



Total Dissolved Gas Levels Below Foster Dam and Implications for Chinook Salmon and Steelhead Populations

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▶ Goal

- Estimate exposure of eggs, alevin, juvenile, and adult Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) lifestages to total dissolved gas (TDG) downstream of Foster Dam

▶ Objectives

- Evaluate TDG exposure to spawning grounds downstream of Foster Dam
 - TDG in surface water
 - Depth compensated TDG in the hyporheic zone
 - Dissipation of TDG downstream
- Evaluate the relationship between Foster Dam operations and TDG levels
 - Help to inform other Willamette dam operations based on TDG exposure

Monitoring Schedule

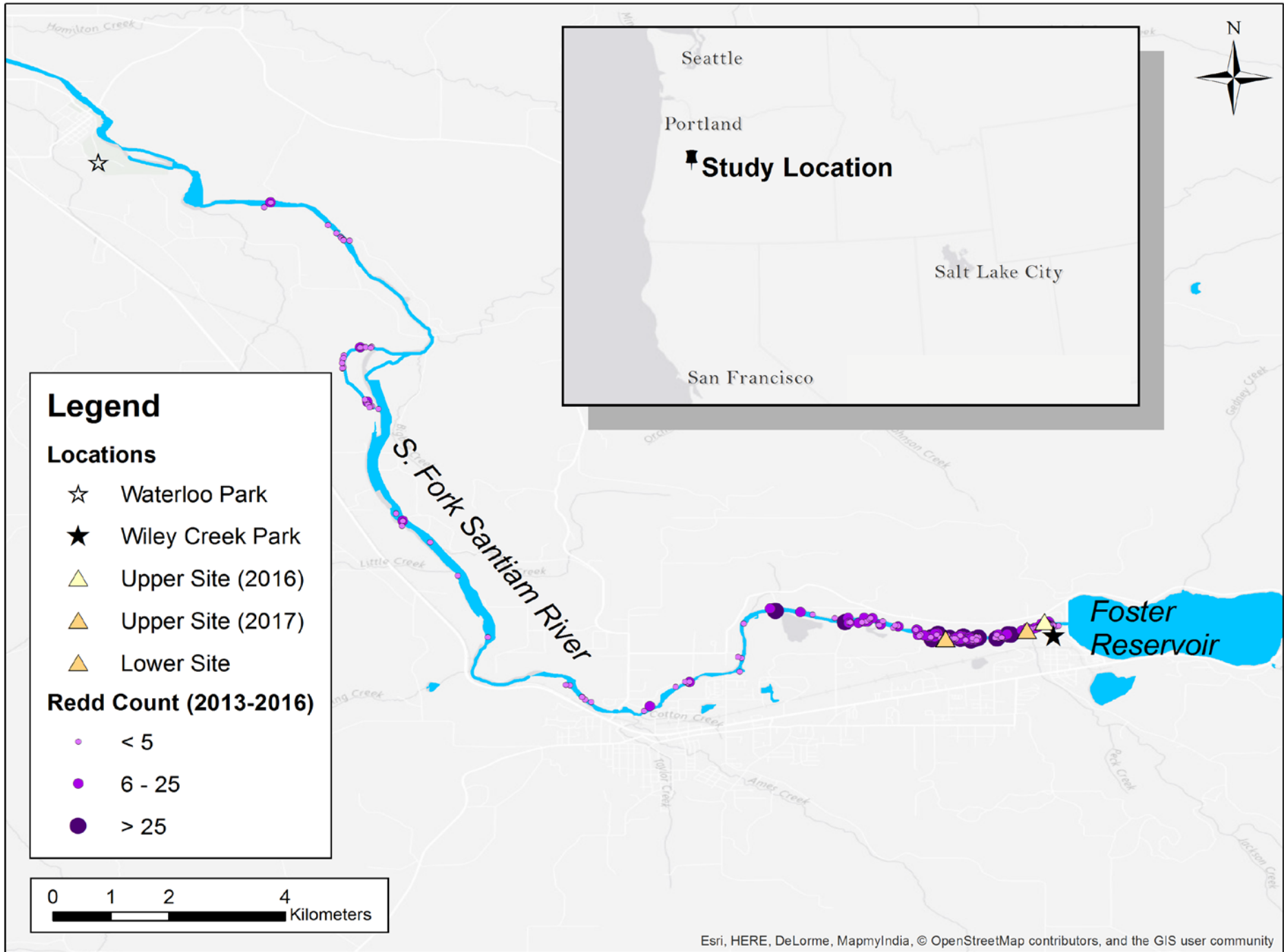
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2016			2017					

Spring Chinook Salmon

Eggs	Eggs, Sac-fry	Sac-fry, Fry	Fry	Alevin		Adults and Juveniles	
Fall smolts				Spring smolts			

Winter Steelhead

Juveniles			Adults		Adults and Juveniles	
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Legend

Locations

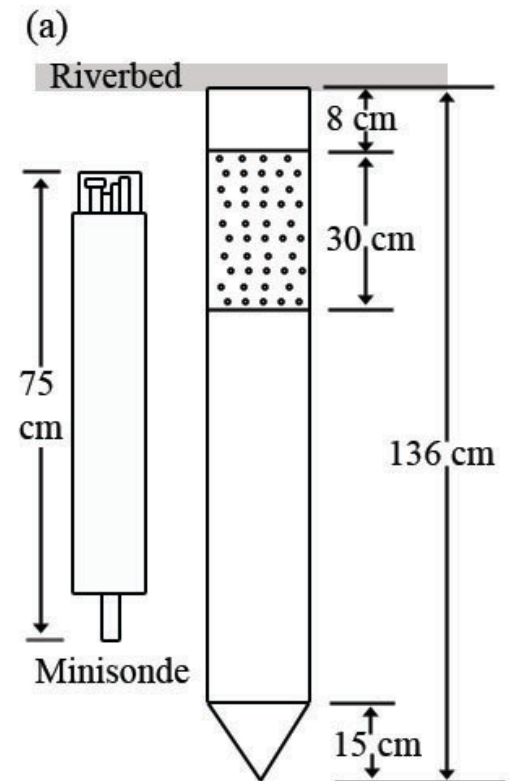
- ☆ Waterloo Park
- ★ Wiley Creek Park
- △ Upper Site (2016)
- ▲ Upper Site (2017)
- ▲ Lower Site

