

An aerial photograph of a wide, winding river flowing through a lush, green forest. The river meanders through the landscape, creating several large islands and peninsulas. The water is a deep blue-grey color, and the surrounding forest is a vibrant green. In the distance, the river continues to wind through the forest under a clear sky.

**Angie Reed**

***Water Resources Planner***

***Penobscot Indian Nation***

# **Data Management Challenges and Best Practices for Tribes:**

**Round Table Discussion**

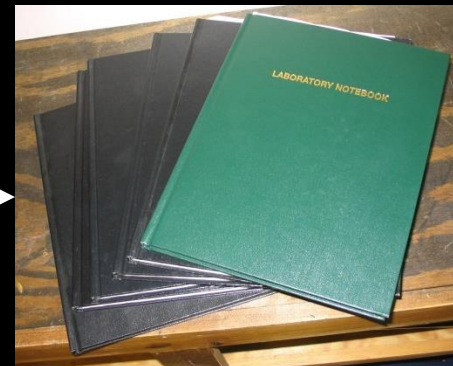
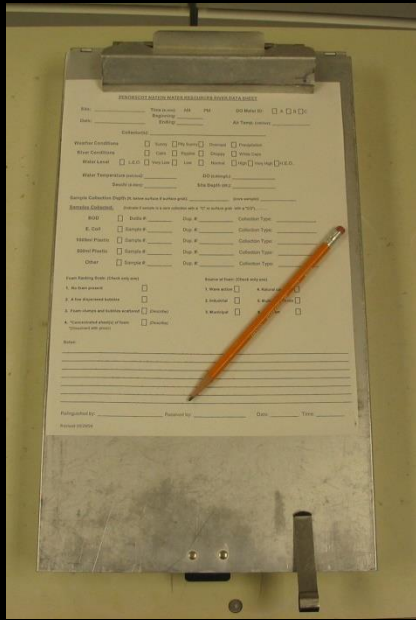
*Virtual Data Academy and Conference*

*October 28, 2020*

***Penobscot Indian Nation (PIN)***

**[www.penobscotnation.org](http://www.penobscotnation.org)**

# The past and present – not so easy access to data!



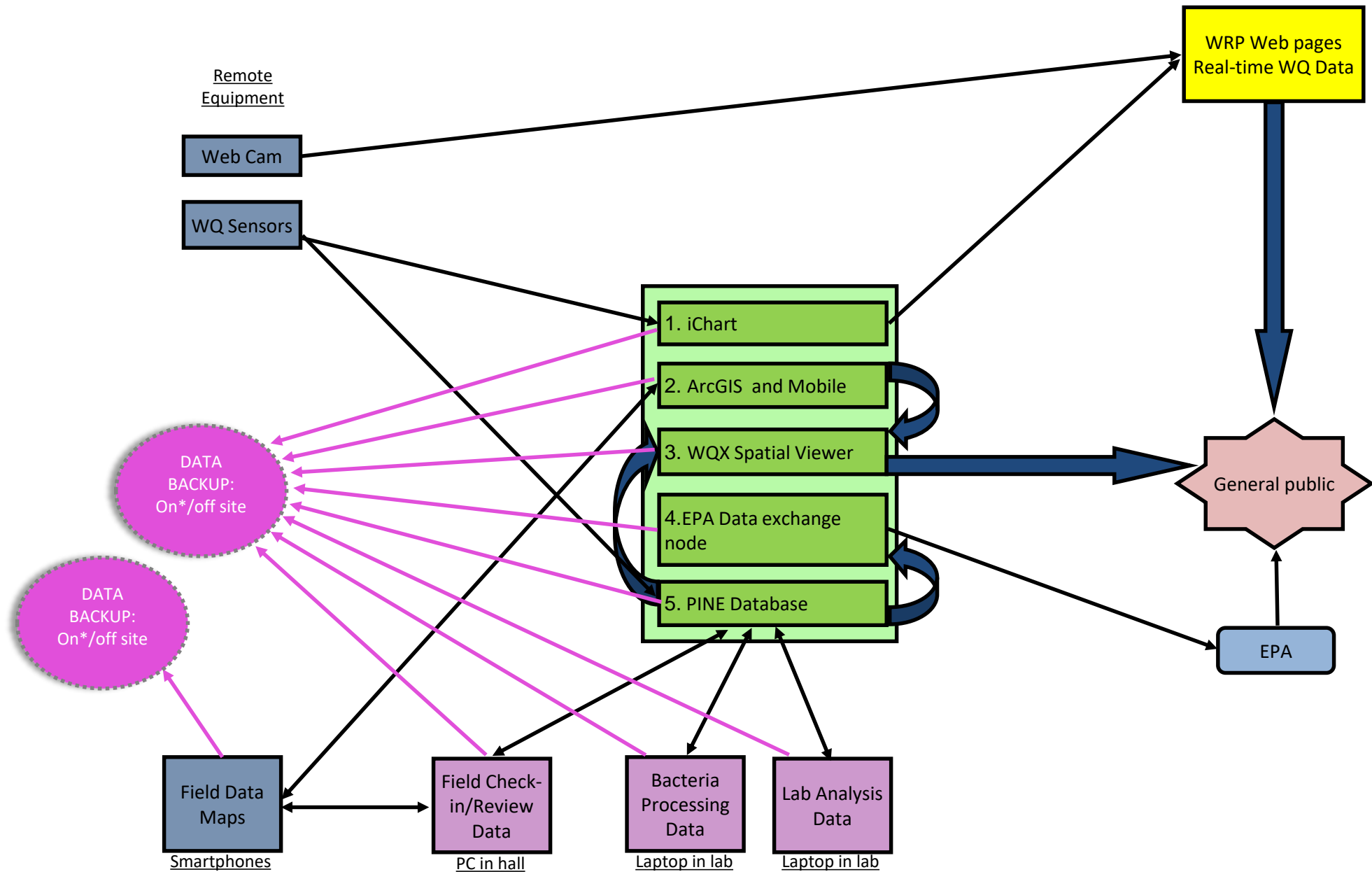
**“You will fight your data  
on the way in  
or on the way out.”**

