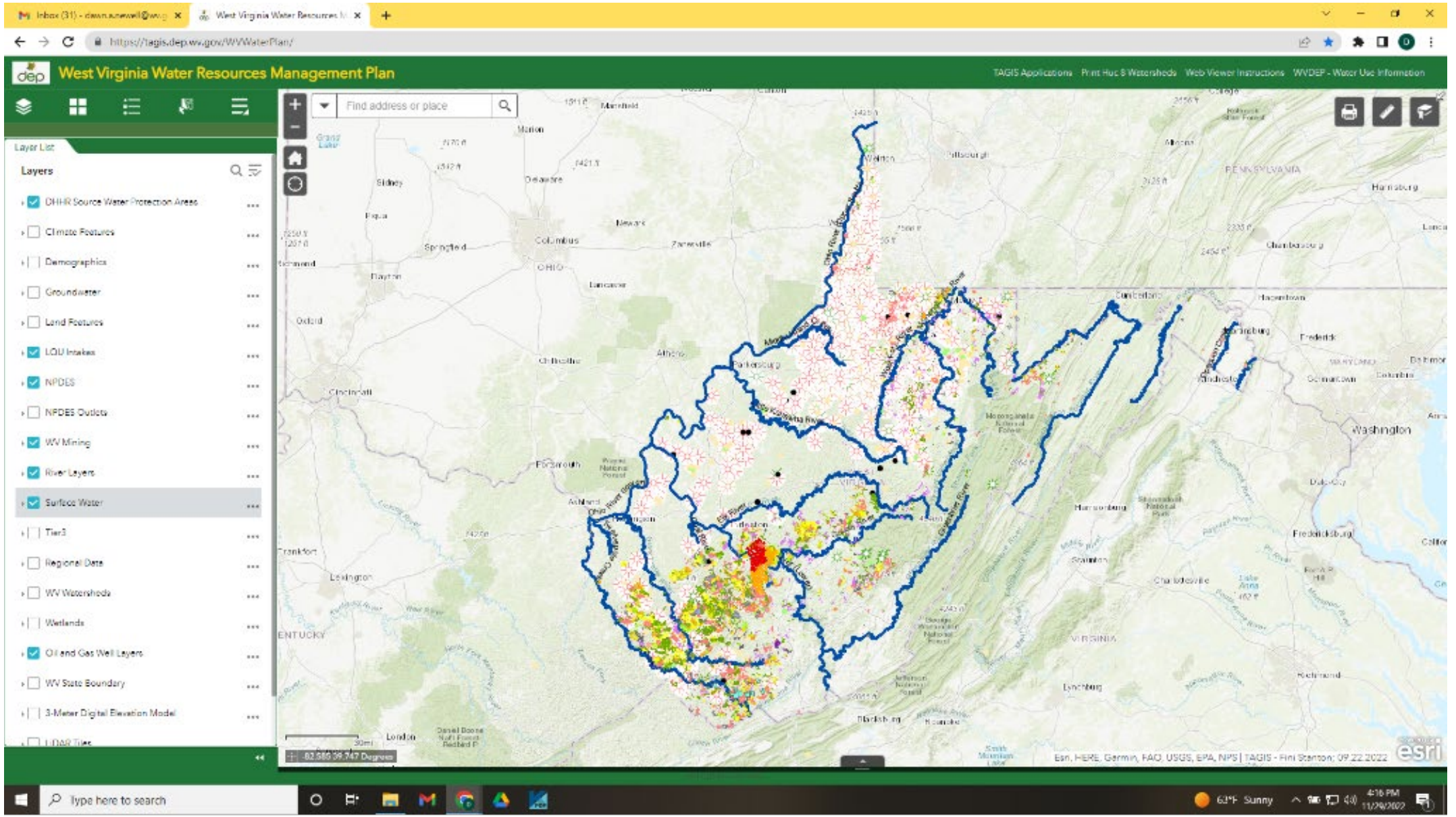
Preliminary water supply stress index analysis (WVU)

Water Resources Management Mapping Tool

Used by industry, state and federal agencies, and general public to access geographic data relevant to water management.

