Sensor Station User Group Gathering

May 24, 2019 at Great Marsh Institute
9:00a-3:00p (float trip to follow)
Introduction – Overview of today

Agenda

- 9:00-9:15  Introductions and plan for the day
- 9:15-10:15  Updates on sensor stations, network, resources, data portal, support
- 10:15-10:30  Break
- 10:30-12:00  Discussion and begin presentations
  - Kim Hachadoorian, Addressing upstream impacts on streams in First State National Historical Park
  - Paul Wilson, Mayfly Networks in Higher Education
  - Sarah Crothers, Connecting Students from The Hill School to the Schuylkill River
  - Mike Bullard, Sediment Loading in Pickering Creek
  - George Seeds, Gaining an Understanding of Water Quality on Two Reaches of Pickering Creek in Chester Co.
- 12:00-12:30  Lunch
- 12:30-1:30  Presentations
  - Lauren McGrath, Ridley Creek Sensor Stations at Ashbridge Preserve
  - Chuck Wagner, Golf Course Stream Management
  - Francis Collins, Little creek with a lot of issues
  - Dave Yake, Watershed RunOff Sediment Model
  - Jim Moore, Low cost EC sensor station
- 1:30-1:45  Break
- 1:45-3:00  Presentations overflow, networking, discussions
- 3:00-6:00  Finish up and float trip
Updates

- Overview of basics
  - Stroud support staff
  - Core group
  - Sites
  - Field maintenance, QC, EnviroDIY Field Visit data sheet, and online entry
  - Manuals and videos – DRWI-specific and comprehensive
  - Online group – review the tabs, locations of files, forum topics
- 4G/LTE
- MasterWS support - workshop to be planned for July, QC kits
- Full suite sampling
- Continuing to do storm sampling and Stroud support
- Stroud field support and resources to replace parts
- Possible bigger workshop winter 2020 (late Jan, Fe)
- Future workshops - June 7 (WS201, discharge and TSS); MWS training TBD July; Aug 9 sensor station management workshop; EnviroDIY Intro Sept 17-18, WS101 Sept 24-25
Stroud support

- Stroud Center support personnel
  - David Bressler – main contact
  - Shannon Hicks – high level technical support
  - Rachel Johnson – technical support, field assistance, small workshop facilitation
  - Matt Gisondi – data analysis (rating curves, loads), field assistance, 1:1 training
  - Christa Reeves – regional assistance, northern Delaware Basin
  - Carol Armstrong – citizen science volunteer assistance, field maintenance and storm sampling, PSU Master Watershed Stewards mentor
  - Dave Arscott (ex dir), John Jackson (senior sci), and Matt Ehrhart (dir of restoration) – original citsci project designers
Core group

- **Sensor Station Core Group**
  - Individuals who are experienced and plan for long term involvement with sensor station network development
  - Geographic coverage of Delaware Basin – support development of the network, facilitate regional workshops, facilitate assistance to groups, technical feedback
  - Individuals
    - Stroud Center – David Bressler, Matt Gisondi, Shannon Hicks, Rachel Johnson, Christa Reeves,
    - Carol Armstrong, PSU Master Watershed Steward, Stroud volunteer
    - Nancy Lawler, Musconetcong Watershed Association
      - Cole Baldino, Trout Unlimited, NJ
    - Christa Reeves, Musconetcong Watershed Association
    - Paul Wilson, PhD, East Stroudsburg University
    - Kim Hachadoorian, The Nature Conservancy, DE
    - Steve Tuorto, PhD, The Watershed Institute
    - Lauren McGrath, Willistown Conservation Trust
    - Kent Himelright, Berks Co. Conservation Trust
Important Field Work

- **Maintenance – every two weeks**
  - Clean sensors
  - Clean around logger
  - Complete Field Visit Data sheet
  - Other site observations, upkeep, photos, etc.
  - Enter data online - [https://wikiwatershed.org/drwi/](https://wikiwatershed.org/drwi/); pass: drwi

- **Quality Control – quarterly**
  - Clean sensors
  - QC Depth
  - QC Chemistry
  - SD card swapping (data download)
### Biweekly – Maintenance and sensor cleaning

