

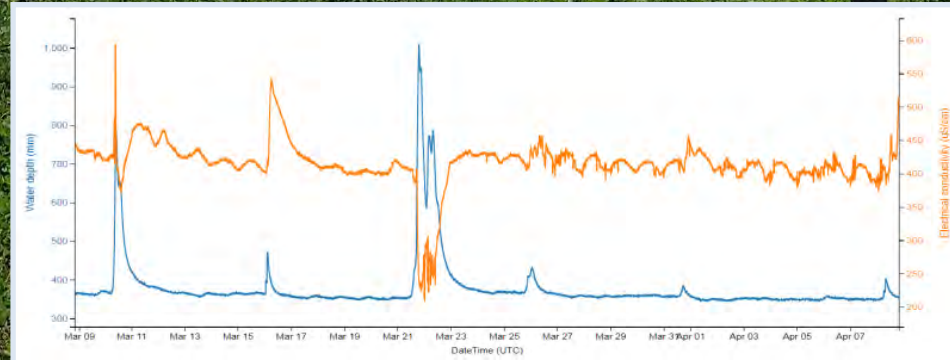
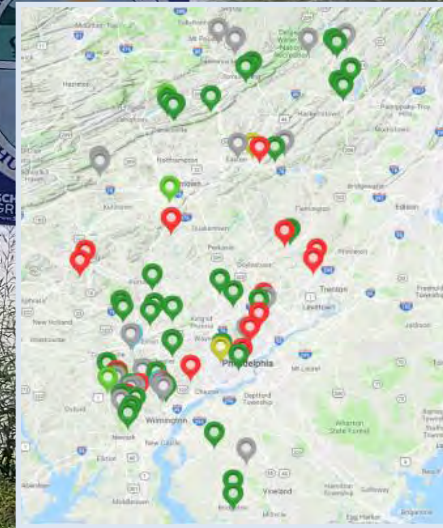
WELCOME!

Monthly EnviroDIY-DRWI User Group Meeting

Online, Thursday June 17, 2021, 2:30-3:30p



 Monitor My Watershed®



STROUD
WATER RESEARCH CENTER

These Monthly Meetings

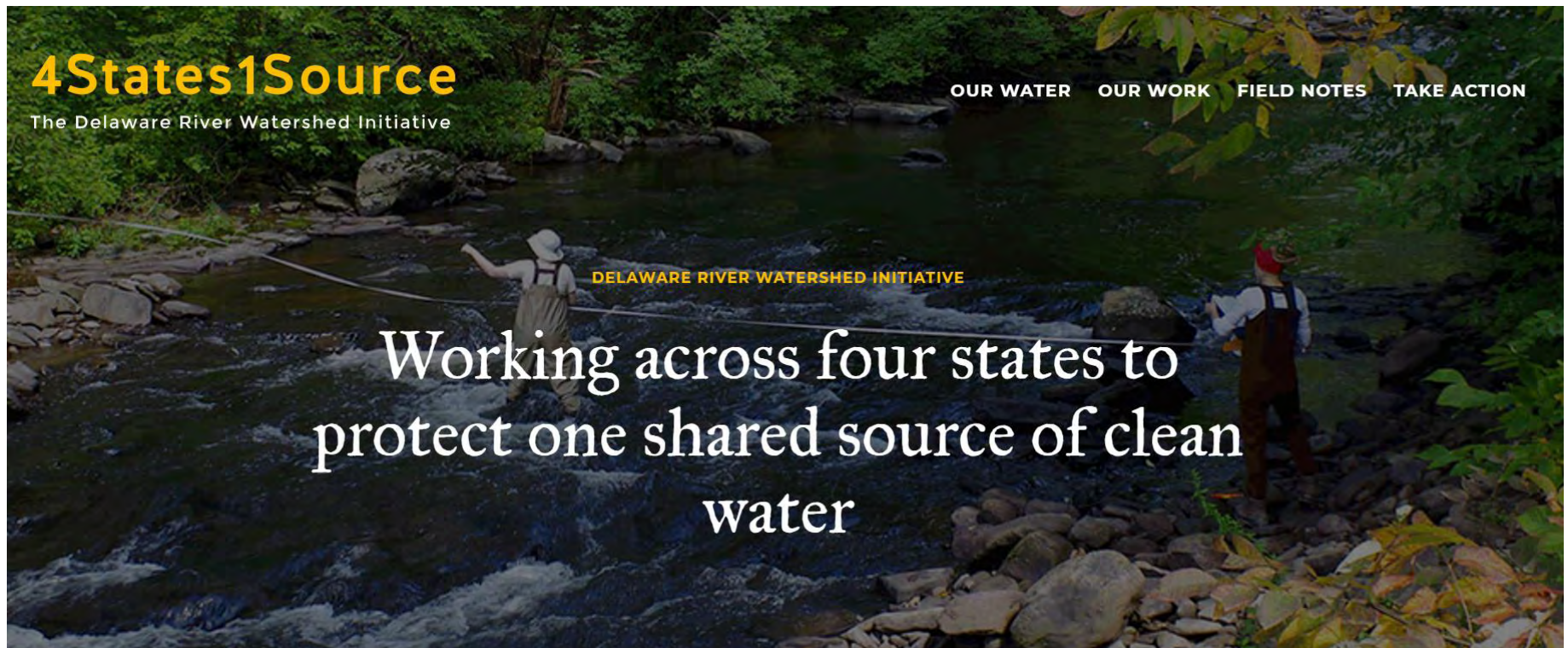
- Every third Thursday of the month
- 2:30-3:30p
- Zoom link will remain the same:
<https://us02web.zoom.us/j/81881801310?pwd=eUFmbXZLbmRibVcxa1dtNVhzRmNvZz09>
- Reminder email will be sent one week prior to each month's meeting
 - Station owners/managers organize volunteers/others to attend and share Zoom link

REMINDER

- Attendees include:
 - Groups working in Delaware River Watershed Initiative (DRWI)
 - Groups working in Delaware River Basin (DRB) but not DRWI
- Stroud Center support via DRWI and C-SAW

Delaware River Watershed Initiative (DRWI)

<https://4states1source.org/>



C-SAW

<https://www.c-saw.info/>



Home

What's Available?

Who's Eligible?

Who Provides Assistance?

Apply

News

Resources

Contact



What is C-SAW?

The Consortium for Scientific Assistance to Watersheds (C-SAW) is a team of specialists who provide *free* organizational and scientific technical assistance to Pennsylvania-based watershed and conservation organizations.

C-SAW does not conduct watershed monitoring or assessments. Instead, C-SAW helps watershed organizations do a better job with their own monitoring and assessments.

Goals for these monthly meetings

- **Time/space to check-in, ask questions, report issues, network, etc.**
- **Updates** from Stroud Center
- **Presentations**
 - **Station Owner/Manager Presentations** – communicate about individual situations, local watershed work
 - **Focus Topic Presentations** – guest presenters talk about technical/ecological/other focus topics

****All of this to support gathering good data and using it purposefully***

Facilitators

Stroud Center Facilitators:

David Bressler, Rachel Johnson, Christa Reeves, Shannon Hicks



Master Watershed Steward Facilitators:

Carol Armstrong, George Seeds (Chester & Delaware Co.)

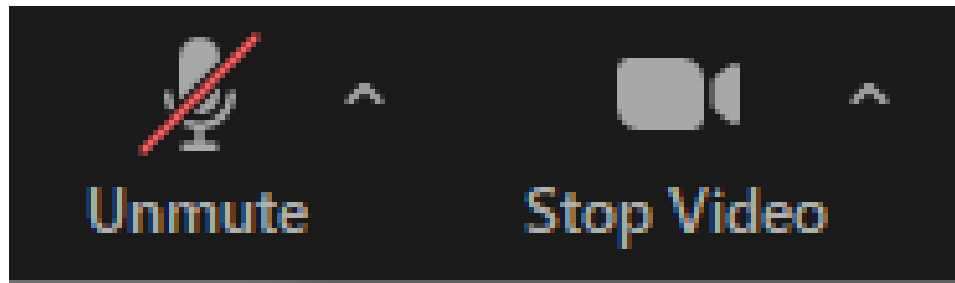




Zoom Orientation



***Meeting is being recorded**



***Mute unless asking question**

These Monthly Meetings

Recordings available at: <https://wikiwatershed.org/drwi/>



Search



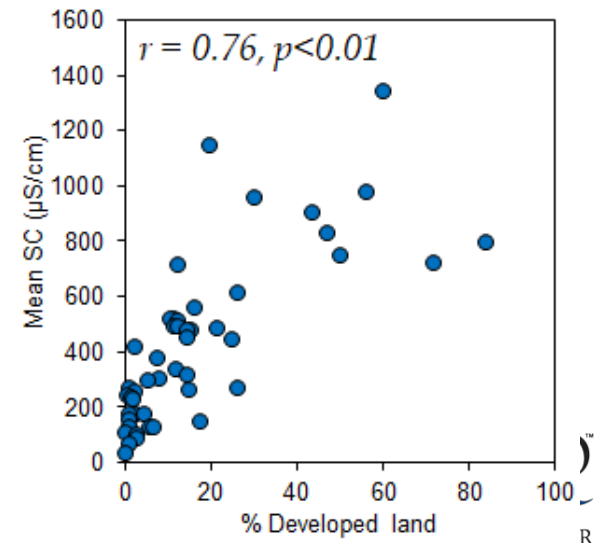
August 2020 EnviroDIY-DRWI Monthly Meeting

15 views • Aug 25, 2020

0 0 SHARE SAVE ...

Stroud Center Perspective – EnviroDIY in DRWI

- Primary Goal
 - Support Station owners, managers, and volunteers
 - Use stations for local purposes
- Secondary Goal
 - Analyze basin-wide data set
 - Develop tools to characterize and contextualize watersheds



Today's Agenda

1. Introduction
2. Stroud Updates
3. Presentation: Where have we come from and where are we going? – David Bressler, Stroud Water Research Center
4. Discussion
5. Conclusion

Stroud Center Updates

**EnviroDIY Troubleshooting Workshop
(virtual), June 23, 2021, 1-4p,
registration:**

<https://forms.gle/XAQ634gjCaVwu3zS6>

***Paste into chat**

Stroud Center Updates

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

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](#)

Stroud Center Updates

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
- Contact Stroud Center with any issues (dbressler@stroudcenter.org)

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)
- Any unknowns contact station owner/manager and Stroud Center (shicks@stroudcenter.org; riohanson@stroudcenter.org; dbressler@stroudcenter.org)

Sensor cleaning and station maintenance (Weekly)

- 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 via <https://wikiwatershed.org/drwi/>
- Reference EnviroDIY Maintenance Quick Guide as needed

Conduct Quality Control (Quarterly)

- Use calibrated hand-held meter to cross check station conductivity and temperature data
 - 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 to secure location
- Complete Field Visit Data sheet and enter into online form via <https://wikiwatershed.org/drwi/>
- Reference EnviroDIY Quality Control Quick Guide as needed

Stroud Center Updates



Current lack of reliability of cell boards

- **Stroud Center has begun testing some NEW cell boards**
- Shannon more info?

Stroud Center Updates

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



Equipment and supply list for maintenance and quality control of standard Stroud Center EnviroDIY Monitoring Station (*pricing and availability subject to change*)

SD cards and adaptors:

- Single micro SD card and SDHC adaptor, \$6.00: <https://www.amazon.com/SanDisk-Mobile-MicroSDHC-SDSDQM-B35A-Adapter/dp/B004ZIEMWU>
- USB adaptor (for use when computer cannot accommodate SDHC adaptor), \$10.99: <https://www.amazon.com/Reader-Adapter-Micro-UHS-I-Cards/dp/B07L63Z54G>
- Micro SD card and adaptor value pack (5 count), \$19.65: <https://www.amazon.com/PACK-SanDisk-MicroSD-SDSDQAB-008G-Packaging/dp/B00MHZ6ZJQ>

Power:

- Lipo Charger, PRT-15217, \$9.95:
 - <https://www.sparkfun.com/products/15217>
 - <https://www.digikey.com/en/products/detail/sparkfun-electronics/PRT-15217/10244131>
 - <https://www.adafruit.com/product/1904>
- USB wall adapter 5V, TOL-11456, \$3.95:
 - <https://www.sparkfun.com/products/11456>
 - <https://www.digikey.com/en/products/detail/philhong-usa/PSAA05A-050QL6-R/6560437>
- Lithium Ion Battery Pack - 3.7V 4400mAh, \$19.95:
 - <https://www.amazon.com/Battery-Packs-Lithium-Pack-3-7V/dp/B0137IRGHG>



Any questions before we move on?



Monthly station owner/manager presentation

Where have we come from and where are we going?

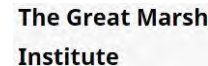
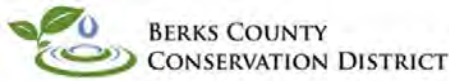
EnviroDIY in the Delaware River Basin



David Bressler, Stroud Water Research Center,
dbressler@stroudcenter.org

Who is “we”?

