



# Yakima River water stargrass, water quality and thermal refuge dynamics

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**U.S. Geological Survey**

**Washington Water Science Center**

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U.S. Department of the Interior  
U.S. Geological Survey

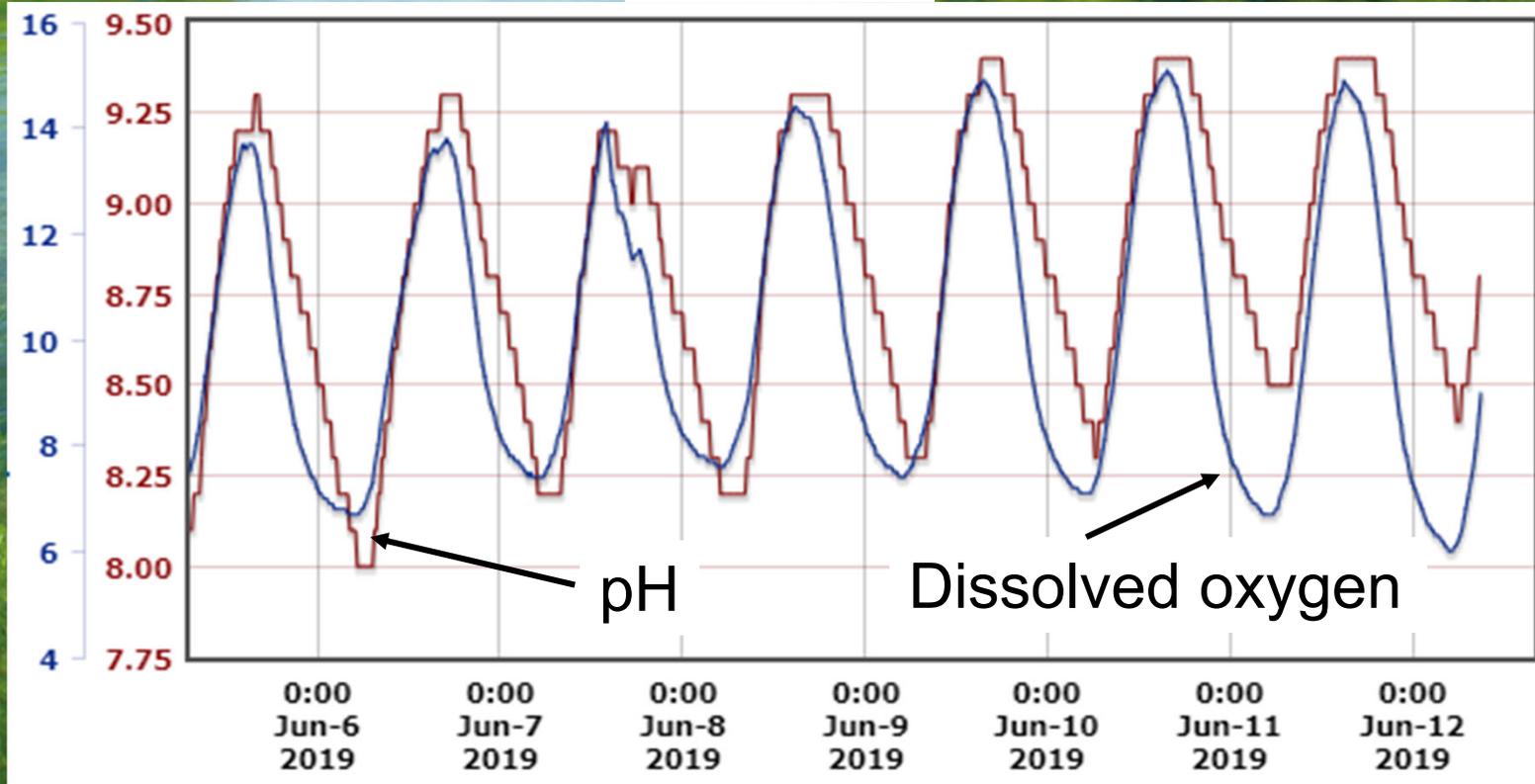
# Introduction

- **Water Quality on the lower Yakima**
  - **Historically low nutrients and sediment plus natural flow regime**
  - **Regulated flow and agriculture led to increased nutrients and sediment, and no flushing flows**
  - **Suspended sediment TMDL, water clears, still high nutrients and altered flow regime**
  - **Large increase in macrophyte growth**
    - **Larger daily oxygen swings**
    - **pH swings**
    - **Change in water temperatures**

# Acknowledgments

- Benton Conservation District
- Centennial Grant – Ecology
- Yakima Basin Integrated Plan
- Yakima Nation

# Kiona



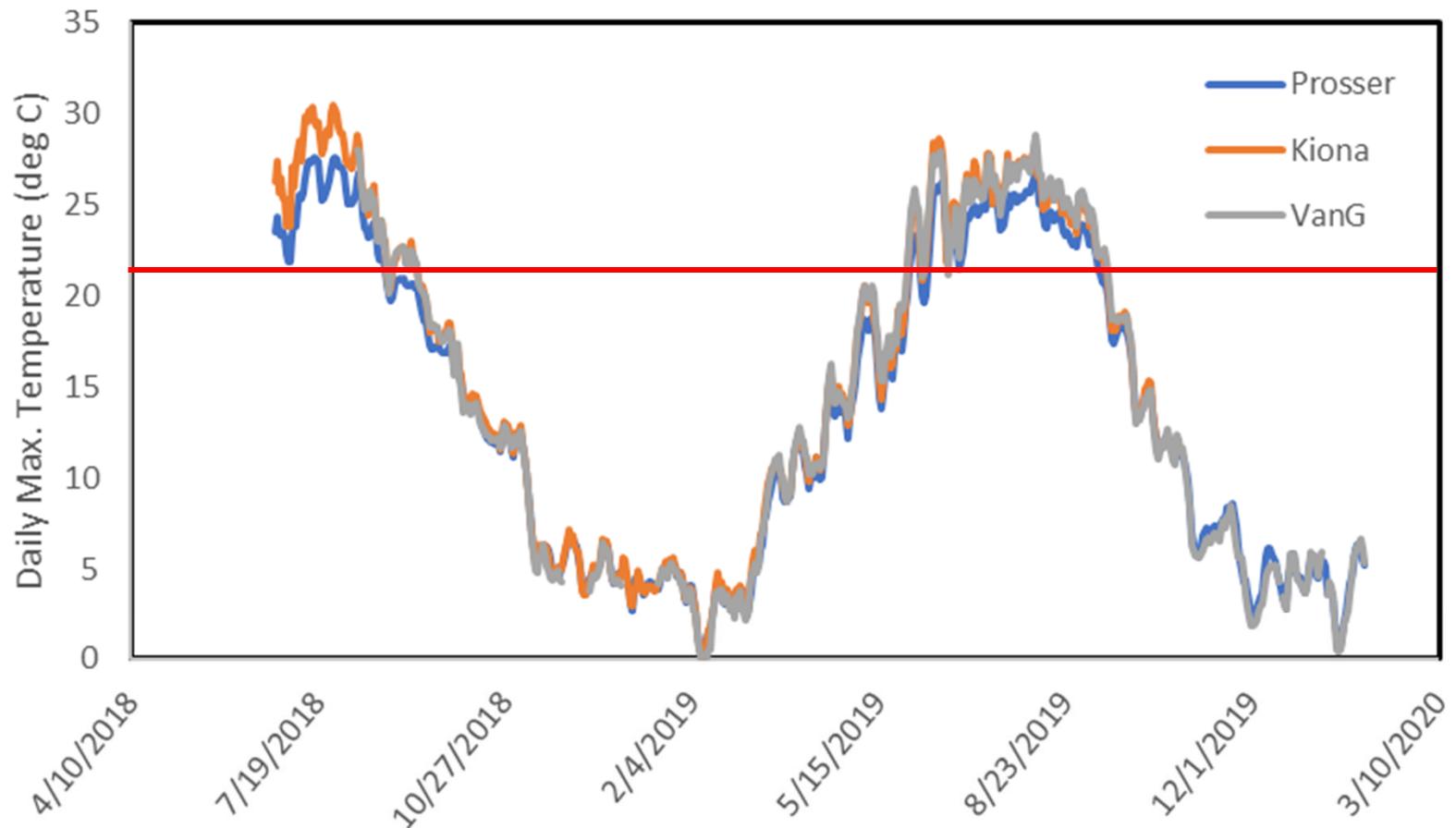
# Project Scope – Water Quality

- **Install three continuous water quality sites on the lower Yakima River**
  - **Prosser, Kiona, Van Giesen**
  - **Parameters: Temperature, conductivity, dissolved oxygen, pH, Turbidity, light, stage**
  - **Continuous nitrate at Kiona and Van Giesen**
- **Prosser and Kiona started in June 2018, Van Giesen in August 2018.**
  - **Continue for 2 years**