Redd Count (2013-2016)

- < 5
- 6 - 25
- > 25



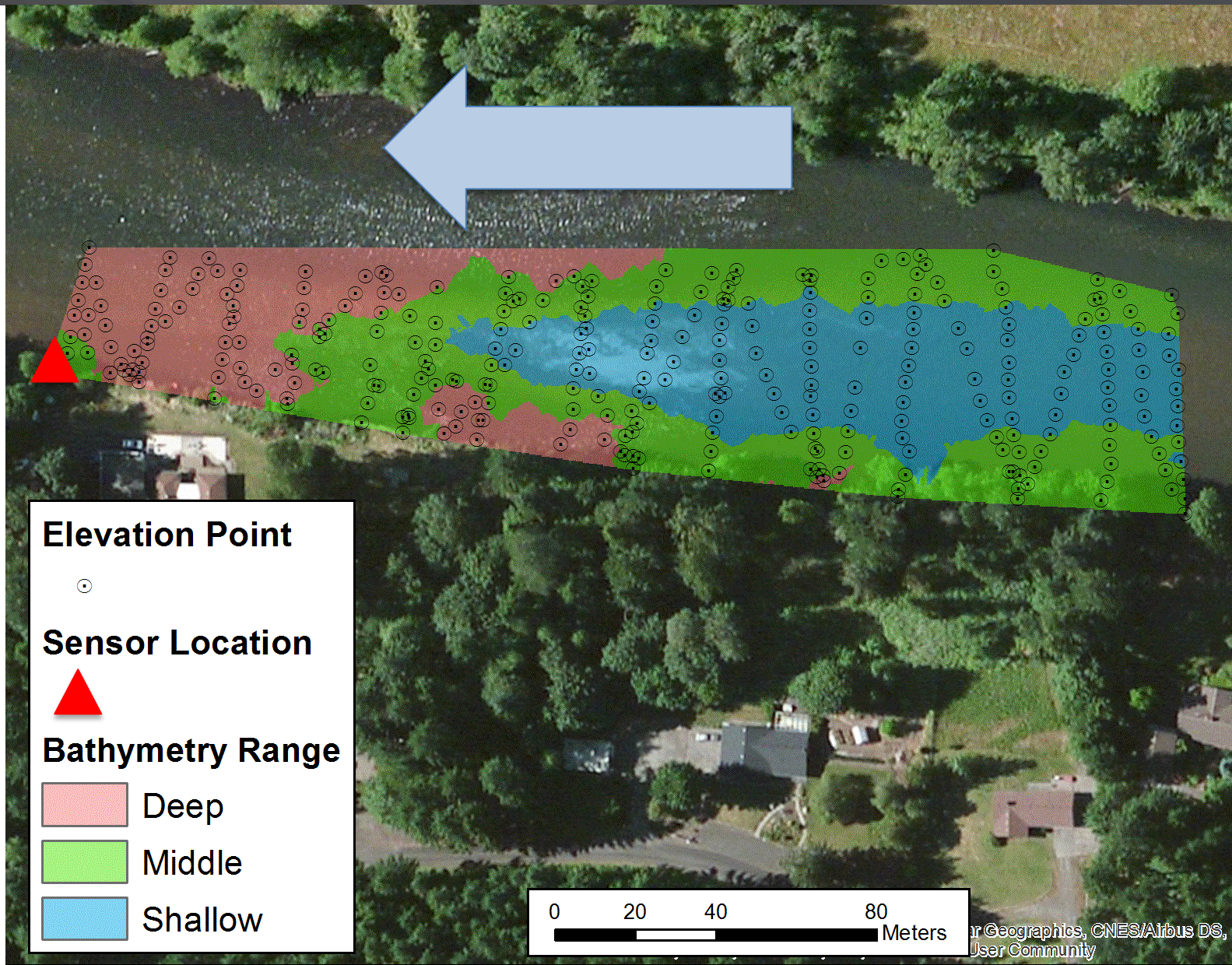
Piezometer Installation



