EnviroDIT Management Training Workshop Berks Nature March 9, 2024 Charlie Coulter and Carol Armstrong

DATA and INTERPRETING PATTERNS

USING MONITOR MY WATERSHED PROBLEMS AND TROUBLESHOOTING TYING DATA TO NATURAL PATTERNS

Desktop Monitoring of station functionality

- Check site(s) of interest on a daily basis via Monitor My Watershed
 - Station live?
 - On "Browse Sites" map: is the station live (i.e. dark green)
 - Timestamp under data block current?
 - Data look good?
 - Are quick view panels showing expected data ranges?
 - Are there any abnormal numbers/patterns in quick view panels or Time series visualization graphs?
 - Communicate
 - Contact station manager/maintenance team with any issues identified.





Ridley Creek Upstream of Ashbridge Lake (PURC1S)

Organization	Willistown Conservation Trust
Registration Date	May 21, 2018, 2:31 p.m.
觉 Deployment Date	April 12, 2018, noon
1 Latitude	39.9846
↔ Longitude	-75.52379
† Elevation (m)	108.33
Elevation Datum	MSL
象 Site Type	Stream
55 Stream Name	Ridley Creek
🔺 Major Watershed	2
Sub Basin	-



Monitor My Watershed - Sparklines

Sparklines are small charts to provide a visual representation of the data.

Monitor My Watershed displays the last 72 hours of data

The y-axis which represents the data value has no fixed range but constantly adjusts to the minimum and maximum value of the displayed data.



Is my station online?



Breaks in data

More than 6 hours

Less than 6 hours



Data gaps longer than 6 hours appear as open spaces on the sparkline. Gaps of less than 6 hours are connected with lines that often appear out of place.

Online Monitoring Basics

- Take time to familiarize yourself with the way your station(s) function properly.
- Learn the stations normal patterns and values
- Daily monitoring is the best way to accomplish this.
- Keep a maintenance log
- Each station have their own version of what is normal or standard.
- Visit the station to understand all the things that may impact your data



Desktop Monitoring – Communicate!

Regular email updates to station maintenance teams Brodhead WA Station Status > Interval



Charlie Coulter <ctcoulter827@gmail.com>

to Edie, Todd, Michael, Paul, Doug, James, candace, Richard, Krista, Genni, doug, Deborah, Stuart, David, Shannon 💌

Hi All,

The only changes since last week are that the conductivity on the CTD sensor at Swiftwater seems to have settled out and Forest Hill is dro Butz Run continues dropping offline overnight due to a low battery and Pocono at Tannersville has an inop CTD sensor for an unknown reasor The rest of your stations look to be in pretty good shape.

Here are their current status:

BWA1	Forest Hill Run	Offline
BWA3	Lower Mill Creek	Normal
BWA4	Butz Run	Offline/Battery low
BWA5	Yankee Run	Normal
BWA6	Pocono Creek on Rail Gap	Normal
BWA7	McMichaels Creek on Pomeroy	Normal
Swift3	14 Swiftwater Creek at 314	Normal
BWA8	Pocono Creek at Tannersville	- CTD Sensor -9999
	- All other parameters	- Normal
BWA9	Upper McMichaels Creek	- Normal
BWA10) Marshalls Creek Falls	- Normal
РКРКЗ	S Paradise Creek at Pour Pt	Normal / Battery getting Low
РКВН7	S Brodhead Creek at Pour Pt	- Normal

Stay safe, stay warm, Charlie



Desktop Monitoring of station functionality



- The first thing I look for is to see if the station is online.
 - Check observation time (circled in red above). The observation time should be within 5 minutes of local time. This is the one parameter most overlooked. Time is always in Eastern Standard Time (EST), it does not adjust for Eastern Daylight Time (EDT). Data is uploaded every 5 minutes and should agree with local time. If current time is greater than five minutes different from the time shown online then data transmission may be an issue. Note, some stations may transmit less frequently (e.g., 15 minute intervals) - in