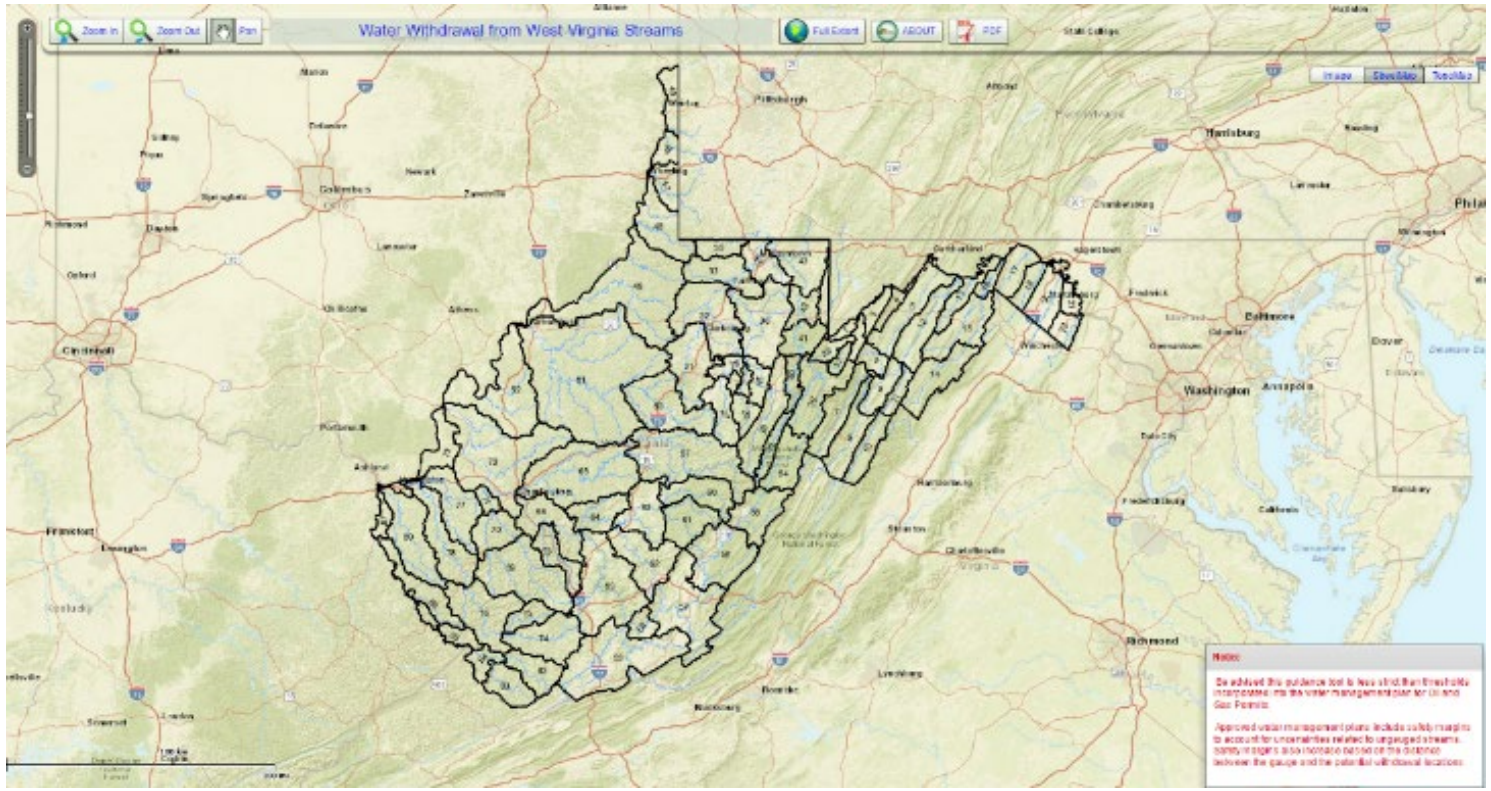


https://tagis.dep.wv.gov/WVWaterPlan/

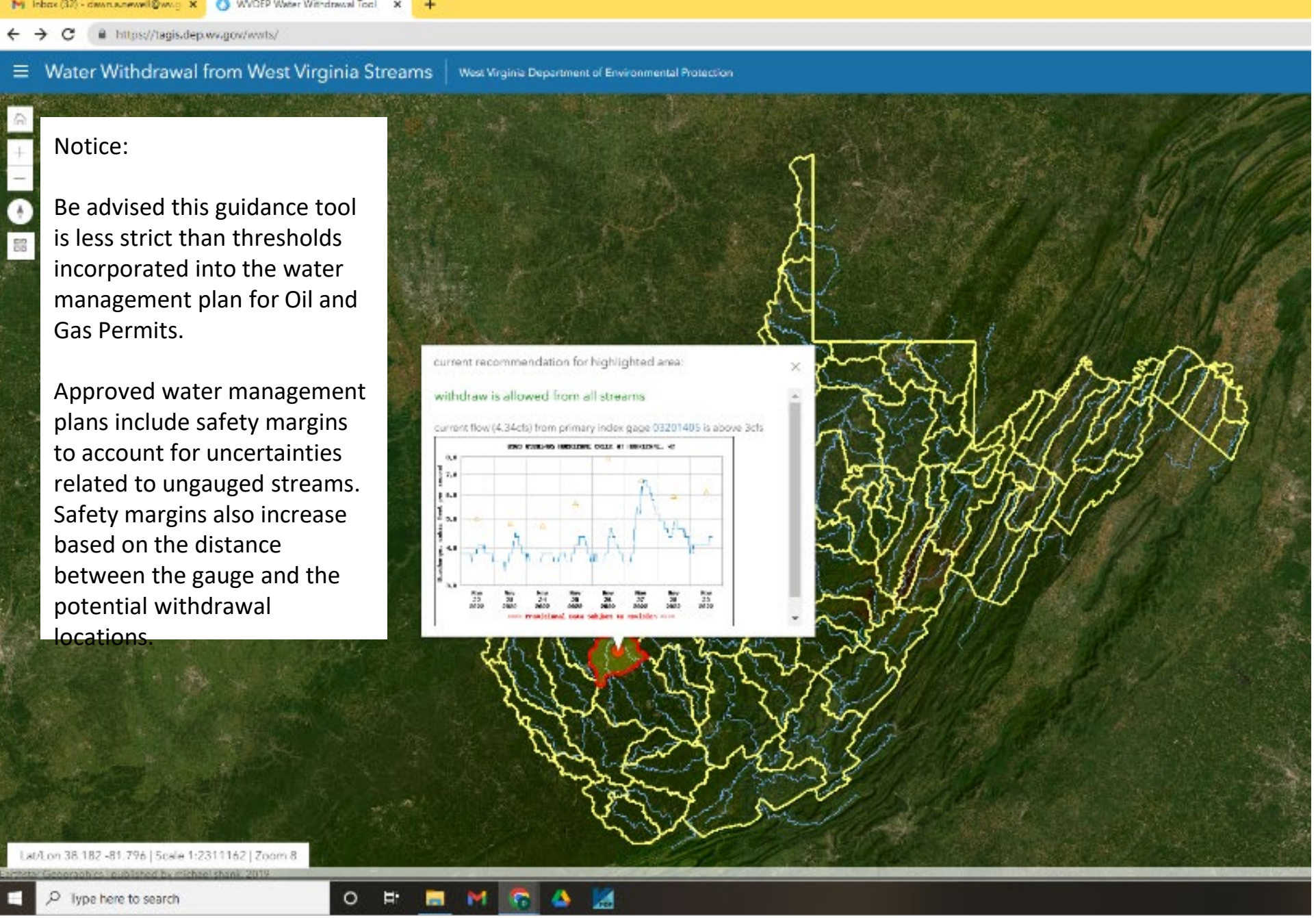

West Virginia Water Resources Management Plan
TAGIS Applications
Print Huc 8 Watersheds
Web Viewer Instructions
WVDEP - Water Use Information
Find address or place
Layer List
Layers
DHHR Source Water Protection Areas
Climate Features
Demographics
Groundwater
Land Features
LOU Intakes
NPDES
NPDES Outlets
WV Mining
River Layers
Surface Water
Tier3
Regional Data
WV Watersheds
Wetlands
Oil and Gas Well Layers
WV State Boundary
3-Meter Digital Elevation Model
LiDAR Tiles
Esri, HERE, Garmin, FAO, USGS, EPA, NPS | TAGIS - Phil Stanton; 09.22.2022
Type here to search
63°F Sunny

Water Withdrawal Guidance Tool

User can select any geographical point in WV to learn current flow and index gage height



https://tagis.dep.wv.gov/wwts/



Knowing when it is environmentally safe to withdraw water from a stream is difficult. In many instances, it is simply impossible to be able to look at a stream and determine if you will be degrading the stream by pumping water from it. This guidance will assist you in deciding where and when you should not be withdrawing water from a stream.

As a stream flow decreases aquatic habitat decreases accordingly. This guidance is based on summer base flow for a period of record, which should afford an appropriate flow to protect the aquatic habitat.

At some point, even if the guidance indicates it is safe to remove water from the stream, you will reach a point where the flow is too small to support that withdrawal, and you should not remove water from the stream.

This guidance tool is not intended to be used for regulation of water withdrawals.