# Project Scope – Water Stargrass

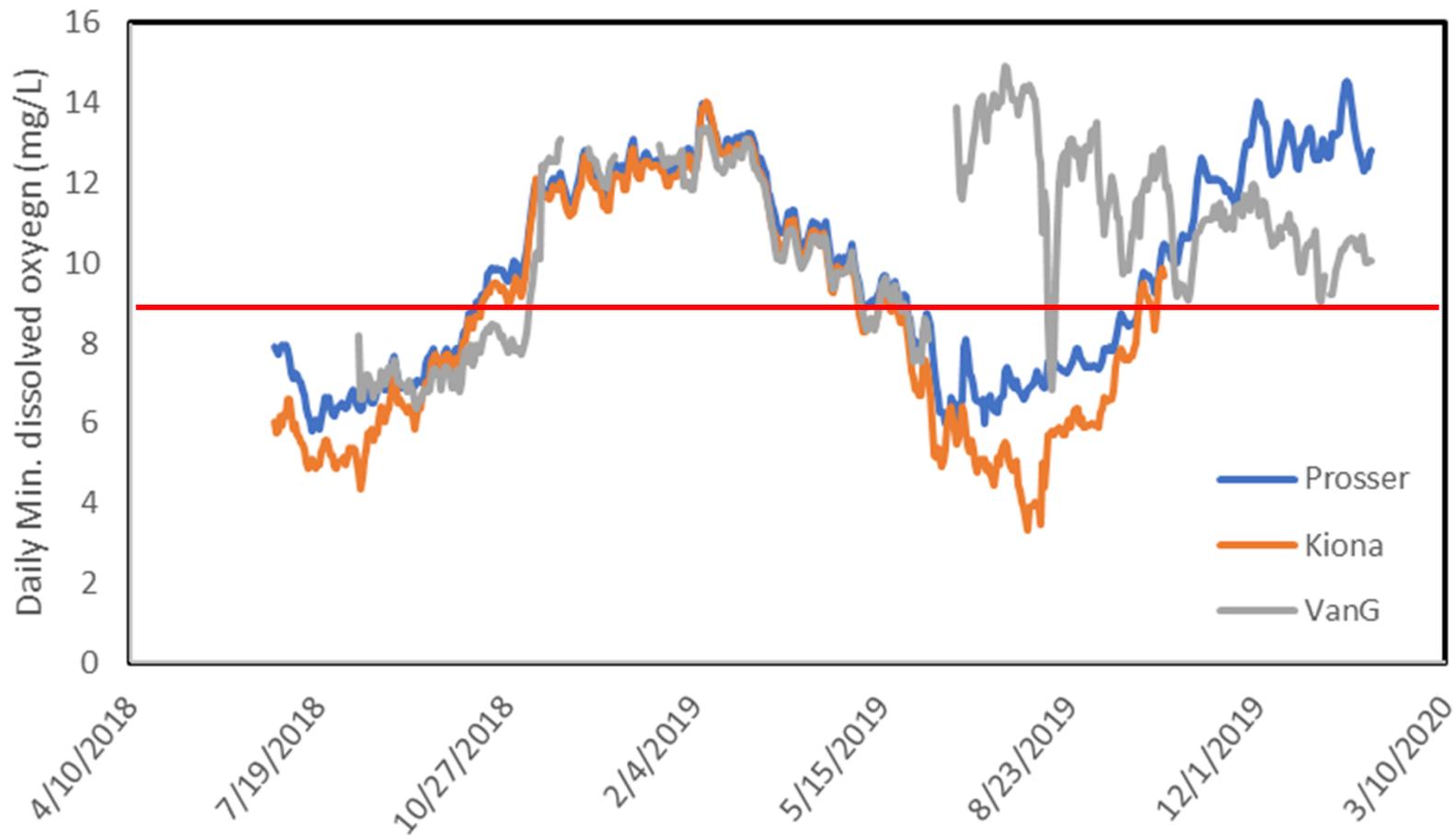
- Document stargrass growth over time
  - Estimate percent cover and biomass from June through September
  - Examine relationships between water quality and plant growth

# Daily maximum temperatures



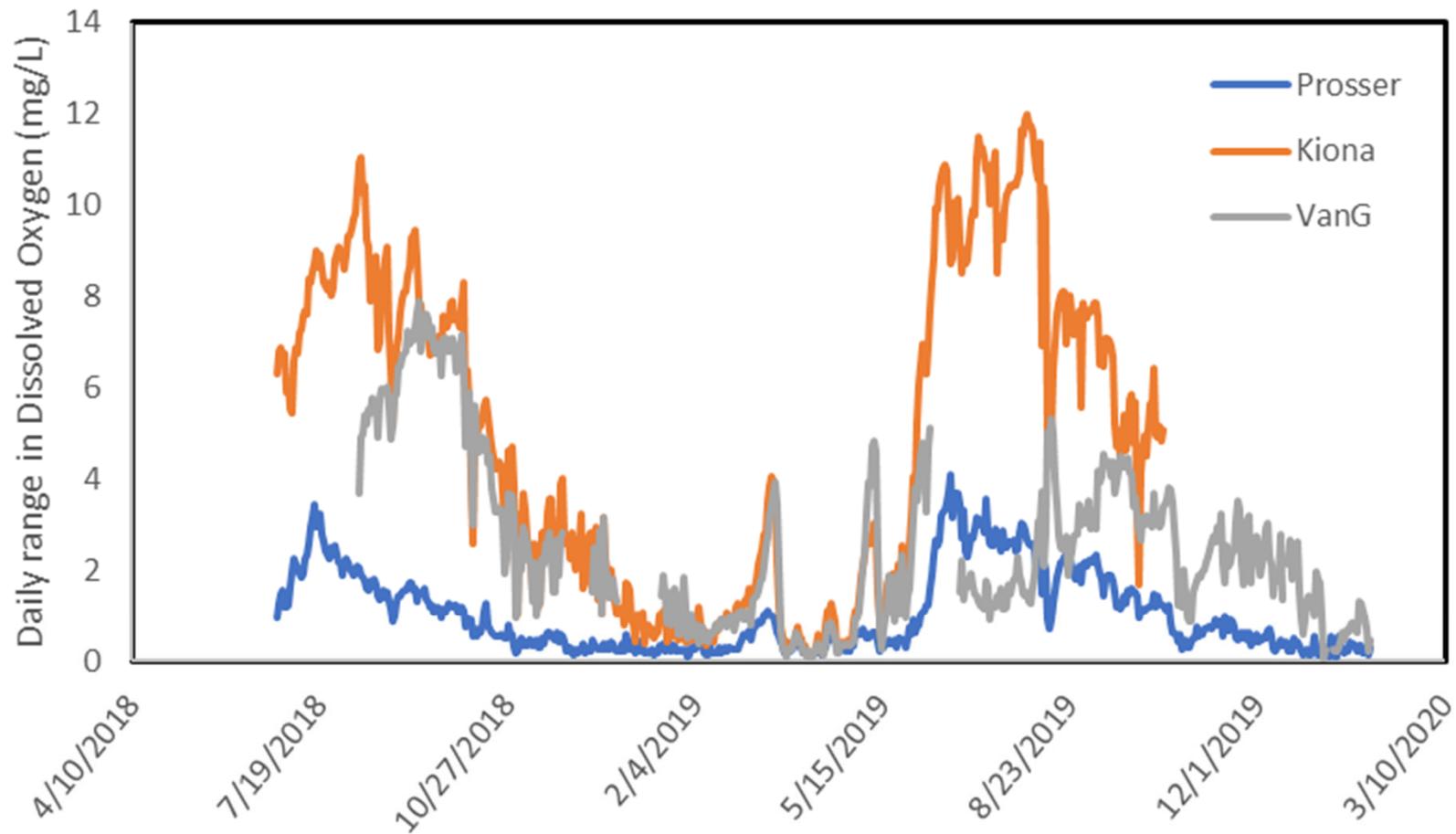
Summer temp exceeds the 21 deg criteria for the lower river

# Daily Dissolved Oxygen minimum



Summer DO min dips below the 9mg/L criteria for the lower river

# Daily Dissolved Oxygen range

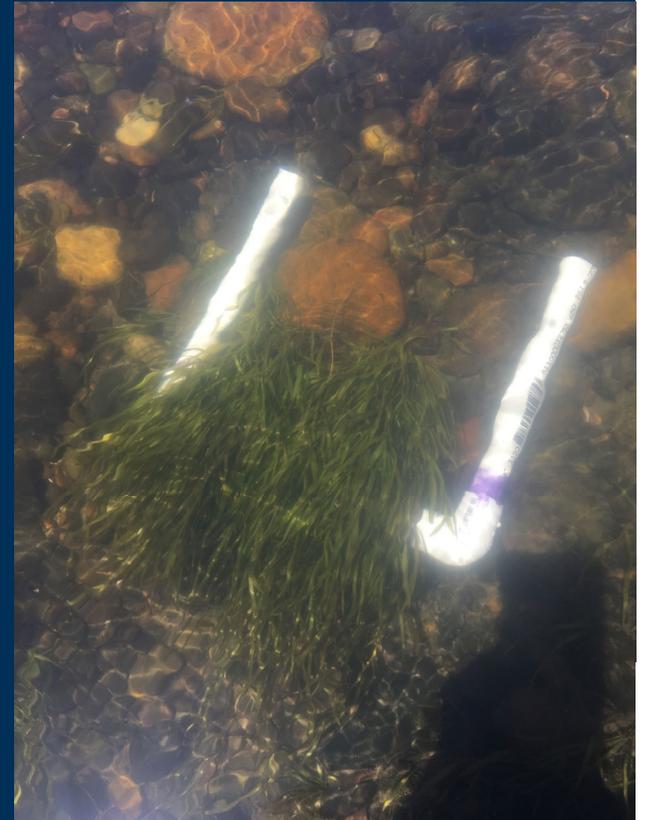


DO range greatest in summer, with Kiona usually exceeding the other two sites

# Stargrass Estimates

- Estimated stargrass cover and biomass in August 2018; June, August, and September 2019
- Measured approximately 150m long reaches, with a minimum of 10 transects
- Harvested 10 samples from each site of known area, tried to capture variability
- Rinsed within river, collected above ground biomass
- Bagged and frozen until lab processing
  - Dried at 60°C for 2 to 7 days to constant weight

