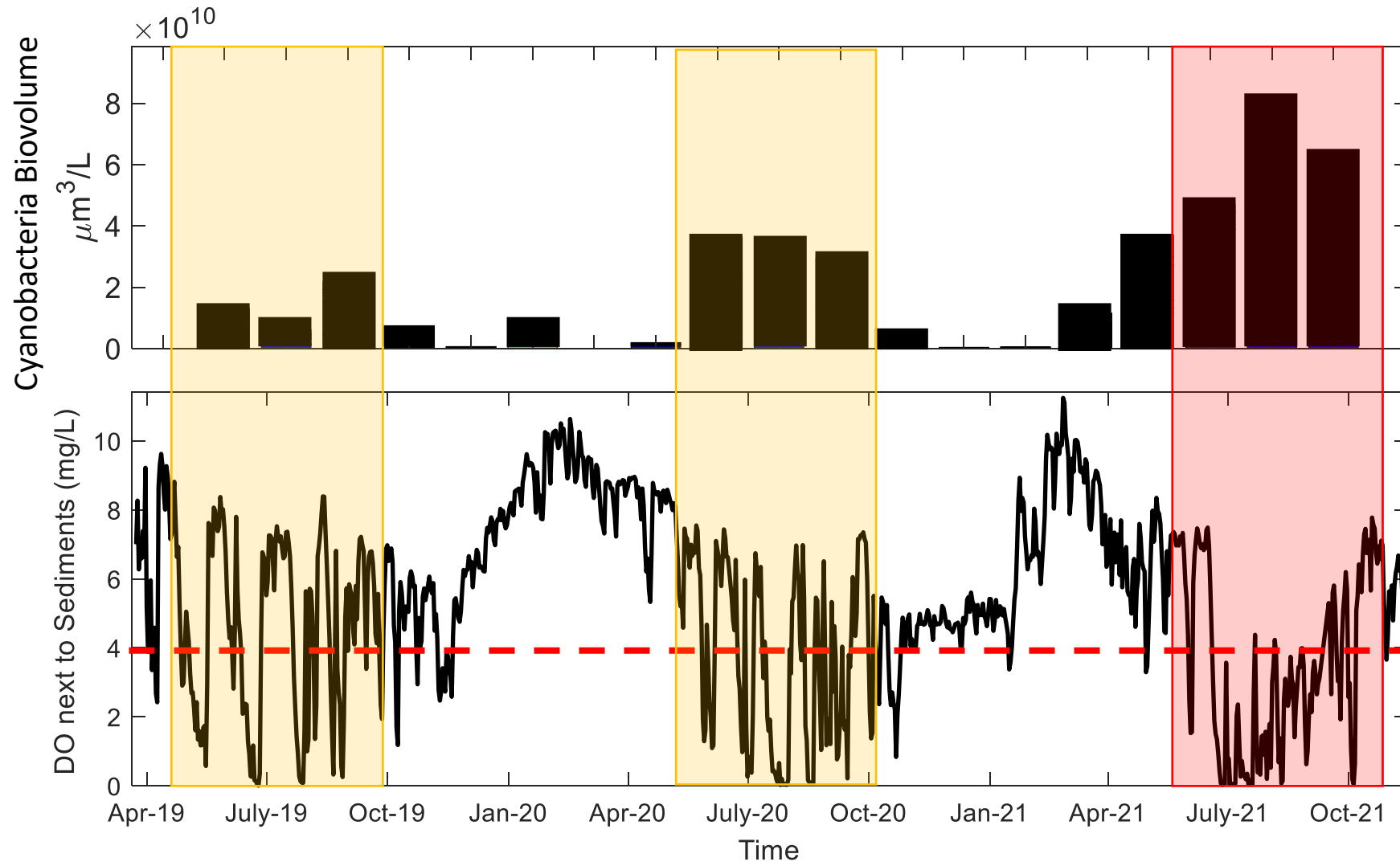


Rehabilitation Project in  
Clear Lake:  
**Hypolimnetic Oxygenation  
Pilot Project in the Oaks Arm**

