

*Westmoreland  
Conservation  
District* 



MONITORING PROGRAM 2023

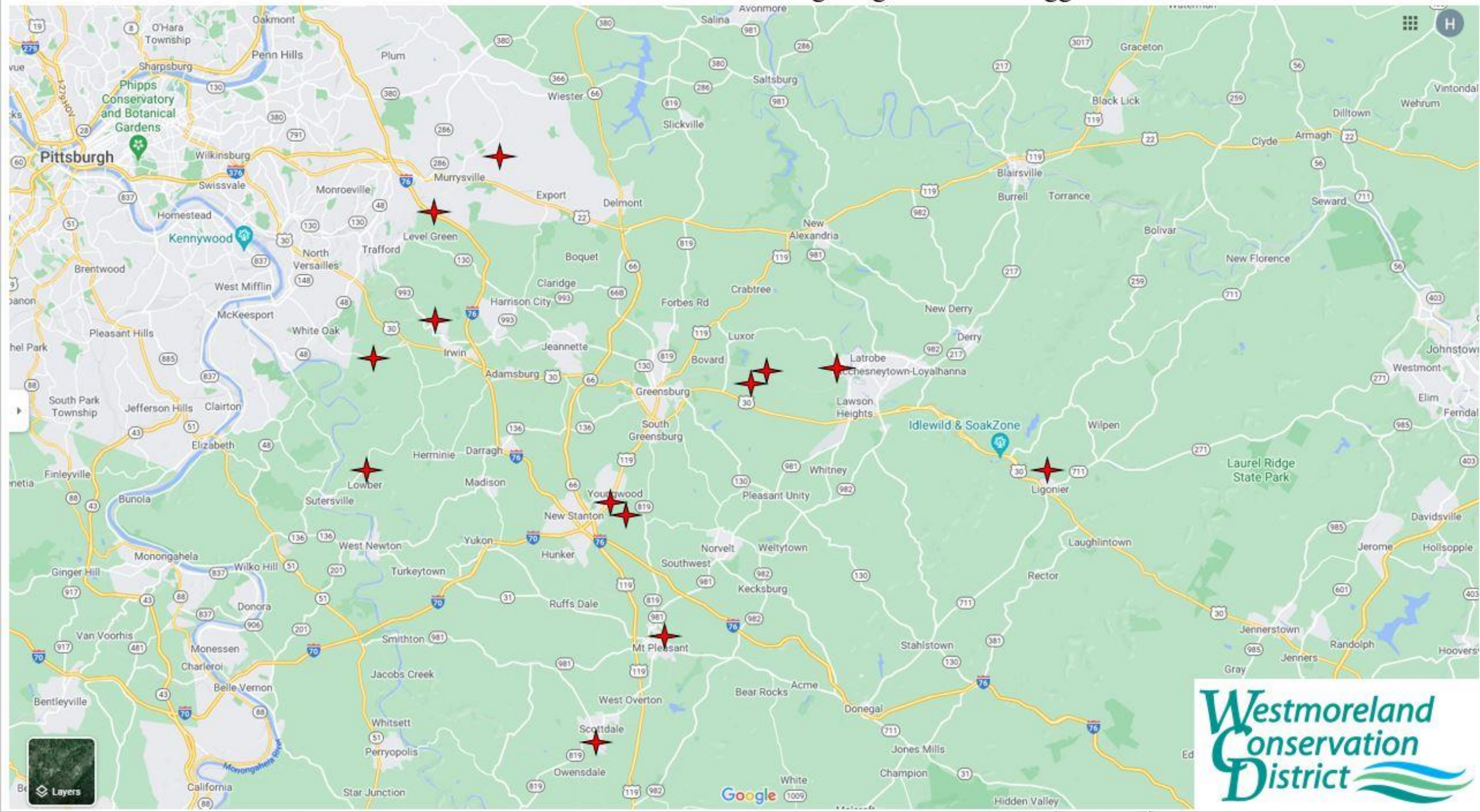
# OVERVIEW

- 13 DATA LOGGERS AROUND WESTMORELAND COUNTY
- 33 TOTAL SENSORS
- WATER LEVEL SENSORS (CTD-10/ HYDROS-21), SOIL MOISTURE SENSORS (GS3), RAIN GAUGES (ECRN-50/100), AND WEATHER STATIONS (ATMOS-41)



# Westmoreland Conservation District Monitoring Program : Data Logger Locations

January 2023







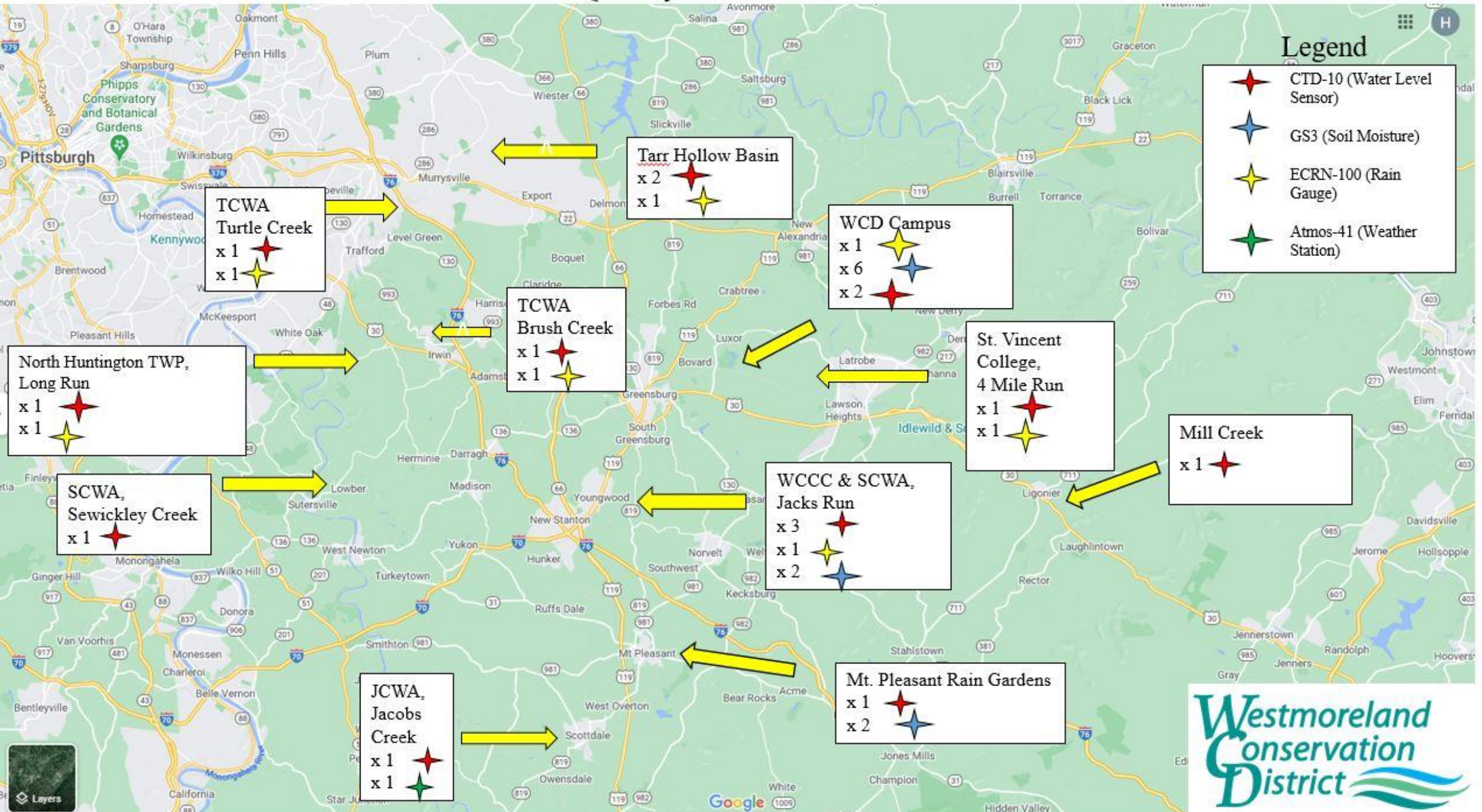


# Quantity of Sensors

January 2023

## Legend

-  CTD-10 (Water Level Sensor)
-  GS3 (Soil Moisture)
-  ECRN-100 (Rain Gauge)
-  Atmos-41 (Weather Station)