- Watershed groups, schools, and universities using EnviroDIY monitoring stations in the Delaware River Basin (DRB) with Stroud Center support (via DRWI)



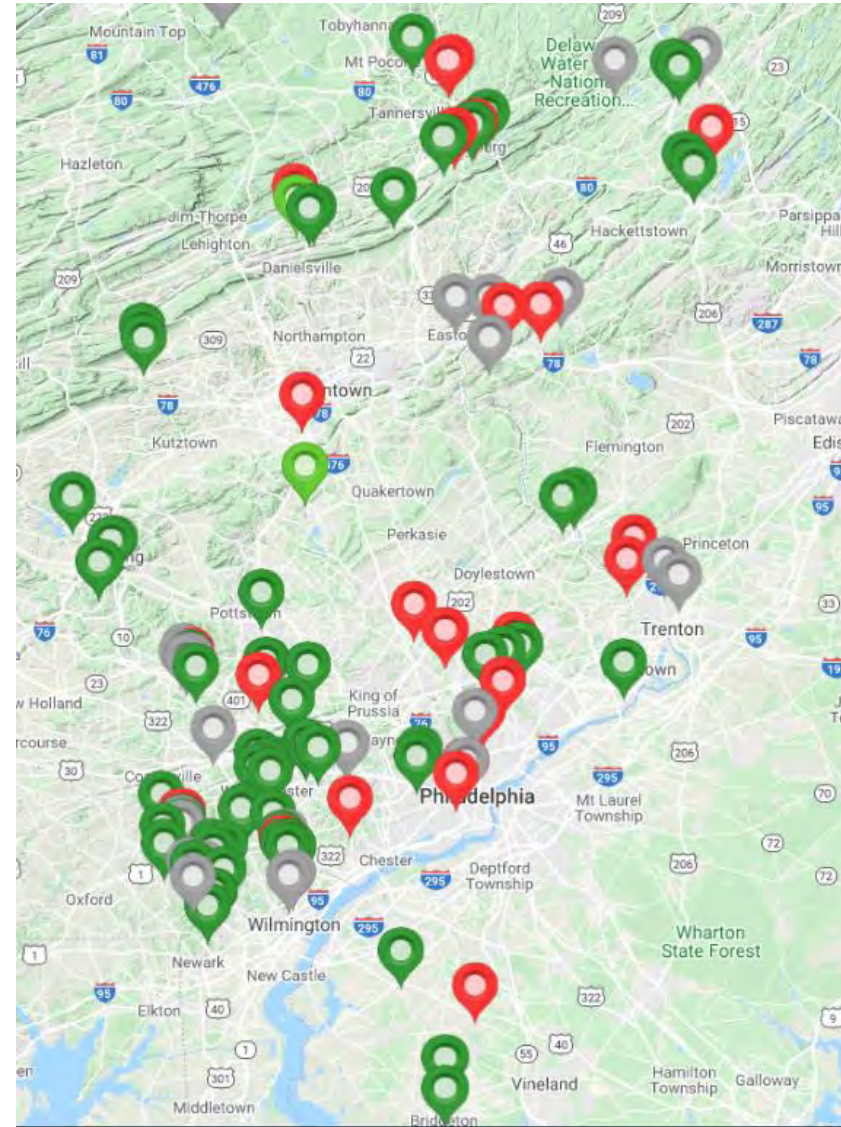
Who is “we”

Abby Weinberg, OSI
American Littoral Society
Angelica Creek Watershed Association
Bartrams Gardens
Berks County Conservation District
Berks Nature
Berks Nature; DCNR; Nolde St Forest
Brandywine River Museum
Brodhead Watershed Association
Darby Creek Valley Association
Deerpark Rural Alliance
Delaware Riverkeeper
East Stroudsburg University
Easter DE Co. Stormwater Coal., Villanova-WPF
Great Marsh Institute
Green Valleys Watershed Association
Independence School
Lake Committee, Somerset Lake Community
Lawrenceville School
Lopatcong Creek Initiative; NJ Highlands Coalition
Master Watershed Stewards, Berks Co.
Musconetcong Watershed Association
Natural Lands Trust, Woodstown High School

Pennypack Ecological Restoration Trust
Perkiomen Creek Trout Unlimited
Poconos-Kittatinny Cluster/East Stroudsburg University
Primrose Creek Watershed Association
PSU MWS, Aquashicola/Pohopoco Watershed Conservancy
Schuylkill River Greenways
Silver Lake Nature Center
South Jersey Land & Water Trust
Stroud Water Research Center
The Land Conservancy for Southern Chester County
The Schuylkill Center for Environmental Education
The Watershed Institute
TNC/FSNHP
Tookany/Tacony-Frankford Watershed Partnership
Trout Unlimited
Trout Unlimited, NJ
Valley Forge Trout Unlimited
Wallkill River Watershed Management Group
West Chester University
White Clay Wild and Scenic
Wildlands Conservancy
Willistown Conservation Trust
Wissahickon Trails

Lots of stations, lots of groups

- Over 100 stations across DRB
- Owned by over 50 groups
- ~Median watershed size = 10 km² (much smaller than USGS watersheds)

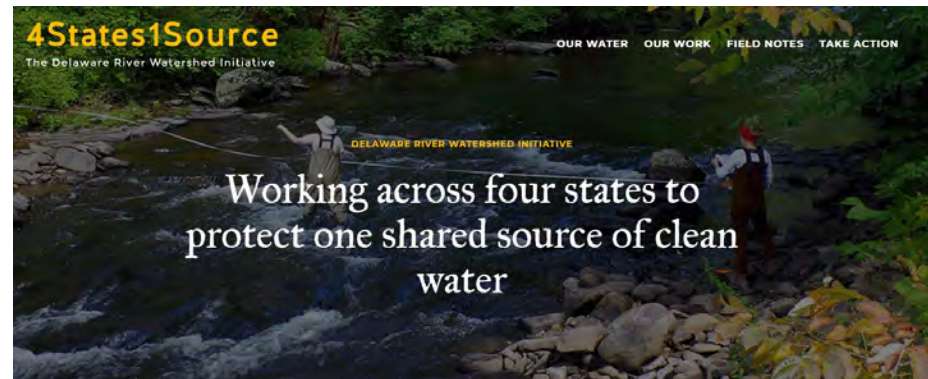


Where have we come from?

- EnviroDIY/DRWI Project
- EnviroDIY Technology
- EnviroDIY.org
- Data Portals
- Funding
- Timeline

Where have we come from? DRWI Project

- ~2015-16 planning for getting EnviroDIY stations and support to watershed groups
 - **Build monitoring and science capacity (via DRWI)**



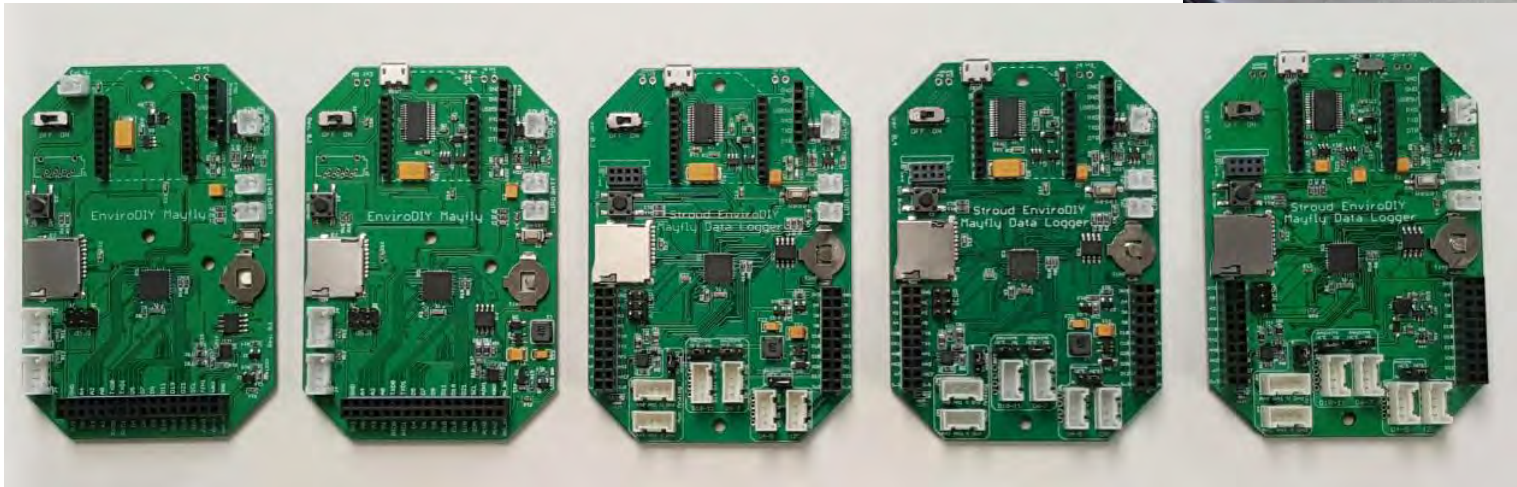
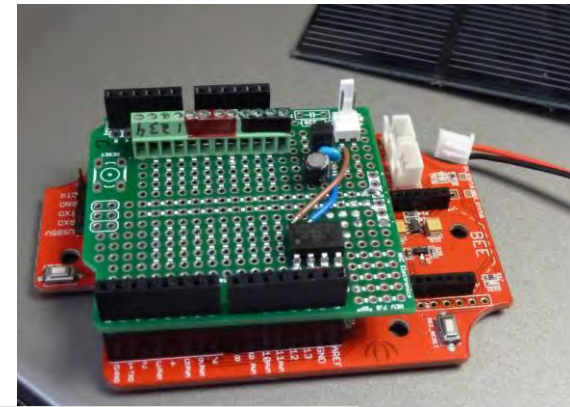
Where have we come from? Technology

- How is it that Stroud Center was able to provide these stations?
 - Technology development by Shannon Hicks for 20+ years



Where have we come from? Technology

- How is it that Stroud Center was able to provide these stations?
 - DIY tech development by Shannon Hicks for 20+ years



Where have we come from? Technology

- Coincidentally, ~2015 Shannon's technology was ready for standardization and public availability



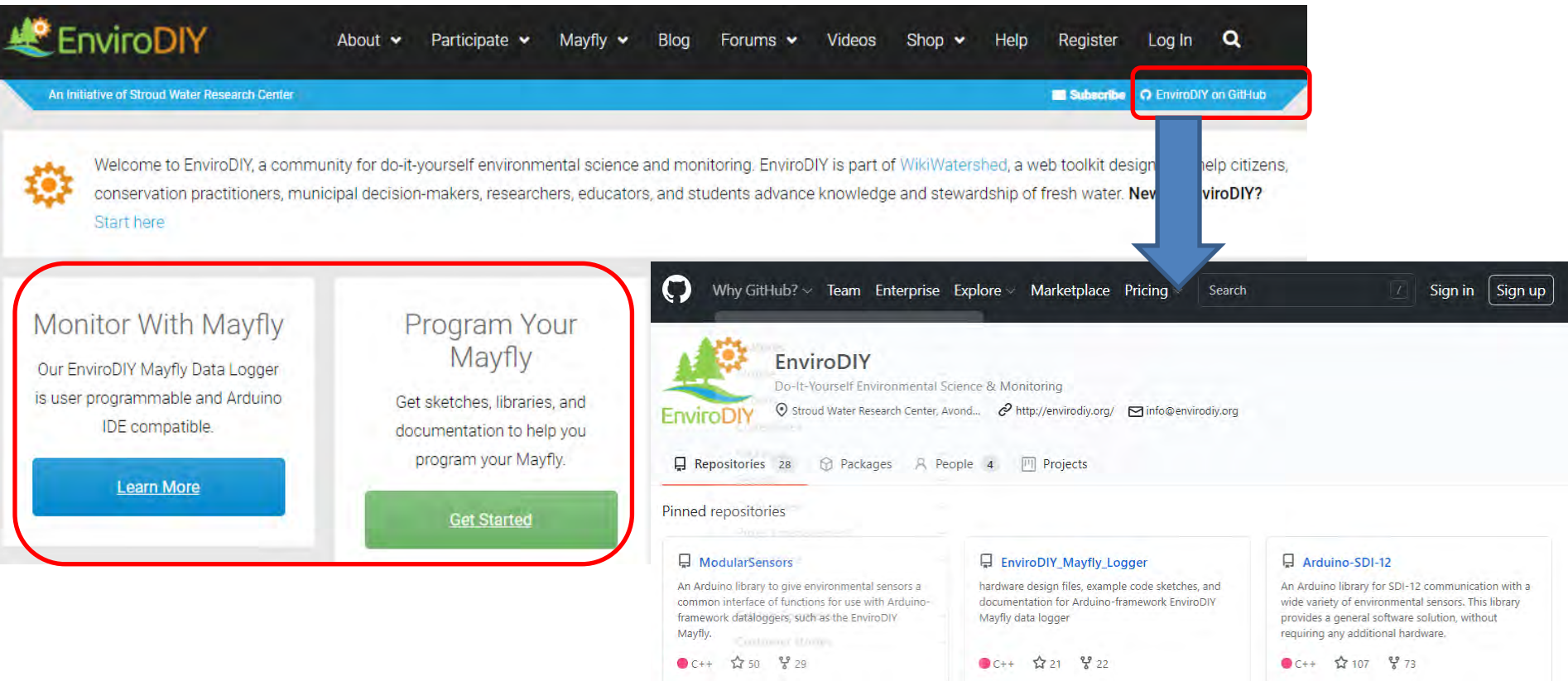
Where have we come from? Technology

- Coincidentally, ~2015 Shannon's technology was ready for standardization and public availability



Where have we come from? EnviroDIY.org

- Anthony Aufdenkampe and Shannon (with Stroud Center support) started EnviroDIY.org
 - Mayfly Data Logger = foundation/centerpiece of EnviroDIY.org
 - Open Source access to technology, code (via GitHub)



The image shows two screenshots. The top screenshot is the EnviroDIY.org website. The navigation bar includes links for About, Participate, Mayfly, Blog, Forums, Videos, Shop, Help, Register, and Log In. A red box highlights the 'EnviroDIY on GitHub' link. Below the navigation bar, a welcome message states: 'Welcome to EnviroDIY, a community for do-it-yourself environmental science and monitoring. EnviroDIY is part of WikiWatershed, a web toolkit designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance knowledge and stewardship of fresh water. New to EnviroDIY? Start here'. Below this, two boxes are highlighted with red borders. The left box is titled 'Monitor With Mayfly' and contains the text 'Our EnviroDIY Mayfly Data Logger is user programmable and Arduino IDE compatible.' with a 'Learn More' button. The right box is titled 'Program Your Mayfly' and contains the text 'Get sketches, libraries, and documentation to help you program your Mayfly.' with a 'Get Started' button. The bottom screenshot is the GitHub profile for EnviroDIY. The profile header shows the EnviroDIY logo and name, followed by the description 'Do-It-Yourself Environmental Science & Monitoring'. Below this, it lists 'Repositories 28', 'Packages', 'People 4', and 'Projects'. A section titled 'Pinned repositories' shows three repositories: 'ModularSensors' (C++, 50 stars, 29 forks), 'EnviroDIY_Mayfly_Logger' (C++, 21 stars, 22 forks), and 'Arduino-SDI-12' (C++, 107 stars, 73 forks). A large blue arrow points from the 'EnviroDIY on GitHub' link in the top screenshot to the GitHub profile in the bottom screenshot.

