Development of Fine-Scale Inputs for the Chesapeake Regional Hydrology Model (CRHM)

Modeling Workgroup Quarterly Call
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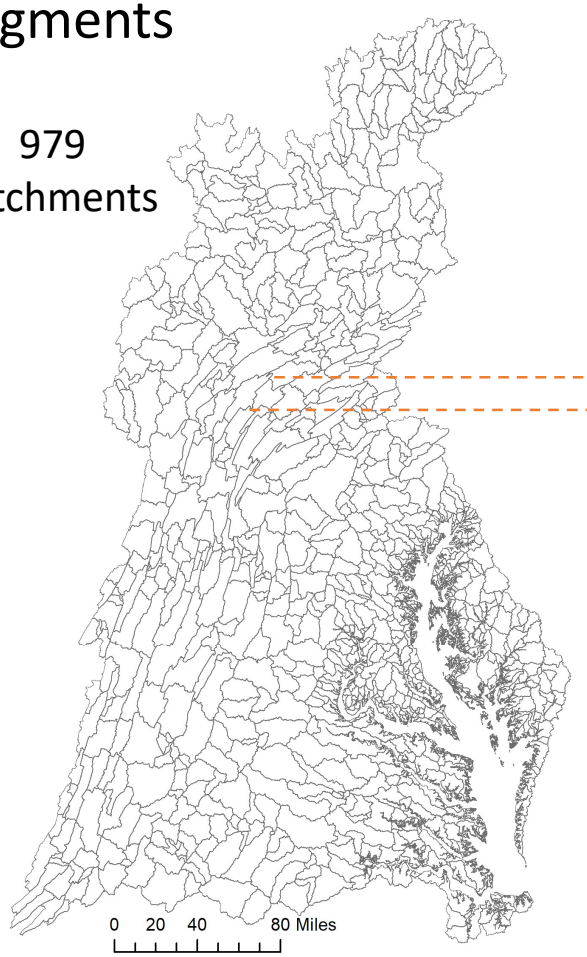
From Phase 6 scale to NHDPlus scale