**Steve Tessler, USGS**



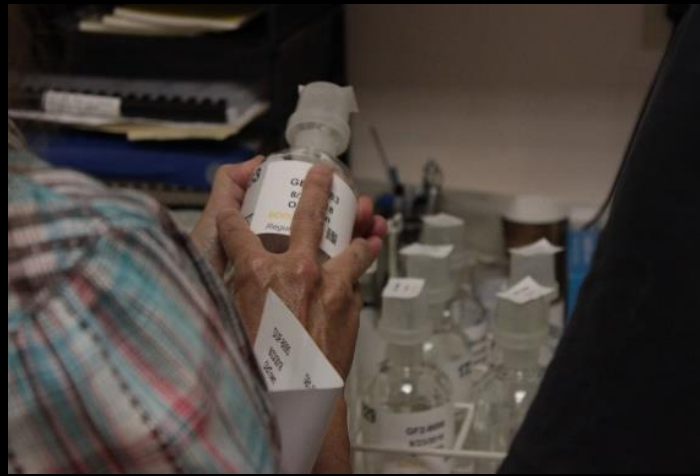
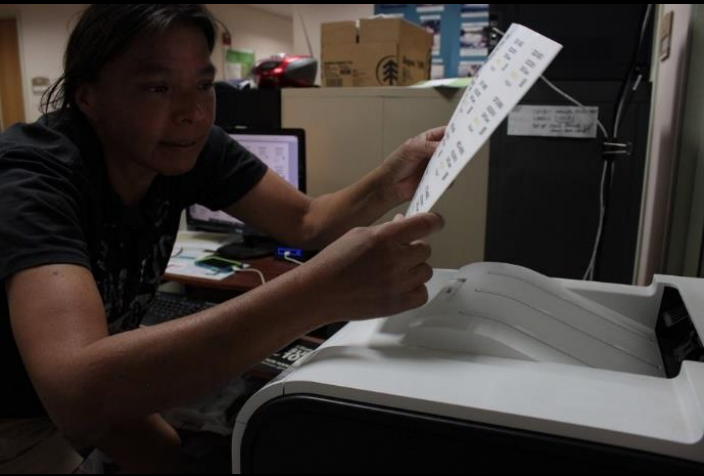
**“LET’S NOT DO BOTH  
ANYMORE!!”**

**Penobscot Indian Nation**



# Discrete sampling made easier when in larger context

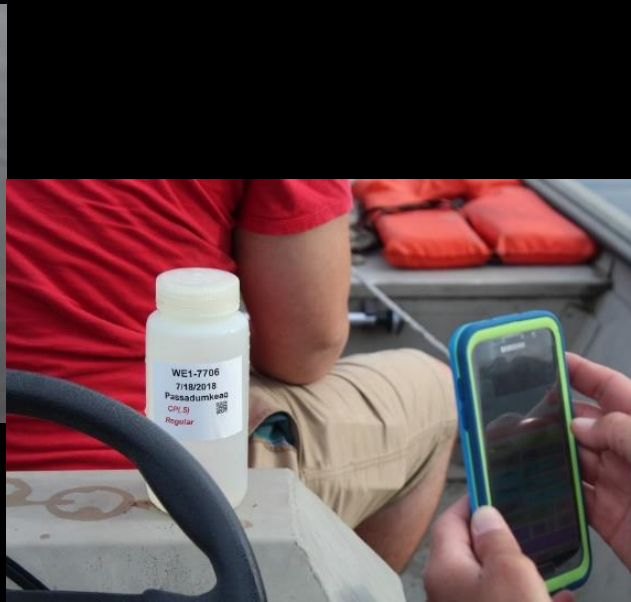
**Printing labels for bottles is easy and gives each one a unique number**



