WELCOME!
Monthly EnviroDIY in the DRB User Group Meeting

Online, Thursday, December 15, 2022, 2:30-3:30p
Today’s Agenda

1. Introduction
2. Stroud Updates
3. Presentation: EnviroDIY in the DRB 2022 year in review
4. Discussion
5. Conclusion
*Meeting is being recorded

*Please mute when not speaking to the group
These Monthly Meetings

Recordings available at: https://wikiwatershed.org/drwi/
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 one week prior to each month’s meeting
  - All are welcome, please share
  - And let us know if others should be added
REMINDER

- **Attendees include:**
  - Groups working in Delaware River Watershed Initiative (DRWI)
  - Groups working in Delaware River Basin (DRB) but not DRWI
  - Folks from outside the DRB

- Stroud Center support via DRWI and C-SAW
Delaware River Watershed Initiative (DRWI)

https://4states1source.org/

Working across four states to protect one shared source of clean water
Goals for these monthly meetings

- Time to check-in, ask questions, report issues, network, etc.
- **Updates** from the 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*
Stroud Center project personnel

Stroud Center Facilitators:

David Bressler          Rachel Johnson          Christa Reeves          Shannon Hicks

Project facilitator          Research Engineer          Northern DRB technician and organization collaborator          Research Engineer, Mayfly and EnviroDIY Inventor/Designer

Elena Hadley
Part-Time Environmental Educator
Research Technician
Stroud Center project personnel

Master Watershed Steward Facilitators:

Carol Armstrong  George Seeds
Stroud Center project personnel

Stroud Center DRWI Leads:

Dr. John Jackson  
Senior Research Scientist

Matt Ehrhart  
Director of Watershed Restoration

Dr. David Arscott  
Executive Director, President Research Scientist
Stroud Center Perspective – EnviroDIY in the DRB

- **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
EnviroDIY manual

EnviroDIY and monitoring resources

- Guidance materials - [https://wikiwatershed.org/drwi/](https://wikiwatershed.org/drwi/)

Shortcut to General Resources
- EnviroDIY Field Visit Data
- EnviroDIY Monitoring Station Help Resources
- Salt Monitoring Resources
- Data and Data Visualization Resources
- Volunteer Management Guidance Materials
- WikiWatershed Toolkit
- Project Updates

Shortcut to Meetings, Workshops, Conferences
- Monthly EnviroDIY-DRWI User Group Meetings
- User Support Workshops and Trainings
- Conference Presentations
- Watershed Ecology Workshops
A number of groups doing **Salt Snapshots**

- Be in touch with the Stroud Center if you’d like assistance in doing this
Watershed Salt Snapshot – Instructions

Overview

The following is a method for documenting salt levels in streams and rivers across a watershed by measuring the concentration of chloride (Cl⁻) (milligrams/liter, mg/L) during baseflow conditions. Measuring electrical conductivity is also recommended as it can provide explanatory information and is directly related to chloride concentration.

The intent of this method is to (1) determine salt levels that aquatic life is exposed to the majority of the time (i.e., during baseflow conditions) in streams of a watershed(s) and (2) identify specific areas of the watershed(s) that may be contributing to or preventing salt contamination of nearby streams.

The basic method:
Over a short period of time (less than a week, to ensure consistency in data) a group of people fans out across a watershed (or other area of interest) during baseflow conditions and collects water samples from pre-determined stream sites. Sites are strategically chosen to help identify specific areas of the landscape that may be contributing to or protecting nearby streams from salt contamination. The samples are returned to a central meeting location where they are measured for chloride (mg/L) and specific conductivity (us/cm). Because sampling is recommended to occur over a relatively short time period, it is important to consider the number of people available to conduct the work and the number of sites that can be visited in the allotted time. Judgment will be required to balance the desired number of sites with personnel and time availability.

Baseflow: the resting state of a stream between precipitation events; a stream or river's normal flow state when not influenced by recent precipitation runoff, often composed primarily of groundwater; the flow that would exist in a stream without the contribution of direct overland runoff from rainfall or melting snow/ice.

Equipment/Supplies

- Chloride OxiTab® Test Strips, 30-600 mg/L, or other chloride measurement method
- Conductivity meter (e.g., Hanna DIstyle-3 Waterproof/EC Tester)
- Conductivity meter calibration solution (e.g., 1413 us/cm Conductivity Standard)
- 300-1000mL clean plastic or glass bottles with lids (one bottle per site)
- Waterproof bottle labels (if possible). Bottles can be directly labeled if necessary or labels can be prepared with normal paper and covered with packaging tape after labeling is completed
- Small plastic cups/containers (one per site) – for chloride strip measurements, should be small enough so chloride strip can stand upright on its own
- Pencil
- Watershed Salt Snapshot Data Sheet
- Portable/collapsible table (big enough to hold all sample bottles)
- Optional: white board to record sample results for group discussion
- Optional: large map to record sample results and locations for group discussion
Stroud Center Updates

• Follow-up Questions/Discussion from these meetings and in general

  ○ Post to ManageMyWatershed.org – Stroud Center current recommendation
Any questions before we move on?
Presentation

- Presentation: EnviroDIY and associated monitoring in the DRB, 2022 year in review
Monthly meeting presentation topics

- **Winter**
  - **January**
    - Monitor My Watershed updates and EnviroDIY technology upgrades/updates (Stroud)
  - **February**
    - Monitoring Pickering Creek (Master Watershed Stewards/Carol Armstrong)
    - Surveys on Monitor My Watershed usage, salt in tap water, and terminology in science and monitoring efforts (Stroud)
  - **March**
    - Survey results on Monitor My Watershed usage, salt in tap water, and terminology in science and monitoring efforts (Stroud)
Monthly meeting presentation topics

