

# **PIKE COUNTY GROUNDWATER-LEVEL OBSERVATION NETWORK 2022**

**U.S. Geological Survey (USGS)  
Pennsylvania Water Science Center (PAWSC)  
in cooperation with  
the  
Pike County Conservation District (PCCD)  
November 14, 2022  
*Revised November 17, 2022***

# PIKE COUNTY GROUNDWATER-LEVEL OBSERVATION NETWORK – PCCD in cooperation with USGS, update November 2022

- Description of observation well network and status 2022
- New USGS data display and interface
- Other related USGS studies, monitoring in/near Pike County





# PURPOSE AND SCOPE - PIKE COUNTY GROUNDWATER-LEVEL OBSERVATION NETWORK

Establish county-wide network of wells to monitor groundwater levels on a monthly basis

Data can be used to assess effects of seasonal, climactic, and water-use changes on groundwater levels



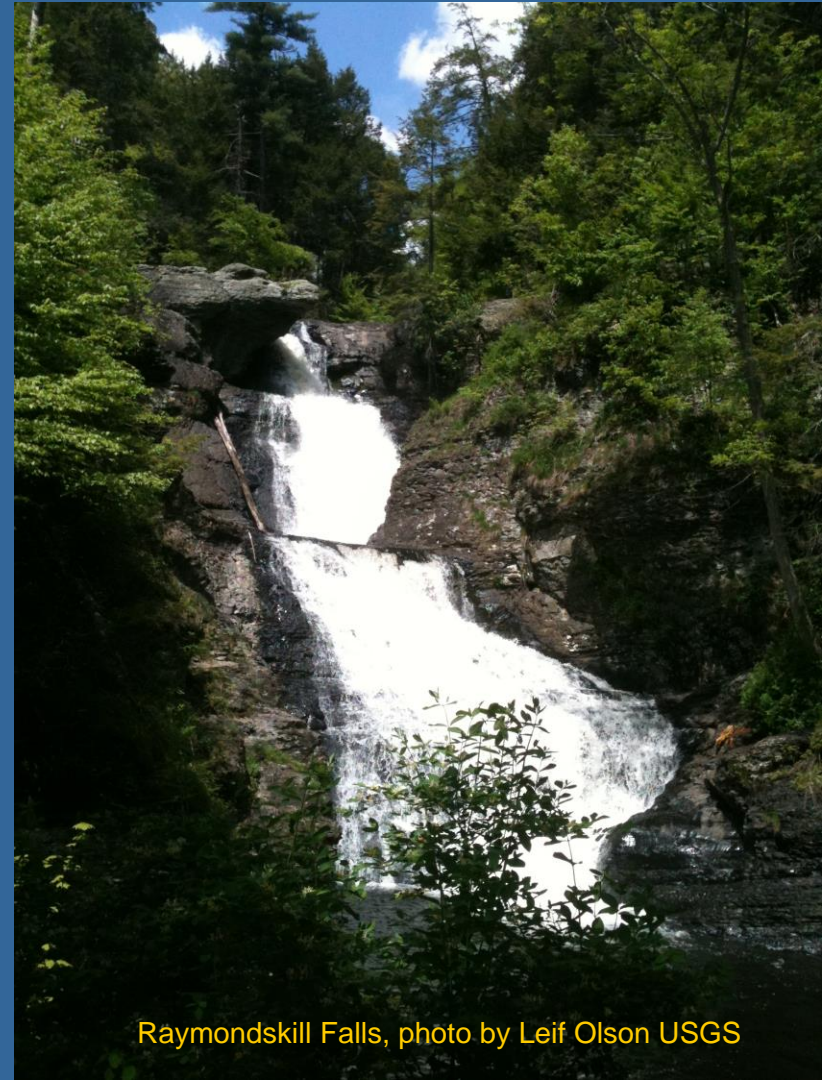
Unused well in Pike County network  
(well PI-88 in network 2007-17)

# Characteristics of aquifers in Pike County

- Fractured-rock aquifers – areally extensive, recharge may be reduced by low-permeability soils or thin glacial cover
- Glacial aquifers – limited areal extent, high-recharge rates in ice-contact units, outwash near Delaware River

# Use of Groundwater Resources in Pike County

- Groundwater is main source of drinking water supply  
(Pike County has continued to grow since 1980s – population increased about 65 percent from 1990 to 2000, ranked 36<sup>th</sup> fastest growing county in nation)
- Groundwater supplies streams as base flow

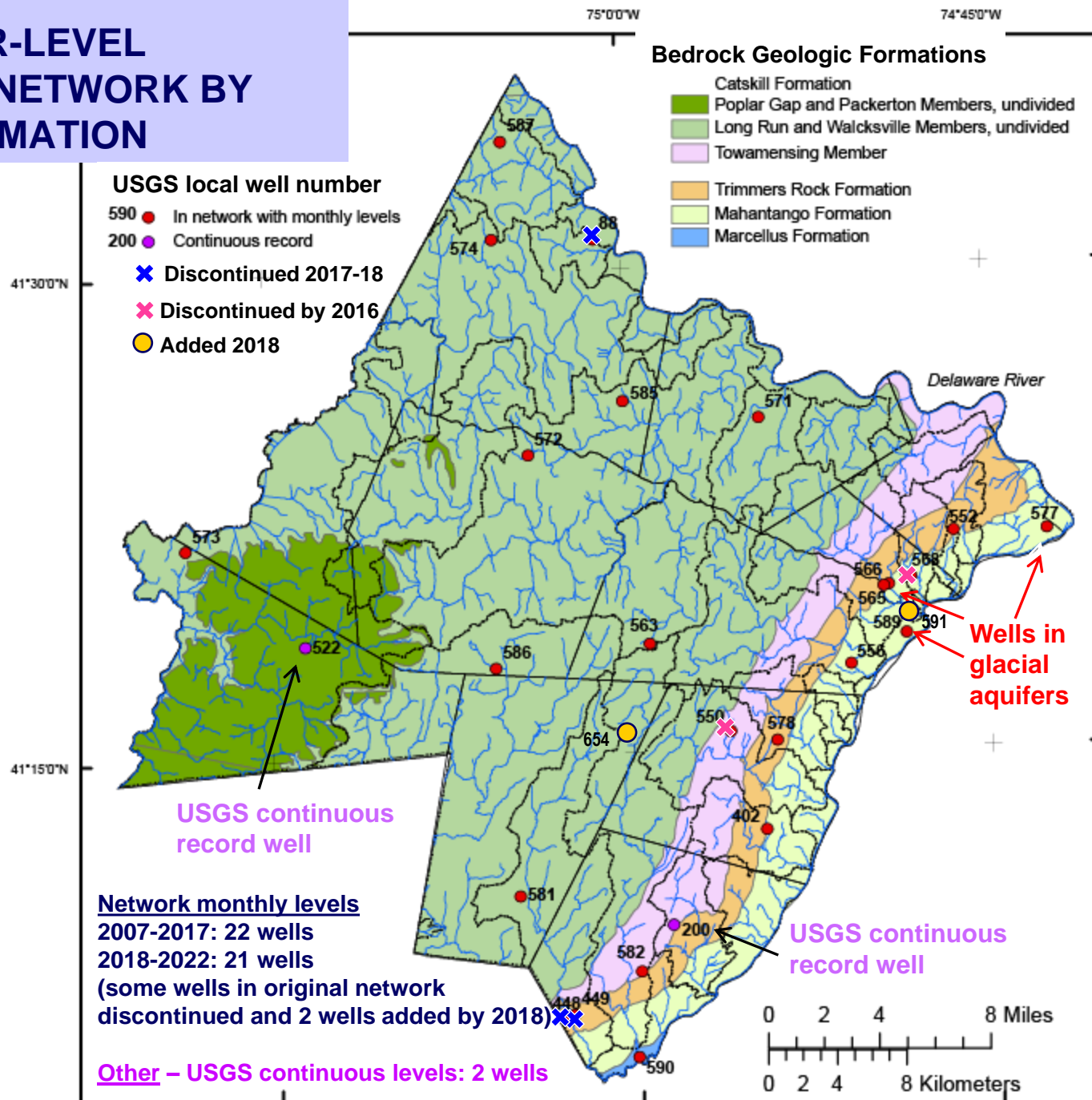




# Pike County groundwater-level observation network, 2007-2022

- 21 wells in network throughout county
- Wells completed in different geologic units
- Wells in most main watersheds
- Levels measured monthly by PCCD, reviewed by USGS and entered into USGS databases for long-term availability, public access; annual USGS QA
- Network continued in cooperation with PCCD from summer 2007 through 2022 (15 years), with planned extension to 2026 (19 years)

# PIKE COUNTY GROUNDWATER-LEVEL OBSERVATION NETWORK BY GEOLOGIC FORMATION



Preliminary Information —  
Subject to Revision.

# Network well characteristics – well depth, geology, watershed

USGS WELL NAME	DEPTH TO WATER (FEET)	DATE OF LEVEL	WELL DEPTH (FEET)	LOCAL AQUIFER	WATERSHED
PI 565	73.69	9/20/2018	154.5	Ice-contact Deposits	Sawkill Creek
PI 566	30.07	9/20/2018	155.5	Ice-contact Deposits	Sawkill Creek
PI 589	99.45	9/20/2018	101	Kame Terrace Deposits	near Delaware River (not state designated)
PI 577	15.06	9/20/2018	24	Outwash	near Delaware River (not state designated)
PI 448	22.19	2/16/2018	72	Till	Saw Creek
PI 522	27.99	9/30/2018	150	Catskill (Poplar Gap Member)	Wallenpaupack Creek
PI 563	16.80	9/21/2018	--	Catskill (Long Run Member)	Shohola Creek
PI 571	84.25	9/20/2018	480	Catskill (Long Run Member)	Walker Lake Creek (Twin Lakes)
PI 572	33.68	9/21/2018	--	Catskill (Long Run Member)	Shohola Creek
PI 573	85.19	9/21/2018	--	Catskill (Long Run Member)	Wallenpaupack Creek
PI 574	55.39	9/20/2018	200	Catskill (Long Run Member)	Lackawaxen River
PI 581	147.78	9/21/2018	270	Catskill (Long Run Member)	Saw Creek
PI 585	28.32	9/20/2018	220	Catskill (Long Run Member)	Shohola Creek
PI 586	26.05	9/21/2018	325	Catskill (Long Run Member)	Bushkill Creek
PI 587	54.18	9/20/2018	--	Catskill (Long Run Member)	Masthope Creek
PI 654	9.33	9/21/2018	--	Catskill (Long Run Member)	Little Bushkill Creek
PI 88	29.40	10/17/2017	748	Catskill (Long Run Member)	West Colang Creek (not state designated)
PI 582	44.28	9/21/2018	725	Towamensing Member (Catskill)	Little Bushkill Creek
PI 200	59.30	8/31/2018	799	Trimmers Rock Formation	Toms Creek
PI 449	17.30	2/16/2018	500	Trimmers Rock Formation	Saw Creek
PI 552	58.41	9/20/2018	--	Trimmers Rock Formation	Cummins Creek
PI 578	70.60	9/21/2018	225	Trimmers Rock Formation	Adams Creek
PI 402	4.64	9/21/2018	825	Mahantango Formation	Hornbecks Creek
PI 556	31.09	9/20/2018	400	Mahantango Formation	Raymondskill Creek
PI 591	26.59	10/4/2018	300	Mahantango Formation	Sawkill Creek
PI 590	26.22	9/21/2018	350	Marcellus Shale	near Delaware River (not state designated)