**Scanning the QR codes on the labels make field data entry much faster**

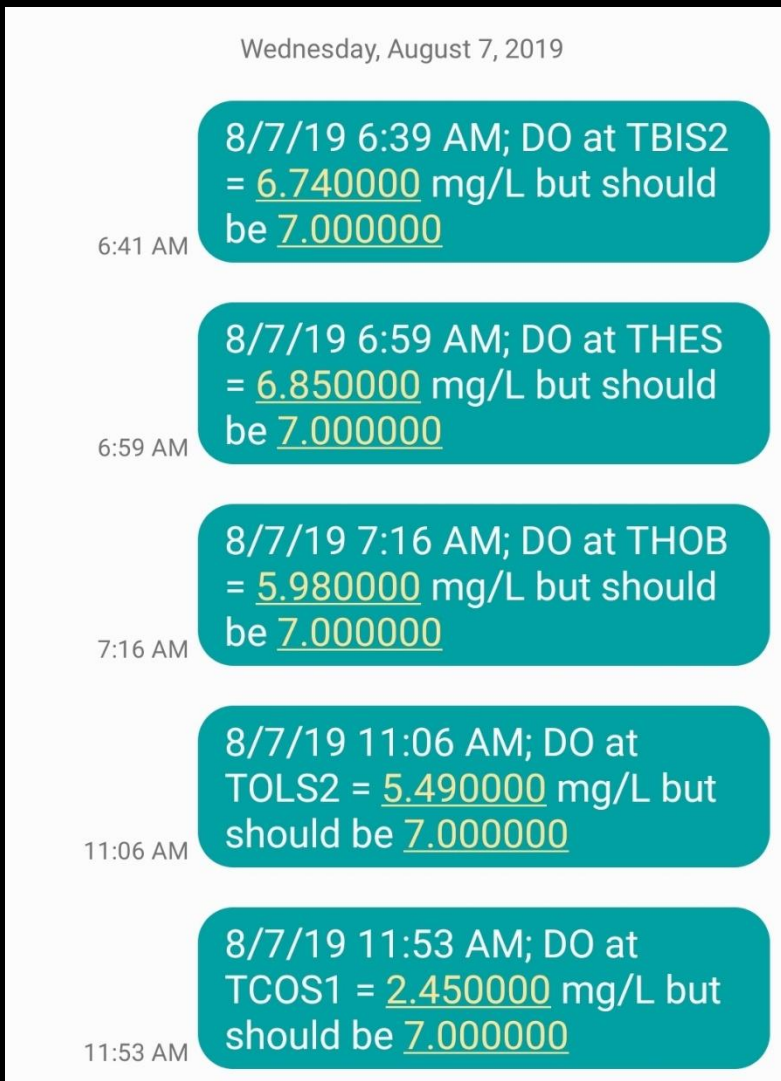
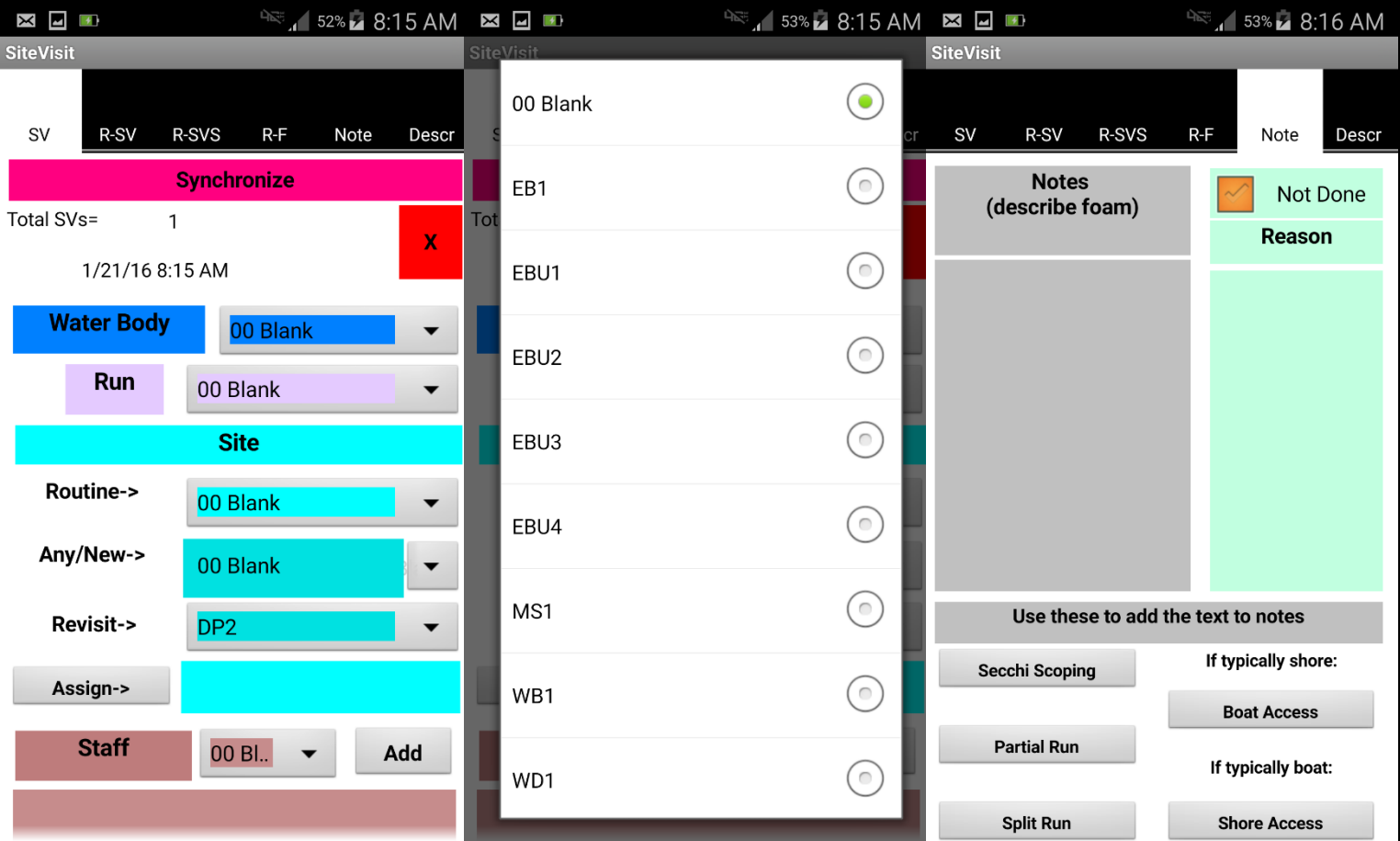


