The Unusual Case of an Invasive Native Plant:

Heteranthera dubia (Water Stargrass)

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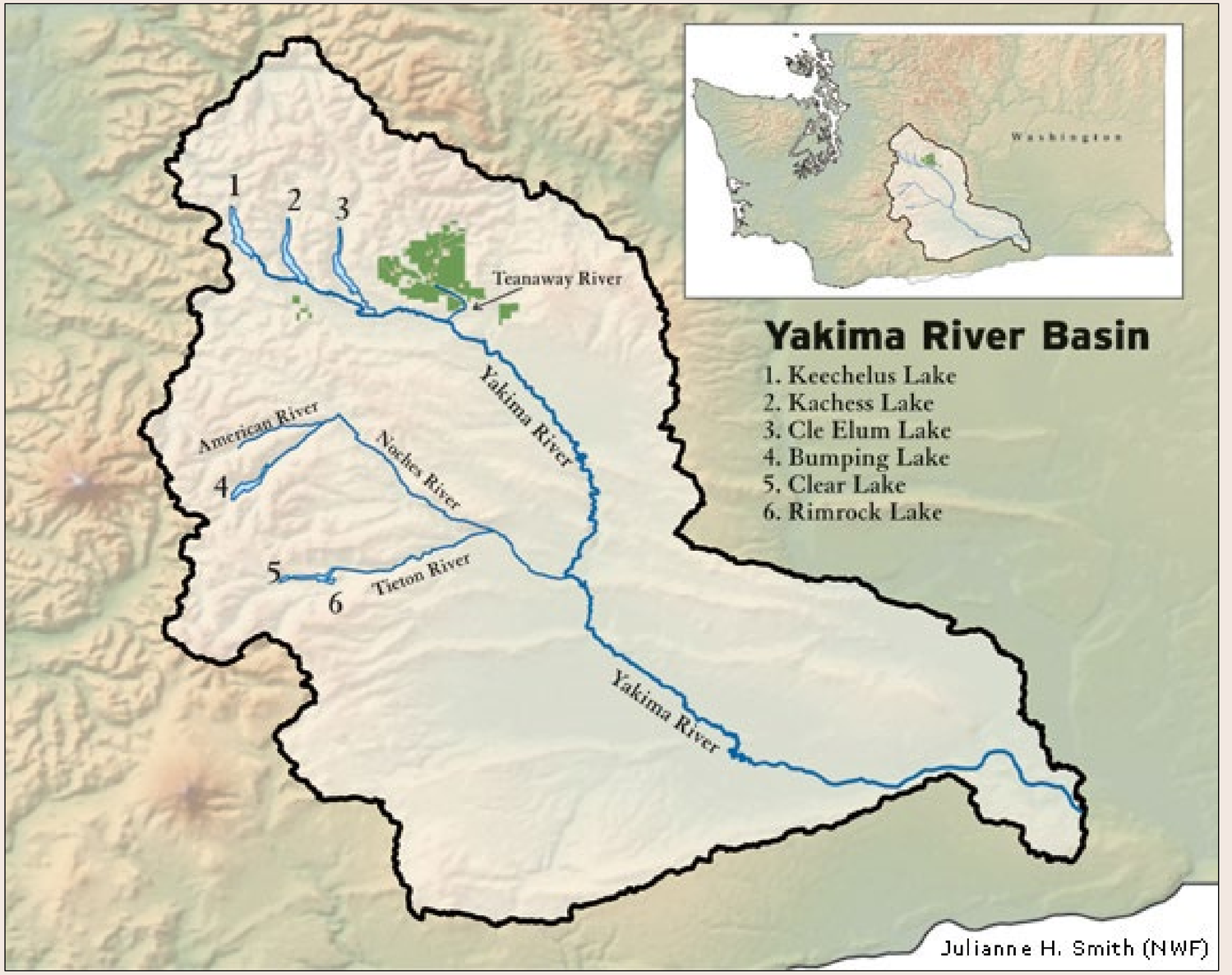
Yakima River Conditions: 1980's & 1990's

- "The Yakima River Basin is one of the most intensively farmed and irrigated areas in the United States"
- "Water-quality characteristics of the lower Yakima River resemble those of the agricultural drains"



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Morace, J.L., U.S. Geological Survey. 1999. *Surface-water-quality assessment of the Yakima River Basin in Washington: Overview of major findings, 1987-91.*