# Stargrass Biomass

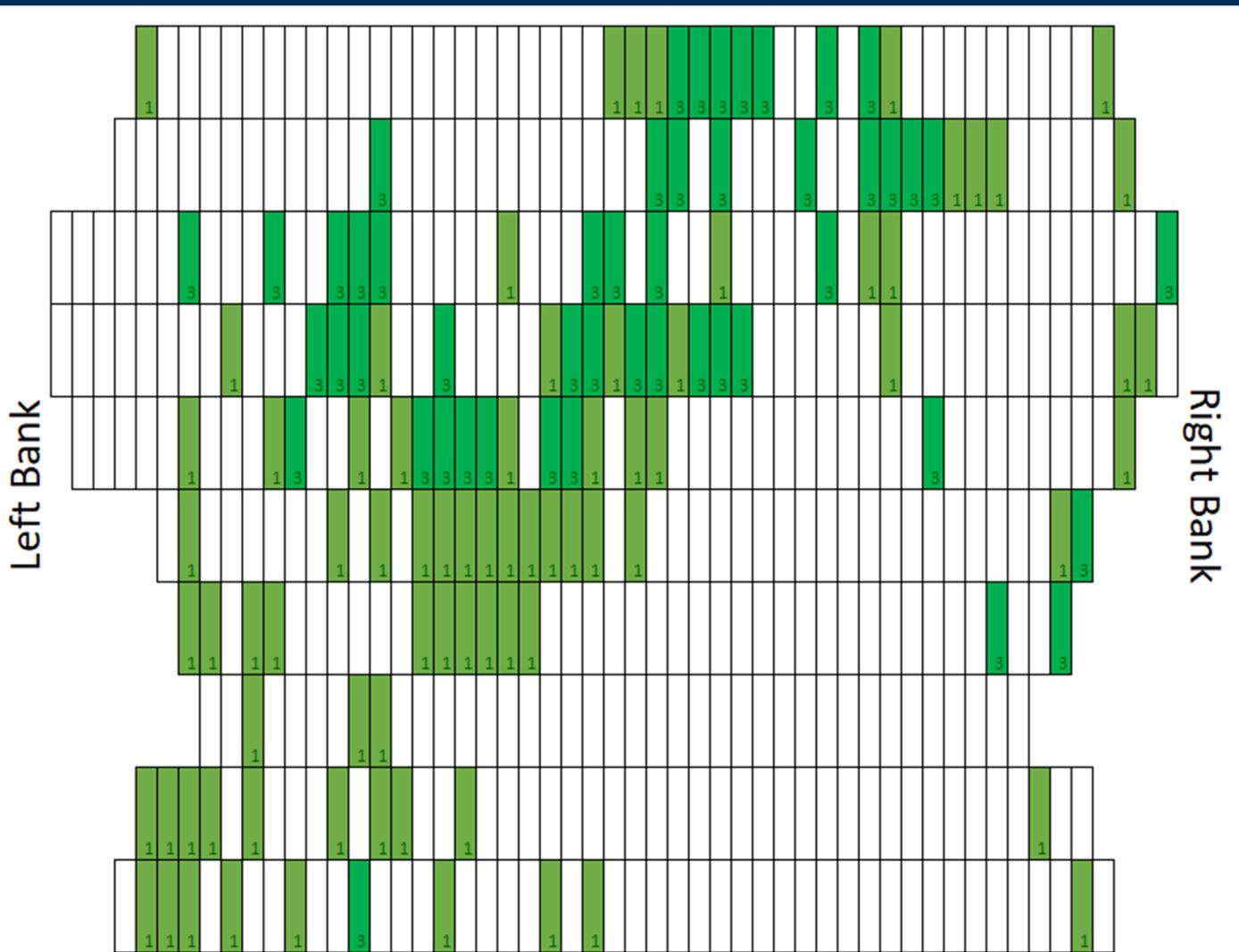


# Stargrass Cover

Van Giesen

Green boxes indicate locations where stargrass is present, white boxes show locations with no stargrass