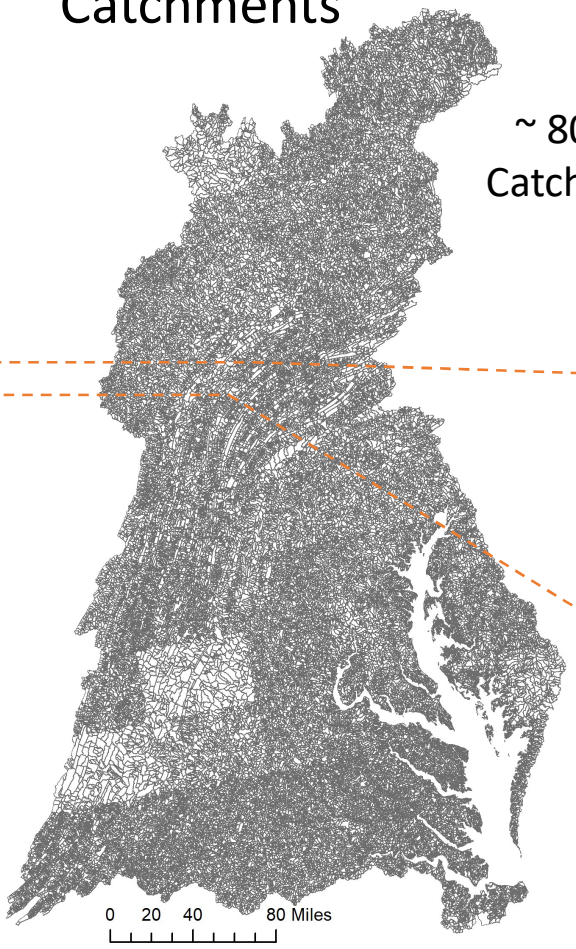
Phase 6 (P6) river segments

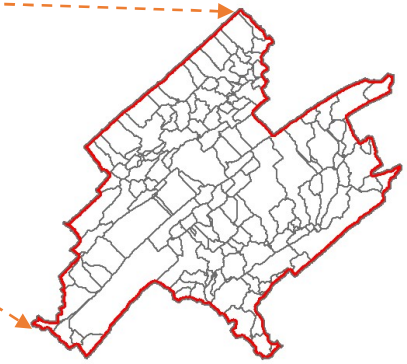
979 Catchments



NHDPlus Catchments

~ 80,000 Catchments

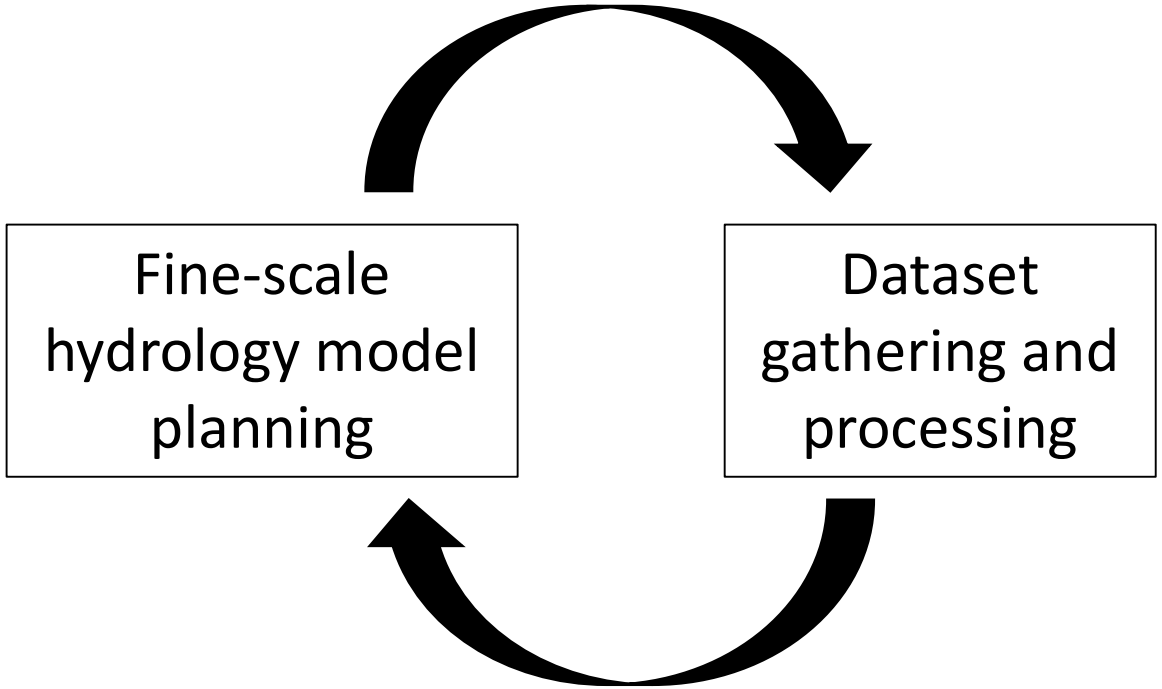




0 3.5 7 14 Miles

From Phase 6 scale to NHDPlus scale

Need for finer-scale datasets



Examples of finer-scale inputs

- Water diversions (collaborators: **John Brakebill** & colleagues)
- Improved Reservoir Operation Rules (collaborators: **ICPRB** (**Sarah Ahmed, Cheri Schulz**), **VA DEQ** (**Rob Burgholzer**) and **SRBC** (**John Balay, Can Liu**)
- Temporal downscaling of monthly point source flow and loads (collaborators: **"ChesapeakeU" student** to start in 2021?)
- Hyper-resolution hydrography and watershed features (**Peter Claggett** & colleagues)
- …
- …

“Low-hanging fruit”: Thermal loading from point sources

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- Heat from point source facilities may have a significant impact **LOCALLY**, especially at the finer NHDplus stream scale

Thermal loading from point sources: what`s available?

Two major sources of information inspected:

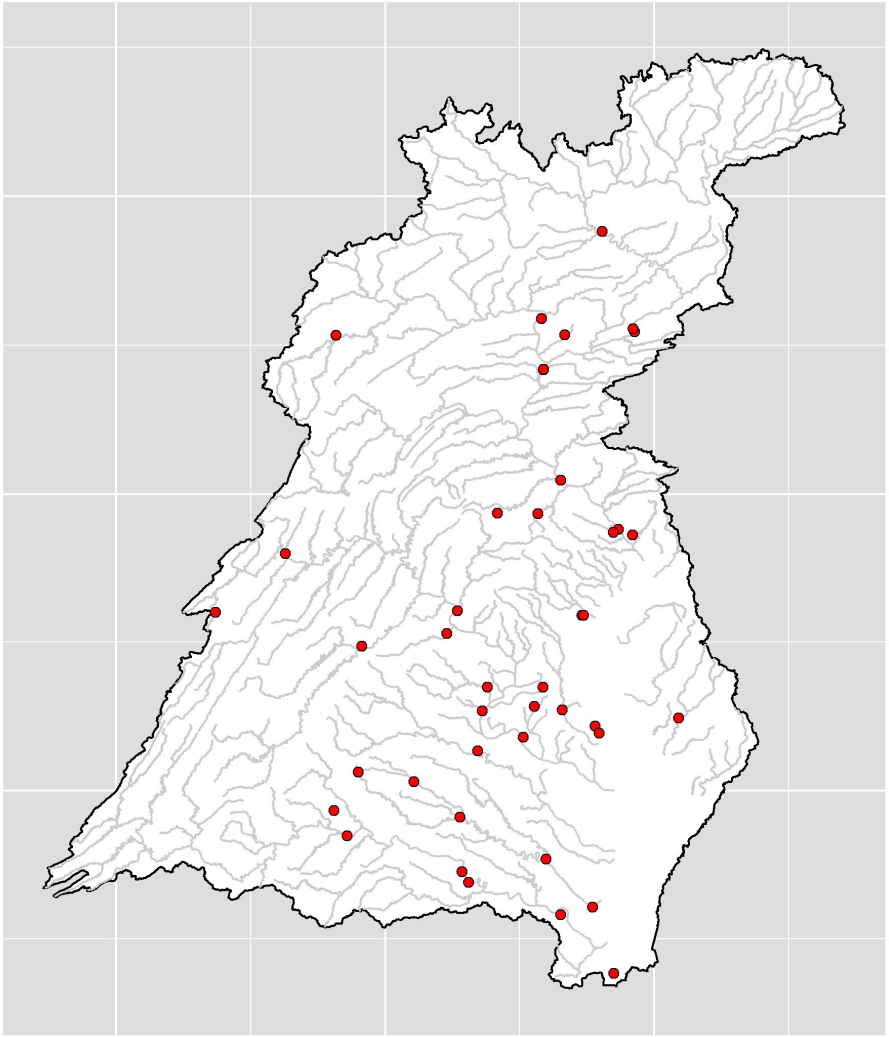
- US Energy Information Administration (**EIA**)
- **ICIS-NPDES** Permit Limit and Discharge Monitoring Report (**DMR**) Data Sets