# GOALS

- RECORD AND REPORT WATER RESOURCE DATA
- INVESTIGATE EFFECTIVENESS OF BMPS
- PROVIDE DATA FOR WATERSHED ASSOCIATIONS, ENGINEERS, MUNICIPALITIES, EDUCATORS

# DATA LOGGERS



ZL6

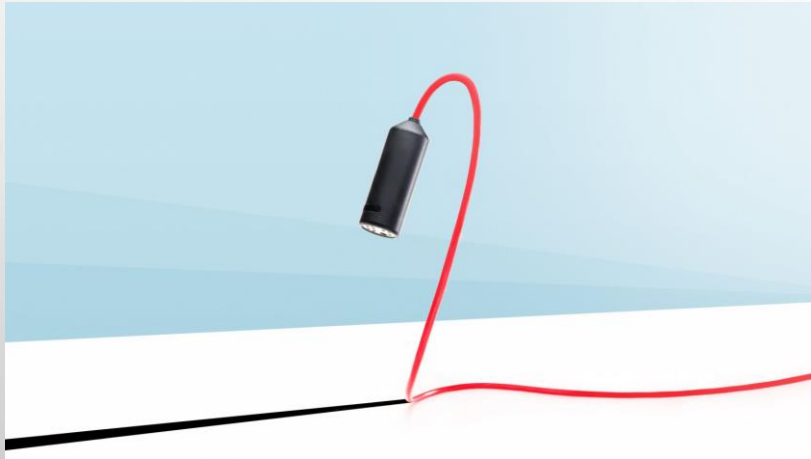
- Measurement recordings every 5 min
- Online reporting every hour
- 3G and 4G communication
- 6 sensor imports
- Rechargeable Solar Battery



TCWA Brush Creek Data Logger



# CTD-10/ HYDROS-21 WATER LEVEL SENSOR

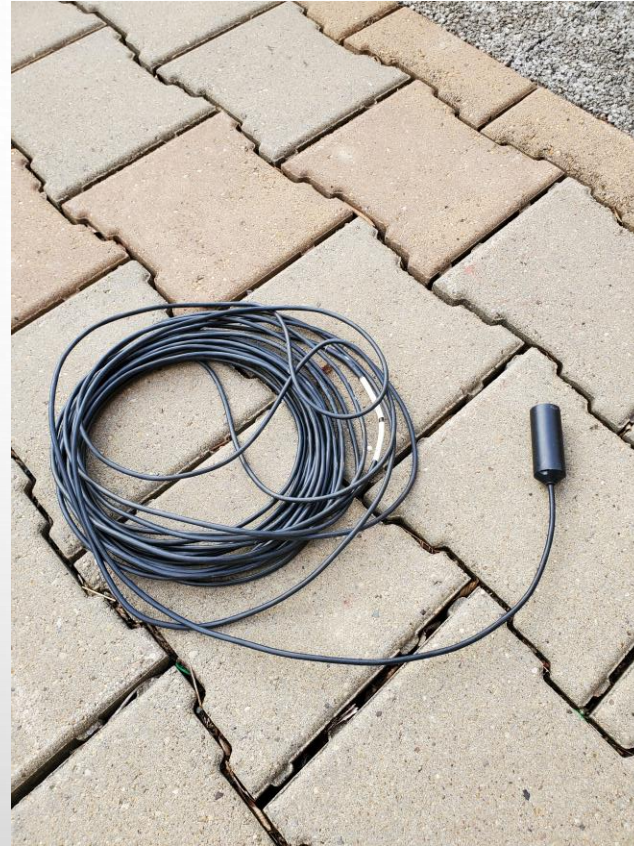


Data Measurements:

Water depth (mm)

Water Temperature ( $^{\circ}\text{C}$ )

Water Conductivity (mS/cm)



Hydros-21 Sensor

# 2022 MONITOR INSTALLATIONS





# NORTH HUNTINGTON TWP. LONG RUN



\* Data accessed by the Army Corp of Engineers to develop flood projection models



# TCWA, BRUSH CREEK



\*Data used to monitor stream conditions and AMD discharge



# ST. VINCENT COLLEGE, 4 MILE RUN INSTALLATION (2021)







4x4x6 Post, 50lb bag of concrete mix, & a multitude of zip ties









# MONITOR MAINTENANCE



Pro Check Reads 28,297 mm stream depth  
= 92.8 ft = **BROKEN**

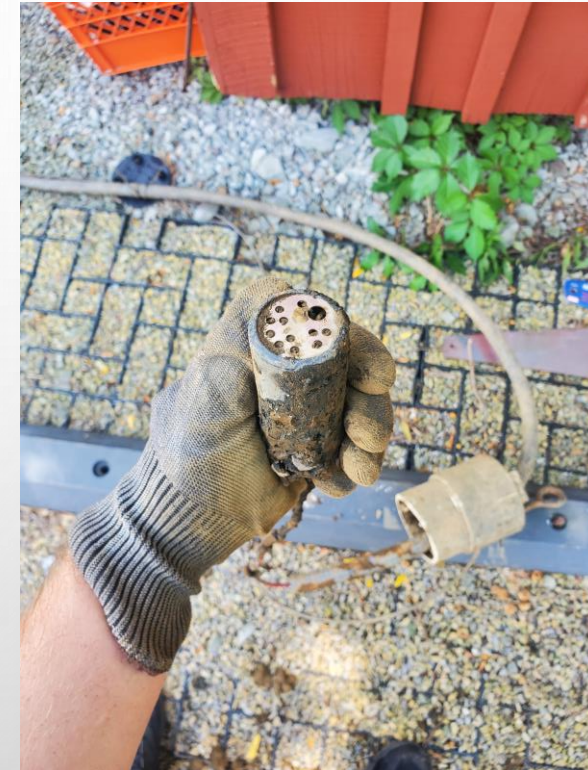
Jack's Run, Sewickley Creek Watershed





Jack's Run, Sewickley Creek Watershed





Sewickley Creek Monitor 2021

Lifespan: 5 Years





Long Run Monitor, Turtle Creek Watershed







Brush Creek Monitor, Turtle Creek Watershed



# WHERE DOES THE DATA GO? ZENTRA CLOUD

ZENTRA Cloud

Keep track of your environmental data with **ZENTRA Cloud**.

By using ZENTRA Cloud and all of its features you, the user, must agree to the [Terms and Conditions](#).

Already Registered?

**Email address**

**Password**

Forgot your password?

**Sign up** **Sign in**

Log In






ZENTRA Cloud Organization: Westmoreland Conser...







- Irwin - Turtle Creek
- Brush Creek
- Latrobe
- Ligonier
- Lowber
- Mt Pleasant
- Murrysville
- Murrysville - Turtle Creek
- WHT Bridge - FTMSA
- TCWA Turtle Creek
- North Huntingdon
- Long Run
- Long Run z6-17944
- Project Monitoring
- Scottdale - Jacobs Creek
- WCD Campus


+ Add new...

Monitor Location Map.  
Click icon for immediate data reading.



