

SHEDS

Project Status
Data Uploading Tutorial
Stream Temperature Model
ICE Updates

Jeffrey D Walker, PhD
Walker Environmental Research, LLC

MEWTWG Meeting
April 29, 2019

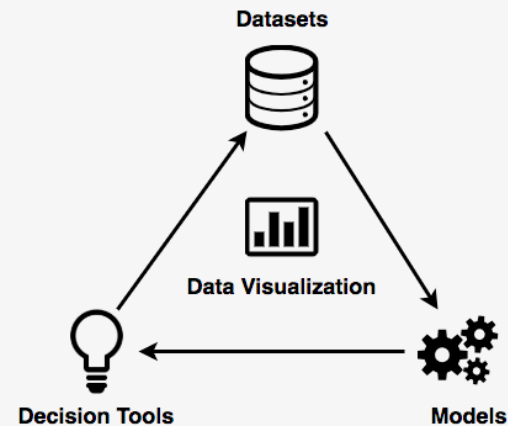
Spatial Hydro-Ecological Decision System (SHEDS)

Seamlessly linking hydro-ecological datasets, models, and decision support systems

What is SHEDS?

SHEDS is a collection of innovative data visualization and decision support tools for exploring and better understanding dynamic relationships in stream ecosystems.

SHEDS seamlessly links datasets, models, and decision support systems into a powerful platform for gaining insight, supporting transparent decision making, and improving management of hydro-ecological resources.



<http://ecosheds.org/>

Project Status

- Bad News
 - Active funding coming to an end... 😞
- Good News
 - USGS is planning to adopt SHEDS! 🎉
 - Migrate to USGS cloud computing services
 - Funding support from USGS Conte Lab for ongoing maintenance and hosting costs
- What this will mean for you
 - SHEDS will live on in its current form with full database functionality, model updates, etc.
 - No further development of existing services without new funding

Project Updates

- Temperature and Brook Trout Occupancy Models
 - Code re-written for (mostly) automated updating
 - Re-calibrate every 6 months
 - New documentation and versioning system
- Interactive Catchment Explorer
 - Code re-written to increase flexibility and allow for larger datasets (more variables)
 - New tutorial and help sections
 - Improved download functionality

Data Upload Tutorial

<http://db.ecosheds.org/>

Stream Temperature Model

Q: Where should we put more loggers to improve model performance?

A: 🤔

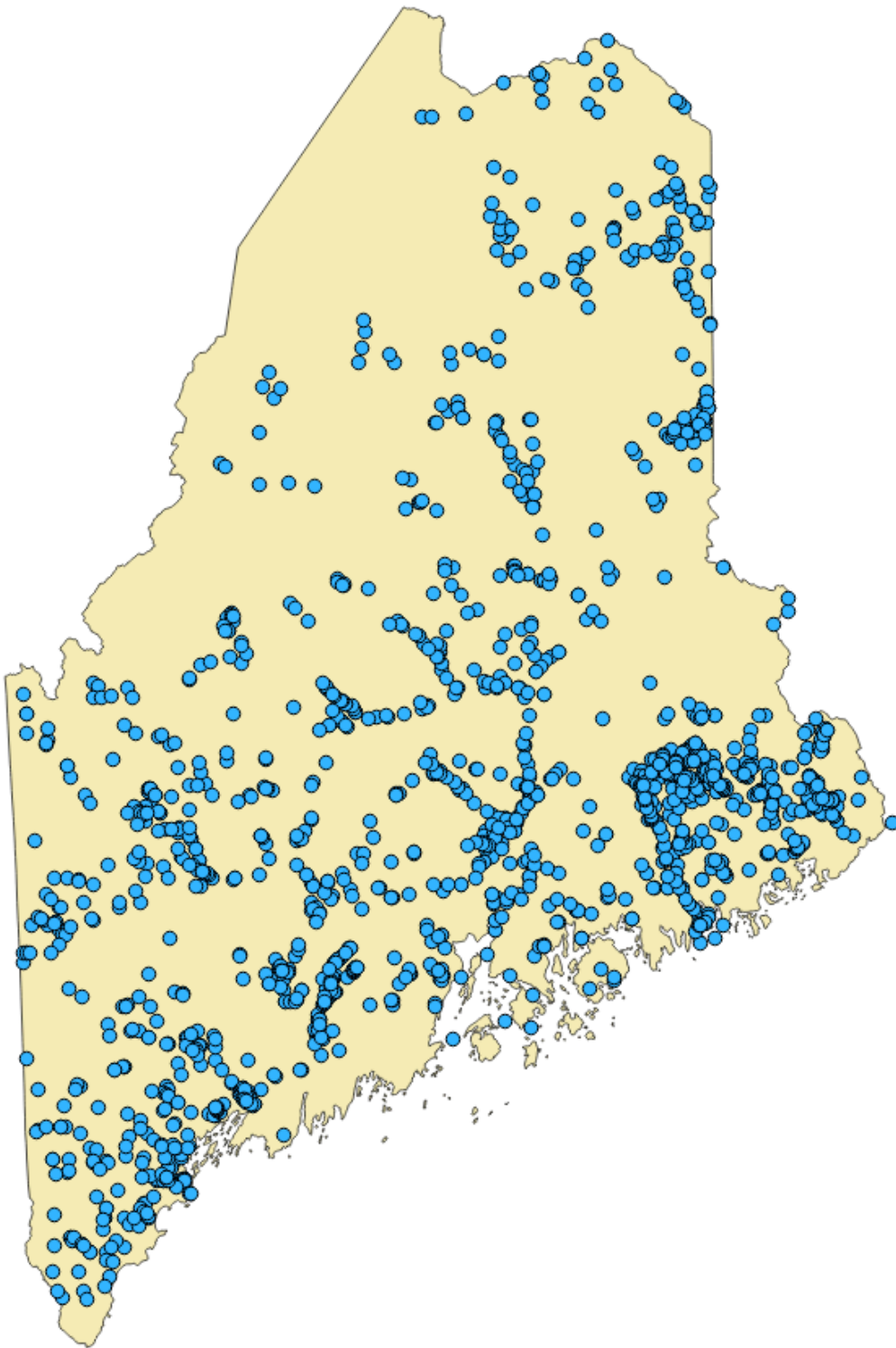
1. Which stations get used in the model?
2. How does each station contribute to the model calibration?