EnviroDIY.org website navigation and content:

- Navigation: About, Participate, Mayfly, Blog, Forums, Videos, Shop, Help, Register, Log In
- Header: An Initiative of Stroud Water Research Center
- Buttons: Subscribe, EnviroDIY on GitHub
- Welcome message: Welcome to EnviroDIY, a community for do-it-yourself environmental science and monitoring. EnviroDIY is part of WikiWatershed, a web toolkit designed to help citizens, conservation practitioners, municipal decision-makers, researchers, educators, and students advance knowledge and stewardship of fresh water. New to EnviroDIY? Start here
- Highlighted sections (red boxes):
 - Monitor With Mayfly**: Our EnviroDIY Mayfly Data Logger is user programmable and Arduino IDE compatible. [Learn More](#)
 - Program Your Mayfly**: Get sketches, libraries, and documentation to help you program your Mayfly. [Get Started](#)

GitHub profile for EnviroDIY:

- Profile: EnviroDIY (Do-It-Yourself Environmental Science & Monitoring)
- Location: Stroud Water Research Center, Avondale, PA
- Contact: <http://envirodiy.org/>, info@envirodiy.org
- Stats: Repositories 28, Packages, People 4, Projects
- Pinned repositories:
 - ModularSensors**: An Arduino library to give environmental sensors a common interface of functions for use with Arduino-framework dataloggers, such as the EnviroDIY Mayfly. C++, 50 stars, 29 forks
 - EnviroDIY_Mayfly_Logger**: hardware design files, example code sketches, and documentation for Arduino-framework EnviroDIY Mayfly data logger. C++, 21 stars, 22 forks
 - Arduino-SDI-12**: An Arduino library for SDI-12 communication with a wide variety of environmental sensors. This library provides a general software solution, without requiring any additional hardware. C++, 107 stars, 73 forks

Where have we come from? EnviroDIY.org

- Anthony Aufdenkampe and Shannon (with Stroud Center support) started EnviroDIY.org
 - Forum Q&A
 - Blog



Today's Activity

[Charitha \(CJ\) replied to the topic How to get a 5V signal out based on a sensor reading in the forum Mayfly Data Logger](#)

Jun 11, 2021 06:22 pm

Thank you so much for the replies. The 5V signal duration varies with site and rain event conditions. However, with my previous field work, using a campbell system, the valve controlled by the actuator was open (5V) for an average of 10 mins (but could be a few hours on extreme rainfall events). How would the duration affect the mayfly? I'm using...[\[Read more\]](#)

[Selbig replied to the topic Logging Mayfly with Decagon SDI-12 Sensor in the forum Mayfly Data Logger](#)

Jun 11, 2021 01:13 pm

I was able to get it to work correctly. The only thing I changed was removal of the UUIDs for all of the variable pointers. I also moved the voltage pin so D7 was getting 5v instead of 3.3. I don't know if that was what caused the initial error but it's working now.

[Shannon Hicks replied to the topic How to get a 5V signal out based on a sensor reading in the forum Mayfly Data Logger](#)

Jun 11, 2021 02:52 am

What's the duration of the 5v signal you want to generate? And how much

Blog

Newest | Posted any date



TIPS & POINTERS

[My Experience Building an EnviroDIY Mayfly Monitoring Station](#)

Cheryl Nolan · 2021-05-19 · No Comments

Computer program downloading and circuit board wiring were not my forte, so the first thing I did was enlist the help of the most tech-savvy people I know.



TIPS & POINTERS

[The Wide, Wide World of DIY \(and DIT\)](#)

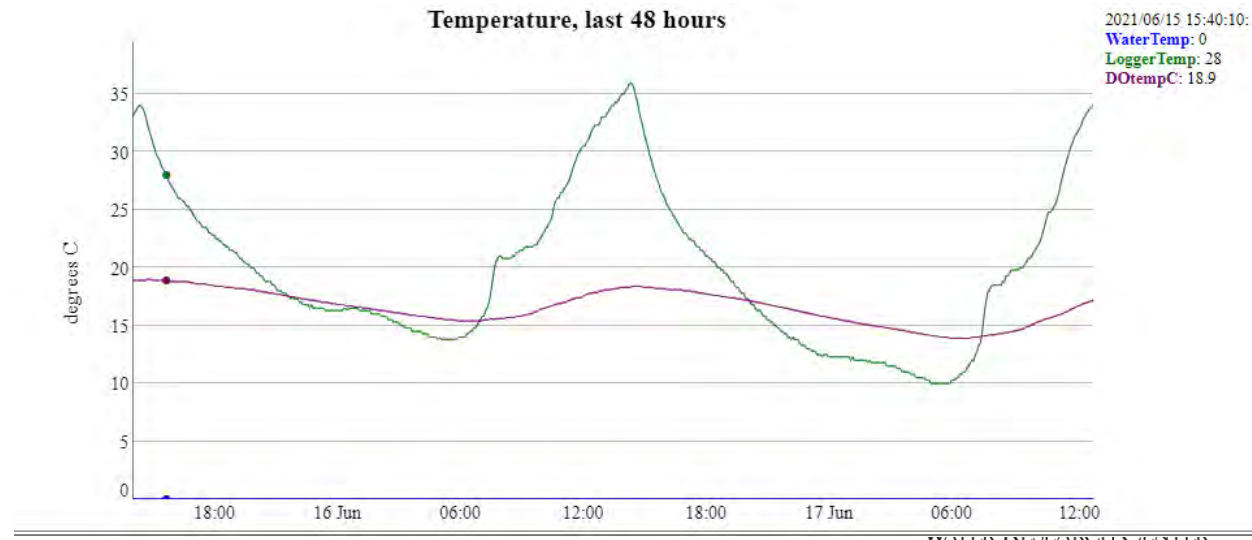
Scott Ensign · 2021-04-28 · 1 Comment

DIY is in many cases a misnomer; in reality, we Do-It-Together! bringing people together to develop and share environmental monitoring and measurement systems.



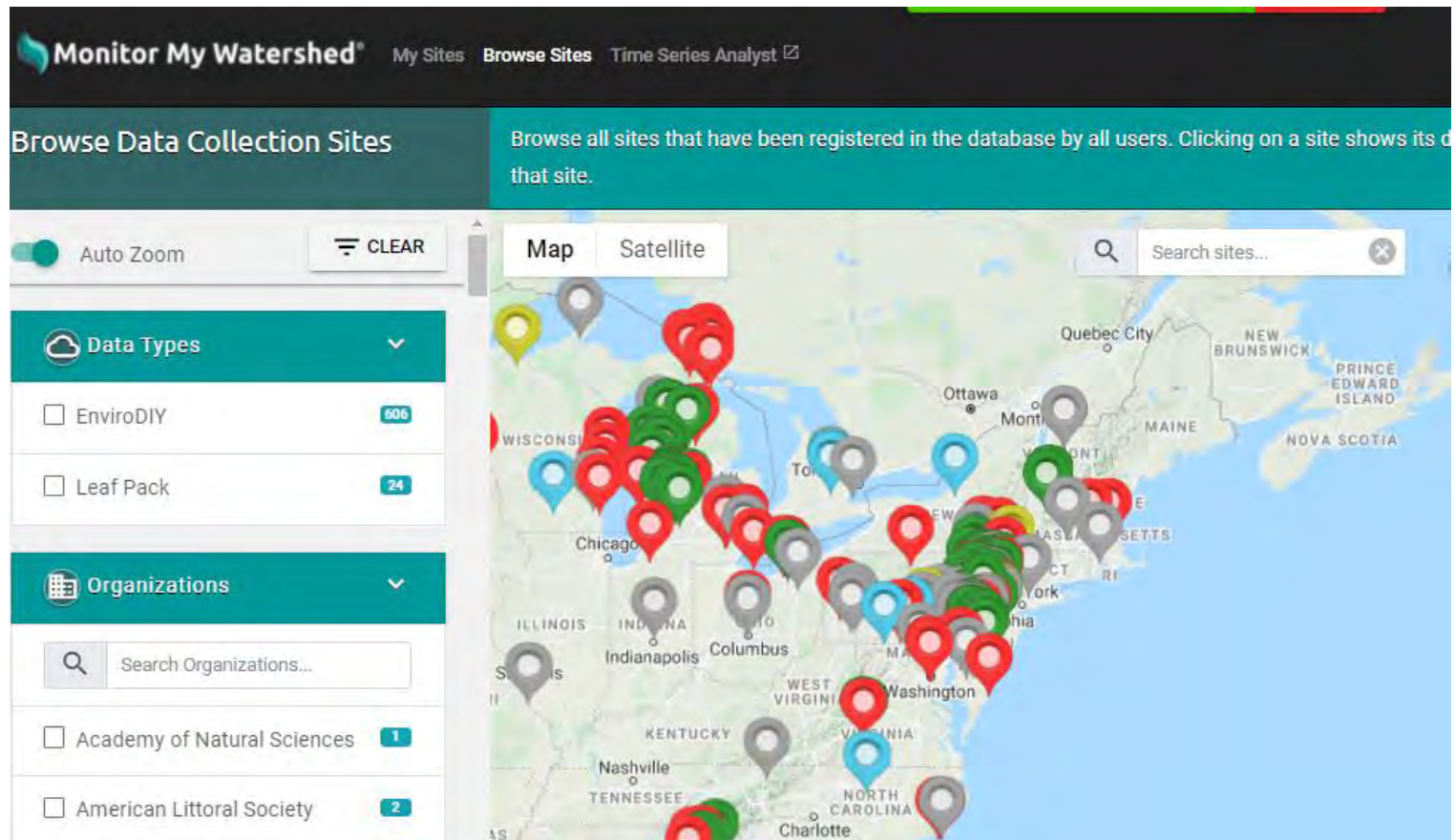
Where have we come from? Data portals

- Dreamhosters was the original data portal (developed by Shannon)



Where have we come from? Data portals

- Monitor My Watershed



Where have we come from? Funding

- Early funding
 - US Environmental Protection Agency grant for EnviroDIY stations at schools
 - National Science Foundation, Critical Zone Observatory grant for Monitor My Watershed development
- More recent funding
 - **Citizen Science grant: William Penn Foundation, Delaware River Watershed Initiative**
 - Consortium for Scientific Assistance to Watersheds (C-SAW, Pennsylvania)

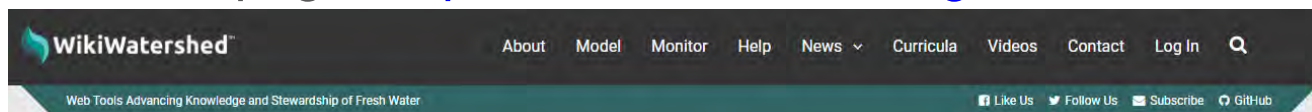
Where have we come from? Timeline

- **2017-2018, Grants from Stroud Center (via DRWI)**
 - EnviroDIY monitoring stations (with CTD and turbidity sensors) granted to groups in DRB
 - Provided by grantees:
 - Project plan explaining how they would use the station(s)
 - Signed contract
 - 1yr of tending to station
 - Pay cell plan
 - Informal – longer term interest/intentions
 - Provided by Stroud:
 - EnviroDIY CTD/Turbidity station
 - Stipend \$1500-2300 per station
 - Installation
 - Ongoing troubleshooting
 - Guidance materials, events, etc.