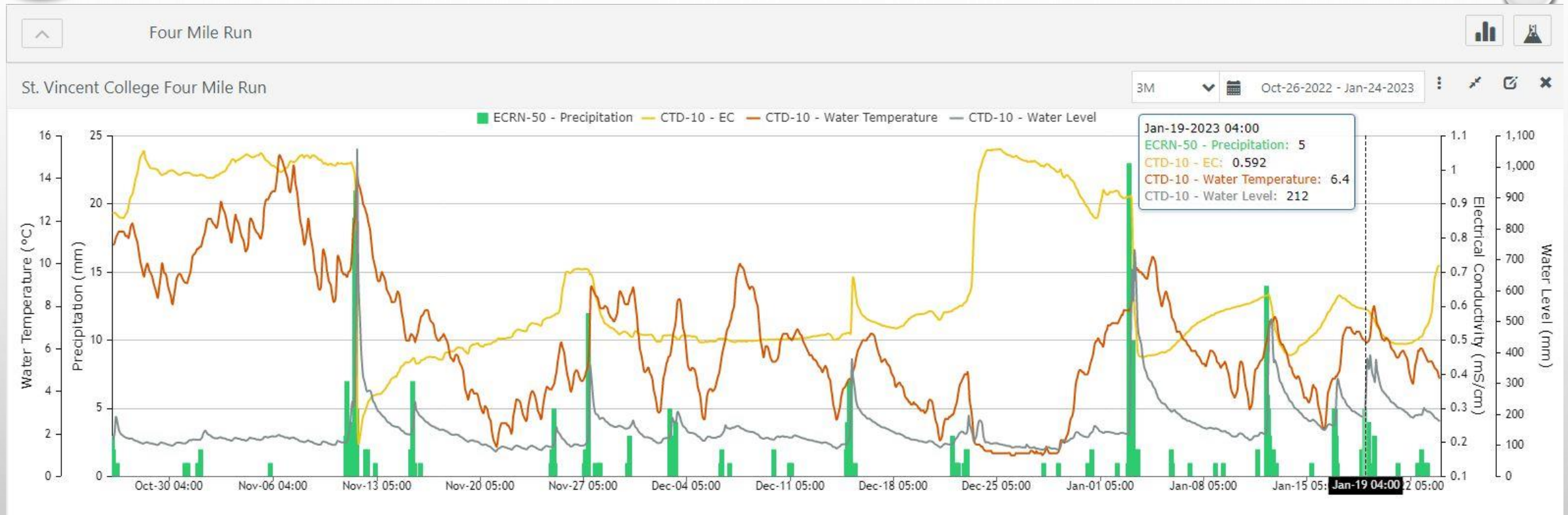
Long Run z6-17944 ZL6 z6-17944		Updated 6 hours ago		 		  	
Port 1	CTD-10	Water Level 279 mm	Water Temperature 4.3 °C	EC 1.754 mS/cm	Sensor Metadata 0		
Port 2	ECRN-50	Precipitation 0 mm	Maximum Precipitation Rate 0.0 mm/h				
	Battery	Battery Percent 100%	Battery Voltage 7871 mV				
	Barometer	Reference Pressure 98.91 kPa	Logger Temperature -0.0 °C				

Loyalhanna Creek EM60G 06-01907		Updated 1 week ago		  		  	
Device subscription expired							

Mill Creek Stream ZL6 z6-04805		Updated 7 hours ago		 		  	
Port 1	CTD-10	Water Level 611 mm	Water Temperature 3.8 °C	EC 0.262 mS/cm	Sensor Metadata 0		
	Battery	Battery Percent 100%	Battery Voltage 8246 mV				
	Barometer	Reference Pressure 98.06 kPa	Logger Temperature -0.9 °C				

List view. Can click icon to download in excel format.

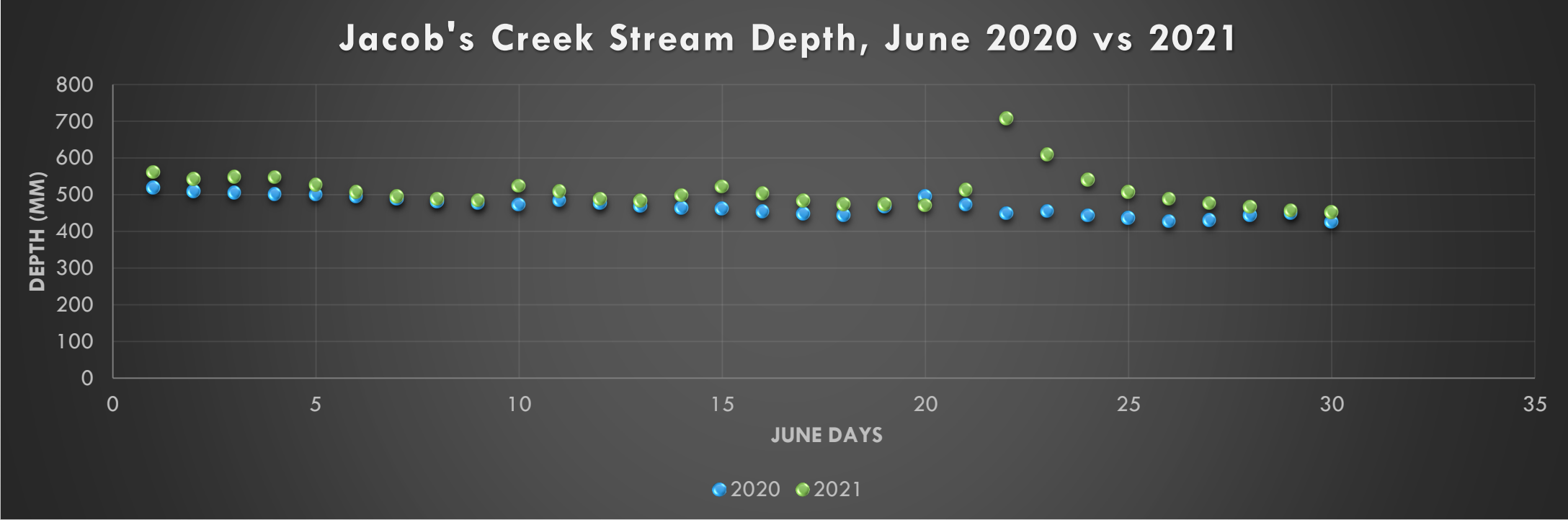




Parameters can be displayed one at a time. This is an example of all data graphed together.