[gray shading indicates wells discontinued from network 2017-18]

[yellow shading indicates wells with continuous water levels operated by U.S. Geological Survey (USGS)]

[aqua shading indicates well added to network in September or October 2018]

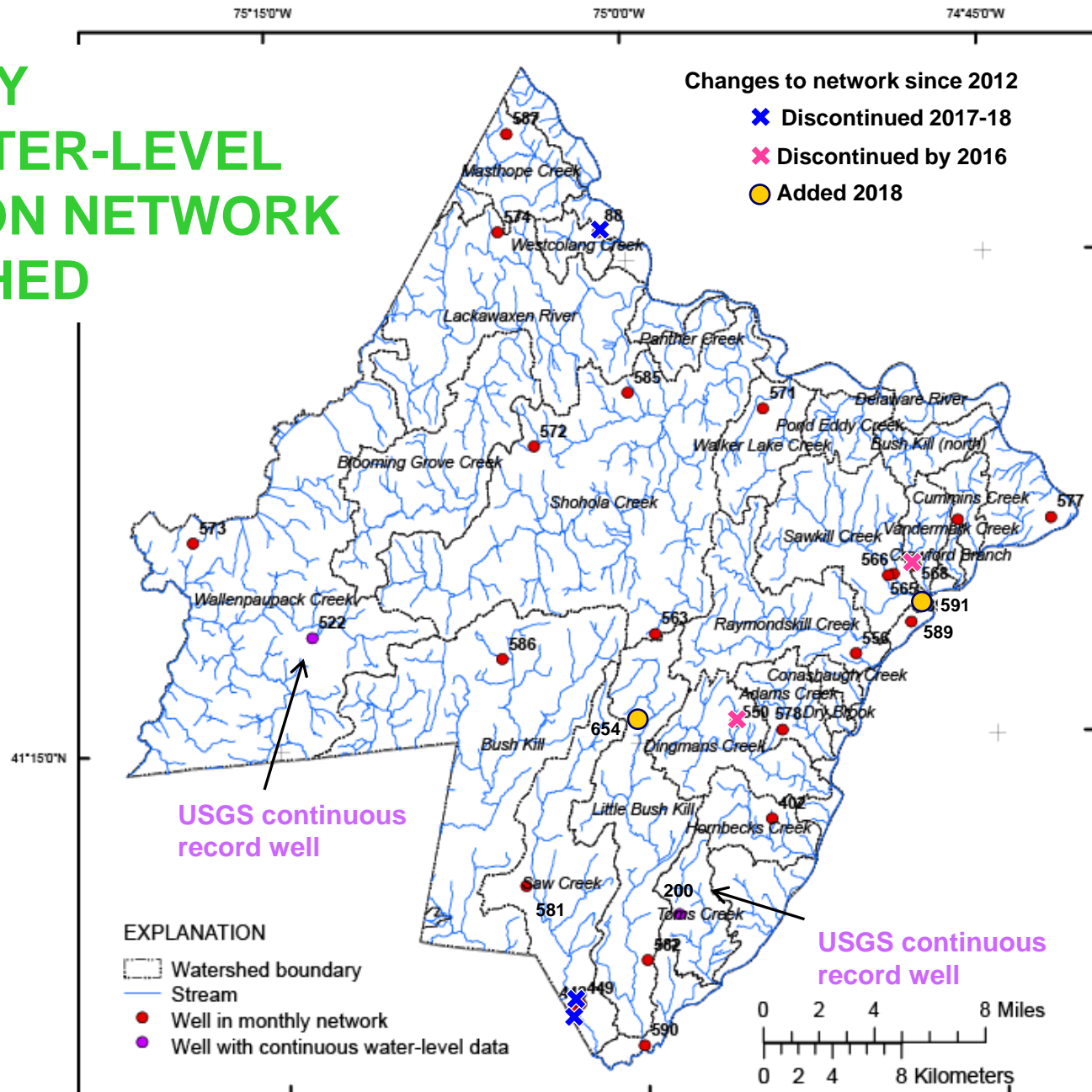
Wells range in  
depth from  
24 to 825 feet

Water levels range  
from ~5 to 148 feet  
below land surface  
(Sept 2018)



# PIKE COUNTY GROUNDWATER-LEVEL OBSERVATION NETWORK BY WATERSHED

Preliminary Information —  
Subject to Revision.



# Pike County groundwater-level observation network applications

- Monitor annual and seasonal range of water level fluctuations and characterize depth to water in wells throughout county
- Long-term data can be used for establishing and monitoring drought conditions
- Useful in determining water budgets for watersheds and estimating stream base-flow conditions

# Network Limitations

**Spatial** - wells not located in some areas of the county; lost some wells from network

**Temporal** — period of record (15 years) may not be representative of full range of hydrologic conditions; monthly measurements — time-scale resolution



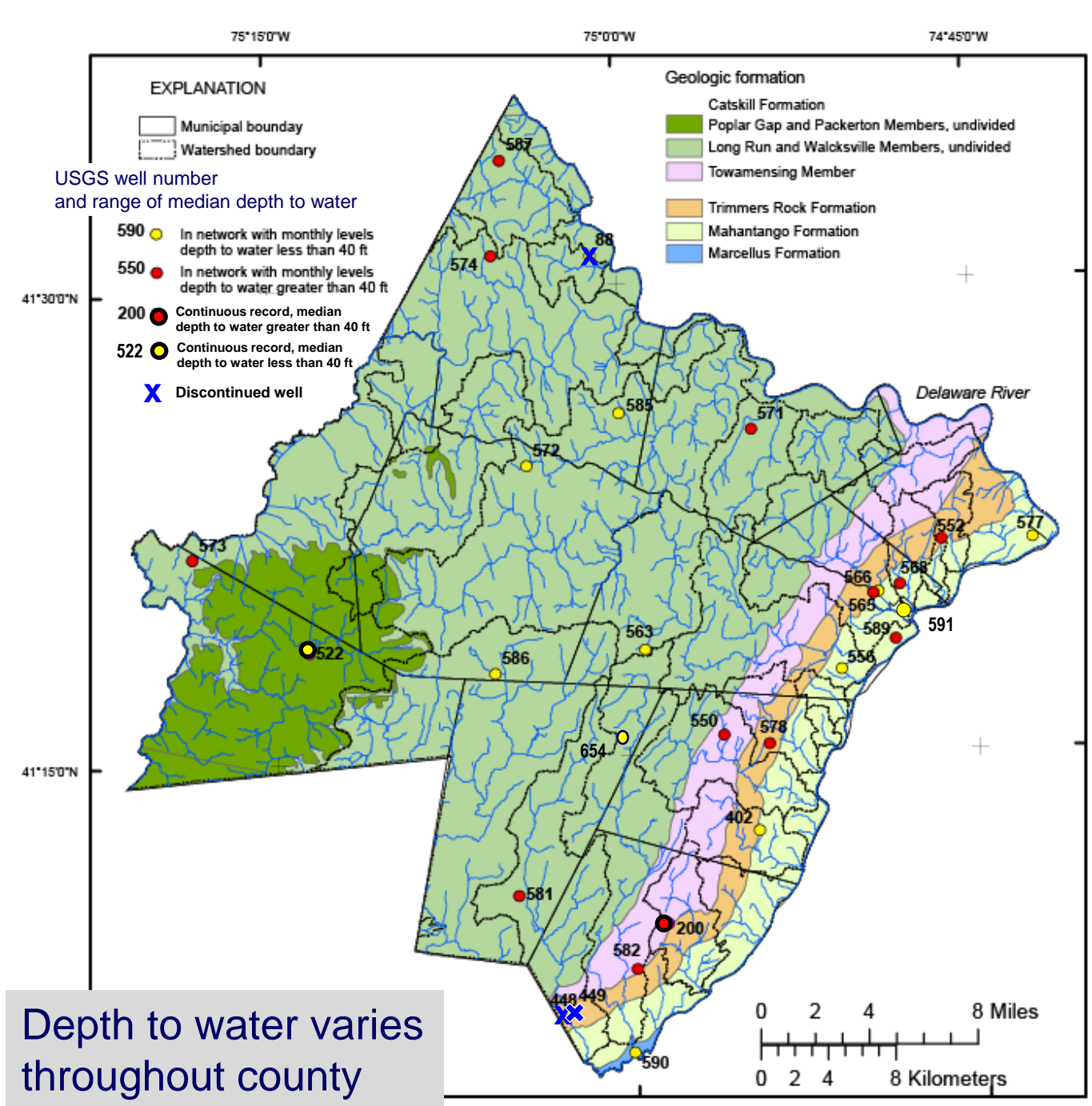
From  
2007-22 data

Depth to water:  
Median 40 ft

- < 40 ft
- >40 ft

Water-level data from  
[https://rconnect.usgs.gov/PAWSC\\_gro\\_undwater\\_watch/](https://rconnect.usgs.gov/PAWSC_gro_undwater_watch/)

Preliminary Information —  
Subject to Revision.