Where have we come from? Timeline

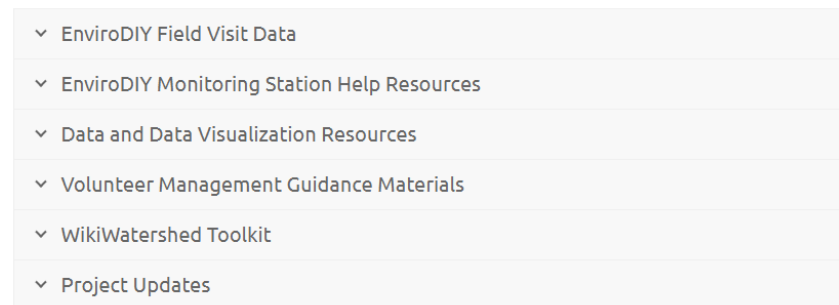
- **2019-2020**

- No more grant stations
- Direct sale of fully functional stations
- Updated operations manual, videos, guidance materials, workshops, on-site assistance
- Resources page: <https://wikiwatershed.org/drwi/>

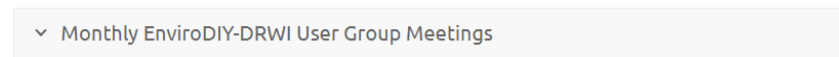


Delaware River Watershed Initiative Resources

General Resources



Meetings, Workshops, and Conferences



Where have we come from? Timeline

- **2020-2021**

- No direct sales, no grant of stations
- Sales via Stroud Center shop of EnviroDIY Monitoring Kits
 - Buyer purchases sensor directly from manufacturer
- Build workshops
- Monthly online meetings
- Continued support
- Testing process for rapid assessment of continuous data (i.e., Watershed Characterization Template)

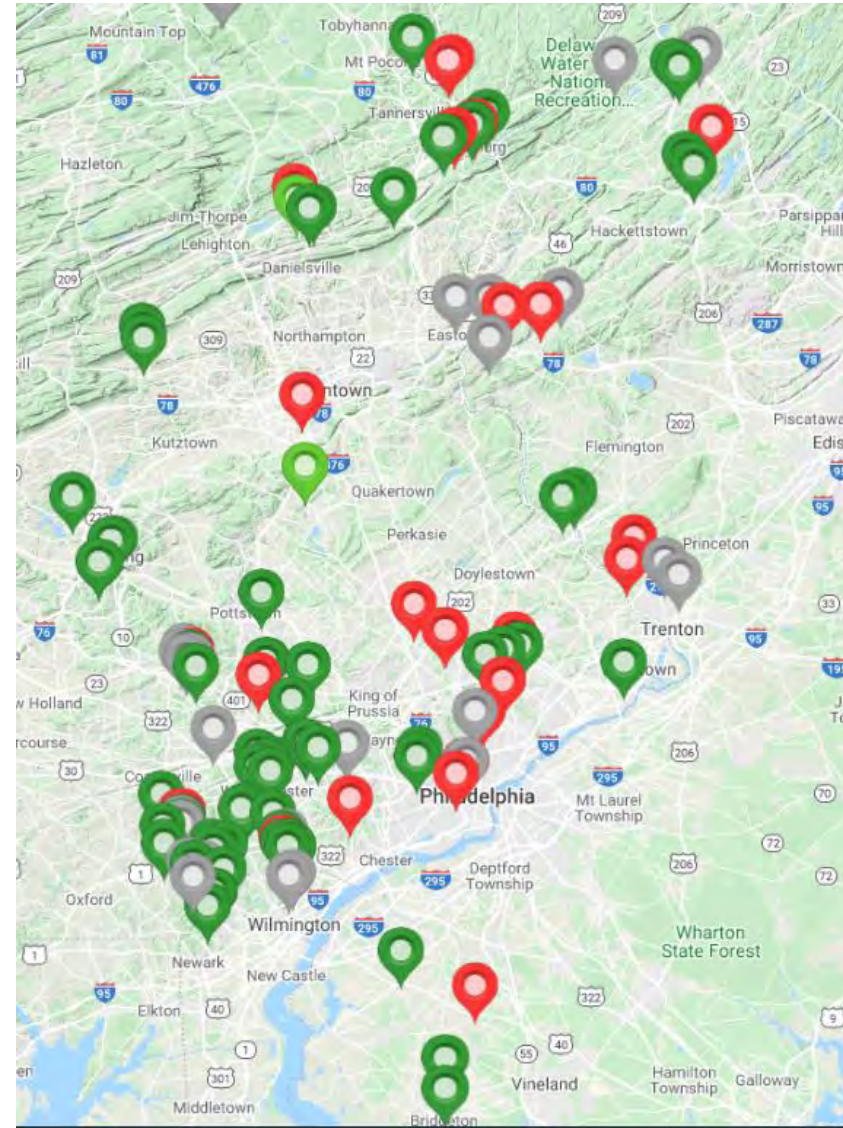


Where are we now?

- Support
- Statistics
- Station usage
- Support materials
- QC results

Where are we now?

- Over 100 stations across DRB
- Owned by over 50 groups
- ~Median watershed size = 10 km² (much smaller than USGS watersheds)



Where are we now? Support

- **2017-2021 support materials summary**

- Field Visit Data sheets w online entry and storage
- EnviroDIY and MonitorMW manuals and Quick Guides
- Videos
- Workshops
- Resources page (<https://wikiwatershed.org/drwi/>)
- Online group – station troubleshooting updates
- **Ongoing assistance and troubleshooting (New EnviroDIY Troubleshooting Service Request form)**

STROUD
WATER RESEARCH CENTER
www.stroudwtr.org

EnviroDIY Field Visit Data

Videos

Name(s): _____
Site ID: _____
Stream Name: _____
GPS (Lat/Lon): _____
Photos? Yes/No: _____
Precipitation: _____
General Notes: _____



GROUP TO GROUP SUPPORT

1. EnviroDIY
2. Overview
3. EnviroDIY
4. Cleaned Sensor
5. GRAB SAMPLE
6. Sample Number:
Bottle Type:
Lab Sent To:
*SENSOR ST
Sensor station Conductivity
Sensor station Turbidity (IN)

▼ Maintaining and
▼ Measuring and
▼ Webinars



Where are we now? Support

- Support materials – demonstrate these links
 - <https://wikiwatershed.org/drwi/>
 - <http://monitormywatershed.org/> (help tab)

Where are we now? Stats

- **Number of stations installed each year in DRB**
 - 2017 – 55 stations
 - 2018 – 35 stations
 - 2019 – 25 stations
 - 2020 – 12 stations
 - 2021 – 4 stations
 - TOTAL – 131 stations deployed

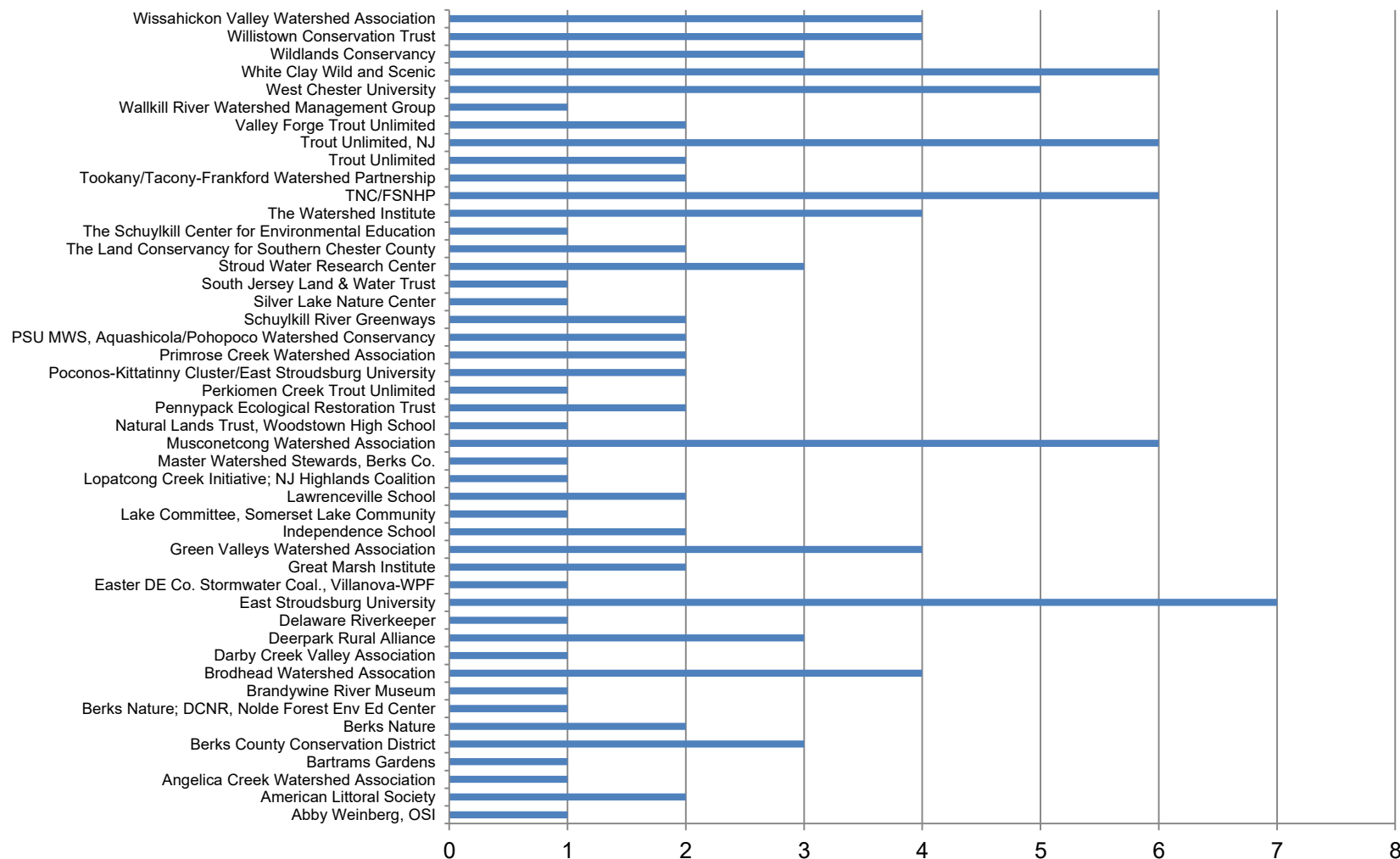
Where are we now? Stats

- **Numbers of data points**
 - 840,000 data points per station per year
 - Stations installed in 2017: 136,000,000
 - Stations installed in 2018: 56,000,000
 - Stations installed in 2019: 20,000,000
 - Stations installed in 2020: 14,400,000
 - >227,000,000 data points

| DateTime | TimeOffset | DateTimeUTC | Decagon_CTD-10_Cond | 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 |

Where are we now? Stats

Number of sites by organization



Where are we now? Stats

- **Station maintenance**

- >3000 site maintenance visits by groups/volunteers since July 2018
- ~900 Quality Control efforts conducted since July 2018
- >350 troubleshooting site visits by Stroud Center in 2019-2020

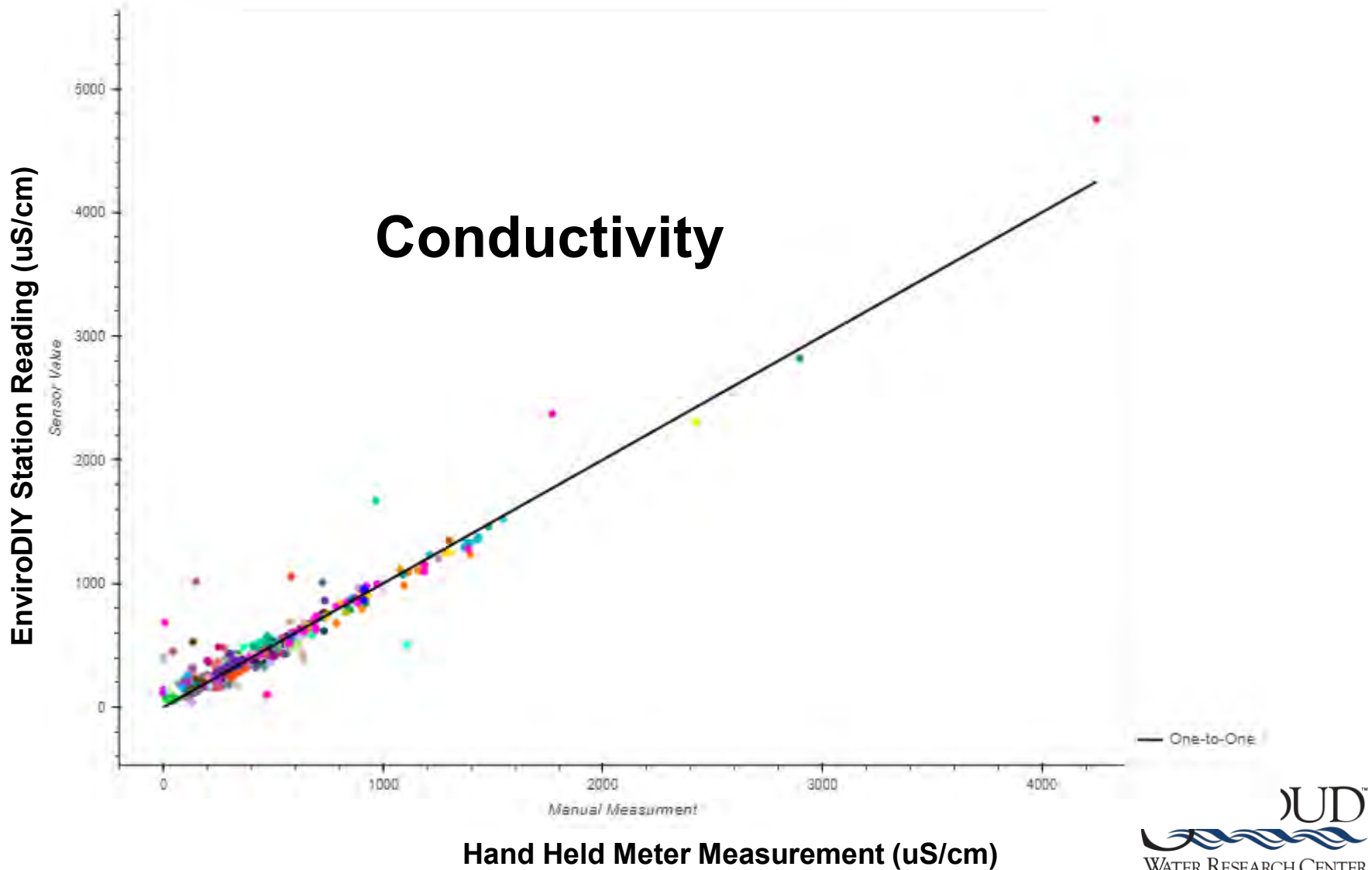
Where are we now? Station usage

- **Examples of work being done** (see <https://wikiwatershed.org/drwi/#project-updates>):
 - Musconetcong and NJ TU – flow/WWTP effluent; temperature and brook trout
 - DE TNC/First State NHP – pollution into national park
 - East Stroudsburg Univ – DRWI PKC cluster; class work
 - Watershed Hydrological Analysis Team – stormwater and sediment
 - White Clay Wild Scenic – municipal work
 - Wallkill and Lopatcong – Watershed Characterization collaboration
 - Paulins Kill – temperature, sediment from dams
 - Basha Kill – Dragon Springs pollution
 - Forest Hills Run – salt sleuthing and municipal infractions
 - West Chester Univ – salt from WCU and WC borough
 - Primrose Creek Watershed Assoc – quarry monitoring