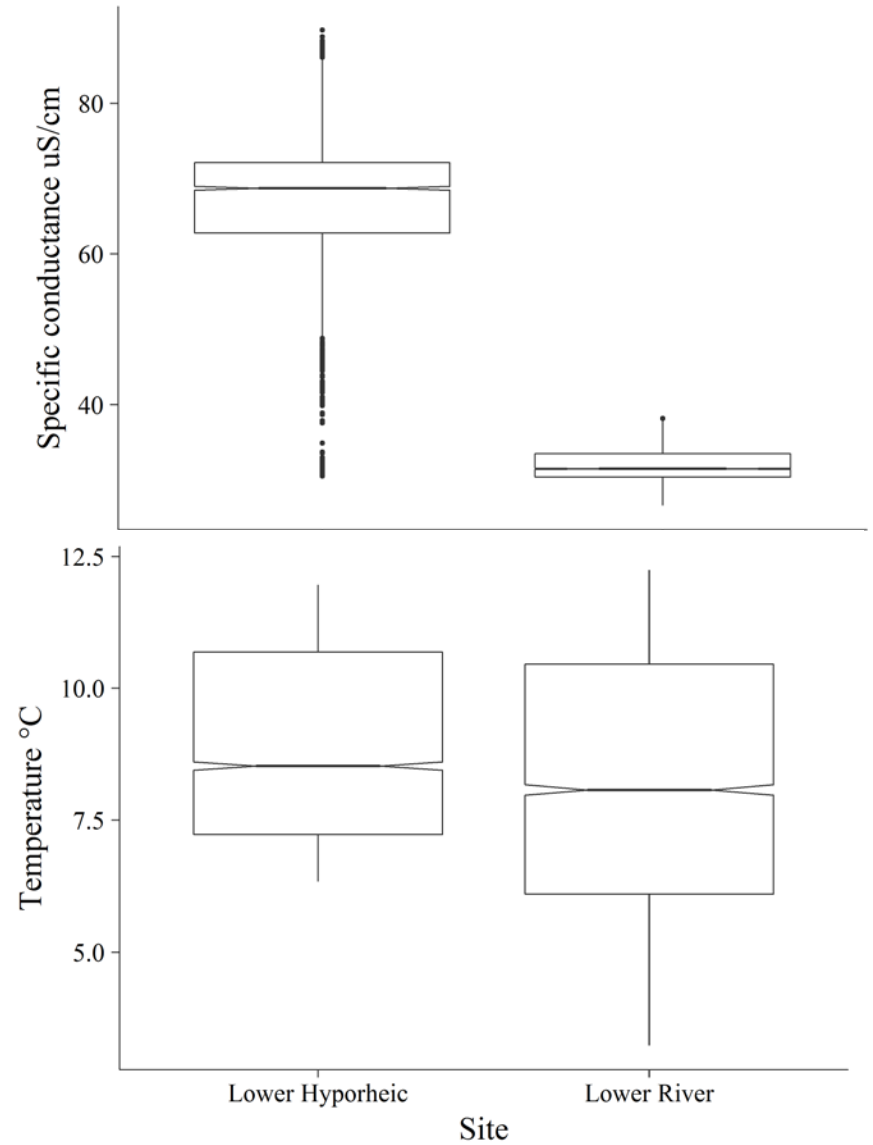
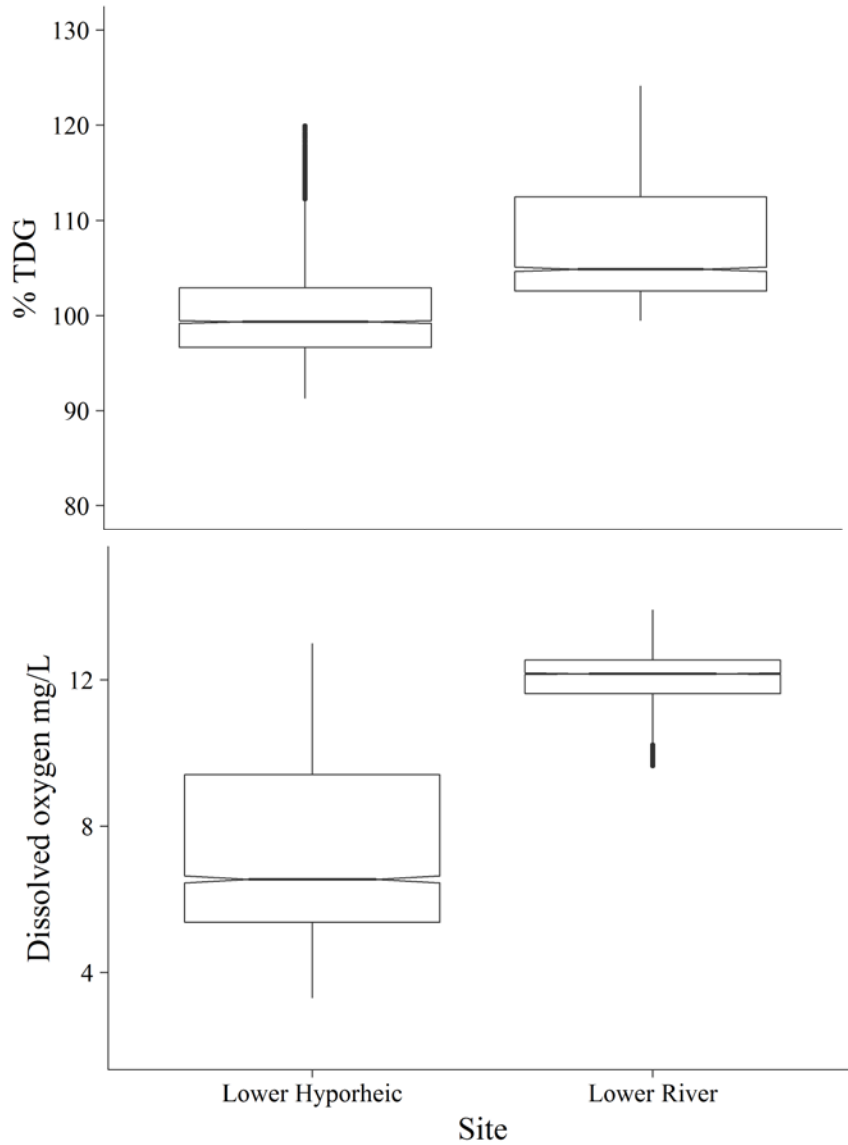
Water Quality Sensors



