WELCOME!

EnviroDIY Troubleshooting Workshop

Online, Thursday June 23, 2021, 1:00-4:00p
Delaware River Watershed Initiative (DRWI)

https://4states1source.org/

4States1Source
The Delaware River Watershed Initiative

Working across four states to protect one shared source of clean water
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

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

- microUSB port
- Bee Module Socket (Xbee/WiFi/Cell)
- Power switch
- MicroSD/SPI connector
- User-defined pushbutton
- MicroSD socket (horizontal)
- 20-pin header for analog pins and 2 UART ports
- Auxiliary 16-bit, 4-channel Analog-to-Digital Converter
- Grove digital ports
- FTDI programming port
- Solar panel connector & charging circuitry
- Red & Green LEDs
- LiPo battery connectors
- DS321 Real Time Clock with battery backup
- 20-pin header for digital pins
- 5V boost converter
- I²C port
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

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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/](https://wikiwatershed.org/help/sensor-help/)

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Monitor My Watershed

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](https://wikiwatershed.org/help/sensor-help/sharing-sensor-data/#sensor-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 week of data.
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

- **EnviroDIY**: Join a community of do-it-yourself enthusiasts sharing open-source ideas for environmental science and monitoring. [Visit EnviroDIY](#).

- **Leaf Pack Network**: Discover what aquatic insects can tell you about your stream's health by performing a simple leaf pack experiment. [Visit Leaf Pack Network](#).

- **Macroinvertebrates.org**: 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](#).

[Stroud Water Research Center](#)
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.

Below 3.5v cell transmission stops.
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/](https://wikiwatershed.org/drwi/))

### General Resources

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<td>EnviroDIY Monitoring Station Help Resources</td>
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#### 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

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

- 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
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)
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- Ensure Hologram cell plan is paid to ensure data transmission to Monitor My Watershed

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
- Swap microSD card with blank SD card and save data file to secure location
- Complete Field Visit Data sheet and enter into online form
- Reference EnviroDIY Quality Control Quick Guide as needed
**Station Owner/Manager – ensuring station is managed properly**

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- Swap microSD card with blank SD card and save data file to secure location
- Complete Field Visit Data sheet and enter into online form
- Reference EnviroDIY Quality Control Quick Guide as needed
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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- Clear vegetation and debris from around the logger and solar panel
- Complete Field Visit Data sheet and enter into online form via https://wikiwatershed.org/drwi/
- Reference EnviroDIY Maintenance Quick Guide as needed
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/](https://wikiwatershed.org/help/sensor-help/)
Conduct Quality Control

Conduct Quality Control (Quarterly and per situational needs)

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- Reference EnviroDIY Quality Control Quick Guide as needed
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

Photo 4. Outer body of CTD sensor before cleaning.
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading before sensor cleaning

Sept 9, 2020, 1:05 p.m. (UTC-05:00)
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading before cleaning

![Conductivity reading before cleaning](image)
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.
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

Conductivity reading after cleaning sensor body

Sept 9, 2020, 1:10 p.m. (UTC-05:00)
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 μS/cm,
65.2 units, 17% different
Case Study: Use of Monitor My Watershed and Quality Control as the foundation for troubleshooting

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

Sept 9, 2020, 1:15 p.m. (UTC-05:00)

356.2 (uS/cm)
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.

QC measurement was 380 μS/cm

Sensor reading now much closer, 23.8 units, 6% different

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

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

https://www.crazyegg.com/blog/product-adoption-to-transform-marketing/
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