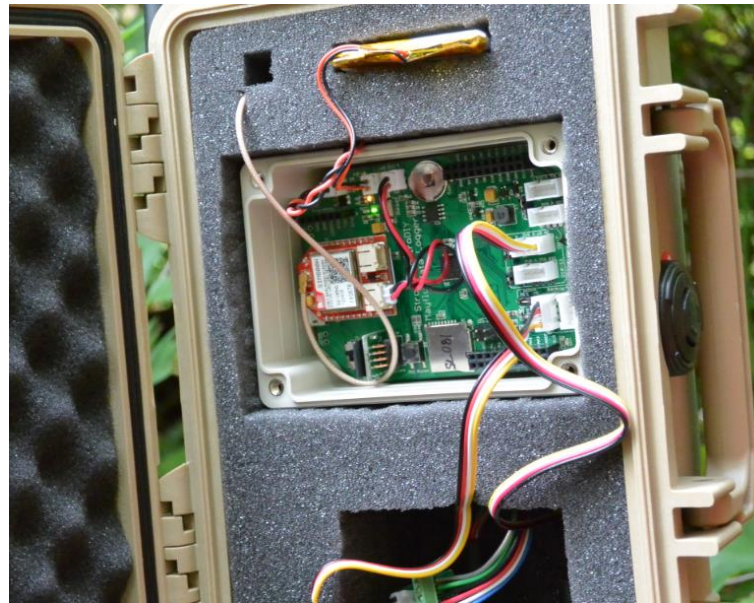


WELCOME!

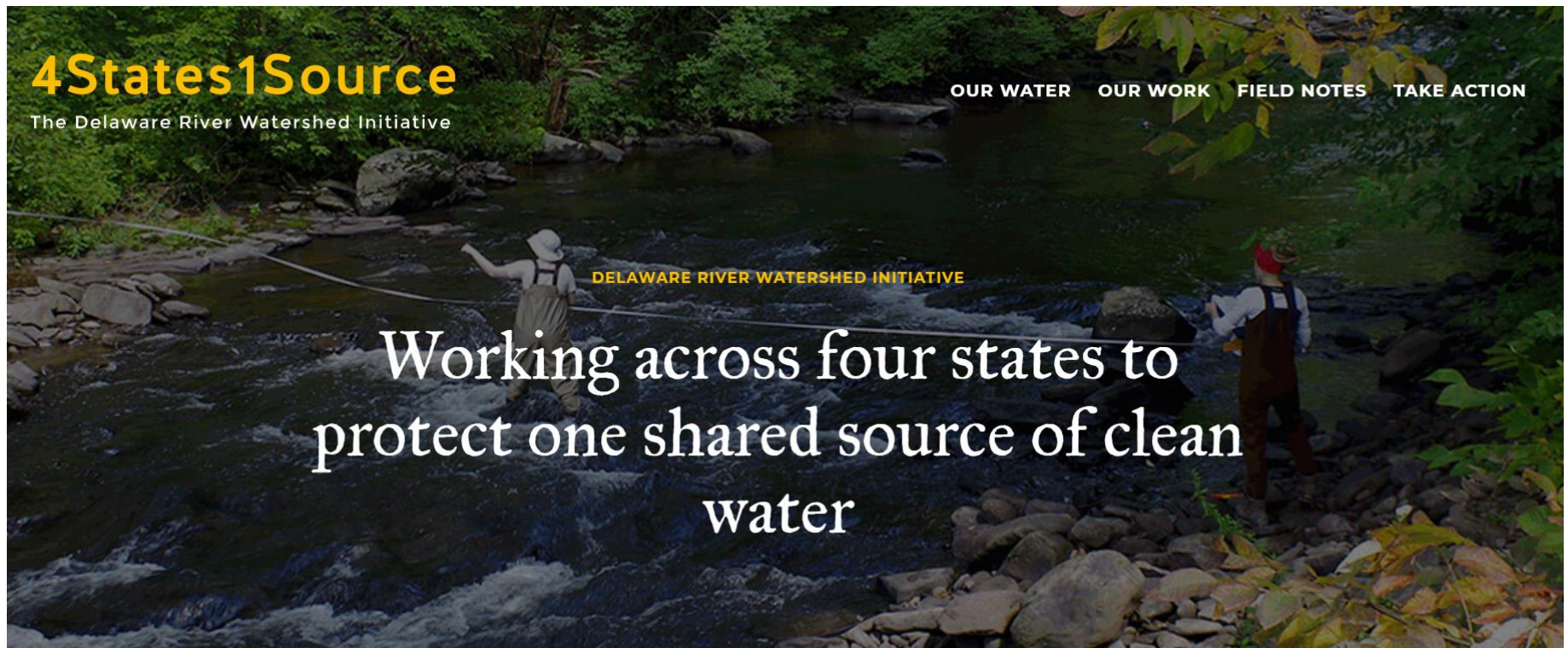
EnviroDIY Troubleshooting Workshop

Online, Thursday June 23, 2021, 1:00-4:00p



Delaware River Watershed Initiative (DRWI)

<https://4states1source.org/>



Agenda

- Workshop 1:00-4:00p
 - Foundations for troubleshooting, Dave Bressler – 45 min
 - Troubleshooting, Rachel Johnson, Research Engineer Technician – 1+ hour
 - Support and expertise, Shannon Hicks, Research Engineer
 - *Break at 2:30ish

Housekeeping

- Enter non-urgent questions in chat
- Mute unless talking
- Urgent questions unmute and talk
- Video on
- Workshop being recorded

Introductions



Introductions



Name	Organization
Adam Gochnauer	Stroud Water Research Center
Barbara Durkin	Montco Master Watershed trainee
Beth Yount	Penn State Extension
Brian Shepard	Clean Water Services
Carol L Armstrong	Master Watershed Steward, Sierra Club, Stroud Water Research Center (volunteer), Penn Env
Charlie Coulter	MWS
Cindy Rushton	Volunteering for Wissahickon Trails
David George	Angelica Creek Watershed Association
Drew Heckman	Center for Freshwater Research and Education
Elisabeth Ruschmann	N/A
Erin Landis	Wissahickon Trails
Francis Collins	Primrose Creek watershed association
Gustavo de Almeida Coelho	George Mason University
James Dare	Bay of Plenty Regional Council
Jan Battle	Stroud Center
Jean Parry	Master Watershed Steward Trainee
Jesse Yonkovich	Milton Hershey School
Jim Moore	Great Marsh Institute
John Barbis	Kendal Crosslands
Jose Eduardo Duenas	Schuylkill Center
Kiera Malone	The Nature Conservancy
Kim Schauer	Fairfax County
Kristina victoreen	Mws
Kristine Rogers	Wallkill River Watershed Management Group
Michael Johnson	Brodhead Watershed Association
Michelle DiBlasio	The Nature Conservancy
Natalie Marioni	Penn State Extension
Rebecca Deegan	Schuylkill Center
Sam Johnson	Musconetcong Watershed Association
Saranya Anantapantula	Master Watershed Steward
walter jahn	orange county community college

Foundations for Troubleshooting





- The standard EnviroDIY monitoring station – know the components
- The data portal: Monitor My Watershed – know how to use it
- Standard recommended roles/responsibilities for ensuring proper station function – set up a work plan
- **Focus point/themes: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting and ensuring station function is maintained**
 - **Case study at the end**


Foundations for Troubleshooting

<https://wikiwatershed.org/drwi/>

[About](#) [Model](#) [Monitor](#) [Help](#) [News](#) [Curricula](#) [Videos](#) [Contact](#) [Log In](#) 

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WikiWatershed is an initiative of [Stroud™ Water Research Center](#). The Stroud Center seeks to advance knowledge and stewardship of freshwater systems through global research, education, and watershed restoration.

[Home](#) > [Delaware River Watershed Initiative Resources](#)

Delaware River Watershed Initiative Resources

General Resources

- ▼ [EnviroDIY Field Visit Data](#)
- ▼ [EnviroDIY Mayfly Monitoring Station Help Resources](#)
- ▼ [Data and Data Visualization Resources](#)
- ▼ [Volunteer Management Guidance Materials](#)
- ▼ [WikiWatershed Toolkit](#)
- ▼ [Project Updates](#)

Meetings, Workshops, and Conferences

- ▼ [Monthly EnviroDIY-DRWI User Group Meetings](#)
- ▼ [User Support Workshops and Trainings](#)
- ▼ [Conference Presentations](#)
- ▼ [Watershed Ecology Workshops](#)

NEWS

[Virtual Training Session Available: Updates and Improvements to Model My Watershed](#)

[Model My Watershed Release 1.27](#)


[Model My Watershed Release 1.26](#)

[Model My Watershed Release 1.25](#)

[WikiWatershed® Wins Green Stormwater Infrastructure Award](#)

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The Standard EnviroDIY Station

