Boating Impacts on Lakes – An Overview

Tim Asplund, WDNR

Presentation for Wisconsin Water Week

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Ecosystem Impacts

- Engine pollution
- Turbidity/sediments
- Shoreline erosion
- Aquatic plant effects
- Wildlife disturbance
- Shoreline development
- Dispersal of exotics

User conflicts

- Incompatible uses
- Conflicting uses
- Safety
- Crowding
- Values/expectations
- “Us vs them”
- Perception

Mechanisms vs. Effects

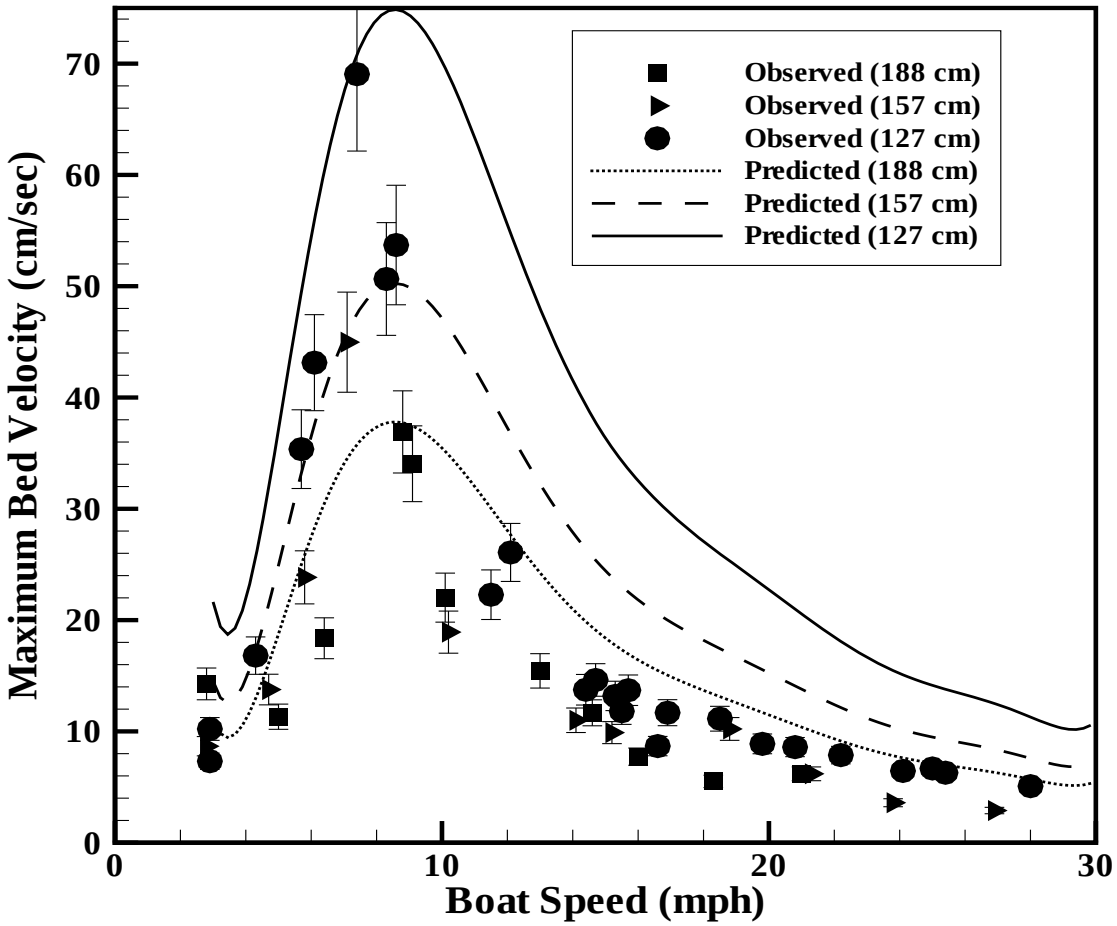
Mechanism: *Effect:*	**Emissions and exhaust**	**Propeller or hull contact**	**Turbulence**	**Waves and wake**	**Noise**	**Movement**
Water Clarity (turbidity, nutrients, algae)		■	■	■		
Water Quality (metals, hydrocarbons, other pollutants)	■					
Shoreline Erosion				■		
Macrophytes (plant communities)		■	■	■		
Fish	■	■	■			■
Wildlife (Birds, mammals, frogs, turtles)		■		■	■	■
Human enjoyment (air quality, peace and quiet, safety, crowding)	■			■	■	■