**Enter all data online:** wikitwatershed.org/drwi; password: drwi

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**Sensor Cleaning**

*Recommended frequency: weekly or biweekly, monthly if only CTD sensor*

- **Cleaned Sensors:** Yes/No
  - If Yes, exact time: AM/PM? EST/EDT?
  - *Clean >5 min. before grab sampling*

**Grab Samples**

*Frequency: Situational, for rating curves, collect when water is high/bursty or higher than normal conductivity*

- **Grab Sample Taken:** Yes/No
- **Time collected:** (to minute): AM/PM? EST/EDT?
- **Notes:**

**Quality Control - Chemistry Data**

- **Parameter:**
  - **Conductivity (uS/cm):** AM/PM? EST/EDT?
  - **Temperature (degC):** AM/PM? EST/EDT?
  - **Dissolved Oxygen (ppm):** AM/PM? EST/EDT?

**Quality Control Chemistry Field Meter Information**

- **Parameter:**
  - **Conductivity (uS/cm):** Yes/No
  - **Temperature (degC):** Yes/No
  - **Dissolved Oxygen (ppm):** Yes/No

**Sensor Station Maintenance**

- **Sensors Submerged:** Yes/No
- **Retrieved Memory Card:** Yes/No
- **Changed Batteries:** Yes/No
- **Cleaned Solar Panel:** Yes/No
- **Other sensor station maintenance:** Yes/No
- **Notes:** Describe specific sensor station management actions and any other issues.

**Other In-Situ Parameters**

- **Parameter:**
  - **Salinity:**
  - **DO (mg/L):**

**Other Information**

- **Field Duplicate Taken:** Yes/No
- **Flow Measurement w/ Neutrally Buoyant Object:** Yes/No
- **Flow Measurement w/ another Method:** Yes/No
**Quarterly – Quality Control**

**EnviroDIY Field Visit Data**

- Enter all data online: wikiwatershed.org/drwi; password: drwi

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### QUALITY CONTROL - CHEMISTRY DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>QC Hand-held Meter Result</th>
<th>QC Time</th>
<th>QC AM/PM?</th>
<th>QC EST/EDT?</th>
<th>Sensor Station Result</th>
<th>Sensor Station-Time (Military, EST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity (uS/cm)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature (degC)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### QUALITY CONTROL CHEMISTRY FIELD INSTRUMENT INFORMATION

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Field Meter Brand/Model/Serial No.</th>
<th>Standard Calibration</th>
<th>Standard Calibration</th>
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</thead>
<tbody>
<tr>
<td>Conductivity (uS/cm)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td>EST/EDT</td>
</tr>
<tr>
<td>Temperature (degC)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td>EST/EDT</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td>EST/EDT</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>AM/PM</td>
<td>EST/EDT</td>
<td>EST/EDT</td>
</tr>
</tbody>
</table>

### SENSOR STATION MAINTENANCE

- Sensors Submerged? Yes/No
- Location of Sensors Changed? Yes/No
- Changed Batteries? Yes/No
- Cleaned Solar Panel? Yes/No
- Other sensor station maintenance? Yes/No
- Notes (Describe specific sensor station management actions and any other issues):

### OTHER IN-SITU PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Band/Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Duplicate Taken of Grab Sample?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Performed Cross Section Survey?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Flow Measurement w/ Neutrally Buoyant Object?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Flow Measurement w/ another method?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Flow Measurement w/ Flow Meter?</td>
<td>Yes/No</td>
<td></td>
</tr>
</tbody>
</table>

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**GRAB SAMPLES** (Rec frequency: Situational, for rating curves, collect when water is high/buried or higher than normal conductivity)

- Grab Sample Taken? Yes/No
- Time collected (to minute): AM/PM | EST/EDT
- Volume:
- Date Shipped:

**SENSOR STATION DATA TO MATCH WITH GRAB SAMPLE LAB RESULTS** (Complete in field or office)

- Sensor station Conductivity (uS/cm):
- Time (military): Not applicable | Always EST
- Sensor station Turbidity (NTU):
- Time (military): Not applicable | Always EST