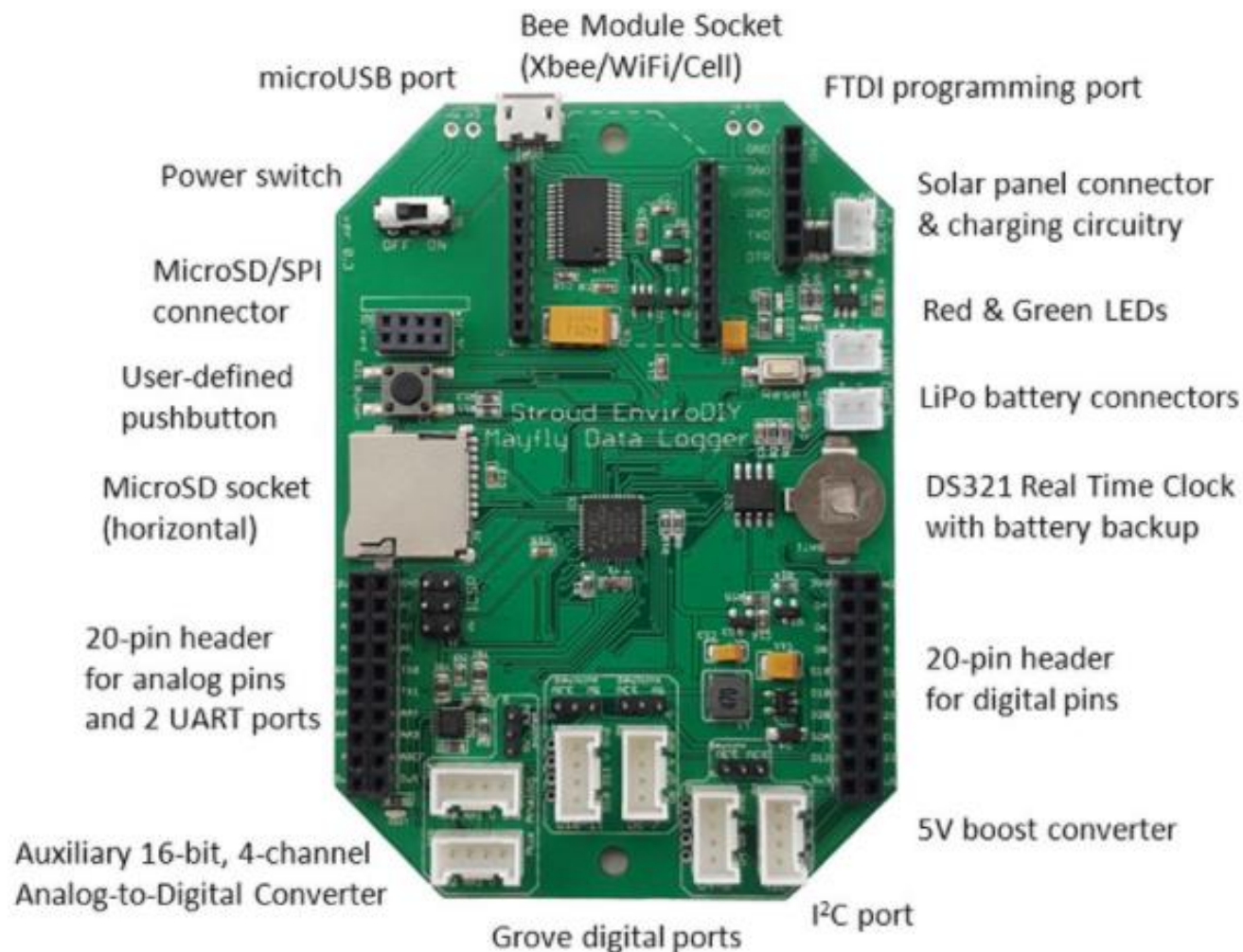


The Standard EnviroDIY Station, Logger Box



The Standard EnviroDIY Station, Mayfly

Features of the EnviroDIY Mayfly Data Logger



The Standard EnviroDIY Station, Cell Board



Cell board

- Stroud Center has begun putting out some NEW tester cell boards
 - Should improve reliability

The Standard EnviroDIY Station, Sensor Bundle



The Standard EnviroDIY Station, Sensors



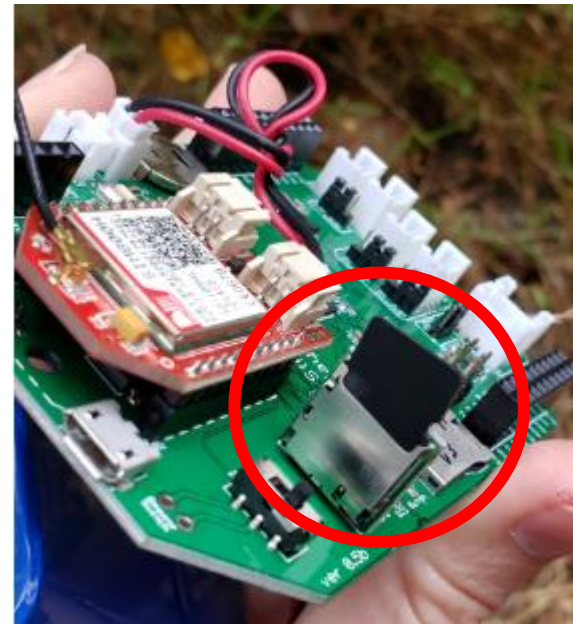
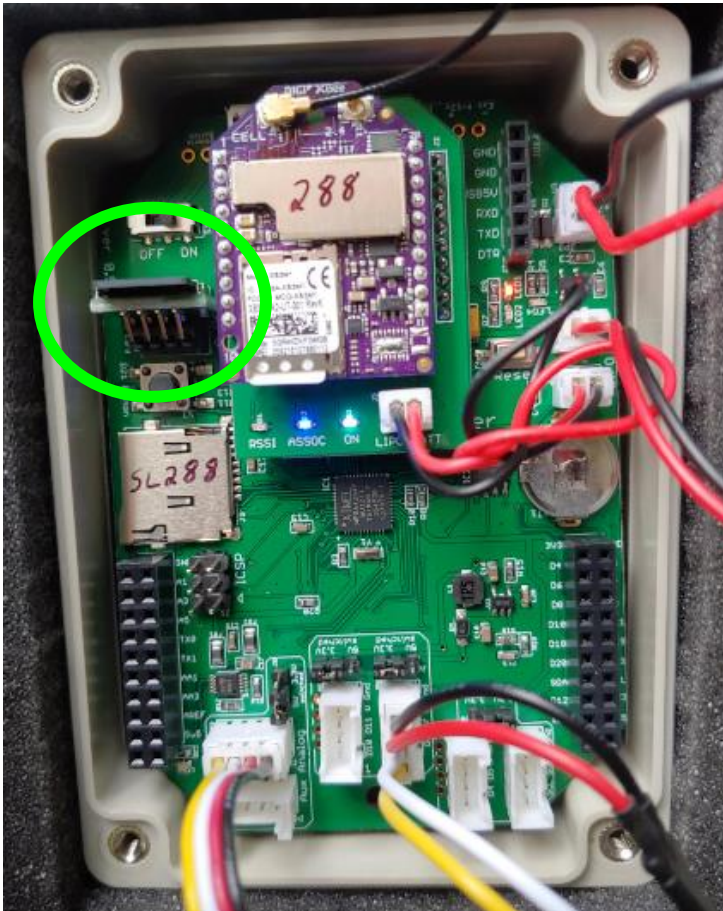
CTD Sensor (Meter Hydros 21)



Turbidity Sensor
(Campbell OBS 3+)

The Standard EnviroDIY Station, microSD card

microSD card files are generally the most secure data – very important



*Need to be careful that
microSD card is inserted
properly

The Standard EnviroDIY Station, microSD card data file

Generally, microSD card data are the most secure data – use these files to check data when data are not online

DateTime	TimeOffset	DateTimeUTC	Decagon_CTD-10_Conc	Decagon_CTD-10_Temp	Decagon_CTD-10_Depth	EnviroDIY_Mayfly_Temp	EnviroDIY_Mayfly_Batt	Digi_Cellular_SignalPercent
4/26/2021 13:30	-5:00	4/26/2021 18:30	302.2	14.3	210.8	4.215	26	109
4/26/2021 13:35	-5:00	4/26/2021 18:35	306.5	14.3	212.8	4.215	29.25	51
4/26/2021 13:40	-5:00	4/26/2021 18:40	308.8	14.3	206.7	4.23	30	90
4/26/2021 13:45	-5:00	4/26/2021 18:45	308.2	14.4	206	4.23	30.25	109
4/26/2021 13:50	-5:00	4/26/2021 18:50	308.5	14.4	205.7	4.215	30.25	109
4/26/2021 13:55	-5:00	4/26/2021 18:55	309	14.4	202.8	4.23	29.75	109
4/26/2021 14:00	-5:00	4/26/2021 19:00	308.2	14.5	203	4.215	29.25	51
4/26/2021 14:05	-5:00	4/26/2021 19:05	309.5	14.5	200.3	4.23	29	109
4/26/2021 14:10	-5:00	4/26/2021 19:10	307.7	14.6	200	4.23	28.5	109
4/26/2021 14:15	-5:00	4/26/2021 19:15	308.8	14.6	199.8	4.23	27.5	109
4/26/2021 14:20	-5:00	4/26/2021 19:20	307.3	14.6	199	4.215	26.5	51
4/26/2021 14:25	-5:00	4/26/2021 19:25	308.3	14.7	197.5	4.215	24.75	109

The Standard EnviroDIY Station, microSD card data file

Upload data files to MonitorMW for stations not online or missing data

- <https://wikiwatershed.org/help/sensor-help/>



Uploading Sensor Data to Monitor My Watershed – *Filling Data Gaps for Real-Time Stations*

For EnviroDIY monitoring stations that are programmed to transmit data to Monitor My Watershed (MonitorMW) you can upload data files (i.e., micro SD card files) by following the steps below.