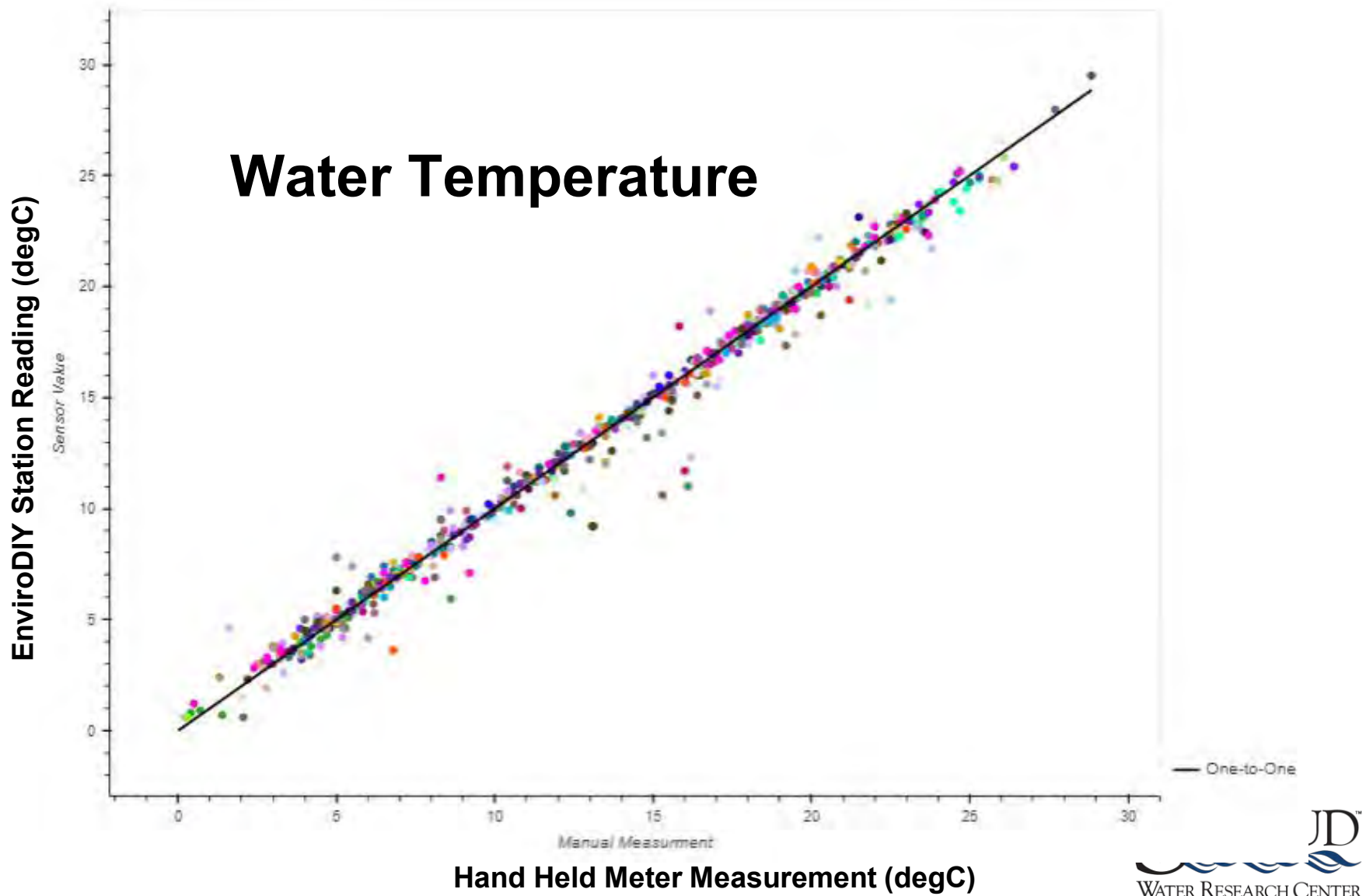
Where are we now? Quality Control Results

- Quality Control Results, 1:1 Scatterplots
 - Conductivity
 - Temperature
 - Depth

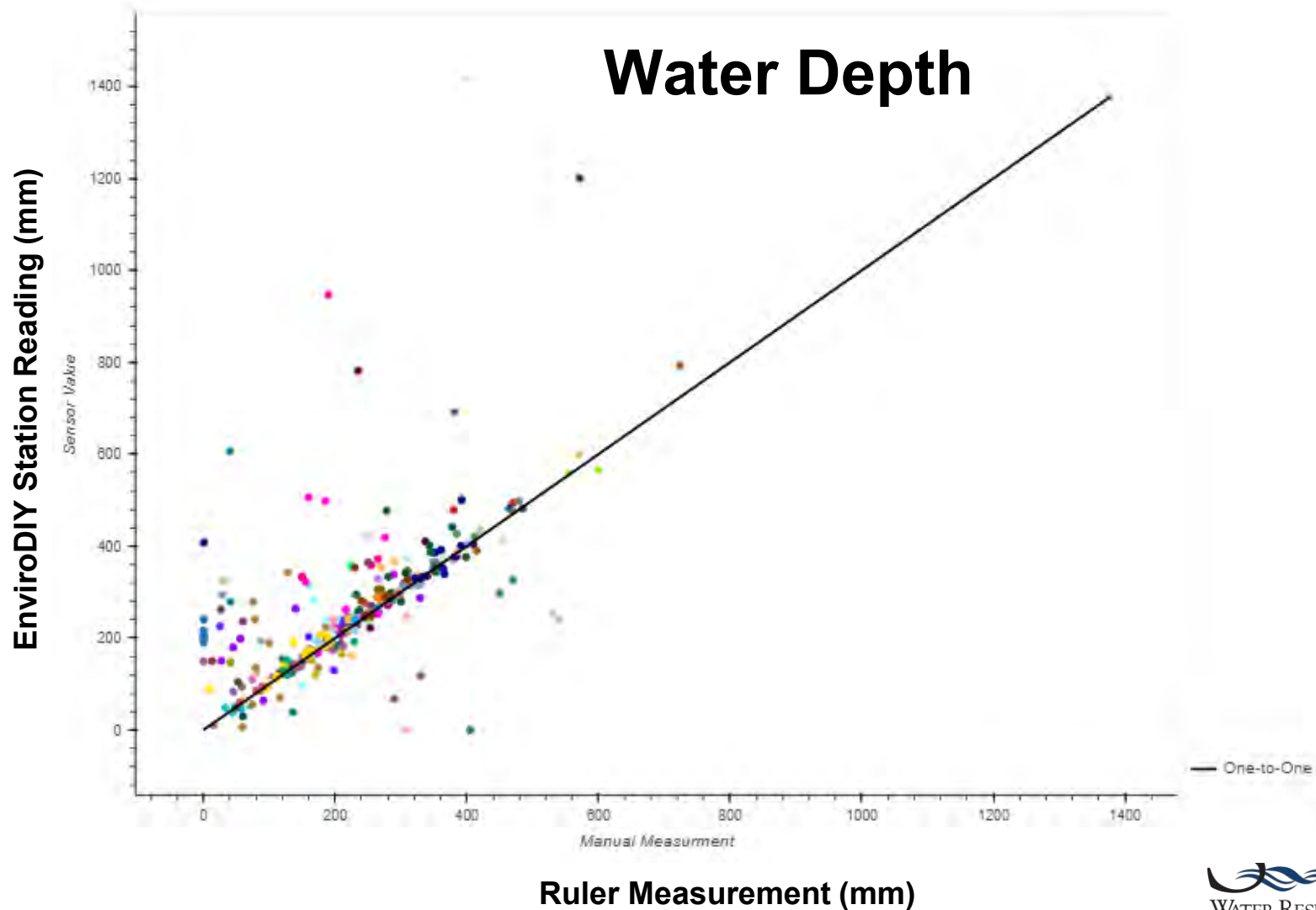
Where are we now? Quality Control Results



Where are we now? Quality Control Results

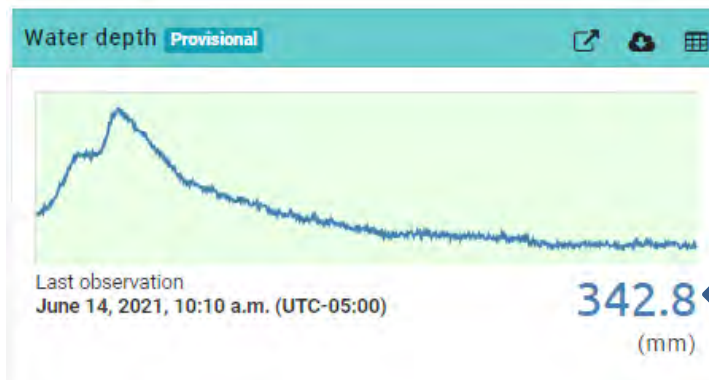


Where are we now? Quality Control Results



Where are we now? Quality Control lessons learned

- Use the online Field Visit Sheet records to check your data quality – **for this to work both station and QC data have to be recorded and entered**
- **Always check to see if results match up**
 - **If they don't, start troubleshooting**



e.g. 340mm

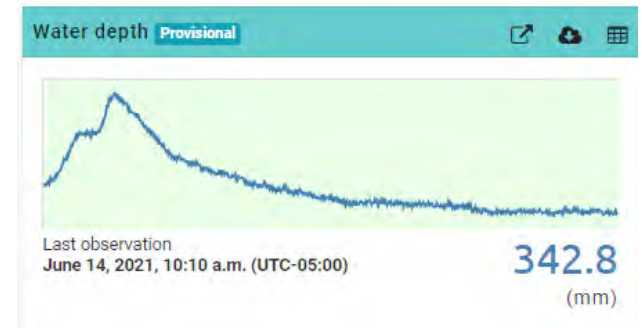


e.g. 315 uS/cm



Where are we now? Maintenance and QC quick tips

- Maintenance
 - Important to regularly check MonitorMW
 - Station online?
 - Data normal?
 - Troubleshooting tips
 - Cycle power
 - Check SD card to cross check
 - CTD slot - focus on this for cleaning
 - Frequency of visits very situational
- Quality Control
 - Do QC when numbers are suspect
 - Quarterly QC to ensure good data is documented



Where are we now? Stroud Center usage of data

- Examples:
 - Conductivity data in salt-related peer-review papers by Stroud Center
 - Freshwater salinization in DRB (see Oviedo-Vargas presentations at [wiki/drwi](http://wiki.drwi))
 - Temperature issues (see Marc Peipoch presentation at wiki/drwi)
 - Turbidity data (see presentations by Ensign and Damiano at wiki/drwi)
 - Watershed Characterization Paulins Kill – process for rapid assessment of continuous data, i.e., watershed characterization template (see presentation by Rogers and Leifer at wiki/drwi)
 - The many stations have provided lots of feedback for EnviroDIY technology development

Where are we now? Stroud Center usage of data

Jackson JK, Funk DH. 2019. Temperature affects acute mayfly responses to elevated salinity: implications for toxicity of road de-icing salts. Phil. Trans. R. Soc. B 374:20180081.