**QUALITY CONTROL - WATER LEVEL DATA** (Rec frequency: quarterly or more frequently as needed)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Band/Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff Gauge Height (m):</td>
<td>AM/PM</td>
<td>EST/EDT</td>
</tr>
<tr>
<td>Sensor Station Water Depth (mm):</td>
<td>AM/PM</td>
<td>EST/EDT</td>
</tr>
<tr>
<td>QC Sensor Station Water Depth (mm):</td>
<td>AM/PM</td>
<td>EST/EDT</td>
</tr>
</tbody>
</table>

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*a - Staff Gauge Height and Sensor Station Water Depth readings should be from the same time (+/- 5 minutes).
*b - Use metric ruler to measure from pressure transducer (white disc in CTD sensor) to water surface. Note: this depth measurement may be slightly different from the sensor-measured depth but should be consistent over time.*
Importance of sensor cleaning and QC

Pike Creek, The Independence School

Conductivity, temperature and depth readings before cleaning

05/20/2019 at 06:10 PM

20.9 degC

200 uS/cm

239.7 mm
Importance of sensor cleaning and QC

Conductivity, temperature and depth readings **after** cleaning

**Conductivity** change of ~60 uS/cm
**Depth** change of ~5mm;
**Temp** change of 0 deg C
Manuals

- EnviroDIY Sensor Station Operation Manual V1, DRWI
  - Operation manual for CTD/Turbidity EnviroDIY sensor stations (Delaware River Watershed Initiative context)
  - Access web link via Delaware Basin Sensor Station online group, Uploaded Files tab, “Guidance docs” category; link: https://docs.google.com/document/d/17iWKFOjD6tSFT6- a5mItXlgO8uhXjsA_voGDVRxEBTI/edit?usp=sharing

- EnviroDIY Mayfly Sensor Station Manual
  - Comprehensive – building, coding, installation, management
    - Does not contain DRWI specific info, e.g., online EnviroDIY Field Visit Data sheet
Videos

- Stroud sensor station video tutorials:
  - Installation is done
    - https://www.envirodiy.org/videos/
    - Youtube: https://www.youtube.com/results?search_query=envirodiy+mayfly+data+logger+steps+1-5
    - Link also on Delaware Basin Sensor Stations online group forum
  - Sensor cleaning
  - Data download
  - Sensor bundle removal
  - Discharge calculator, Stage-to-Area predictor, Load calculator
Monitor My Watershed

- Monitor My Watershed (MonitorMyWatershed.org)
- Personal Login info (make custom modifications to page, site info, etc.)
  - Personal/group site login – edit/modify personal sensor station page
    - **Login** = first name initial + last name e.g., khachadoorian
    - **Default Pass** = “stroud970”
  - Spreadsheet “Sensor station information and site specific Monitor My Watershed login details” in **Uploaded Files** tab in Delaware Basin Sensor Stations online group
Monitor My Watershed

- Limnotech restructuring system for the long term – please bear with us during this process
  - Drwisensors.dreamhosters.com continues to be functional
    - For longer term stations modifications being made to display historical data
Monitor My Watershed

- Can demonstrate usage today if some folks would like
- **Notable functions:**
  - Custom overlay of sensor parameters
  - Custom overlay of multiple sites
  - Upload data (for offline stations and to fill data gaps for online stations) – *in development*
  - Zoom on x and y axes
  - Data summaries
  - Custom time ranges
  - Edit personal station pages
  - Follow and get updates on chosen stations
  - For online stations, get alerts if/when data stop transmitting
Monitor My Watershed

- Online demonstration: [http://monitormywatershed.org/](http://monitormywatershed.org/)
Delaware Basin Sensor Station online group

- Weekly reports from Carol Armstrong
- General updates from Bressler
- Gisondi uploading lab results, rating curves, etc.
- Uploaded Files tab – multiple categories – lots of files here
- Guidance docs for use of the site and the forum
- Forum topics – important ones pinned to the top
- Review today if folks would like: [https://wikiwatershed.org/groups/delaware-basin-sensor-stations/](https://wikiwatershed.org/groups/delaware-basin-sensor-stations/)
4G/LTE

- Shannon Hicks making progress on the technology – again please bear with us
  - Currently testing on stations local to Stroud
- Most sites that are currently offline will have 4G capacity
- Once testing complete Shannon Hicks and Rachel Johnson will be updating stations according to need/requests
  - 4G will be a bit more expensive, probably <$20/month
4G/LTE
4G/LTE