Photo credit:  
Tyler Quiring

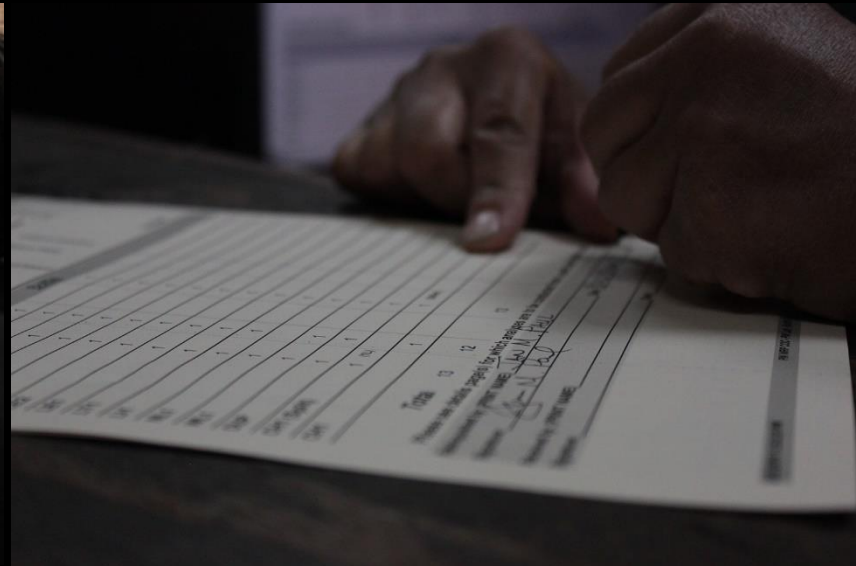
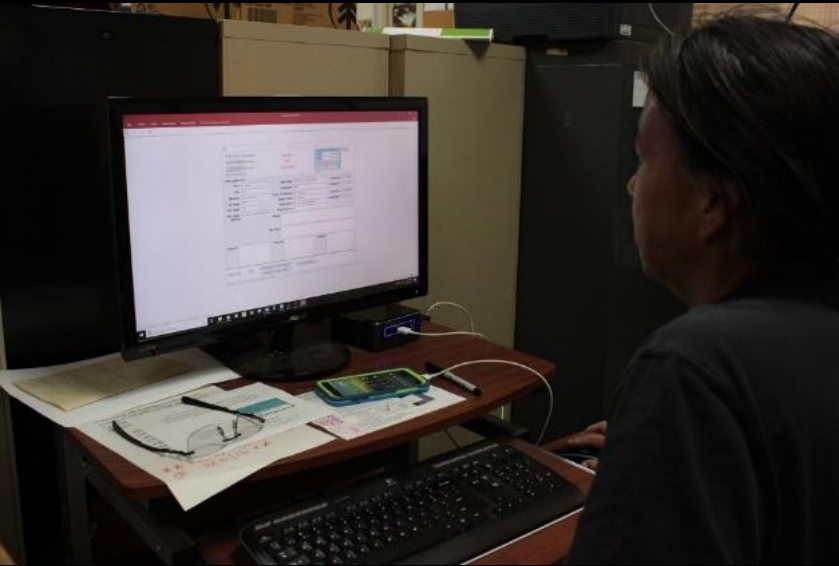


Drop-down menus and pre-defined notes are some of the many options that improve the quality of field data entry

Text alerts can be immediately sent when standards are not being met



**Digital field data is quickly loaded into office tables, checked and used to make chain of custodies and populate lab data entry forms**