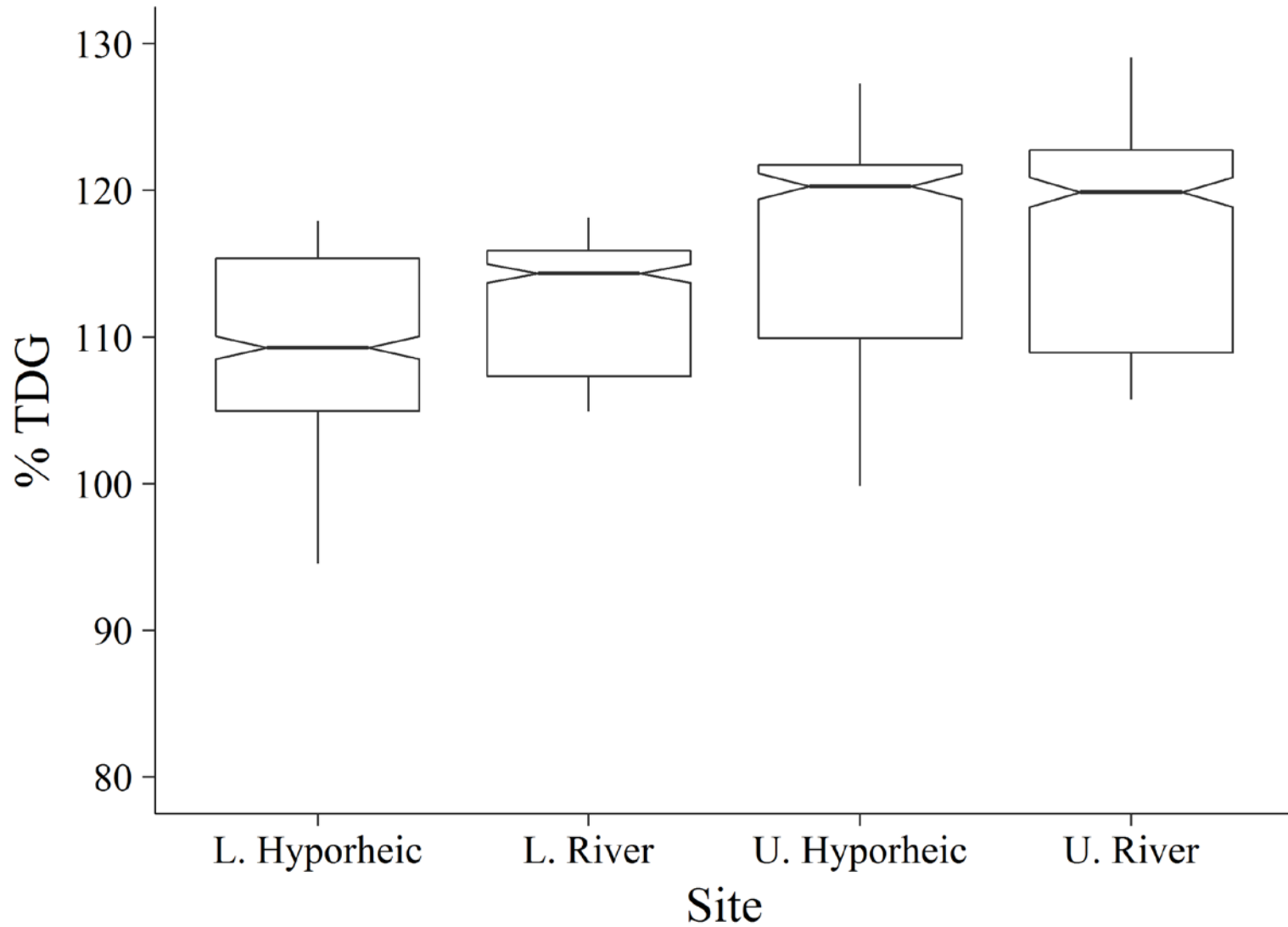
Lower Site Bathymetry



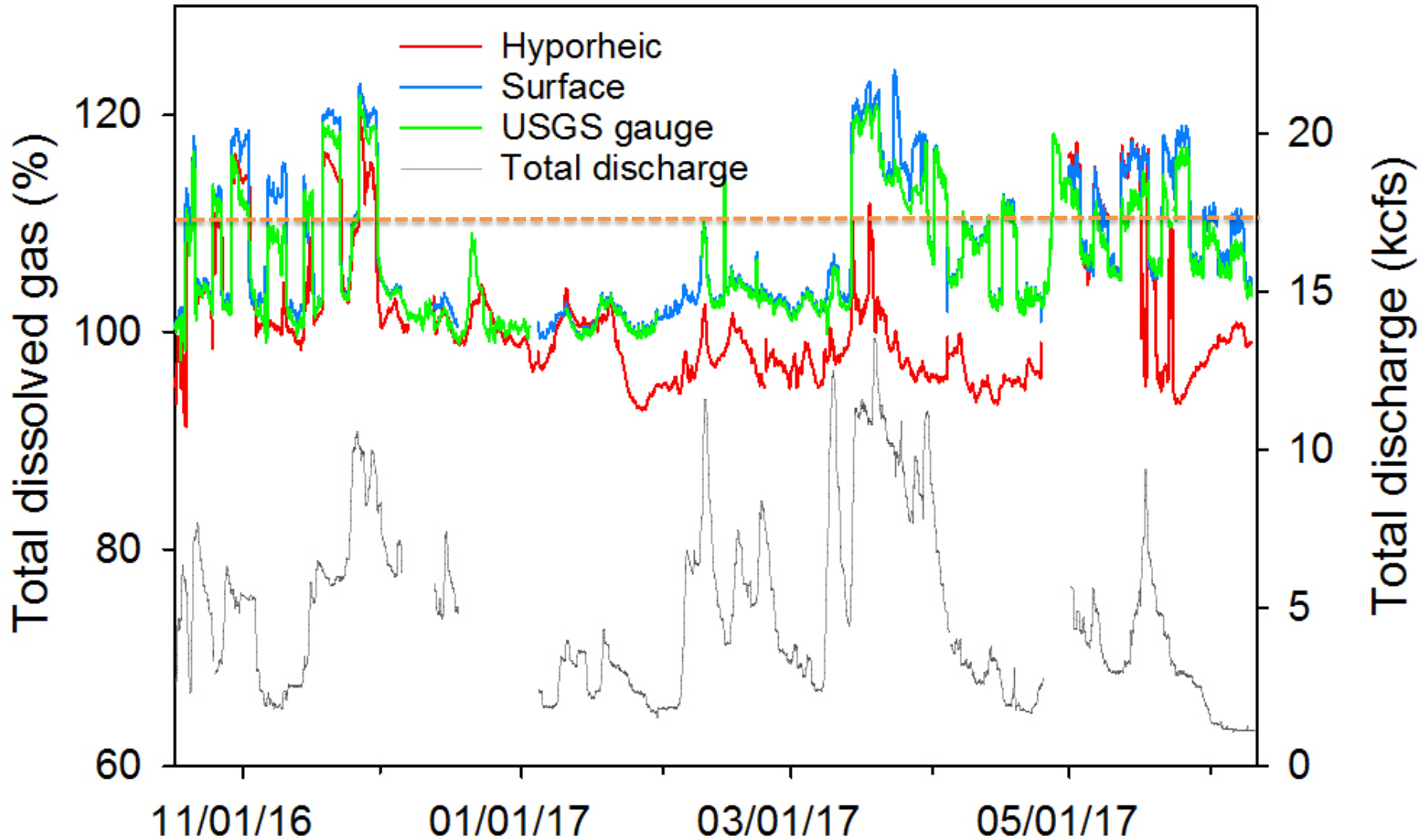