Sediment
disturbance


Sediment
disturbance


Sediment
disturbance

Boat speed and water depth affect sediment disturbance



(From Beachler and Hill, 2003)

UWSP "Waves, Wind, Watercraft and Water Clarity Study" – Clark Lake

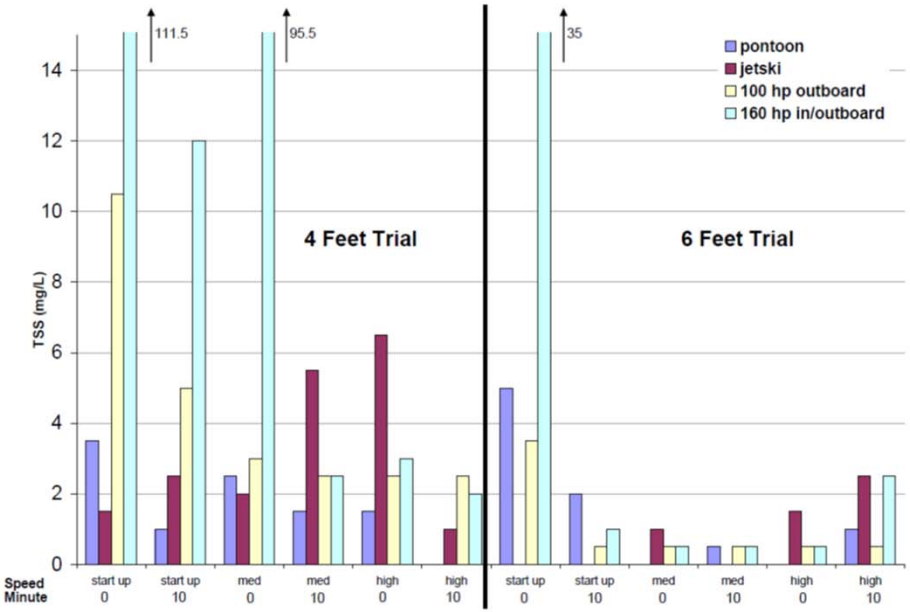
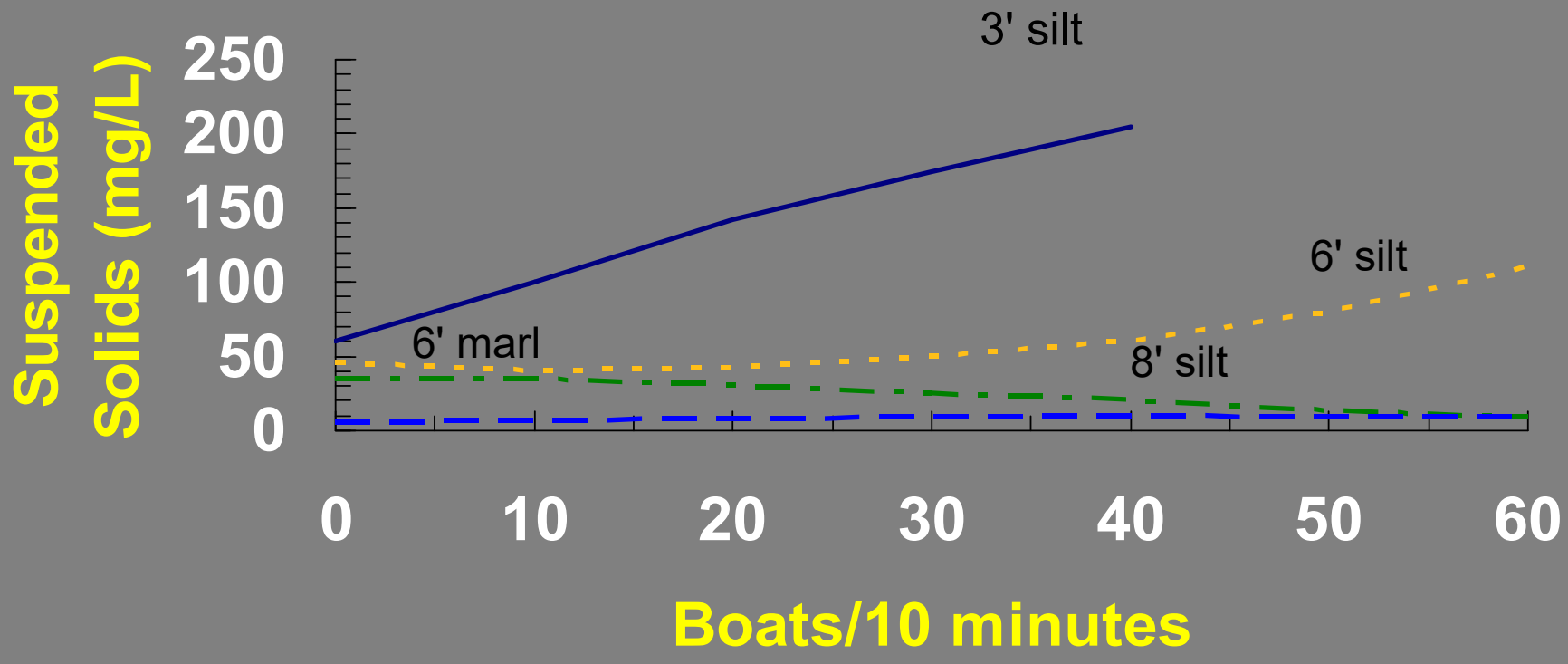