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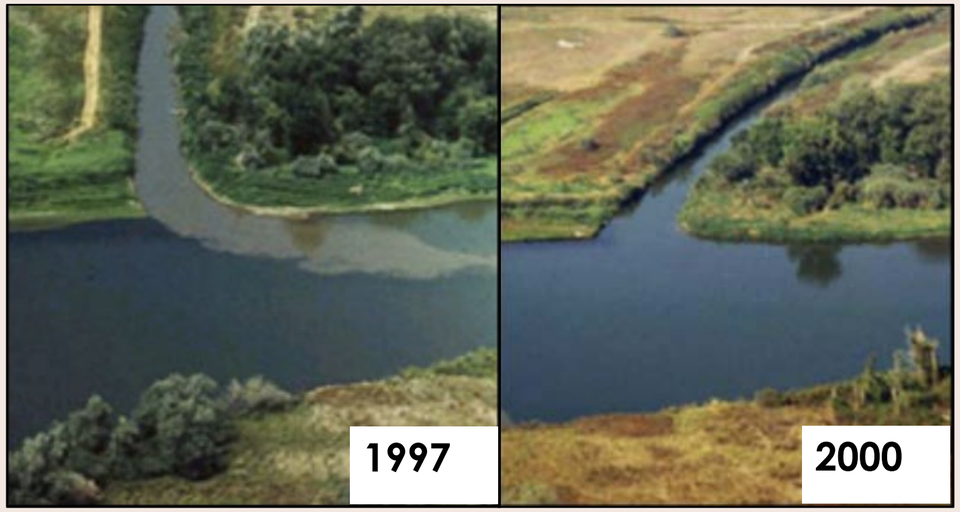
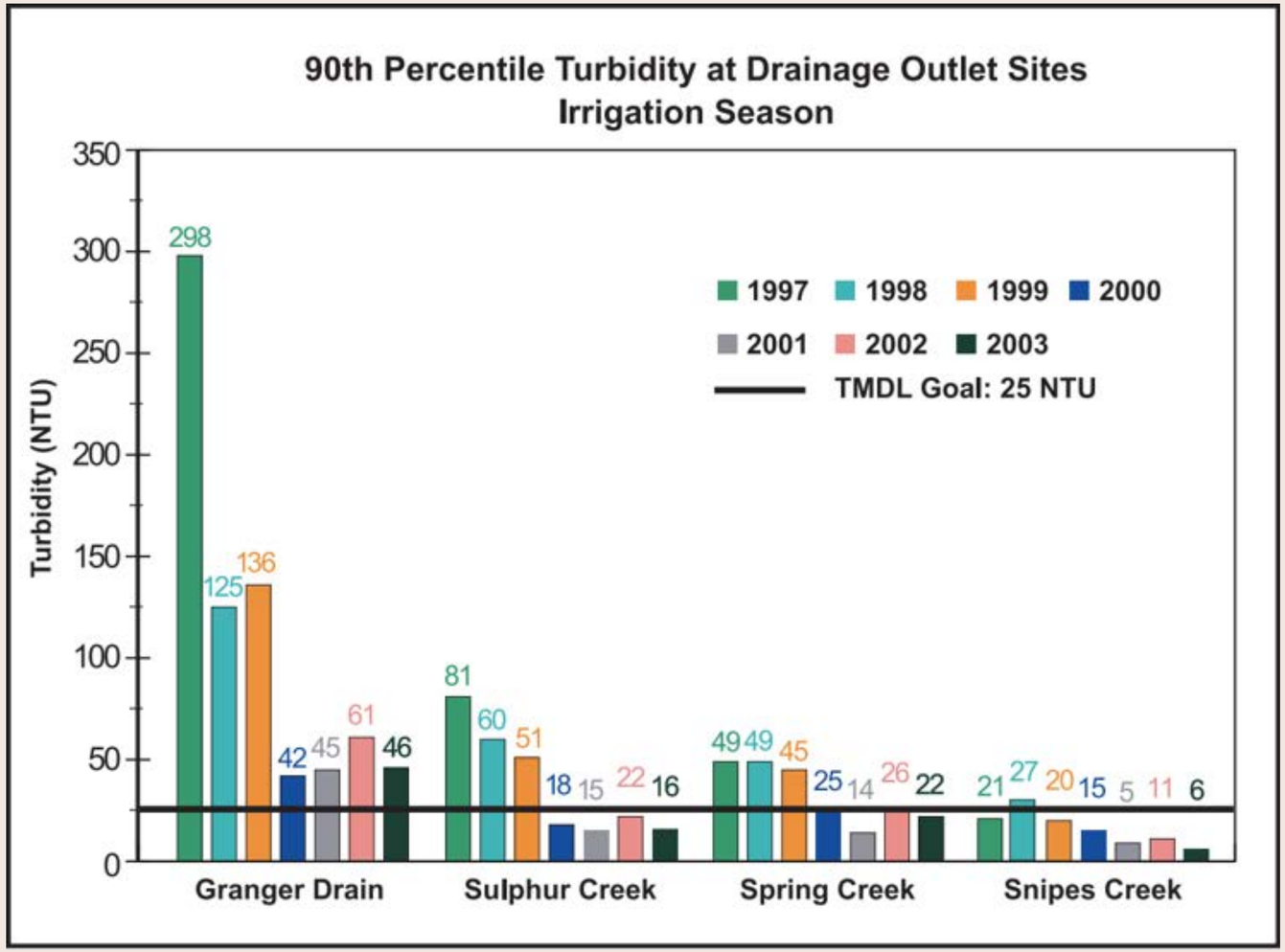
Yakima River Conditions: Early 2000's