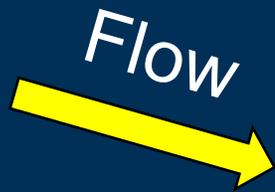
Flow



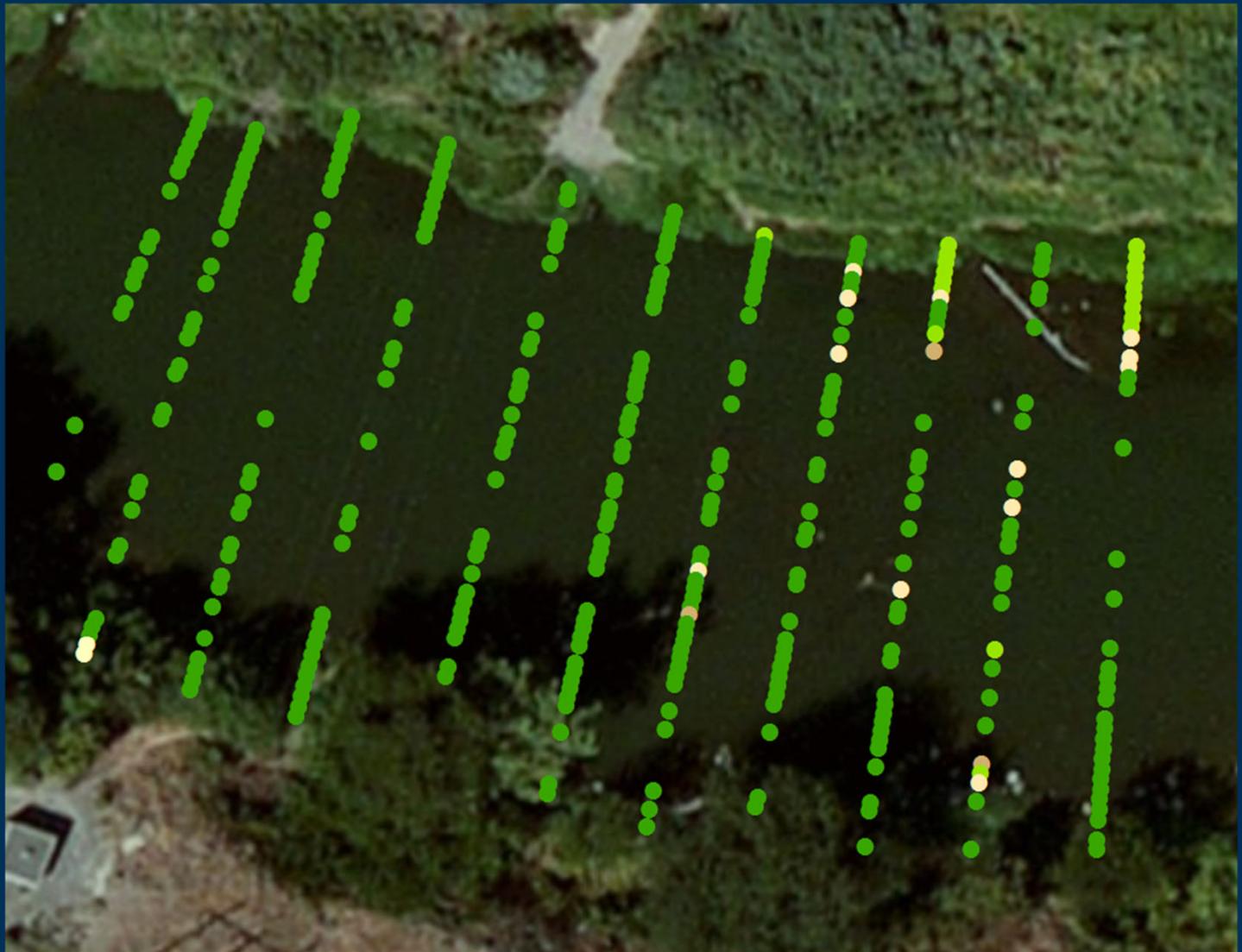
Preliminary Data – Subject to Revision

# Stargrass Cover

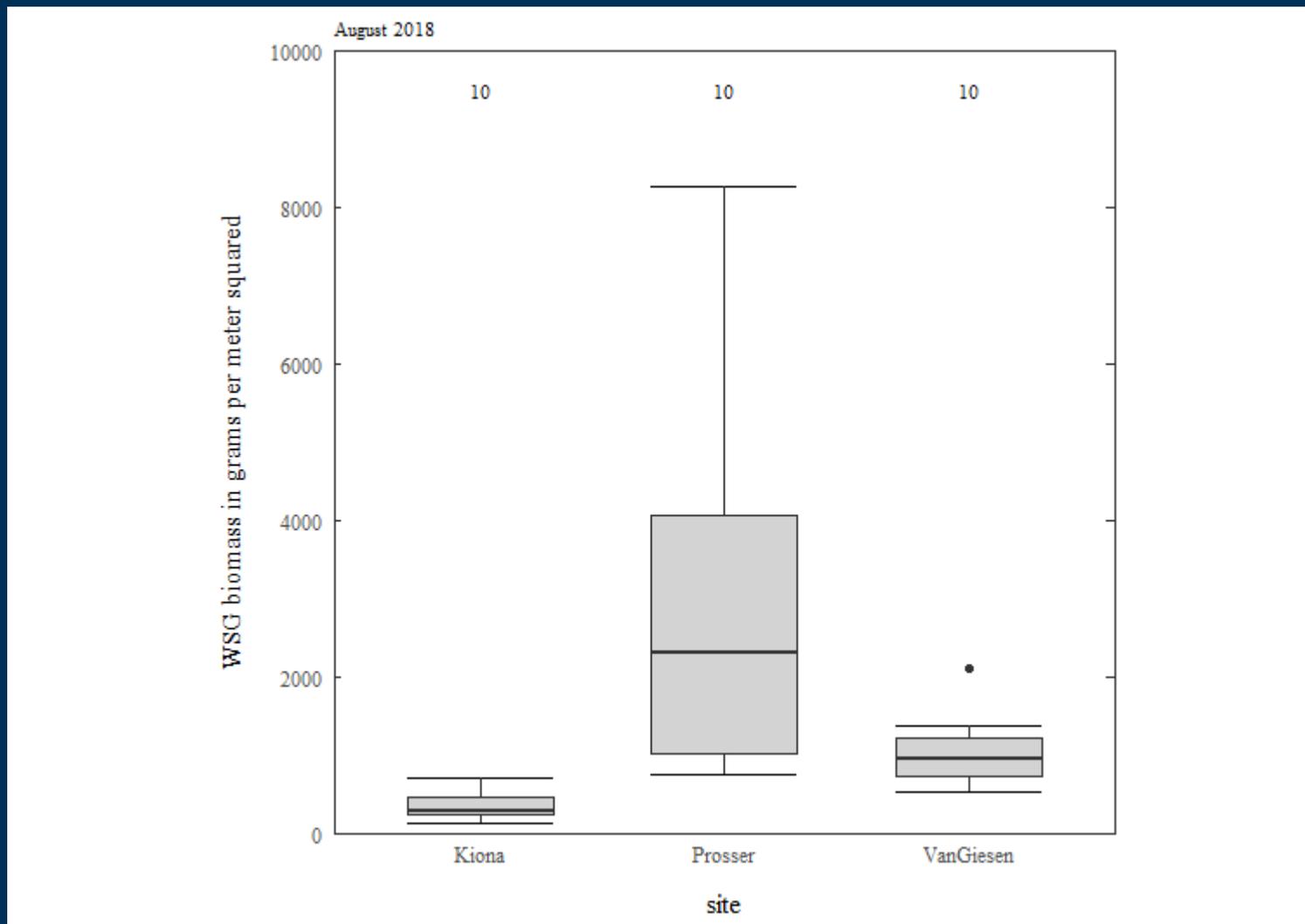
Prosser



Green is where we see only stargrass, other colors indicate a mix of plants that includes stargrass

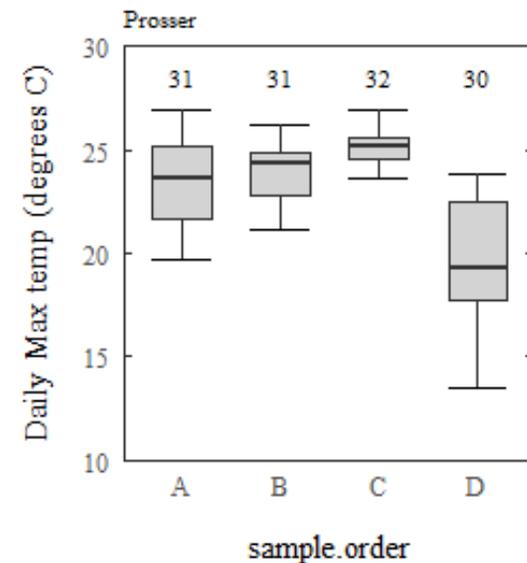
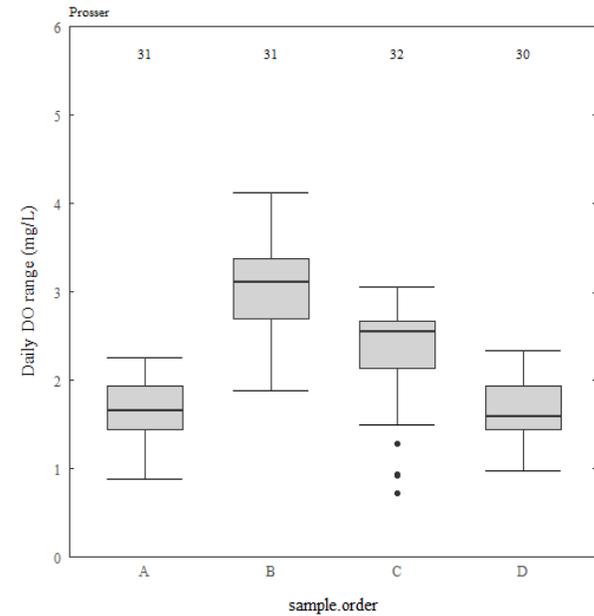
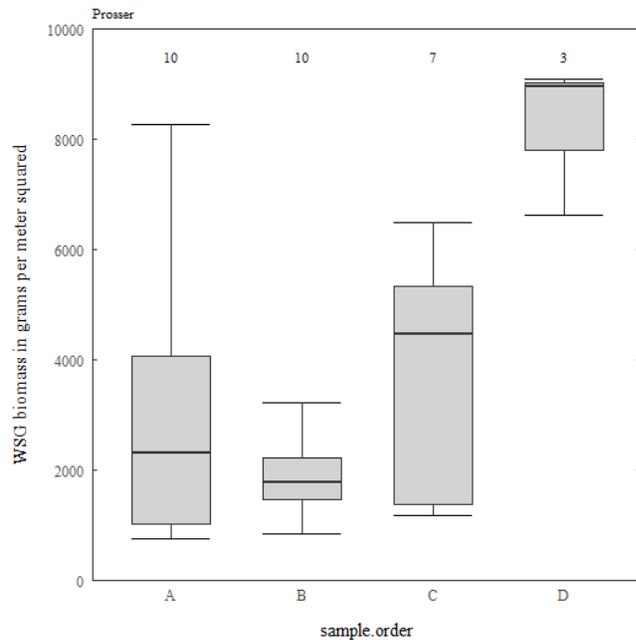


# Stargrass Biomass across sites



# Stargrass Biomass and WQ

## Prosser



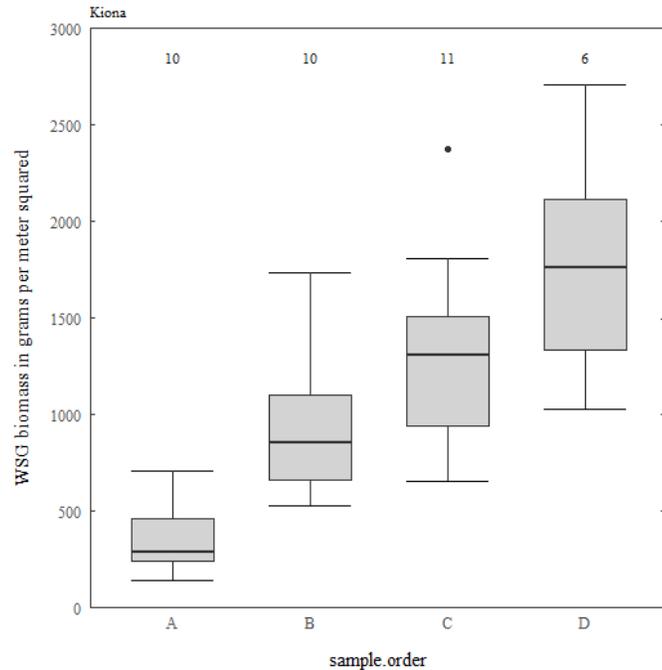
Sample order – Aug2018, June 2019, Aug2019, Sept2019