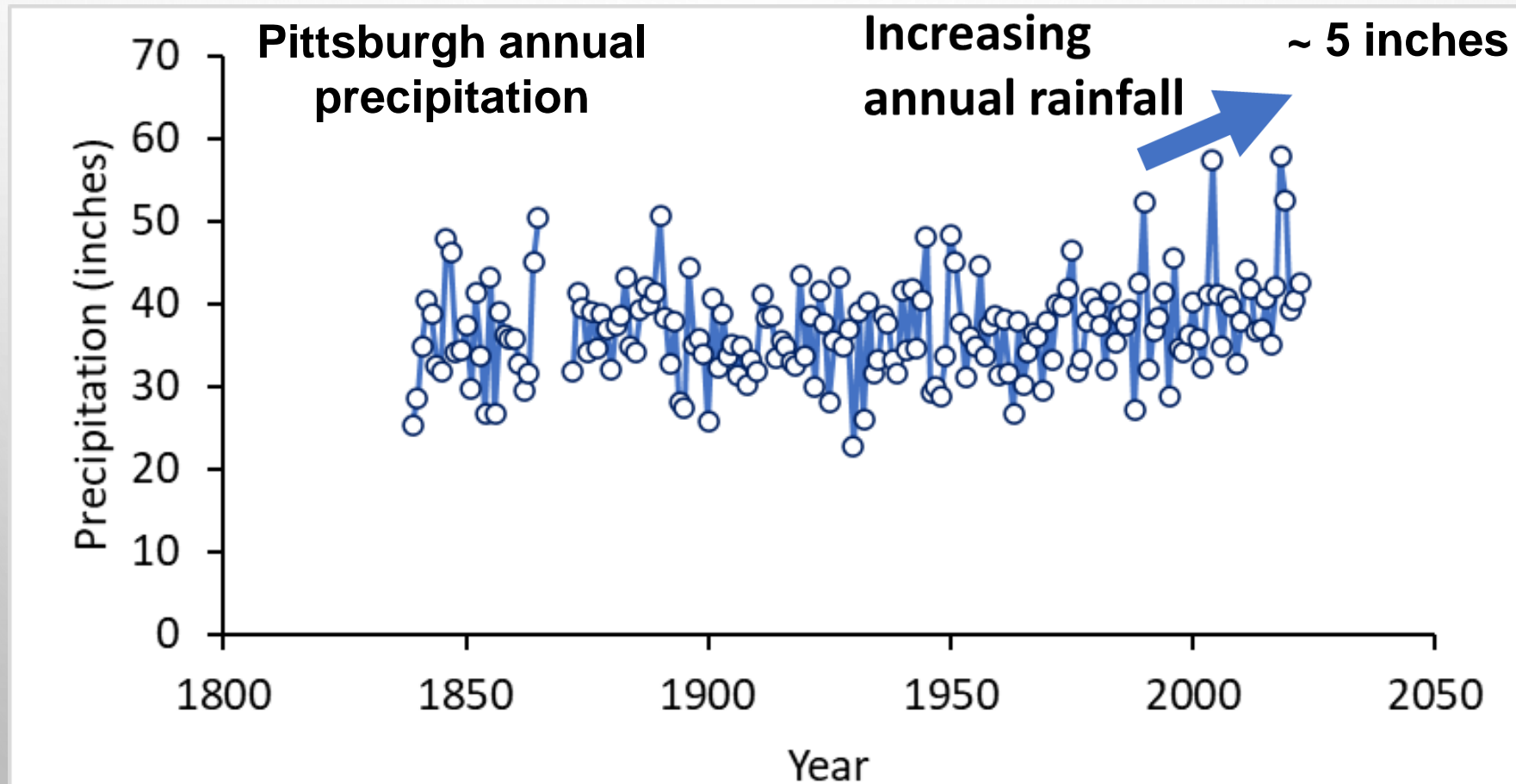
# APPLICATIONS OF DATA





# APPLICATIONS OF DATA – TEACHING

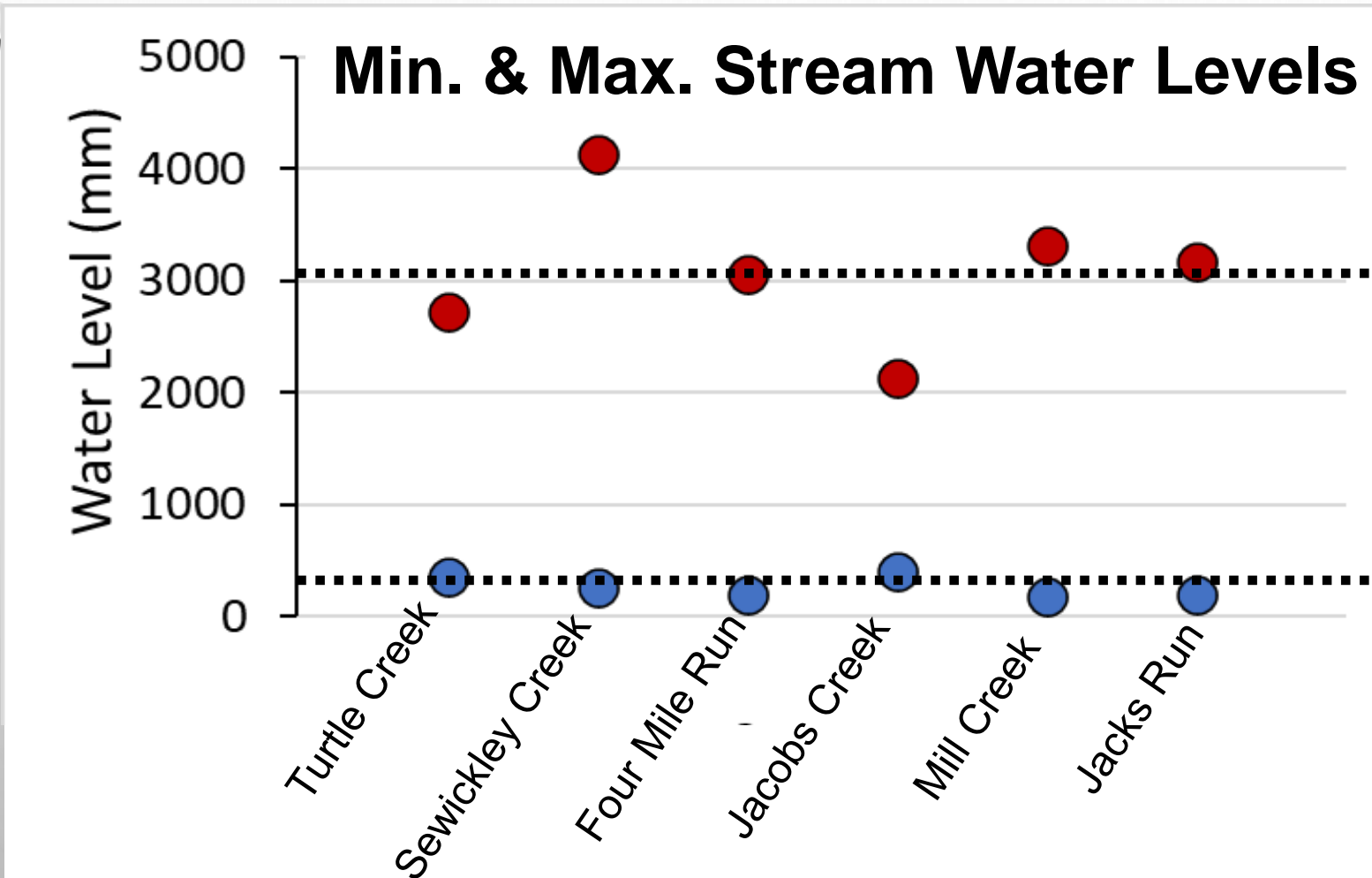
- GOAL → MANAGE WATER QUANTITY (WATER STORAGE, FLOODING & DROUGHTS) AND WATER QUALITY (DRINKING WATER, HUMAN & ENVIRONMENTAL HEALTH)
- PRECIPITATION IS INCREASING IN SOUTHWESTERN PA DUE TO CLIMATE CHANGE





# APPLICATIONS OF DATA – QUANTITY

- HOW ARE LOCAL STREAMS RESPONDING?