Please note:

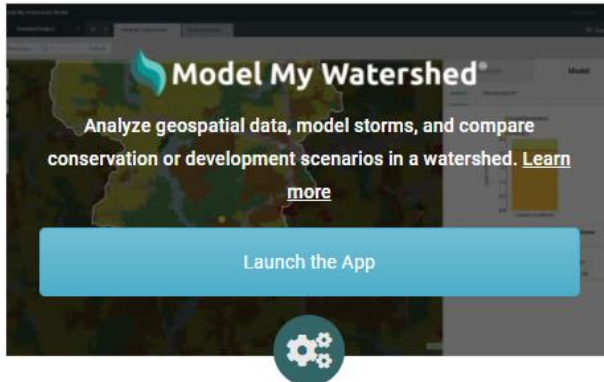
- Uploading data is only necessary when real-time transmission of data to MonitorMW has stopped or is sporadic, i.e., to fill data gaps.
- Only station owners or users with MonitorMW login access can upload data.
- For information on formatting and uploading files from stations not programmed for direct transmission or upload to MonitorMW, see Section 7 of the Monitor My Watershed Sensor Data Manual: <https://wikiwatershed.org/help/sensor-help/sharing-sensor-data/#sensor-data>

***Size limit on file upload: about a week of data**

How to Fill Data Gaps

1. Download the .csv file from the micro SD card to your computer.
2. As of March 2020, only files that are 1 MB or less can be uploaded. This equates to about one

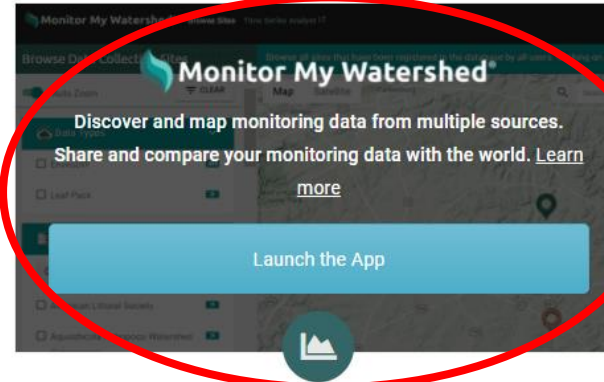
Data Portal: “Monitor My Watershed”



Model My Watershed®
Analyze geospatial data, model storms, and compare conservation or development scenarios in a watershed. [Learn more](#)

Launch the App

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Monitor My Watershed®
Discover and map monitoring data from multiple sources. Share and compare your monitoring data with the world. [Learn more](#)

Launch the App

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EnviroDIY
Join a community of do-it-yourself enthusiasts sharing open-source ideas for environmental science and monitoring.

Visit EnviroDIY

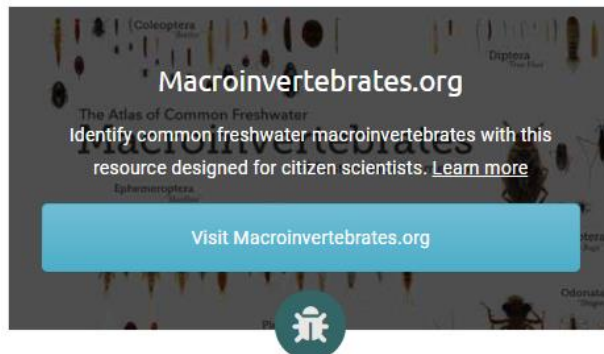
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Leaf Pack Network®
Discover what aquatic insects can tell you about your stream's health by performing a simple leaf pack experiment.

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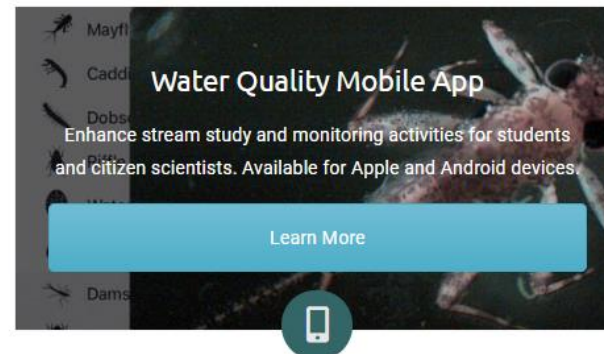
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Macroinvertebrates.org
The Atlas of Common Freshwater Macroinvertebrates
Identify common freshwater macroinvertebrates with this resource designed for citizen scientists. [Learn more](#)

Visit Macroinvertebrates.org

🐛



Water Quality Mobile App
Enhance stream study and monitoring activities for students and citizen scientists. Available for Apple and Android devices.

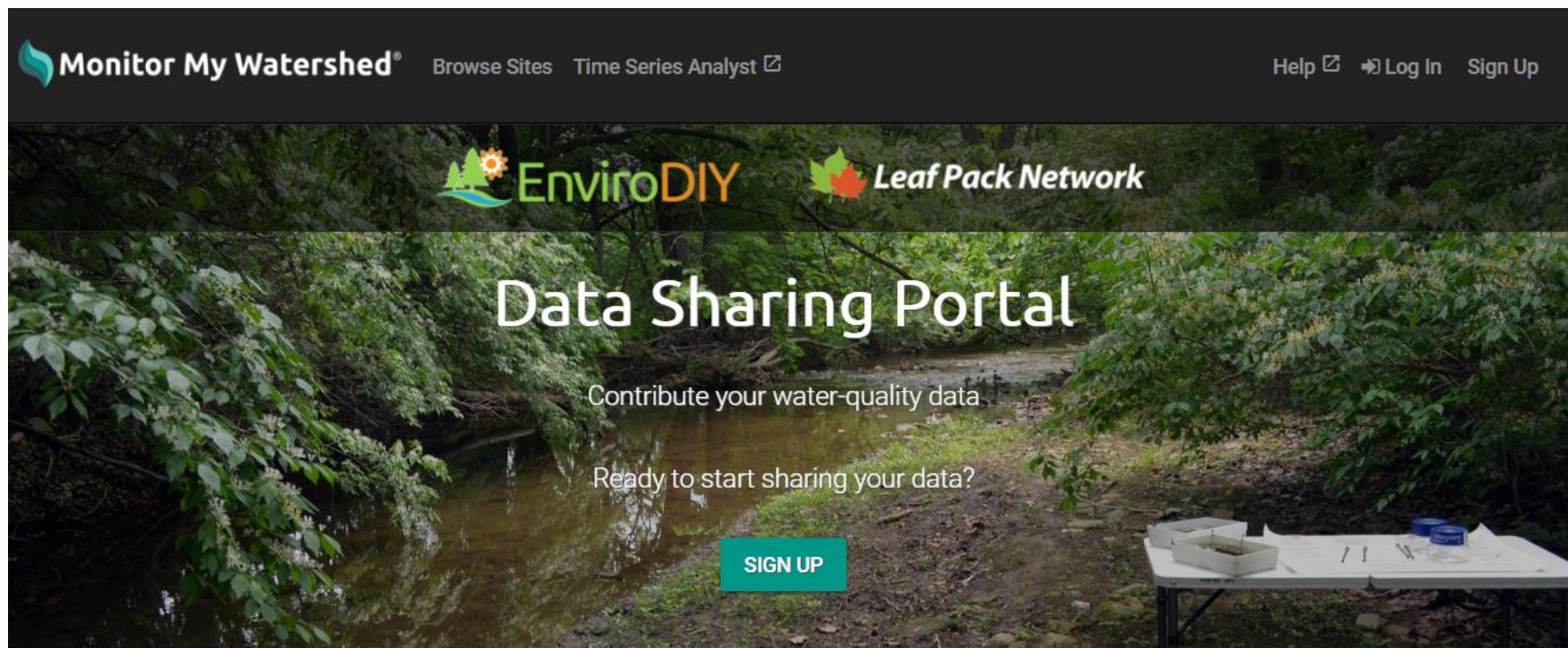
Learn More

📱

Monitor My Watershed

- Monitor My Watershed = where troubleshooting usually starts

<http://monitormywatershed.org/>

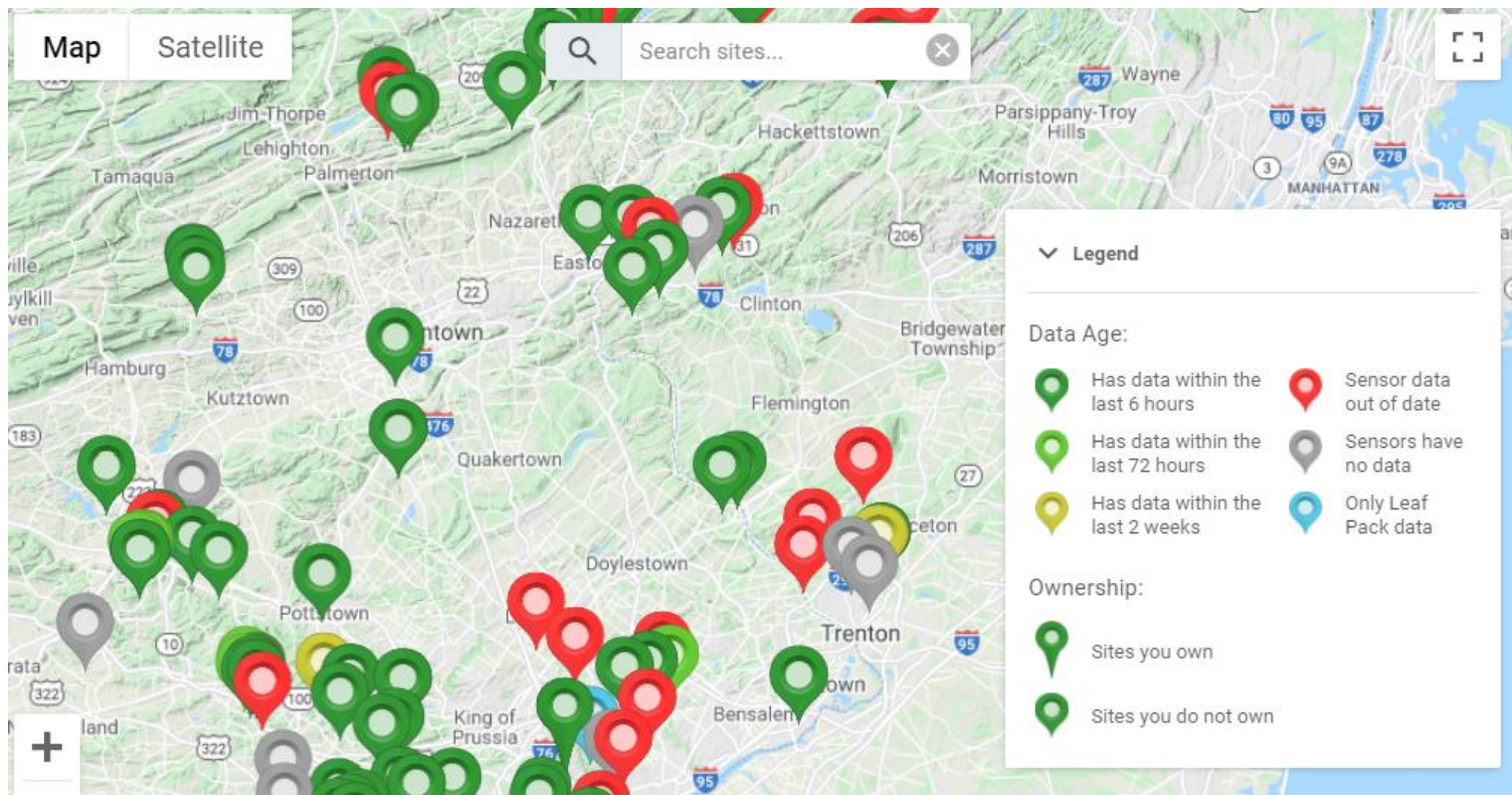


Monitor My Watershed, Help

- <http://monitormywatershed.org/>
- <https://wikiwatershed.org/help/sensor-help/>