EIA Data

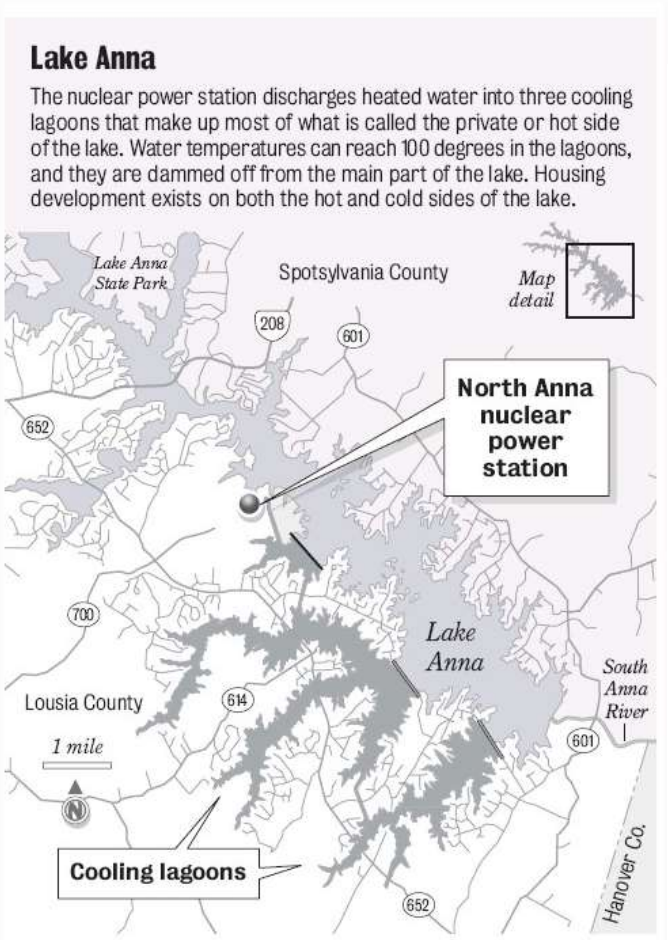
- Monthly average and maximum temperature at Intake and Discharge of ~ 40 thermoelectric power plants in the CB watershed

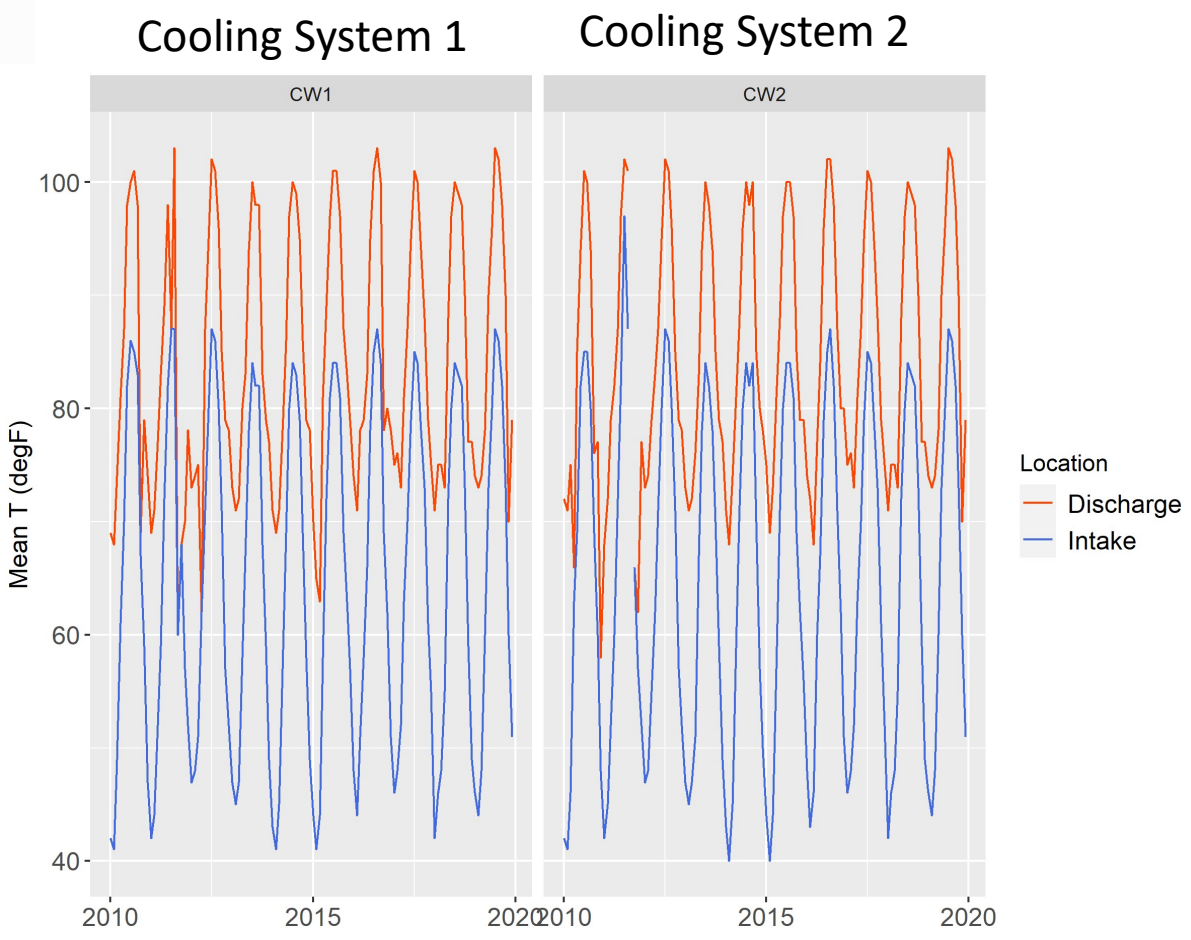
- Monthly data on diversion, withdrawal, consumption, and discharge volumes