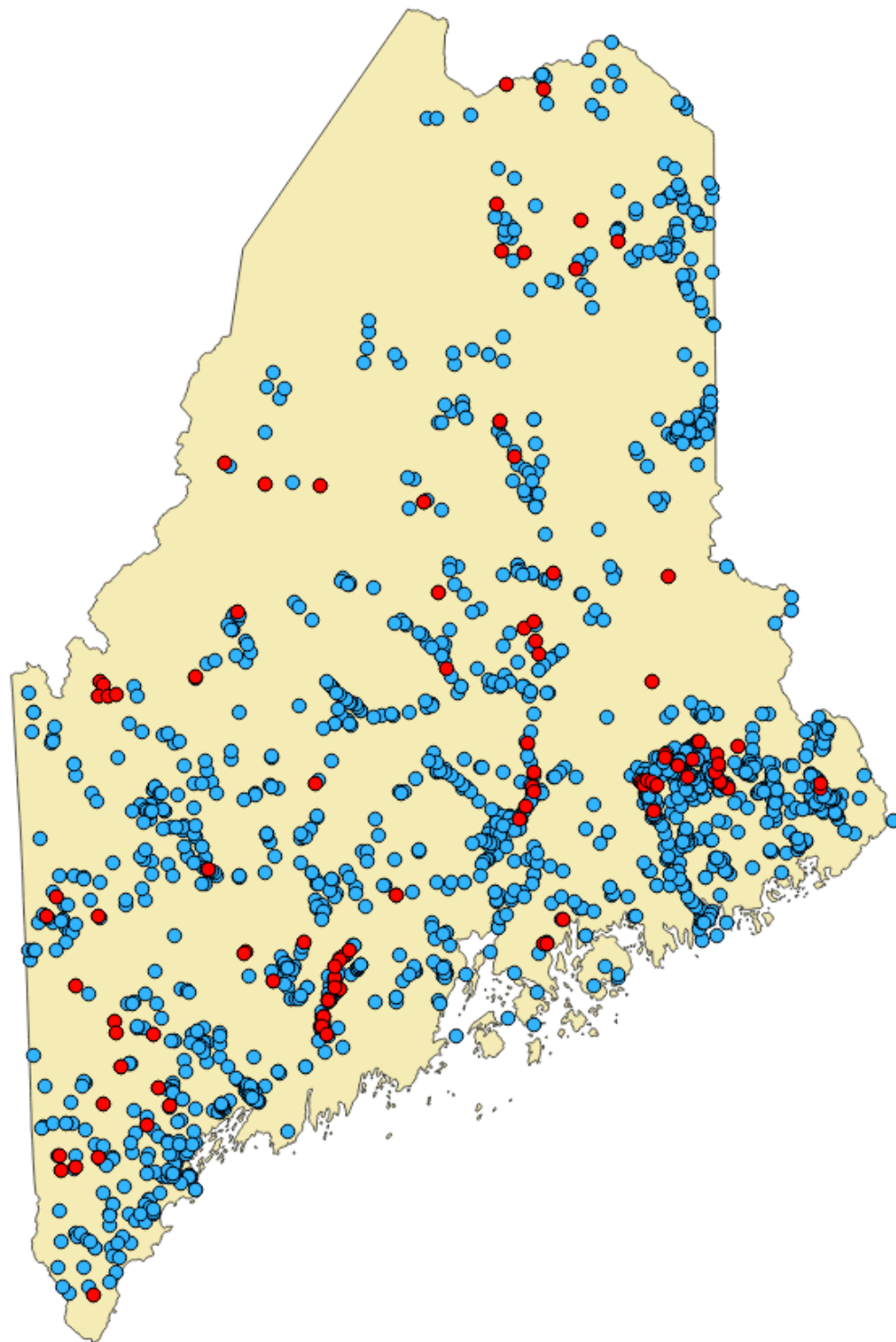
Part 1

Which stations get used in the model?

Station Screening

1,780 Total Stations (in ME)

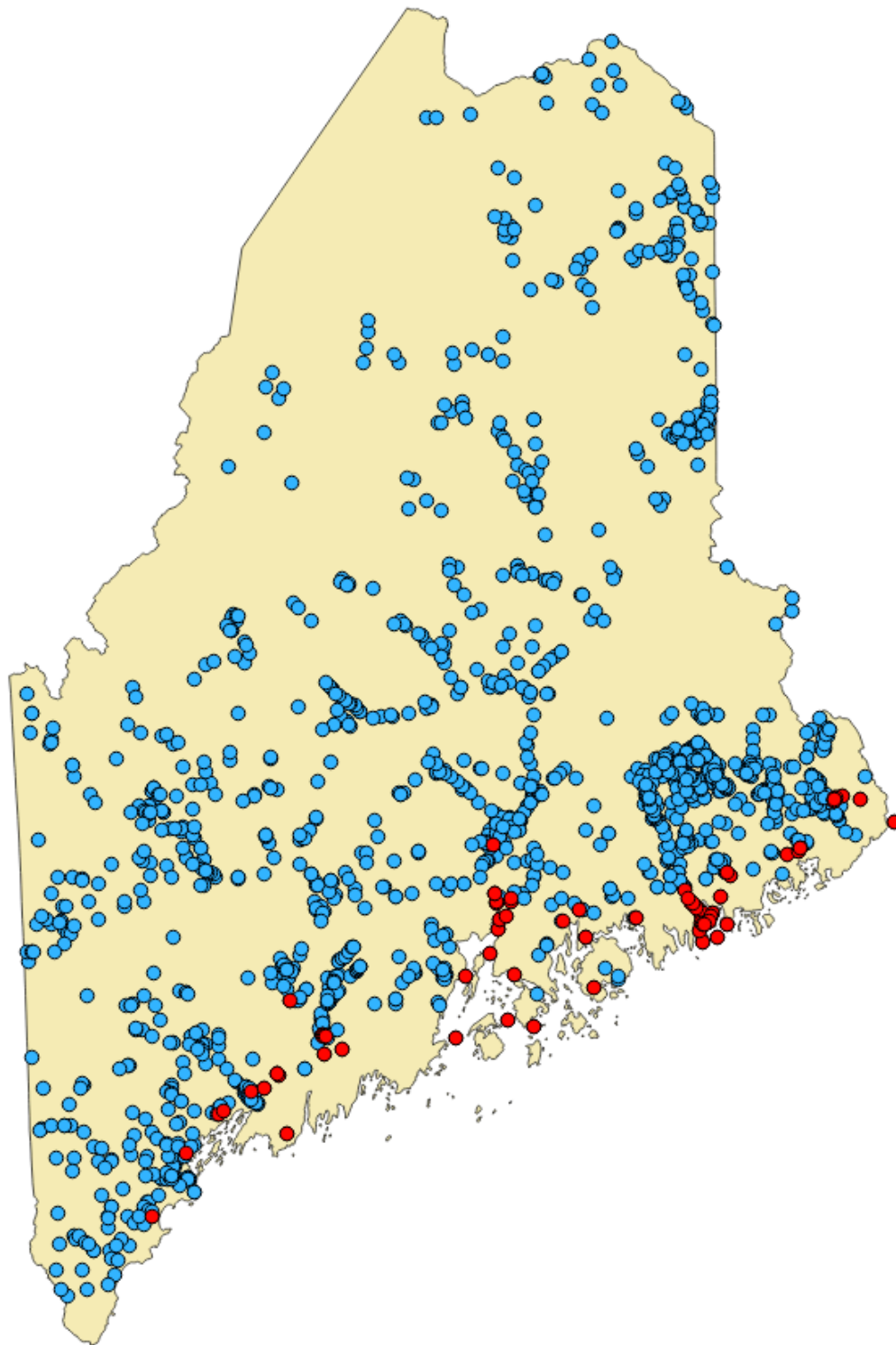




Station Screening

1,780 Total Stations (in ME)

– 106 No Data

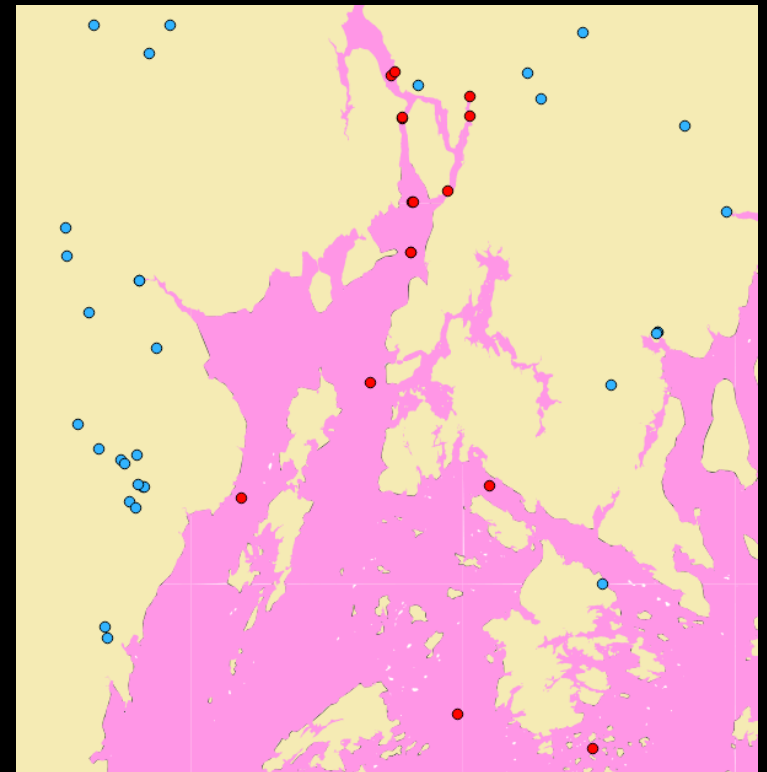


Station Screening

1,780 Total Stations (in ME)