Water Quality Results



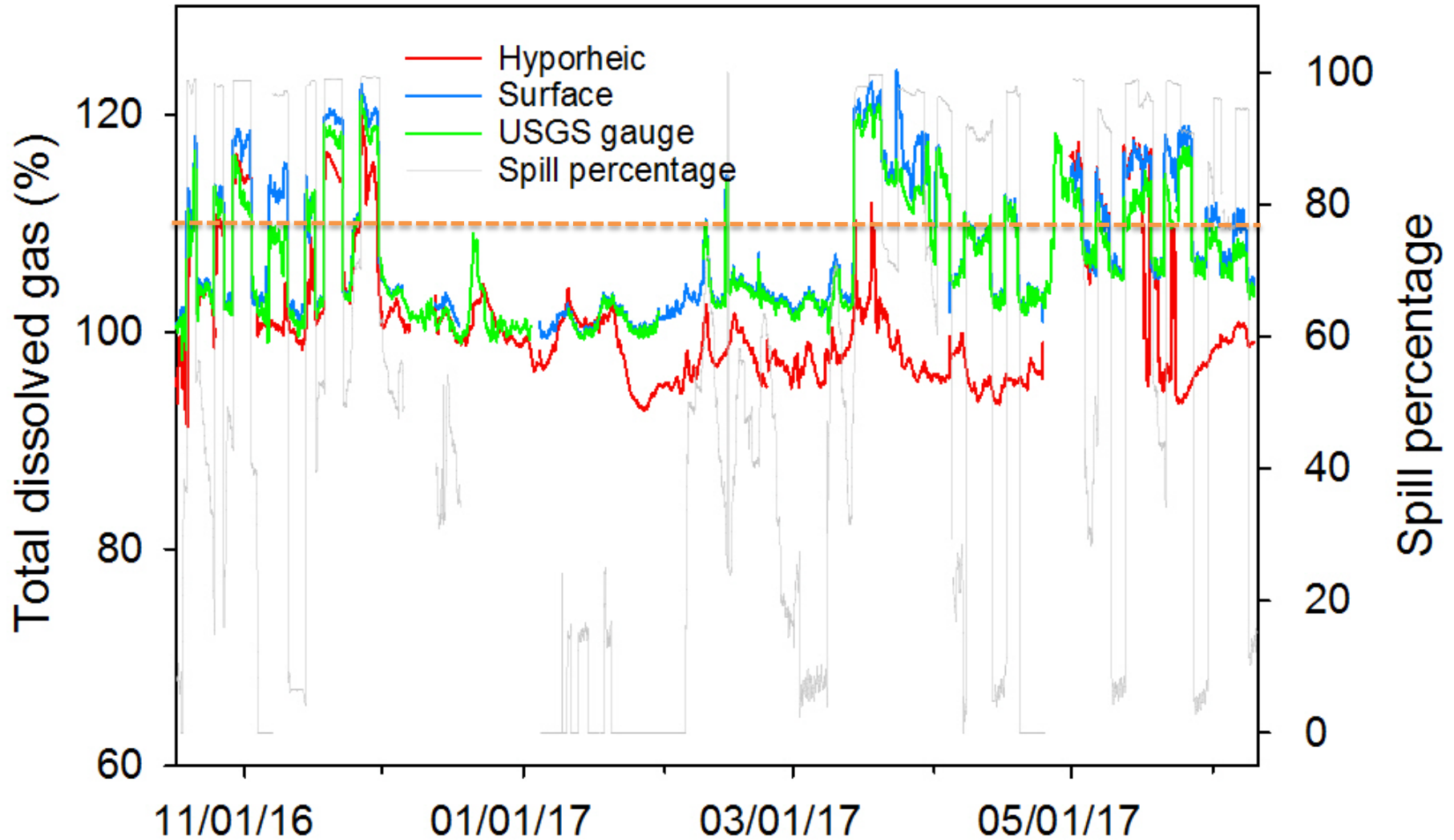