- Starting in 2010

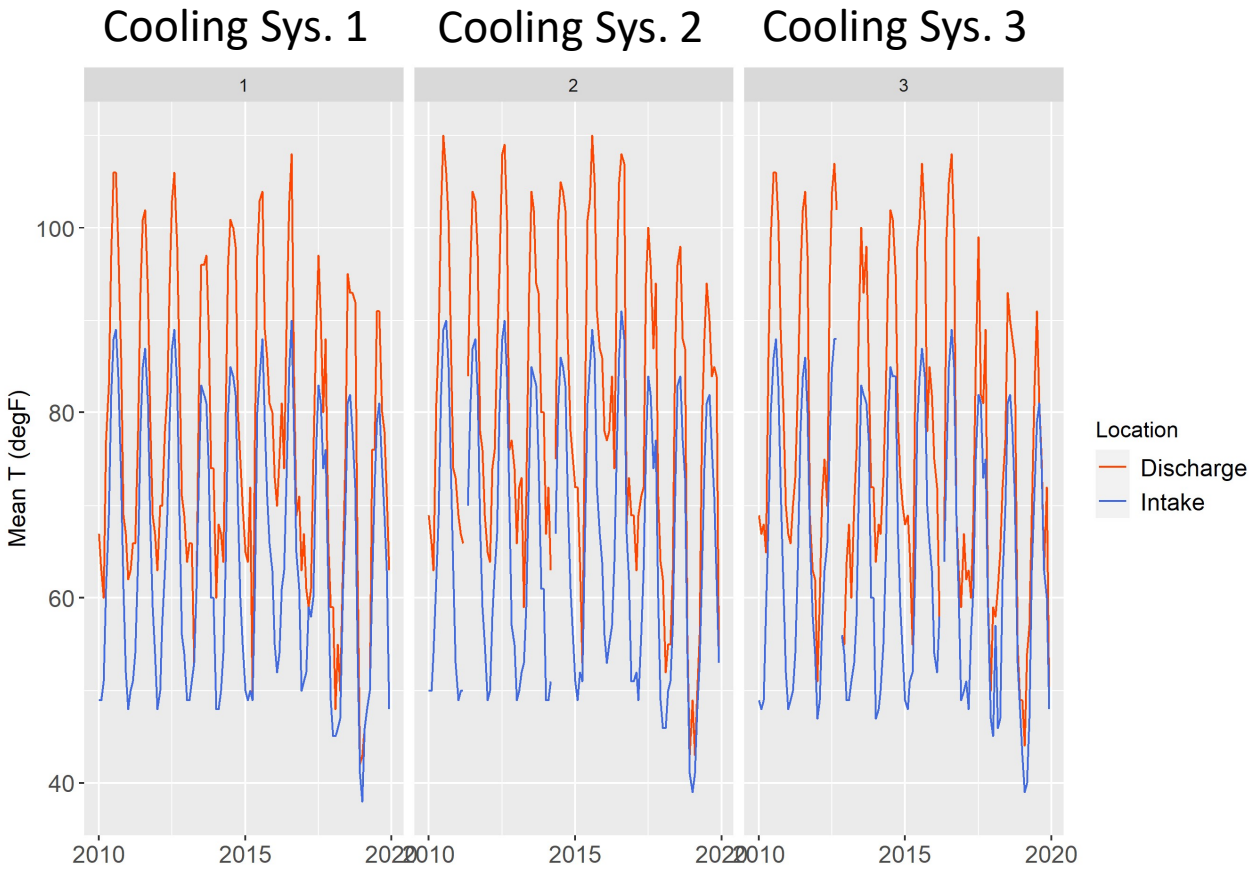


Example of EIA data: North Anna Power Plant, VA





Example of EIA data: Mt. Storm Power Plant, WV



EIA Data

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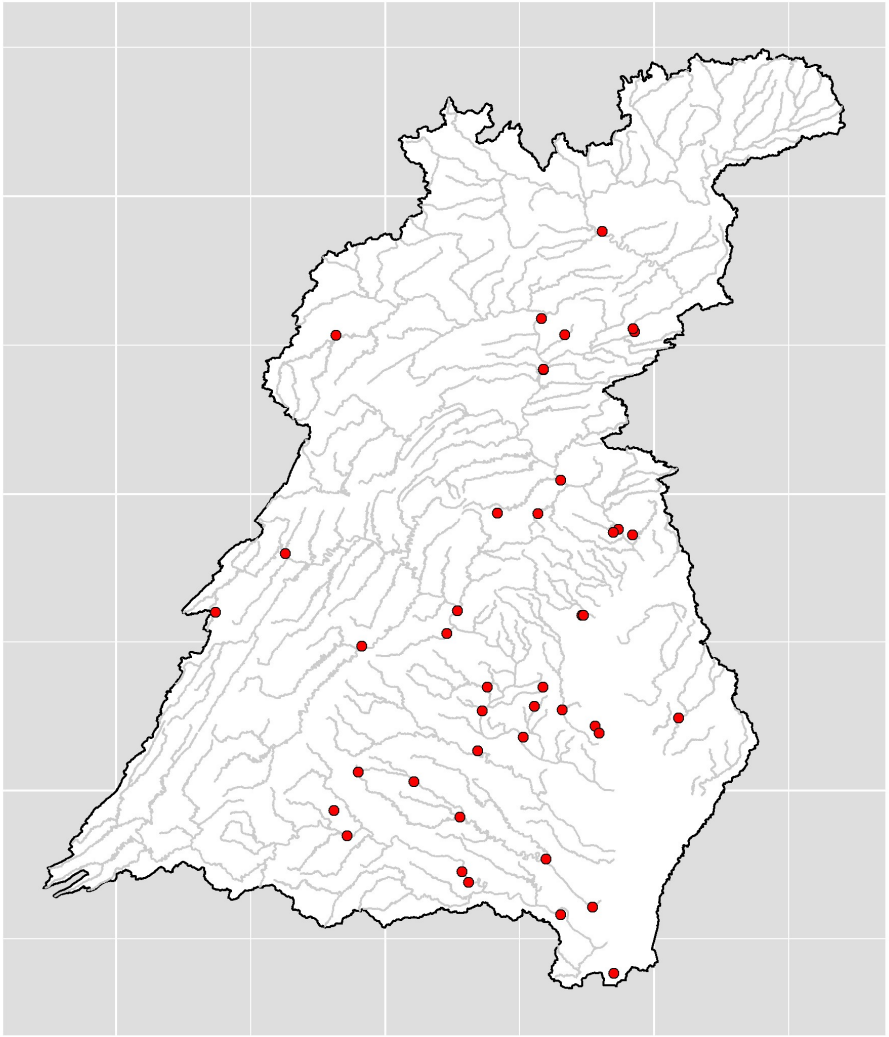
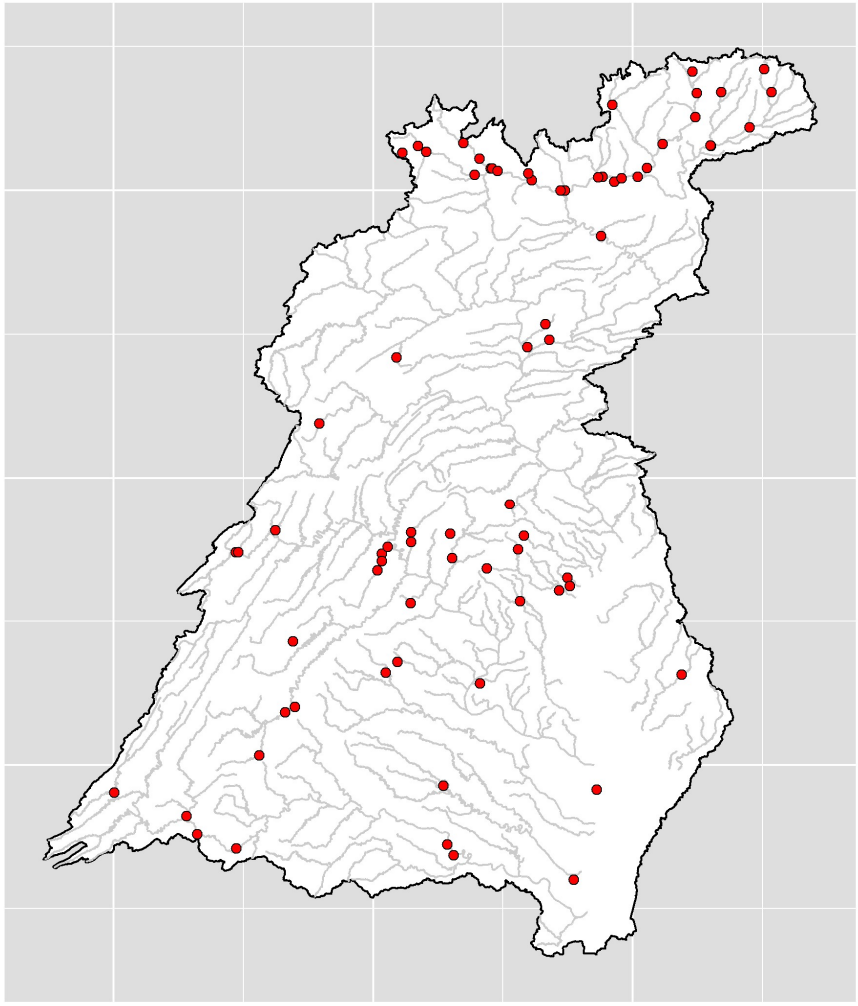
- **We cross-checked and all facilities that report to EIA also report to ICIS-NPDES**