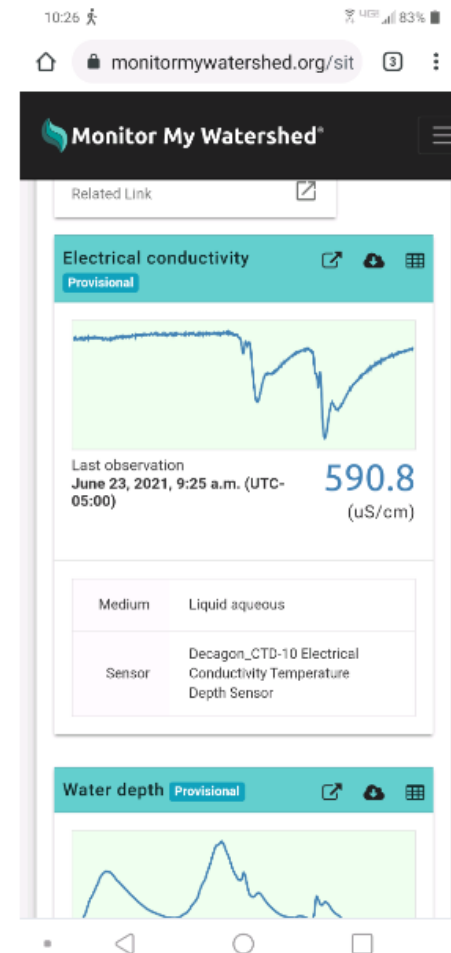
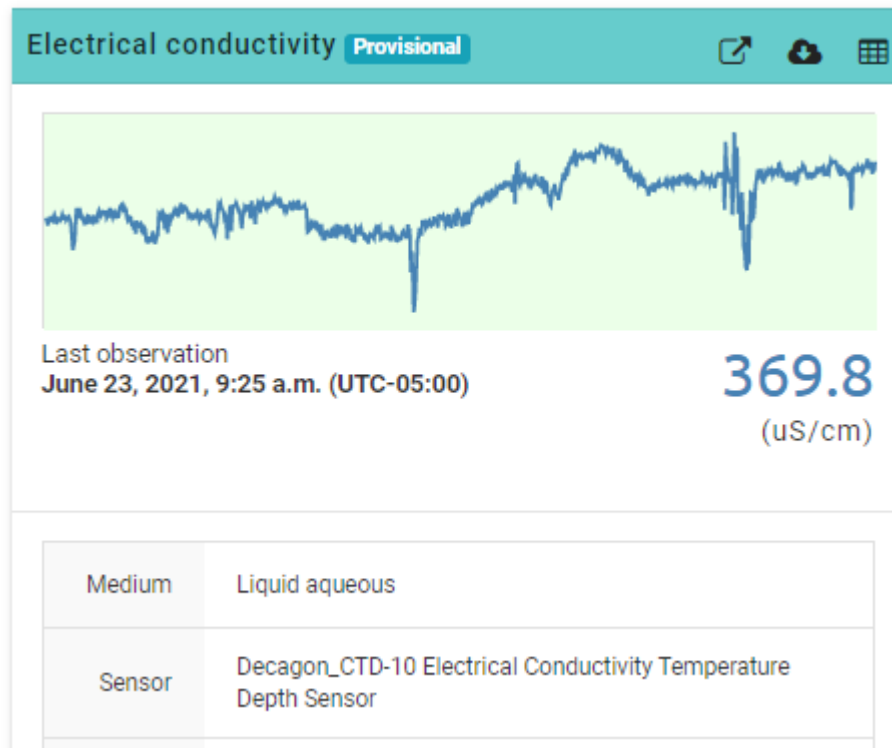
Monitor My Watershed

Clickable map with color legend provides quick view of station online status



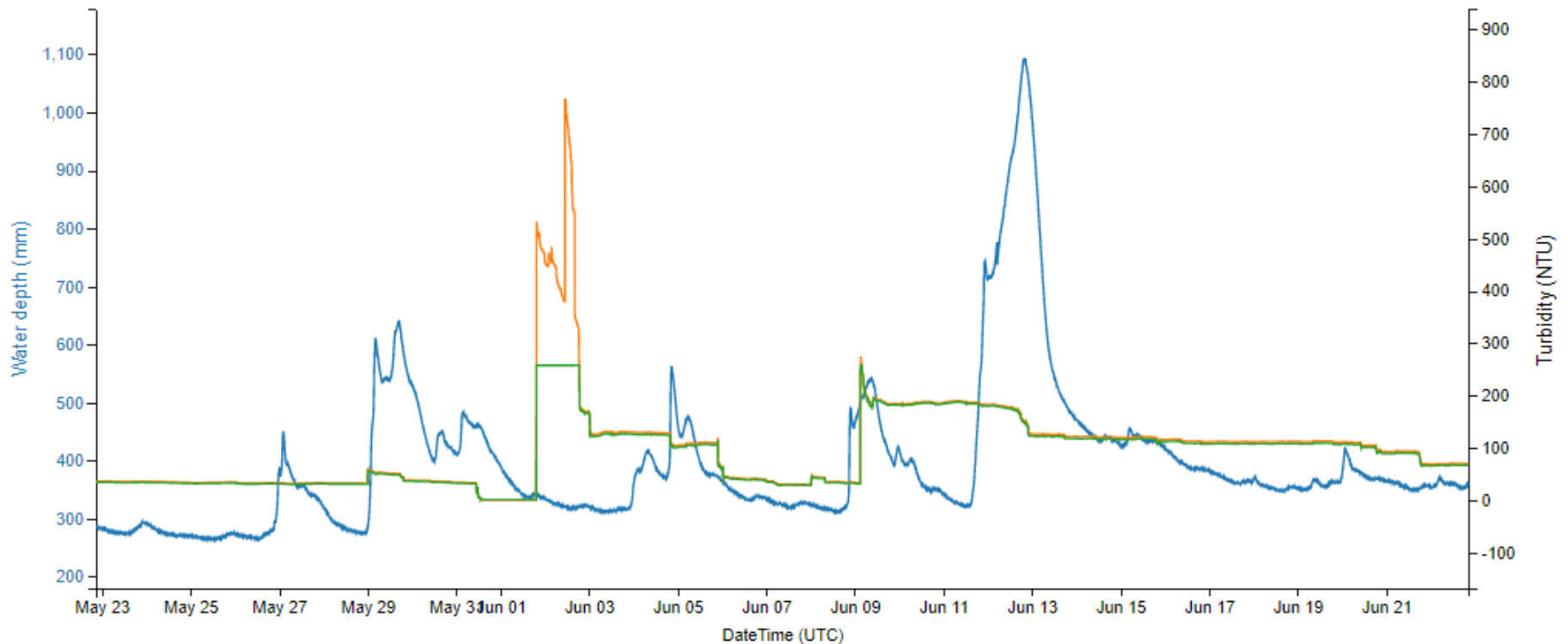
Monitor My Watershed

Data panels provide most current readings and are easy to access and read on a smart phone



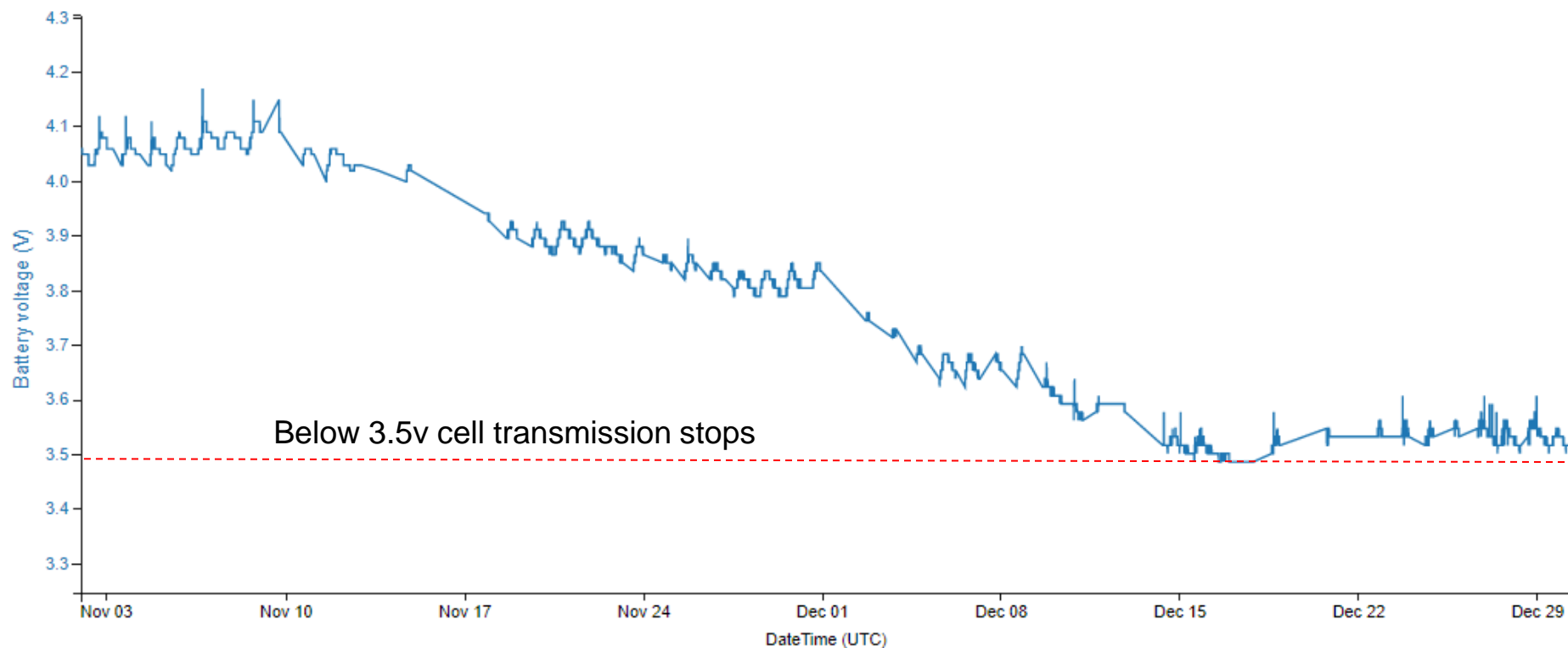
Monitor My Watershed

Time Series Analyst (TSA) graphs provide ability to see past data trends and multiple parameters