Preliminary Data – Subject to Revision

# Stargrass Biomass and WQ

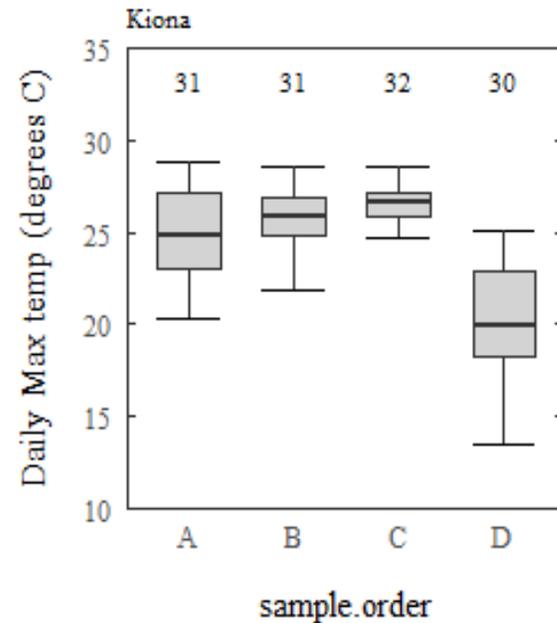
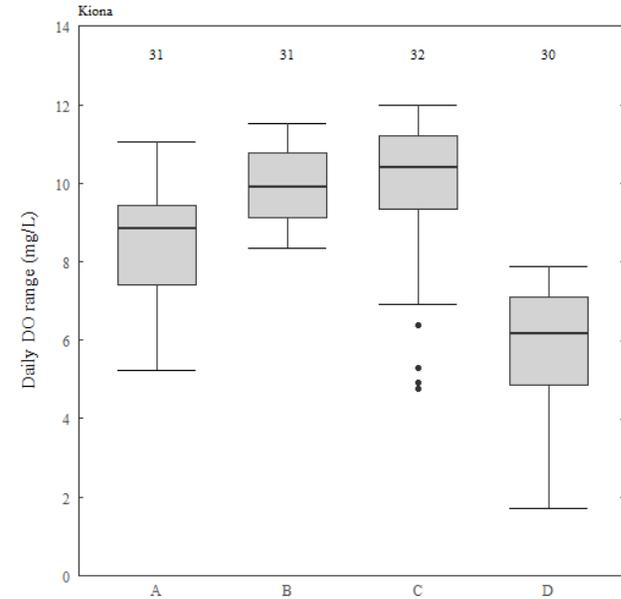
## Kiona



Sample order – Aug2018, June 2019, Aug2019, Sept2019

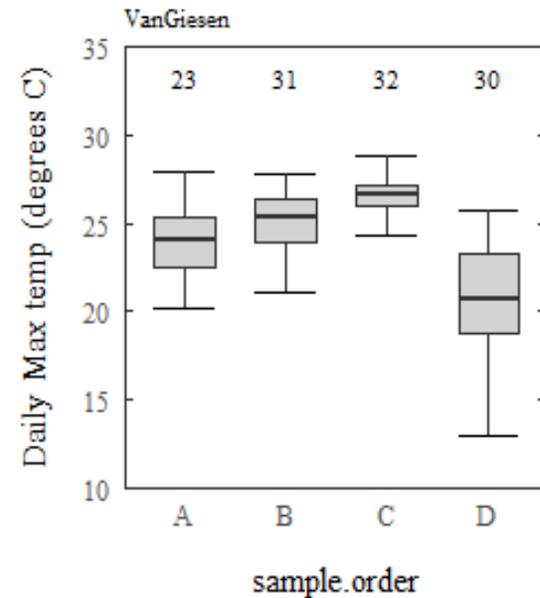
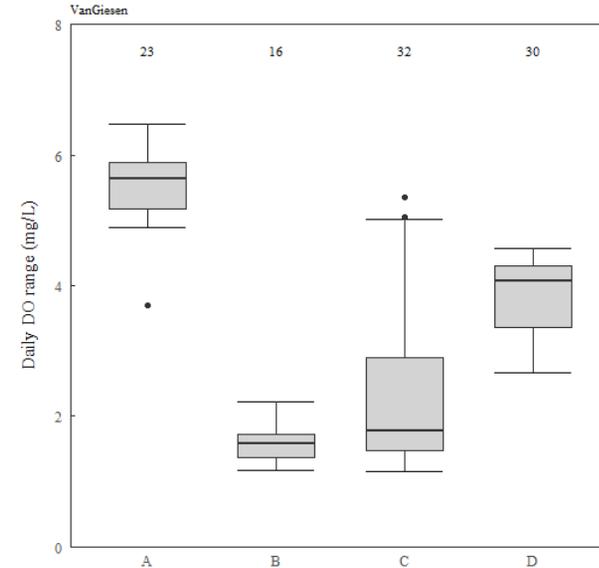
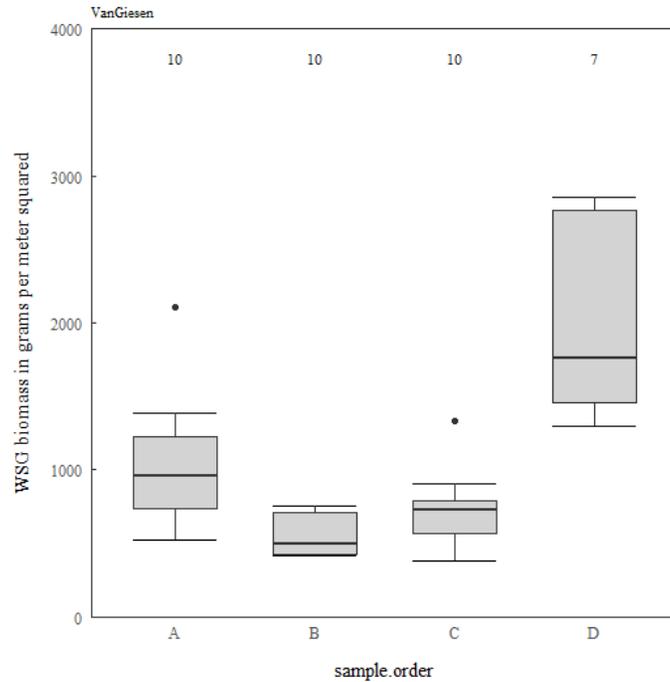


Preliminary Data – Subject to Revision



# Stargrass Biomass and DO range

## VanGiesen



Sample order – Aug2018, June 2019, Aug2019, Sept2019



Preliminary Data – Subject to Revision

# Stargrass biomass and water quality

- At all sites, we see increase in biomass over the growing season
- With biomass increase, we see max water temp increase, although Sept 2019 we saw a dip due to changing weather conditions.
- DO range increased with biomass most clearly at Van Giesen

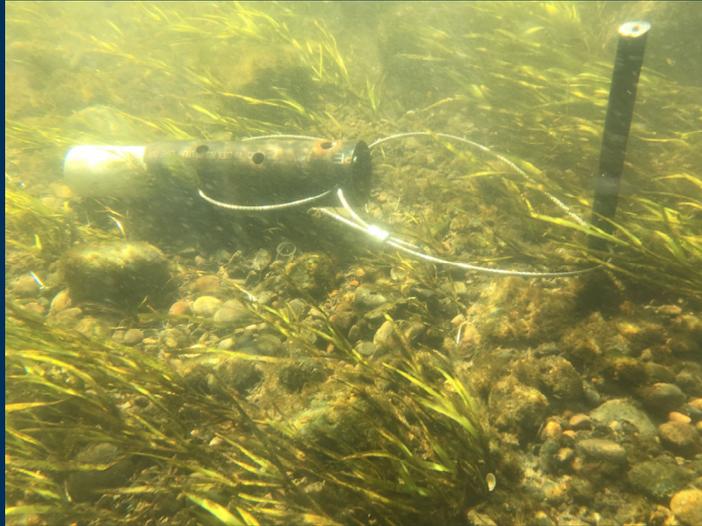
# Stargrass other physical observations

- Prosser - deep, slow velocity – large plants
- Kiona – fast flowing, mid-range depths, big plants on margins of channel
- Van Giesen – fast flowing, shallow, much smaller plants
  
- Hydrology is influencing the amount and size of plants we see

# Project Scope – thermal refuge dynamics

- Install continuous temperature loggers at 8 locations on the lower Yakima River
  - Four sites instrumented in Sept 2018, data downloaded in September 2019
    - Amon wasteway; I182 side channel; Fox island; Spring/Snipes creek
  - Four additional sites instrumented in Sept 2019
    - Harkins channel; Corral Creek; two upstream in Wapato reach
- Test and document extent and persistence of thermal refugia