- "In 1996 the lower Yakima River was placed on Washington's 303(d) list for impairments"
- "Reductions of total suspended sediment loadings between 50 and 70 percent in 2003 (as compared to 1995)"



Sulfur Creek



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U.S. Environmental Protection Agency. 2005. *Changes in Irrigation Practices Reduce Turbidity in the lower Yakima River.* Section 319 Nonpoint Source Program Success Story, Washington.

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Yakima River Conditions: Early 2000's

- "By 2003, excessive plant growth produced nuisance conditions in the lower river"

- "Dissolved oxygen concentrations and pH levels exceeded the Washington State water-quality standards"

Water stargrass beds in the Yakima River near Kiona, Washington, when water turbidity was about 0 FNU. (Photograph by Kurt Carpenter, U.S. Geological Survey, July 2005.)

Wise, D.R., U.S. Geological Survey. 2009. *Assessment of Eutrophication in the Lower Yakima River Basin, Washington*, 2004-07.

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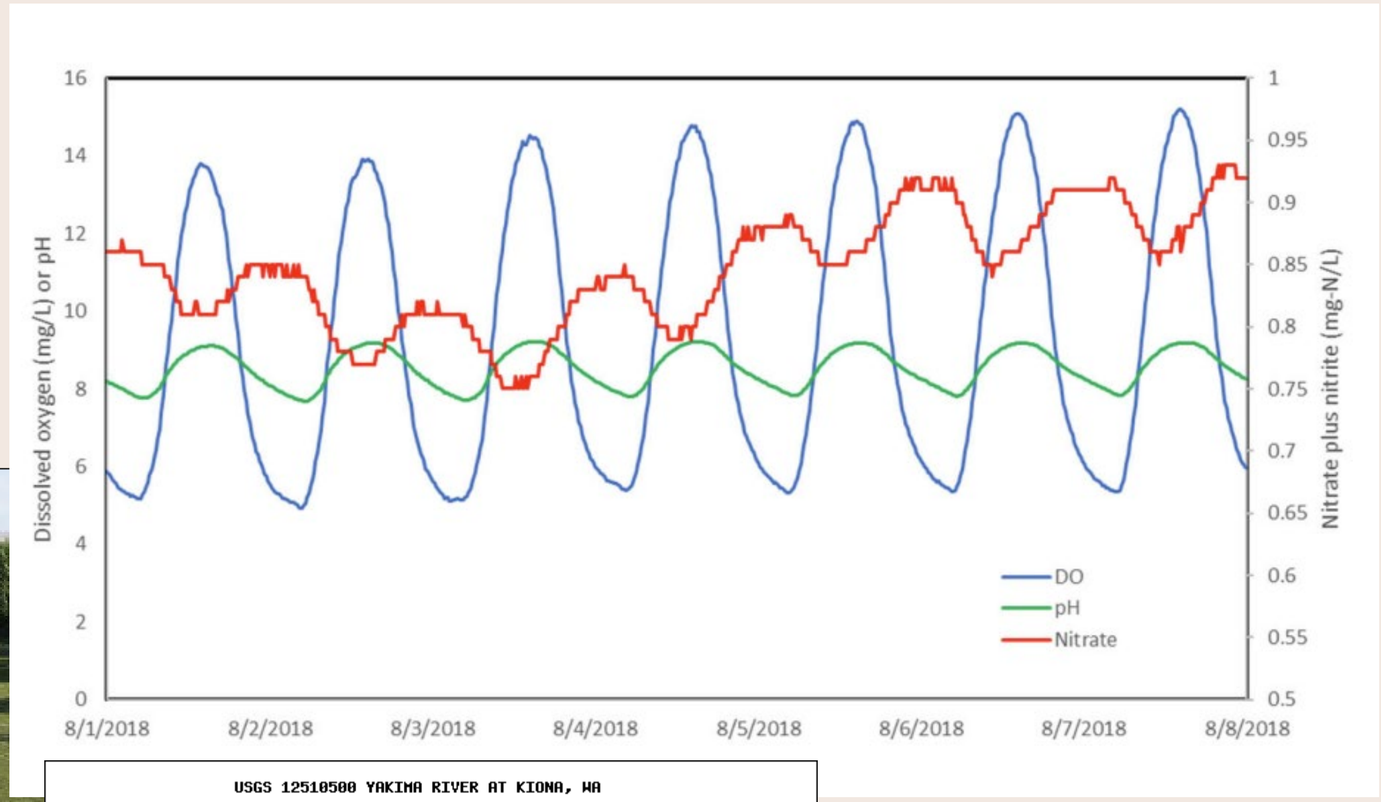
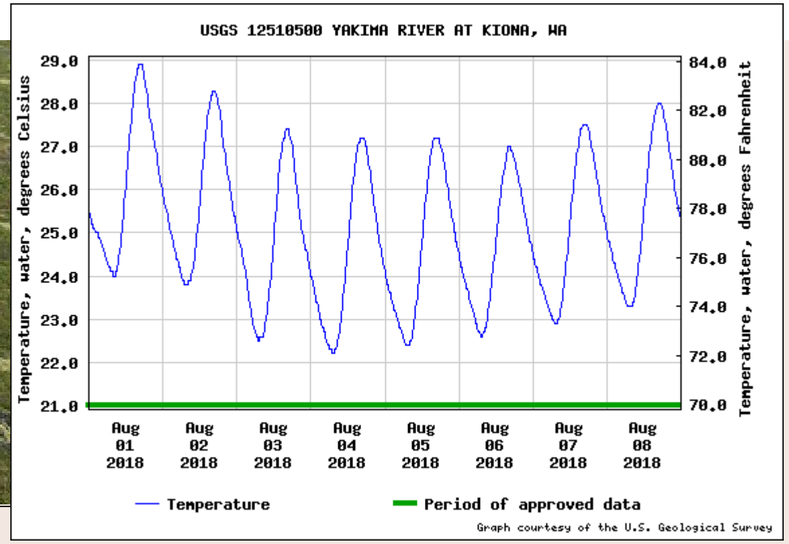
Yakima River Conditions: Present Day

