White River Benthic Algae Study

2020 Technical Advisory Group Update
December 8th, 2020

Presented by Natalie Day

U.S. Geological Survey

Outline of Presentation

- Review of Study Design and Approach
- Timeline of Data Collection
- Data Collection in 2020 and Preliminary Results
- Winter 2021 Data Analysis and Interpretation

Study Design and Approach

Objective: document and understand benthic algal occurrence, characteristics, and controls at multiple locations within the White River study area.

1. Use historical data analysis and literature review to inform new data collection efforts

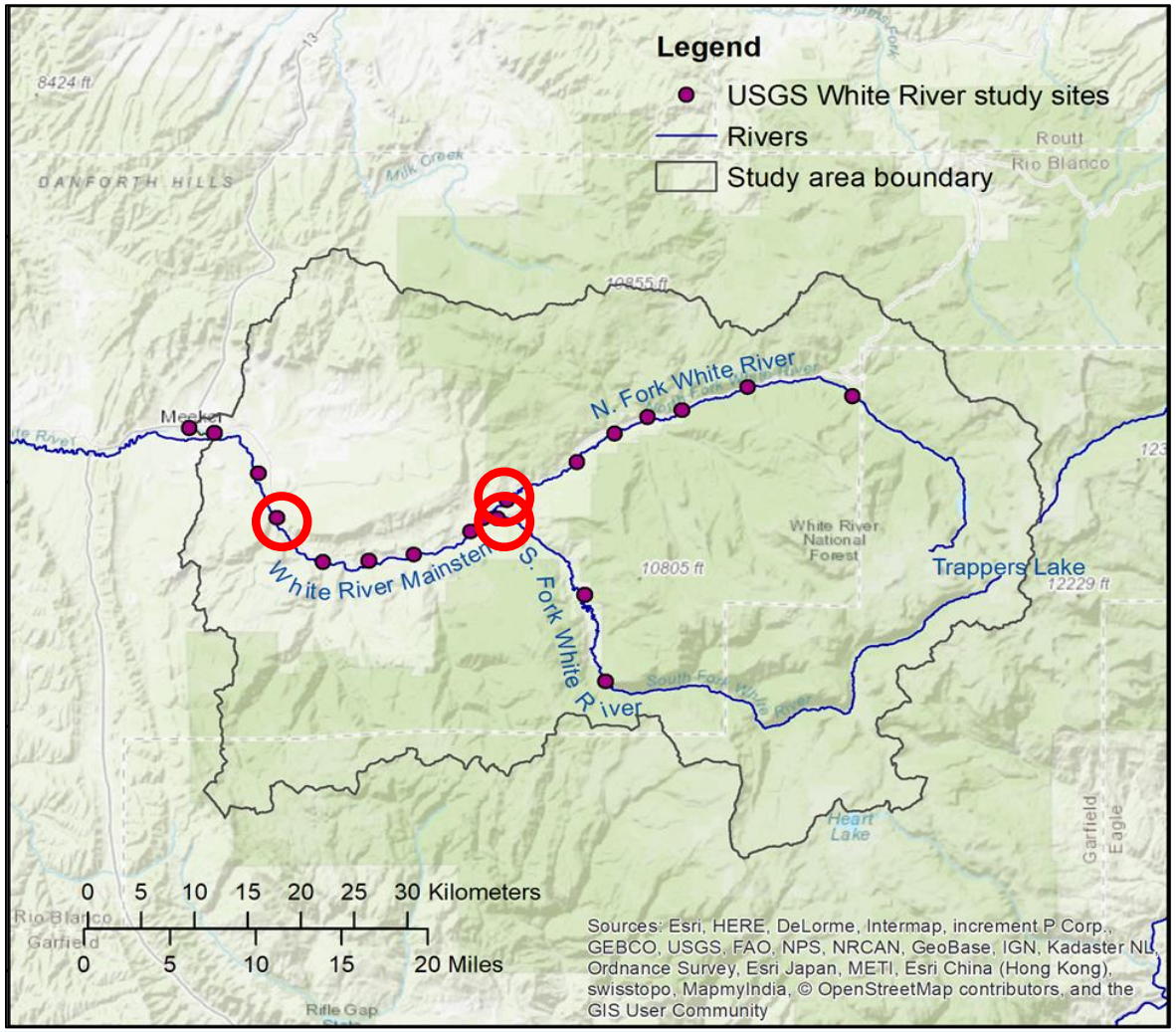
2. Collect new data to characterize the different chemical, physical, and biological conditions along the river

Study Design and Approach

1. Historical data analysis and literature review

Using long-term USGS records from White River above Coal Creek, White River above Dry Creek near Buford, North Fork White River at Buford, and South Fork White River at Buford to examine long term records of streamflow and nutrients and answer questions like:

- How have these factors changed over time?
- When do the changes happen? Seasonally and temporally
- How much have they changed?
- Do the changes occur throughout the basin or just at one site?
- How do these changes compare to other basins in Colorado?