Monitor My Watershed

Time Series Analyst (TSA) graphs provide ability to see past data trends and multiple parameters



Recommended roles/responsibilities for ensuring proper station function

- **Roles and Responsibilities Quick Guide** – use it for staying on top of EnviroDIY management (located at <https://wikiwatershed.org/drwi/>)

General Resources

▼ EnviroDIY Field Visit Data

▲ EnviroDIY Monitoring Station Help Resources

Manual

- [Monitoring station manual on EnviroDIY](#)

Quick Guides

- [EnviroDIY Monitoring Stations Management Roles and Responsibilities Quick Guide](#)
- [EnviroDIY Maintenance Quick Guide](#)
- [EnviroDIY Quality Control Quick Guide](#)
- [EnviroDIY Data Patterns Quick Guide](#)
- [EnviroDIY Time Zone Guide](#)
- [Understanding your EnviroDIY Monitoring Station Data](#)



Quick Guide: Recommended Roles/Responsibilities for Managing an EnviroDIY Monitoring Station

Contact Stroud Center support team with issues/questions (dbressler@stroudcenter.org; shicks@stroudcenter.org; rjohnson@stroudcenter.org)

Access resources referenced below via <https://wikiwatershed.org/drwi/>

Station Owner/Manager – ensuring station is managed properly

- Assign individuals to the following roles: 1) desktop monitoring of station functionality via Monitor My Watershed, 2) sensor cleaning and station maintenance, and 3) quality control (QC)
- Track above tasks and make sure that they are being accomplished
- Ensure Hologram cell plan is paid to ensure data transmission to Monitor My Watershed

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Desktop monitoring of station functionality via Monitor My Watershed (Daily)

- Check site(s) of interest on a daily basis via Monitor My Watershed:
 - On “Browse Sites” map: Is the station live (i.e., dark green)?
 - Are the quick view data panels showing expected data ranges?
 - Are there any abnormal numbers/patterns in quick view data panels or in Time Series Analyst graphs?
- Contact station owner/manager, maintenance, and/or QC people with any issues identified (e.g., sensor fouling, low battery)

Sensor cleaning and station maintenance (Weekly)

- Review station data on Monitor My Watershed before and after station maintenance
- Visit station at least once a month (weekly is recommended)
- Clean sensor(s)
- Clear sediment and debris from under and near sensor(s)
- Clear vegetation and debris from around the logger and solar panel
- Complete Field Visit Data sheet and enter into online form
- Reference EnviroDIY Maintenance Quick Guide as needed

Conduct Quality Control (Quarterly and per situational needs)

- Review station data on Monitor My Watershed before and after conducting QC
- Use calibrated hand-held meter to cross check station conductivity and temperature data
 - Make sure QC measurement and sensor station reading match up – if they don't (difference greater than 10%), proceed with troubleshooting or contact Stroud Center
- If turbidity is a high priority, conduct cross check using a turbidity tube or turbidity meter when conditions are suitable (i.e., when water is cloudy/muddy enough to assess turbidity data)
- Use metric ruler and on-site QC rebar pin (or staff gauge) to cross check station depth data
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Four basic ways to support station function

- Roles and Responsibilities Quick Guide
 - Station Owner/Manager – ensuring station is managed properly
 - **Desktop monitoring of station functionality via Monitor My Watershed (Daily)**
 - **Sensor cleaning and station maintenance (Weekly)**
 - **Conduct Quality Control (Quarterly and per situational needs)**

