

A New Wave of Thinking



Shoreline and Shallows Conference

Welcome to the Shoreline and Shallows Conference, “A New Wave of Thinking”, co-hosted by the Midwest Glacial Lakes Partnership and the Michigan Natural Shoreline Partnership.

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- To learn more about the Michigan Natural Shoreline Partnership and its resources for contractors, property owners, and more, go to the website: MIShorelinePartnership.org

Defining No-Wake Zones for Wake Surf Boats – A Data Driven Approach

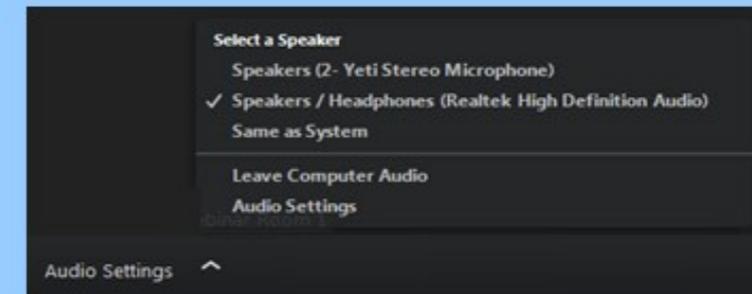
Alex Ray



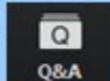
Lake Conservation Webinar Series

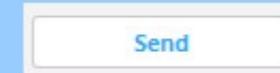
Getting Started

- Audio is through your computer speakers or headset: **You may not hear sound until webinar begins.**
- Use the **Audio Settings** option to do a sound check.
- During the webinar if you do not hear audio, make sure your sound is turned on, then contact the **Help Desk**.



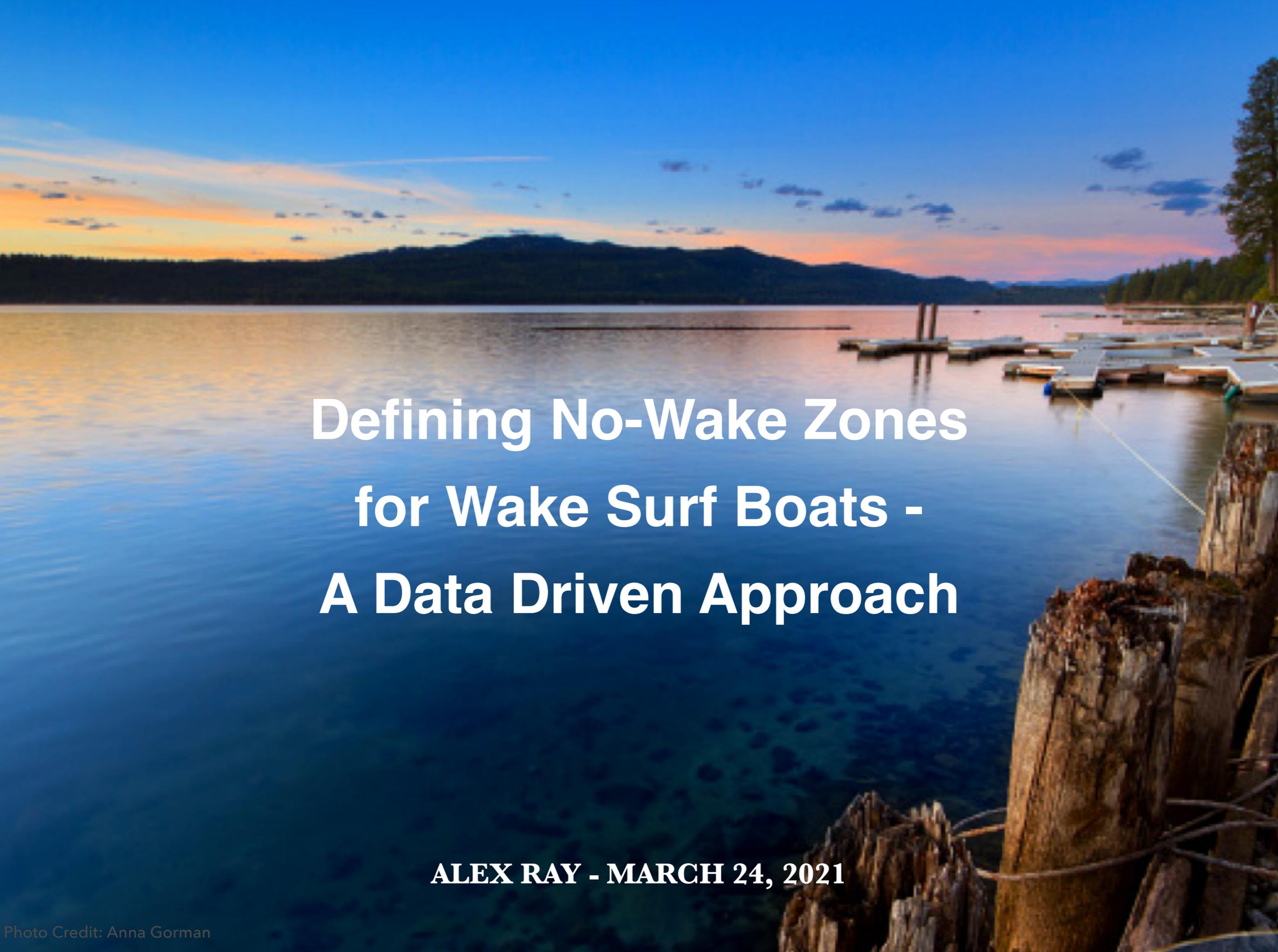
How to Ask Questions

1. Click on the Q&A icon () to submit a question to the presenters.
2. Type your question in the box and click the Send button.



Help Desk

Call the Distance Learning Help Desk (800) 500-1554 for technical support.