ICIS-NPDES DMR Data

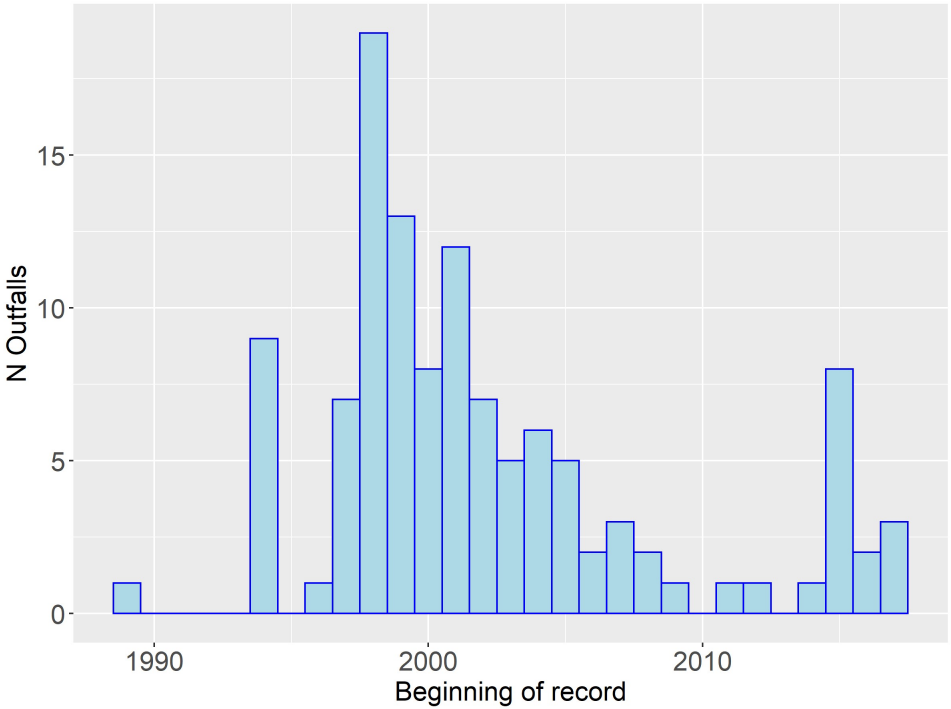
- Monthly outfall temperature/BTU data (thanks to Point Source team – **Jess Rigelman, Megan Thynge, Suchit Ravi**)

- As an example, out of 519 **significant** facilities, 70 report temperature data