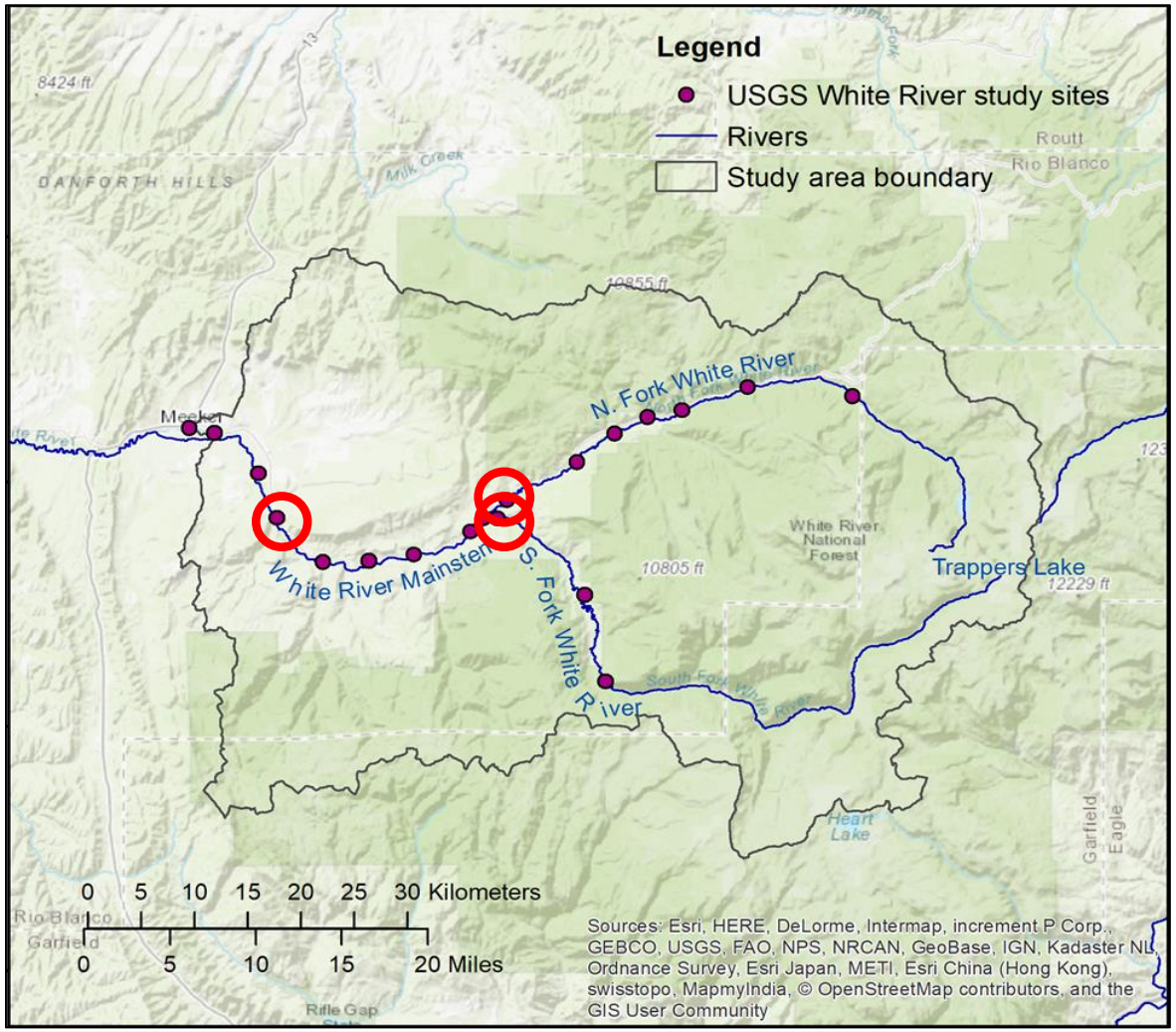


Study Design and Approach

1. Historical data analysis and literature review

KEY FINDINGS:

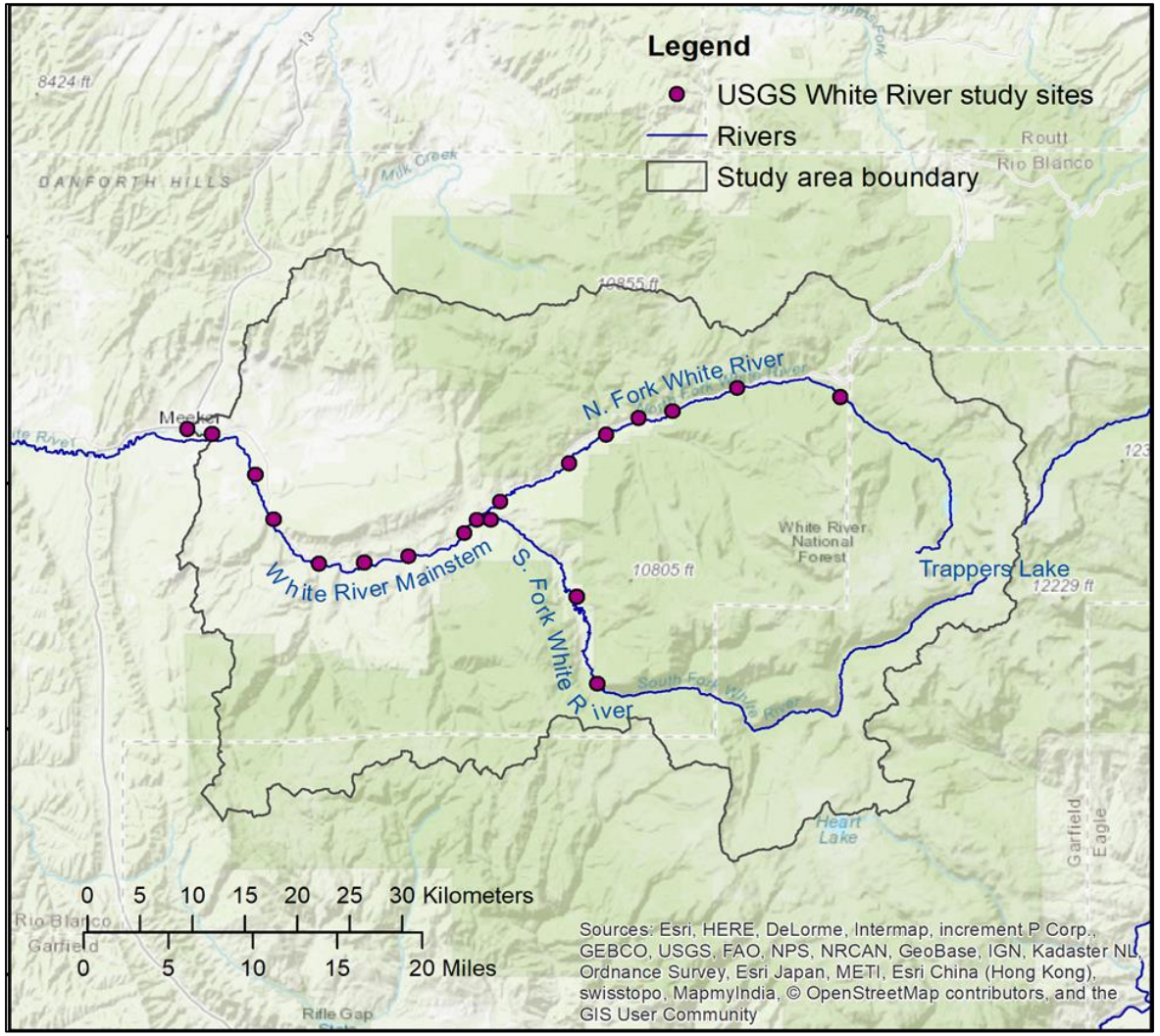
- We see increases in phosphorus and to a smaller degree, nitrogen concentrations and loads at mainstem and tributary sites during last 20 years.
- Other rivers in the West are experiencing algae blooms. Nutrient availability and physical disturbance during high streamflow can play a large role in controlling blooms.



Study Design and Approach

2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements
- Channel surveys, grain-size analysis, continuous QW monitoring
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis



Study Design and Approach

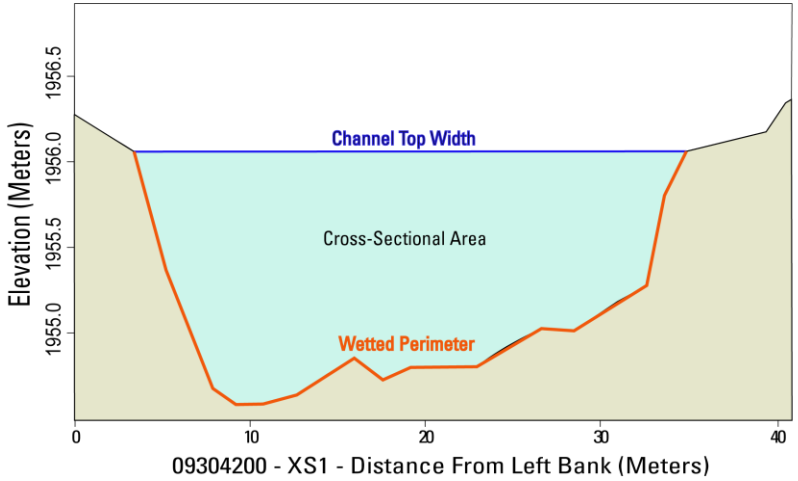
2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements, channel surveys, grain-size analysis
- ~~Continuous QW monitoring~~
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis

Study Design and Approach

2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements, channel surveys, grain-size analysis
- Continuous QW monitoring
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis



Study Design and Approach

2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements, channel surveys, grain-size analysis
- Continuous QW monitoring
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis

Study Design and Approach

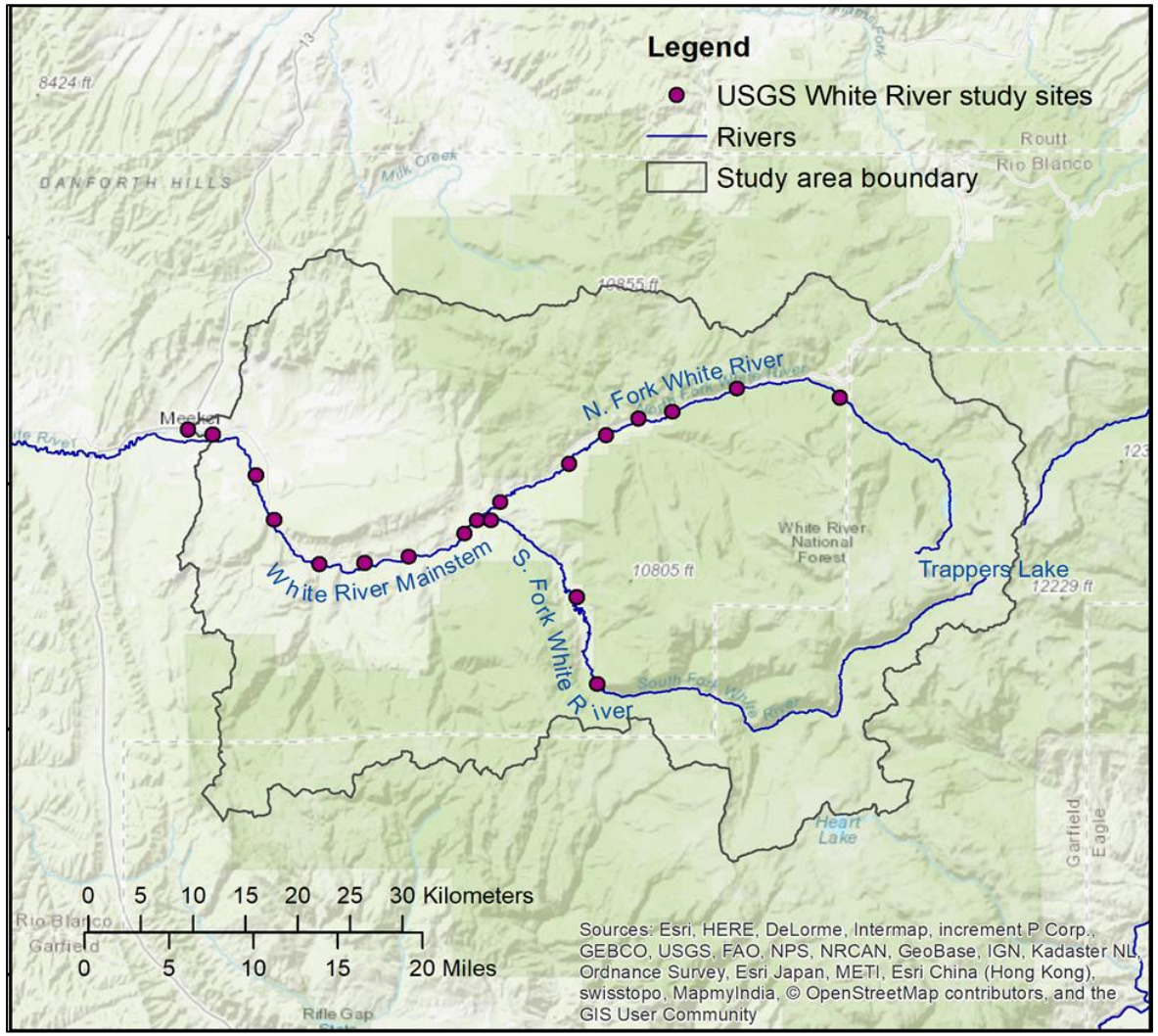
2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements, channel surveys, grain-size analysis
- Continuous QW monitoring
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis

Study Design and Approach

2. New data collection of physical, chemical, and biological factors

- High-flow condition measurements, channel surveys, grain-size analysis
- ~~Continuous QW monitoring~~
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis



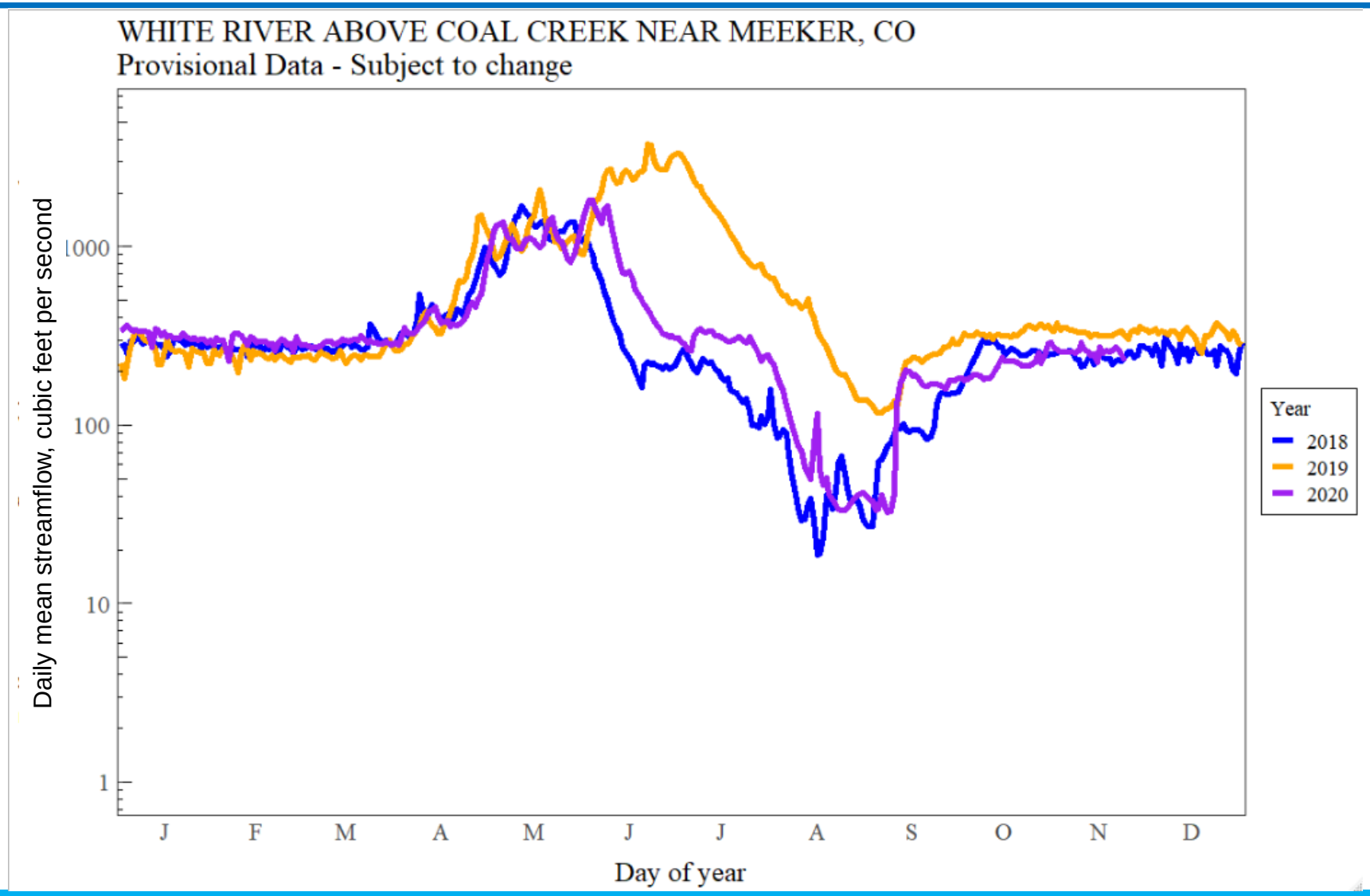
Data Collection Timeline and Locations

2. New data collection of physical, chemical, and biological factors

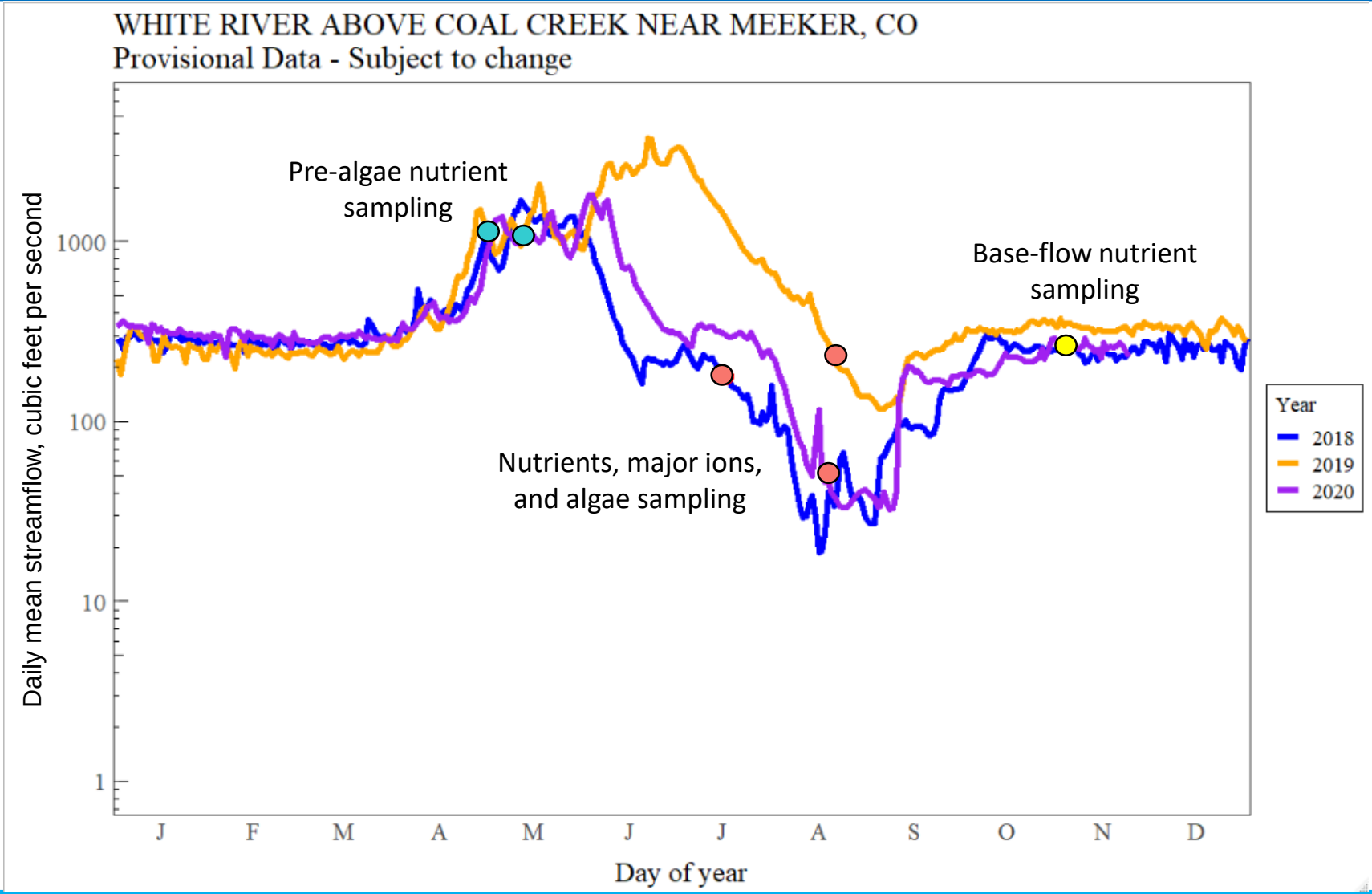
- High-flow condition measurements, channel surveys, grain-size analysis
- Continuous QW monitoring
- Water-quality sampling
- Algae sampling- Chlorophyll *a* and taxonomy
- Isotope sampling (Nitrogen source analysis)
- Nutrient load/source area analysis

Task	2018	2019	2020	2021
Particle-Size Analysis	X			
Channel Surveys	X			
High-Flow Condition Measurements	X	X	X	
Water-Quality Sample Collection		X	X	
Algae Survey and Chlorophyll a	X	X	X	
Isotope Collection (Nitrogen source analysis)	X	X		
Nutrient Load/Source-Area Analysis			X	
Data analysis and report writing			X	X