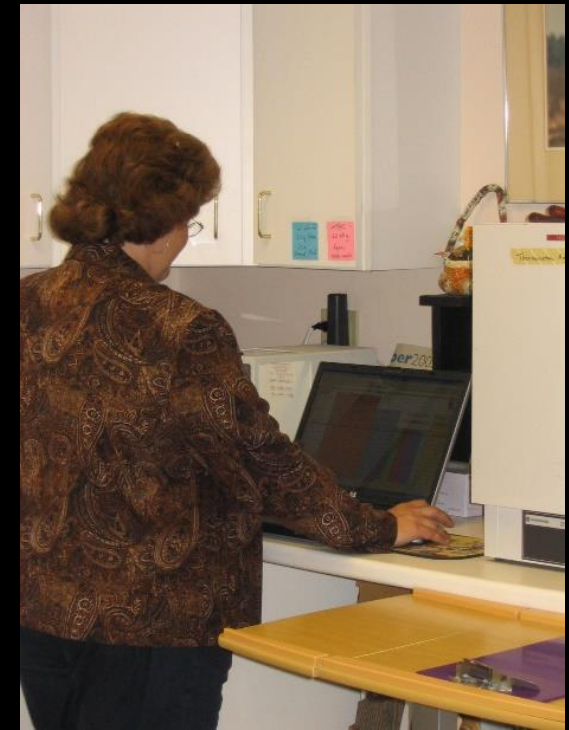
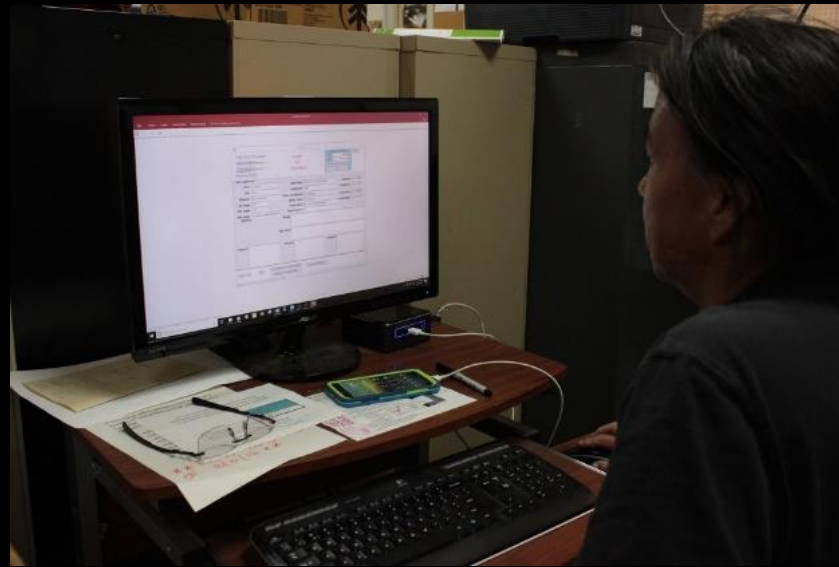
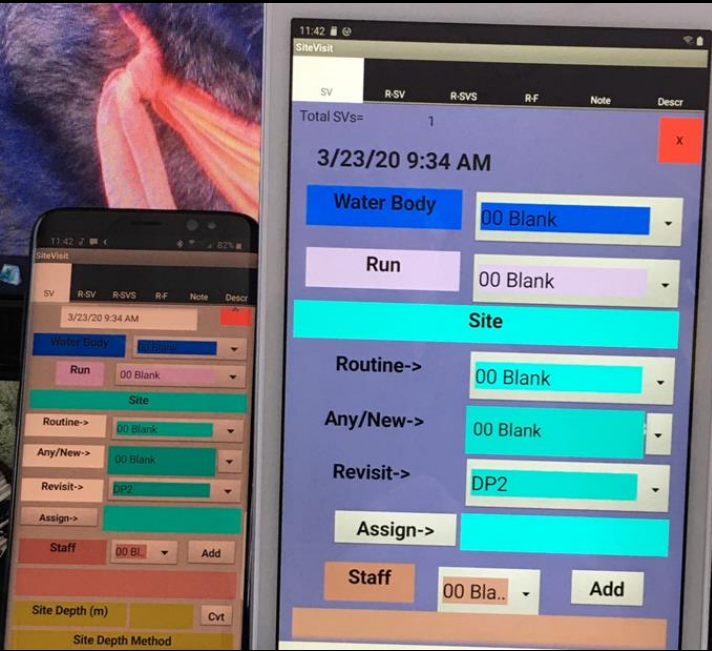


**Digital lab data allows for quick assessment of holding and analysis time exceedances**

Photo credit: Tyler Quiring



# A good data management system can be used in off-season and pandemic





# Transitions made/making/will make

## ➤ Software

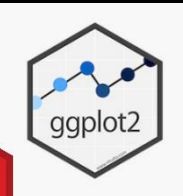
- CSV and Excel files to Access to SQL Server
- Excel/Streamline/Access/WRDB to R
- Tableau to Spatial Viewer (to Rshiny?)
- DroidDB to Survey123?

## ➤ Data structures

- Many files to central storage
- Flat files to relational tables
- Field forms mimic final database structure