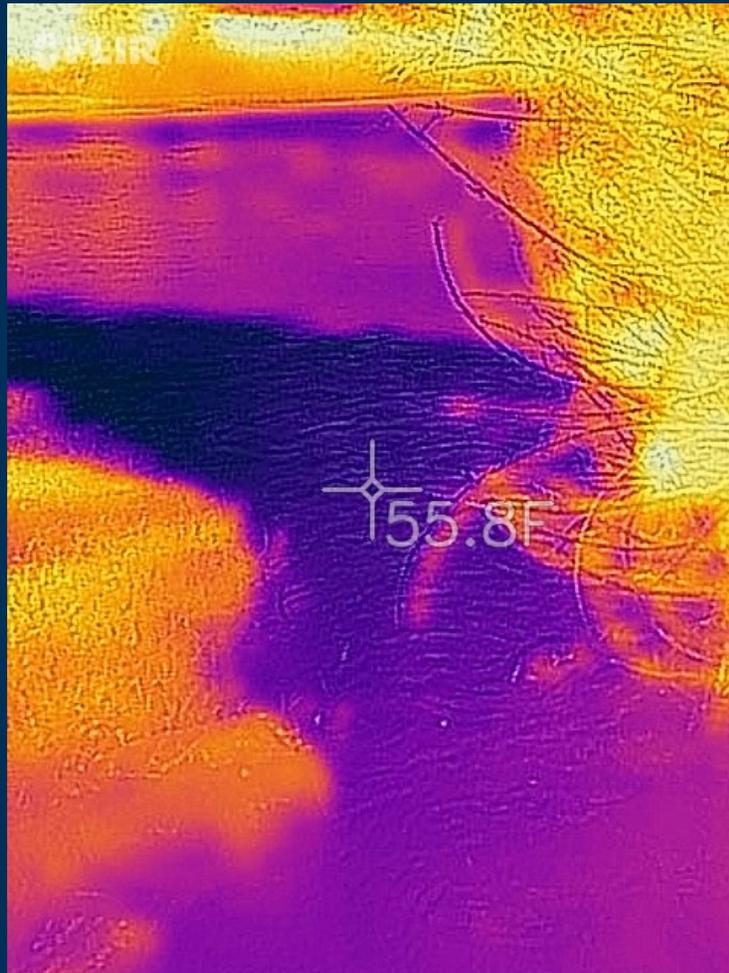
# Temperature installs



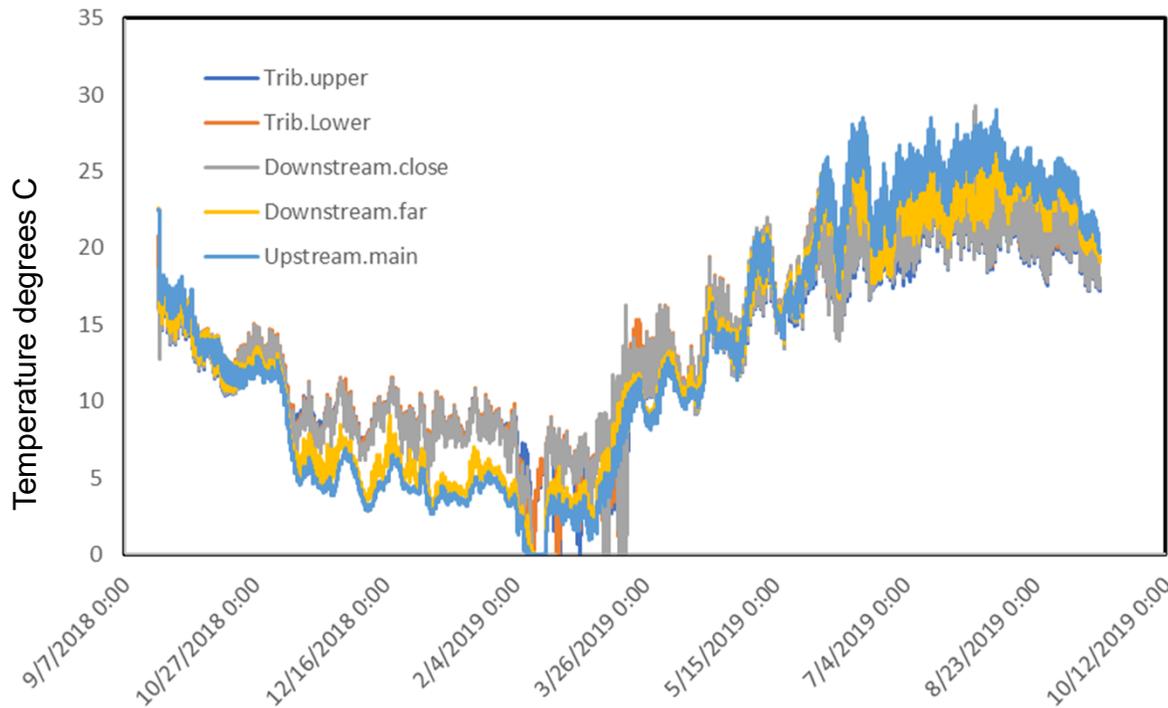
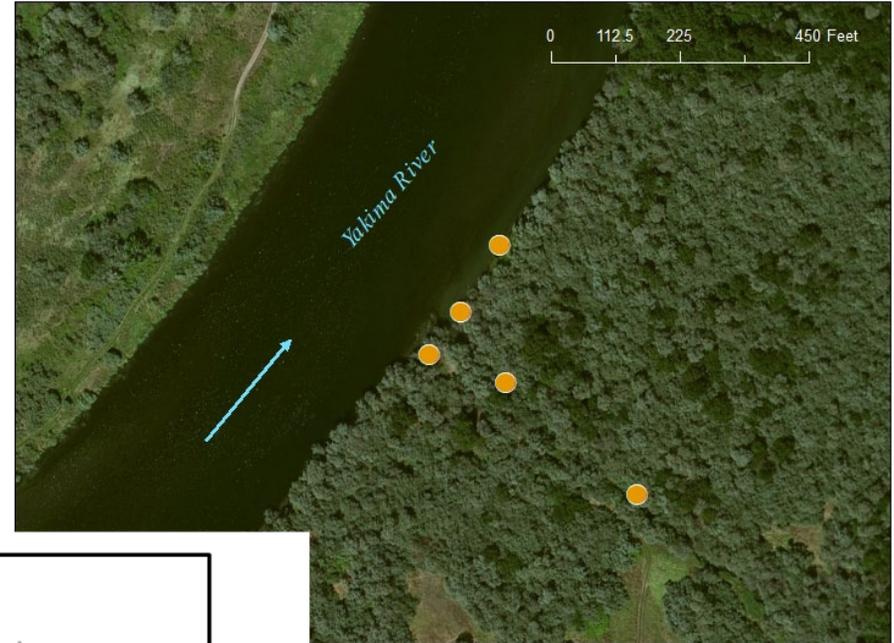
# Corral Creek



# Corral Creek

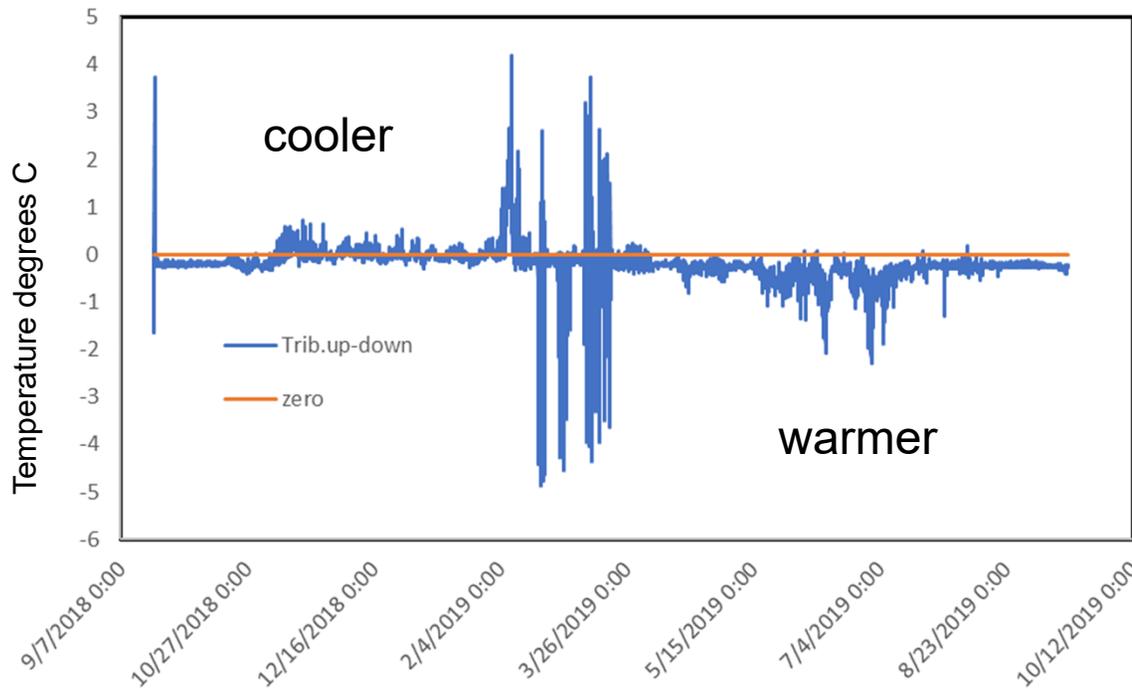
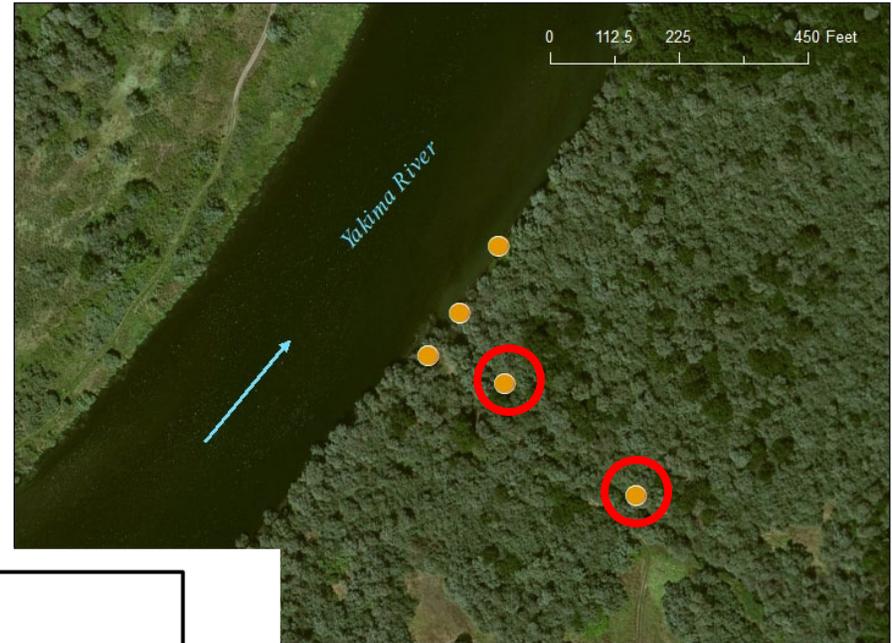