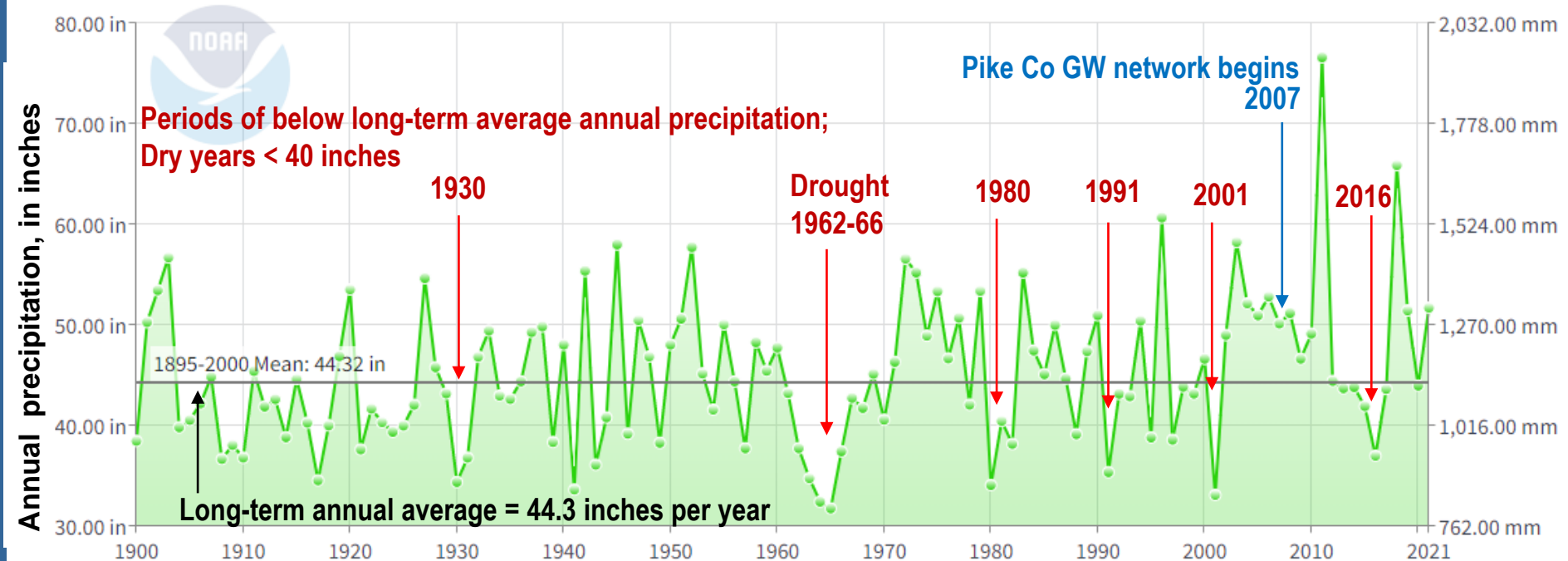


Depth to water varies  
throughout county

# Annual precipitation in Pike County, Pennsylvania, 1900-2021

## Pike County, Pennsylvania Precipitation *from NOAA Climate at a Glance*

January-December



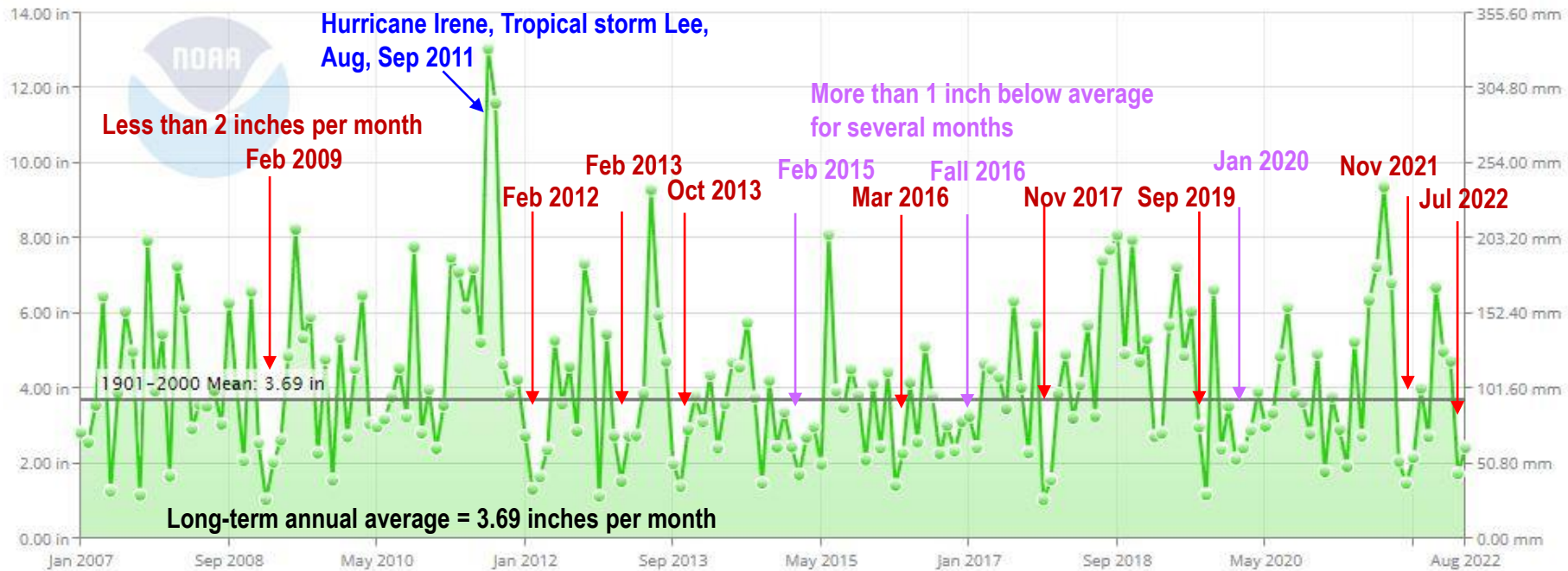
During 2007-2021 period of Pike County groundwater-level network annual precipitation was **above long-term average** 2007-11, 2018-19, 2021; annual precipitation was **below long-term average** 2015-16.

# Monthly precipitation in Pike County, Pennsylvania, 2007-2022

Pike County, Pennsylvania Precipitation

Monthly precipitation in Pike County, January 2007 – August 2022,  
from NOAA Climate at a Glance

Monthly precipitation, in inches

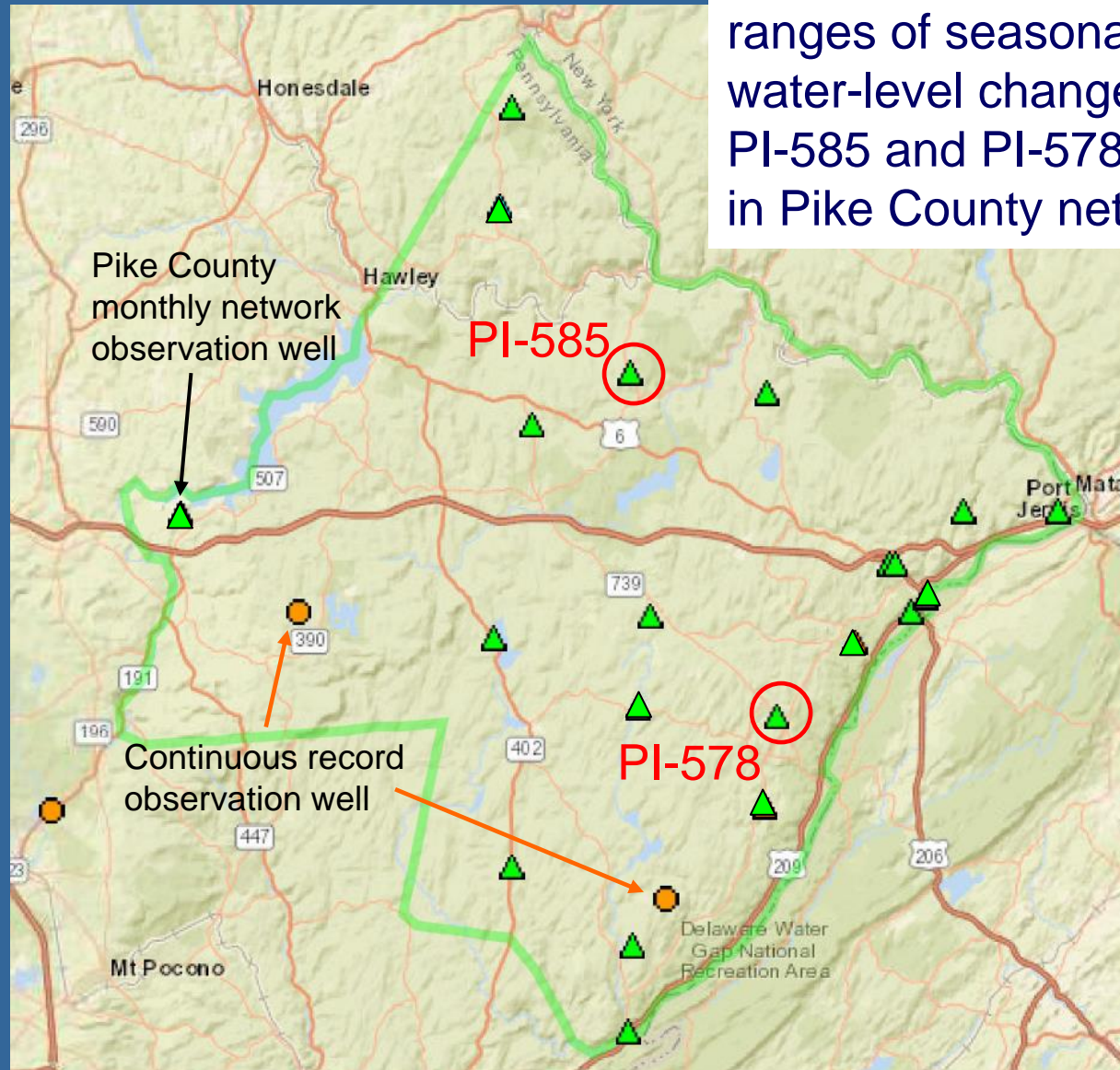


During Jan 2007- Aug 2022 period of Pike County groundwater-level network; monthly precipitation was **below long-term monthly average** in years with both average annual precipitation (2009, 2012) and below average annual precipitation (2015-16).