**Can we reduce or prepare for this?**

**~10 ft of water**

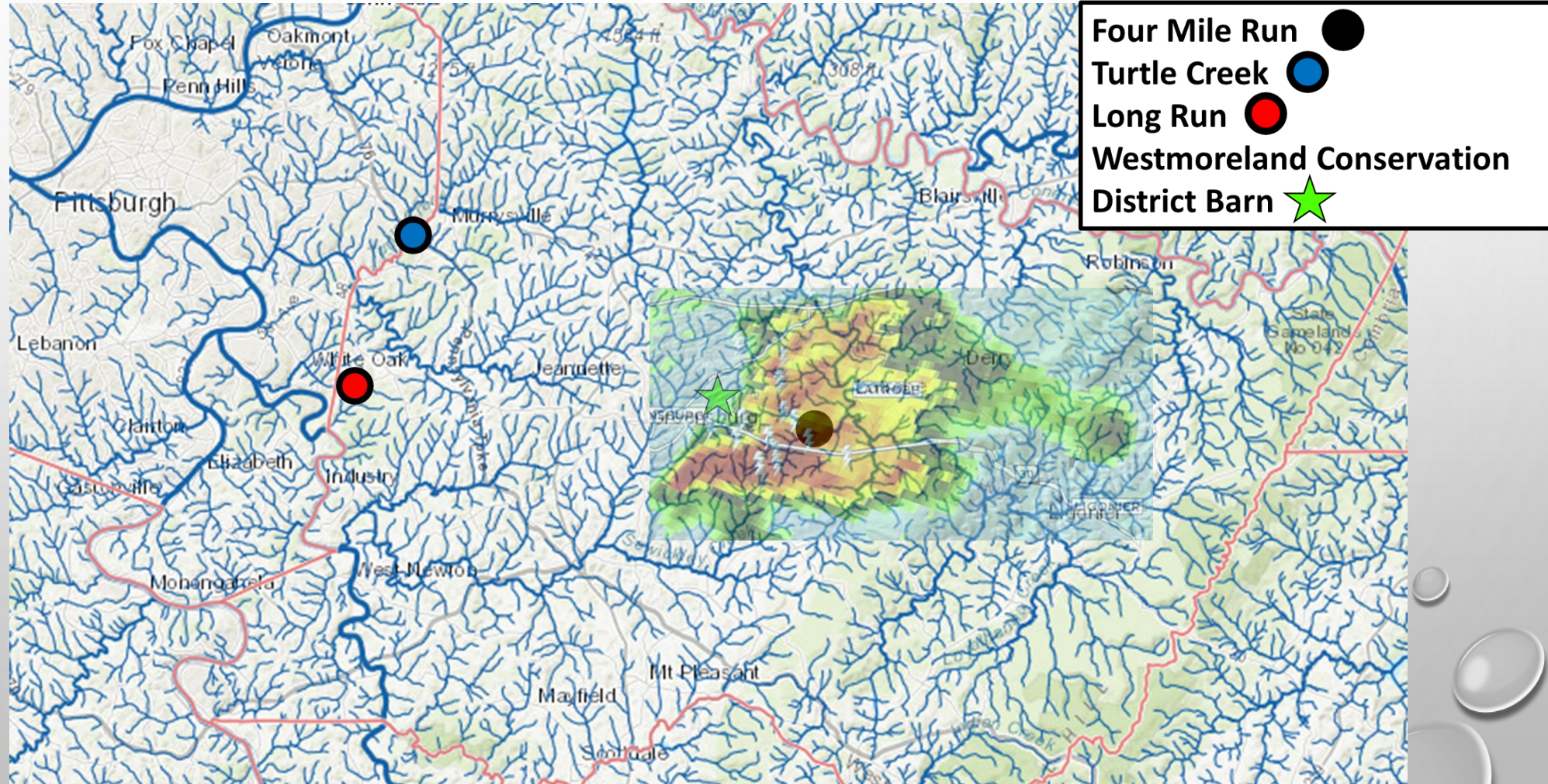
**~1 ft of water**



# APPLICATIONS OF DATA – QUANTITY

- HOW MUCH RAIN RESULTS IN A FLOOD FOR OUR STREAMS?

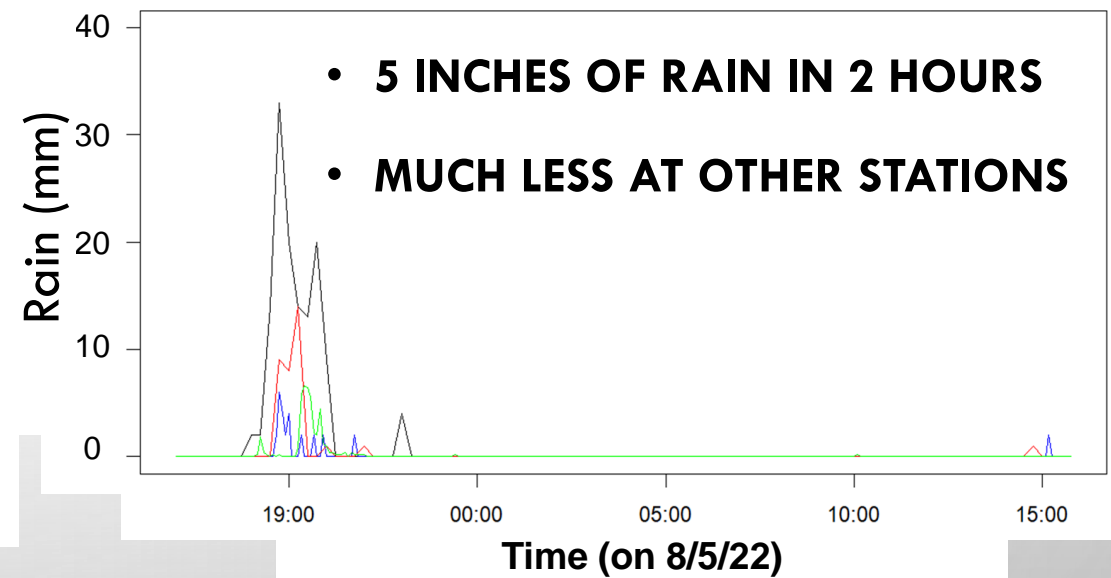
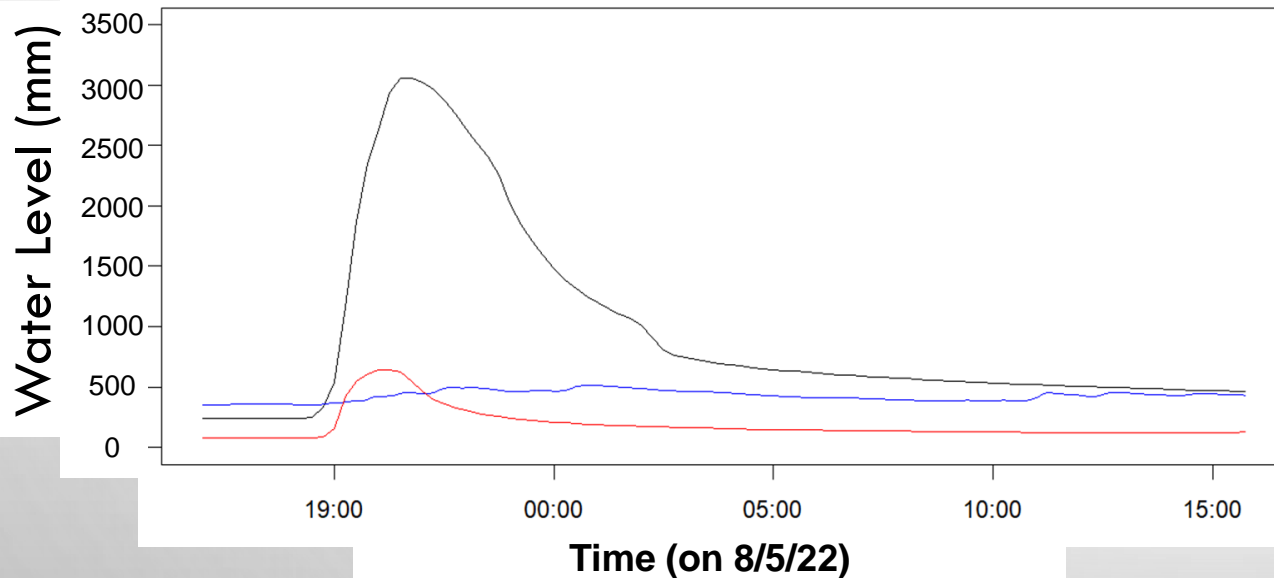
STREAM MAP FOR  
WESTMORELAND  
COUNTY WITH 3  
STREAM SITES &  
THE WCD BARN