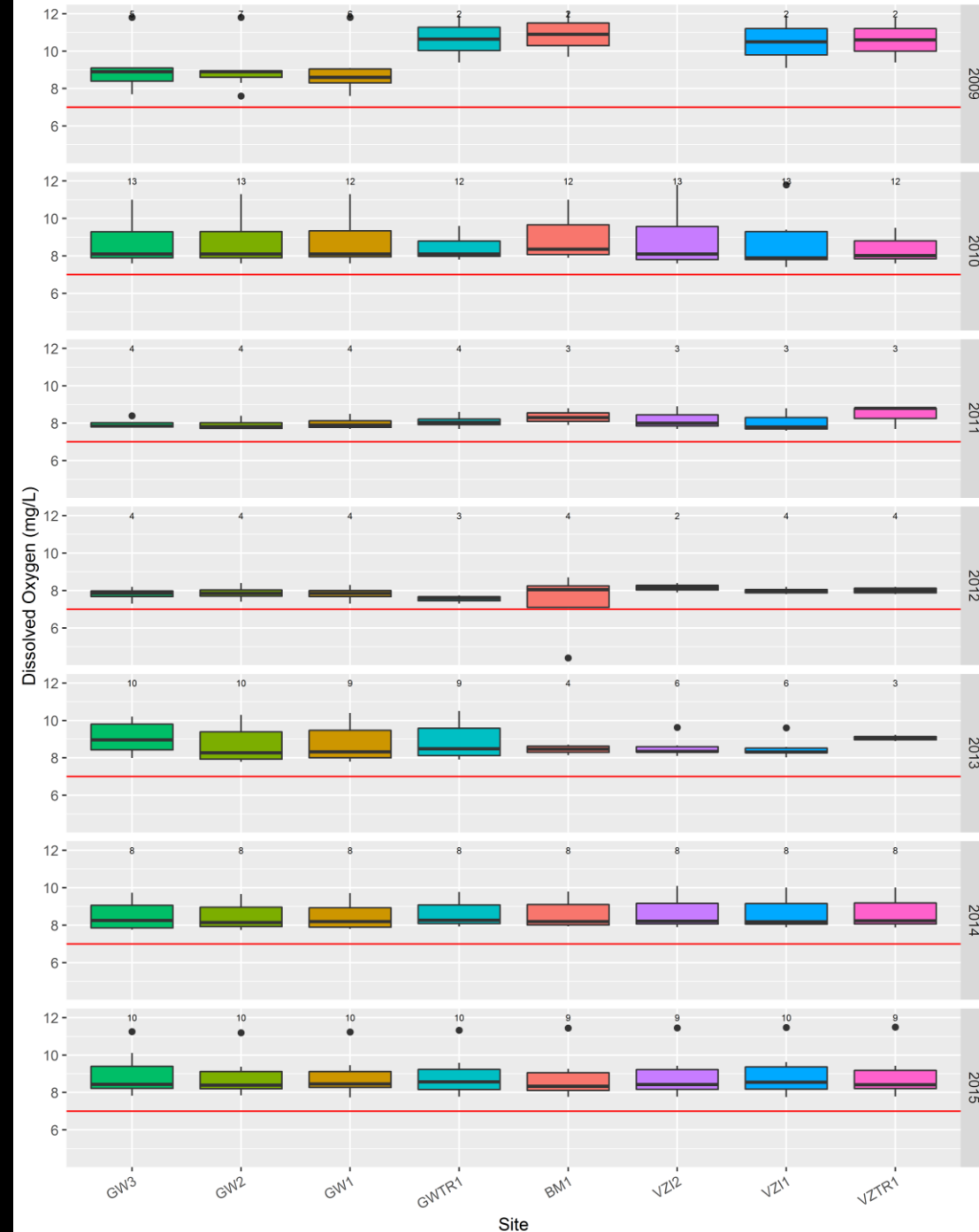
## ➤ Functionality

- Storage versus manipulation/analysis/display
- Ease of repeatability
- R solves a lot of these



# Data management connections to output

- Complicated graph in R
  - Need all results in one column
  - Need columns by which the data can be grouped
- Data structures
  - Relational tables often already in this format
  - Usually easier to transpose vertical data
- Centralized storage
  - Easier to connect to/load one or a just a few files
  - Never have to worry about format changing!!

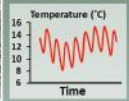


# Continuous sampling made easier when in larger context



## A Simple Protocol Using Underwater Epoxy to Install Annual Temperature Monitoring Sites in Rivers and Streams

Daniel J. Isaak  
Dona L. Horan  
Sherry P. Wollrab





HOBOWare Pro

File Device Edit View Tools Window Help

- Launch... Ctrl+L
- Readout... Ctrl+R
- Status... Ctrl+I
- Stop... Ctrl+K
- Manage Shuttle...
- Manage HOBO Data Node Network... Ctrl+Shift+H
- Configure Modules/Ports... Ctrl+Shift+C
- Manage U30
- Manage RX3000...
- Lab Calibration...
- Select Device... Ctrl+N
- Default Action
- Utilities

HOBOWare Pro

File Device Edit View Tools Window Help

MLO\_365\_10756015\_20180125.hobo

#	Time, GMT-04:00	Temp, °C	Coupler Detached	Coupler Attached	Host Connected	End Of File
1	08/05/15 06:00:00 AM	20.770	Logged			
2	08/05/15 06:30:00 AM	20.460				
3	08/05/15 07:00:00 AM	18.985				
4	08/05/15 07:30:00 AM	18.652				
5	08/05/15 08:00:00 AM	19.222				
6	08/05/15 08:30:00 AM	19.127				
7	08/05/15 09:00:00 AM	23.641				

Expand All Collapse All

Details

- Series: Temp, °C
- Event Type: Coupler Detached
- Event Type: Coupler Attached
- Event Type: Host Connected
- Event Type: End Of File