– 106 No Data

– **90 Tidal**



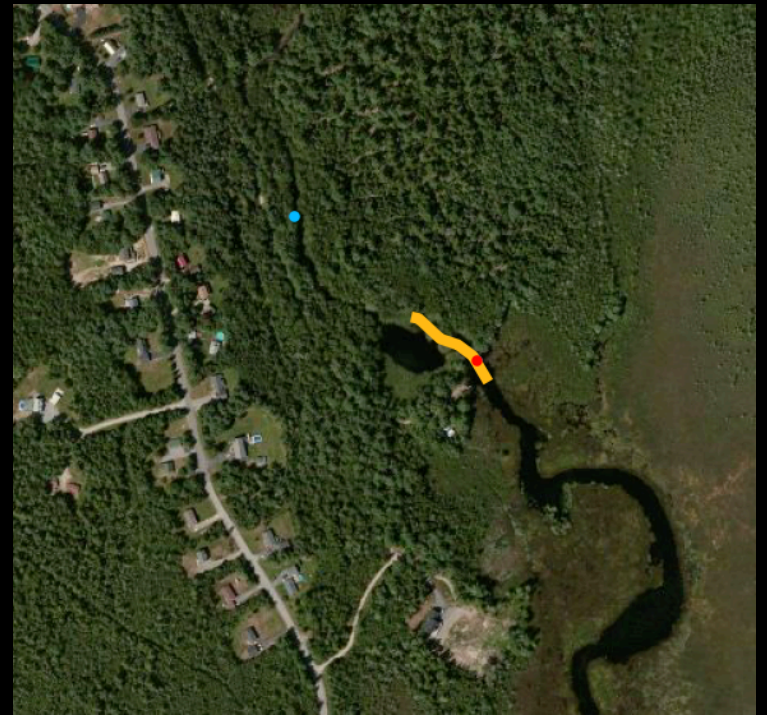
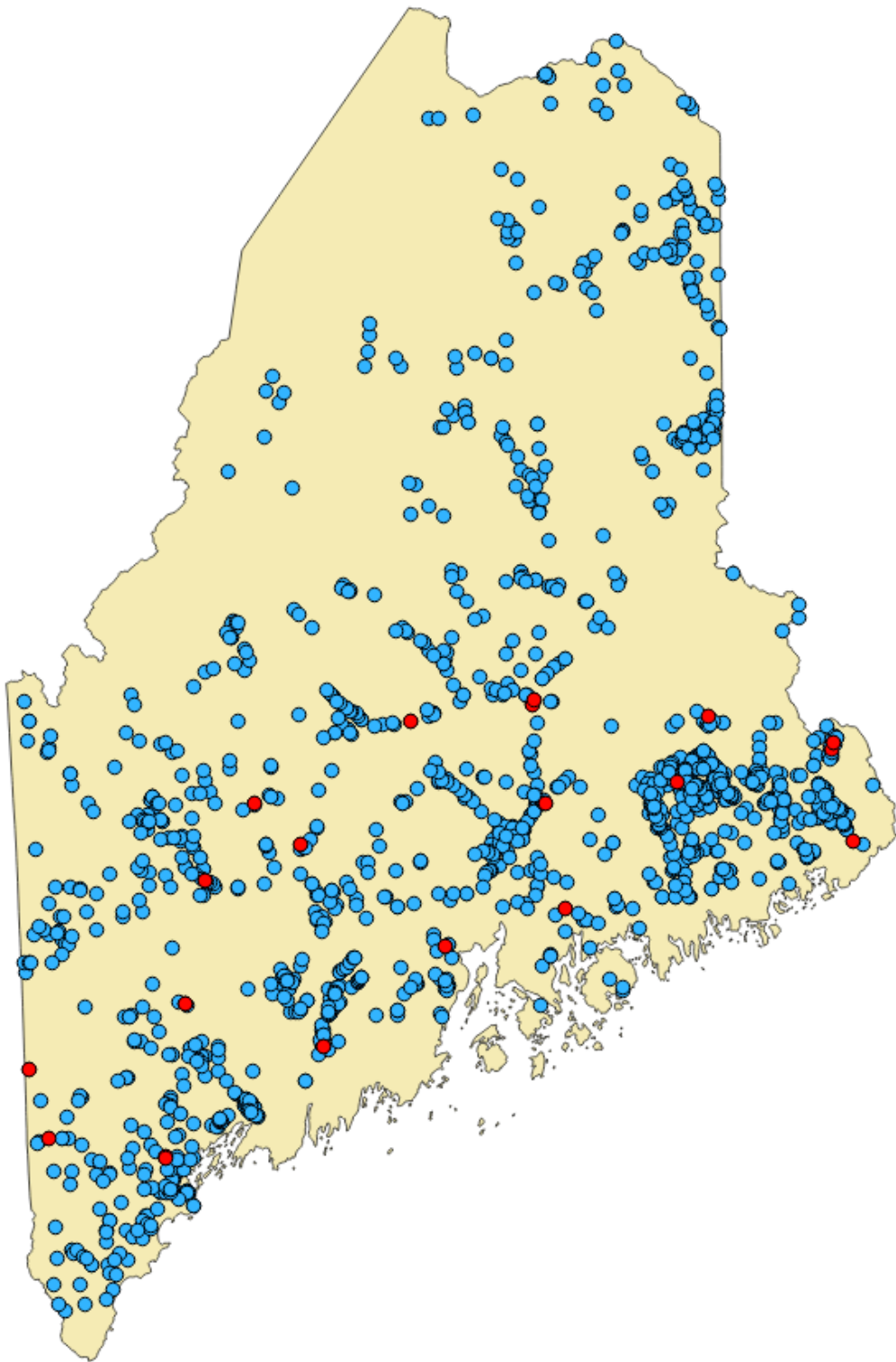
Station Screening

1,780 Total Stations (in ME)

– 106 No Data

– 90 Tidal

– **21 Near Impoundment**



Station Screening

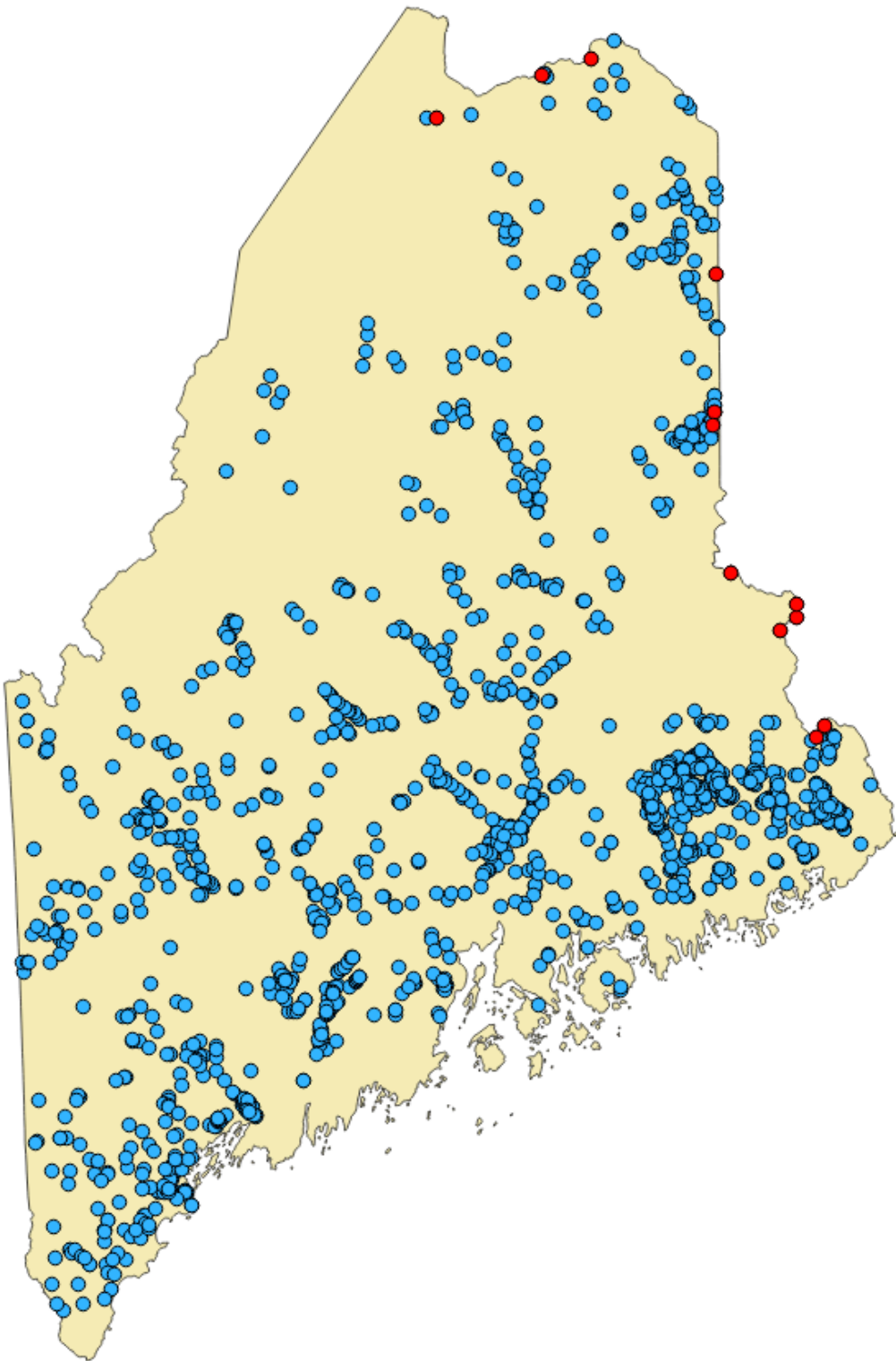
1,780 Total Stations (in ME)