- **Abundant Water Stargrass is present from mid-summer until high flow events**





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Sheibley, Rich et al., U.S. Geological Survey. In Prep. *Relationships between continuous water quality, stream metabolism, and water stargrass growth in the lower Yakima river, 2018 to 2020.*

Water Stargrass Growth Habit

- **Water Stargrass can form monocultures around the edges of lakes, rivers, ponds, and irrigation ditches (Wilkinson 1961, Wylie, 1912, Zhu et al., 2014)**

- **Water Stargrass can be prolific under a variety of sediment types and nutrient concentrations, but is dependent on high light and temperature (Johnson and Ostrofsky, 2004, Madsen et al., 1996, Shields and Moore, 2016, Wilkinson 1961 and 1963)**

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Wilkinson, R.E., 1961. *Effects of reduced sunlight on water stargrass (Heteranthera dubia).* Weeds.
Wilkinson, R.E., 1963. *Effects of light intensity and temperature on the growth of waterstargrass, coontail, and duckweed.* Weeds.
Wylie, R.B., 1912. *Notes on Heteranthera dubia.* In Proceedings of the Iowa Academy of Science.
Zhu, et al., 2014. *Interactions between invasive Eurasian watermilfoil and native water stargrass in Cayuga Lake, NY, USA.* Journal of Plant Ecology.
Johnson, R.K. and Ostrofsky, M.L., 2004. *Effects of sediment nutrients and depth on small-scale spatial heterogeneity of submersed macrophyte communities in Lake Pleasant Pennsylvania.* Canadian Journal of Fisheries and Aquatic Sciences
Shields, E.C. and Moore, K.A., 2016. *Effects of sediment and salinity on the growth and competitive abilities of three submersed macrophytes.* Aquatic Botany,
Madsen J.D, et al., (1996) *The Aquatic Macrophyte Community of Onondaga Lake: Field Survey and Plant Growth Bioassays of Lake Sediments, Lake and Reservoir Management.*

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Yakima River Characteristics

- **The Lower Yakima River is wide, shallow, and slow moving.**
- **The river is highly managed with diversions, dams, and intakes to meet irrigation needs.**

Mowing lanes

Water Stargrass Impacts

- Vegetation and sediment cover salmon spawning gravels
- Clogged irrigation intakes and fish ladders
- Favorable conditions for invasive fish, amphibians, and mosquitos
- Recreation impairment

Water Stargrass Management: Hand Pulling

- In the summer of 2010, 100's of hours were spent hand pulling Water Stargrass
- Salmon spawning occurred in cleared areas
- Water Stargrass returned, growing over spawning gravels ~3 years after removal

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Water Stargrass Management: Mechanical Harvesting

