STREAM TEMPERATURE IN THE CHESAPEAKE BAY WATERSHED

JOHN CLUNE, TAMMY ZIMMERMAN, JAMES COLGIN AND CHARLES SANDUSKY

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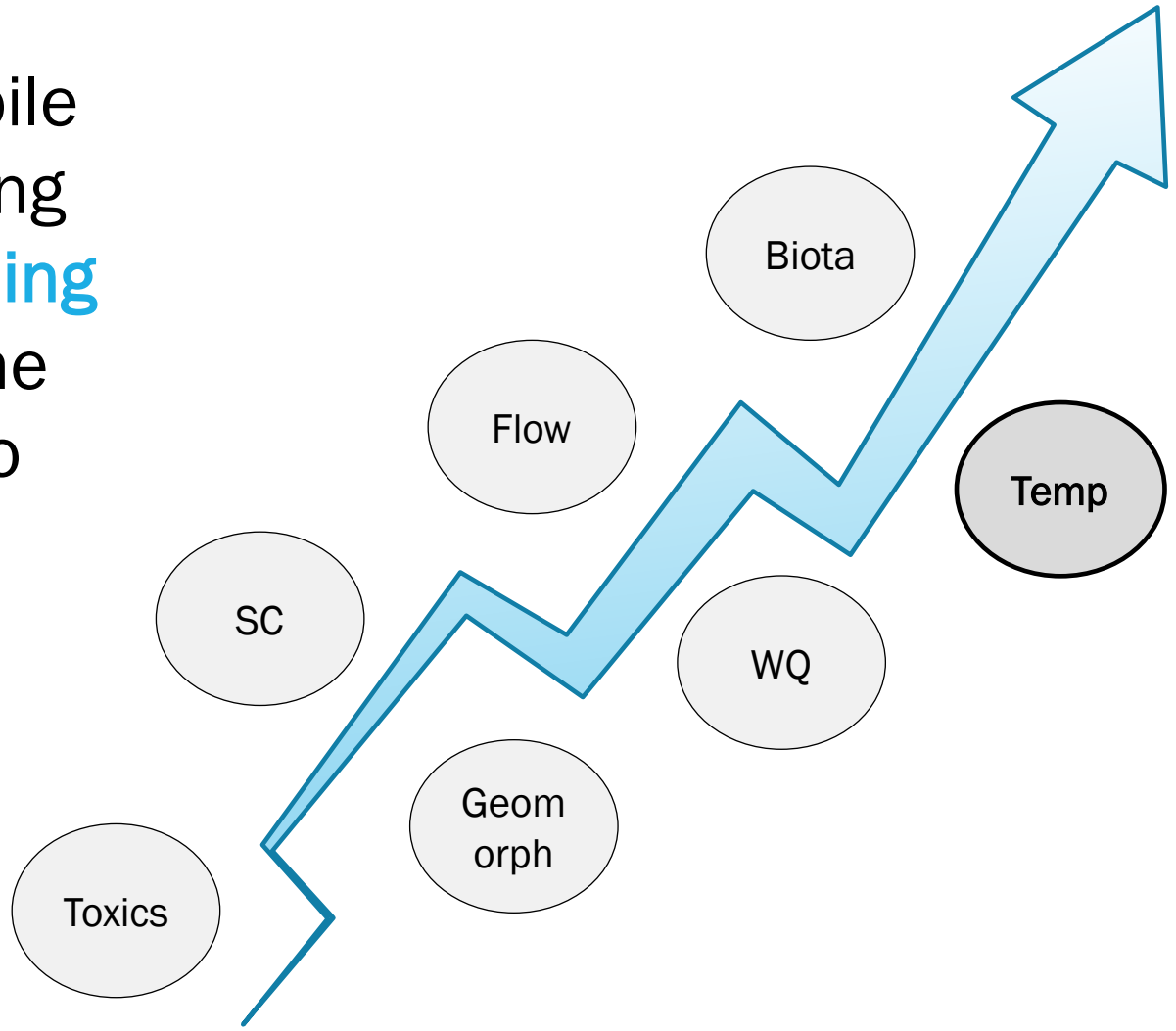
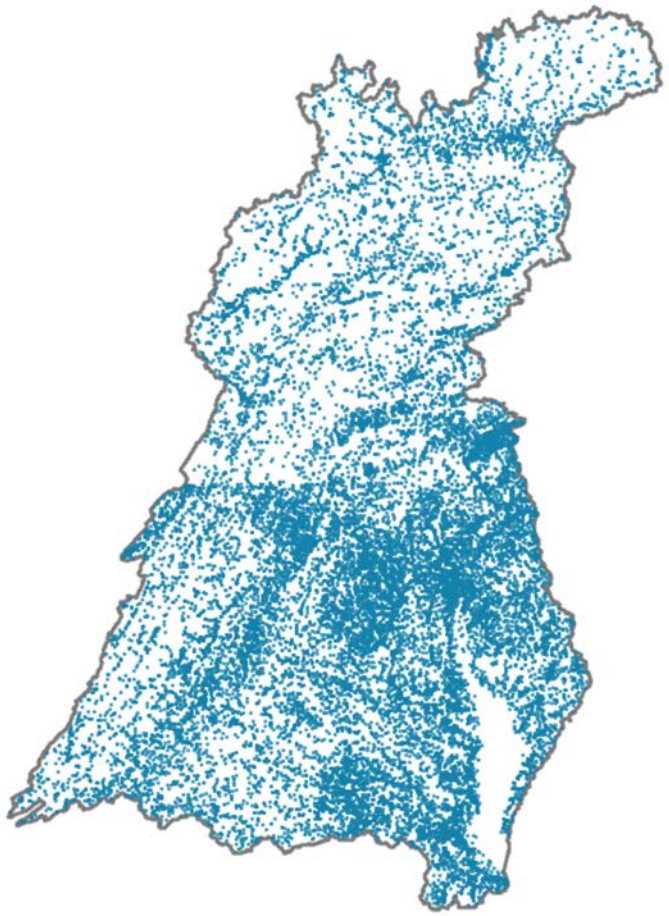
The USGS has begun to compile **multi-agency data** for assessing **status and trends,** and **modeling** stream temperature across the Chesapeake Bay watershed to better understand the drivers and stressors of fish health