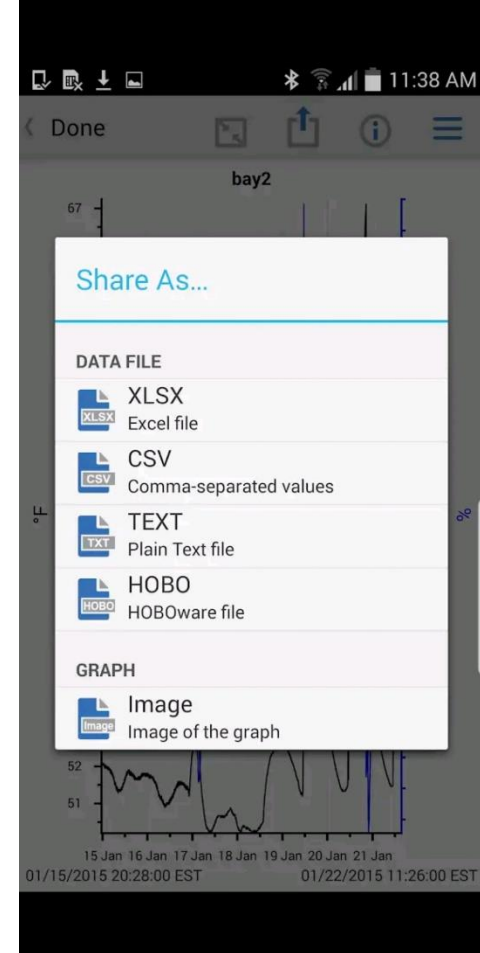
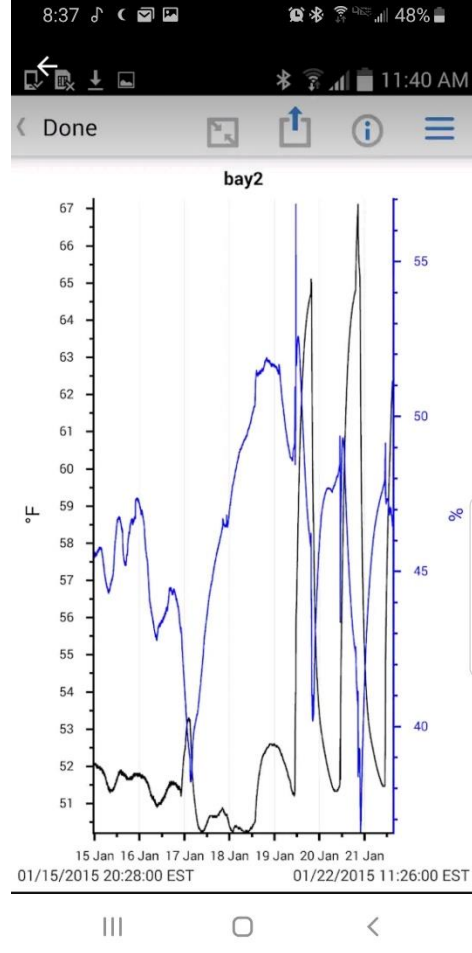
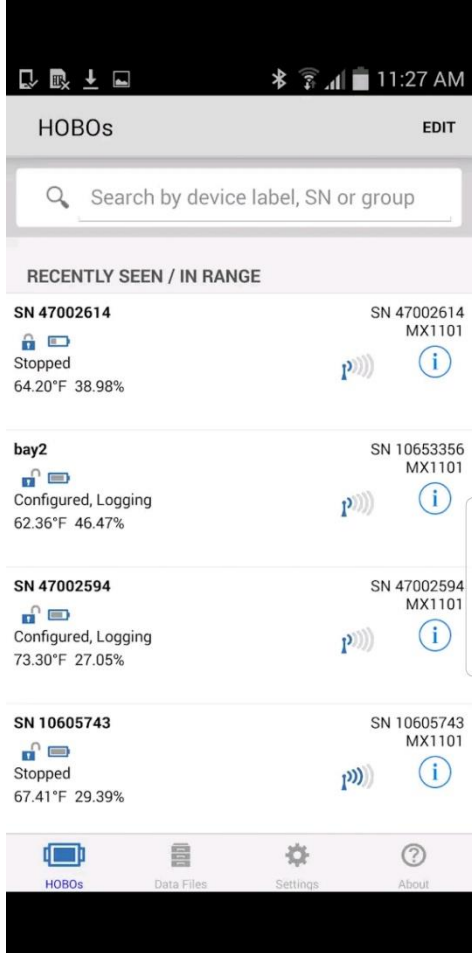
TRMLOut\_365\_10756015

Temp, °C

- Coupler Detached
- Coupler Attached
- Host Connected
- End Of File

<input type="checkbox"/>	Name	Date modified
<input type="checkbox"/>	MLO_365_10756015_20160628.hobo	6/28/2016 12:05 PM
<input type="checkbox"/>	MLO_365_10756015_20170825.hobo	8/25/2017 9:40 AM
<input checked="" type="checkbox"/>	MLO_365_10756015_20180125.hobo	7/5/2018 9:17 AM
<input type="checkbox"/>	MLO_365_10756015_20190912.hobo	9/12/2019 11:44 AM

<input type="checkbox"/>	Name	Date modified
<input type="checkbox"/>	MLO_365_10756015_20160628.csv	12/19/2019 4:30 PM
<input type="checkbox"/>	MLO_365_10756015_20170825.csv	12/19/2019 4:30 PM
<input type="checkbox"/>	MLO_365_10756015_20180125.csv	12/19/2019 4:30 PM
<input type="checkbox"/>	MLO_365_10756015_20180705.csv	12/19/2019 4:30 PM
<input type="checkbox"/>	MLO_365_10756015_20190912.csv	12/19/2019 4:30 PM



<input type="checkbox"/>	Name	Date modified
<input type="checkbox"/>	MLO_365_10756015_20160628.hobo	6/28/2016 12:05 PM
<input type="checkbox"/>	MLO_365_10756015_20170825.hobo	8/25/2017 9:40 AM
<input checked="" type="checkbox"/>	MLO_365_10756015_20180125.hobo	7/5/2018 9:17 AM
<input type="checkbox"/>	MLO_365_10756015_20190912.hobo	9/12/2019 11:44 AM

<input type="checkbox"/>	Name	Date modified
<input checked="" type="checkbox"/>	MLO_365_10756015_20160628.csv	12/19/2019 4:30 PM
<input checked="" type="checkbox"/>	MLO_365_10756015_20170825.csv	12/19/2019 4:30 PM
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<input checked="" type="checkbox"/>	MLO_365_10756015_20180705.csv	12/19/2019 4:30 PM
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<input type="checkbox"/>	Name	Date modified	Type
	AS1	12/19/2019 4:01 P...	File folder
	AS3	1/8/2020 8:56 AM	File folder
	AS5	1/8/2020 8:56 AM	File folder
	AS9	1/8/2020 8:56 AM	File folder
	BM1	1/8/2020 8:56 AM	File folder
	BPO1	1/8/2020 8:56 AM	File folder
	EBLO1	1/8/2020 8:56 AM	File folder
	EBU4	1/8/2020 8:56 AM	File folder
	GB	1/8/2020 8:56 AM	File folder
	GW1	1/8/2020 8:56 AM	File folder
	GW3	1/8/2020 8:56 AM	File folder
	GWTR1	1/8/2020 8:56 AM	File folder
	JAB1	1/8/2020 8:56 AM	File folder
	LAS1	1/8/2020 8:56 AM	File folder
	LAS5	1/8/2020 8:56 AM	File folder
	LAS7	1/8/2020 8:56 AM	File folder
	MAS2	1/8/2020 8:56 AM	File folder
	MGL3	1/8/2020 8:56 AM	File folder
	MLI	1/8/2020 8:56 AM	File folder
<input checked="" type="checkbox"/>	MLO	1/8/2020 8:56 AM	File folder
	MOB1	1/8/2020 8:56 AM	File folder
	NBDR	1/8/2020 8:56 AM	File folder
	ROB	1/8/2020 8:56 AM	File folder
	SA	1/8/2020 8:56 AM	File folder
	SAF	1/8/2020 8:56 AM	File folder
	SBLO1	1/8/2020 8:56 AM	File folder
	STBR	1/8/2020 8:56 AM	File folder