# APPLICATIONS OF DATA – QUANTITY

- STREAM WATER LEVEL OF FOUR MILE RUN (BLACK), TURTLE CREEK (BLUE), AND LONG RUN (RED) – 8/5/22

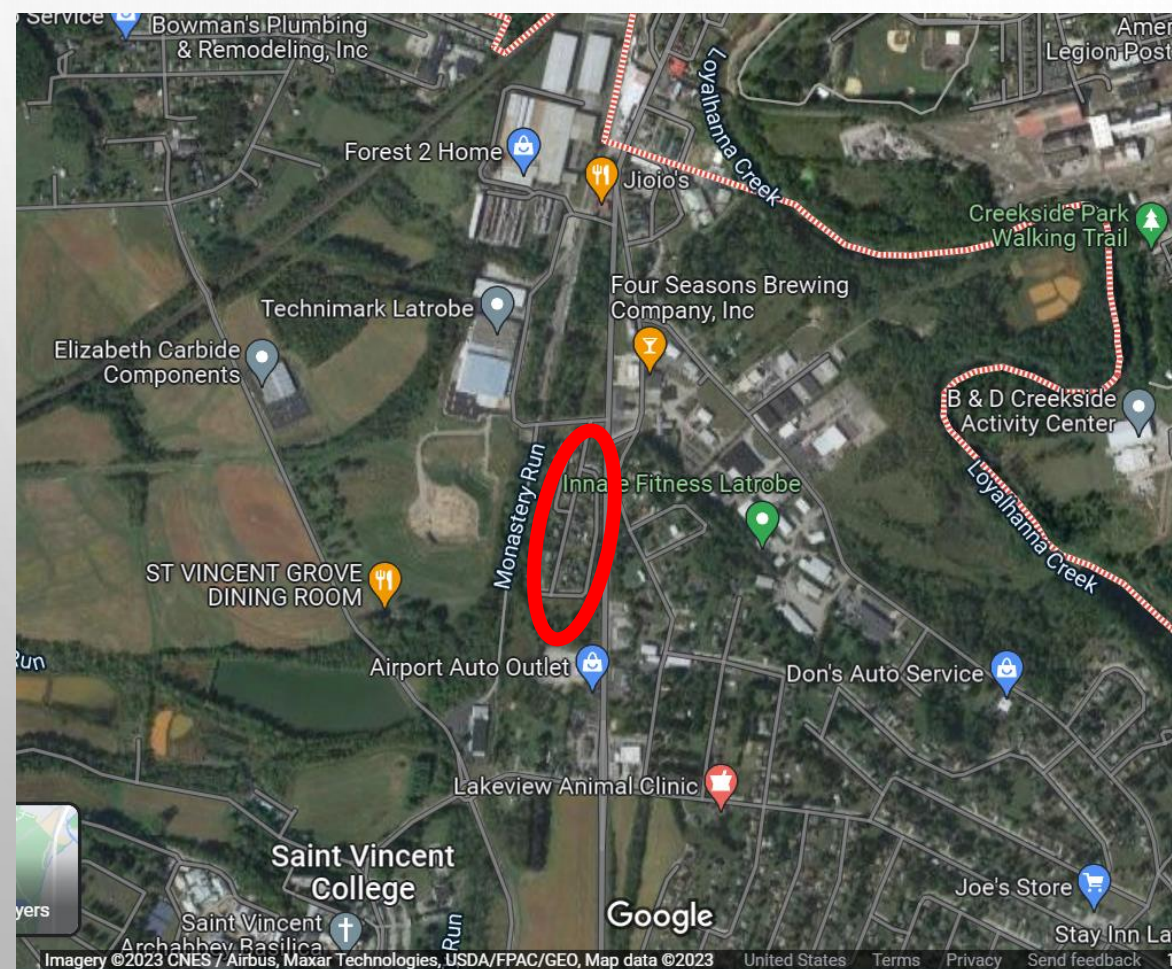


- WATER LEVEL IN FOUR MILE RUN **INCREASED FROM ~1 FT TO 10 FEET IN 1.5 HOURS!**
- LOW RESPONSE IN OTHER STREAMS → LOCALIZED FLOODING EVENT