- **Mechanical harvesting captures most of the plant, and results in sustained reductions in plant matter**

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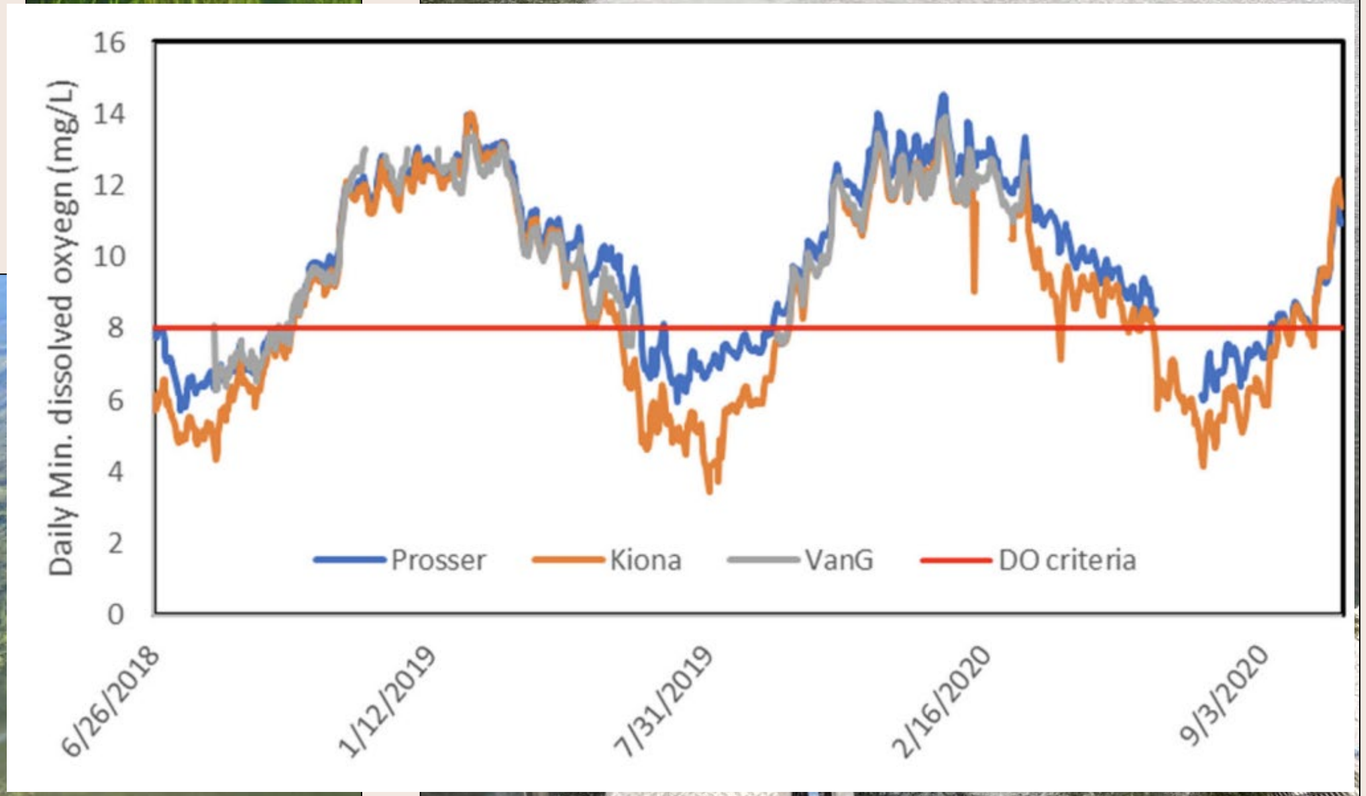
Water Stargrass Management: Mechanical Harvesting

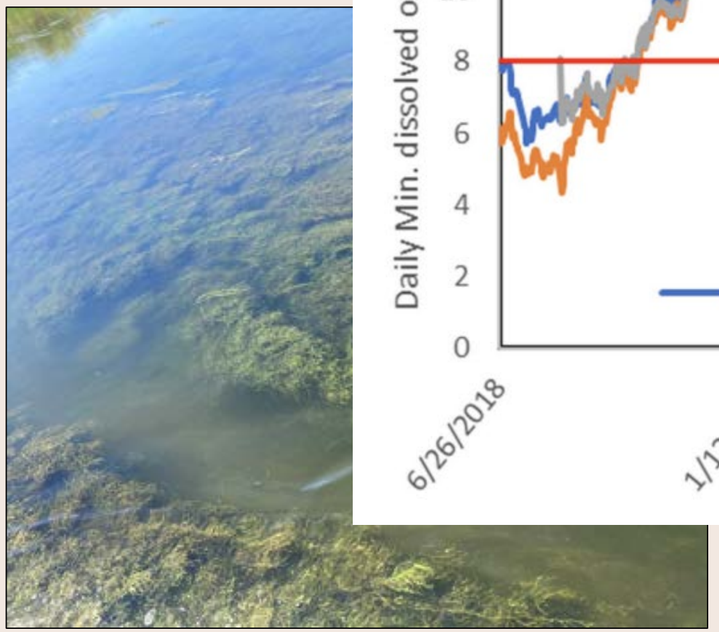
- **Harvesting can remove large amounts of material, but is limited to accessible sites**