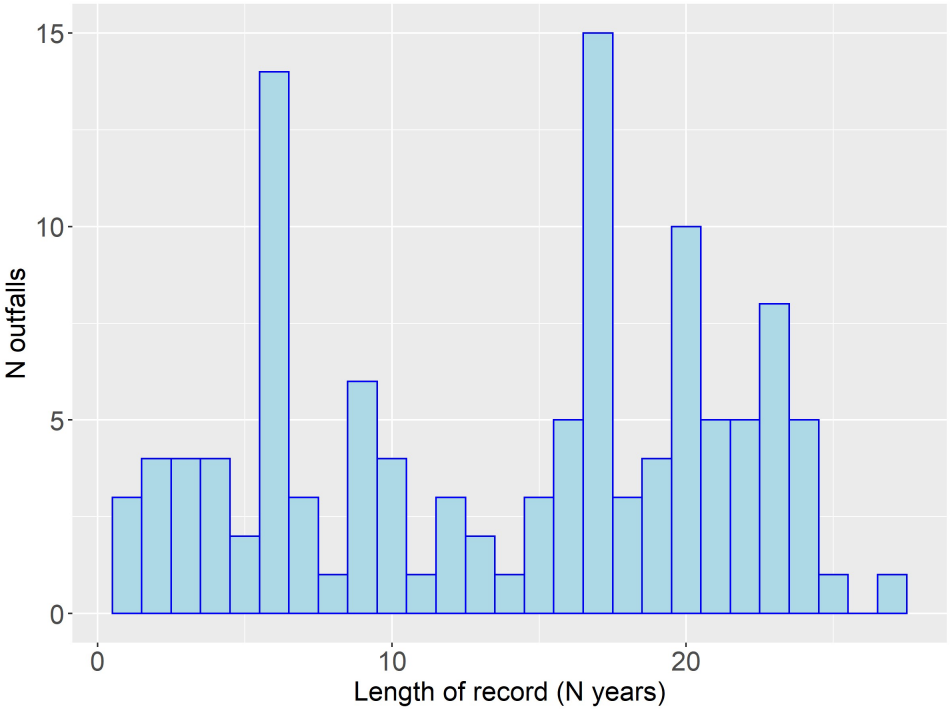


ICIS-NPDES DMR Data – Significant Facilities

Beginning of record



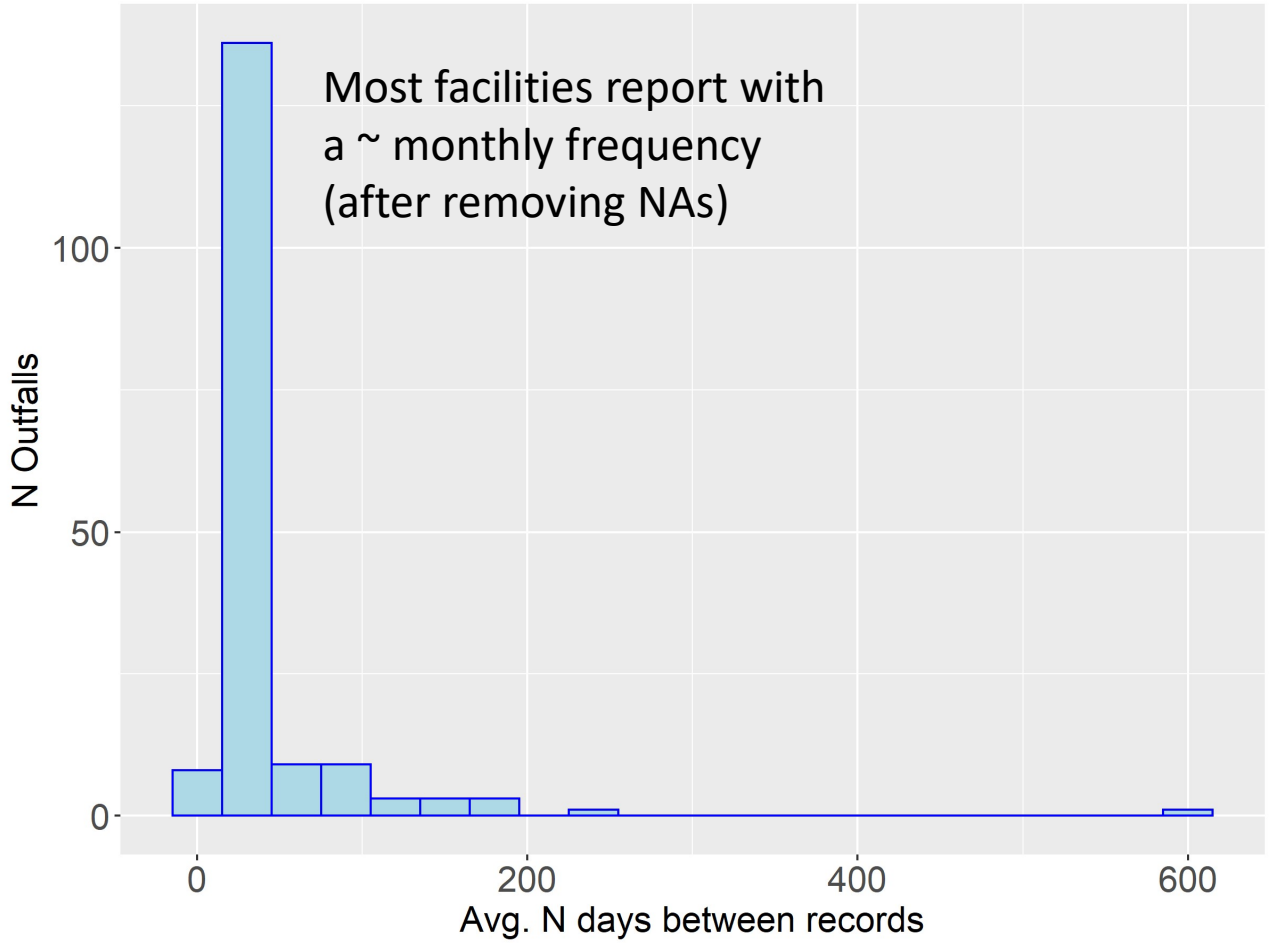
Length of record