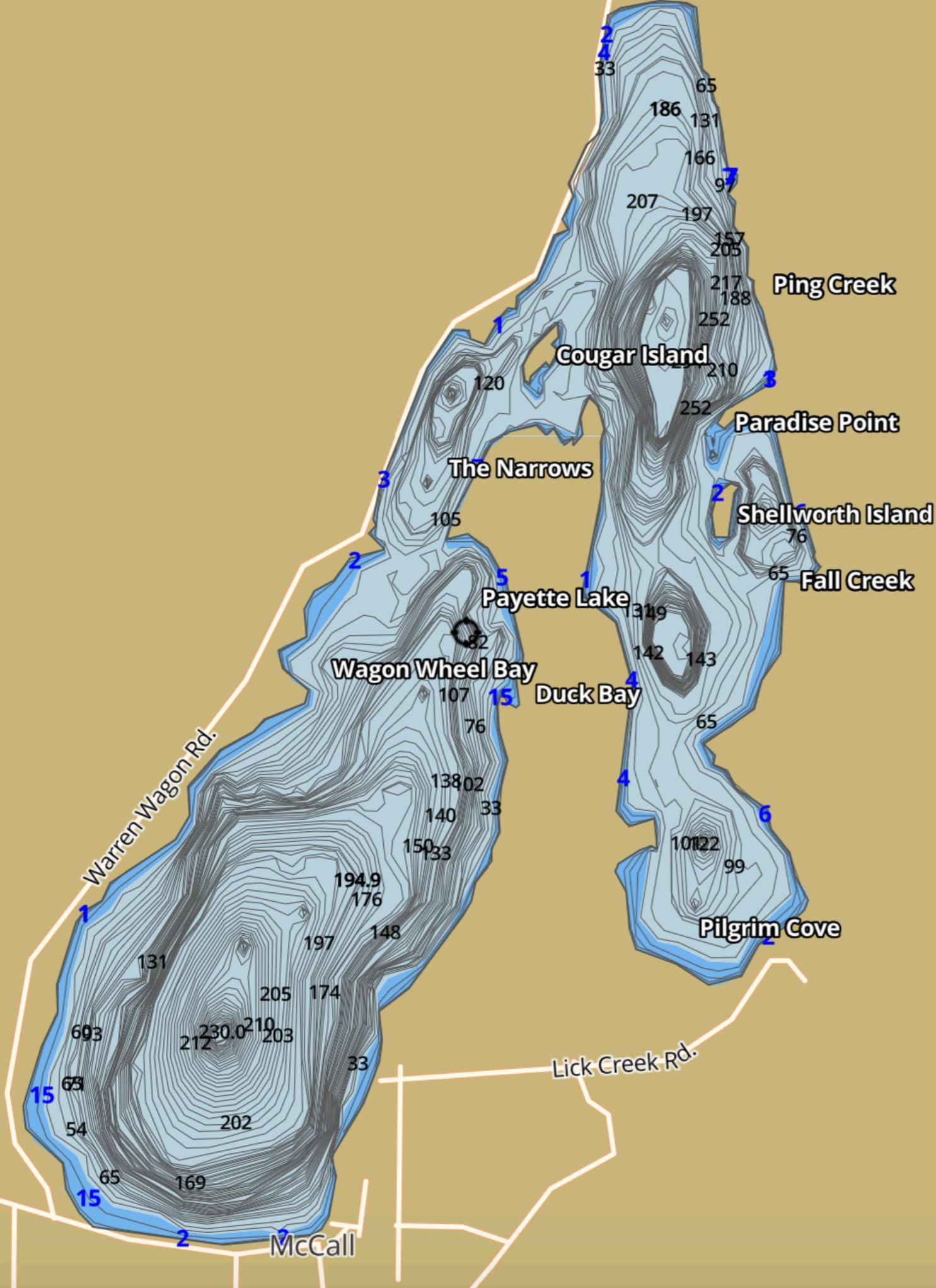
A scenic view of a lake at sunset or sunrise. The sky is a mix of blue, orange, and pink. The water is calm, reflecting the sky. In the foreground, there are several wooden posts, likely part of a dock or pier. In the background, there are mountains and a forested shoreline.

Defining No-Wake Zones for Wake Surf Boats - A Data Driven Approach

ALEX RAY - MARCH 24, 2021

Background

- Acres: 4,987
- Max Depth: 300'
- Catchment: 144 MI²
- Residence Time: 2.35 yrs.
- Source of McCall drinking water



1997 - Eutrophication Potential of Payette Lake - Paul Woods, USGS -

- Landscape scale fires in 1994 contributed heavily to Phosphorous and Nitrogen loading in lakebed sediments.
 - Lakebed sediments in SW basin contained elevated levels of Phosphorous, compared to other areas of the lake.
 - Substantial hypolimnetic dissolved-oxygen deficits, with development of anoxia, constituted strong symptomatic evidence that Payette Lake had undergone eutrophication.
-

Primary Questions

- What are the potential effects of motorized watercraft, and specifically wake-surf boats, on shoreline and near shore sediments?
- Is a 300' no-wake zone sufficient to protect environmental and economic resources in Payette Lake?
- How can data be employed to effectively delineate no-wake zones for wake-surf boats?