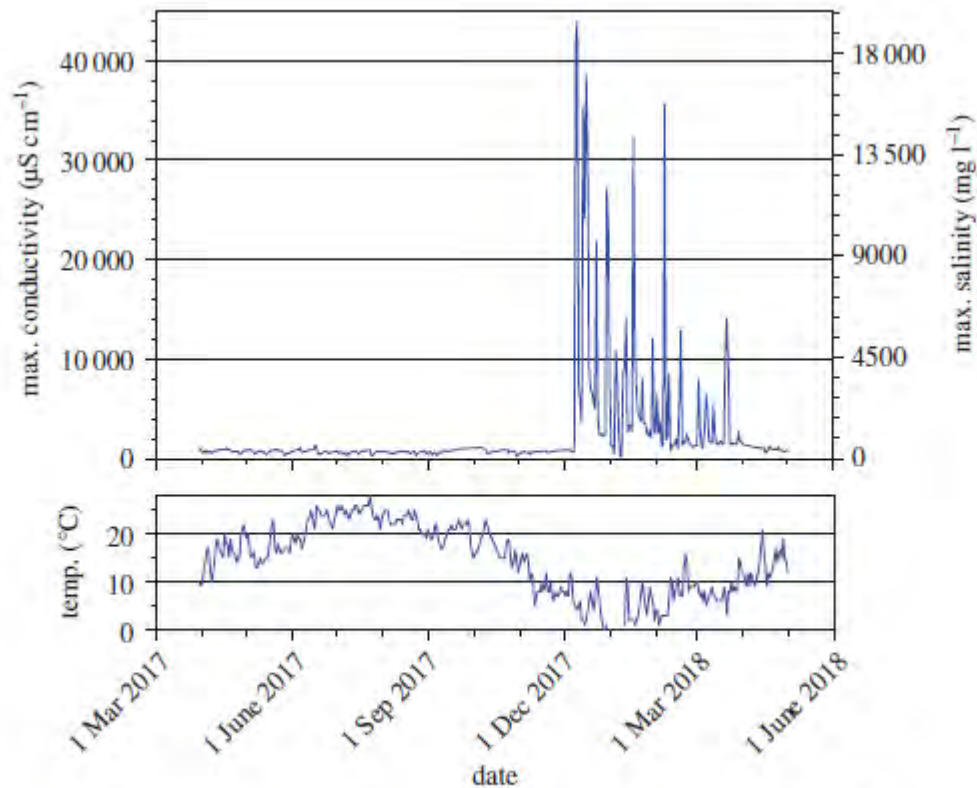
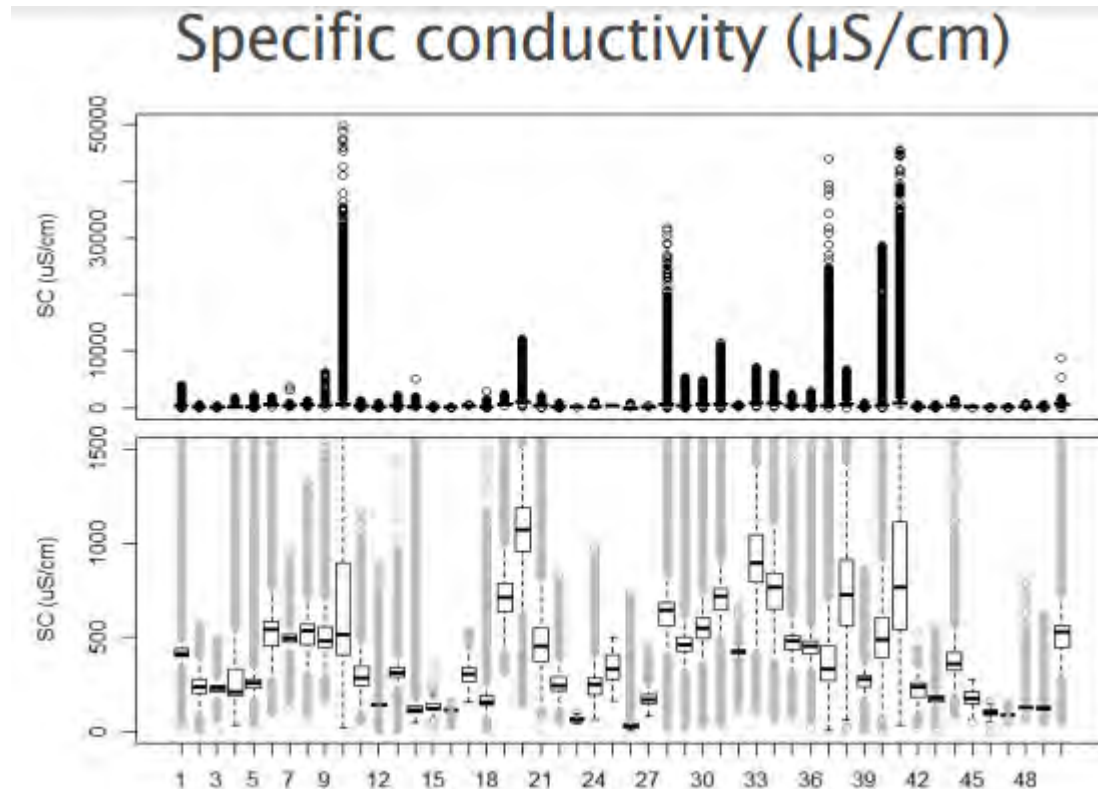


Figure 2. Seasonal variation (from 30 March 2017 to 1 May 2018) in maximum daily salinity as conductivity ($\mu\text{S cm}^{-1}$) and mg l^{-1} , and maximum daily temperature ($^{\circ}\text{C}$) for Rocky Run, First State National Historic Park, New Castle County, Delaware. (Online version in colour.)

Where are we now? Stroud Center usage of data

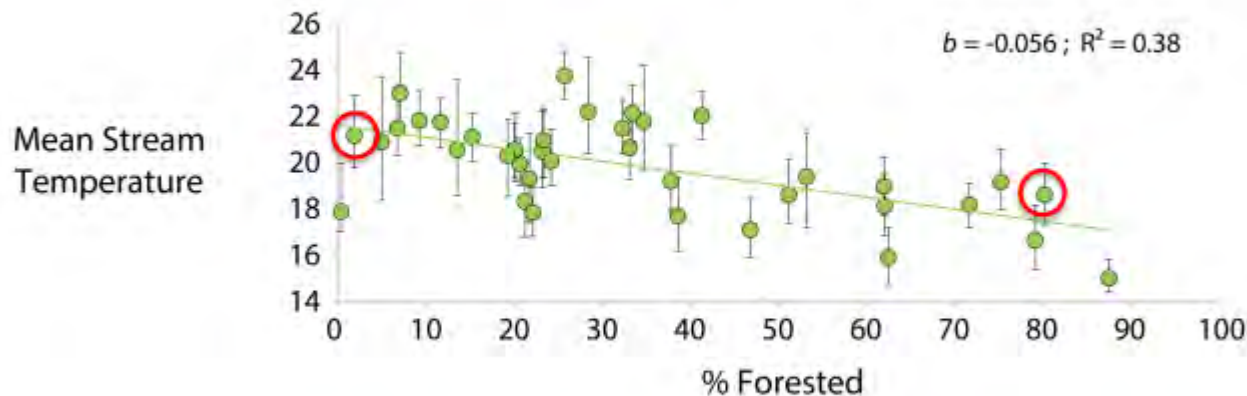
- Freshwater salinization in DRB
 - Watershed Congress 2020, **Spatio-temporal patterns of specific conductivity in streams and rivers of the Delaware River Basin**, Diana Oviedo-Vargas



Where are we now? Stroud Center usage of data

- Thermal patterns across the DRB
 - Watershed Congress 2020, **Spatio-temporal patterns of specific conductivity in streams and rivers of the Delaware River Basin**, Marc Peipoch

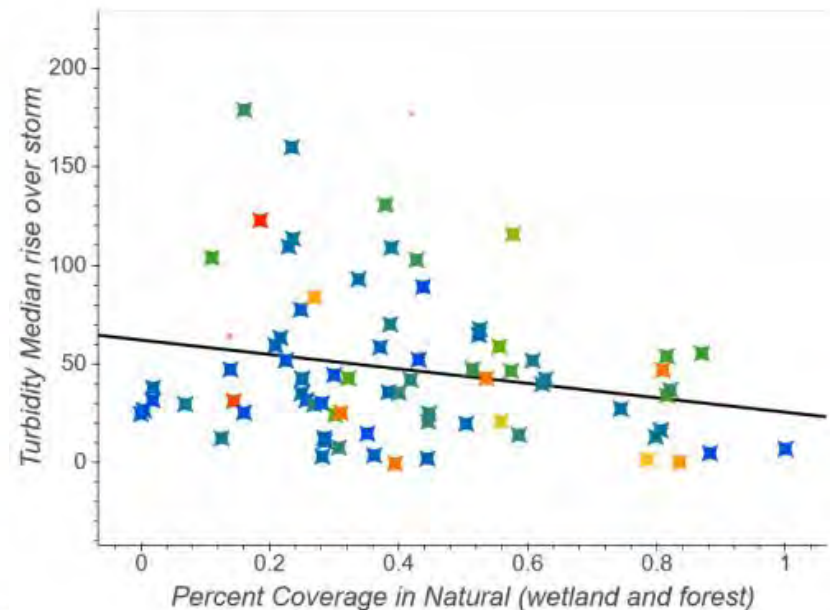
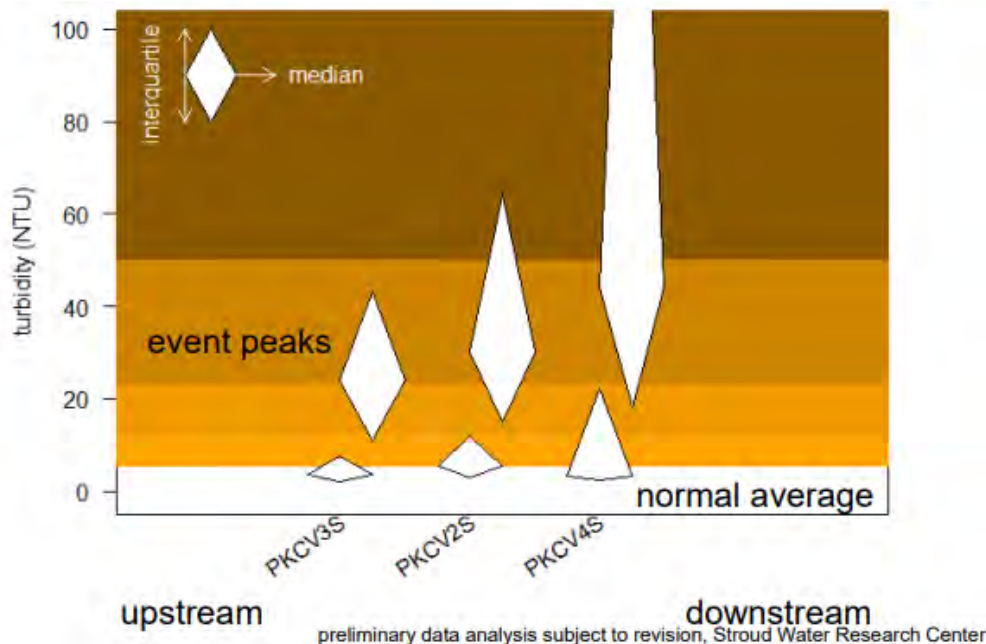
Forest area and stream temperature



10% forested area yields a 0.5°C decrease

Where are we now? Stroud Center usage of data

- Turbidity patterns in the DRB
 - Monthly meeting presentations, Scott Ensign and Sara Damiano



Where are we now? Stroud Center usage of data

- Development of process for rapid assessment of continuous data
 - Watershed Characterization for Upper Paulins Kill, Kristine Rogers, Juniper Leifer, and David Bressler

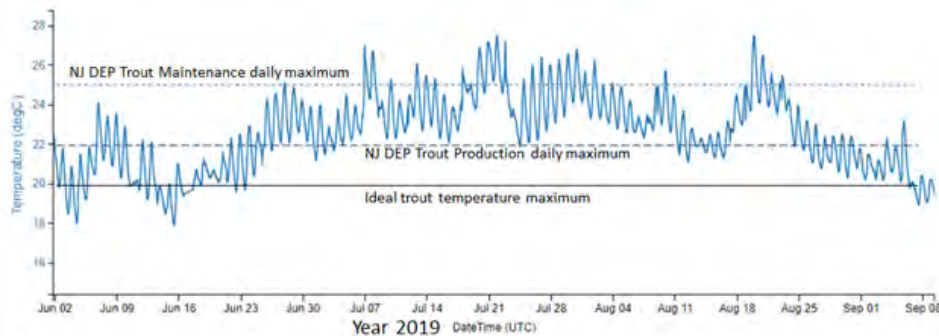


Figure 2 and 3. Water temperature data and NJDEP Trout Maintenance and Trout Production daily maximum thresholds for 2019 and summer 2019 from Paulins Kill at SCCC. Ideal trout temperature maximum provided is not a NJDEP standard and is provided only for reference.

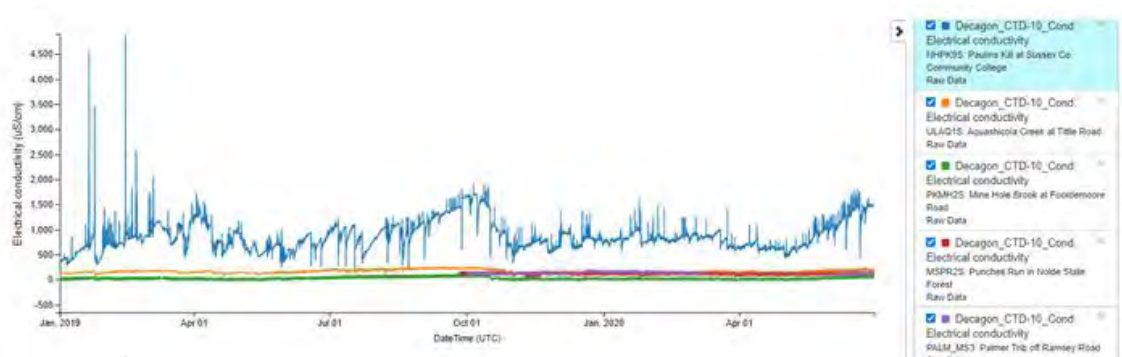


Figure 9. Conductivity data for Paulins Kill at SCCC, Aquashicola Ck, Mine Hole Brook, Punches Run and Palmer Run.

Where are we going?