# APPLICATIONS OF DATA – QUANTITY

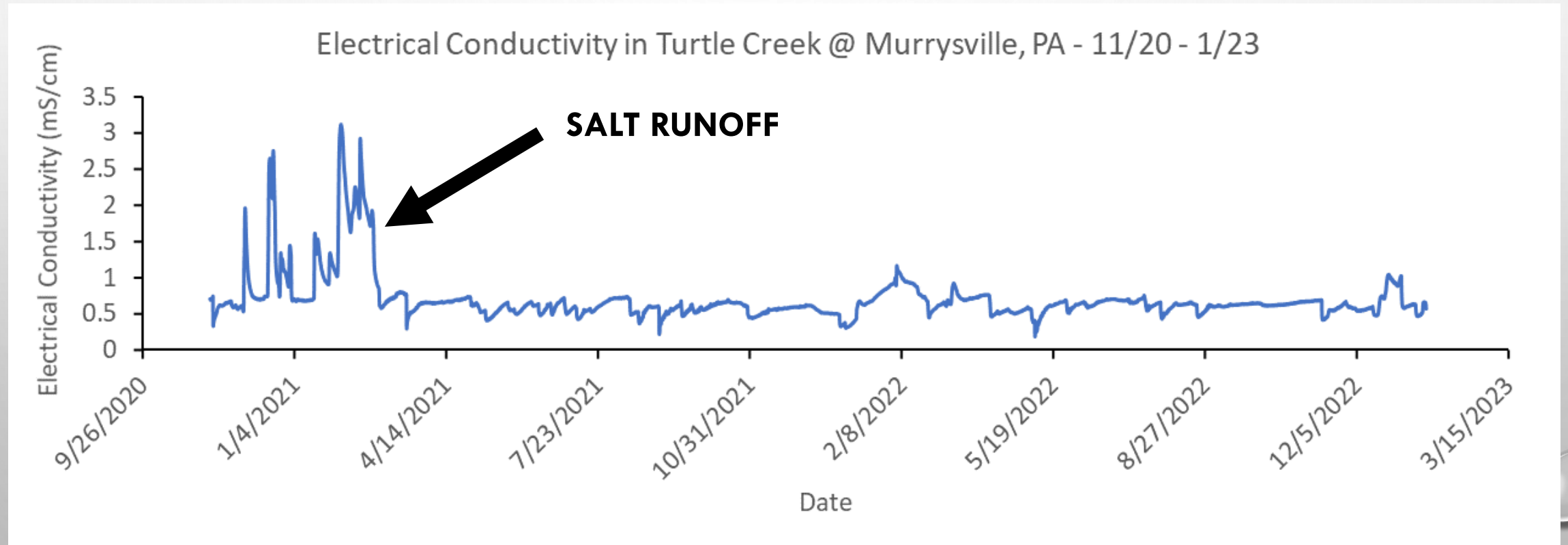
- FLOODING IN DOROTHY (LATROBE) FROM MONASTERY RUN ON 8/5/22





# APPLICATIONS OF DATA – QUALITY

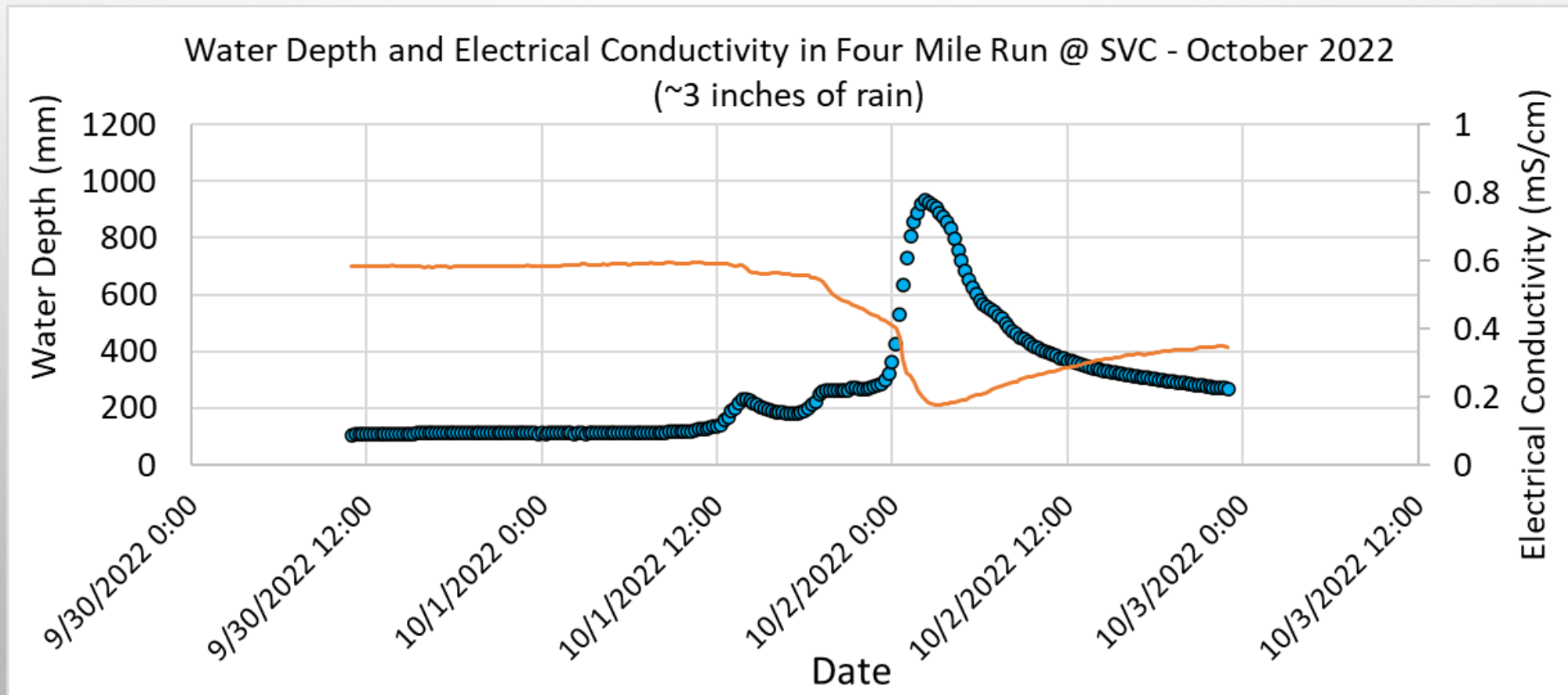
- **WATER QUALITY** – HOW ARE AMOUNTS OF DISSOLVED SUBSTANCES (EX. SALT) CHANGING?
- ESTIMATE TOTAL DISSOLVED SOLIDS (TDS) FROM ELECTRICAL CONDUCTIVITY (EC);  $TDS = EC * 640$





# APPLICATIONS OF DATA – QUALITY

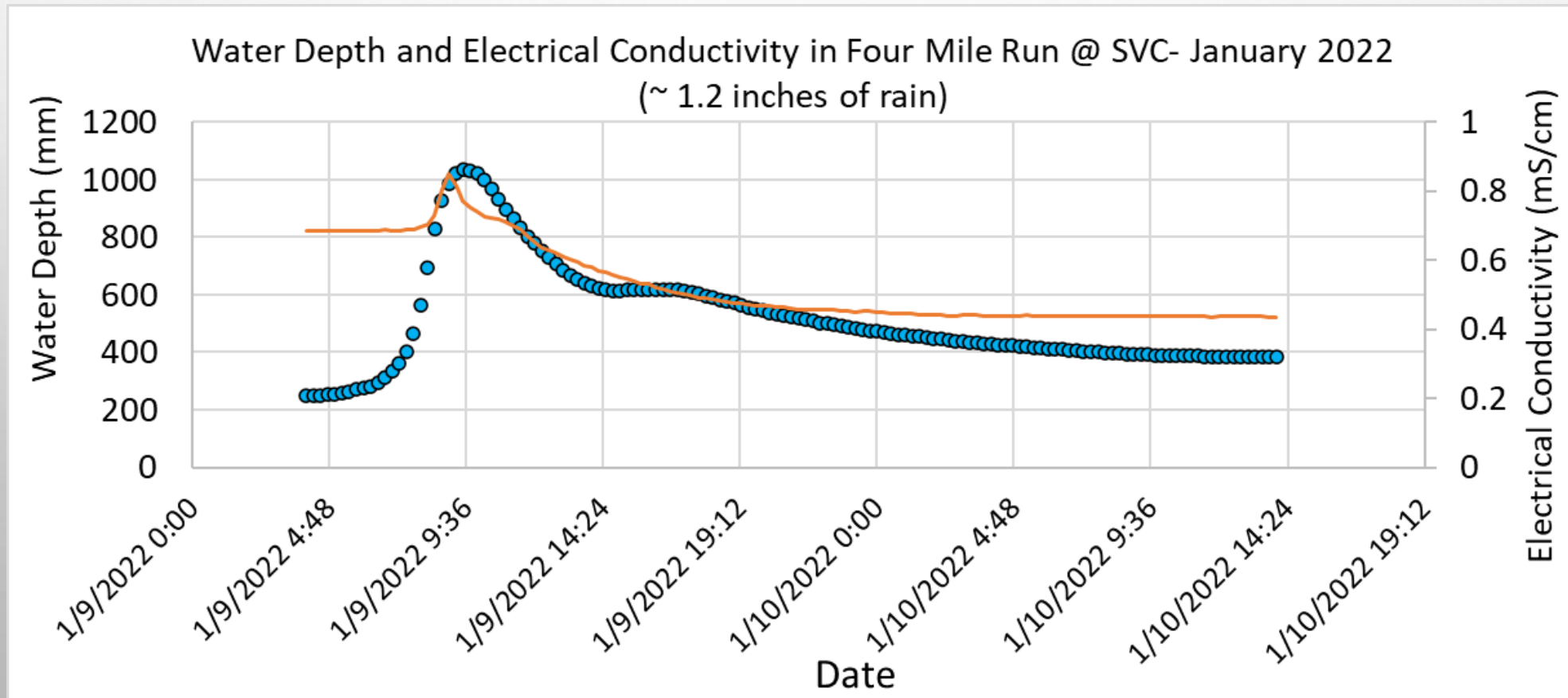
- STREAMFLOW AFFECTS WATER QUALITY; RUNOFF & DILUTION
- MEASURE WATER QUALITY PARAMETERS AT DIFFERENT STREAMFLOW LEVELS





# APPLICATIONS OF DATA – QUALITY

- STREAMFLOW AFFECTS WATER QUALITY; RUNOFF & DILUTION
- MEASURE WATER QUALITY PARAMETERS AT DIFFERENT STREAMFLOW LEVELS





# APPLICATIONS OF DATA – SUMMARY

- PREPARE FOR INCREASED PRECIPITATION & MORE VARIABLE STREAMFLOW
- USE WCD MONITORING DATA TO REDUCE FLOODING IMPACTS AND IMPROVE WATER QUALITY
- SAMPLE AT DIFFERENT STREAMFLOW LEVELS & DURING DIFFERENT SEASONS