Figure 32 TSS measured at 0 and 10 minute interval following first pass of watercraft.

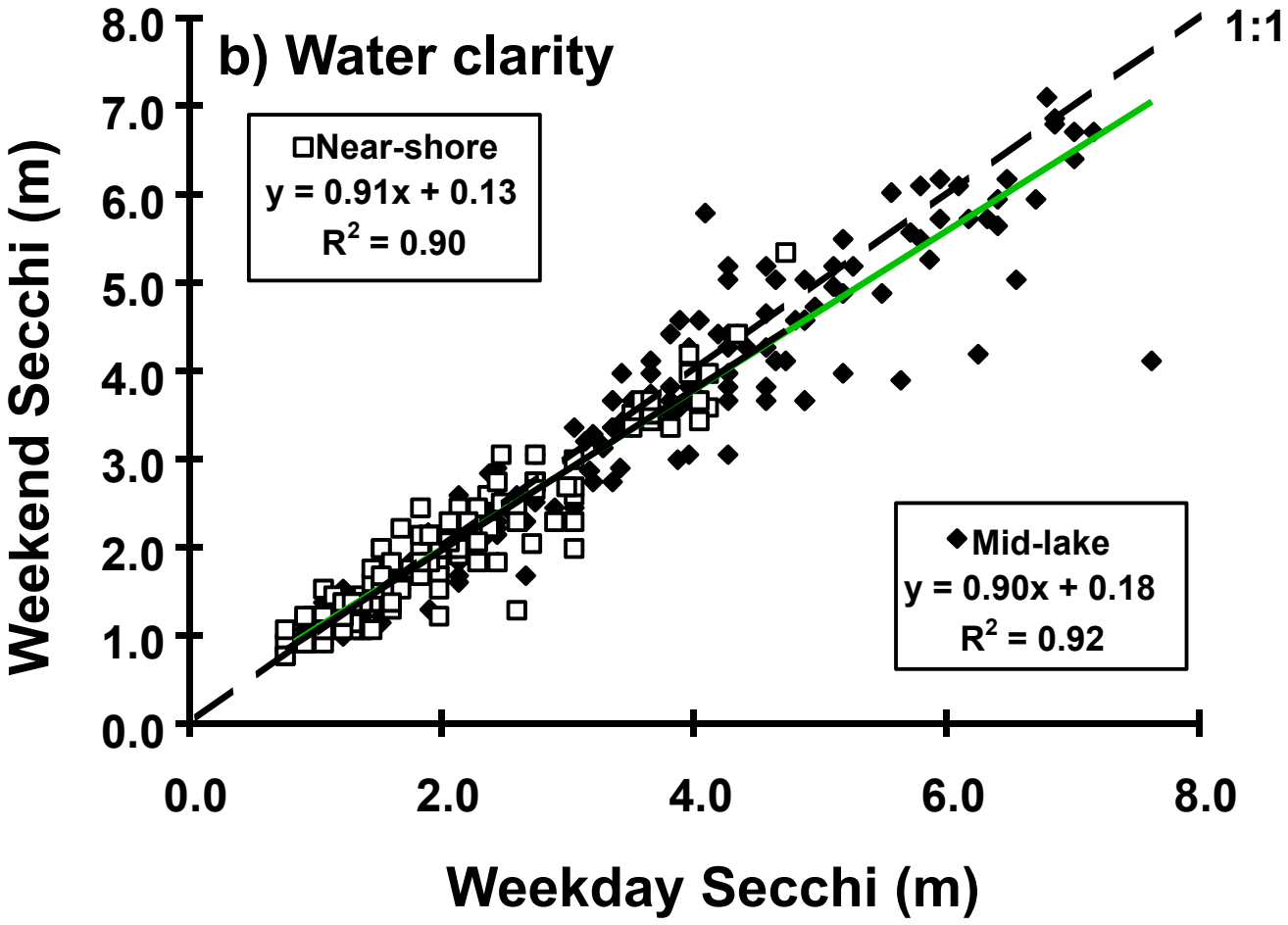
Hoverson and McGinley, 2007

- No-wake speeds had an undetectable impact on the sediment.
- In general, the bigger the boat, motor, and draft of the boat the more likely it will resuspend sediment.