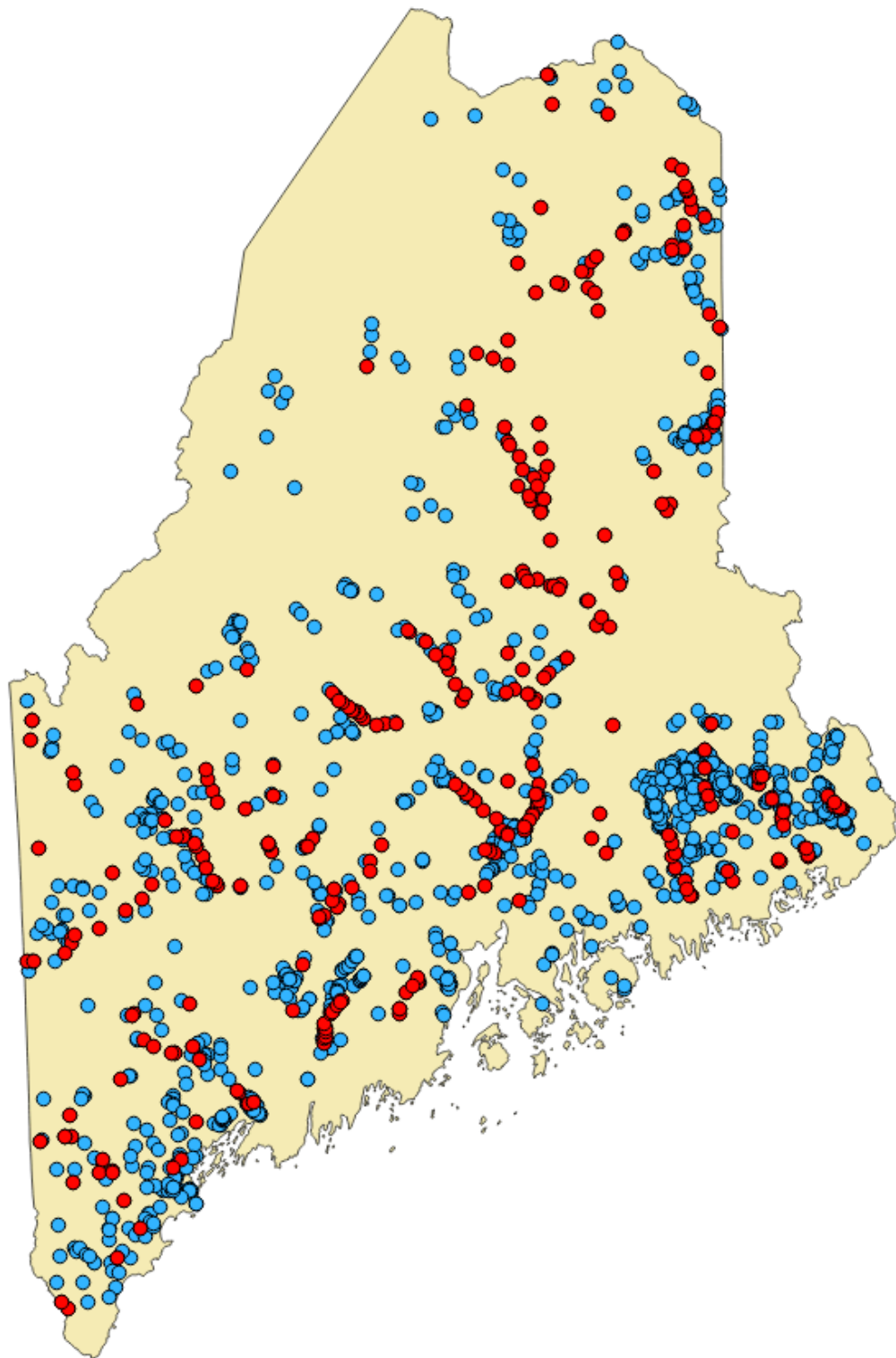
– 106 No Data

– 90 Tidal

– 21 Near Impoundment

– **13 Missing Covariates**





Station Screening

1,780 Total Stations (in ME)

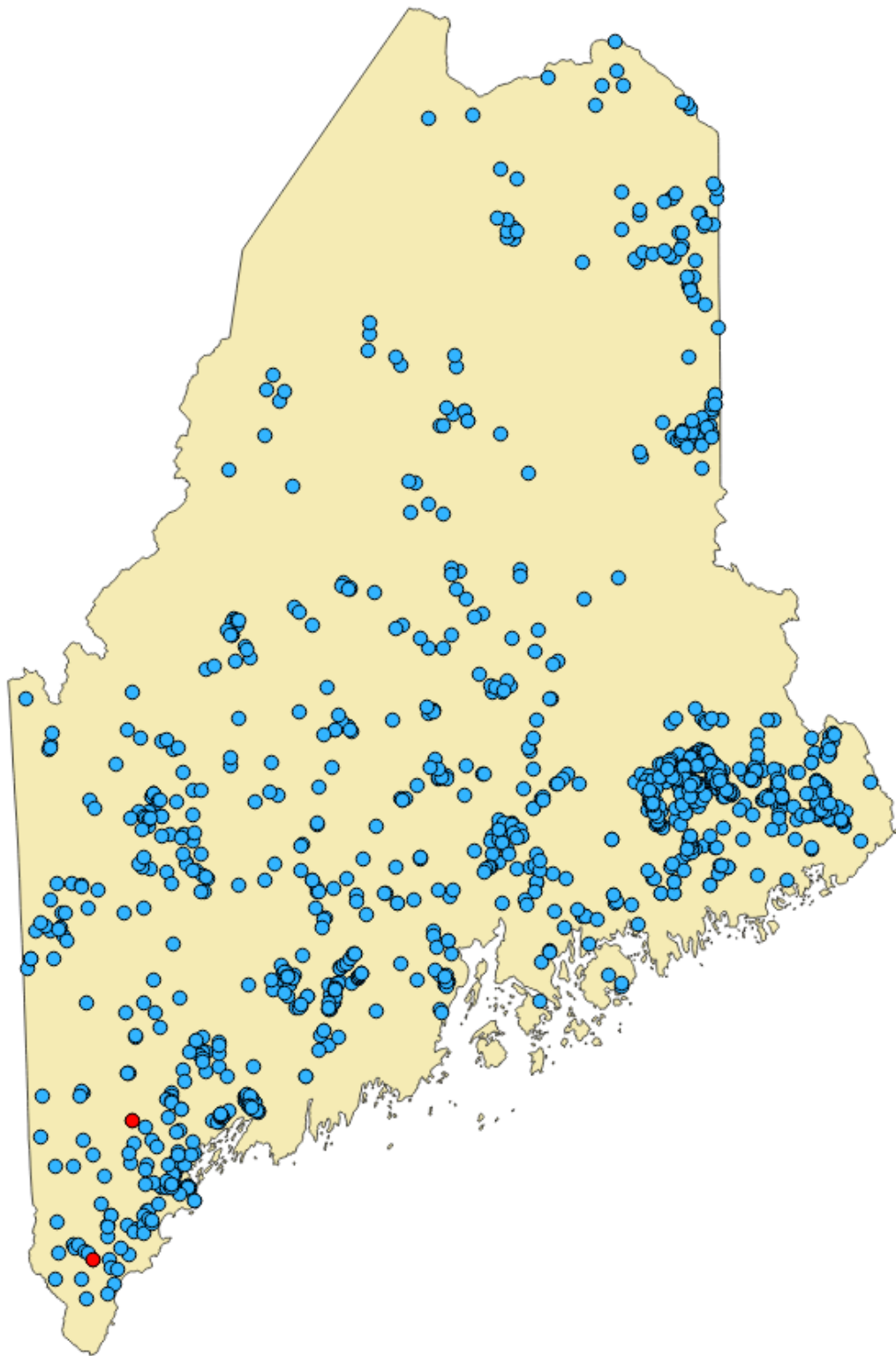
– 106 No Data

– 90 Tidal

– 21 Near Impoundment

– 13 Missing Covariates

– **383 Drainage Area > 200 km²**



Station Screening

1,780 Total Stations (in ME)