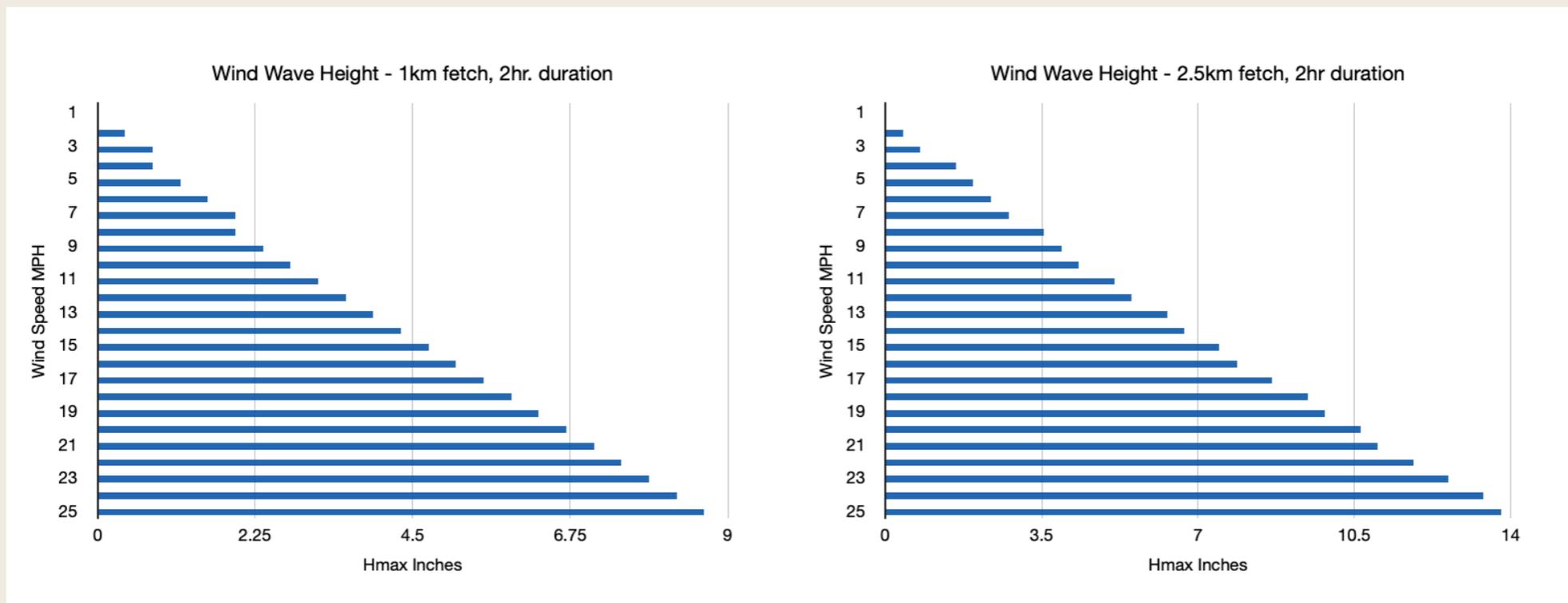
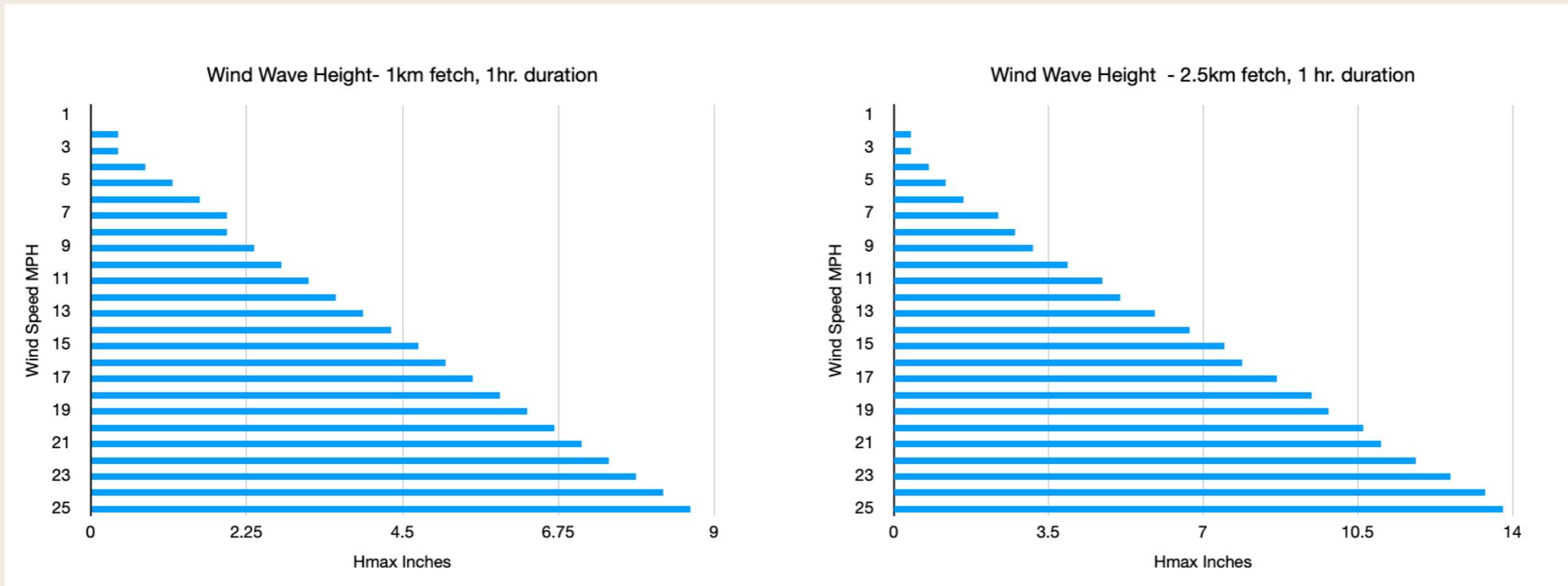