Note that the N of outfalls is > N of facilities (one facility can have multiple permitted outfalls)

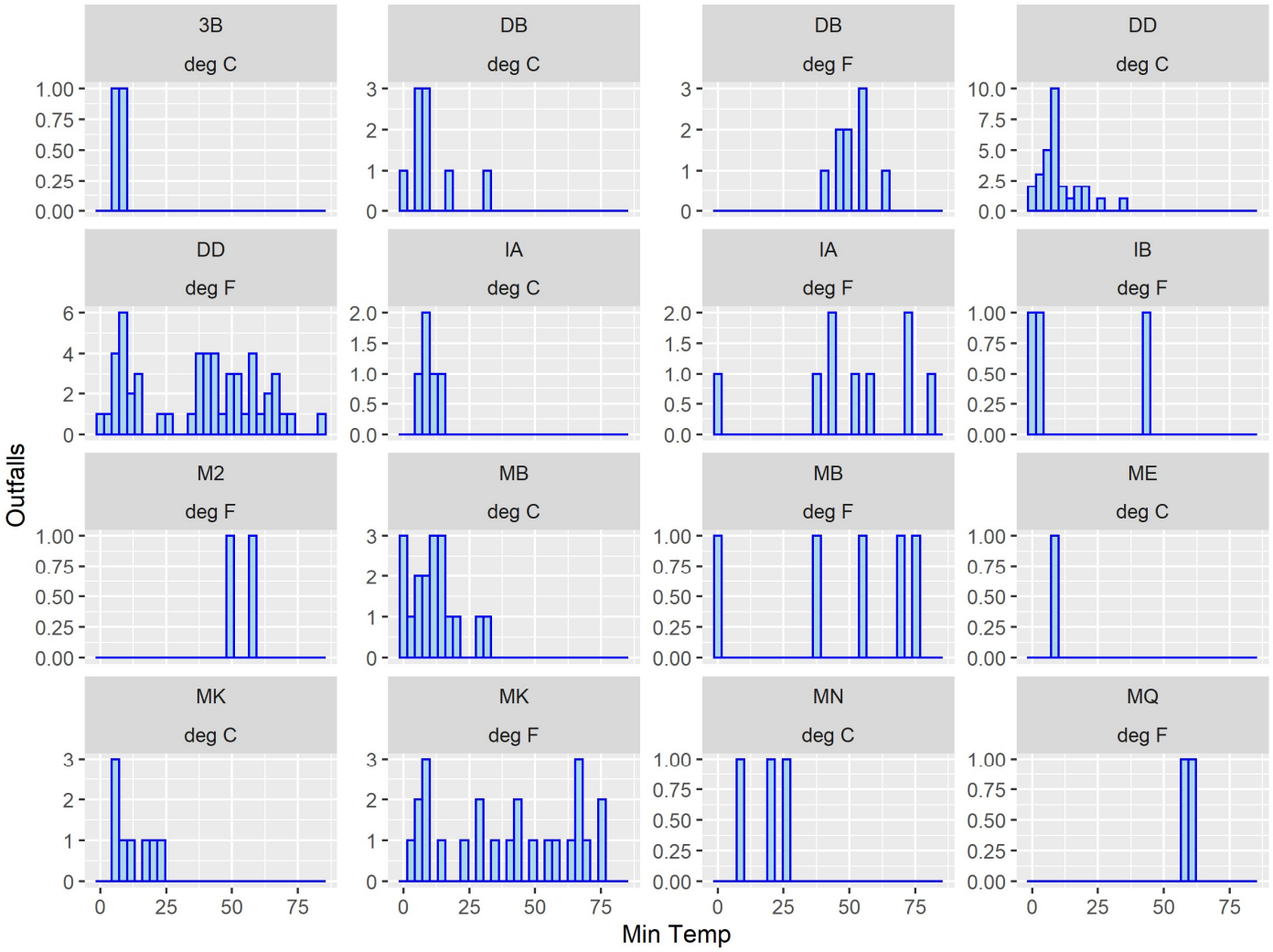
ICIS-NPDES DMR Data – Significant Facilities