Data Collection and Preliminary Results

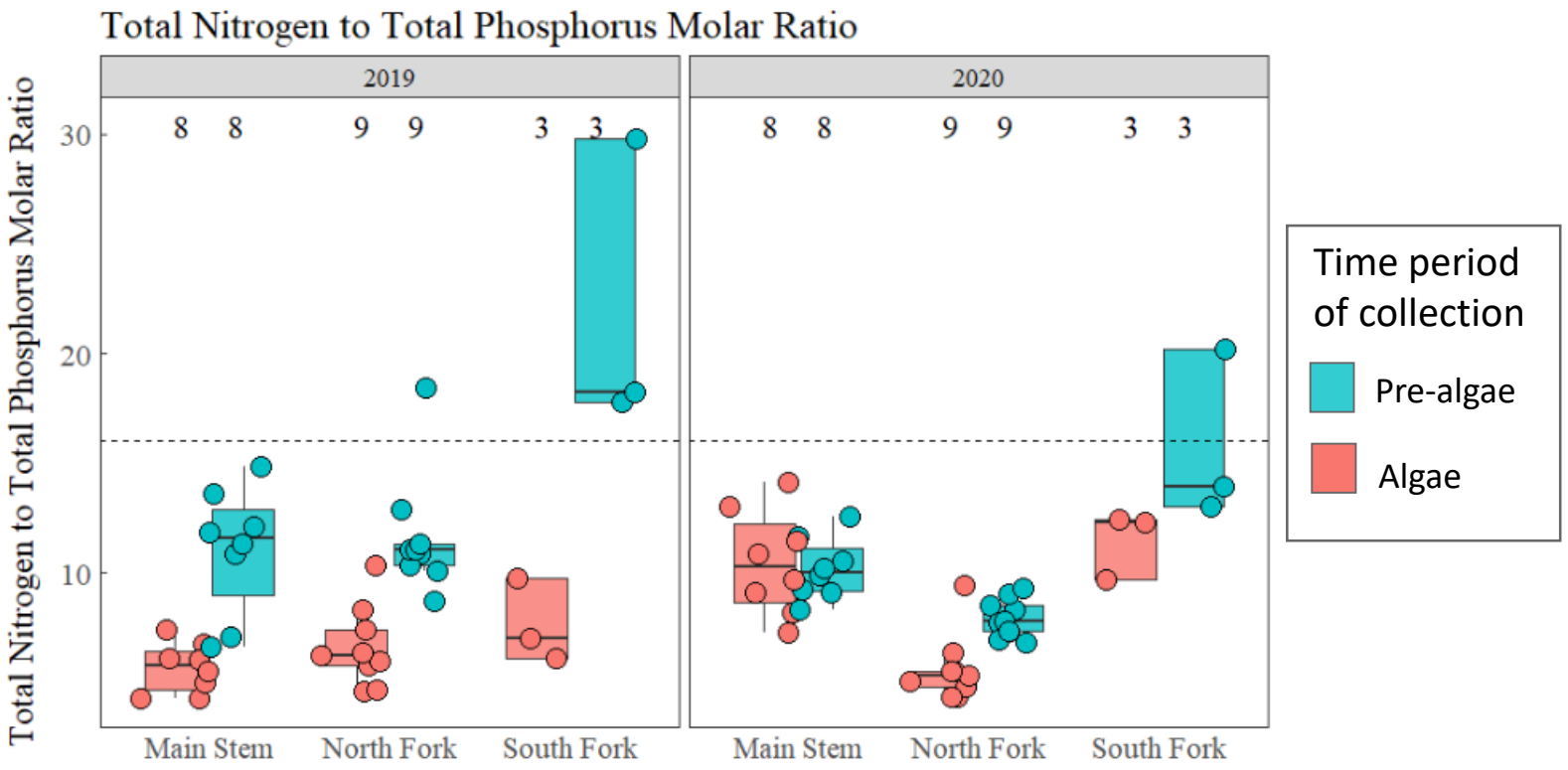


Data Collection and Preliminary Results

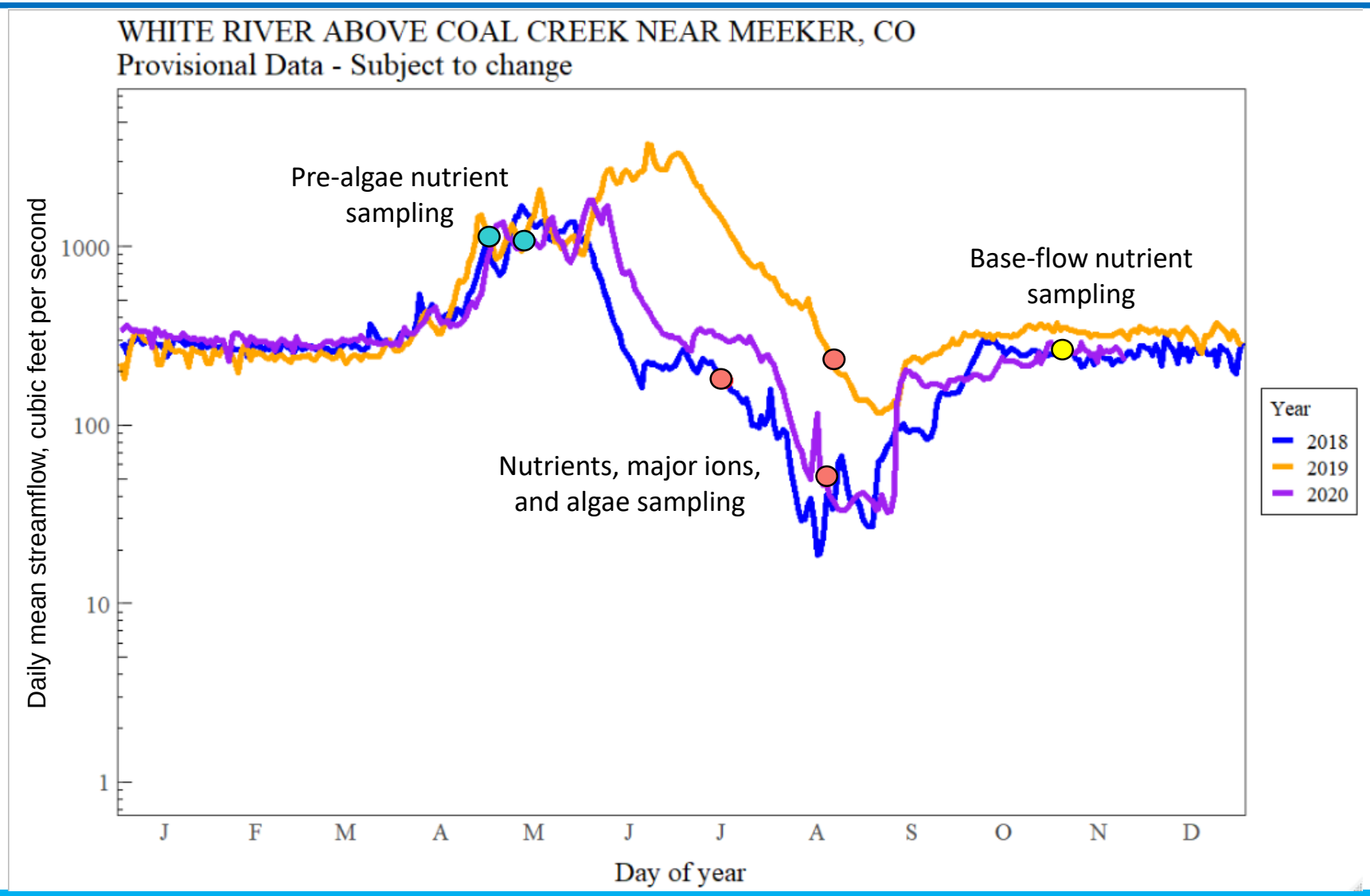


Data Collection and Preliminary Results

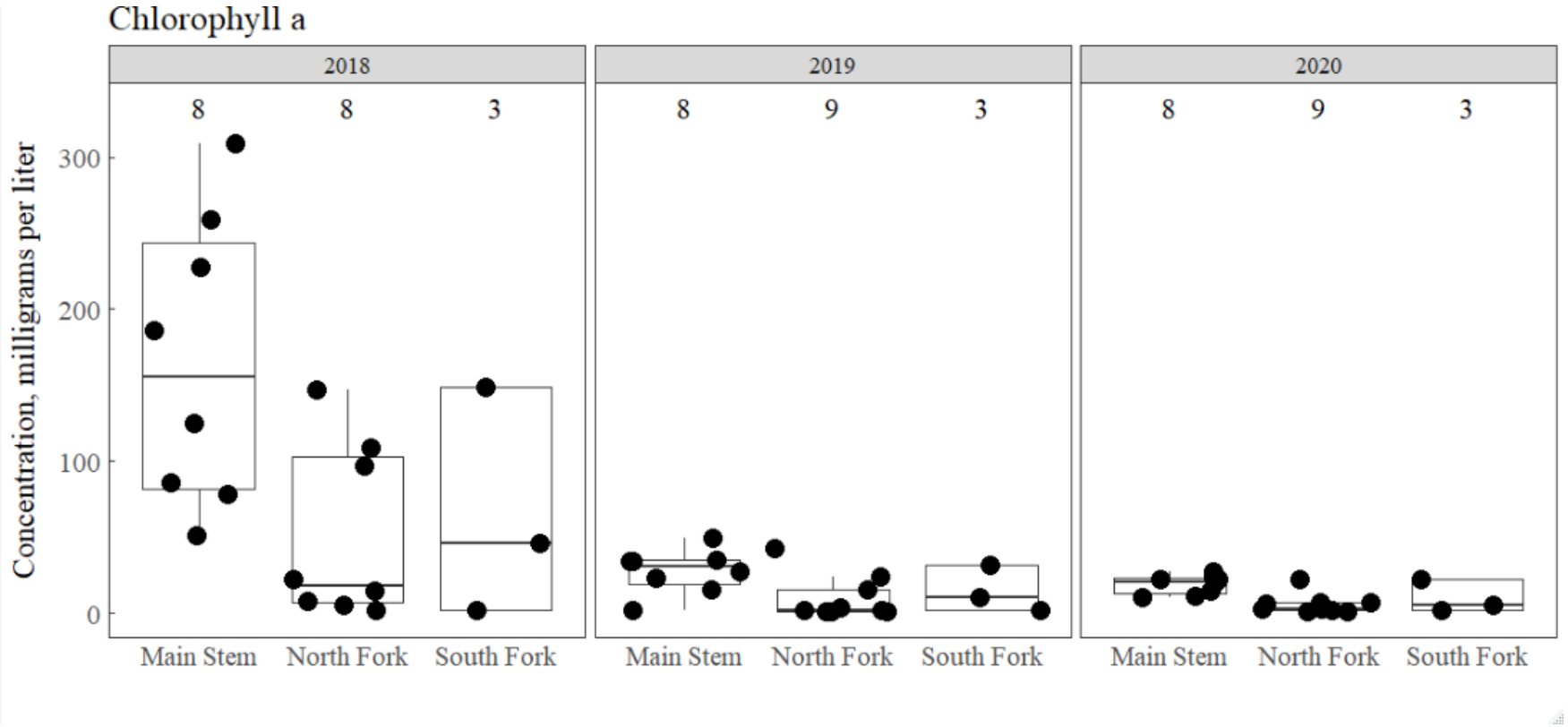
Data Collection and Preliminary Results



Data Collection and Preliminary Results



Data Collection and Preliminary Results



Winter 2021 Data Analysis and Interpretation

- Finish up data analysis
  - Look at taxonomy results – what algae are occurring? Where?
  - Calculate shear stress during high flow 2020
  - Input all data collected into a model to identify which factors influence algae
- Present and synthesize findings in two USGS reports