3 Research Areas

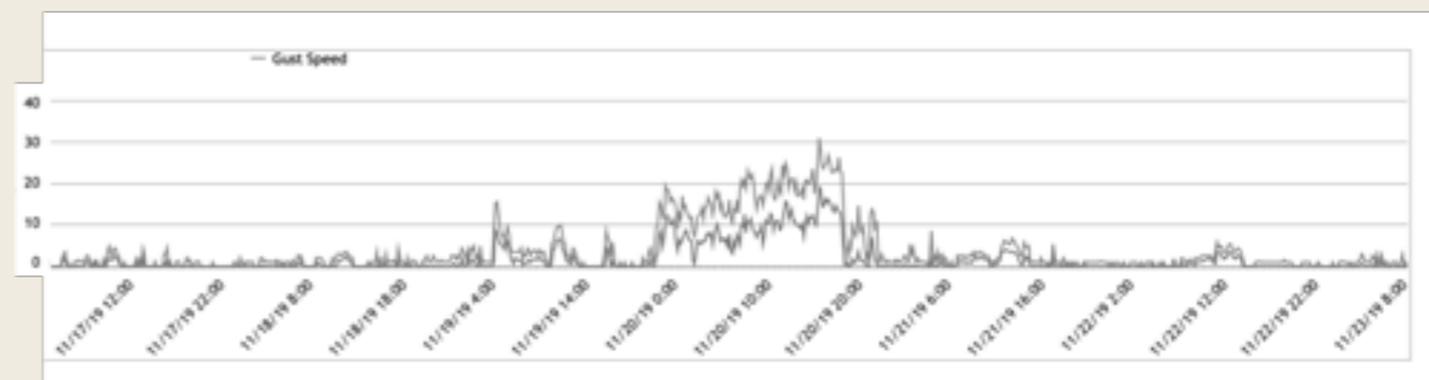
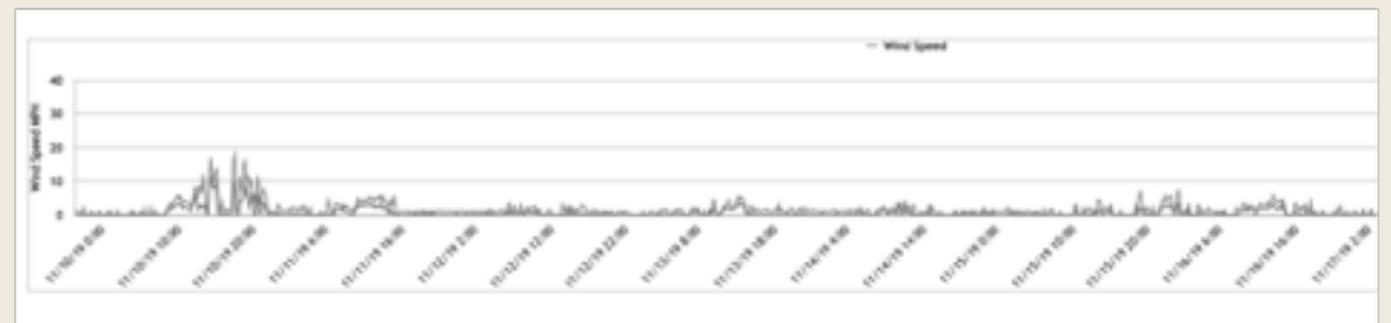
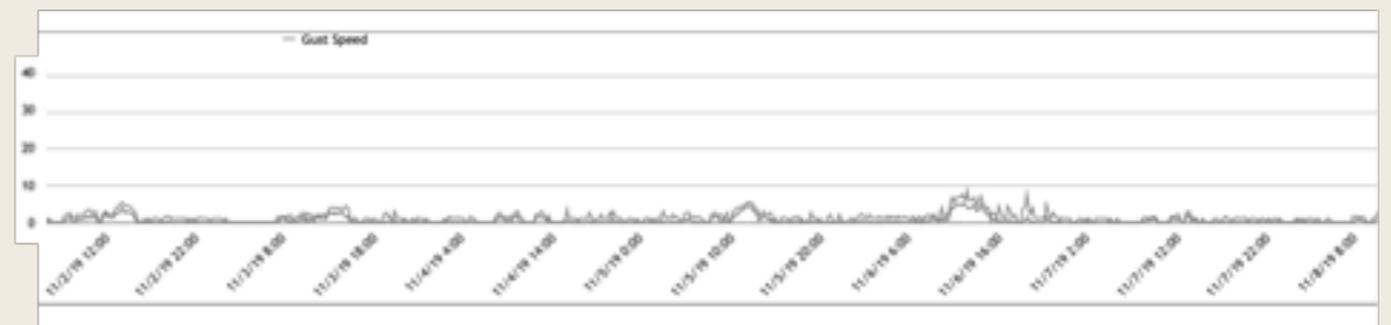
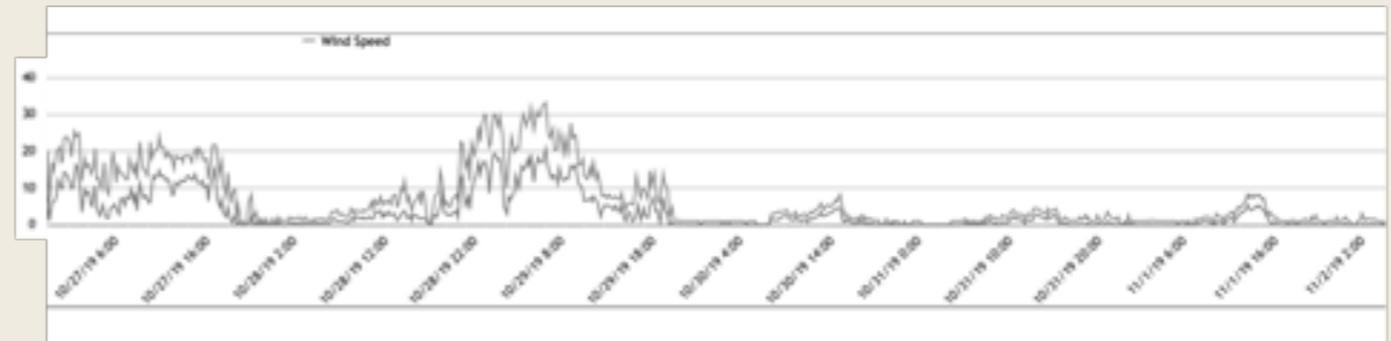
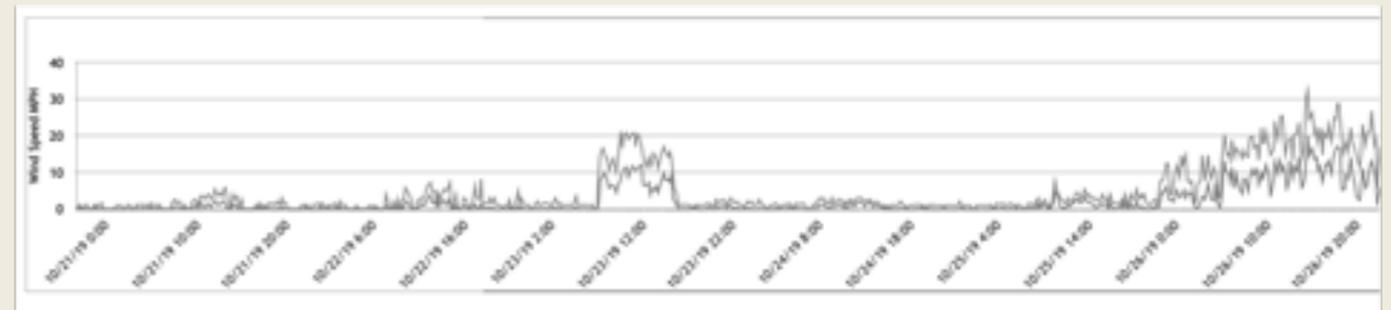
- Analyzed wind wave regimes on Payette Lake.
- Measured surface waves from wake boats and other motorized watercraft.
- Modeled depth influence of wake boat slip-streams.