TDG at Lower and Upper Sites

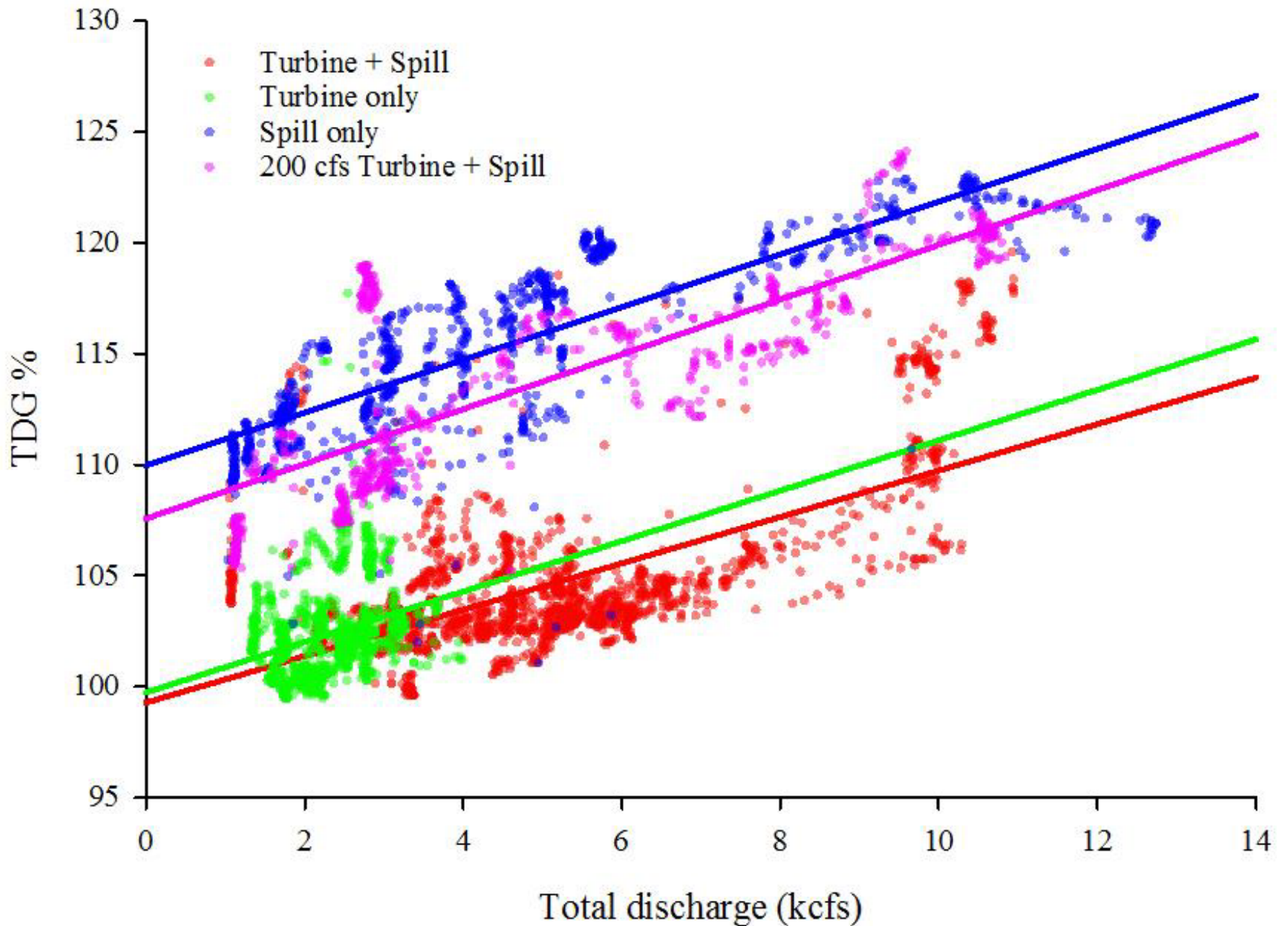


Total Dissolved Gas (%)