Blue Ribbon Committee Meeting  
March 10<sup>th</sup>, 2022



# Cyanobacteria and Low Dissolved Oxygen

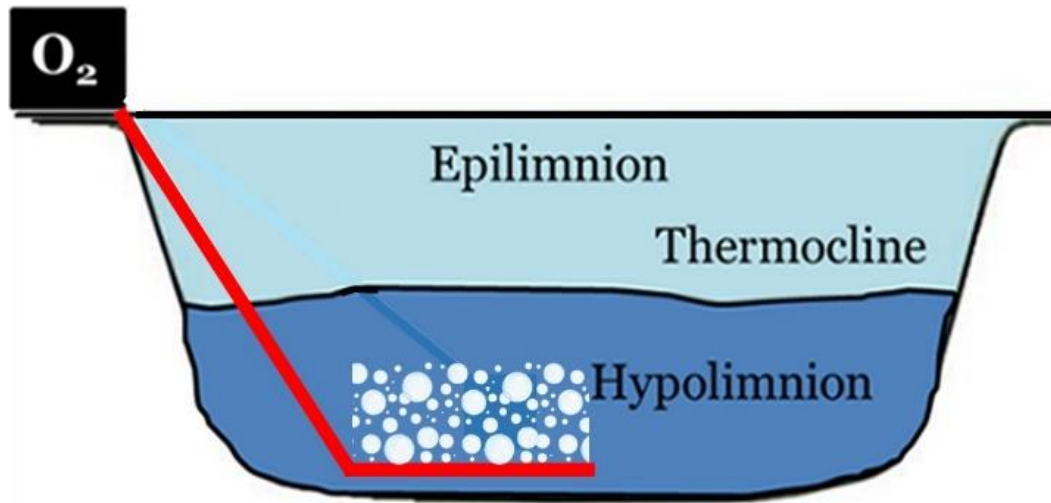


There was no more than  
**~7 consecutive days**  
of hypoxia in  
summer **2019 and 2020**

But almost  
**~3 consecutive weeks**  
of hypoxia in  
summer **2021**

# Rehabilitation Pilot Project in the Oaks Arm: Hypolimnetic Oxygenation

Direct addition of pure oxygen to the lake's hypolimnion, that is, the lower stratum of the lake, next to the sediments



❑ Goal: Reduce Hypoxia next to the sediments (hence, reduce HABs)

❑ Challenges:

- Large lake surface (150 km<sup>2</sup>) > **Pilot (testing) Project in the smallest Arm (Oaks Arm ~ 14 km<sup>2</sup>)**
- Large Sediment Oxygen Demand (-0.9 gO<sub>2</sub>/m<sup>2</sup>/day)

❑ Advantages:

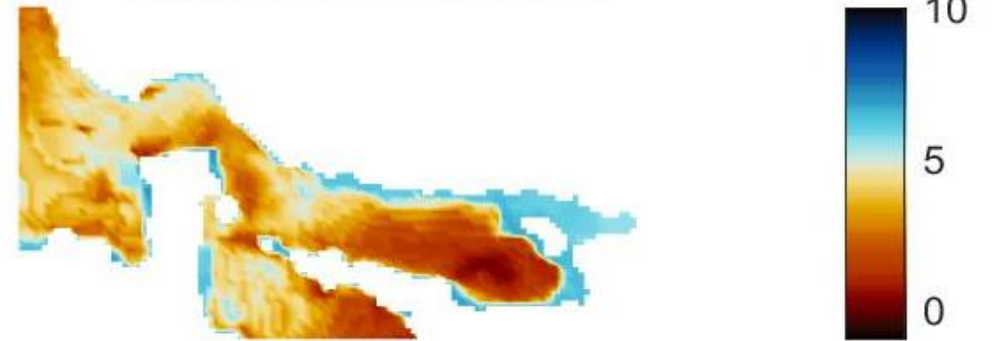
- Strong currents which can transport oxygen injected in one location to a larger area