Wind Wave Analysis

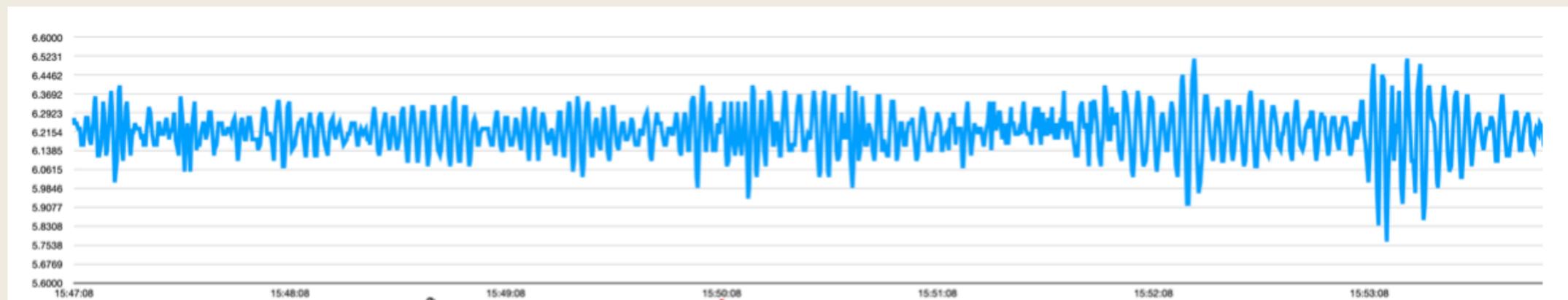
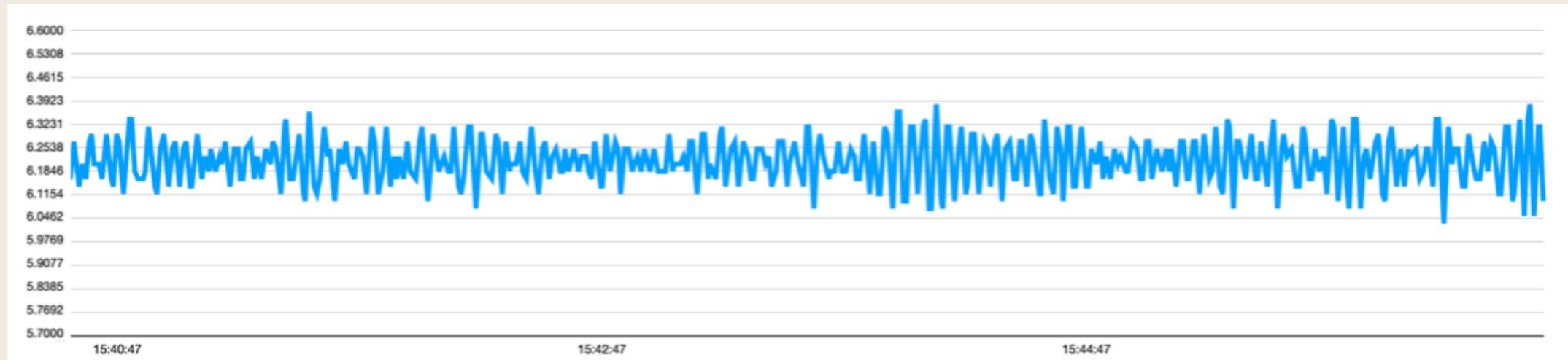
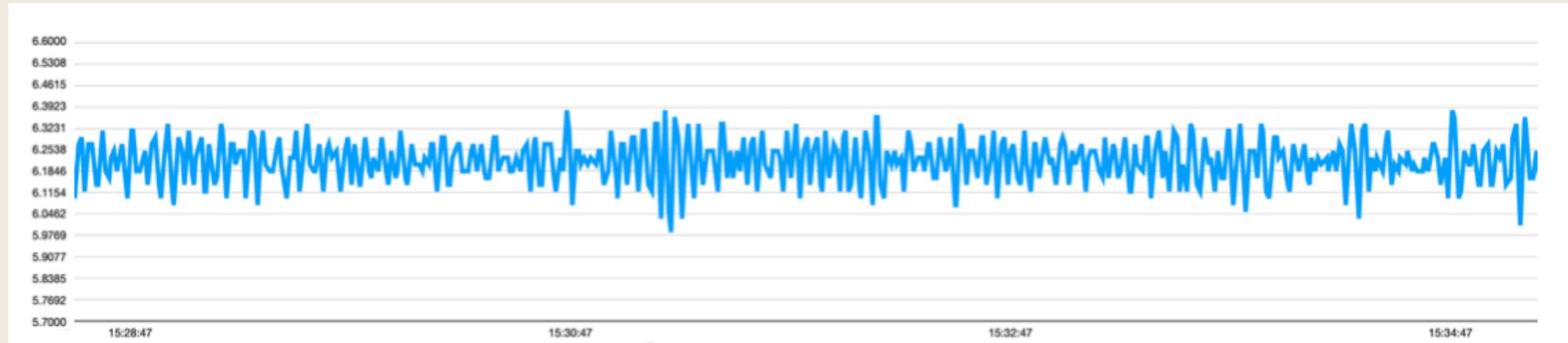