- Boats operated in a shallower depth of water were more likely to resuspend sediment.
- Startup of a boat can lead to greater resuspension when the angle of boat directs the force to the bottom of the lake.

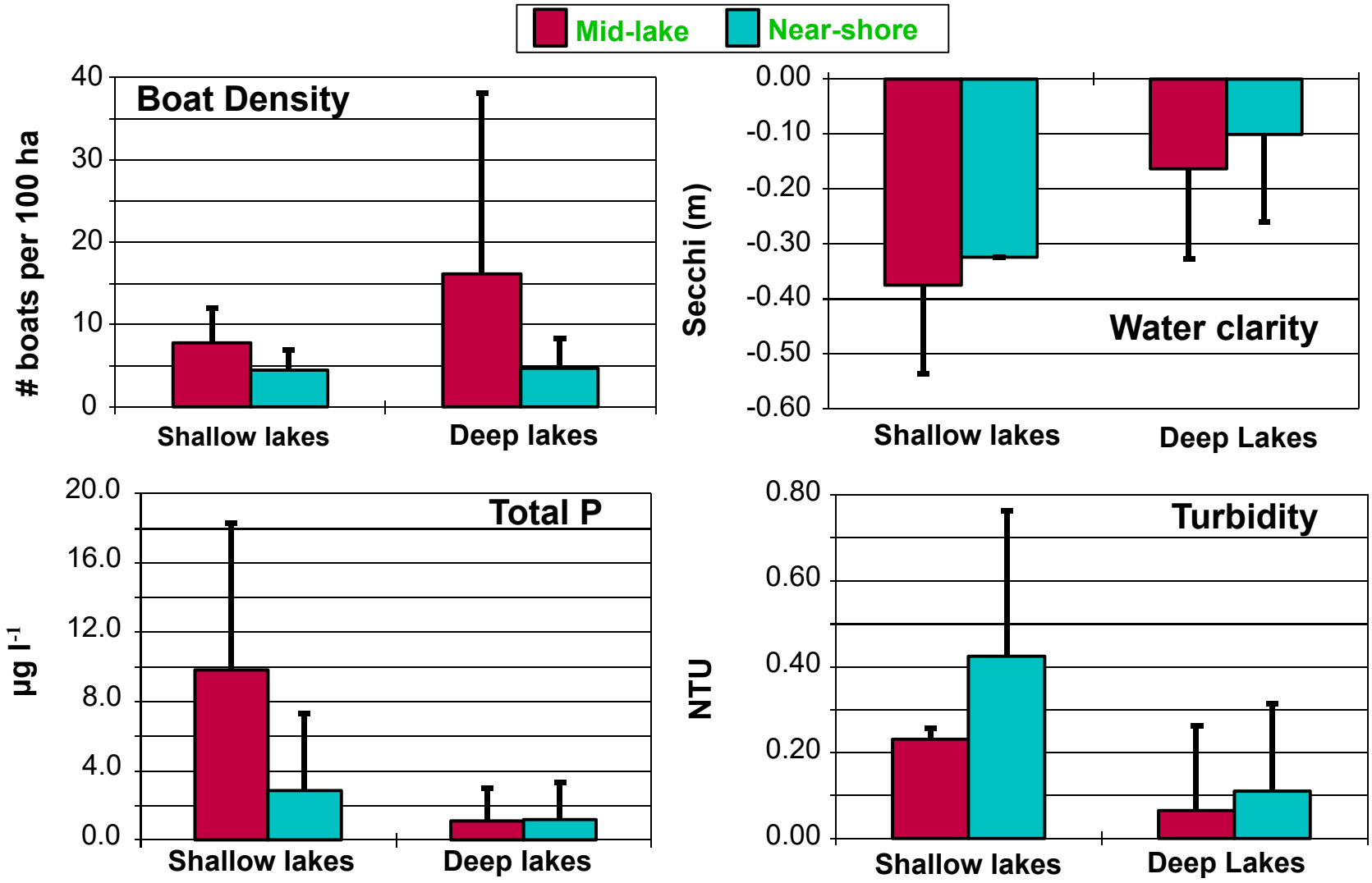
Boat traffic effects on sediment resuspension in the Fox River Chain O'Lakes, IL