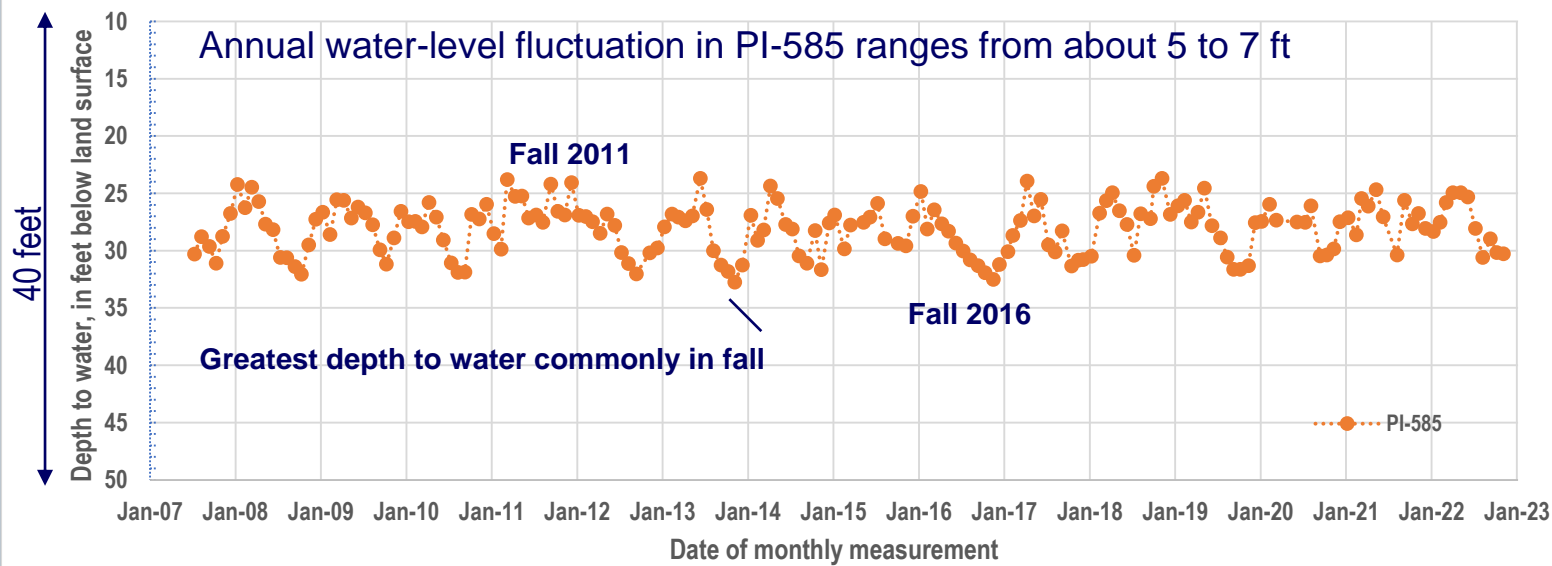
Data from [https://www.nci.noaa.gov/cag/county/time-series/PA-103/pcp/all/8/2007-2022?base\\_prd=true&begbaseyear=1901&endbaseyear=2000](https://www.nci.noaa.gov/cag/county/time-series/PA-103/pcp/all/8/2007-2022?base_prd=true&begbaseyear=1901&endbaseyear=2000)



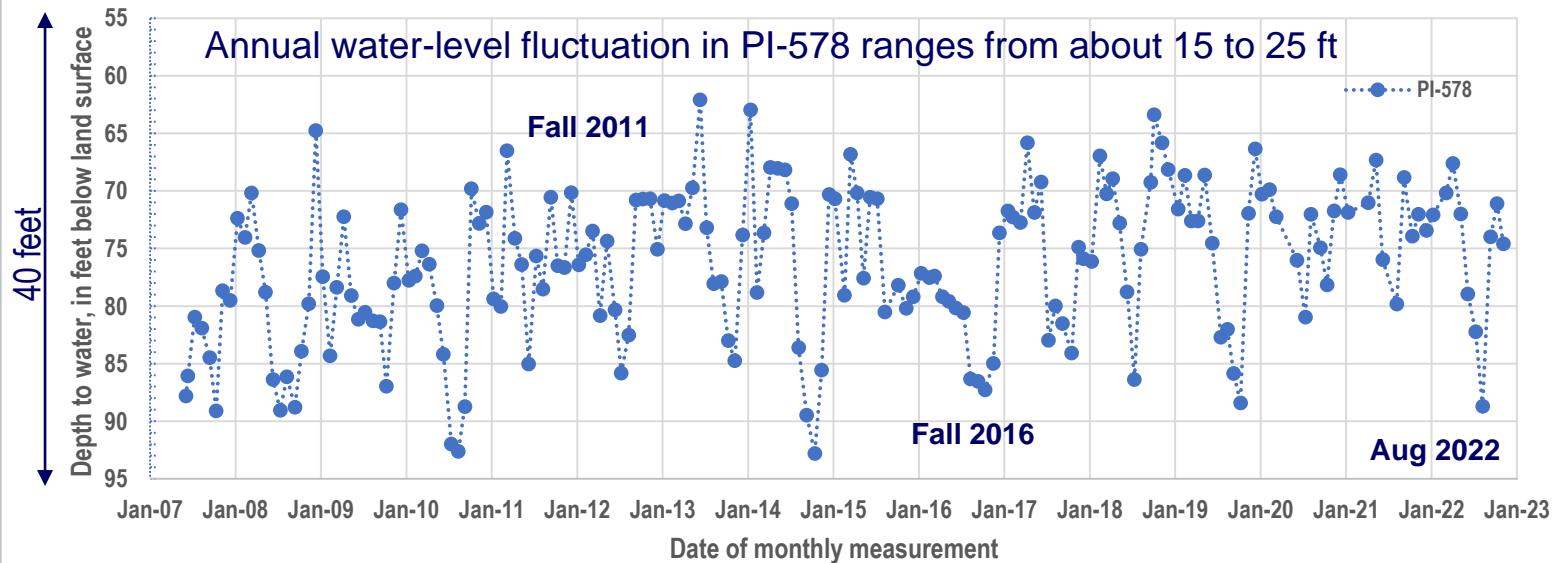
Two wells with different  
ranges of seasonal  
water-level changes,  
PI-585 and PI-578  
in Pike County network



PI-585  
water levels  
2007-22



PI-578  
water levels  
2007-22

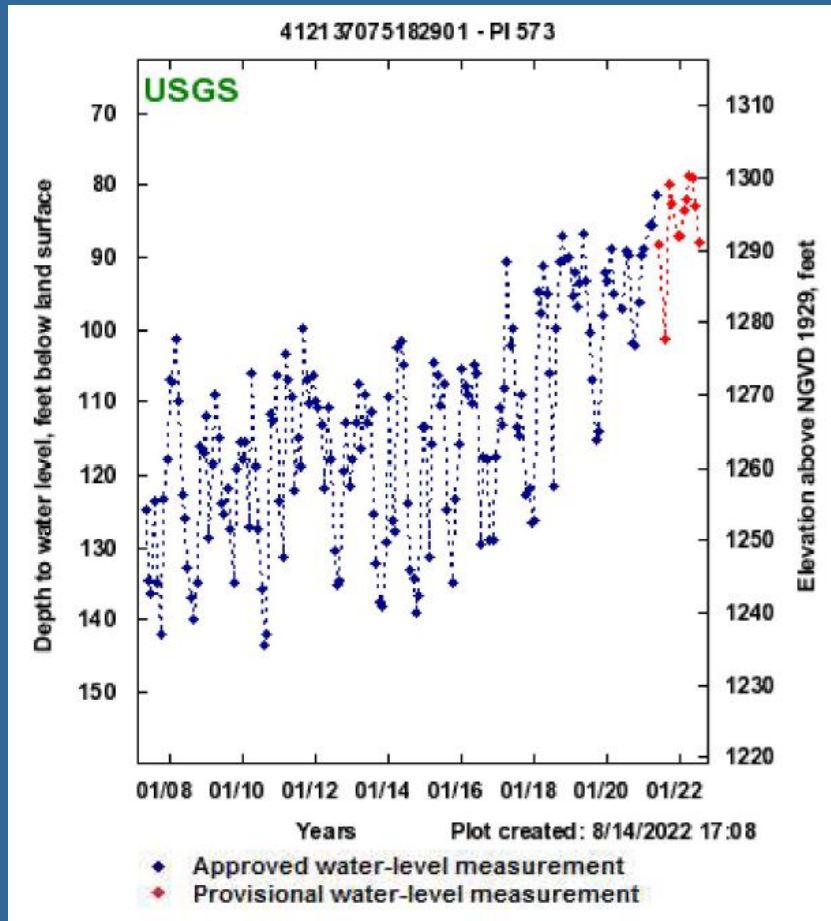


Preliminary Information —  
Subject to Revision.

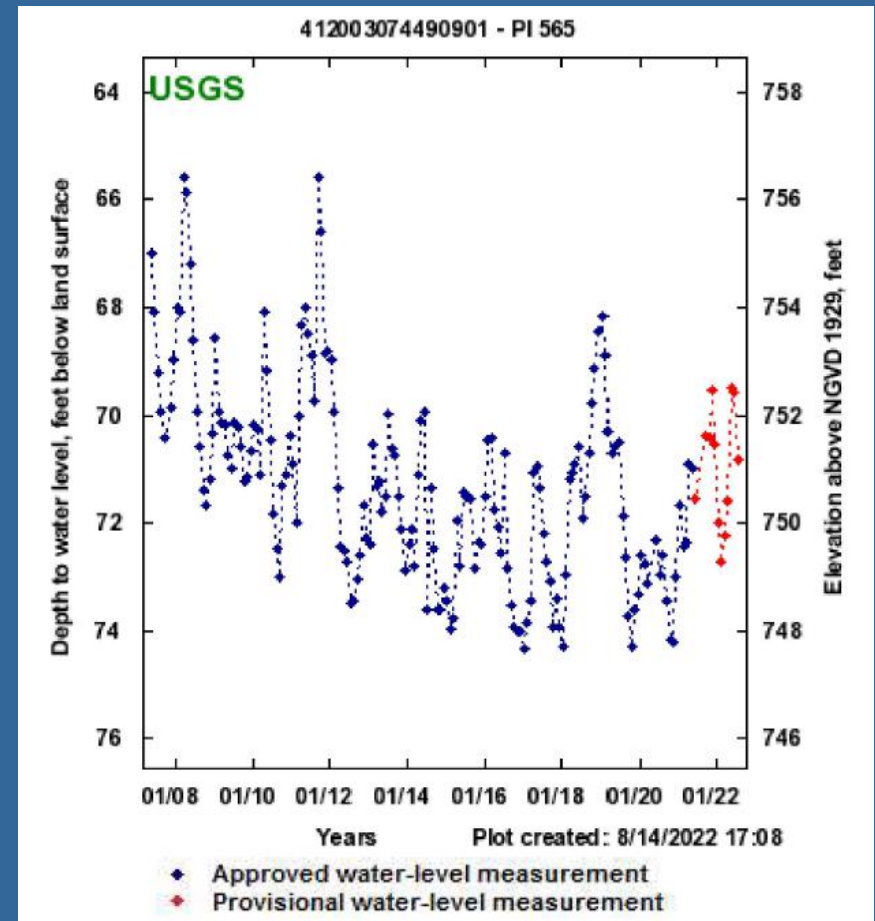


Range of seasonal water-level fluctuations varies by well

In addition to seasonal fluctuations, apparent trends may be indicated by observed water levels in some wells



Upward trend 2007-22 in PI-573?



Downward trend 2007-22 in PI-565?