Different lights give info on of 4G/LTE connection status and signal strength

- **White light** - tells you when the radio is on
- **Blue status light** - blinks a different pattern depending on whether it has a valid connection to the network or not,
- **Orange signal light** - brightness gives you an idea of the signal strength. Really bright means high signal, really faint means really low signal.
Penn State Master Watershed Steward support

- PSU MWS (https://extension.psu.edu/programs/watershed-stewards)
  - County level organization – coordinator for each county
    - Berks, Bucks, Chester/Delaware, Lackawanna/Luzerne/Wyoming, Lehigh/Northampton Monroe, Montgomery, Philadelphia (new)
  - Stewards pay to enter program and are formally trained in watershed science and conservation for several months
  - Required volunteer hours after graduation to hold certification
Penn State Master Watershed Steward support

- MWS collaboration with Stroud on sensor station support
  - Stewards currently signing up to assist with specific stations (station owners on-board)
  - Training in July (date TBD) at Berks Ag Center
  - Mentorships after training
Full suite grab samples

- Full suite samples collected at time of station installation (*if at baseflow*)
  - Analyzed at Stroud, Chesapeake Bay Labs, Univ of Del

- Full suite sample results on Delaware Basin Sensor Stations online group – **Uploaded Files tab** – **Grab Sample Lab Results category**
## Full suite grab samples

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Source</th>
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<tbody>
<tr>
<td>Suspended Sediments</td>
<td>mg/L</td>
<td></td>
</tr>
<tr>
<td>DOC</td>
<td>µg C/L</td>
<td></td>
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<tr>
<td>Chloride</td>
<td>ppm</td>
<td>[Dionex]</td>
</tr>
<tr>
<td>Nitrate-N</td>
<td>ppm</td>
<td>[Dionex]</td>
</tr>
<tr>
<td>Nitrate</td>
<td>ppm</td>
<td>[Dionex]</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>ppm</td>
<td>[Dionex]</td>
</tr>
<tr>
<td>Nitrite</td>
<td>ppm</td>
<td>[Dionex]</td>
</tr>
<tr>
<td>Sulfate</td>
<td>ppm</td>
<td>[Dionex]</td>
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<td>Cl</td>
<td>mg/L</td>
<td>from SEAL</td>
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<tr>
<td>NH4N</td>
<td>mg/L</td>
<td>from CBL NASL</td>
</tr>
<tr>
<td>PO4P</td>
<td>mg/L</td>
<td>from CBL NASL</td>
</tr>
<tr>
<td>TDN</td>
<td>mg/L</td>
<td>from CBL NASL</td>
</tr>
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<td>TDP</td>
<td>mg/L</td>
<td>from CBL NASL</td>
</tr>
<tr>
<td>TN</td>
<td>mg/L</td>
<td>from CBL NASL</td>
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<tr>
<td>TP</td>
<td>mg/L</td>
<td>from CBL NASL</td>
</tr>
<tr>
<td>AL</td>
<td>mg/L</td>
<td>from DE-ICP</td>
</tr>
<tr>
<td>B</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<td>CA</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<td>CU</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<td>FE</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<td>MG</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<tr>
<td>MN</td>
<td>mg/L</td>
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<tr>
<td>NA</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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<td>P</td>
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<td>from DE-ICP</td>
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<td>SI</td>
<td>mg/L</td>
<td>from DE-ICP</td>
</tr>
<tr>
<td>ZN</td>
<td>mg/L</td>
<td>from DE-ICP</td>
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</tbody>
</table>
Full suite grab samples