***Steps take time – multiple people with some time or fewer people with lots of time**

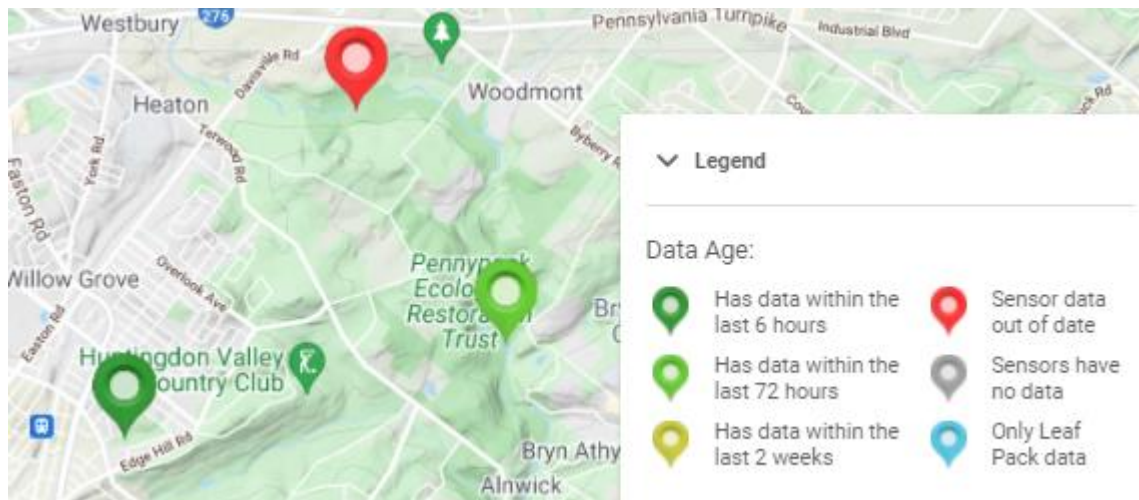
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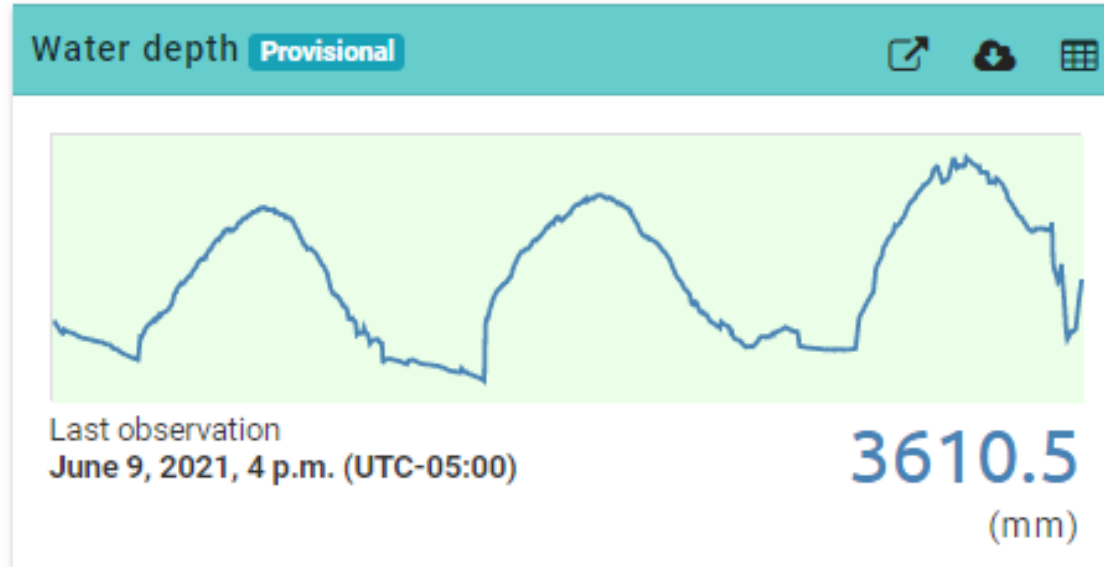
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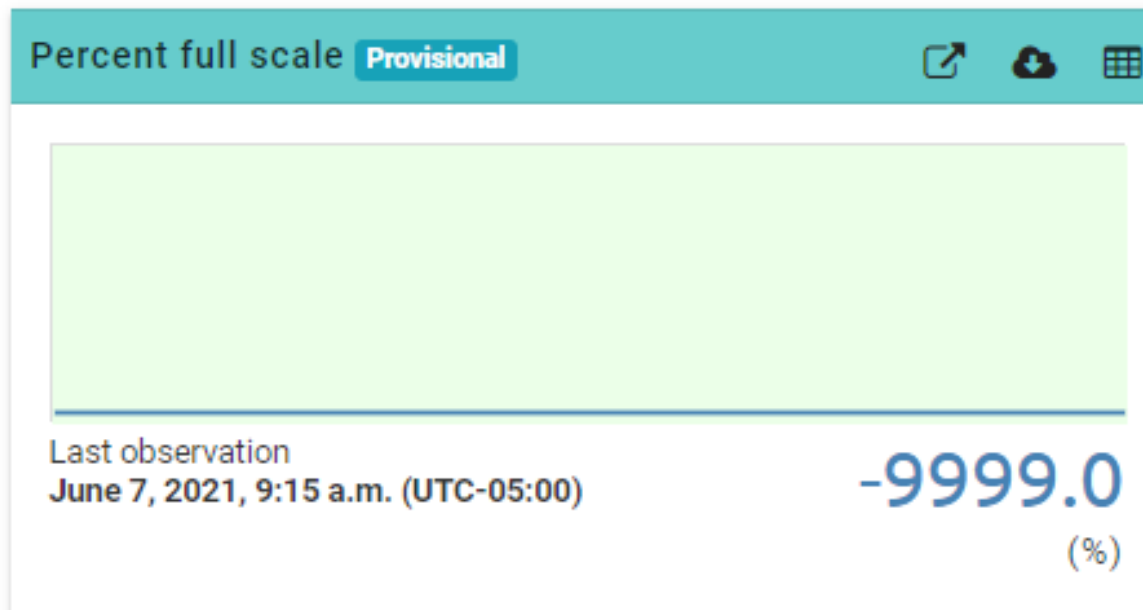
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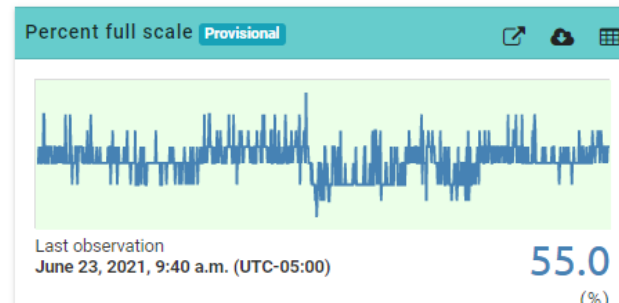
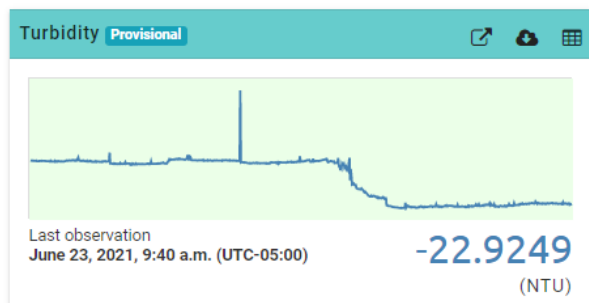
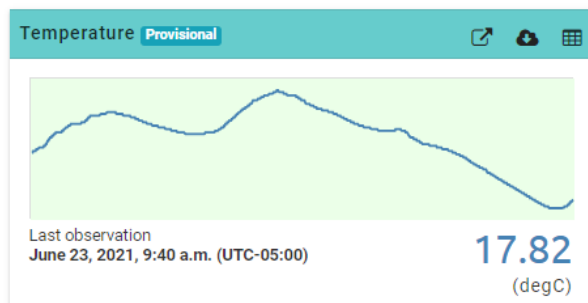
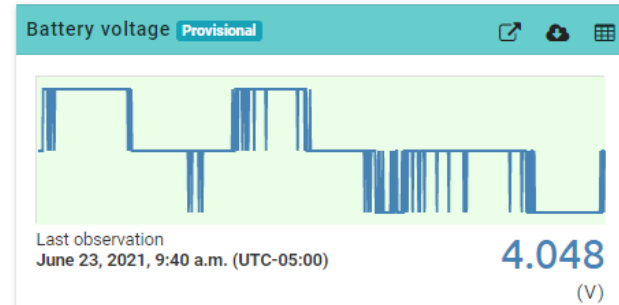
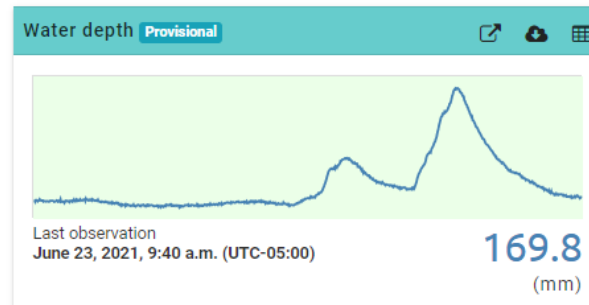
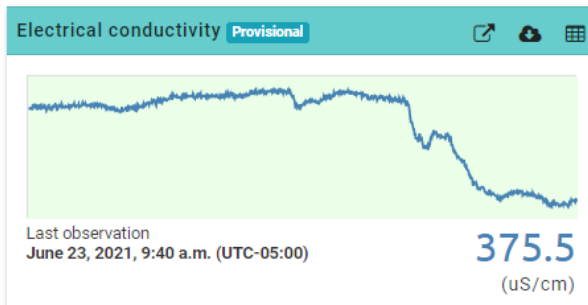
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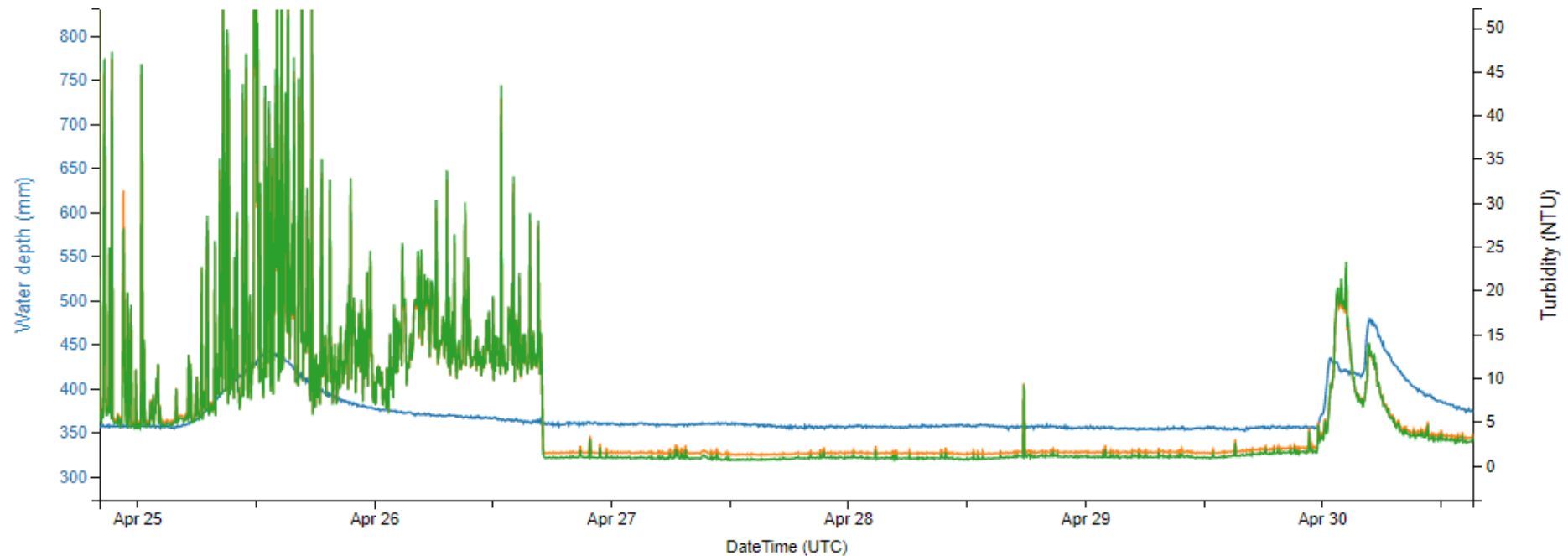
Sensor cleaning and station maintenance

Before cleaning sensors check readings via **sparkline plots** and Time Series Analyst in Monitor My Watershed



Sensor cleaning and station maintenance

Before cleaning sensors check readings via sparkline plots and **Time Series Analyst**



*For guidance on using Monitor My Watershed go to: <https://wikiwatershed.org/help/sensor-help/>

Conduct Quality Control

Conduct Quality Control (Quarterly and per situational needs)

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Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

- Example

<https://www.envirodiy.org/blogs/>

TIPS & POINTERS

Increase Data Quality From Your Meter Hydros 21 CTD Sensor With These Tips



By [Dave Bressler](#) on 2020-10-07

[No Comments](#)

By [David Bressler](#), [Rachel Johnson](#), [Mike Hartshorne](#), and [Scott Ensign](#)

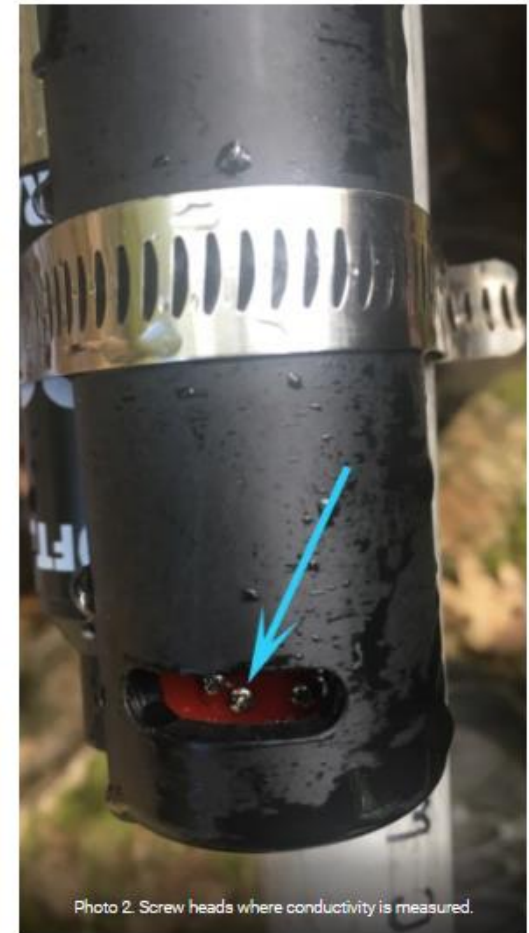
Quick quiz: How often should you clean the conductivity and turbidity sensors on your EnviroDIY Monitoring Station?

- A. Once a year.
- B. Once a week.
- C. Once a day.