Harvesting Effects

- Harvesting immediately results in improved water flow and changes in behavior of invasive species

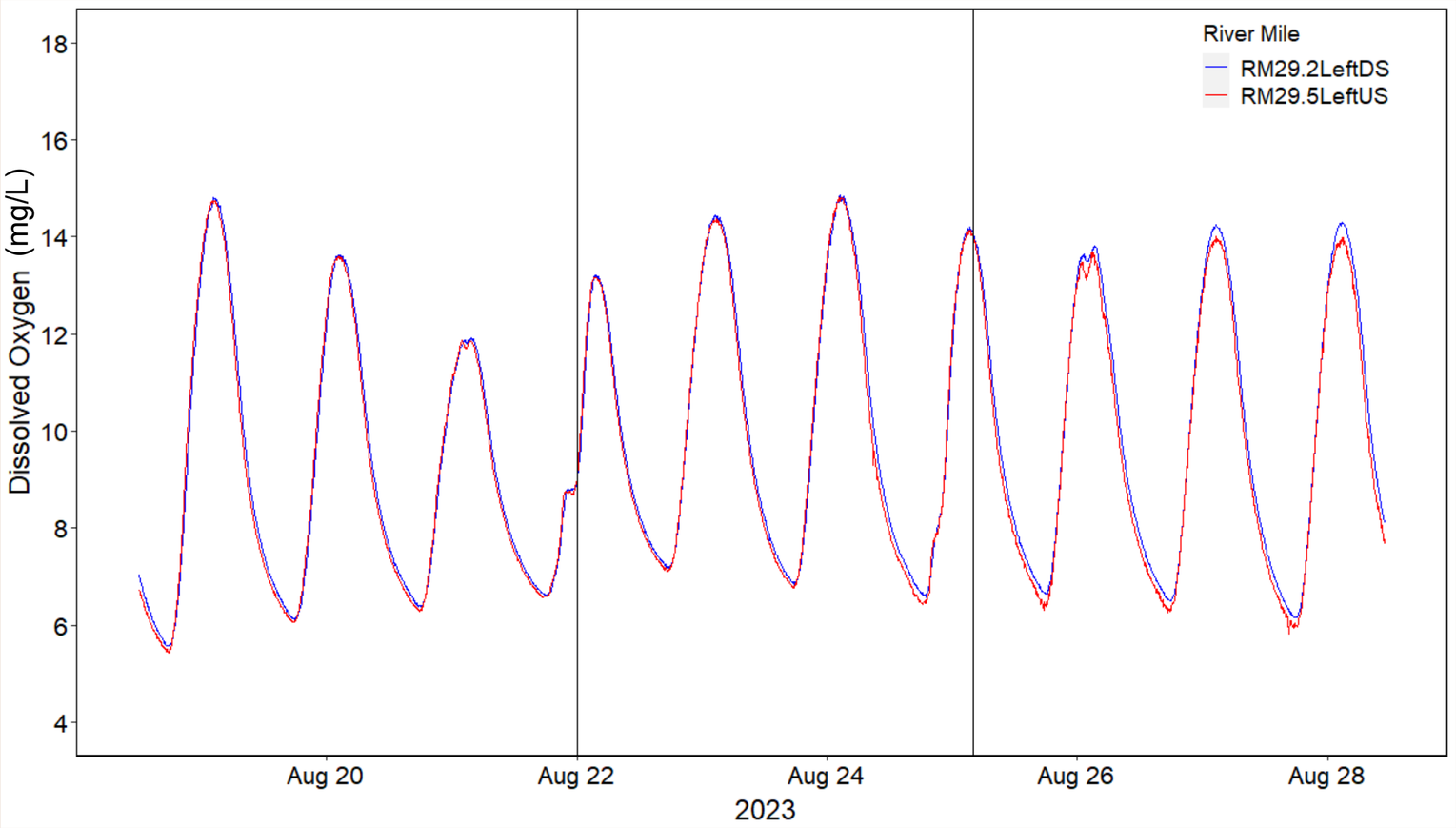
- Dissolved oxygen and temperature were monitored to assess impacts of harvesting on water quality