# GS3 SOIL MOISTURE SENSOR

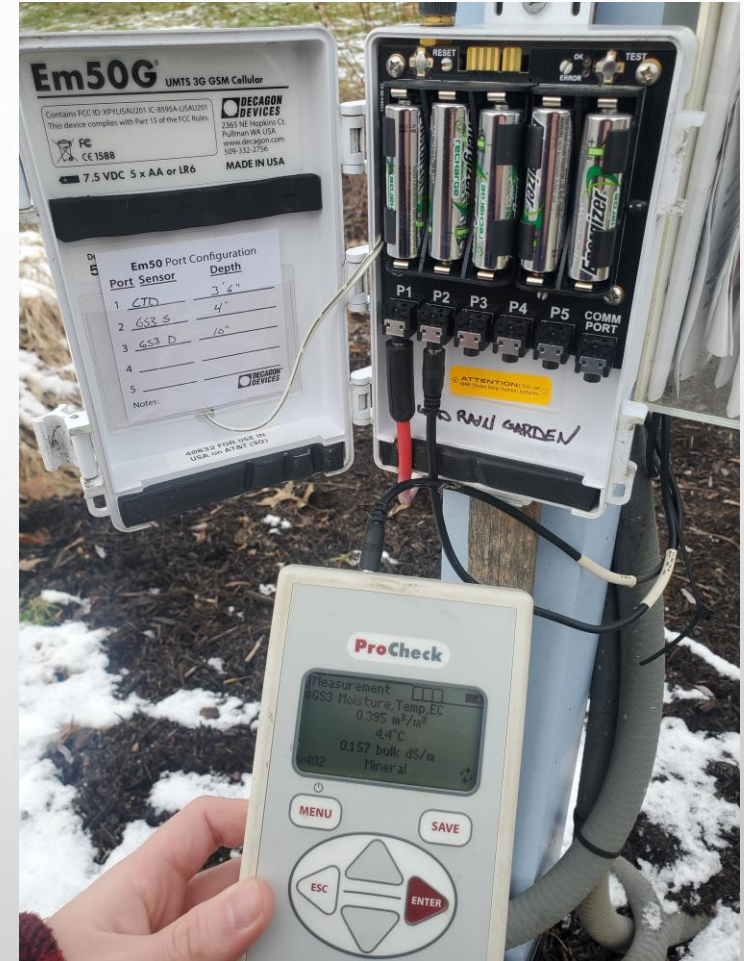
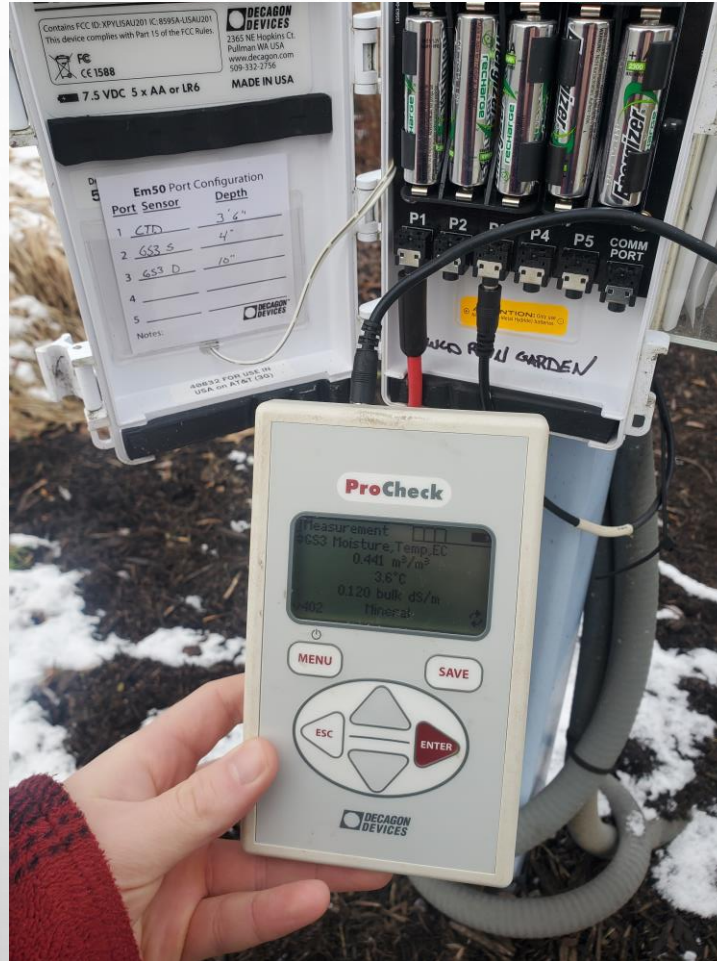
## Data Measurements:

Water Content      ( $\text{m}^3/\text{m}^3$ )  
Soil Temperature    ( $^{\circ}\text{C}$ )  
Soil Conductivity    ( $\text{mS}/\text{cm}$ )





# WCD CAMPUS, RAIN GARDEN GS3 MONITOR



4" depth = .441 m<sup>3</sup>/m<sup>3</sup>

10" depth = .395 m<sup>3</sup>/m<sup>3</sup>





# SOIL MOISTURE MONITORING

- VOLUMETRIC WATER CONTENT ILLUSTRATES THAT INFILTRATION BMPS ARE WORKING PROPERLY
  - HOW FAST DOES WATER INFILTRATE IN RAIN GARDENS, INFILTRATION SWALES, AND GREEN ROOFS?
- 



# MT. PLEASANT RAIN GARDENS



As water level decreases and infiltrates, volumetric water content increases



# ECRN-100/ ECRN-50 RAIN GAUGE



Data Measurements:  
Precipitation (mm)

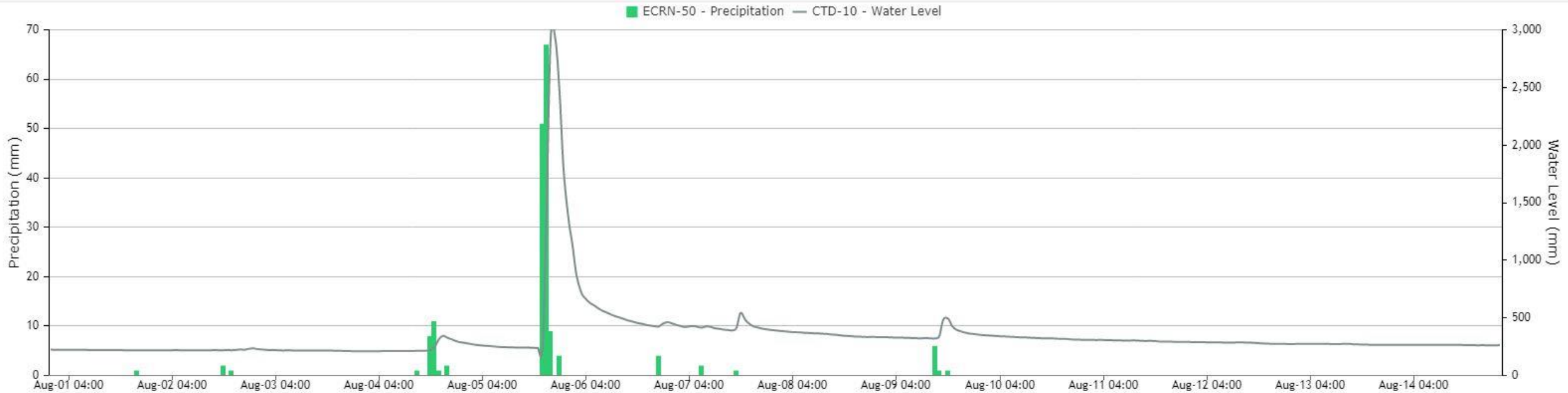


# AUGUST 5<sup>TH</sup> - 6<sup>TH</sup> 2022

Four Mile Run

St. Vincent College Four Mile Run

Fixed D... Jul-31-2022 - Aug-14-2022



**130 mm of rain = 5.12 inch rain in 24 hours**  
**NOAA-100 Year 24-Hour Storm Event = 5.15 in**



# ATMOS-41 WEATHER STATION

## Data Measurements:

Wind Speed (m/s)

Air Pressure (kPa)

Air Temp (°C)

Solar Radiation ( $\text{W}/\text{m}^2$ )





# FUTURE GOALS

- REPLACE/REMOVE DEFECTIVE WATER LEVEL SENSORS (LOYALHANNA CREEK)
- UPGRADE OLD DATA LOGGERS TO UPDATED VERSIONS (MT. PLEASANT RAIN GARDENS, SCWA LOWBER)
- INTEGRATE DATA TO WCD'S WEBSITE
- FIND WAYS TO SHARE DATA WITH THE PUBLIC
- CONTINUE MONITOR INSTALLS FOR INTERESTED MUNICIPALITIES AND ORGANIZATIONS