If you answered once a year, you might be wasting your time deploying a monitoring station because your sensors will be too fouled to make useful measurements. If you answered once a day, you might have too much time on your hands. *If you answered once a week, YOU ARE CORRECT!*

Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Example: cleaning and QCing the CTD sensor – conductivity fouling issues



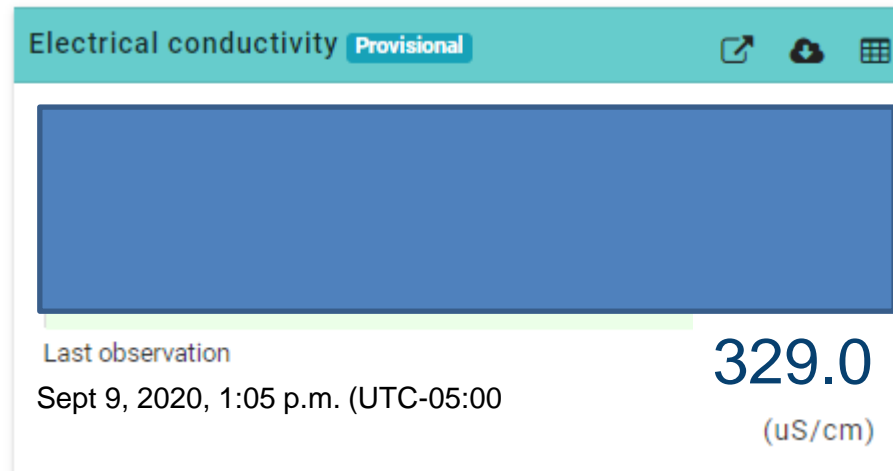
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

The way sensors looked when we got to the site



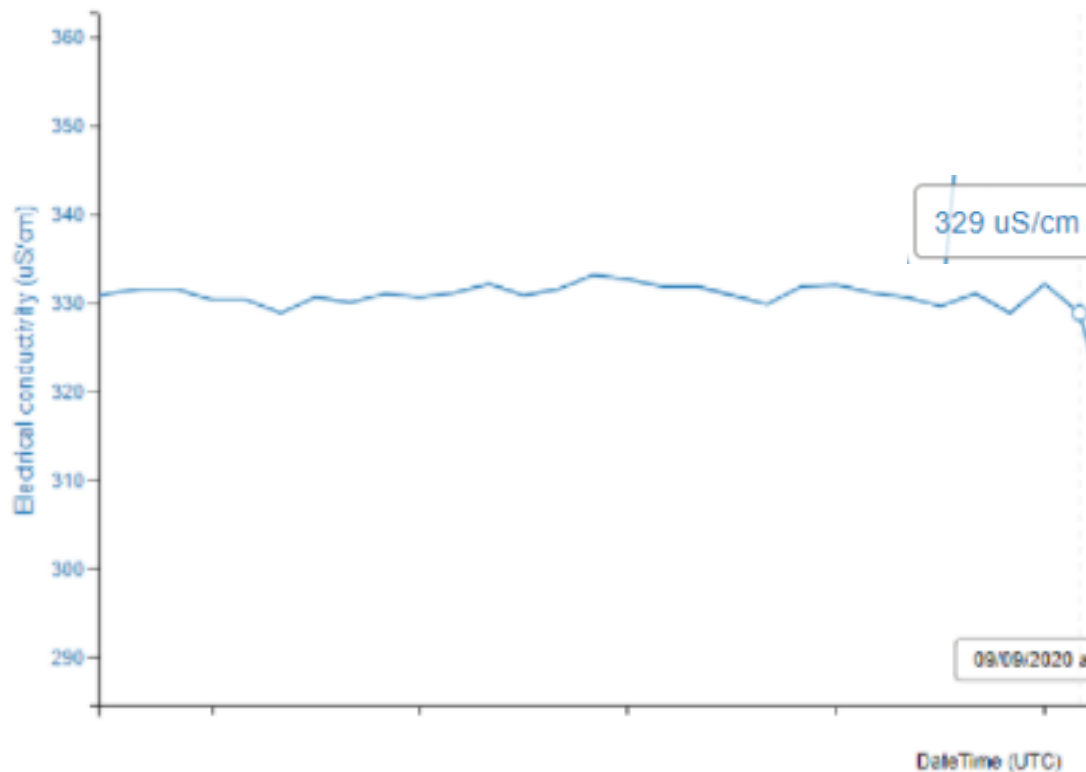
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading before sensor cleaning



Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading before cleaning



Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Cleaned bodies of sensors using the long white bristles of the brush



Photo 4. Outer body of CTD sensor before cleaning.

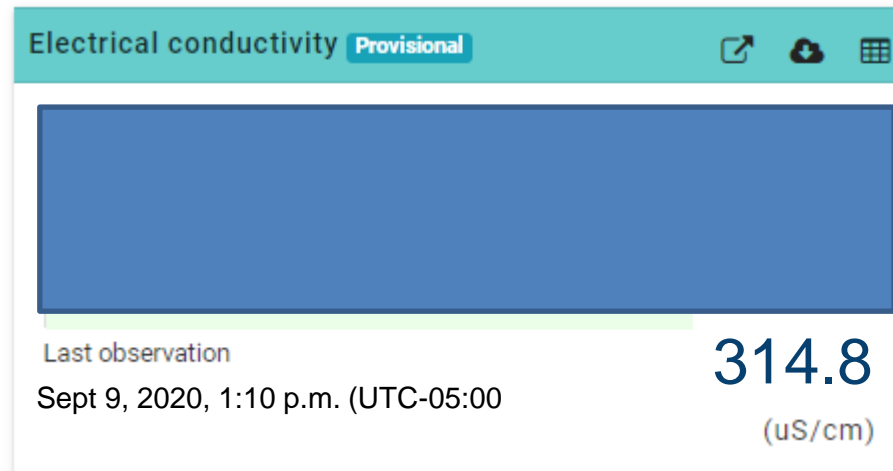


Photo 5. Outer body of CTD sensor after cleaning.



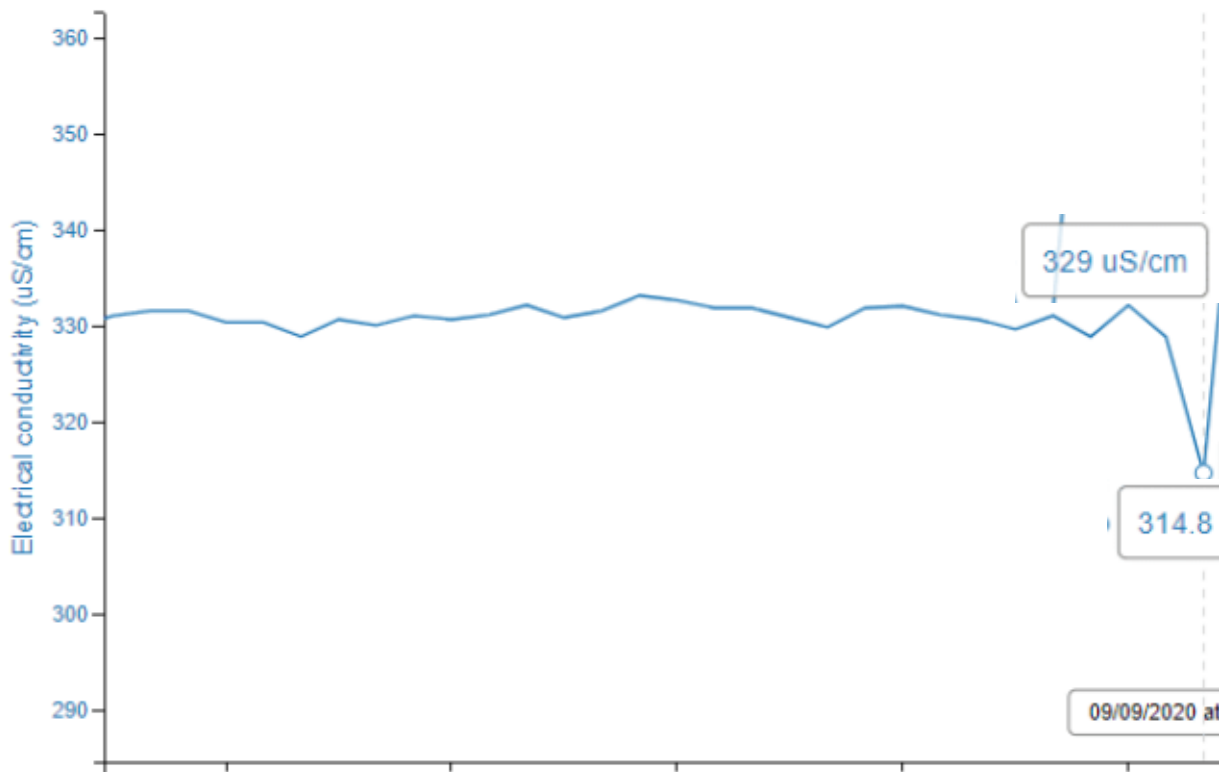
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading after cleaning sensor body



Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity went down after cleaning the body of the CTD sensor – this took the station reading FARTHER away from the QC reading



QC measurement was
380 μ S/cm,

**65.2 units, 17%
different**

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Used long white bristles to clean INSIDE the CTD slot, clean conductivity screw heads

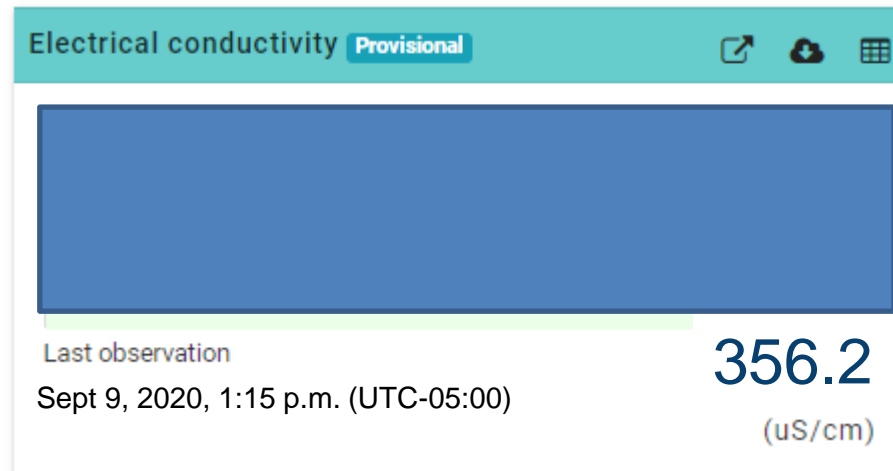


Photo 6. Cleaning the screw heads inside the CTD sensor.