- EnviroDIY technology
- Stroud Center support
- Monitor My Watershed
- Data assessment

Where are we going? Technology

- EnviroDIY technology
 - New cell boards – a few testers are out!
 - Major updates to Mayfly logger sometime in 2021!
 - Updates to manual accordingly
 - New data sheets
 - Guidance for new CTD and turbidity sensors (manufacturer timelines still not known)

Where are we going? Support

- EnviroDIY support
 - Update manual and guidance materials per new sensors, cell boards, etc.
 - Sell Monitoring kits via EnviroDIY shop
 - Host EnviroDIY build workshops
 - Host Monthly EnviroDIY-DRWI meetings
 - Host support workshops (e.g., troubleshooting workshop June 23)
 - Provide on-site assistance and training

Where are we going? MonitorMW

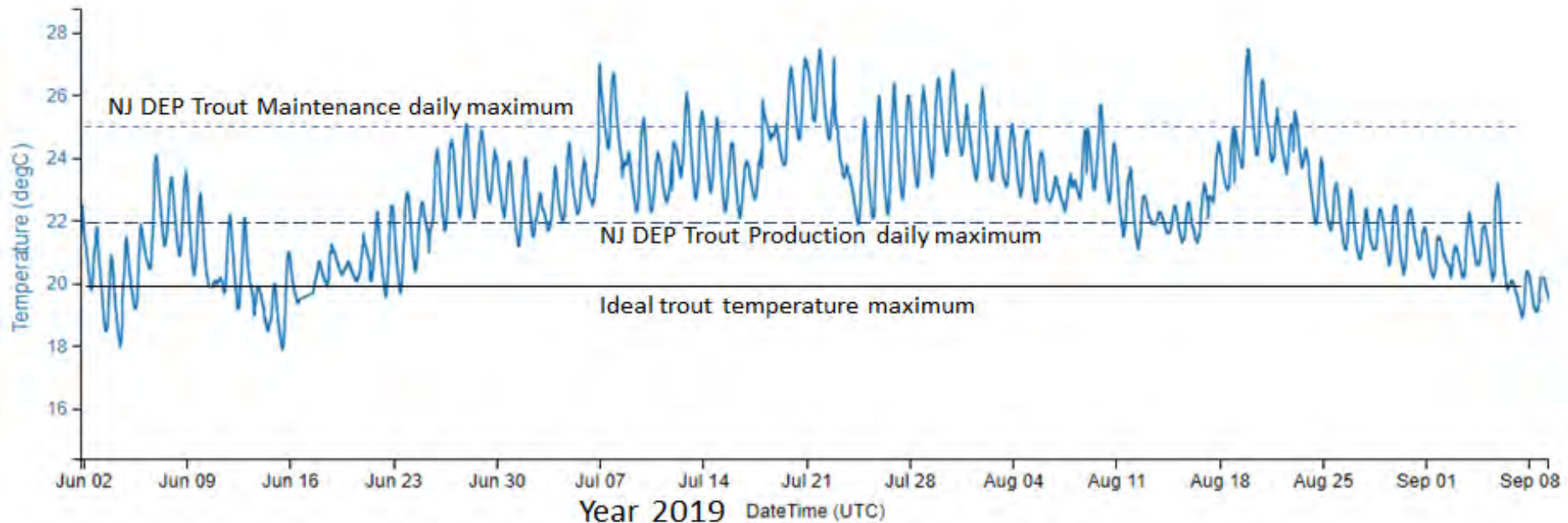
- Monitor My Watershed
 - Transition to Amazon Web Services platform – ongoing, dependent on funding
 - Upgrades to MonitorMW functionality – e.g.,
 - Near term, hopefully: mass data upload, axes on sparklines, map and graph zoom issues, mouse hover labels, map zoom issues, other quirks
 - Long term ideas/requests, **nothing definite**: Stats features (new assessment metrics?), meta-data (data sheets, quality control checks, photos), rating curve equations

Where are we going? Assessment of data

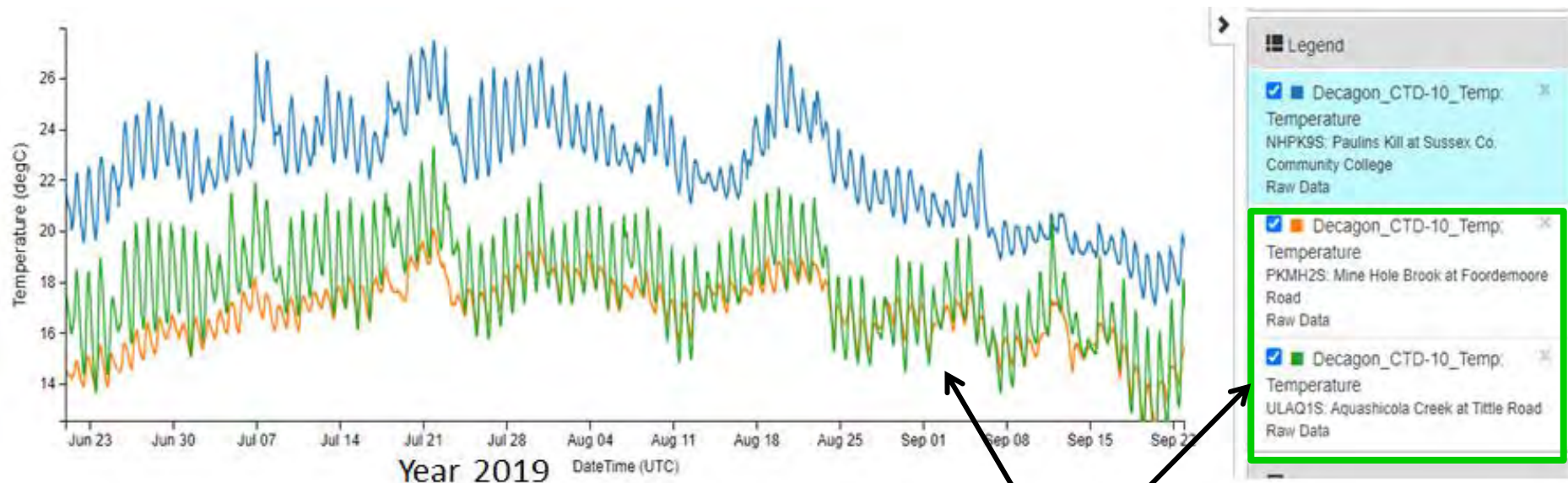
- Watershed Characterization Template – a method for rapid assessment of continuous data
 - Summarize continuous data in metrics and compare to thresholds and other sites (e.g., forested reference)
 - Provide recommendations on follow-up data collection and analysis
 - Provide recommendations on management

**Need more forested “reference” sites across DRB; and possibly more “degraded” sites*

Where are we going? Watershed Characterization Concepts

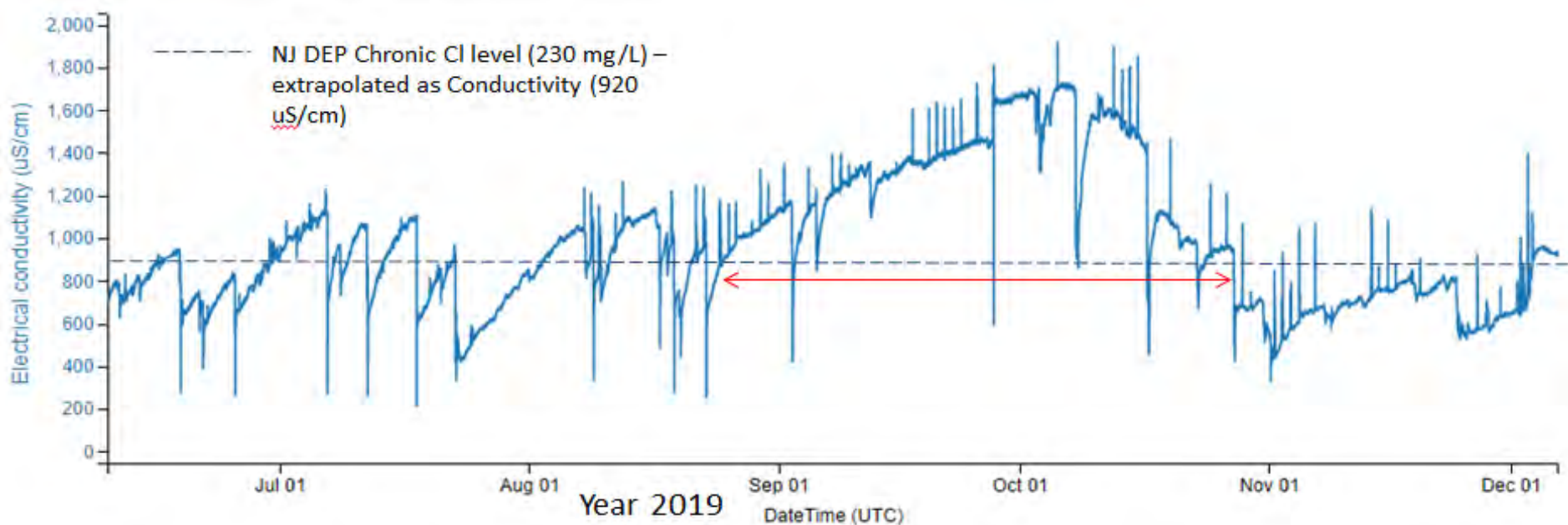


Where are we going? Watershed Characterization Concepts

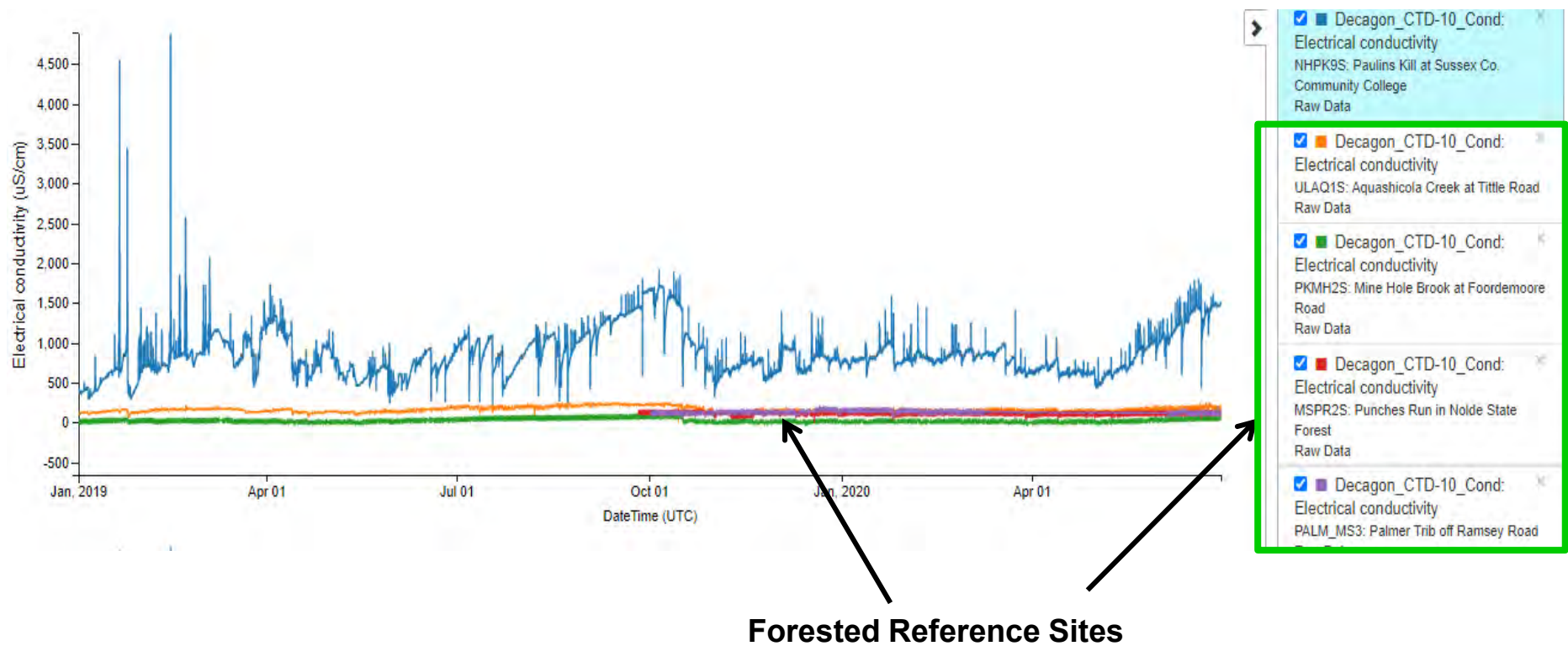


Forested Reference Sites

Where are we going? Watershed Characterization Concepts



Where are we going? Watershed Characterization Concepts



Where are we going? Watershed Characterization Concepts

- Rapid assessment of continuous data – possible scoring system: the more criteria a site meets the better it is

| Parameter | Metric | Threshold to Compare to | Source |
|-------------------------------------|------------------------------|---|-------------------------------------|
| Temperature | 60-day mean | 16 degC (optimal max) | Chadwick and McCormick 2017; others |
| Temperature | 60-day mean | 21 degC (stress max) | Wehrly et al. 2007 |
| Temperature | 60-day mean | 25%ile for >60% forest, 1-4th order | Defined by data set |
| Temperature | 60-day mean | Percentile within rest of DRB | Defined by data set |
| Conductivity | Mean | Stream Specific | Olson and Cormier, 2019 |
| Conductivity | Mean | Ecoregional (EPA Level 3) Reference Ranges | Griffith, 2014 |
| Conductivity | Mean | Reference sites (75%ile, >60% forest) | Defined by data set |
| Conductivity | Mean | Percentile within rest of DRB | Defined by data set |
| Conductivity | Num of cond spikes | Reference sites (75%ile, >60% forest) | Defined by data set |
| Conductivity | Num of cond spikes | Percentile within rest of DRB | Defined by data set |
| Hydrologic flashiness and magnitude | Conductivity median dilution | Reference sites (25pcentile, >60% forest, etc.) | Defined by data set |
| Hydrologic flashiness and magnitude | Conductivity median dilution | Percentile within rest of DRB | Defined by data set |

Conclusions, main points, lessons learned

- Get very familiar with the Mayfly logger and sensors
- Using Monitor My Watershed to track station function daily is IMPORTANT
 - Become fluent in MonitorMW usage
- Cleaning sensors and doing QC is the only way to ensure good data
- Assigning reliable individuals to perform specific tasks ensures station upkeep
 - Having a schedule has been effective for many groups

Conclusions, main points, lessons learned

- Ongoing dialogue on station function with Stroud team can help ensure sustained collection of good data
- Backup funds are important to replace broken or malfunctioning parts
- Before putting stations out know exactly how you will use the data
- “What to do with all this data?” is a big question for some
 - Keep learning about the data and ecology
 - If you’ve been effective, consider writing sharing with others via Manage My Watershed or EnviroDIY blog

Thank you!

Stroud Water Research Center contacts,

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

Master Watershed Stewards, EnviroDIY-DRWI contacts:

- Carol Armstrong, mnem.np@gmail.com, 610-659-7477
- George Seeds, geoseeds@verizon.net, 484-886-9586

Zoom Survey

Questions for the presenter?

???