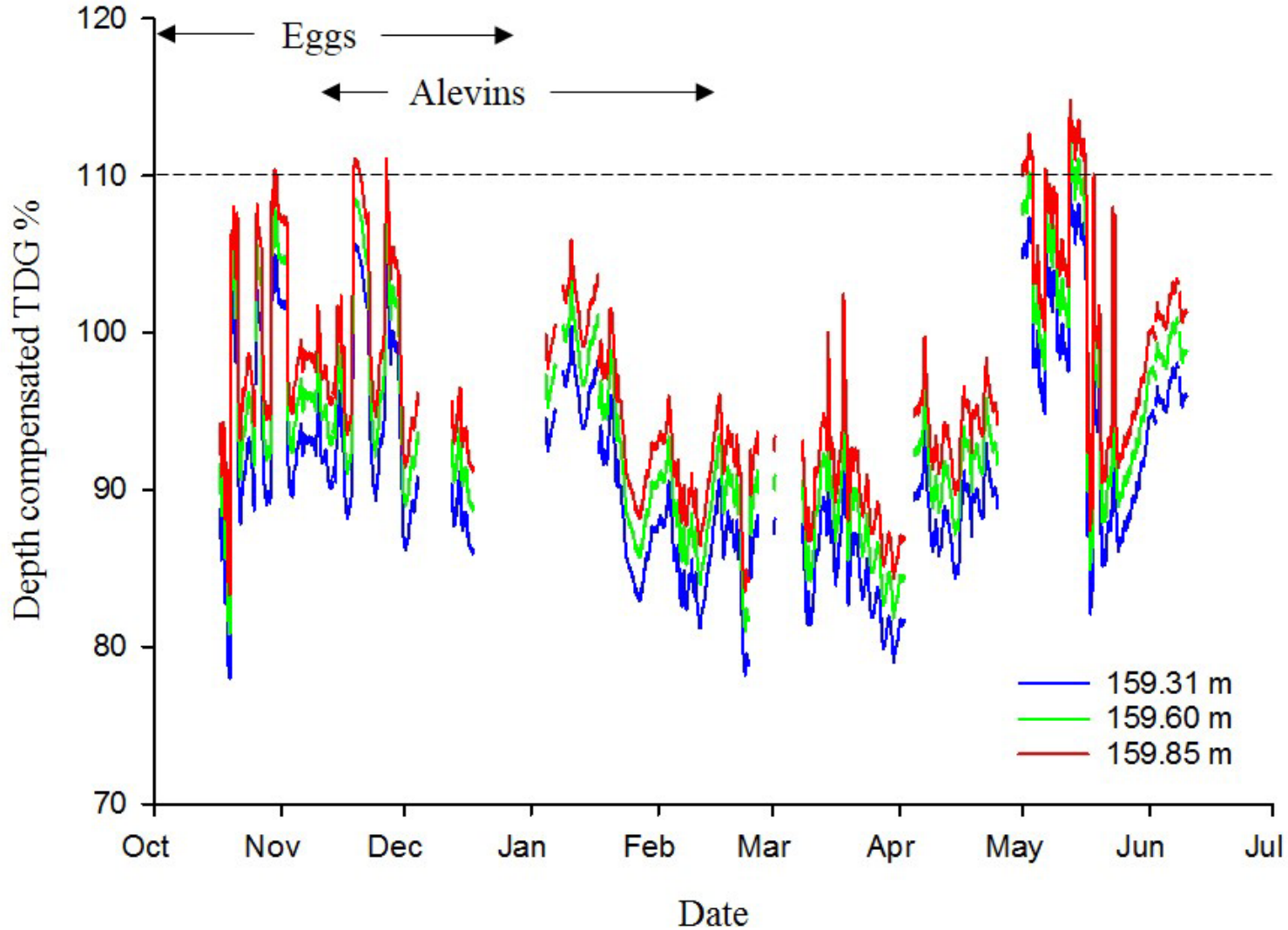


Total Dissolved Gas (%)