# Amon Wasteway



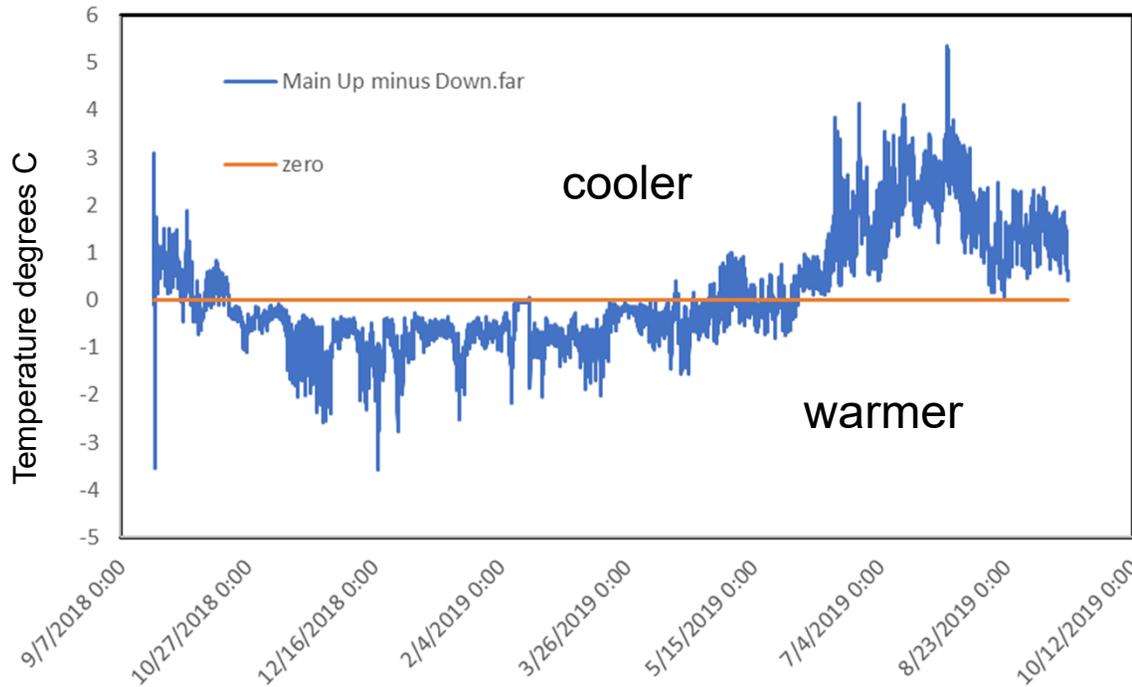
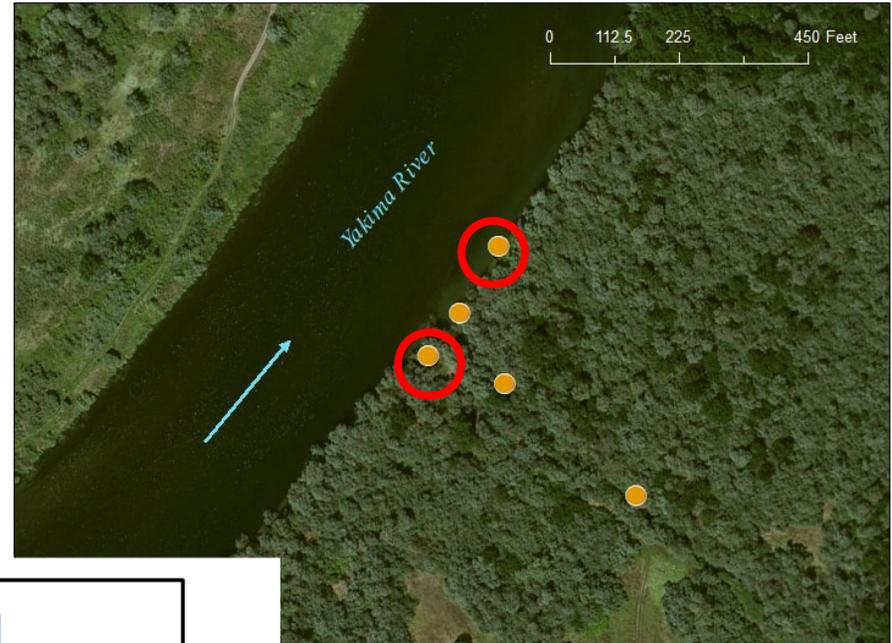
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# Amon Wasteway



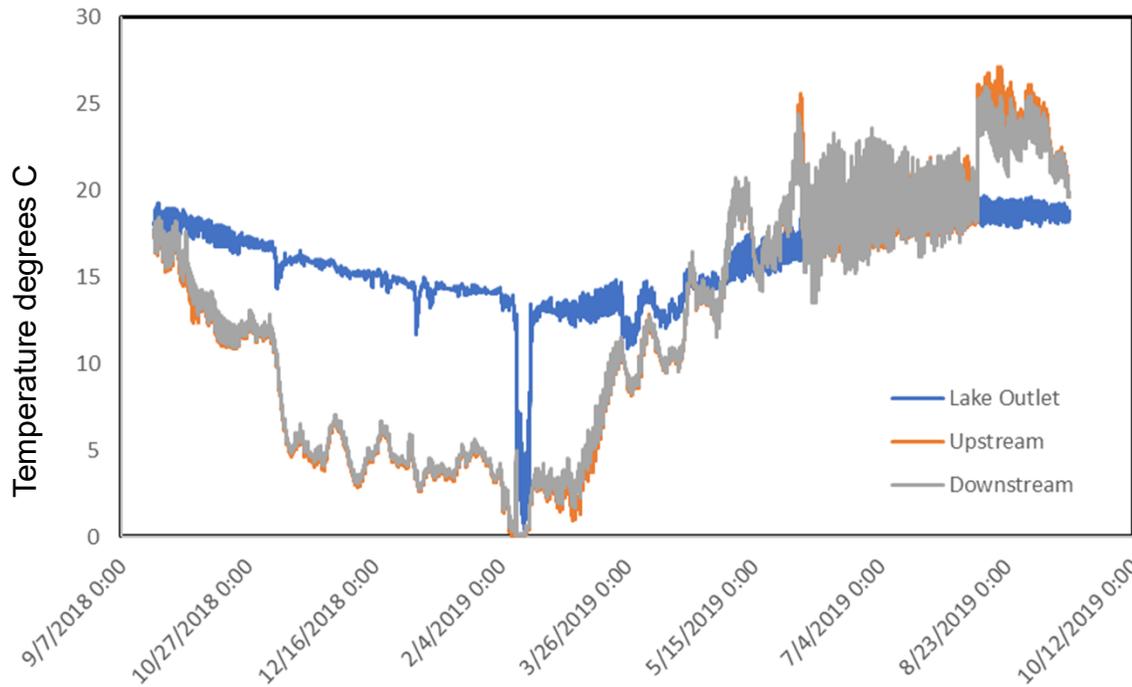
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# Amon Wasteway



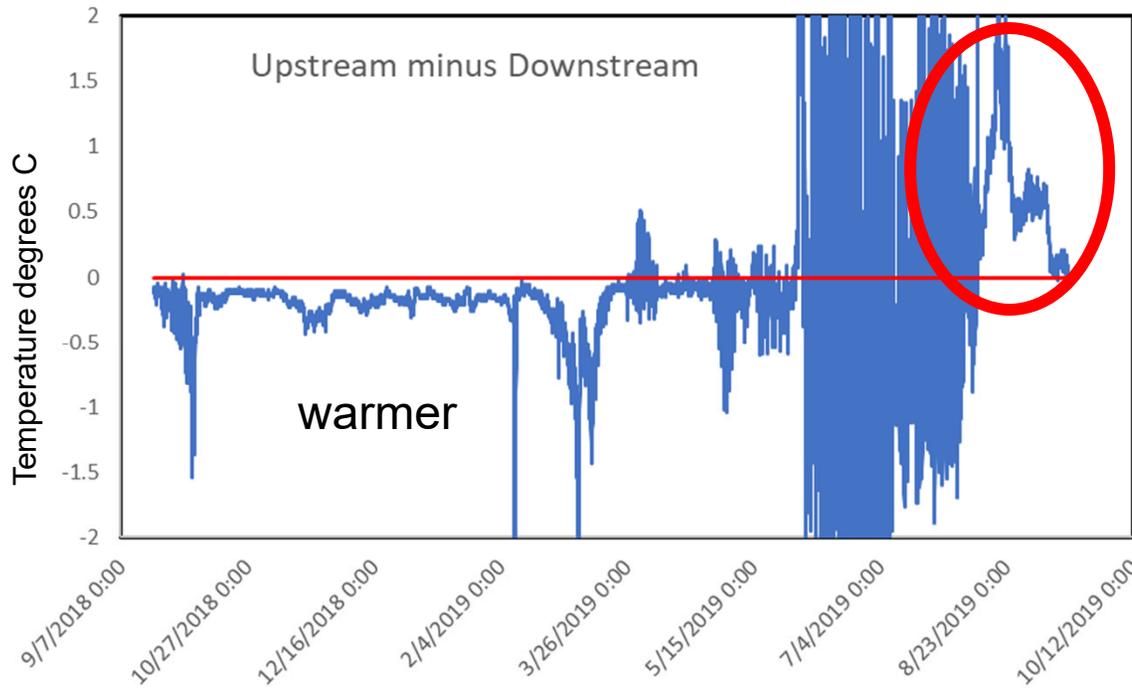
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# I182 side channel