# Version 1 of TERC Lake Model Simulating Oxygen Dynamics in the Oaks Arm

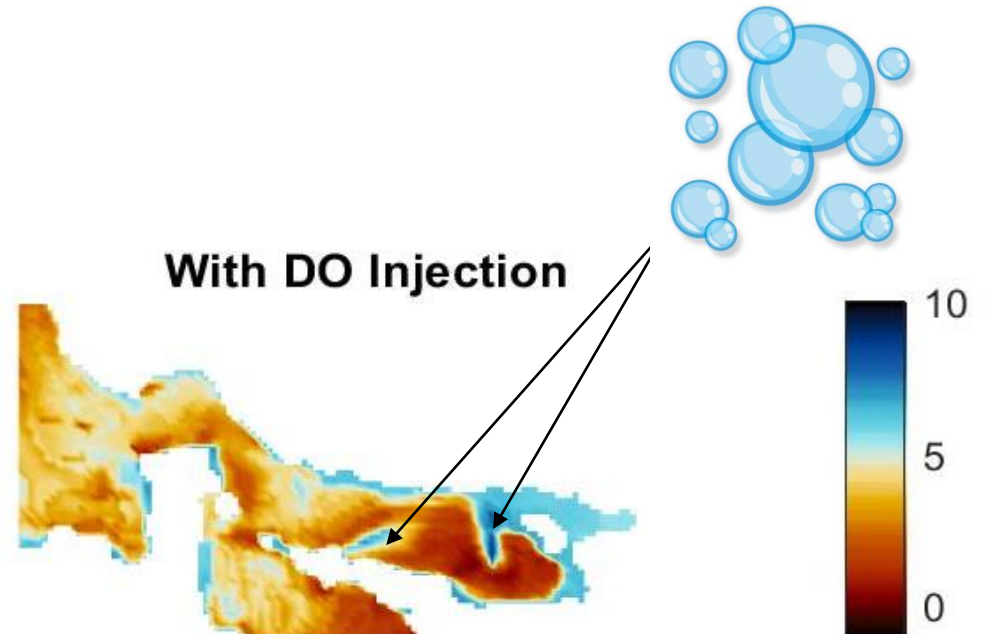
Mean bottom Concentration (Max 10 mg/L)

Time = 7/5/2021 at 4 h

Without DO Injection



With DO Injection

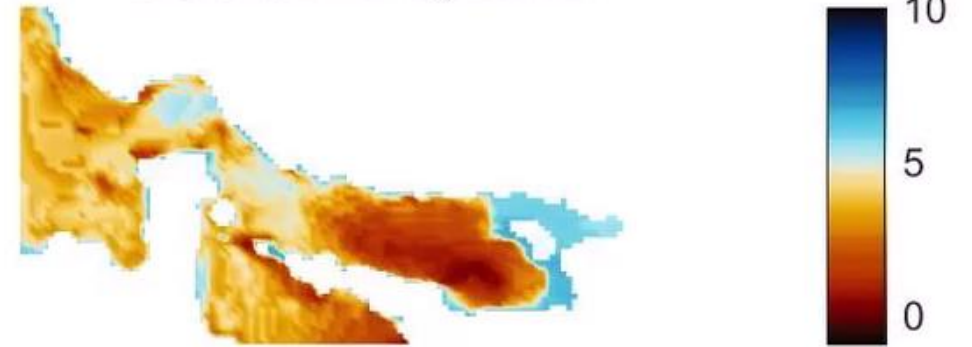


# Version 1 of TERC Lake Model Simulating Oxygen Dynamics in the Oaks Arm

Mean bottom Concentration (Max 10 mg/L)