– 106 No Data

– 90 Tidal

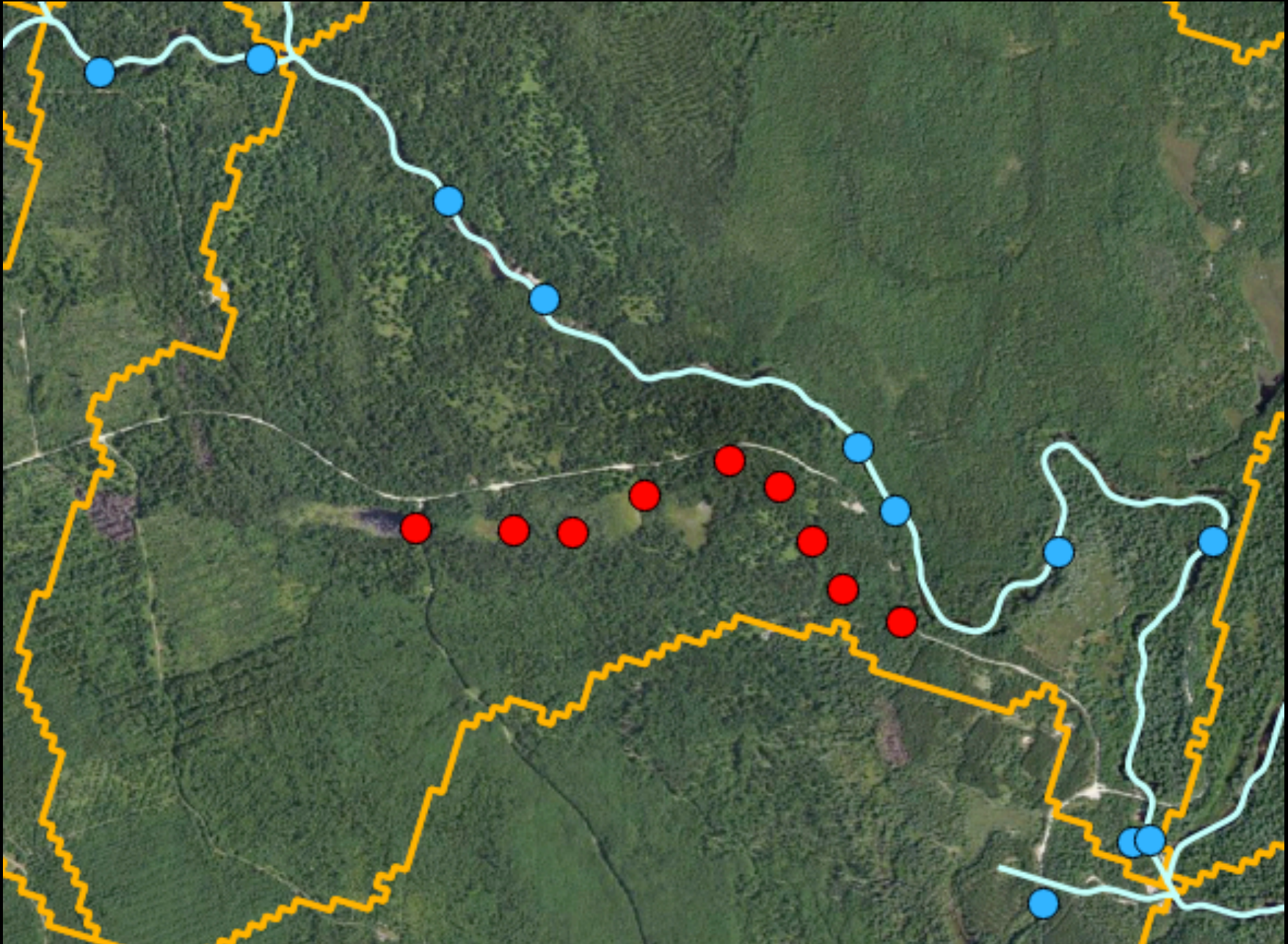
– 21 Near Impoundment

– 13 Missing Covariates

– 383 Drainage Area > 200 km²

– **2 Open Water LU > 50%**

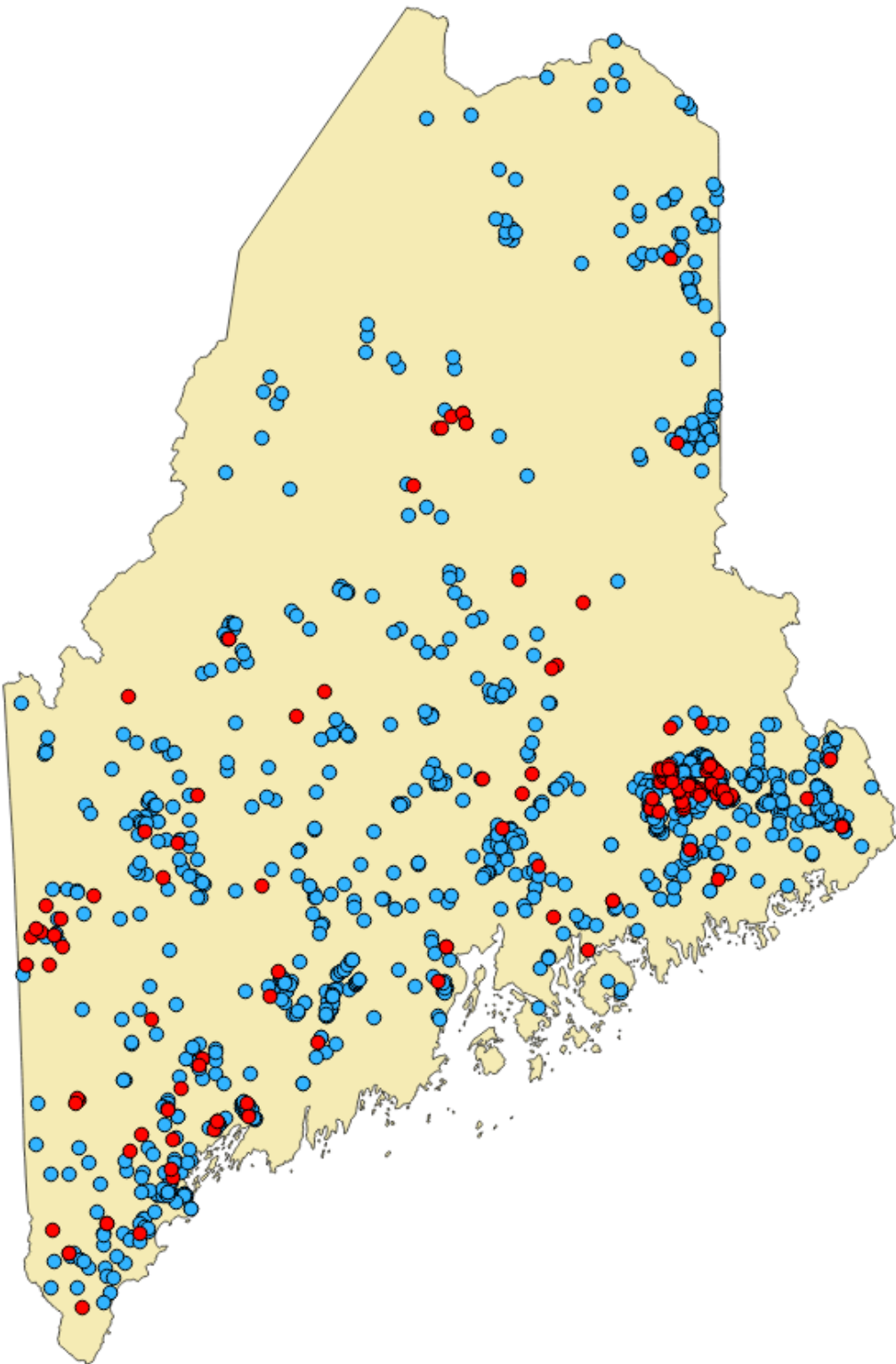
Flowline Distance > 60 m



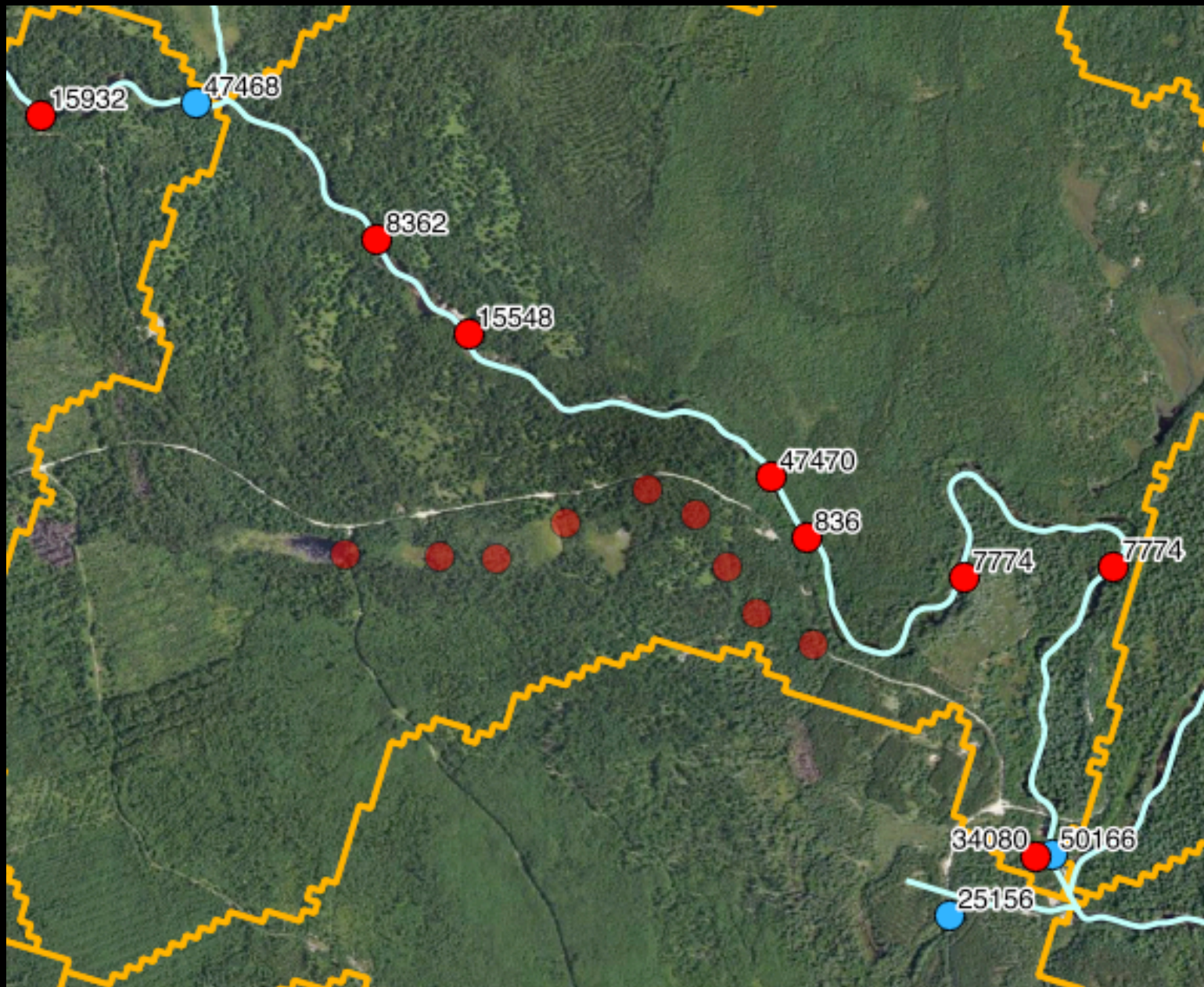
Station Screening

1,780 Total Stations (in ME)

- 106 No Data
- 90 Tidal
- 21 Near Impoundment
- 13 Missing Covariates
- 383 Drainage Area > 200 km²