Wind Waves on Payette Lake

- Average height of 2-4 inches.
- Typical storm events can produce waves up to 8 inches high.
- Wind conditions may occur at times that produce waves up to 12 inches high.
- Wavelength of wind waves significantly shorter than similar waves created by motorized watercraft.

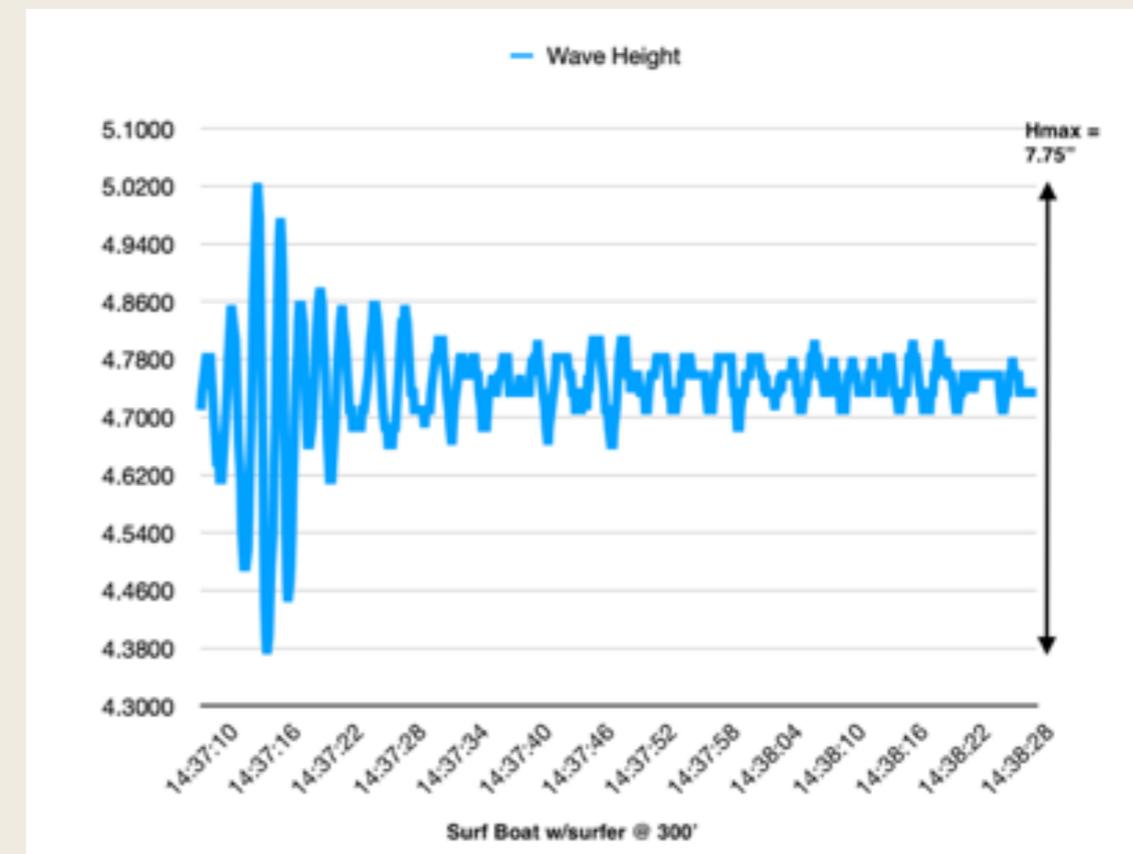
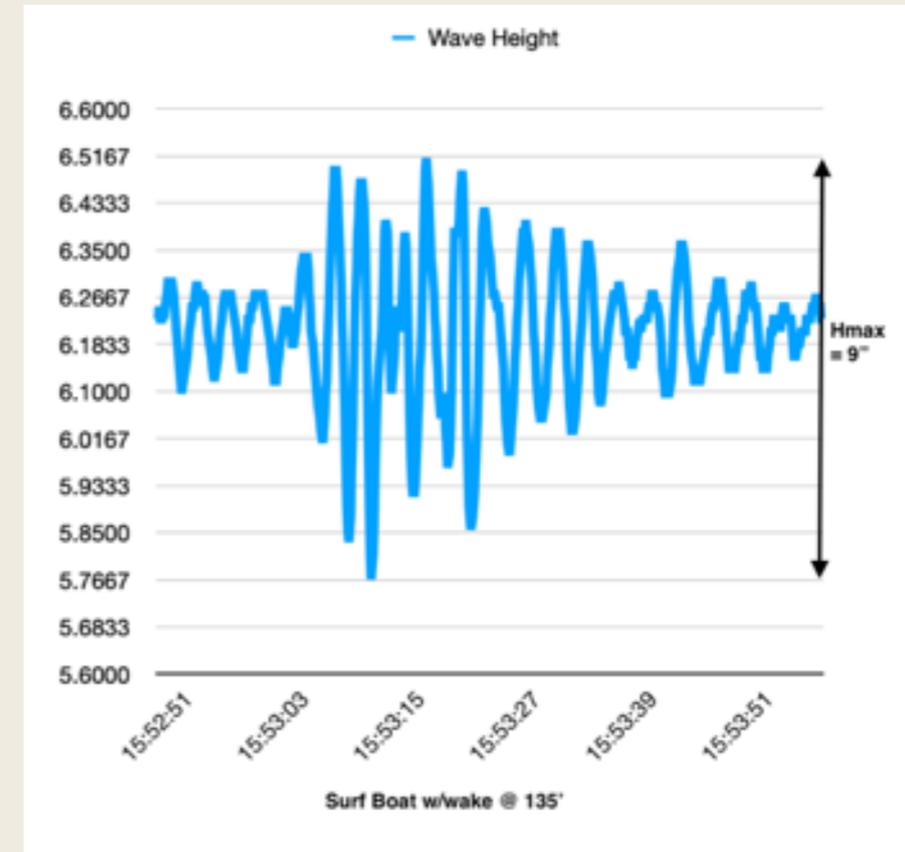