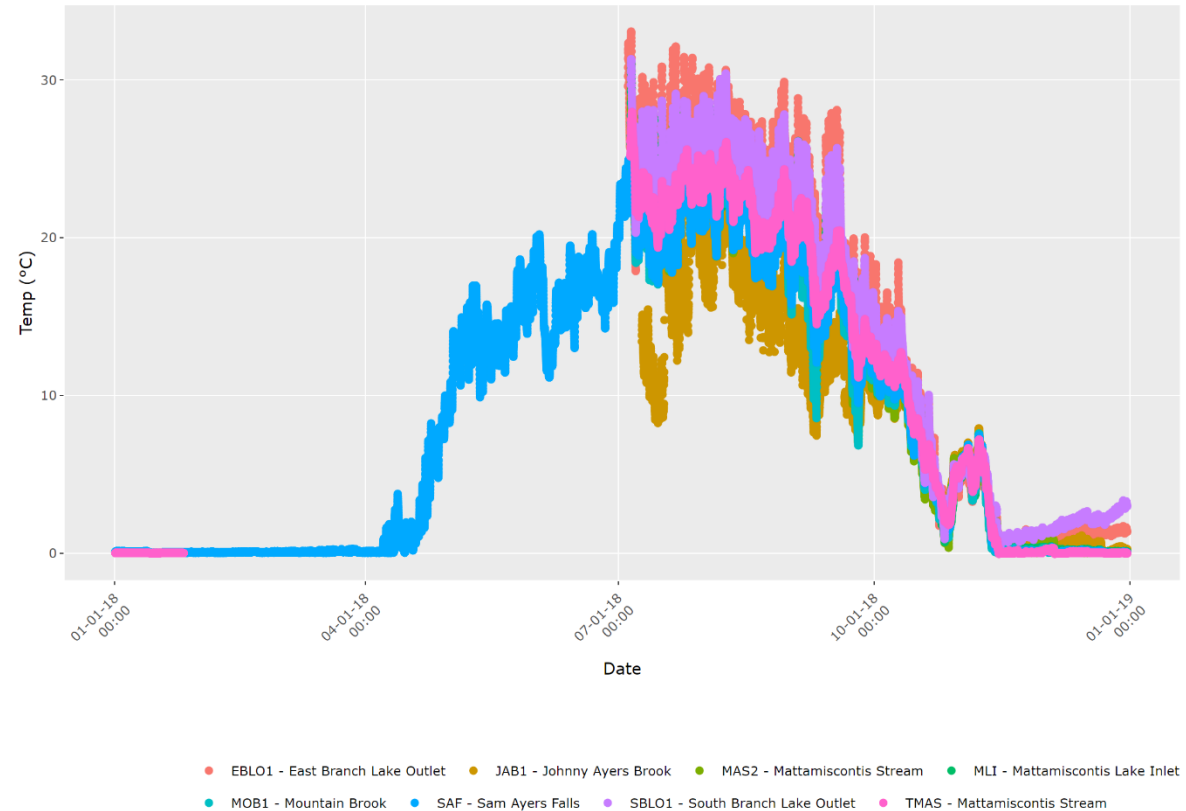
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	CSV_Raw	12/19/2019 4:30 P...	File folder	
	HOBO_Raw	11/19/2019 11:26 ...	File folder	
	ScannedFieldSheets	1/8/2020 8:56 AM	File folder	
	MLO_365_10756015_20160628.csv	11/19/2019 1:12 P...	Microsoft Excel C...	581 KB
	MLO_365_10756015_20170825.csv	11/19/2019 1:12 P...	Microsoft Excel C...	1,345 KB
	MLO_365_10756015_20180125.csv	11/19/2019 1:12 P...	Microsoft Excel C...	1,621 KB
	MLO_365_10756015_20180705.csv	10/18/2019 7:36 P...	Microsoft Excel C...	1,621 KB
	MLO_365_10756015_20190912.csv	10/18/2019 7:27 P...	Microsoft Excel C...	774 KB

<input type="checkbox"/>	Name	Date modified	Type	Size
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	CSV_Raw	12/19/2019 4:30 P...	File folder	
	HOBO_Raw	11/19/2019 11:41 ...	File folder	
	ScannedFieldSheets	1/8/2020 8:56 AM	File folder	
	MOB1_365_20020056_20190926.csv	10/18/2019 7:28 P...	Microsoft Excel C...	801 KB

# R to make all steps easier

- File and folder management
  - Copy from one folder to many different
  - Change file names
- Upload a group (batch) of files
  - From one or more folders
  - Temporary copies in memory and only save what you need
- Perform task on entire batch of files
  - Repeat these processes very easily
  - Can determine conditions under which each task happens
- Create high quality summaries
  - Repeat these processes very easily
  - Complicated graphs that are difficult/impossible in common tools

6.2.7 30-minute temperature readings at each intensive tributary site



# Stay in touch

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