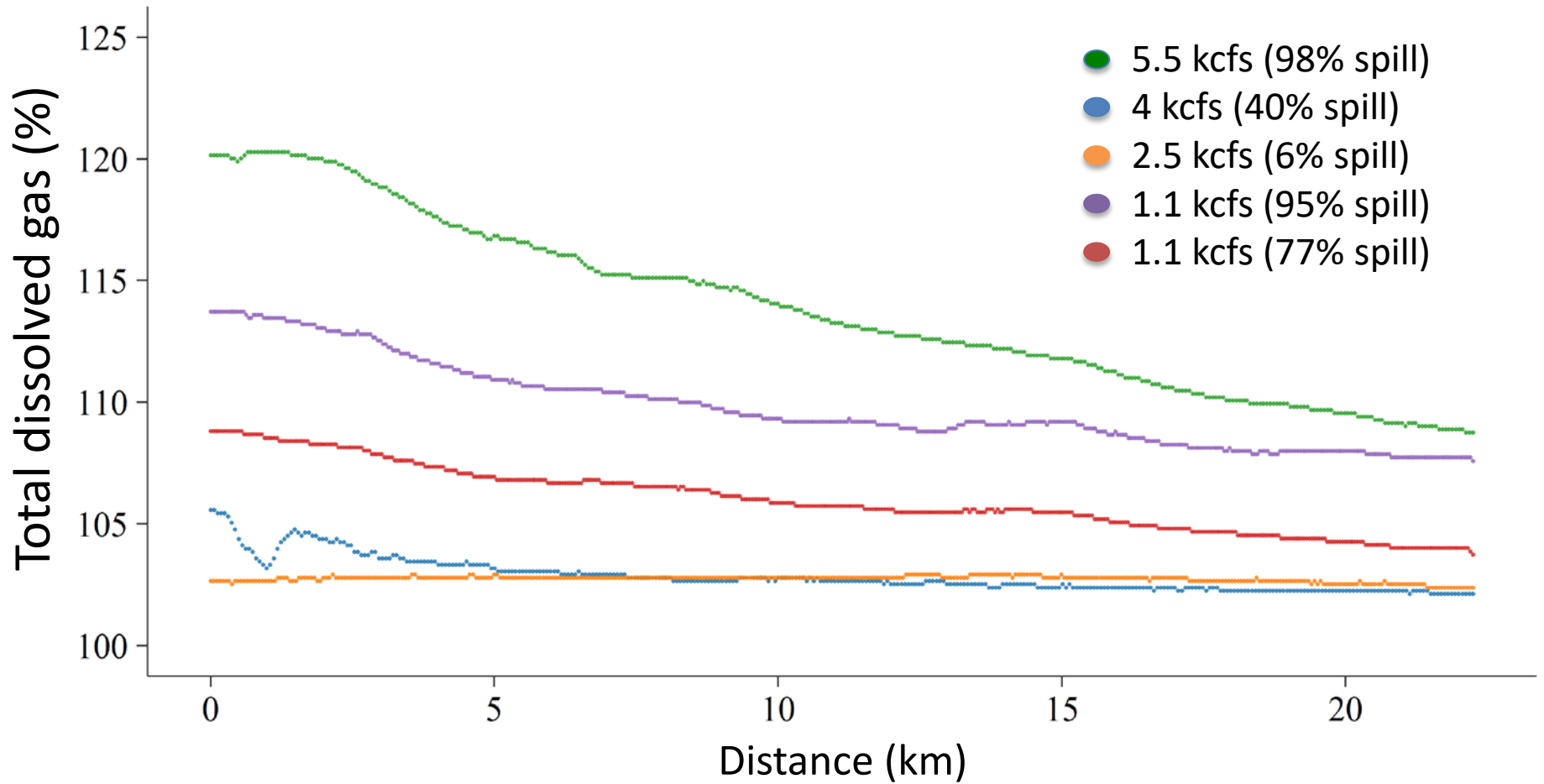




Depth Compensated TDG



Dissipation of TDG



Implications for Salmonids

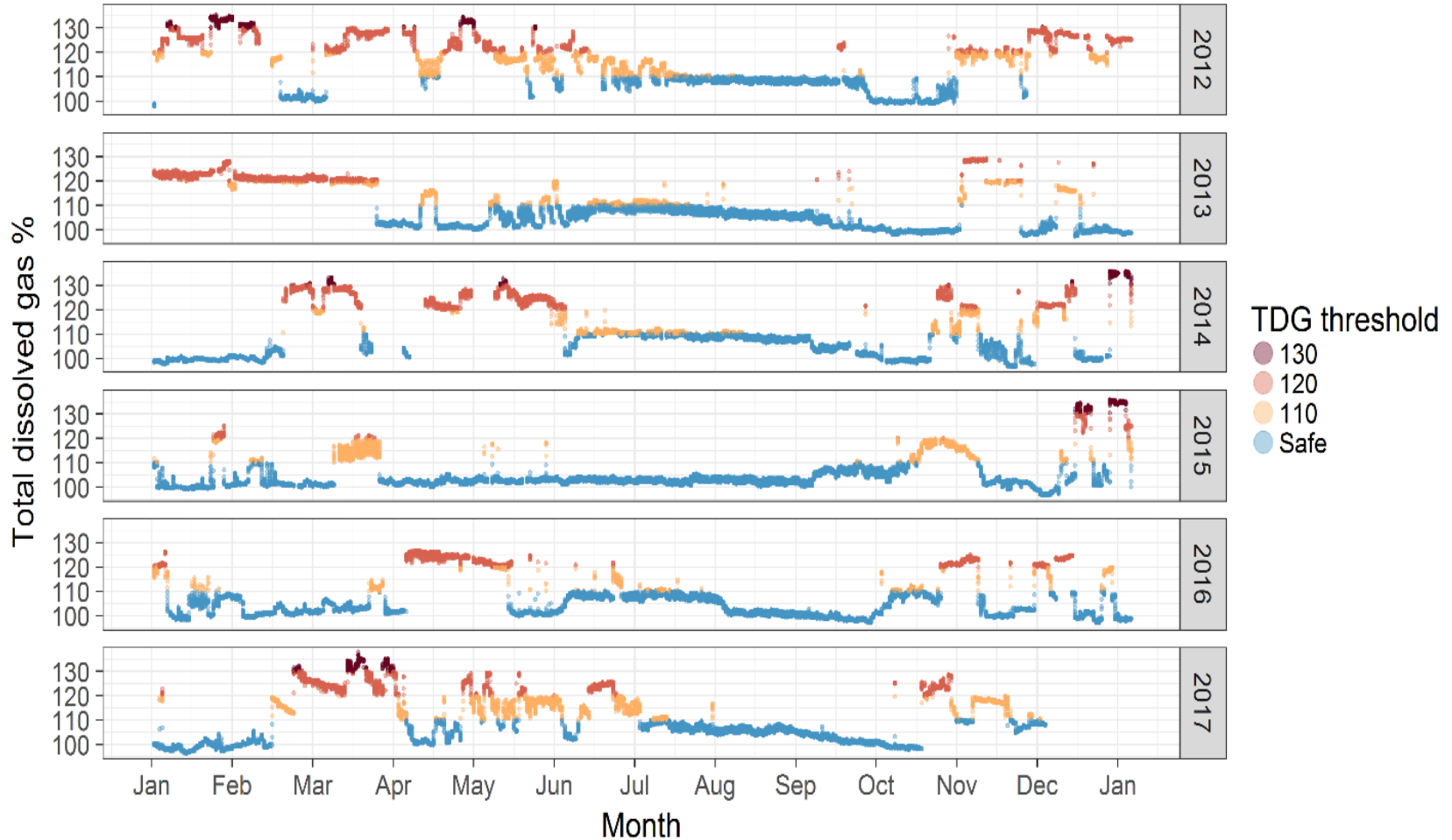
- ▶ Biological effects:
 - GBD reported for various alevin species at dc TDG levels ranging from 101-108%
 - 105% generally adopted for regulatory purposes
 - Juveniles/adults generally tolerate 110-120% when they can depth compensate in surface water

- ▶ Depth compensated TDG for shallow redds:
 - > 105% for 12% of monitoring period
 - > 110% for 2% of monitoring period

- ▶ Surface TDG:
 - > 110% for 32% of monitoring period



Implications for Other Willamette Valley Project Dams



Acknowledgements

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