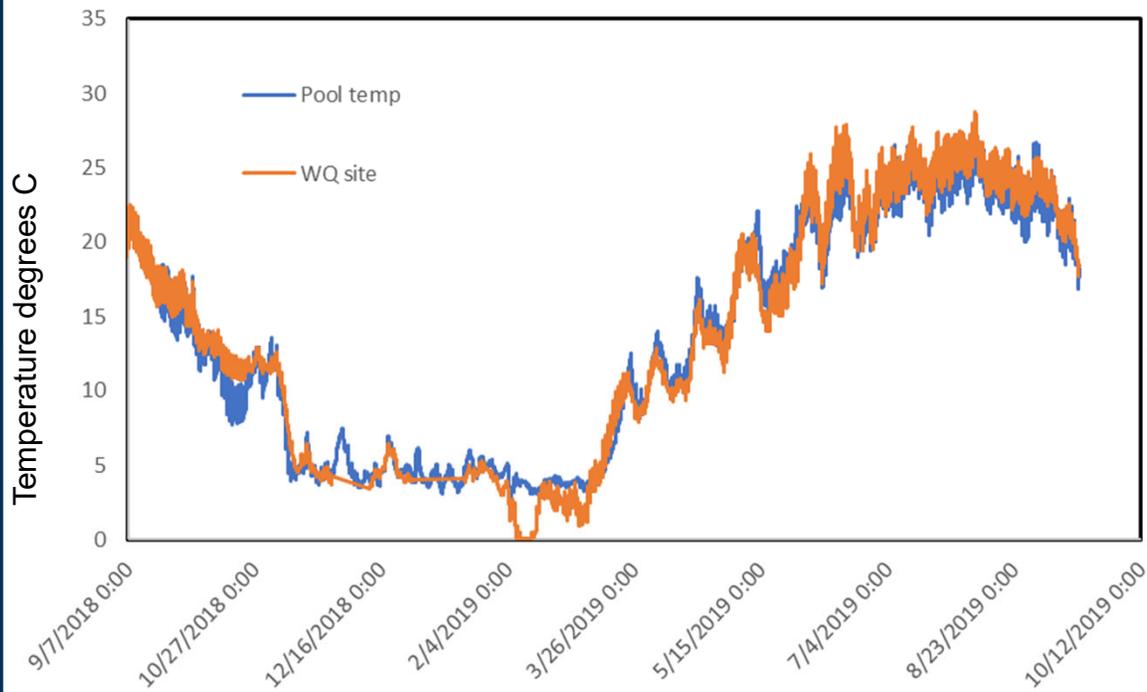
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# I182 side channel



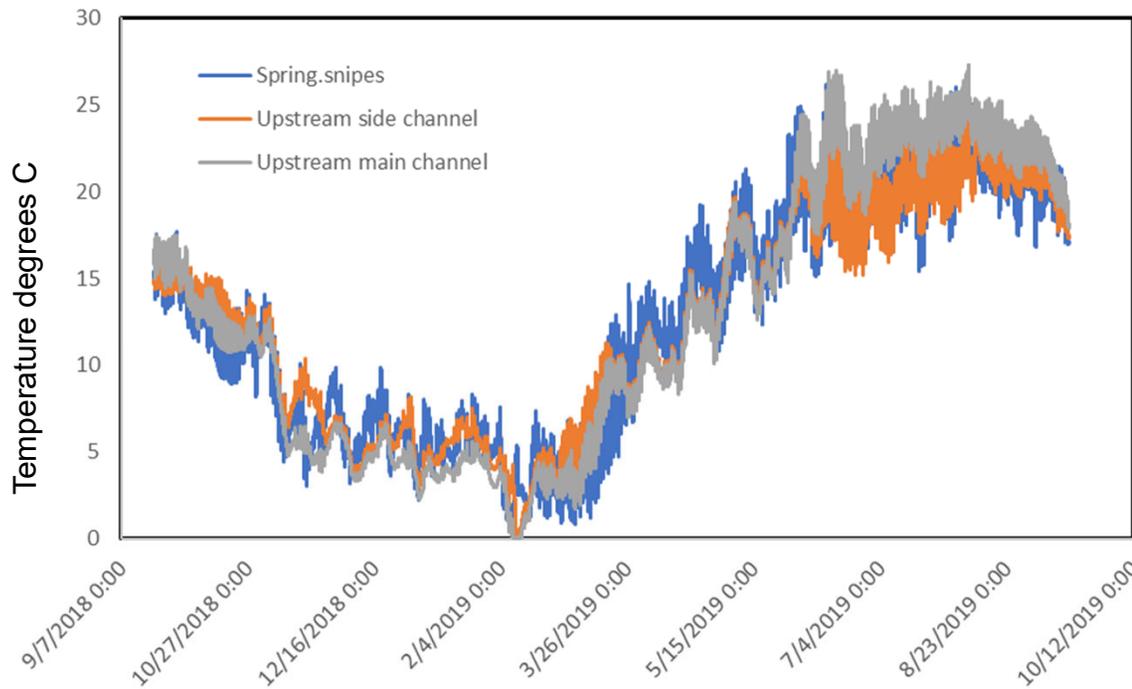
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# Fox Island



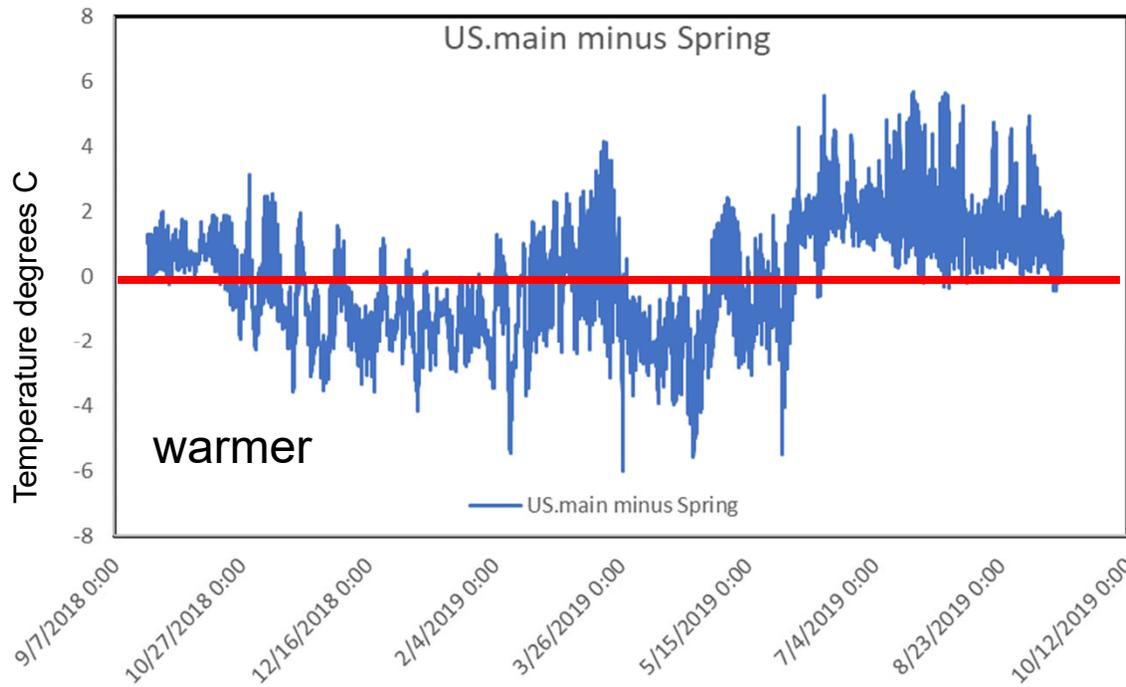
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# Spring/Snipes



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# Spring/Snipes



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# Summary

- Water stargrass biomass increases during growing season
- Some evidence of relationships between WQ and biomass
- Thermal refuge sites show warming in fall/winter and cooling in summer
- Next steps – map refuge sites better to look at extent
  - FLIR; GPS mapping

# Questions?