- 2 Open Water LU > 50%
- **138 Flowline Distance > 60 m**



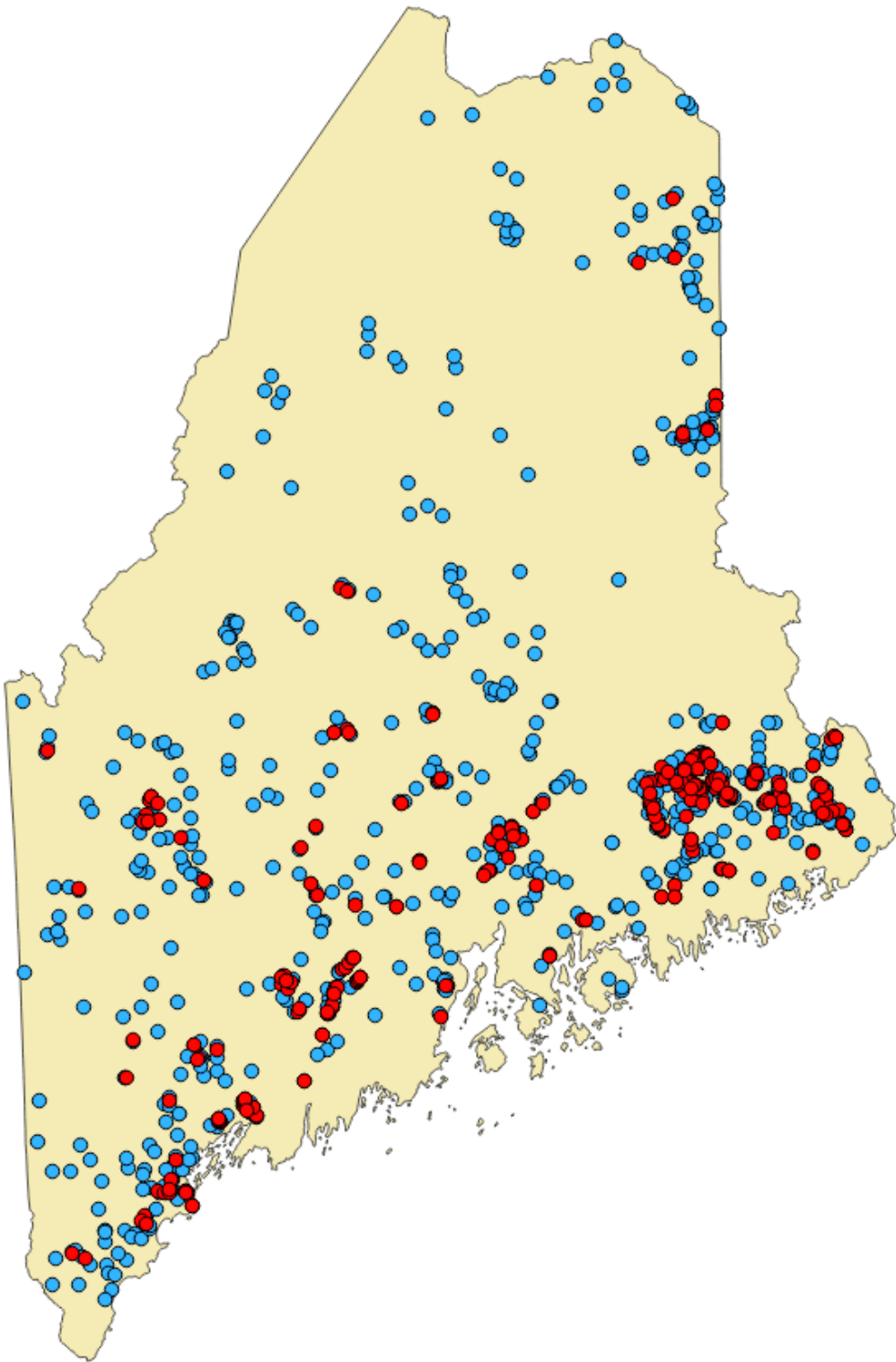
Secondary Stations within Catchment



Station Screening

1,780 Total Stations (in ME)

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- 21 Near Impoundment
- 13 Missing Covariates
- 383 Drainage Area > 200 km²
- 2 Open Water LU > 50%
- 138 Flowline Distance > 60 m
- **295 Secondary in Catchment**