In the past 70 years, **stream temperature data** has been collected at **31,142 sites** by multiple agencies across the Chesapeake Bay Watershed

**Additional datasets are being added and values may change*

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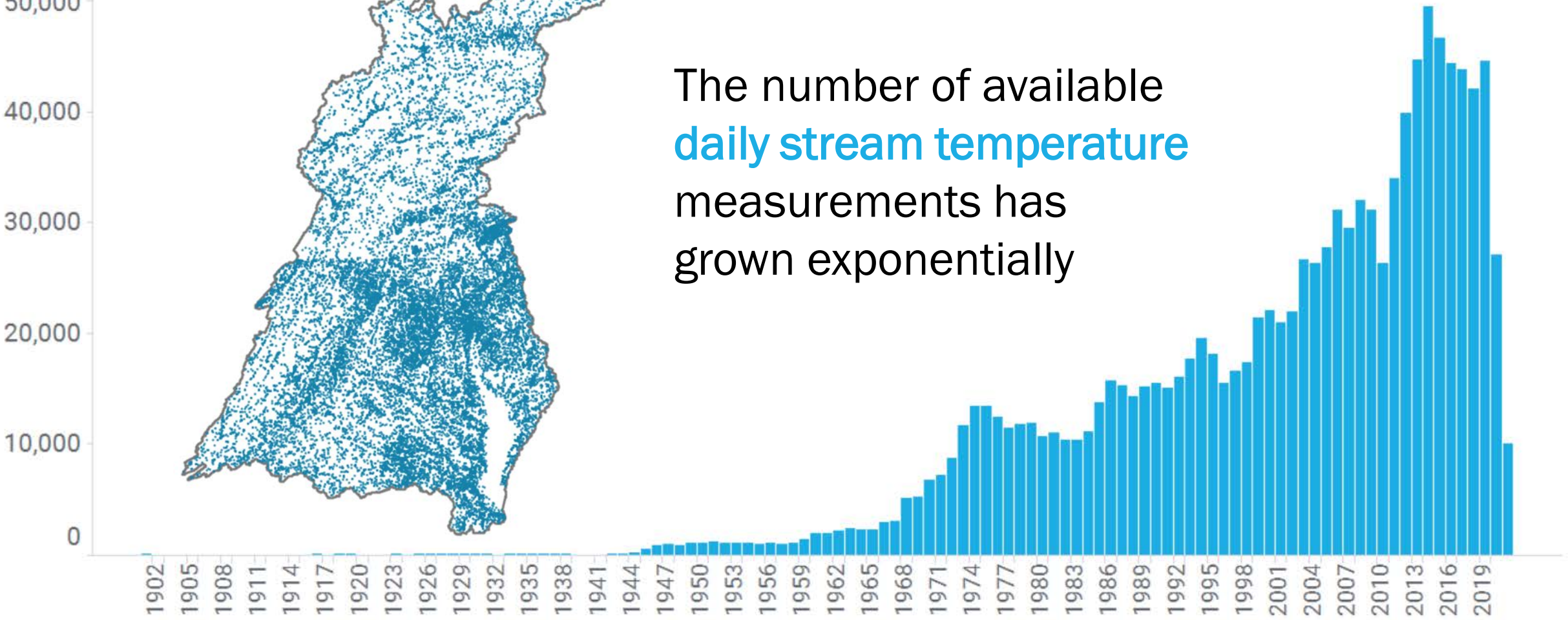
The number of available **daily stream temperature** measurements has grown exponentially