- 43 of the 71 total sensor station sites have full suite lab analyses completed

- 28 of the 71 still need to collect grab samples
  - Gisondi and Stroud interns will be collecting these this summer
<table>
<thead>
<tr>
<th>Site code</th>
<th>Stream</th>
<th>Location</th>
<th>Watershed</th>
<th>Logger ID</th>
<th>Full Suite Sample date</th>
<th># Full Suite Samples</th>
<th># ANI/SS Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEAV MS2</td>
<td>Beaver Ck</td>
<td>300m US of Brandywine Creek Road crossing</td>
<td>Delaware</td>
<td>SLO81</td>
<td>0</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>RAN MS2</td>
<td>Ramsay Run</td>
<td>50m DS of Ramsay Rd crossing</td>
<td>Delaware</td>
<td>SLO82</td>
<td>0</td>
<td>9</td>
<td></td>
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<tr>
<td>ROCK US3</td>
<td>Rocky Run, Upper</td>
<td>Rocky - 200m DS of Hwy 200, behind Courtyard Mar</td>
<td>Delaware</td>
<td>SLO83</td>
<td>0</td>
<td>9</td>
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<tr>
<td>HURR US2</td>
<td>Hurricane Run</td>
<td>Hurricane - DS side of Woodlawn Rd crossing</td>
<td>Delaware</td>
<td>SLO91</td>
<td>0</td>
<td>9</td>
<td></td>
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<td>ROCK DS2</td>
<td>Rocky Run</td>
<td>300m DS of confluence with Hurricane</td>
<td>Delaware</td>
<td>SLO92</td>
<td>0</td>
<td>5</td>
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<tr>
<td>PALMERS</td>
<td>Palmer (Unnamed Trib)</td>
<td>100m US of dirt road/trail crossing (off of Ramse</td>
<td>Delaware</td>
<td>SLO93</td>
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<td>NHMCRS</td>
<td>Musconetcong River</td>
<td>Waterloo Rd</td>
<td>Delaware</td>
<td>STL101</td>
<td>10/25/2017</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>NMUITS</td>
<td>Musconetcong River</td>
<td>Riverside Park,</td>
<td>Delaware</td>
<td>STL102</td>
<td>10/25/2017</td>
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<td>2</td>
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<tr>
<td>PKGCVS</td>
<td>Cherry Creek</td>
<td>Cherry Creek Downstream</td>
<td>Delaware</td>
<td>STL103</td>
<td>0</td>
<td>10</td>
<td></td>
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<tr>
<td>PGCVS</td>
<td>Cherry Creek</td>
<td>Cherry Creek</td>
<td>Delaware</td>
<td>STL104</td>
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<td>11</td>
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<td>NPKFTS</td>
<td>Paulins Kill</td>
<td>Memory Park</td>
<td>Delaware</td>
<td>STL105</td>
<td>06/29/2017</td>
<td>1</td>
<td>2</td>
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<tr>
<td>MSMC6S</td>
<td>Manor Creek</td>
<td>Manor Ck. (Brown.prop.)</td>
<td>Delaware</td>
<td>STL107</td>
<td>04/26/2017</td>
<td>1</td>
<td>3</td>
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<td>MSMC7S</td>
<td>Manor Creek</td>
<td>Manor Ck. (Derkin.prop.)</td>
<td>Delaware</td>
<td>STL108</td>
<td>04/26/2017</td>
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<td>7</td>
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<tr>
<td>BCGR010S</td>
<td>Bread Run</td>
<td>Watson Mill Road crossing</td>
<td>Delaware</td>
<td>STL109</td>
<td>0</td>
<td>6</td>
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<td>BCWG9S</td>
<td>Egypt Run</td>
<td>Egypt Run bridge</td>
<td>Delaware</td>
<td>STL110</td>
<td>0</td>
<td>6</td>
<td></td>
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<tr>
<td>PPUPPS2</td>
<td>Pennypack Creek</td>
<td>Parkway location</td>
<td>Delaware</td>
<td>STL111</td>
<td>06/01/2017</td>
<td>1</td>
<td>5</td>
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<td>PUPPS3</td>
<td>Pennypack Creek</td>
<td>Paper Mill Bridge</td>
<td>Delaware</td>
<td>STL112</td>
<td>06/01/2017</td>
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<td>7</td>
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<tr>
<td>SHP3S</td>
<td>UT east, Pickering Creek</td>
<td>Just downstream of Byrn Coed Lane</td>
<td>Delaware</td>
<td>STL113</td>
<td>06/06/2017</td>
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<td>6</td>
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<tr>
<td>SHPK4S</td>
<td>UT west, Pickering Creek</td>
<td>200m upstream of UT East confluence</td>
<td>Delaware</td>
<td>STL114</td>
<td>06/08/2017</td>
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<td>6</td>
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<tr>
<td>NHTB1S</td>
<td>Trout Brook</td>
<td>Confluence with Paulinskill</td>
<td>Delaware</td>
<td>STL115</td>
<td>0</td>
<td>0</td>
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<tr>
<td>NPBT1S</td>
<td>West Portal Brook</td>
<td>Waverly Rd</td>
<td>Delaware</td>
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<td>Navmont Run</td>
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Storm grab samples