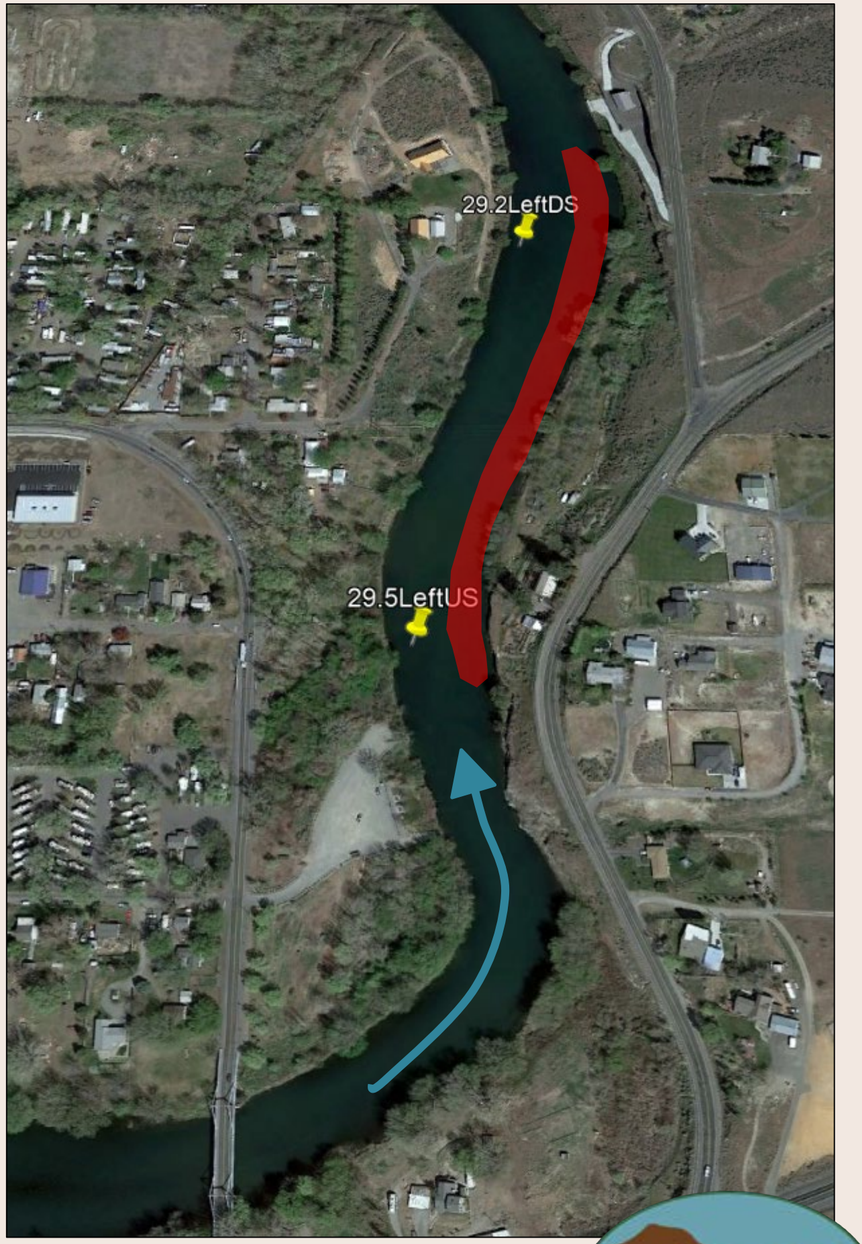




Water Quality Effects

- **Within the short monitoring distance, significant increases in daily maximum dissolved oxygen were observed (0.2 mg/L)**