*Additional datasets are being added and values may change

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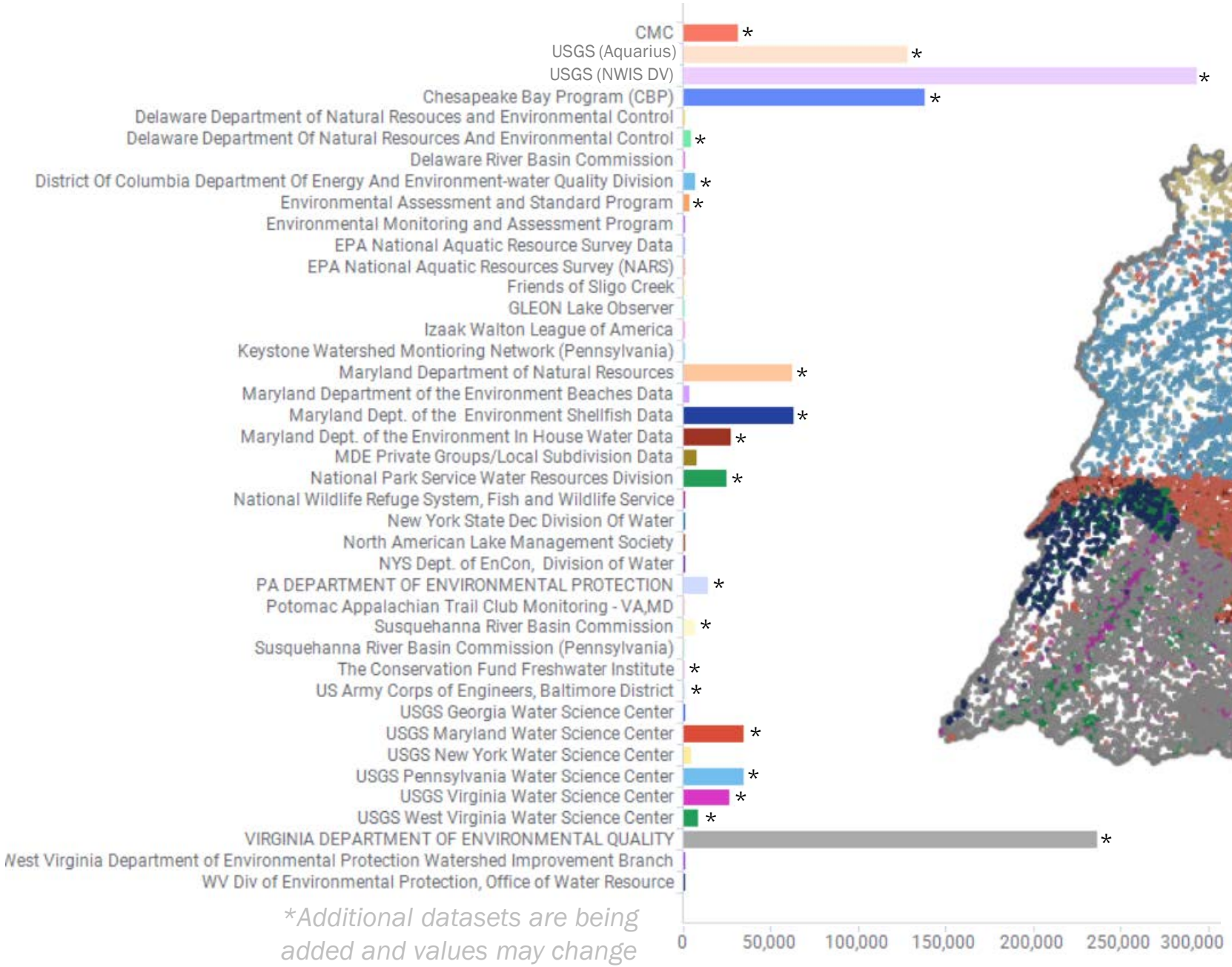

*Additional datasets are being added and values may change

Daily Stream Temperature Observations

* Networks currently in use (recent data since 2019)

Some **sites** and **agencies** have more observations than others

Note: USGS (NWIS DV) refers to aggregate data statistics (i.e. mean, max, min) provided by the readNWISdata dv function call in the USGS R dataRetrieval package. USGS (Aquarius) data refers to temperature routine check measurements made during streamflow measurements acquired from the USGS Aquarius database.

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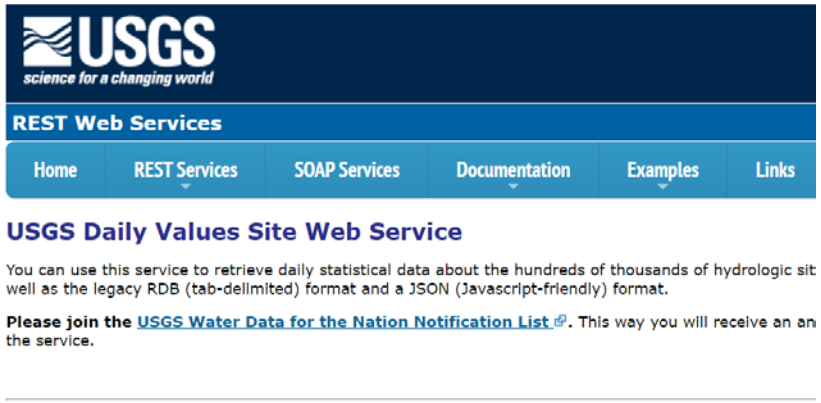
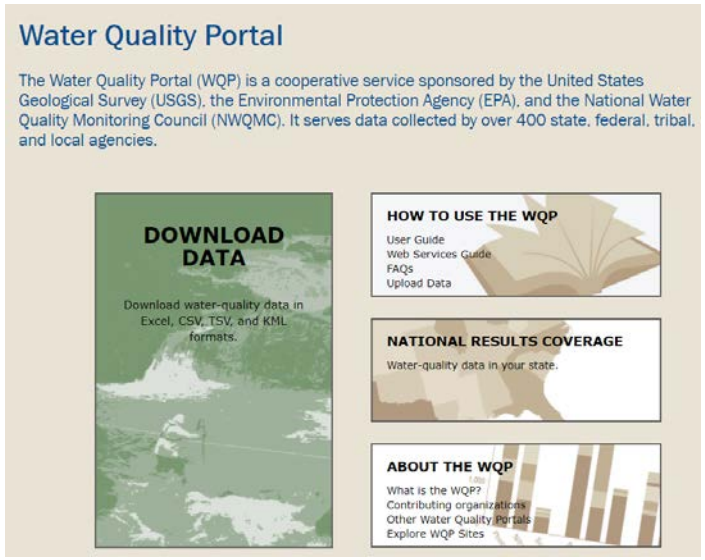
Compiling data is a challenge and needs a future coordinated framework