National Water Information System

<https://waterdata.usgs.gov/nwis>

## USGS

### National Water Information System (NWIS) Modernization 2019-2023 Next Generation Water Data for the Nation

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Legacy web pages being replaced nation-wide

- USGS continuous streamflow data
- USGS continuous groundwater-level data

Legacy application replaced by USGS

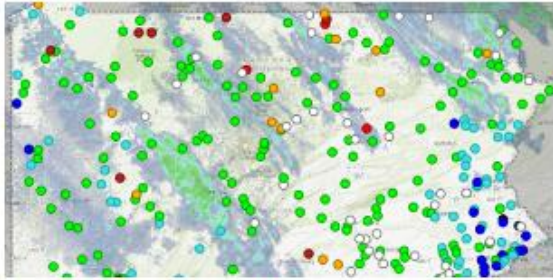
Pennsylvania Water Science Center (PAWSC)

- Groundwater statistics (Groundwater watch)
- Nationwide page discontinued 9/1/2022

# Access to water data on USGS Pennsylvania Water Science Center web site

<https://www.usgs.gov/centers/pennsylvania-water-science-center/data>

## National Water Dashboard

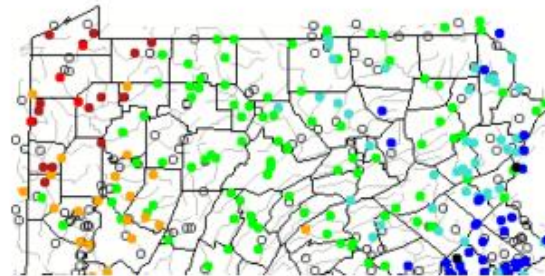


View over 13,000 USGS real-time stream, lake, reservoir, precipitation, water quality & groundwater stations in context with current weather & hazard conditions.

**Water Dashboard**

New interface to continuous data

## Current Conditions



National Water Information System

Streamflow || Groundwater || Water  
Quality

**Current Conditions**

Legacy interface to continuous  
streamflow data

## Hydrologic Toolbox

StreamStats

National Water Information System  
(NWIS)

Flood Inundation Mapper

Water Alert

Delaware River Basin Streamflow  
Estimator (DRB-SET)

Baseline Streamflow Estimator (BaSE)

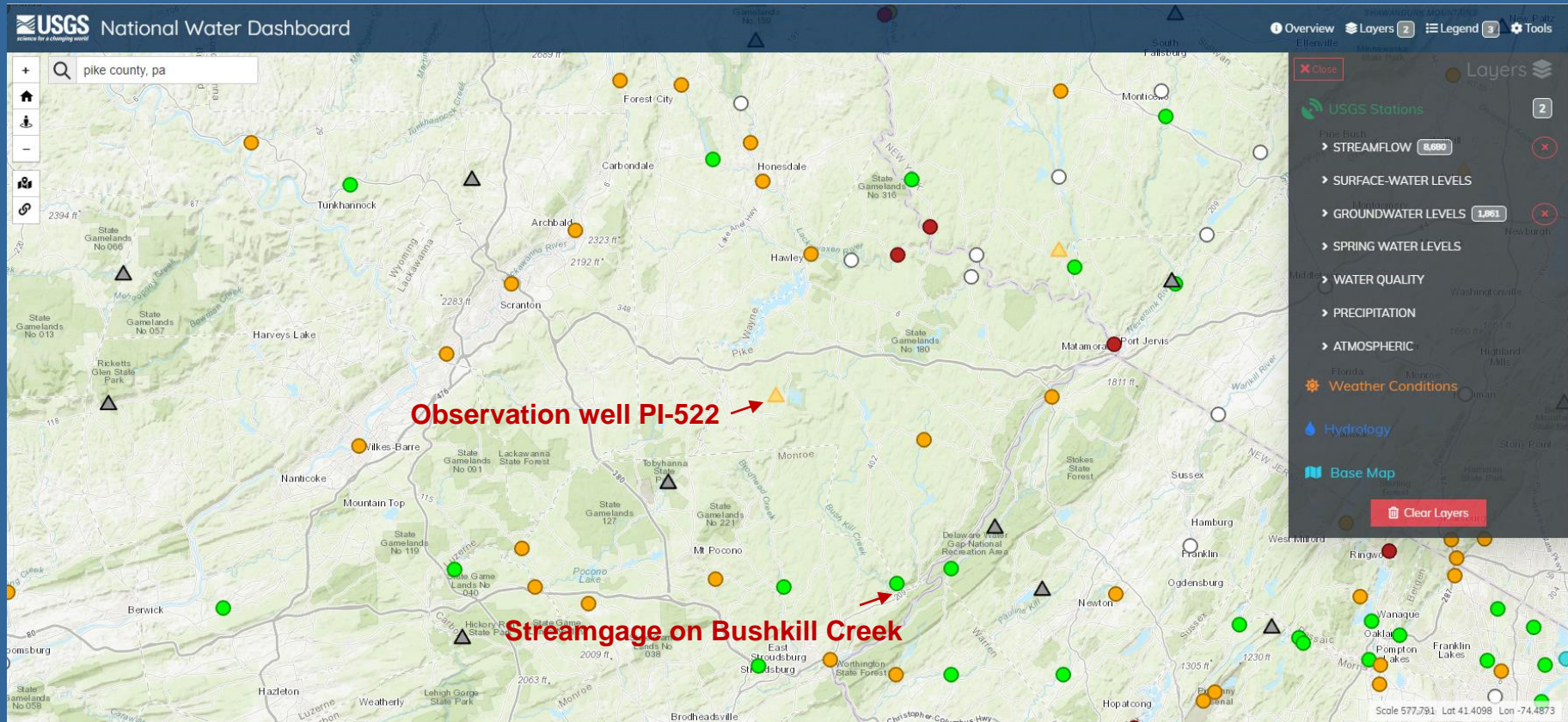
WaterWatch

**Pennsylvania Groundwater Watch**

New interface to monthly  
groundwater-level data



# USGS National Water Dashboard – example showing layers for location of USGS continuous streamflow and groundwater levels sites



<https://dashboard.waterdata.usgs.gov/app/nwd/lang-en/?aoi=default>

## PI 522 Pike County Observation Well



**IMPORTANT** [Legacy real-time page](#)

Monitoring location 411833075133601 is associated with a WELL in PIKE COUNTY, PENNSYLVANIA. Current conditions of DEPTH TO WATER LEVEL are available. Water data back to 2001 are available online.

☐ 7 days ☐ 30 days ☒ 1 year

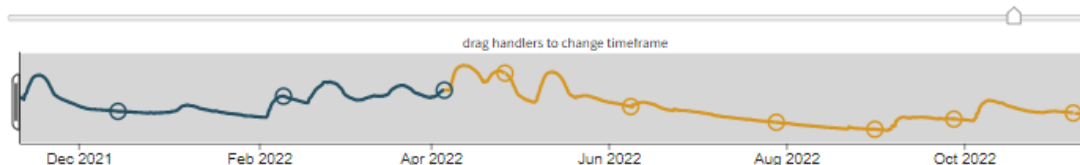
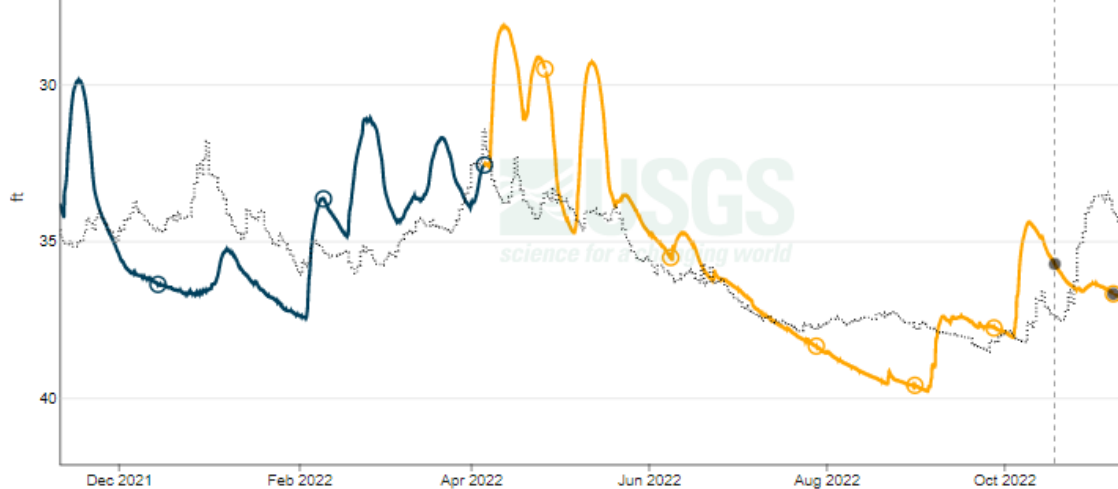
Change time span

Retrieve data

Depth to water level, ft below land surface

35.73 ft - Oct 18, 2022 09:00:00 AM EDT

36.68 ft - Nov 07, 2022 10:42:00 AM EST



Current: — Approved — Provisional  
Field visit: ○ Approved ○ Provisional  
Median: ..... 2002 - 2022

☐ Compare to last year

☒ Display median

<https://waterdata.usgs.gov/monitoring-location/411833075133601/#parameterCode=72019&period=P7D>



## Bush Kill at Shoemakers, PA



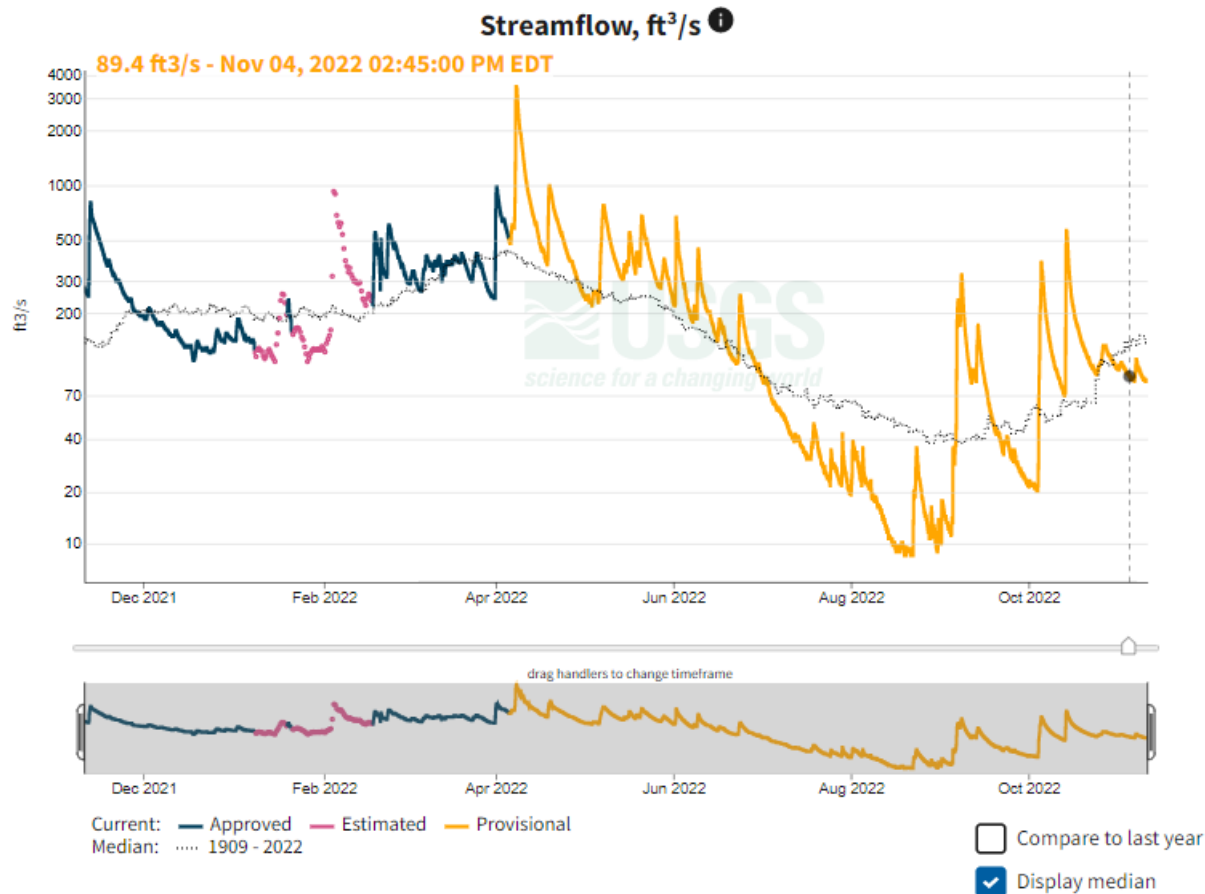
**IMPORTANT** [Legacy real-time page](#) ⓘ