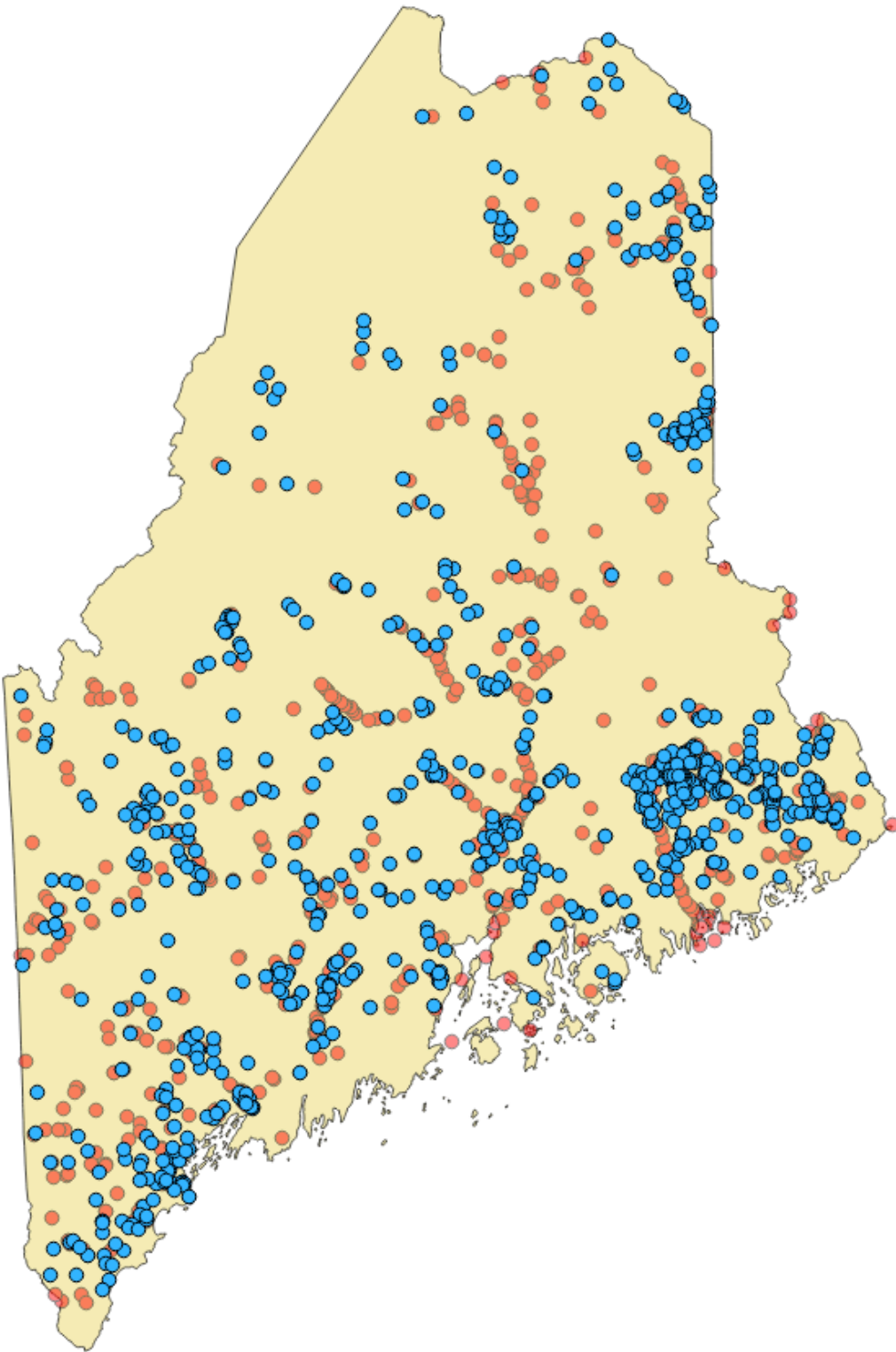


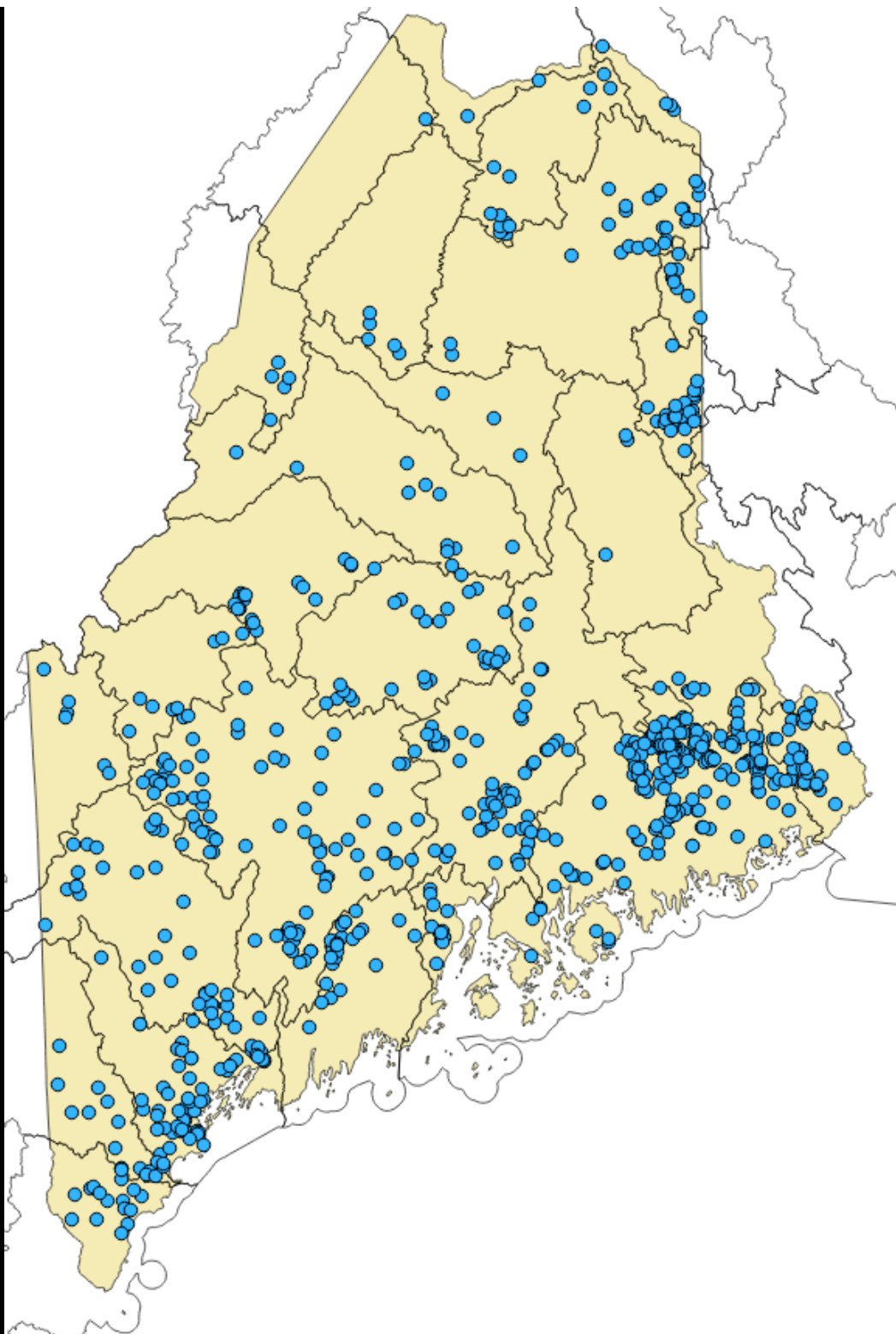
Station Screening

1,780 Total Stations (in ME)

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- 2 Open Water LU > 50%
- 138 Flowline Distance > 60 m
- 295 Secondary in Catchment

**= 732 Selected Stations
(40% of Total)**





Process Data

Raw Data:

732 Stations

1,399 Time Series

13,844,458 Measurements



Temperature QAQC &
Daily Aggregation

Model Input Dataset:

530 Catchments

25 HUC8s

1,099 Time Series

105,298 Daily Mean Values

Stream Temperature Model

Q: Where should we put more loggers to improve model performance?

A1: Any location that will meet the model selection criteria

1. Places to avoid

- Tidal Zones
- Impoundments
- Large Drainage Areas ($> 200 \text{ km}^2$)
- Catchments with existing stations

2. Places to target

- On the main flowline
- Near the pour point of the catchment

How do I find the main flowline and pour point of a catchment?

Station Map

Turn on Minor Streams and Catchment Boundaries Layers

The screenshot shows a web map interface with a map of a catchment area. The map displays a network of streams and catchment boundaries. A legend on the right side of the map lists the following layers:

- Open Street Map
- Bing Satellite
- USGS Topo
- Major Streams
- Minor Streams
- NHD Waterbodies
- HUC8 Boundaries
- HUC12 Boundaries
- Catchment Boundaries

Below the legend, there is a legend for stream status:

- Active
- Inactive
- Planned
- Unknown
- Selected


The map shows a network of streams and catchment boundaries. A blue dot on a stream indicates an active pour point. Two green dots on other streams indicate inactive pour points. A red dot on a stream indicates a selected pour point. The map also shows major roads like State Route 13, Seabrook Road, and State Route 105, and Ridgeview Airport.

Leaflet | © OpenStreetMap contributors

Part 2

How does each station contribute to the model calibration?