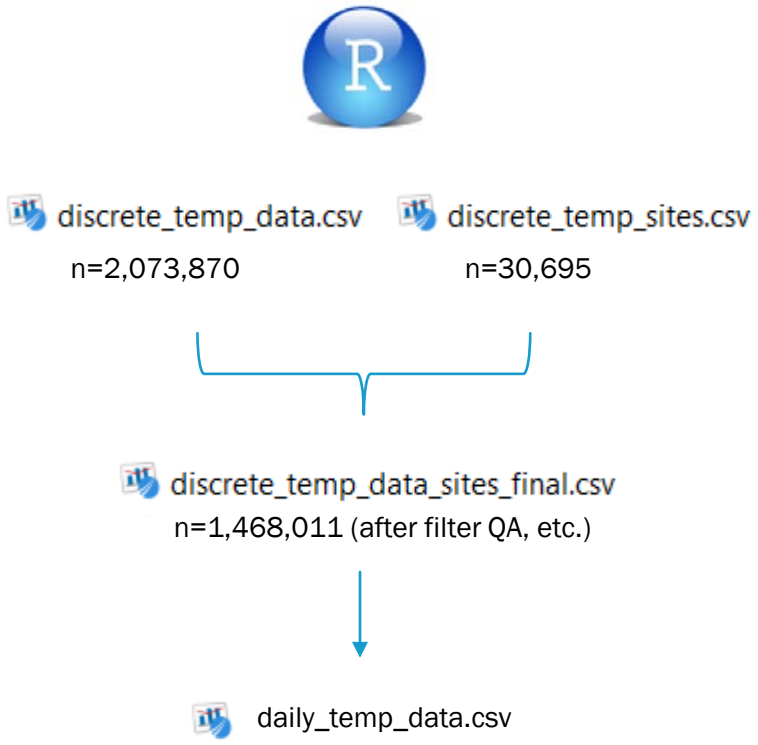




CMC
PA DEP
SRBC
NY DEC
VIMS
DOEE
ICPRB

MD DNR
MD Baltimore County
NPS
UVA
VEROS
WV DNR

Currently developing methods that can be used for routine data compilation cycles (every 2 years, etc.)



DiscreteData_WaterTemp_WQP.R

Source on Save | Run | Source

```
1  setwd("C:
2
3  install.packages("dataRetrieval")
4  library (dataRetrieval)
5
6  # Pulls and saves site information for discrete sites in Bay watershe
7  discrete_temp_sites_pull <- whatWQPsites(huc=c("0205*","0206*","0207*
8
9  # Pulls and saves temperature data for sites in Bay watershed
10 discrete_temp_data_pull <- readWQPdata(huc=c("0205*","0206*","0207*",
11
12 # Removes unwanted columns (see Methods - Appendix I for notes on col
13 discrete_temp_sites <- discrete_temp_sites_pull[which(names(discrete_
14 discrete_temp_data <- discrete_temp_data_pull[which(names(discrete_te
15
16 # Merge discrete_temp_sites & discrete_temp_data
17 discrete_temp_data_sites <- merge(discrete_temp_sites, discrete_temp_
18
```

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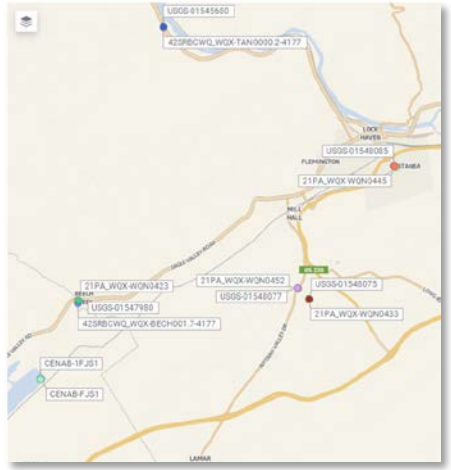
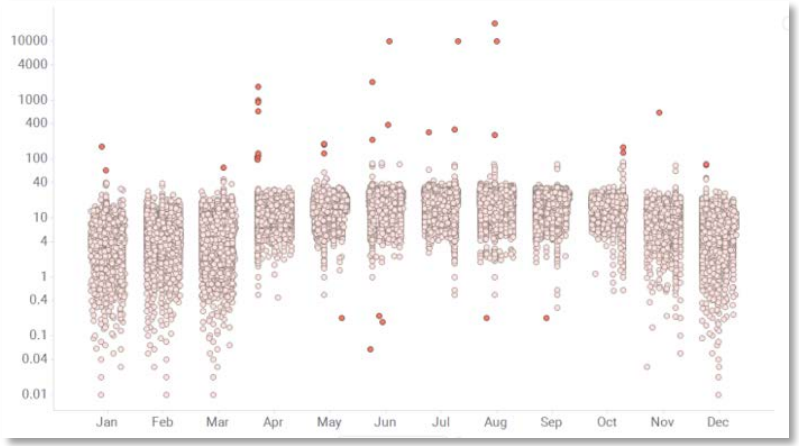
Implementing quality control (QC) procedures that can improve multi-agency datasets