- **Spring**
  - April
    - Analysis of continuous data from the DRB (Stroud)
    - Chloride/Conductivity rating curves for different DRB watersheds
  - May
    - Temperature monitoring in the Musconetcong watershed (Musconetcong Watershed Association)
  - June
    - Developing data communication products (Tookany-Tacony/Frankford Watershed Partnership, Pennypack Ecological Restoration Trust, Wissahickon Trails)
Monthly meeting presentation topics

- **Summer**
  - July
    - Review of warehouse development on Tunkhannock Ck and monitoring using EnviroDIY stations (Tobyhanna/Tunkhannock Creek Watershed Association and Brodhead Watershed Association)
  - August
    - Stats and data summaries of EnviroDIY station data across DRB (Stroud)
    - Revisit pilot Salt in Tap Water Survey results
    - Review of MonitorMW features for station tracking
    - Review of data on station visits and Quality Control
  - September
    - Salt snapshots – methods and purpose (Stroud)
Monthly meeting presentation topics

- **Fall**
  - **October (Stroud)**
    - Winter salt data (conductivity, chloride, and cations Na, K, Mg, and Na) and importance in understanding salt pollution
    - Feedback on monthly meeting format/content
  - **November**
    - Darby Creek Headwaters Monitoring Project and recent salt snapshot (Willistown Conservation Trust/Darby Creek Valley Association)
  - **December**
    - 2022 Year in Review (Stroud)
Technology

- Tech upgrades
  - Mayfly upgrades from ver0.5b to ver1.0 or higher – 43 stations
    - Ver1.1 is current
  - Upgrade to EnviroDIY LTE bee cell board – 43 stations
- View the details of changes between board versions here:
Understanding water quality using continuous data

Comparing water temperature to trout criteria/thresholds

Ideal trout temperature
Understanding water quality using continuous data

Comparing water temperature in streams from different landscapes
Understanding water quality using continuous data

Comparing conductivity (and chloride) in to criteria/thresholds

[Graph showing electrical conductivity over the year 2019 with a line indicating the NJ DEP Chronic Cl level (230 mg/L) extrapolated as Conductivity (920 uS/cm).]
Understanding water quality using continuous data

Comparing conductivity (and chloride) in streams from different landscapes

Stream in developed watershed

Streams in forested watersheds
Broad data trends

- Salt levels increase with imperviousness – more roads and parking lots means more salt

Research has shown:
- 40-50 mg/l Chloride = impact on aquatic life
- ~10% (and less) impervious surface = impact on aquatic life

*Preliminary data*
Across the DRB

- Average chloride (via Conductivity) at EnviroDIY sites in DRB

*Preliminary data*
- Average conductivity at EnviroDIY sites in DRB

*Preliminary data*
Across the DRB

- Maximum chloride (via Conductivity) in relation to thresholds/criteria

- **860 mg/l**, EPA recommended and regulatory for many states
- **640 mg/l**, Canada regulatory

*Preliminary data*
Across the DRB

- Average summer water temperature in relation to trout thresholds

*Preliminary data*
Reminders

- If station goes offline, cycle power
  - Just like your computer sometimes turning off and on works!
Reminders

- If station is offline and you’re concerned about missing data:
  1. Swap MicroSD card
  2. Look at data file on your computer,
  3. Send MicroSD card files to Stroud if you need feedback or help troubleshooting an issue.
Reminders

- Cellular data payments (Station Owners)
  - Check Hologram $ balance (at least once yearly)
  - Schedule date(s) to reload money
    - Hologram emails sometimes go to spam so check your account proactively and then know when reload is necessary
Reminders

- **Sensor cleaning**
  - Frequency – weekly to start, then situational
    - Always look at data before and after cleaning – fine tune frequency accordingly
Reminders

- **Quality Control** (i.e., making sure the station is getting accurate data)
  - Frequency – every three months (and situationally)
  - Conductivity and water temperature – crosscheck with a handheld meter
  - *Depth – crosscheck with metric ruler
  - Swap SD card if online data is incomplete
Reminders

● **Quality Control**
  (i.e., making sure the station is getting accurate data)
  ○ *Depth – crosscheck with metric ruler*

Generation 1 Hydros 21 CTD

Generation 2 Hydros 21 CTD (no side slot)
Reminders

- **Additional monitoring** - Synoptic sampling (aka snapshots, blitzes) and similar approaches to get more information about contamination patterns and sources.

Use continuous data to sample at the right time – e.g., for understanding year-round salt contamination sample during baseflow (when conductivity and depth are flat-ish).
Reminders

Continuous data
(EnviroDIY)
Reminders

- **Additional monitoring** – Targeted sampling to describe events (e.g., road salt flushes)

Use continuous data to sample at the right times
Reminders

- Use synoptic and targeted event sampling to develop rating curves
  - Rating curve allows you to use conductivity to estimate chloride
Reminders

- Data communication products – templates available, be in touch if you’d like assistance
Final things to consider, from George Seeds

- It All Turns on Affection – book by Wendell Berry

- “We have the world to live in on the condition that we will take good care of it. And to take good care of it we have to know it. And to know it and to be willing to take care of it, we have to love it.” – Wendell Berry

  - Technical stuff is necessary, but it’s not everything
    - Use the tech and data to know the landscape for yourself
    - Data can help clarify your observations/suspicions

  - Learn how it all connects – “that’s how you start to care about things” (George Seeds)
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*
Conclusion

Next month’s meeting will be on:

Thursday January 19, 2023
2:30-3:30p
Onward!

Stroud Water Research Center, EnviroDIY-DRWI 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