Online Monitoring Basics

Daily Monitor Log

	Α	В	D	E F	G H	I J	K L	M N	O P	Q R
L	Week of:			Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2	26-Feb-24	Mean	Units	02/26/24	02/27/24	02/28/24	02/29/24	03/01/24	03/02/24	03/03/24
3	PURC1S 4G	Rid	lley Crk	- Upstream	n <mark>of Ashbri</mark>	dge Lake	SL155	Willistown Trus	st - Lauen McG	rath
1	-Time		EST	EST	EST	EST	EST	EST	EST	EST
5	- Water Level		mm	mm	mm	mm	mm	mm	mm	mm
5	- Water Temp		°C	°C	°C	°C	°C	°C	°C	°C
7	- Conductivity		ųS/cm	ųS	ųS	ųS	чS	ųS	ųS	ųS
3	- Turbidity Low		NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU
)	- Turbidity High		NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU
0	- Box Temp		°C	°C	°C	°C	°C	°C	°C	°C
1	- Battery Voltage		Vdc	Vdc	Vdd	Vdc	Vdc	Vdc	Vdc	Vdc
2	- Signal Strength		%FS	%FS	%FS	×FS	%FS	%FS	×FS	%FS
3	PURC2S 2G	Rid	lley Crk	- Downstr	eam of Ash	bridge Lake	SL156	Willistown Trus	st - Lauen McG	rath
4	-Time		EST	EST	EST	EST	EST	EST	EST	EST
5	- Water Level		mm	mm	mm	mm	mm	mm	mm	mm
6	- Water Temp		°C	°C	°C	°C	°C	°C	°C	°C
7	- Conductivity		ųS/cm	ųS	ųS	ųS	ųS	ųS	ųS	ųS
8	- Turbidity Low		NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU
9	- Turbidity High		NTU	NTU	NTU	NTU	NTU	NTU	NTU	NTU
0	- Box Temp		°C	°C	°C	°C	°C	°C	°C	°C
1	- Battery Voltage		Vdc	Vdc	Vdd	Vdc	Vdc	Vdc	Vdc	Vdc
2	- Signal Strength		%FS	%FS	%FS	×FS	%FS	%FS	×FS	%FS
3	- Box Humidity		%RH	×BH	×BH	N XRH	×.RH	×BH	×BH	×BH
4	PURC3S 4G	Rid	lley Cre	ek at Garre	tt Mill		SL248	Willistown Trus	st - Lauen McG	rath
5	-Time		EST	EST	EST	EST	EST	EST	EST	EST
<		/ert	Print	Sheet1	Sheet2	Time	+			

Online Monitoring Basics

Station Maintenance Log

	Α	В	С	D	E	F	G	Н	Ι
1		RAMS_MS2	Ram	Ramsey Run @ Ramsey Road		4G LTE / Mayfly 1.1			
2		Date	EST		Problem	Plan	Repair Date	EST	Comment
3									
4									
6		26-Sep-23	1150		Station is offline		30-Sep-23	1910	Network Outage
7		18-Sep-23	0430	Battery	Battery level at 3.58v				hethom outage
8		1-Aug-23			System upgrade		1-Aug-2023	1225	Shannon and Rob replaced: Battery, Mayfly Board and Solar Panel. Conductivity sensor was within 10%
9		20-Jun-23		Battery	Battery level at 3.6v	Replace battery with a charged one	21-Jun-23	0730	Rob replace with charged battery
10		14-Nov-22	1950	Offline	Station dropped OFFLINE		15-Nov-2022	0905	Self Corrected - offline 13 hours
11		5-Sep-22		Battery	Battery level at 3.6v	Replace battery with a charged one	5-Sep-22	0725	Rob replace with charged battery
12		18-Aug-22		Battery	Battery level at 3.64	Replace battery with a charged one	19-Aug-2022	0915	Rob replace with charged battery
13	1711	8-Aug-22	1430	Battery	Station went offline, battery Voltage is at 3.54v	Replace battery with a charged one	9-Aug-2022	0830	Tom replace with charged battery
14		3-Aug-22	0840	Network	MMW network down 3hrs		03-Aug-22	1220	Network was restored 3 Aug 22 @12:20
15	1710	24-Jul-22	2215	Battery	Station went offline, battery Voltage is at 3.54v	Replace battery with a charged one			
16	1709	6-Jun-22		Solar Panel	Battery drops to 3.6 volts at night but goes back to 4.3 volts when the sun comes up.	Troubleshoot	6-Jul-2022		Replaced solar panel with a new one and installed a new battery
17		3-Jun-22	1355	Sparkline	Box Humidity data point added to station				
18	1708	28-Oct-21		Box	Rodents chewed through th Pelican Box	Need to Replace Box	3-Jun-2022		Removed box and took to Stroud. See 1705
19	1707	17-Oct-21		SIM			27-Oct-2021		Upgraded Sim Card
20	1706	25-Oct-21		Cellular	Upgrade Cell Board to 4G		25-Oct-2021		Replace Cell Board w/ new 4G version
	1705	16-Sep-21	1200	CTD	Rodent chew marks on CTD cable	Replace with possibly a shorter cable and some type of shielding.	Solar Panel		Rachel moved station to a new location on the opposite side of the stream 40 yards upstream. Everyting was new including the box. The cables were run in flexable metal conduit. It has a v1.1
	$\langle \rangle$	··· BCPR	8S-GNA	BCRS9	S-Red Clay ROCK_US3 ROCK_DS2 HU	RR_US2 PALM_MS3 RAMS_MS2 s ···	+ : •		(, , , , , , , , , , , , , , , , , , ,