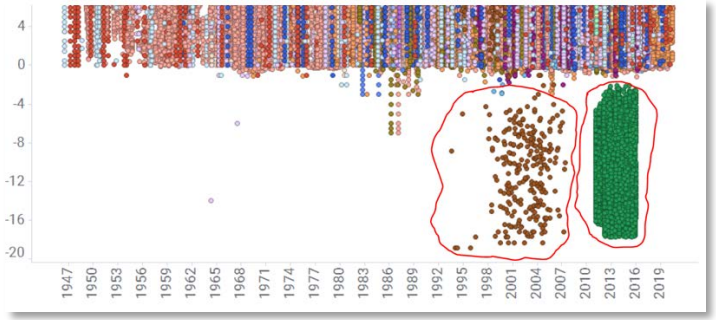
Site Duplication



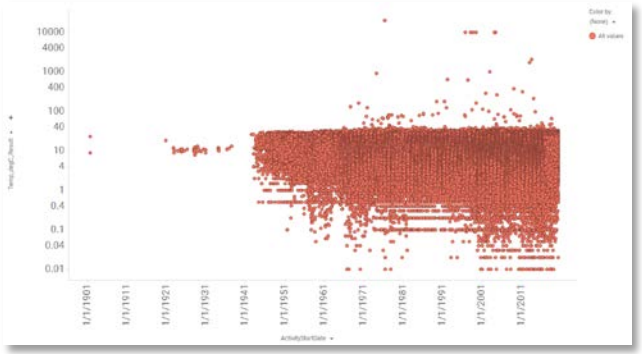
Outliers



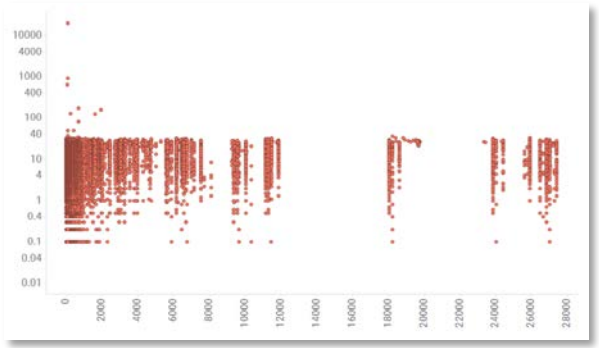
Wrong Units



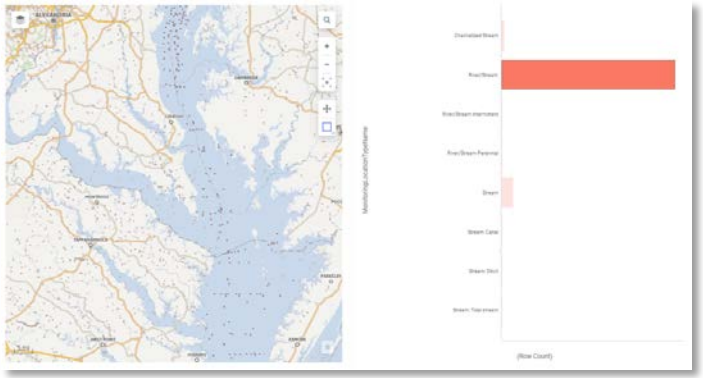
Detection Limits



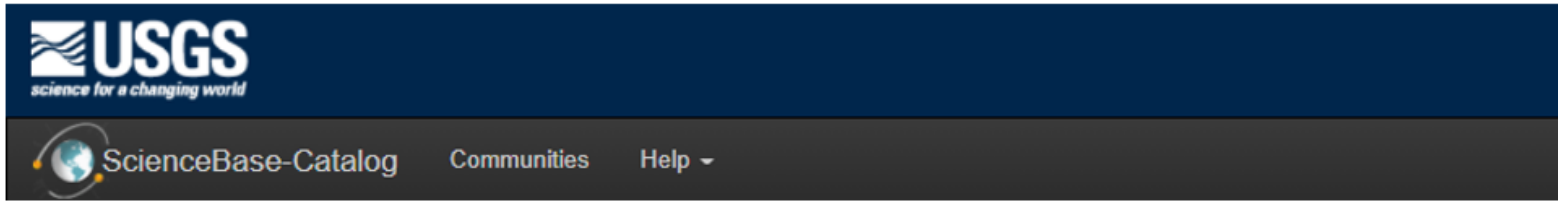
Incomplete Metadata



Coding Issues



Preparing a USGS data release that can be used as a foundation for a future framework