Motorized Watercraft Surface Waves



Wake Boat Surface Waves

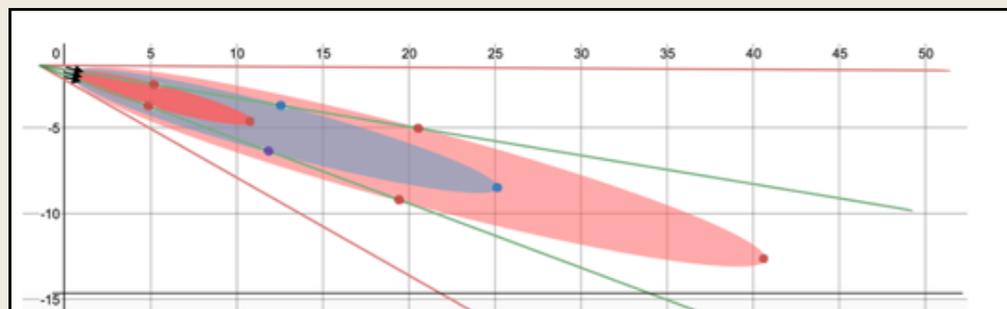
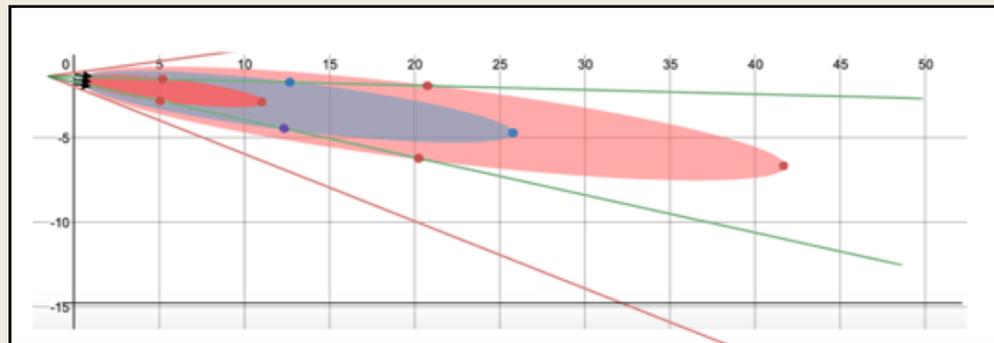
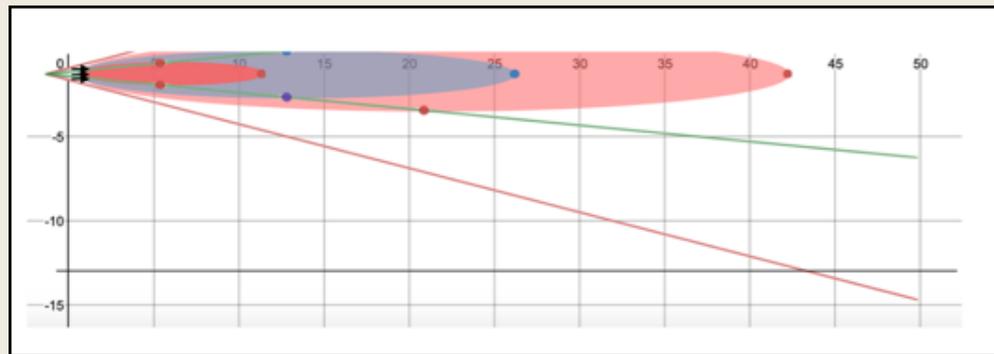
- A wake boat operating at the 300' no-wake zone boundary produced a wave that was 7.75 inches high when it reached shore.
- A wake boat operating 135' from shore produced a wave that was 9 inches high when it reached shore.
- **Due to their greater height and wavelength, surface waves produced by motorized watercraft carry far more energy than wind waves on Payette Lake.**
- Results consistent with data collected by researchers with the University of Quebec in 2014 and the University of Tasmania in 2018. (>500' needed to attenuate wakes and wave energy from surf-boats; 300' more than other boats)