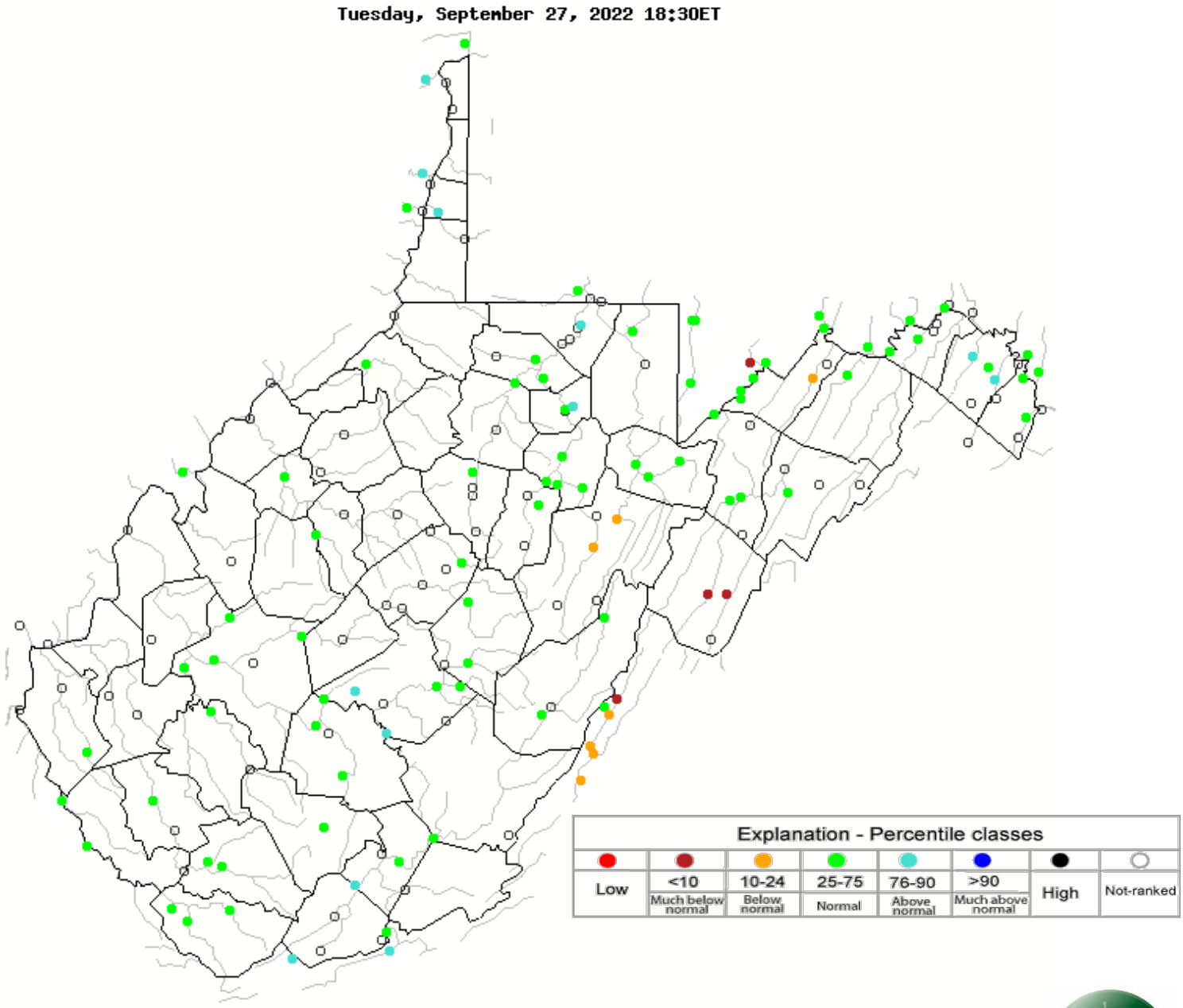
Plans and Priorities

- Converted WMP database from MS Access to Oracle Application Express (APEX).
- Develop new GIS layer(s) based on WMP data.
- Update GIS layers associated with LQU data.
- Continue with transition for new LQU database platform.
- Continue to fill section vacancies.

Program Needs

- The USGS stream gage & groundwater level network are the most important assets to DEP water resource management.
- Our models & online tools are dependent on data from USGS.

Thank you for supporting stream gage funding!



USGS

Local USGS Network Funding

Federal Fiscal Year (October 1 through September 30)	State of WV	Sum of USGS Funding	Other Locality, Federal and Private Funding	Total Funding	Overall Annual Increase
FY 2019	$765,000	$545,320	$809,330	$2,119,650	N/A
FY 2020	$800,000	$562,800	$805,380	$2,168,180	2.24%
FY 2021	$800,000	$561,765	$841,440	$2,203,205	1.59%
FY 2022	$820,000	$560,234	$882,500	$2,262,734	2.63%
FY 2023	$876,230	$549,730	$937,460	$2,363,420	4.26%

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