Data release: Compilation of multi-agency water temperature observations for streams in the Chesapeake Bay Watershed, 1894 -2021

Dates

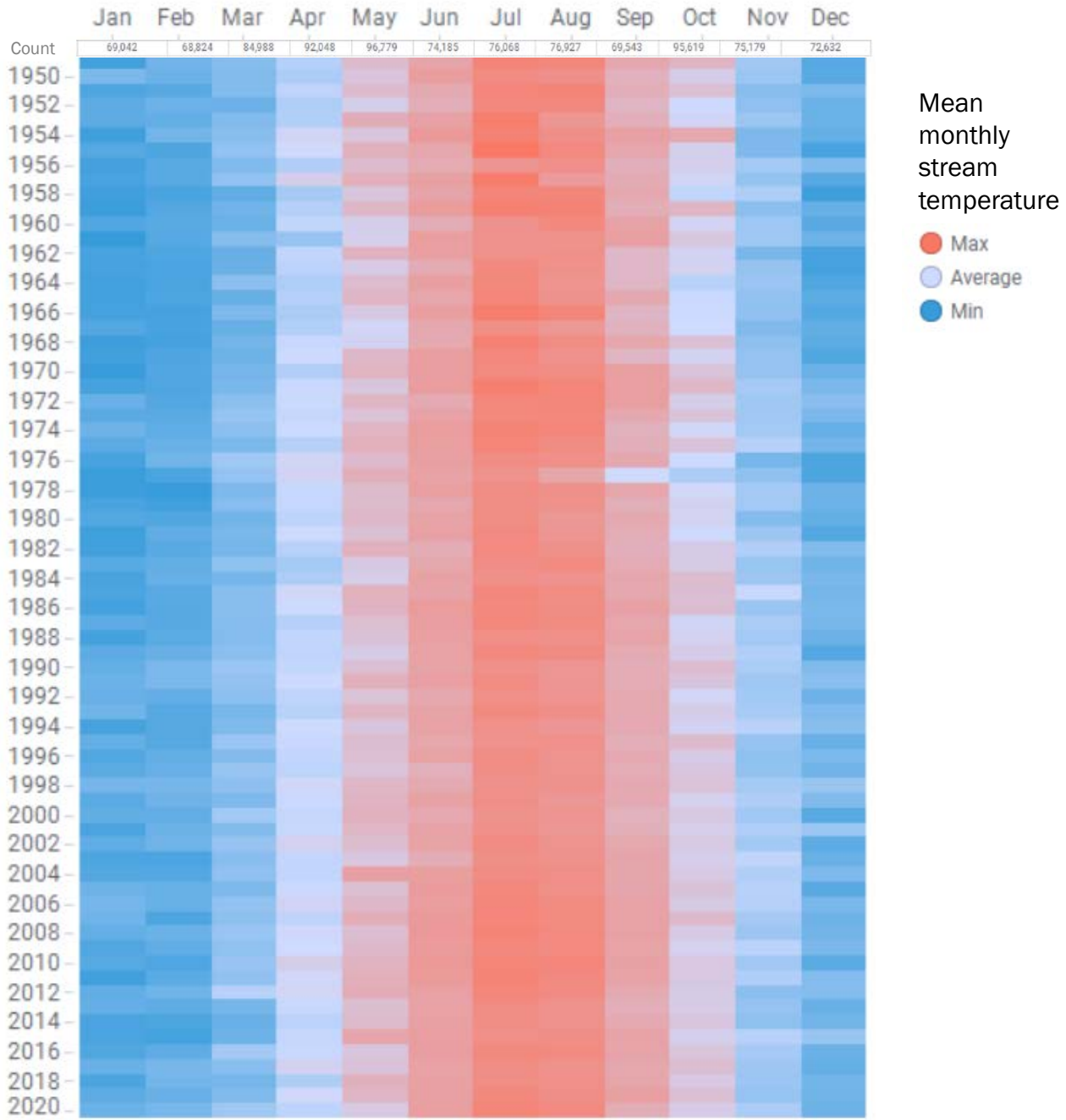
Publication Date: 2021
Start Date: 1894-08-30
End Date: 2021-12-01

Citation

John W. Clune, James Colgin, Charles Sandusky, and Tammy Zimmerman, 2021, Compilation of multi-agency water temperature observations for streams in the Chesapeake Bay Watershed, 1894 -2021 1: U.S. Geological Survey, https://doi.org/10.XXXX/XXXXX

site_id	date	mean_temp_degC	min_temp_degC	max_temp_degC	n_obs	source	flag	date_
USGS-01434025	2020-07-12T00:00:00Z	15.96	15.50	16.80	96	nwis_uv	P	7/12/2020
USGS-01434025	2020-07-13T00:00:00Z	15.91	15.20	16.80	96	nwis_uv	P	7/13/2020
USGS-01434025	2020-07-14T00:00:00Z	15.74	15.10	16.50	96	nwis_uv	P	7/14/2020
USGS-01434025	2020-07-15T00:00:00Z	15.42	14.80	16.10	96	nwis_uv	P	7/15/2020
USGS-01434025	2020-07-16T00:00:00Z	15.32	15.10	15.80	96	nwis_uv	P	7/16/2020
USGS-01434025	2020-07-17T00:00:00Z	15.09	14.60	16.10	96	nwis_uv	P	7/17/2020
USGS-01434025	2020-07-18T00:00:00Z	15.22	14.20	16.50	96	nwis_uv	P	7/18/2020
USGS-01434025	2020-07-19T00:00:00Z	15.82	15.00	17.00	96	nwis_uv	P	7/19/2020