Taking a closer look



Clicking the icon to the upper right of the data block allows you to scroll through the last 72 hours of data.

Note that the timestamp is listed in UTC so it is 5 hours earlier than EST.

Time Series Visualization (TSV)



Time Series Visualization (TSV)



Introduction to Data Errors and Signals (Charlie)

- Most common data issues
 - 1) Battery / Solar Panel
 - 2) Station is offline
 - 3) Cell board problems
 - 4) Sensor fouling or malfunction
 - 5) -9999: Loss of sensor signal

Evaluating Battery Voltage



The Battery Voltage parameter consist of two parts A charging voltage while the solar panel is active and a baseline voltage when it is not.

The Charging voltage appears like a plateau.

The Baseline is the actual battery voltage and should be used for evaluation.

>4.0v	Fully charged battery
3.9v – 3.7v	Battery Discharging
3.69v – 3.59v	Replace battery
~3.54v	Cellular board will shut down/Station offline. Logger still saves data to SIM card.

Evaluating Battery Voltage

CLOSE



Decreasing battery voltage



Excess Power usage



Troubleshooting Charging/Power usage

• Solar panel not providing enough charge

- Not enough sunlight
- Misaligned
- Panel too small
- Charging circuit
- Corrosion on plug
- Plug not fully seated
- Battery not excepting the charge
 - Old/defective battery
 - Battery plug corrosion
 - Plug not fully seated
- System using too much power
 - Poor cell tower signal check signal st
 - Old/defective cell board
 - Cell board not fully seated
 - Logger board old/defective



Solar panel not charging



Station not Online

- Hologram account not active
- Battery Voltage <3.55v
 - May come on as panel recharges battery and drop off overnight
- Network Problem
 - Check other Stations
- Cell Board issue
 - Battery charged
- Poor cell tower signal
 - % Full Scale <30%



Loss of Signal (-9999)

- -9999 Loss of Signal
 - No CTD signal
 - Sensor cable cut
 - Rodent Damage
 - Cable plug loose
 - Sensor failure



CTD Failure (-9999)



Conductivity sensor buried

A drop in conductivity caused by a storm that does not return



Buried CTD Sensor



Something does not look right



Comparing data patterns



Level Sensor – abnormal indication



Negative level indication

Level Sensor – abnormal indication



Crum Creek - Feb 2024

Stream freezing

- o Ice formation on the level sensor disc can destroy it
- o Sensors in shallow and slow-moving water are most at risk
- o Temperature will drop to
 the freeze point and level
 out





Closing thoughts

- Desktop Monitoring of station functionality
 - Be familiar with station(s) functions
 - Know normal patterns/values
 - Know what may indicate an error
 - Monitor on a daily basis
 - Visit the station to understand all the things that may impact it.