- Storm grab samples analyzed at Stroud only for:
  - Total Suspended Solids
  - Chloride

- Storm grab sample results on Delaware Basin Sensor Stations
  online group – **Uploaded Files tab** – **Grab Sample Lab Results category**
Developing rating curves across the Delaware Basin

- Stroud (Matt Gisondi and interns) to facilitate rating curve development this summer, *as time and storms allow*
  - Discharge and grab samples
  - Matt will be in touch with groups if he’s in the area
    - Assistance welcomed, opportunity for on-site training
    - Spur of the moment because of the nature of storms and field sampling
Rating curves

Data from Ridley Creek at Ashbridge Preserve (PURC1S, SL155), Willistown Conservation Trust, Lauren McGrath
Figure 3. Regression relations of turbidity and suspended-sediment concentration for French Creek near Phoenixville, Pennsylvania.

Data from Pickering Creek at Montgomery School (SHPK5S, SL135), Carol Armstrong, George Seeds, and David Kline (and students)
Stroud field support and resources

- Shannon Hicks, Rachel Johnson, and Matt Gisondi available for field support
  - Station troubleshooting
  - Staff gauge fixes/modifications/replacements
  - Sensor replacements
    - *Stroud has resources to replace sensors for free in some situations (communicate with Stroud)*
    - Sensor manufacturer warranty 1 year
Data sharing

- Stroud compiling SD card data
  - Google drive link shared via email and included on Delaware Basin Sensor Stations online group forum
  - SD card data most complete
  - This will continue to serve as a basin-wide SD card data repository
Bressler meeting with Stroud data folks next week to start the process
  o To start - temperature and conductivity, basin-wide analysis
Stroud data analysis

● Ideas to start:
  ○ Average annual, monthly, and seasonal for all sites; and box/whisk plots
  ○ Avg and box/whisk plots by stream order
  ○ Avg and box/whisk plots by land use categories, e.g., dom forest, dom ag, dom urb
  ○ Scatterplots max (and/or 75th or 90th) versus %lulc; avg and/or med vs lulc
  ○ Daily, monthly, seasonal site ranges
  ○ Temp changes due to summer storm flushes - diff between urb, ag, forest; diff between stream size
  ○ Extended conductivity elevations beyond winter

● We can discuss this today if folks have ideas, requests, questions…
● Google drive link located in Delaware Basin Sensor Stations online group forum
Today as a pilot – larger version winter 2020?

- Presentation format as a template/pilot for possible larger gathering Jan-Feb 2020
  - Opportunity to present to larger audience
  - Invitations to people outside DRWI
  - Invitations to folks not working with stations
  - Share on Basecamp, EnviroDIY.org, CUASHI, Michigan TU and others working with EnviroDIY and other technologies
Upcoming workshops, 2019

- June 7 – Watershed 201, Measuring Discharge and TSS, setting up an inexpensive TSS lab, Willistown Conservation Trust
  - Host/facilitator: Lauren McGrath and Stroud
- July TBD – PSU Master Watershed Stewards Sensor Station Maintenance and QC training, Berks Ag Center
  - Host/facilitator: Karin Wulkowicz (Berks Co PSU Master Watershed Steward Coordinator) and Stroud
- Aug 9 – Sensor Station Management Workshop, Cherry Valley National Wildlife Refuge
  - Host/facilitator: Paul Wilson, Jim Vogt(? Monroe Co MWSteward Coordinator) and Stroud
- Sept 17-18, Standard Introduction to EnviroDIY Workshop, Stroud Water Research Center
  - Host/facilitator: Stroud
- Sept 24-25, Watershed 101, Watershed Ecology and Monitoring, Stroud Water Research Center
  - Host/facilitator: Stroud
- Possibly today discuss other possible workshops for 2019
Future user group gatherings

- Today possibly discuss:
  - Hosts
  - Themes
  - Timing/scheduling

- Cumulative meeting notes – google doc (Gisondi taking notes today)