Abundant daily stream temperature measurements will be available for **data exploration** (seasonal, monthly and annual)



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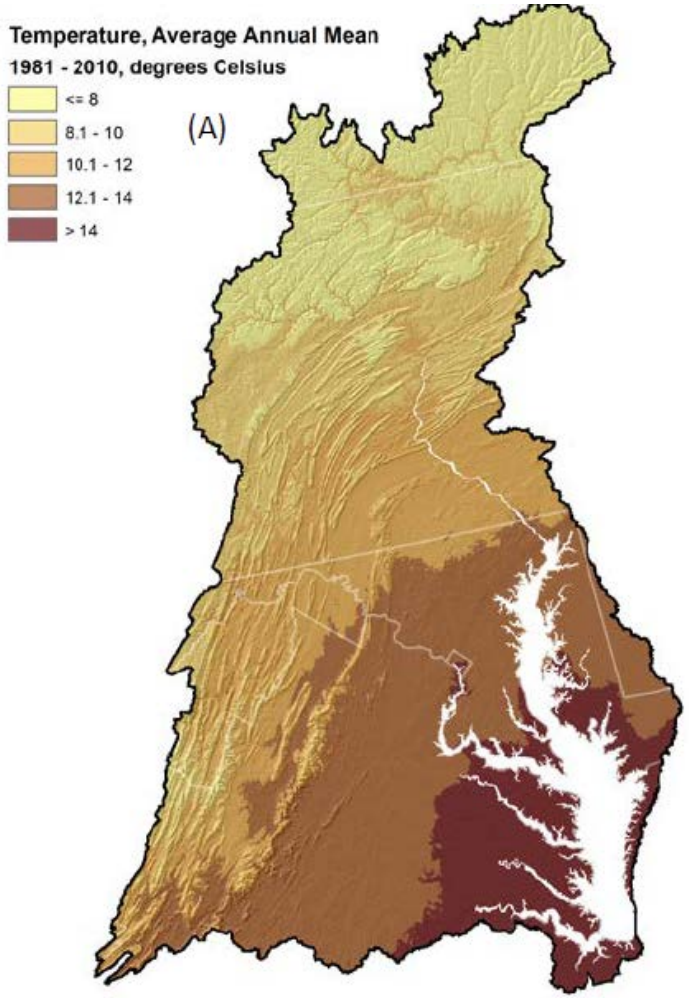
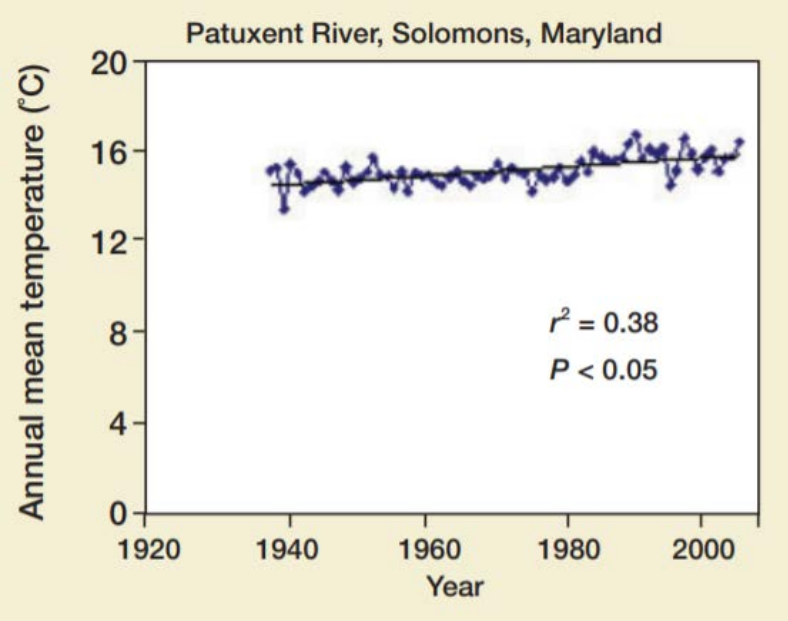


Publishing methods that will use daily observations to develop status and trends at sites with long term records



(https://doi.org/10.1890/090037)