Time = 7/4/2021 at 16 h

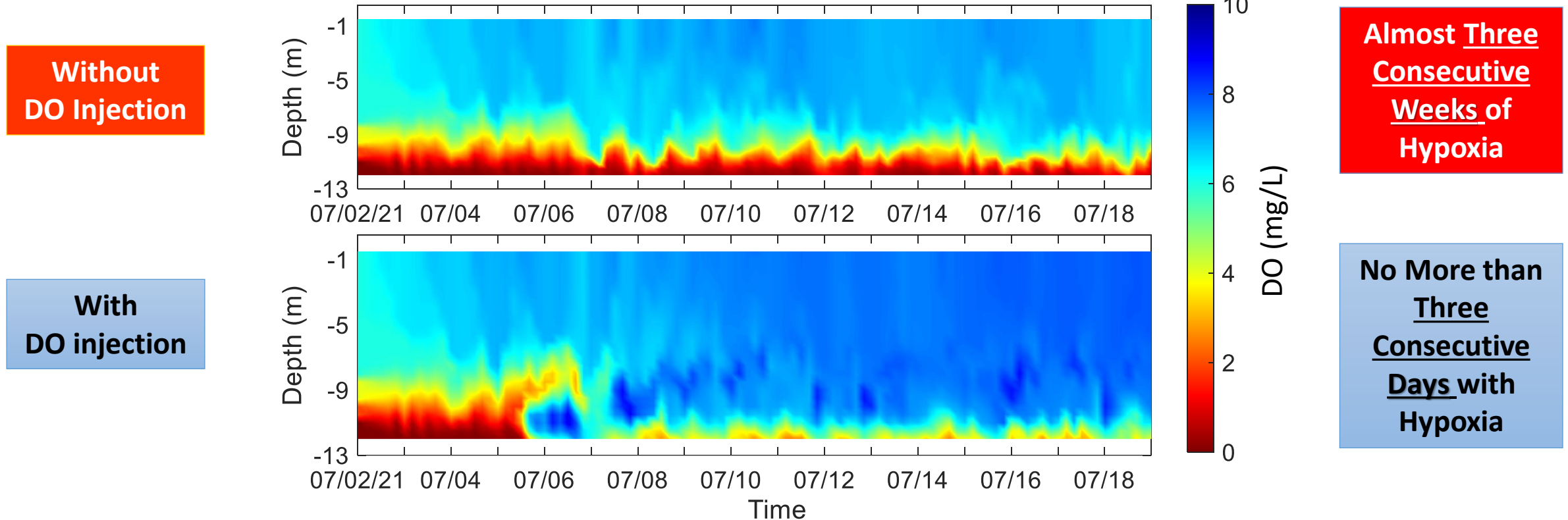
Without DO Injection



With DO Injection



# Comparison of Preliminary Model Results **Without** and **with DO Injection**



These results will improve due to:

1. Refine DO model including the phytoplankton dynamics. Currently, it only uses fixed parameterizations
2. Refine bathymetry from the upcoming bathymetrical survey



# Hypolimnetic Oxygenation Project: Short and Long Term

	What?	Who?	When?	How much?
Pilot (Testing) Project: Oaks Arm	Permitting	<ul style="list-style-type: none"><li>• Site location</li><li>• Road access</li><li>• CEQA</li></ul>	Broad Team	TBD
	Design & Outreach	<ul style="list-style-type: none"><li>• 3D Lake model</li><li>• System dimensions</li><li>• Monitoring</li></ul>	TERC & Contractor	~ 2 M
	Construction		Contractor	
	First Dissolved Oxygen Injection and Monitoring	<ul style="list-style-type: none"><li>• Four months</li><li>• Intensive Monitoring</li></ul>	TERC & Contractor	
July 2023 – Dec 2023				
Jan 2024 – June 2024				
July 2024 – Oct 2024				
Long-Term Project: Whole Lake	If positive results, submit a proposal in June 2025 for funding to implement Hypolimnetic Oxygen Systems in the other two Arms		Start June 2026	~10 M ~1M/year

# Research Team

<https://terc-clearlake.wixsite.com/cldashboard>

Thank you!  
Questions?

Name	Position
Geoff Schladow	Principal Investigator (PI)
Alex Forrest	Co-PI
Steve Sadro	Co-PI
Alicia Cortes	Project Scientist
Lidia Tanaka	Project Scientist (Phycologist)
Shohei Watanabe	Data manager & Project Scientist
Anne Liston	Research Associate (Chemistry)
Steven Sesma	Research Associate (Chemistry)
Helen Fillmore	Research Associate (Chemistry)
Erik Young	Research Associate (Field)
Katie Senft	Research Associate (scuba & field)
Brandon Berry	Research Associate (scuba & field)
Samantha Sharp	Graduate Student
Micah Swann	Graduate Student
Ruth Thirkill	Graduate Student
Kanarat (Job) Pinkanjanavee	Graduate Student
Carmen Woods	Project administration
Lindsay Vaughan	Undergraduate