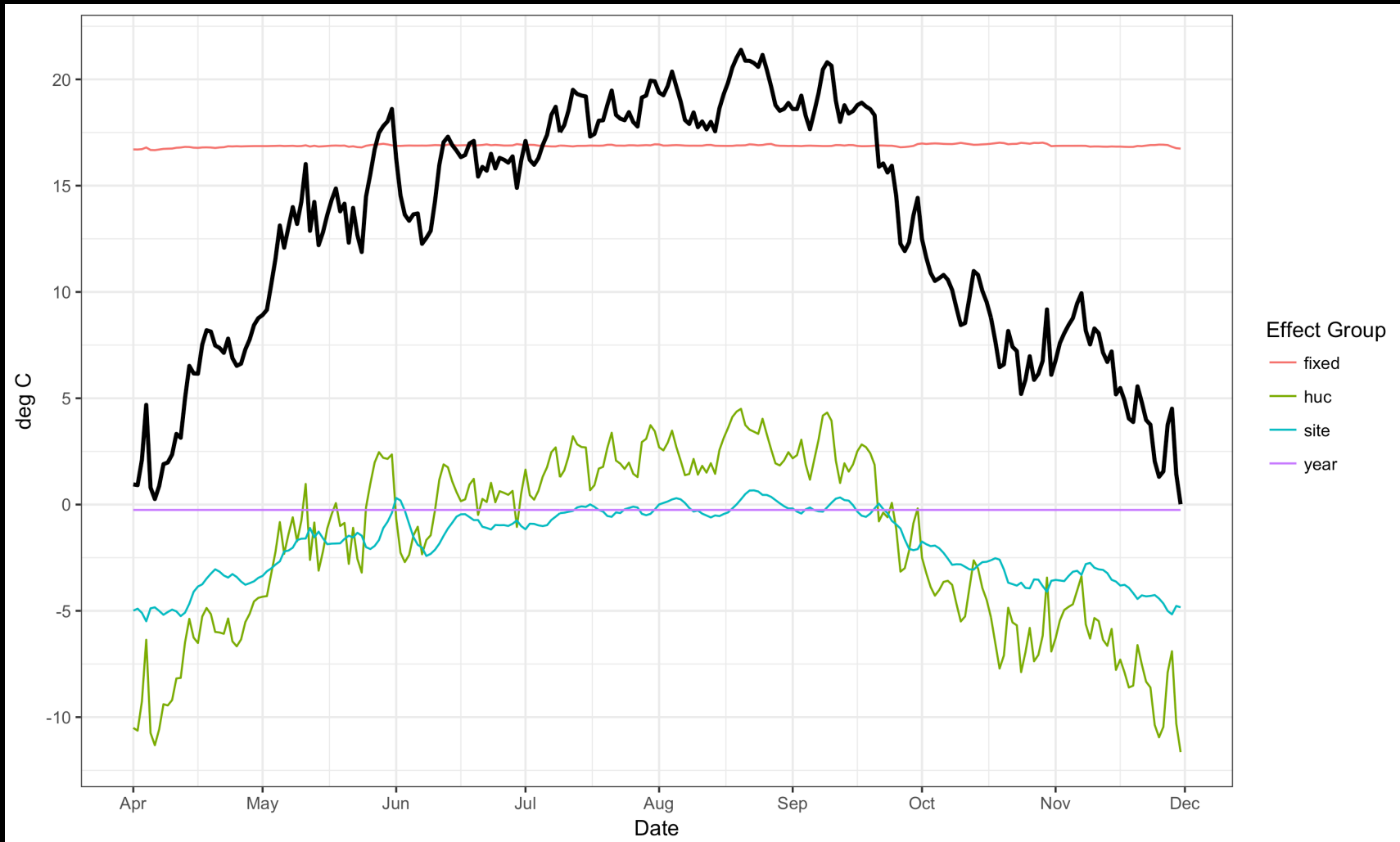
Model Equation

$$\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \dots$$


$$Temp_{huc,catchment,year,day} = X_{fixed} B_{fixed} + X_{huc} B_{huc} + X_{catchment} B_{catchment} + X_{year} B_{year}$$

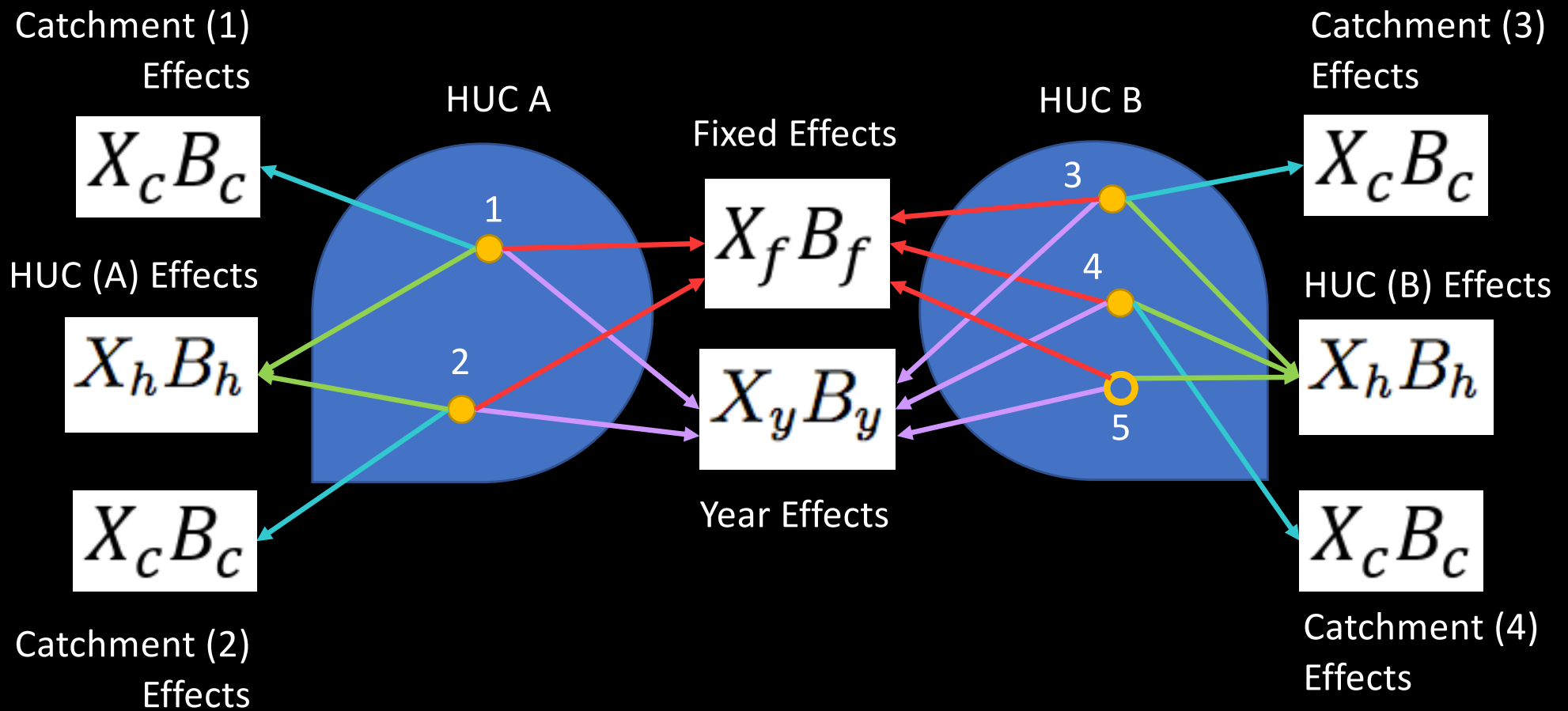
$$T_{h,c,y,d} = X_f B_f + X_h B_h + X_c B_c + X_y B_y$$

Example Calculation



$$T_{h,c,y,d} = X_f B_f + X_h B_h + X_c B_c + X_y B_y$$

Hierarchical Nesting



$$T_{h,c,y,d} = X_f B_f + X_h B_h + X_c B_c + X_y B_y$$

Stream Temperature Model

Q: Where should we put more loggers to improve model performance?

A2: Any catchment where you want more accurate model predictions, or any HUC that doesn't have many stations

Stream Temperature Model

- New model versioning
- New model documentation
- New model downloads

<http://ecosheds.org/models/stream-temperature/latest/>

ICE Updates

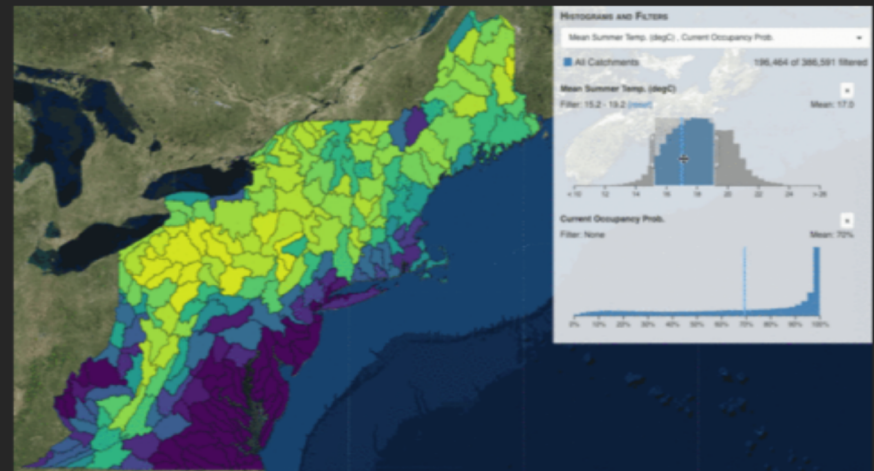
Interactive Catchment Explorer part of the [Spatial Hydro-Ecological Decision System](#)

What is ICE?

The Interactive Catchment Explorer (ICE) is a dynamic visualization interface for exploring catchment characteristics and environmental model predictions.

ICE was created for resource managers and researchers to explore complex, multivariate environmental datasets and model results, to identify spatial patterns related to ecological conditions, and to prioritize locations for restoration or further study.

ICE is part of the [Spatial Hydro-Ecological Decision System \(SHEDS\)](#).



Launch ICE >

<http://ice.ecosheds.org>

Questions?