Kaushal and others, 2010

Rice and Jastram,

Ashizawa and Cole, 1994

Webb and Nobilis, 1995

Durance and Ormerod, 2007

Wagner and others, 2017

Hirsh and others, 2010

Oliver and others, 2022

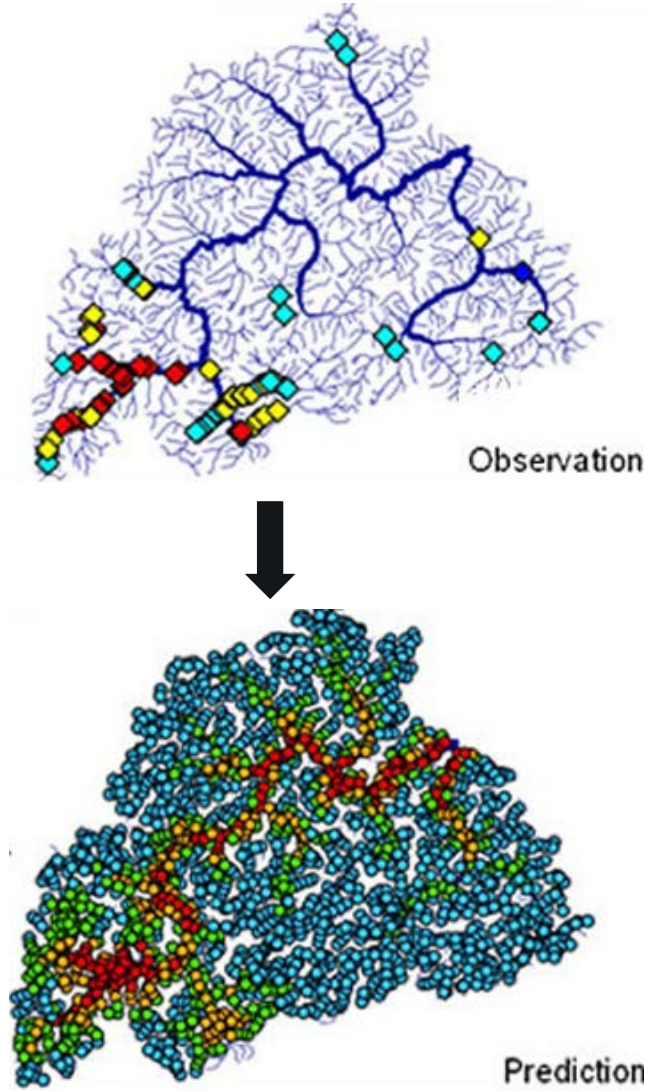
Evaluating **models** that will use these data to better **predict stream temperature** spatially across the Chesapeake Bay watershed (100k, 24k scale)

USGS SPARROW

Ecosheds

Bay Model

EPA SSN Models



Courtesy
Naomi Detenbeck (US EPA)

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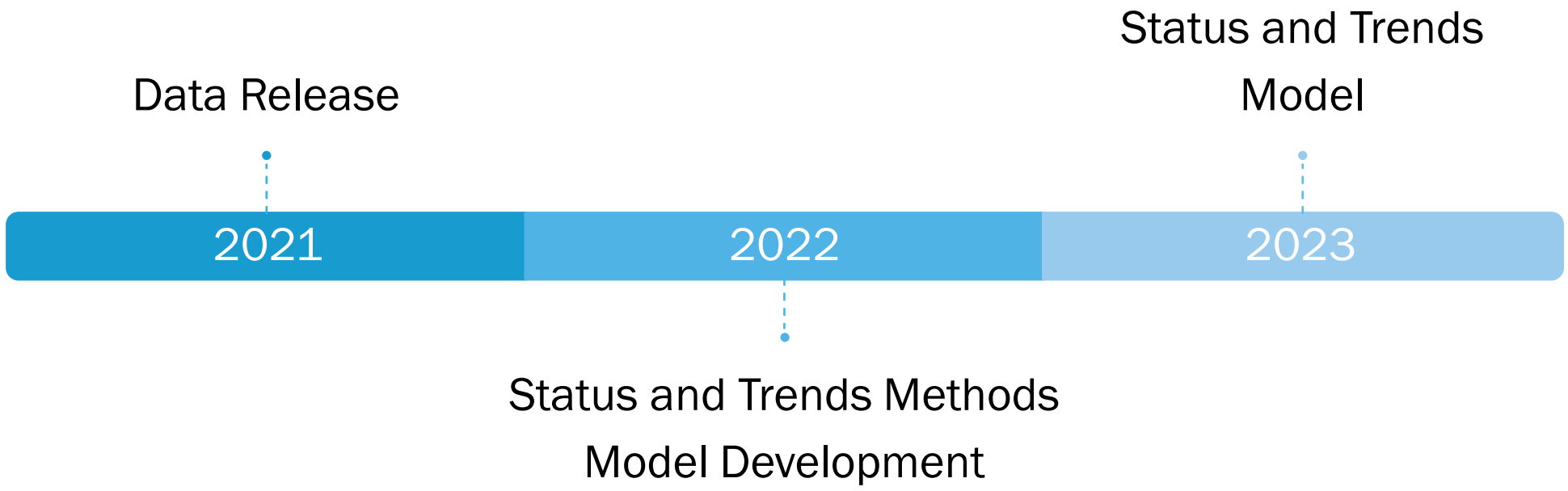
The next few years will bring new
advances in understanding stream temperature
across the Chesapeake Bay watershed.



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THANK YOU


Photo by Max Andrey from Pexels

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