Volunteer Study -
Change in 20 lakes for 13 summer weekends

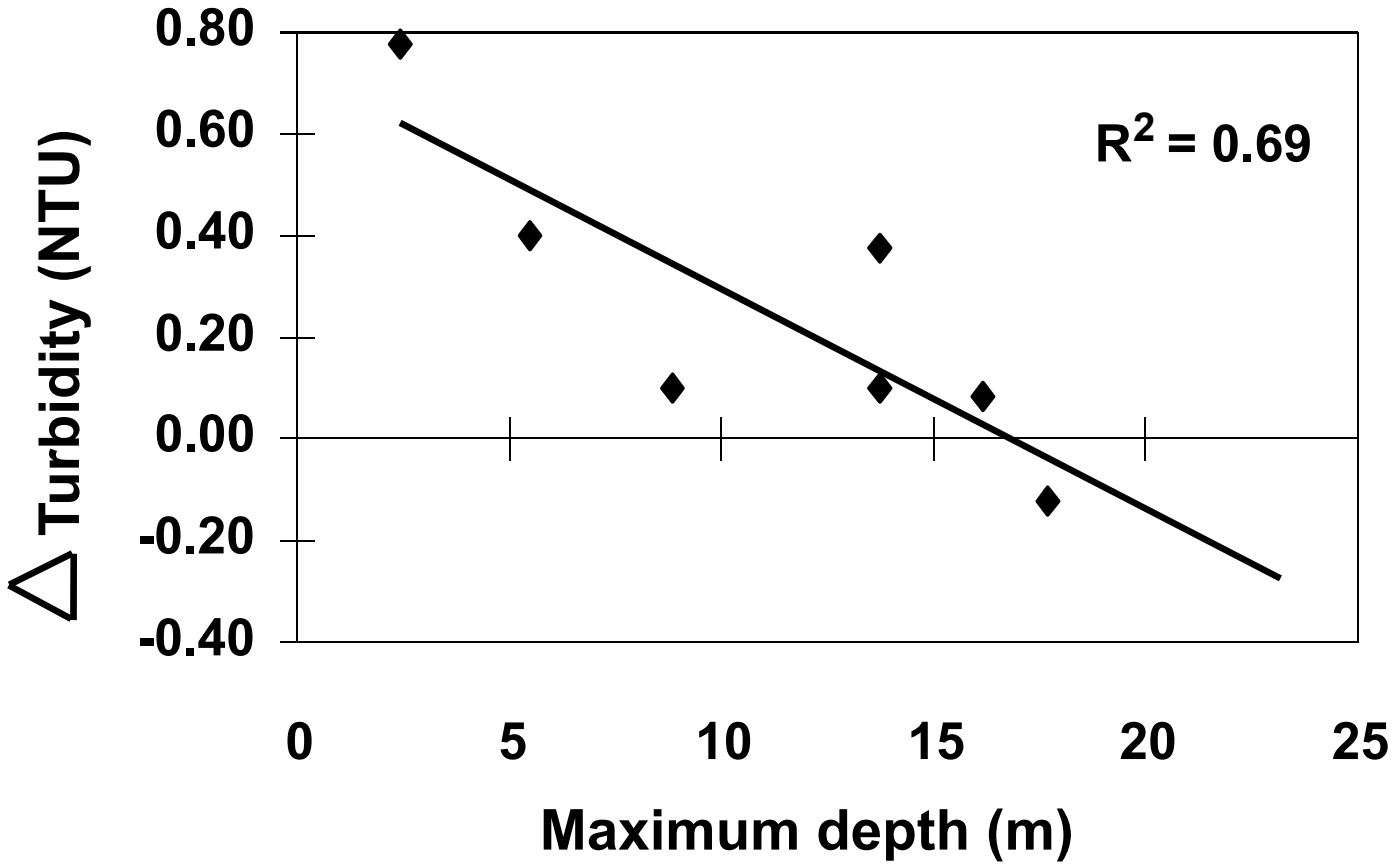


Weekday to Weekend Change (Asplund, 1996)