Monitoring location 01439500 is associated with a STREAM in MONROE COUNTY, PENNSYLVANIA. Current conditions of DISCHARGE, GAGE HEIGHT, SPECIFIC CONDUCTANCE, and MORE are available. Water data back to 1908 are available online.

☐ 7 days ☐ 30 days ☒ 1 year

Change time span

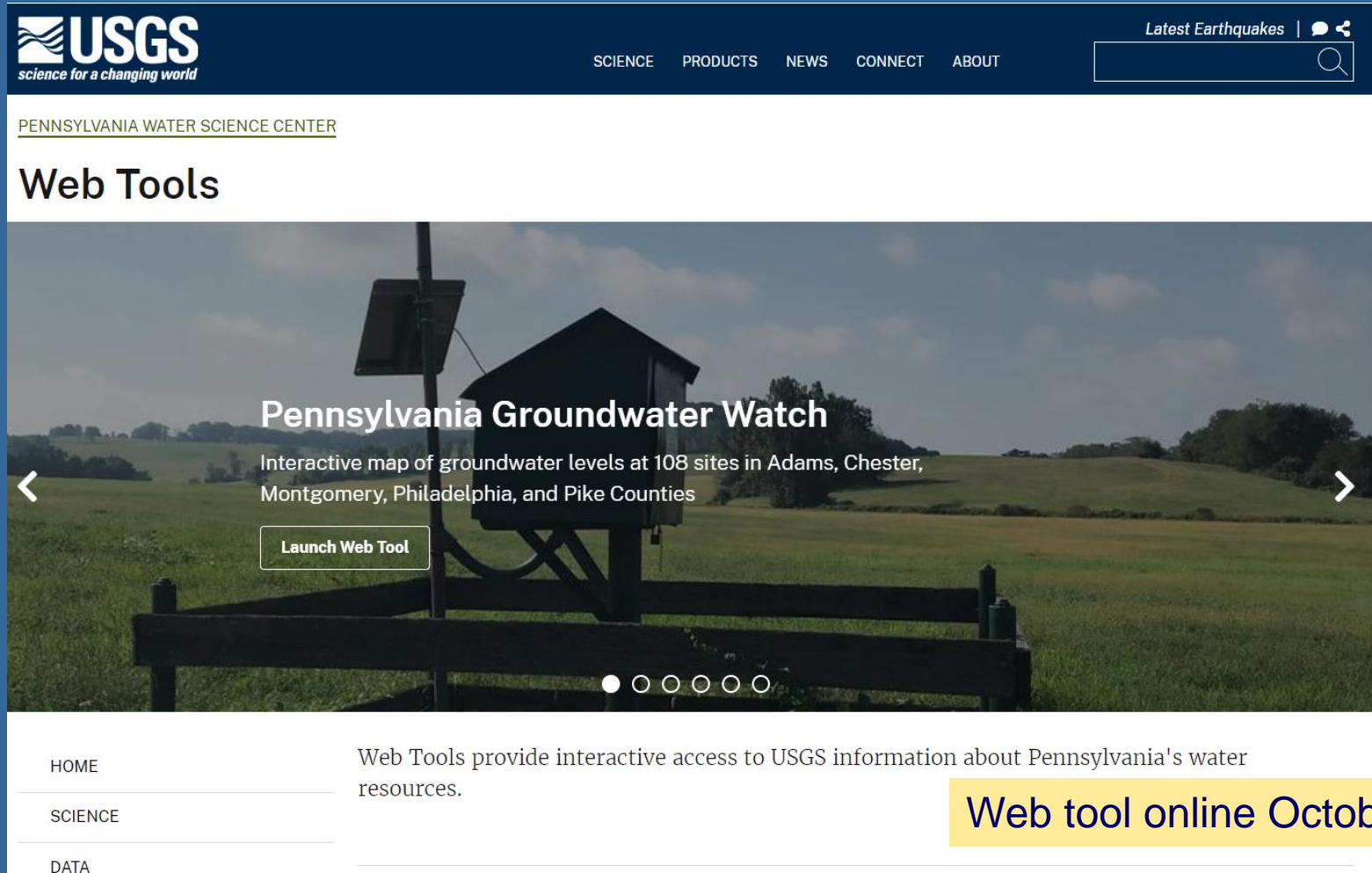
Retrieve data



<https://waterdata.usgs.gov/monitoring-location/01439500/#parameterCode=00060&period=P365D>

Example of new  
USGS web page  
showing  
continuous  
streamflow data

# New USGS Pennsylvania Water Science Center replacement web page for USGS Groundwater Watch – groundwater data and statistics



**USGS**  
science for a changing world

SCIENCE PRODUCTS NEWS CONNECT ABOUT

Latest Earthquakes |

PENNSYLVANIA WATER SCIENCE CENTER

## Web Tools

### Pennsylvania Groundwater Watch

Interactive map of groundwater levels at 108 sites in Adams, Chester, Montgomery, Philadelphia, and Pike Counties

[Launch Web Tool](#)

HOME

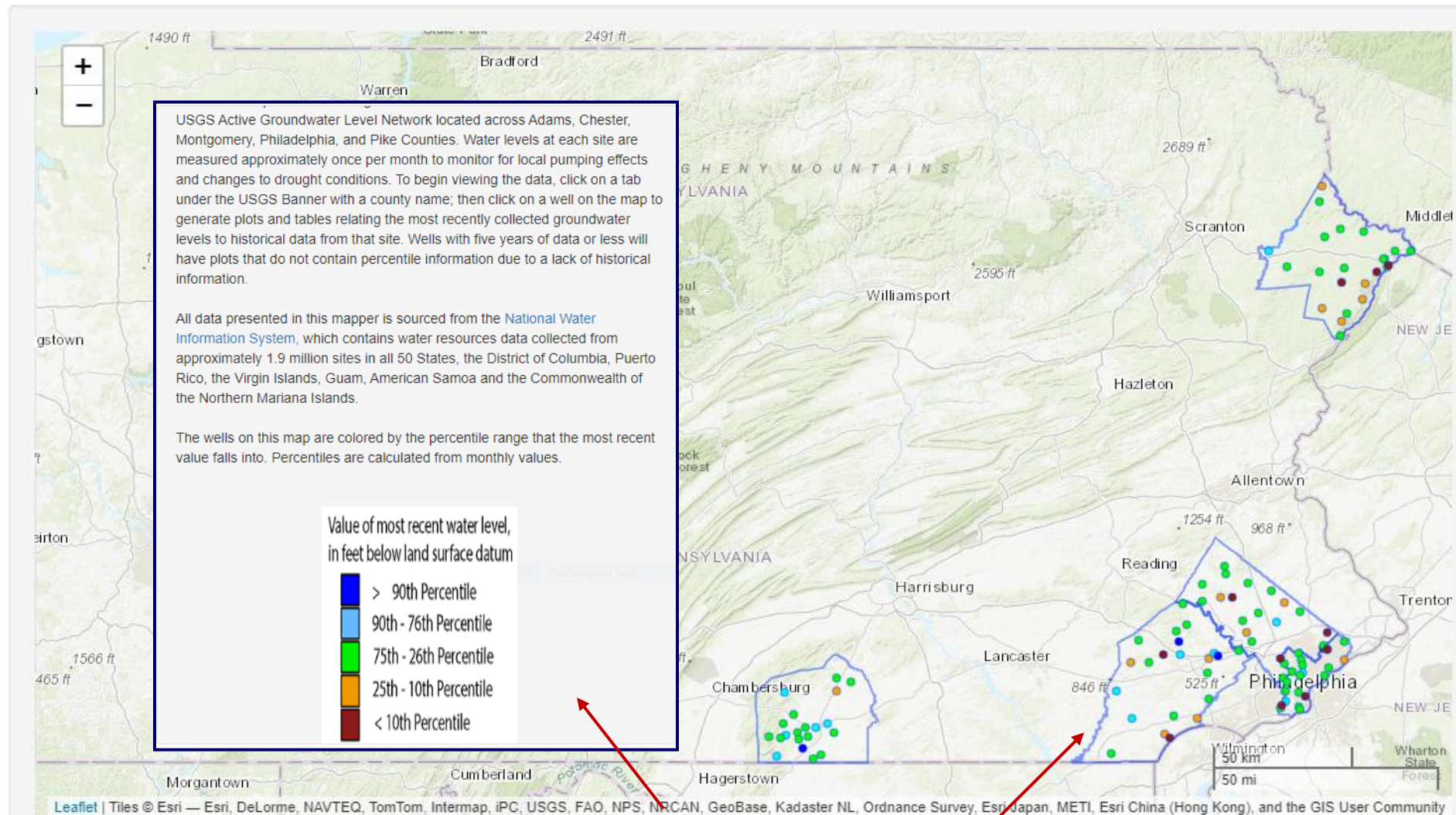
SCIENCE

DATA

Web Tools provide interactive access to USGS information about Pennsylvania's water resources.