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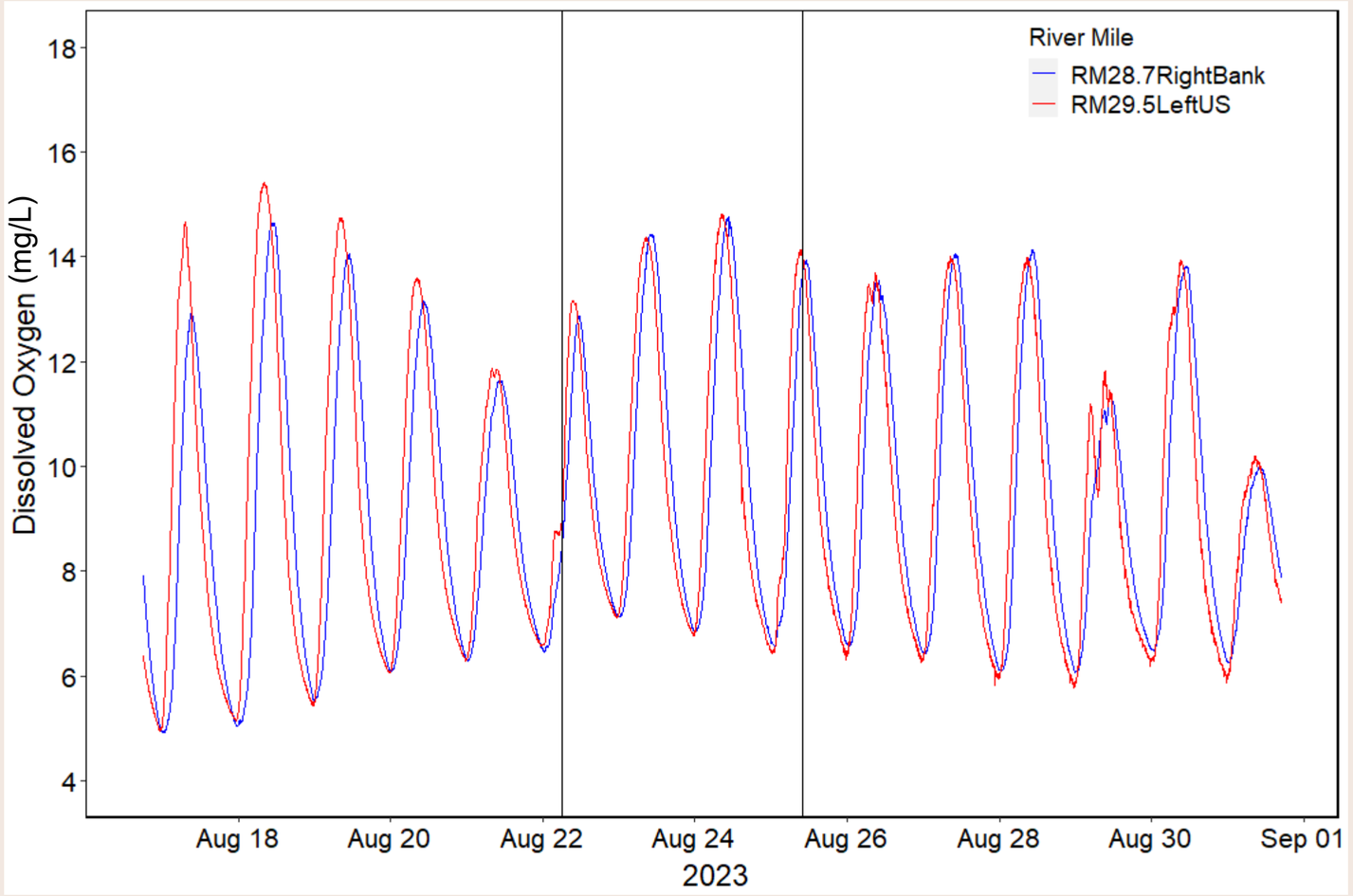
Water Quality Effects

- **Increases in dissolved oxygen were a larger magnitude when measured farther downstream (0.8 mg/L)**



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Continued Monitoring

- **Temperature and dissolved oxygen are likely to see greater effects in slower moving water**

- **Harvesting many miles is not feasible**

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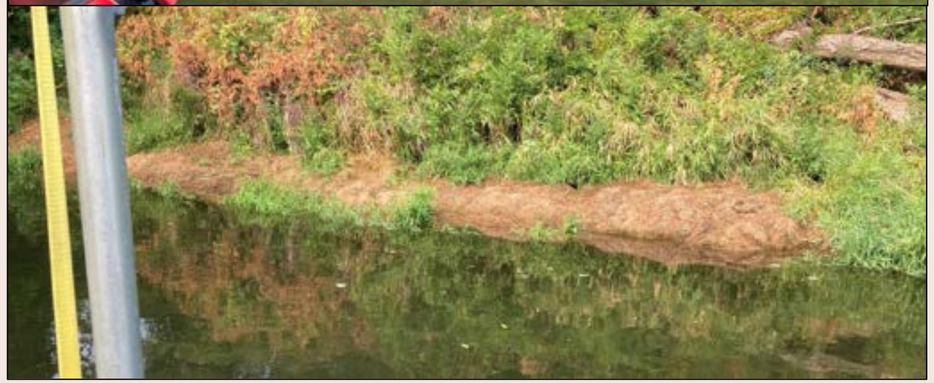
Management of Harvested Water Stargrass

- Not viable as livestock feed or for biofuel production
- Can be mulched or tilled as a soil enhancement
- Mostly water when harvested, large transport volume and weight



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Future Work

- Secure funding to continue to manage and monitor Water Stargrass
- Identification of crucial areas and access points
- Improve understanding of Water Stargrass dynamics and impacts on water quality

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