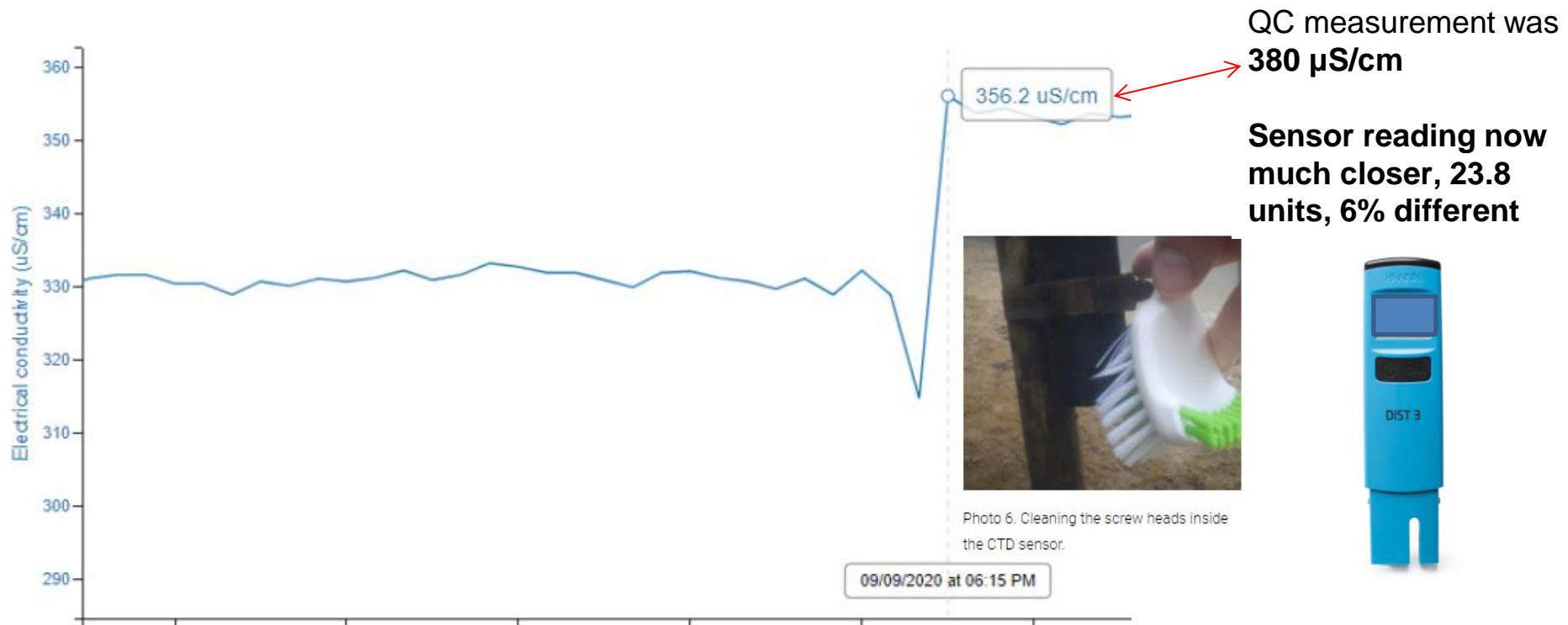
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading after cleaning



Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity went up after cleaning inside the CTD slot – brought the station reading CLOSER the QC reading



Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Additional point: screws need to be pointing out from sensor bundle so they can be cleaned



*Sometimes sensors are installed with the screw heads facing toward the rebar on which sensors are mounted – does not allow cleaning

Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

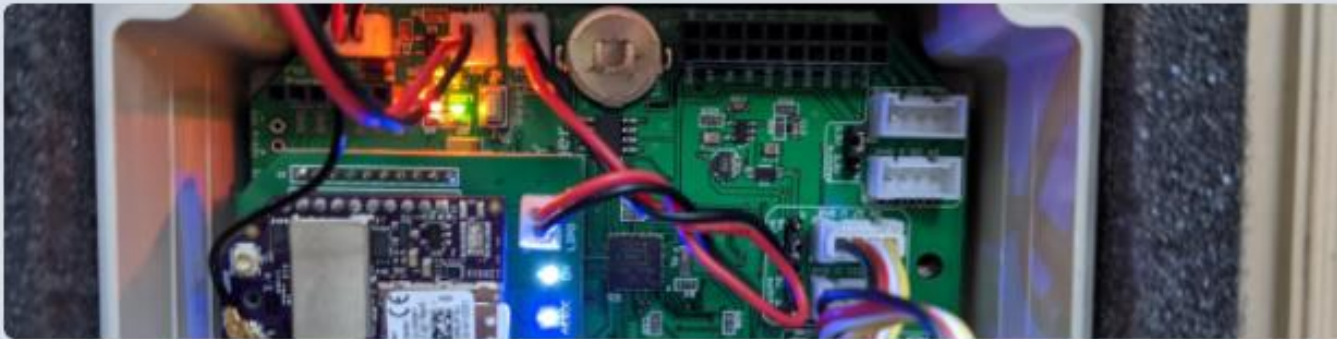
“The screw heads in your own CTD sensor may not need to be cleaned during every visit, particularly if sensors are being cleaned weekly or if there has not been significant accumulation of debris in and on the sensor. **However, the only way to know whether further cleaning is needed is by making independent quality control measurements.**”

-EnviroDIY blog “Increase Data Quality...”

- *This goes for all data from all sensors
 - check accuracy of sensor data using QC cross checks with calibrated hand meters and equipment

New: EnviroDIY Service Request Form

Only available for groups working within the Delaware River Basin – Rachel will have more on this

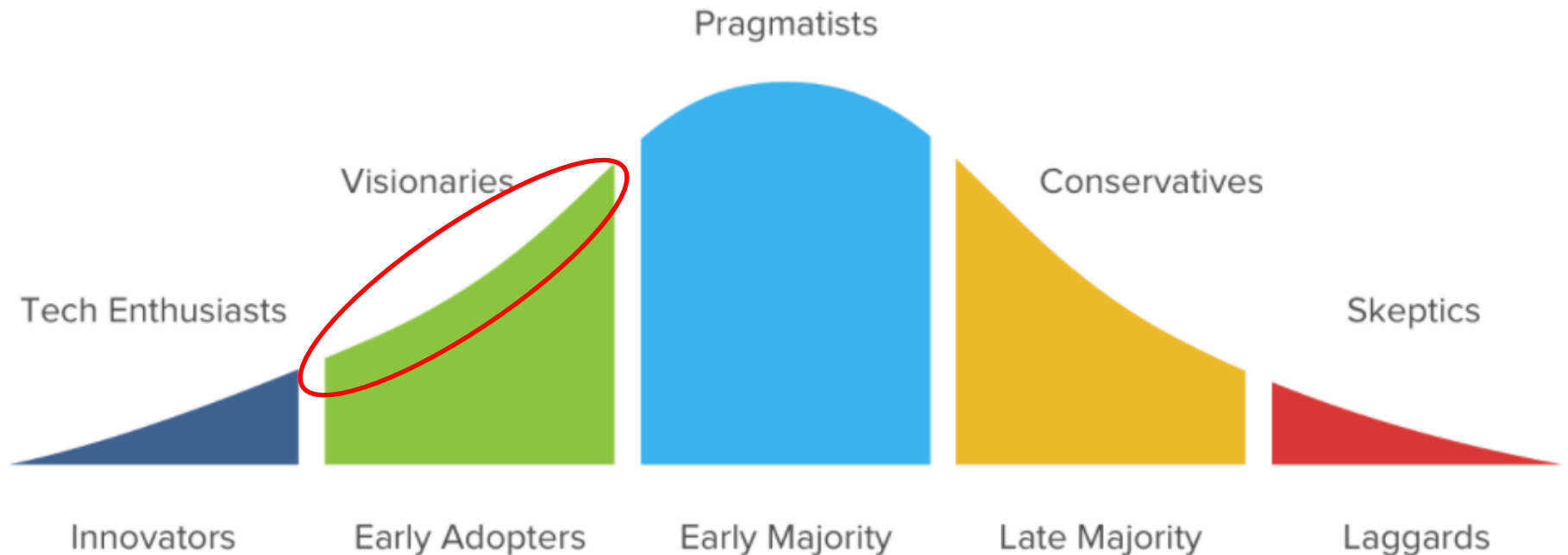


EnviroDIY Monitoring Station Service Request Form

Please complete this form with as much information as possible to assist Stroud Water Research Center technicians in troubleshooting your problem. For extremely urgent issues please contact the Stroud Center team directly (rjohnson@stroudcenter.org; shicks@stroudcenter.org; dbressler@stroudcenter.org).

*Please note, station assistance is only available to groups working within the Delaware River Basin

This is all new – new inventions, new technology,
new guidance materials



Thank You!

Stroud Water Research Center, EnviroDIY-DRWI troubleshooting contacts:

- Rachel Johnson, rjohnson@stroudcenter.org, 973-557-8995
- Shannon Hicks, shicks@stroudcenter.org, 610-268-2153 x267
- Christa Reeves, christa@musconetcong.org, 908-537-7060
- David Bressler, dbressler@stroudcenter.org, 410-456-1071

On to Rachel Johnson!

Notes

- Intro to stations and MonitorMW (include data upload to MonMW, MonMW problems and how to report issues); emphasize QC as a way to determine if data are correct (which is the whole point) - 1hr or less - Dave