Web tool online October 2022

<https://www.usgs.gov/centers/pennsylvania-water-science-center/tools>





# New USGS Pennsylvania Groundwater Watch - data and statistics



Pennsylvania Groundwater Watch - Wednesday, November 09, 2022

Overview

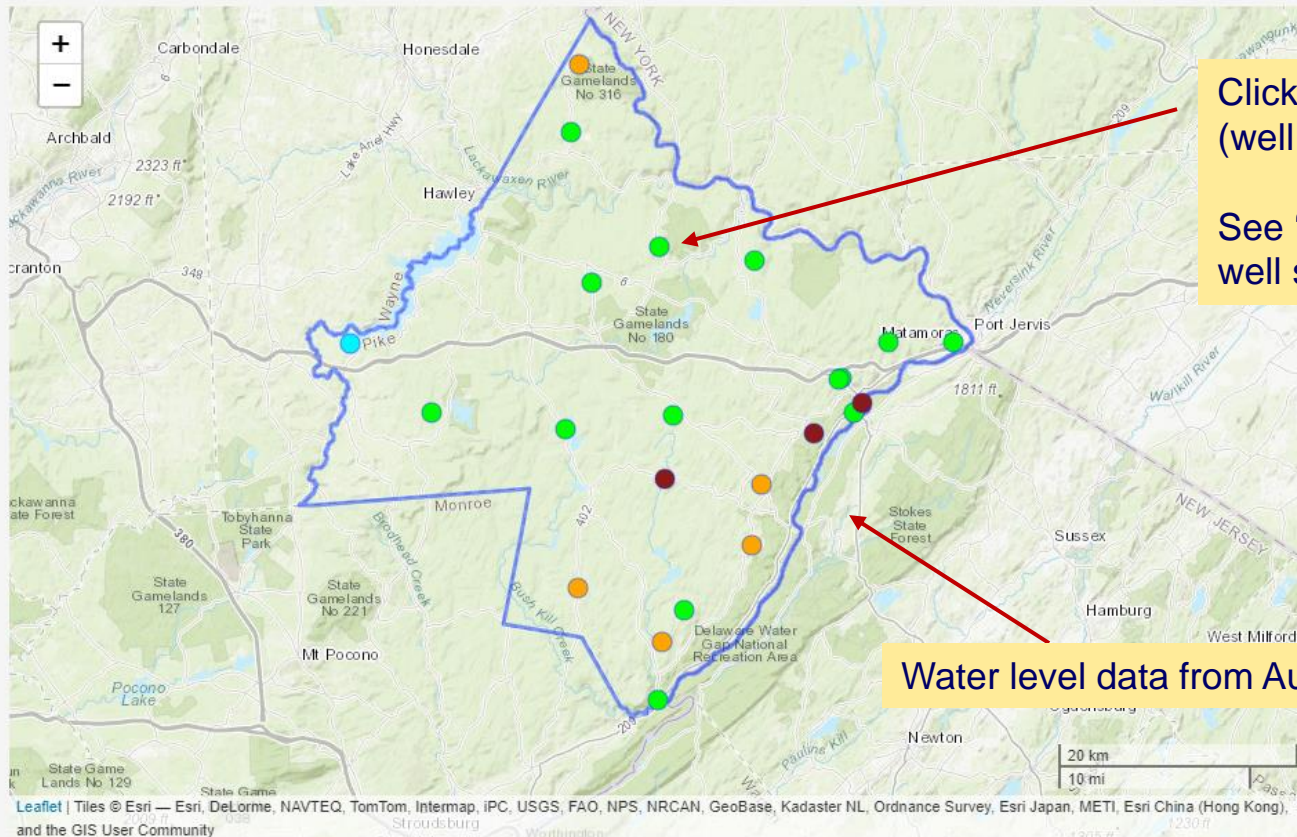
Adams

Chester

Montgomery

Philadelphia

Pike



Click on a well to view a site description and data

Click on well for data  
(well PI-585)

See 'Overview' tab for definition of  
well symbol shading

Water level data from August 2022

For more information about the Pike County Groundwater Level Monitoring webpage, please contact [GS-W-PA\\_is@usgs.gov](mailto:GS-W-PA_is@usgs.gov)



Preliminary Information — Subject to Revision. Not for Citation

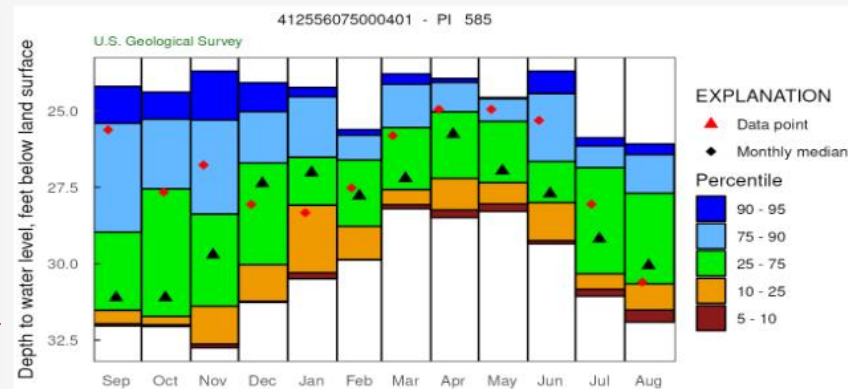


# New USGS Pennsylvania Groundwater Watch – data and statistics

## Site Description

Coordinate Location	41°25'56.4" N, 75°00'04.2" W
Well Depth	220 feet below land surface
Land Surface Altitude	1,267 feet above NGVD29.
National Aquifer	Other aquifers (N9999OTHER) national aquifer.
Local Aquifer	Long Run, Beaverdam Run, Walckville Mbrs of Catskill Fm, Undivided (341LRBW) local aquifer

## Site Statistics



Measured water levels in last 12 months plotted relative to historical percentiles of monthly values; well symbols on map are shaded by color of historical percentile

Month	Highest value	90th %ile	75th %ile	Median	25th %ile	10th %ile	5th %ile	Lowest value	Number of Years
January	24.23	24.54	26.52	27.02	28.08	30.29	30.49	30.49	14
February	25.61	25.79	26.60	27.78	28.78	29.87	29.88	29.88	14
March	23.79	24.12	25.54	27.21	27.58	28.07	28.20	28.20	14
April	23.94	24.07	25.03	25.76	27.21	28.24	28.49	28.49	12
May	24.56	24.60	25.34	26.96	27.34	28.05	28.29	28.29	13
June	23.70	24.43	26.65	27.71	28.00	29.24	29.35	29.35	13
July	25.88	26.15	26.85	29.18	30.33	30.83	31.06	31.06	14
August	26.08	26.43	27.69	30.06	30.66	31.52	31.91	31.91	14
September	24.20	25.41	28.96	31.11	31.52	31.97	32.03	32.03	13
October	24.39	25.27	27.55	31.11	31.73	32.00	32.05	32.05	13
November	23.70	25.30	28.38	29.71	31.39	32.62	32.75	32.75	14
December	24.08	25.02	26.71	27.38	30.03	31.23	31.26	31.26	14

Preliminary Information —  
Subject to Revision.

## Link from USGS Pennsylvania Groundwater Watch to new web page showing site data for well



Water Resources | Water Dashboard

About Water Data for the Nation | Data Information | Data Inventory | Why Next Gen? | How-to

### PI 585

IMPORTANT [Inventory Page](#)

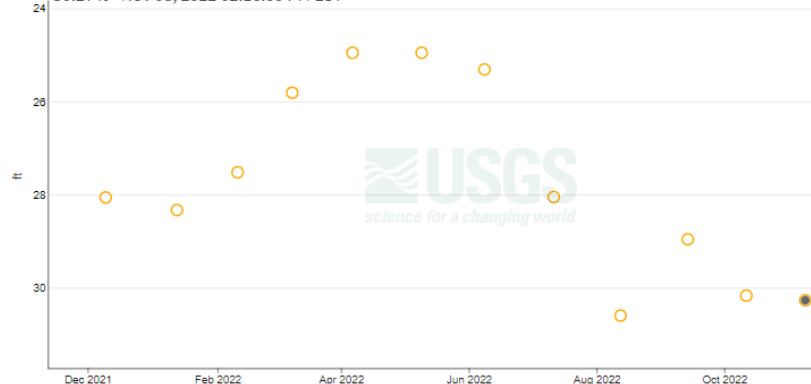
Monitoring location 412556075000401 is associated with a WELL in PIKE COUNTY, PENNSYLVANIA. Water data back to 2007 are available online.

☒ 1 year ☐ 10 years ☐ Period of record

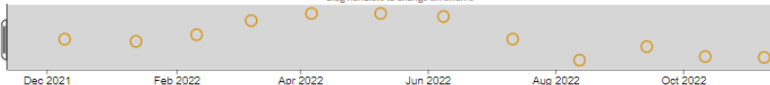
Change time span | Retrieve data

#### Depth to water level, ft below land surface

30.27 ft - Nov 08, 2022 02:16:00 PM EST



drag handlers to change timeframe



Field visit: ○ Provisional

☐ Compare to last year  
☐ Display median

IMPORTANT Data may be provisional - [learn more](#)

### Select data to graph

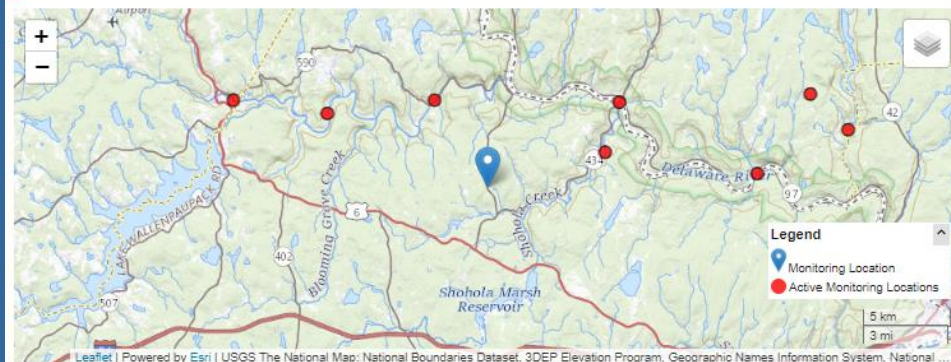
- ☒ Depth to water level, ft below land surface 2007-07-10 to 2022-11-08 ^
- ☐ Groundwater level above NAVD 1988, ft 2007-07-10 to 2022-11-08 v
- ☐ Groundwater level above NGVD 1929, feet 2007-07-10 to 2022-11-08 v

Hydrograph data table(s) +

Groundwater data BETA -

#### Why don't I see a groundwater graph?

No groundwater level statistical daily data has been reported for this location.



Interested in understanding how to access the upstream/downstream data? [Learn about the Network-Linked Data Index \(NLDI\)](#)

Summary of all available data +

Location metadata +



<https://waterdata.usgs.gov/monitoring-location/412556075000401/#parameterCode=72019&period=P1Y>

Preliminary Information — Subject to Revision.