Future meeting presenters

- July 15 – Mike Burns, Villanova University (Naylors Run)
- August 19 – Jake Lemon and Matt Barney, Trout Unlimited (EnviroDIY at Trout Unlimited)
- September 17 – Carol Armstrong, Penn State Master Watershed Steward (Pickering Creek)

***Please be in touch if you'd like to do an owner/manager presentation or a focus topic presentation**

Reminder: Resources to Support the Work

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

General Resources

- ✓ EnviroDIY Field Visit Data
- ✓ EnviroDIY 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

Monthly Meetings

- Every third Thursday of the month
- 2:30-3:30p
- Zoom link will remain the same:
<https://us02web.zoom.us/j/81881801310?pwd=eUFmbXZLbmRibVcxa1dtNVhzRmNvZz09>
- **Station owners/managers organize volunteers/others to attend and share Zoom link**

Mentors currently available

- Carol Armstrong (MWS), mnem.np@gmail.com, 610-659-7477
- George Seeds (MWS), geoseeds@verizon.net, 484-886-9586
- Rachel Johnson (Stroud Center), rjohnson@stroudcenter.org, 973-557-8995
- Christa Reeves (Stroud Center)(in the north, situational), christa@musconetcong.org, 727-520-5849

****Anyone else interested? If so get in touch with Stroud Center or Carol or George***

Resources to Support the Work

- **Delaware Basin EnviroDIY Monitoring Stations**, private online group (<https://wikiwatershed.org/groups/delaware-basin-sensor-stations/>)

Delaware Basin EnviroDIY Monitoring Stations



- Pose questions to the user group community
- Check for updates and new posts
- Set it for daily or weekly email updates

Conclusion

Next month's meeting will be on:

Thursday July 15, 2021
2:30-3:30p

Onward!

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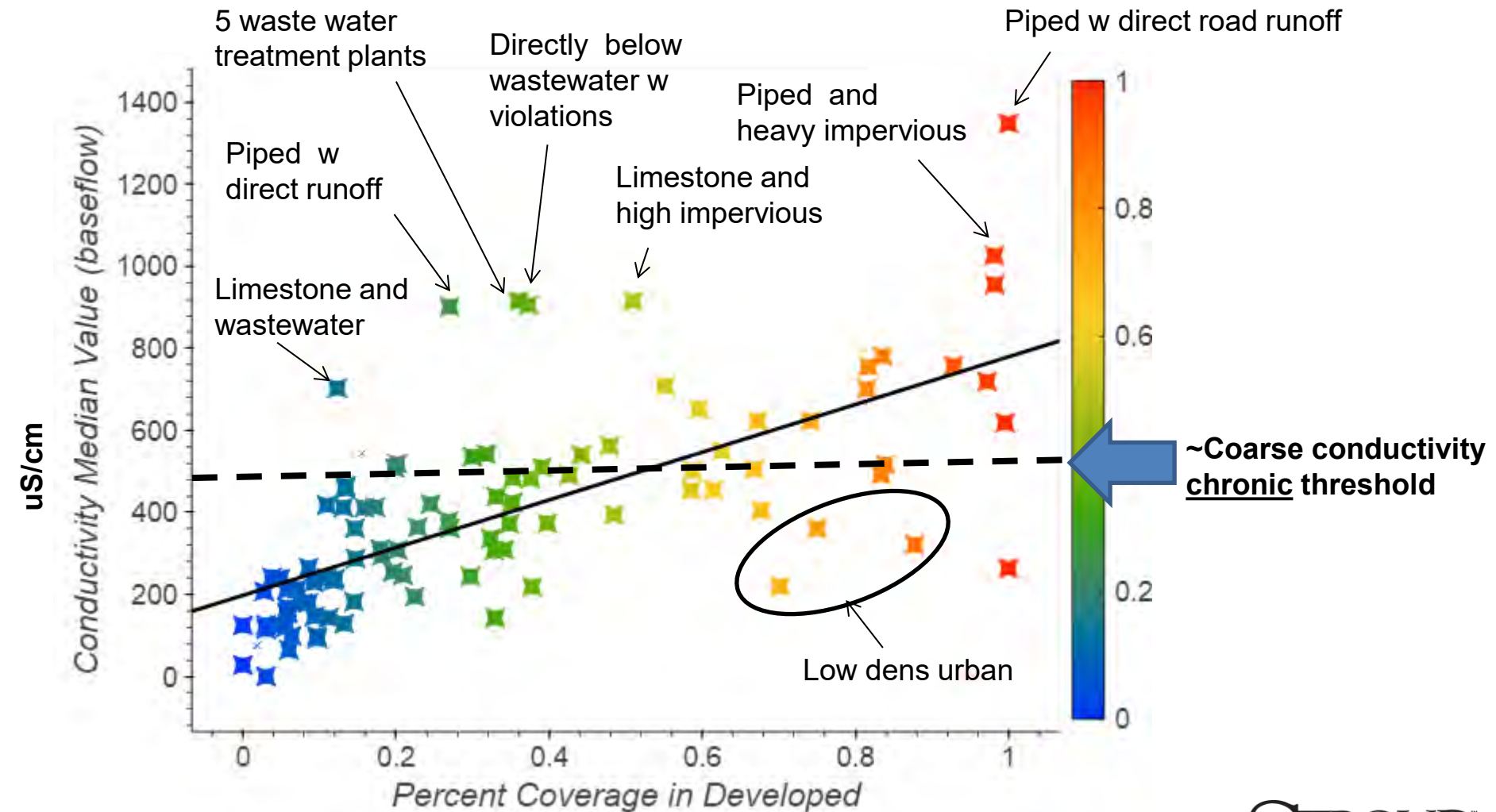
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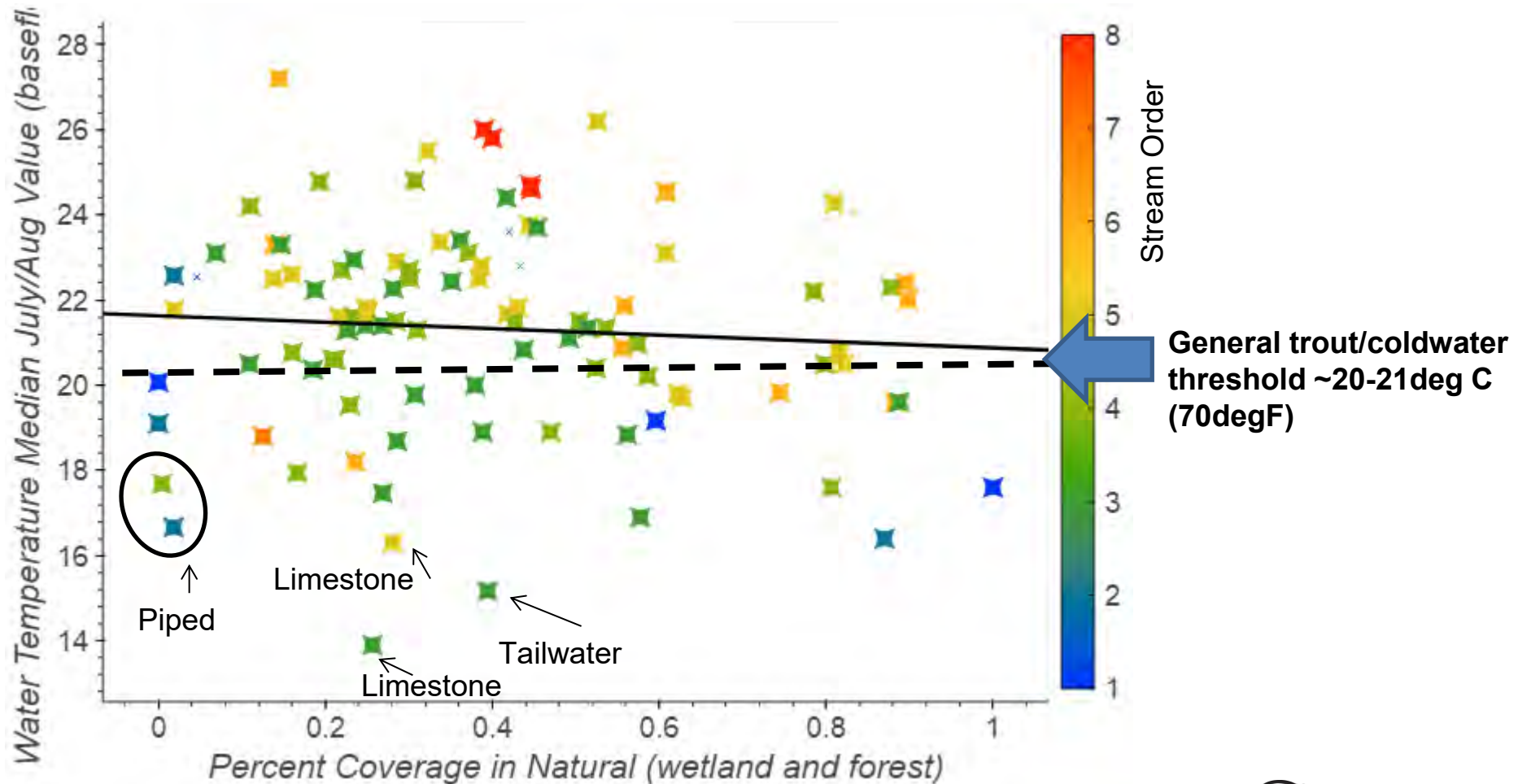
Statistics

- Statistics
 - Number of data points
 - Number of stations installed each year
 - Number of stations owned by each group/school/university
 - Number of assistance visits by Stroud (Johnson/Hicks names on forms)
 - Number of maintenance visits per station per year
 - Number of QC visits per station per year

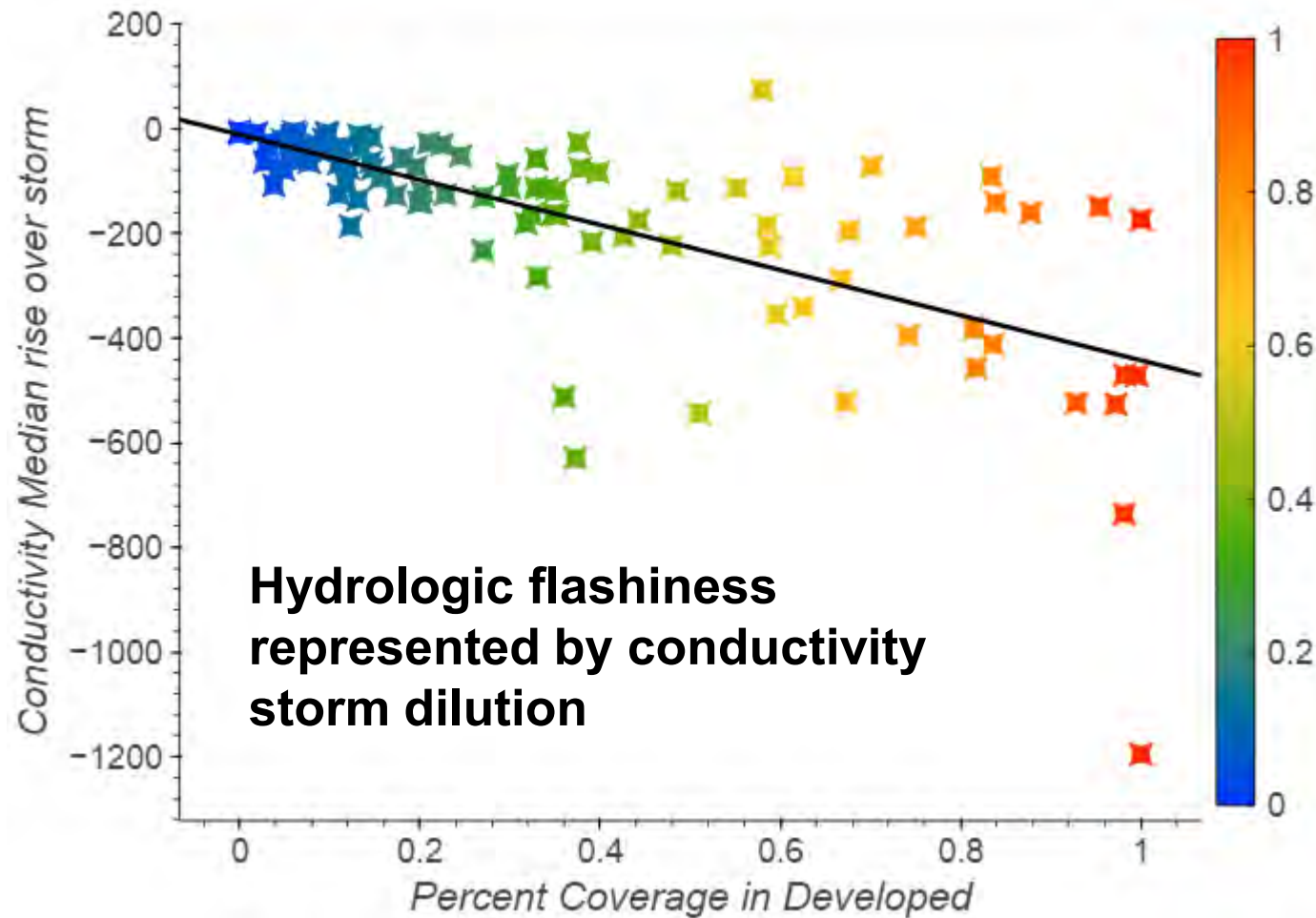
Watershed Characterization Concepts



Watershed Characterization Concepts



Watershed Characterization Concepts



Watershed Characterization Template

- Moving toward a way to make use of the network of users and many sites (currently >100)
- Individual sites are part of the larger group – use this to put things in perspective (is your stream worst, best, median, natural reference, degraded reference, etc)
- Make use of the high population of small streams in network – e.g., seeing super high conductivity in salt flushes (10,000-50,000 $\mu\text{S}/\text{cm}$ in some urban streams)

**Feedback welcomed*