Reporting Frequency



ICIS-NPDES DMR Data – Significant Facilities

Minimum Reported Temperature



- Each panel represents a different combination of SUMMARY METRIC (avg, max..) x UNIT of MEASURE (°C, °F)
- No obvious extreme values, except for some zeroes

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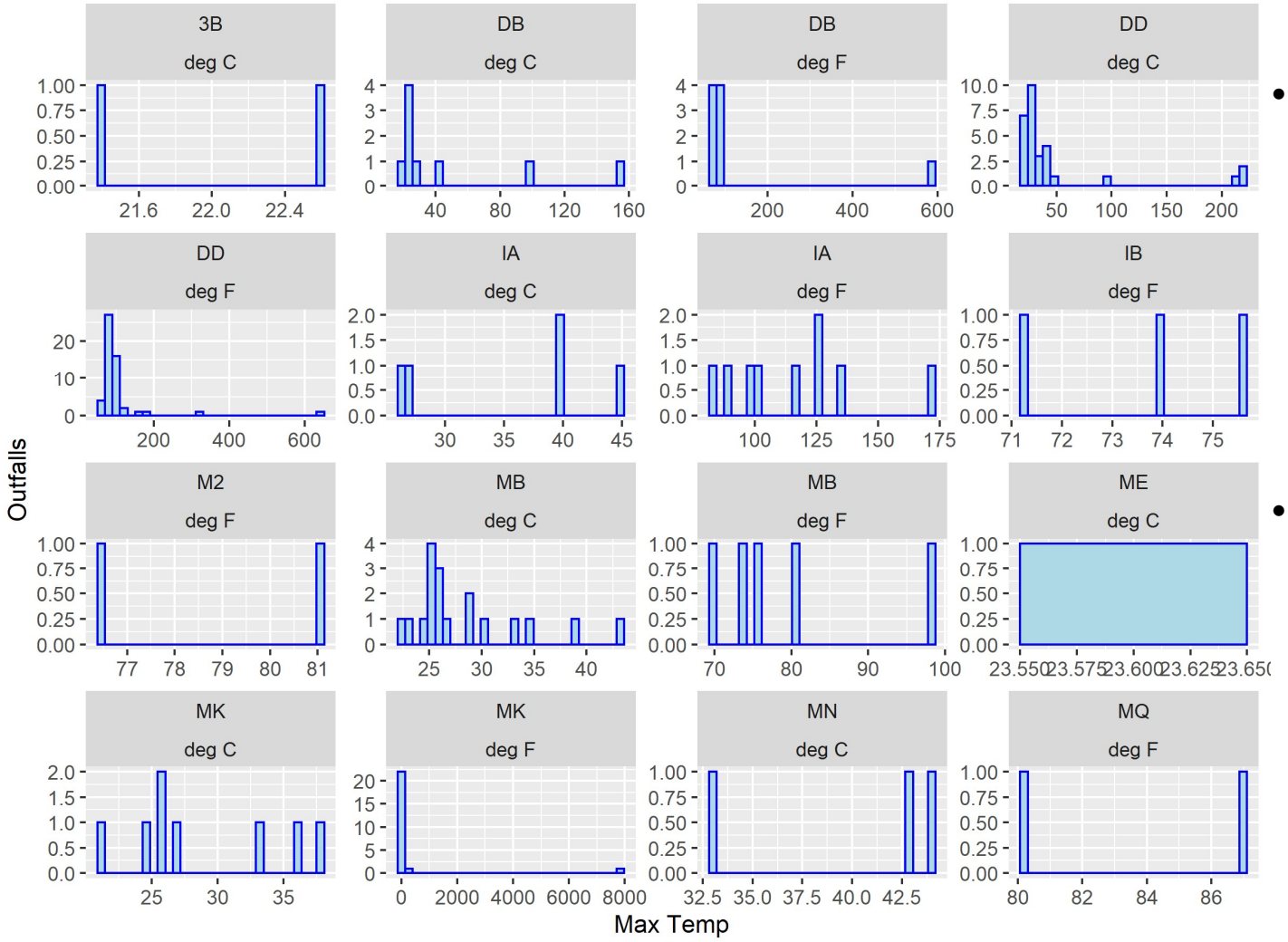

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- Raw point source temperature data from DMR easily available
- Filling in missing data and performing QAQC is the most time-consuming step
- We will need to decide whether potential local gains in terms of temperature prediction accuracy are worth investing resources in processing the raw data
- This could be a suitable project for a “ChesapeakeU” student?