# Other USGS Studies and Monitoring in and near Pike County

## USGS Pennsylvania Drought Condition Monitoring

<https://pa.water.usgs.gov/apps/drought/>

## USGS Delaware River Master

<https://webapps.usgs.gov/odrm/>

## Next Generation Water Observing System (NGWOS) – Delaware River Basin

New stream gages – for example, Shohola Creek in Pike County

Stream temperature monitoring and modeling

Stream salinity – upcoming

For more information, see

<https://www.usgs.gov/mission-areas/water-resources/science/next-generation-water-observing-system-delaware-river-basin>

## Integrated Water Availability Assessments (IWAAs) – Delaware River Basin

Groundwater flow model under development

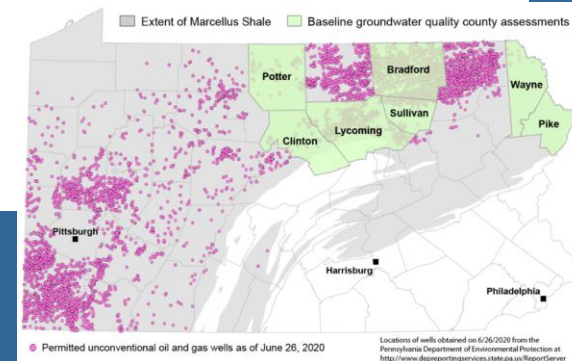
For more information, see

<https://www.usgs.gov/mission-areas/water-resources/science/integrated-water-availability-assessments-delaware-river>

## Baseline groundwater quality, Pennsylvania

Multi-county synthesis in 2022, includes Pike County

<https://www.usgs.gov/centers/pennsylvania-water-science-center/science/groundwater-quality-domestic-supply-wells>





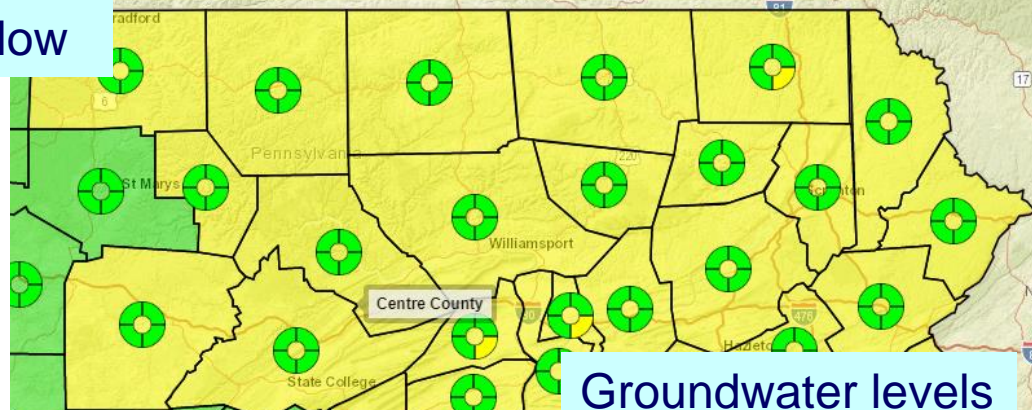
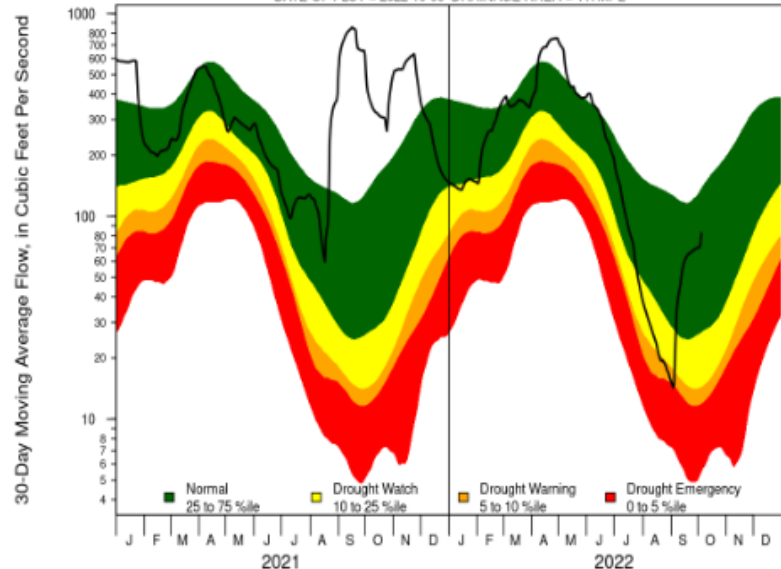
## Pennsylvania Drought Condition Monitoring - October 06 2022



### Streamflow

01439500 - BUSH KILL AT SHOEMAKERS, PA

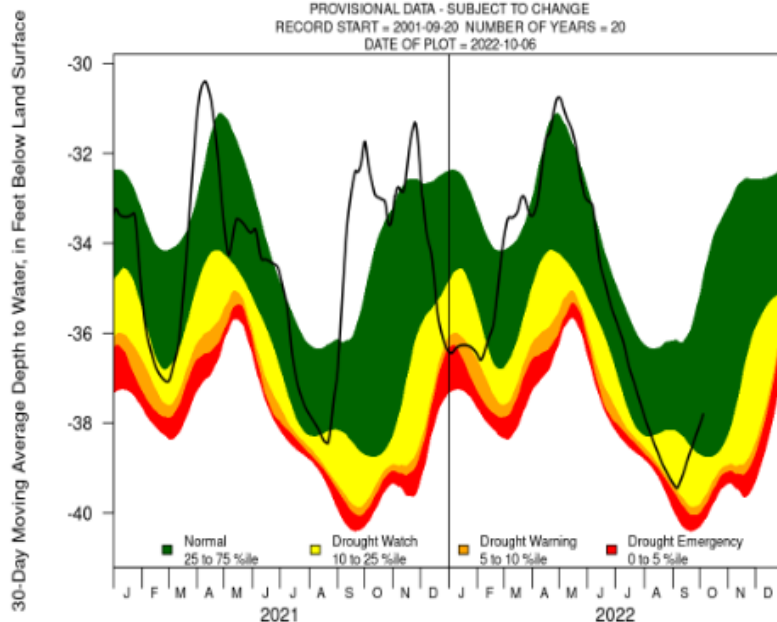
PROVISIONAL DATA - SUBJECT TO CHANGE  
RECORD START = 1908-10-01 NUMBER OF YEARS = 113  
DATE OF PLOT = 2022-10-06 DRAINAGE AREA = 117MI<sup>2</sup>



### Groundwater levels

PI 522 PIKE COUNTY OBSERVATION WELL

PROVISIONAL DATA - SUBJECT TO CHANGE  
RECORD START = 2001-09-20 NUMBER OF YEARS = 20  
DATE OF PLOT = 2022-10-06



Click on  
upper right quadrant to see streamflow indicator

lower right quadrant to see groundwater indicator



# NGWOS: NextGen water observing system



The USGS next-generation water observing system will provide high-fidelity, real-time data on water quantity and quality necessary to support modern water prediction and decision support systems for water emergencies and daily water operations. The Delaware River Basin pilot provides an opportunity to develop the NextGen observing system in a nationally important, complex interstate river system.

USGS 01432495 Shohola Creek near Walker Lake, PA

## Stream Site

Available data for this site SUM

DESCRIPTION:

Latitude 41°27'00", Longitude 74°55'18" NAD83  
Pike County, Pennsylvania, Hydrologic Unit 02040104  
Drainage area: 74.5 square miles  
Datum of gage: 710 feet above NAVD88.

AVAILABLE DATA:

Data Type	Begin Date	End Date	Count
<a href="#">Current / Historical Observations</a> (availability statement)	2018-10-01	2022-11-13	
<a href="#">Daily Data</a>			
Temperature, water, degrees Celsius	2019-04-24	2022-11-12	3747
Discharge, cubic feet per second	2018-10-01	2022-11-12	1504

OPERATION:

Record for this site is maintained by the USGS Pennsylvania Water Science Center  
Email questions about this site to [Pennsylvania Water Science Center Water-Data Inquiries](#)

New stream gage on Shohola Creek as part of NextGen effort in Delaware River Basin



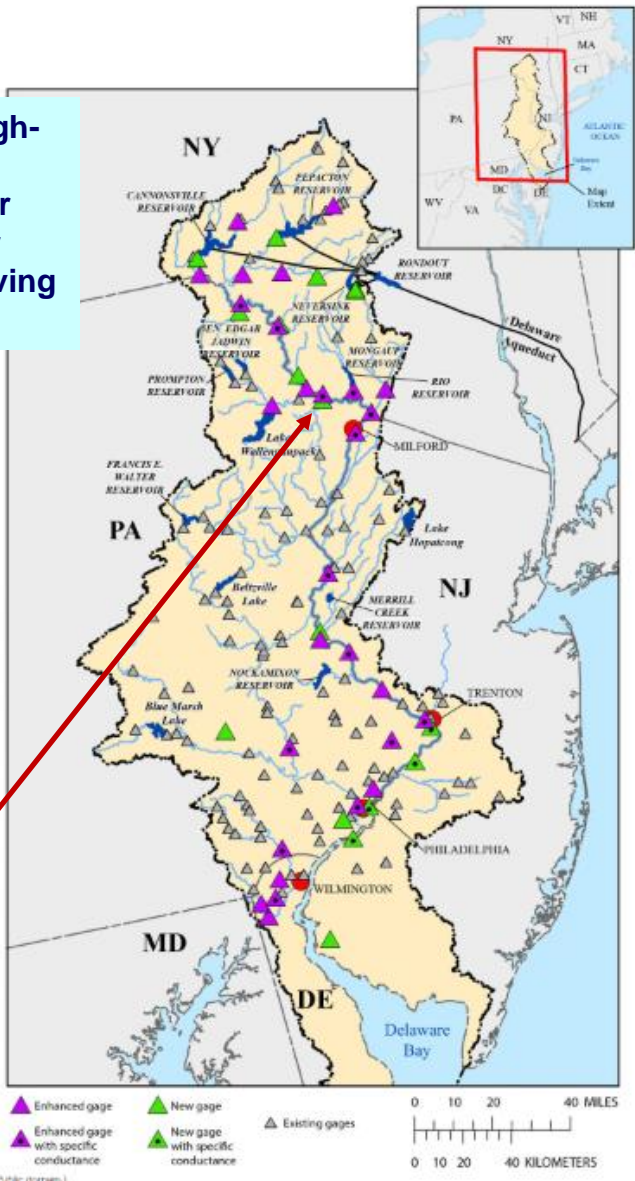
Preliminary Information — Subject to Revision.



SOURCE: PRODUCTS NEWS CONNECT ABOUT  
Topics, Maps, Releases, Contact, Organizations, Info

Search

## NextGen Water Observing System: Delaware River Basin



Pike County well network  
USGS contact for more information

Lisa Senior  
USGS  
Pennsylvania Water Science Center  
[lasenior@usgs.gov](mailto:lasenior@usgs.gov)