Wake Boat Slip-Stream Modeling

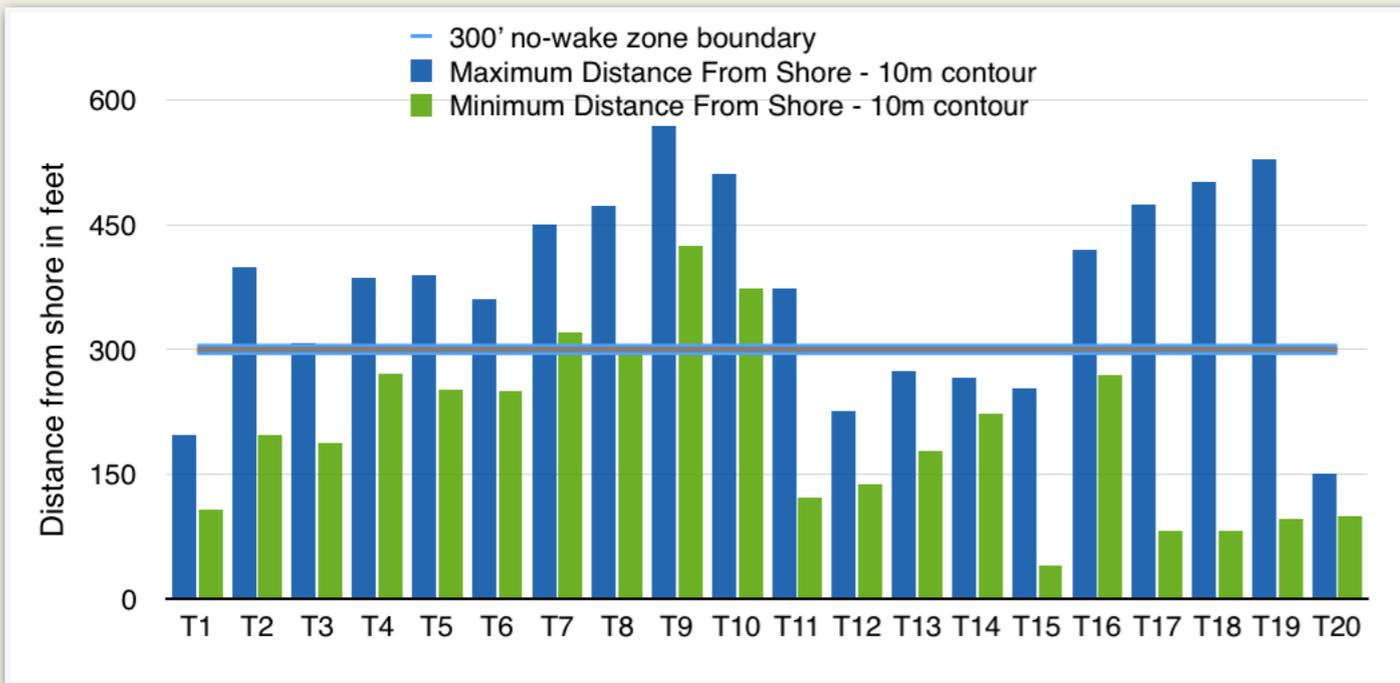
2016 Malibu LSV22 at 0°, 7°, & 15°
Max Slipstream Velocity: 4.49m/s @ 11 mph, 2400 rpm
(chart values in meters)

- Slipstream Velocity > .25m/s
- Slipstream Velocity > .4m/s
- Slipstream Velocity > .9m/s

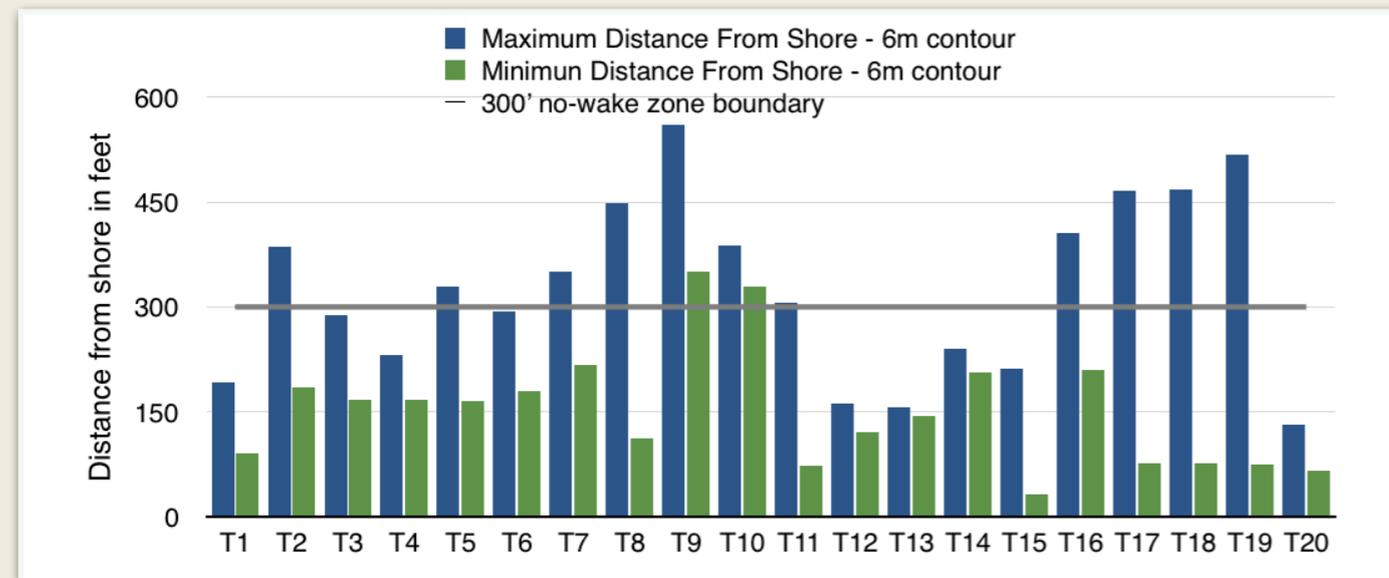


Slip-Stream Analysis

Graph 1 - 10m contour max and min distance from shore (SW Basin)



Graph 2 - 6m contour max and min distance from shore (SW Basin)



- Slip-streams from wake boats may affect sediments at depths up to 12m.
- Portions of the lake were shallower than 10m (33') at the 300' no-wake zone boundary in thirteen out of twenty transects.
- In ten out of twenty transects, portions of the lake were shallower than 6m (20') at the 300' no-wake zone boundary
- **The turbulence imparted by the modeled slip-streams is sufficient to disturb sediments of the size classes commonly found in Payette Lake, at depths regularly encountered at or beyond the 300' no-wake zone boundary.**

Implications

- **The 300' no-wake zone boundary likely does not provide sufficient protection against accelerated shoreline erosion and near-shore lakebed sediment disturbance in Payette Lake.**
- **Water depth is a highly important factor in defining no-wake zones.**
- **Social & economic factors, as well as other user groups, should be considered when defining no-wake zones.**
- **Regulations should be consistent across a resource area.**





Thank you!

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