AT-D1

Holiday weekends - Near-shore

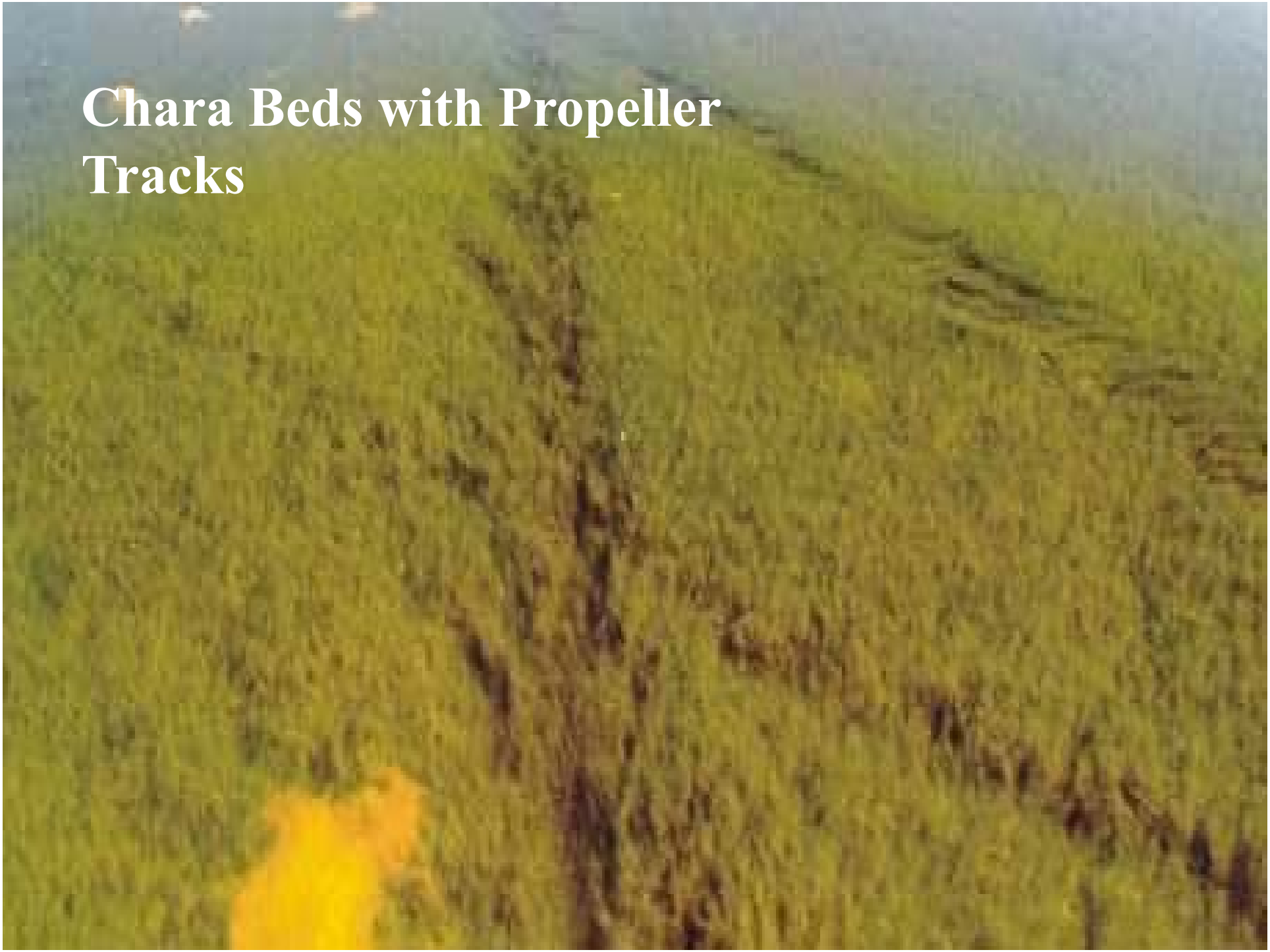


Slide 14

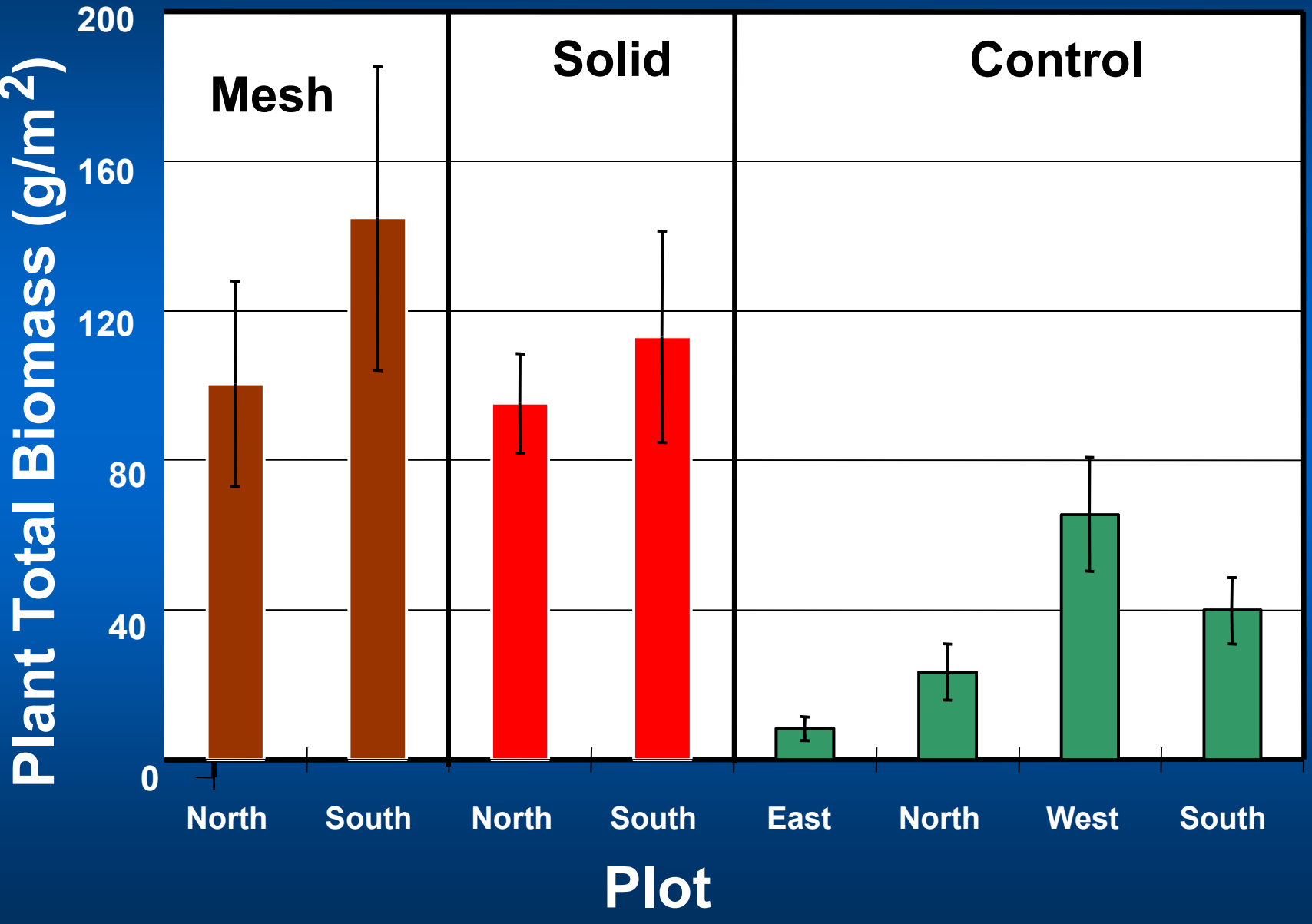
AT-D1 Asplund, Tim - DNR, 03/05/2021

Effects on Plants - Mechanisms

- Propeller damage to shoots
- Uprooting of whole plants
- Substrate disturbance
- Turbidity/light limitation
- Wave stress


Chara Beds with Propeller
Tracks

Plant Growth – Lake Ripley Study



No-wake zones protect plants from disturbance

Long Lake

Fond du Lac Co.

Buoys moved toward shore

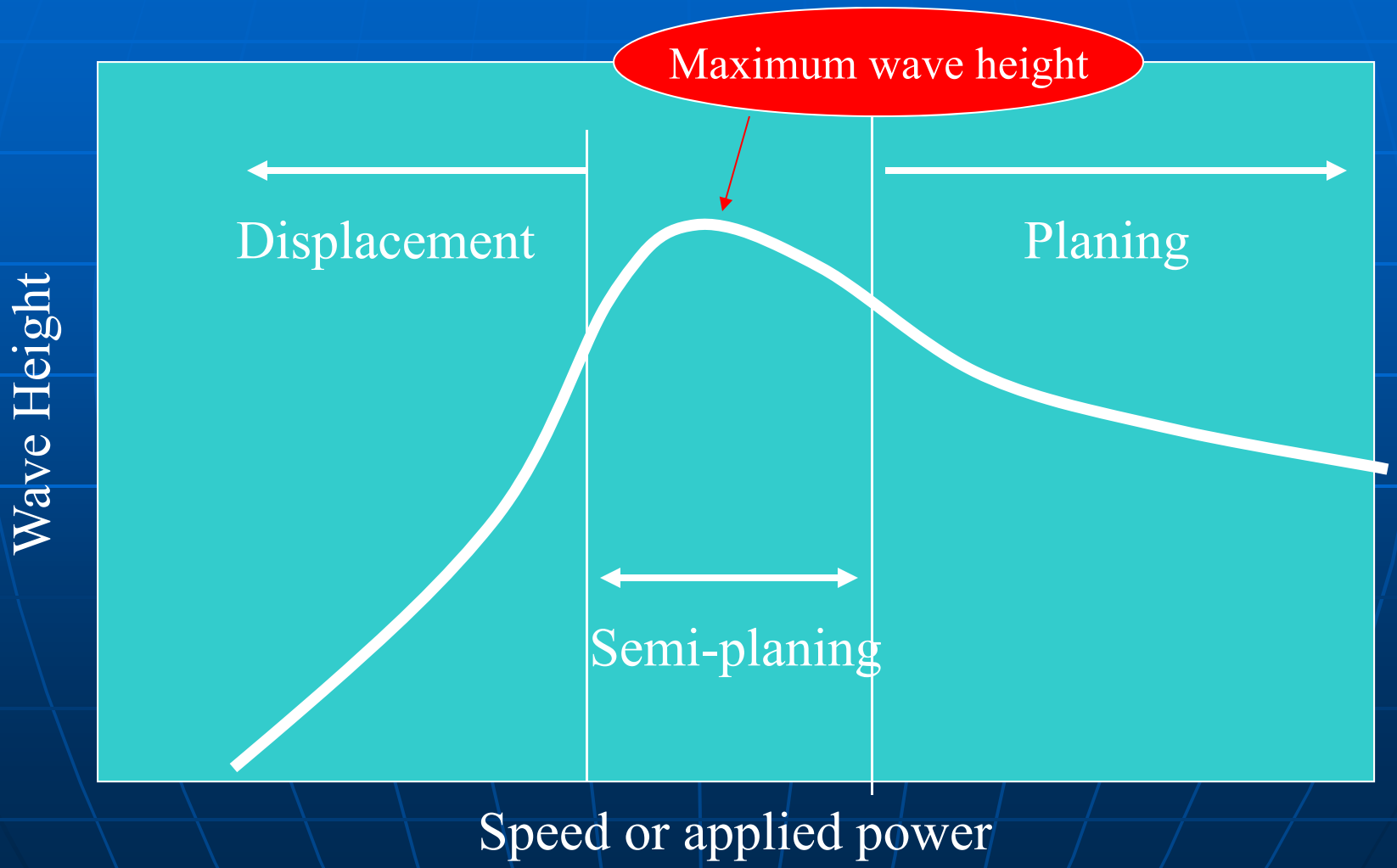
Buoys in place

Pre-study

Boat waves/wake

Boat wave characteristics

(adapted from Maynord, 2005)

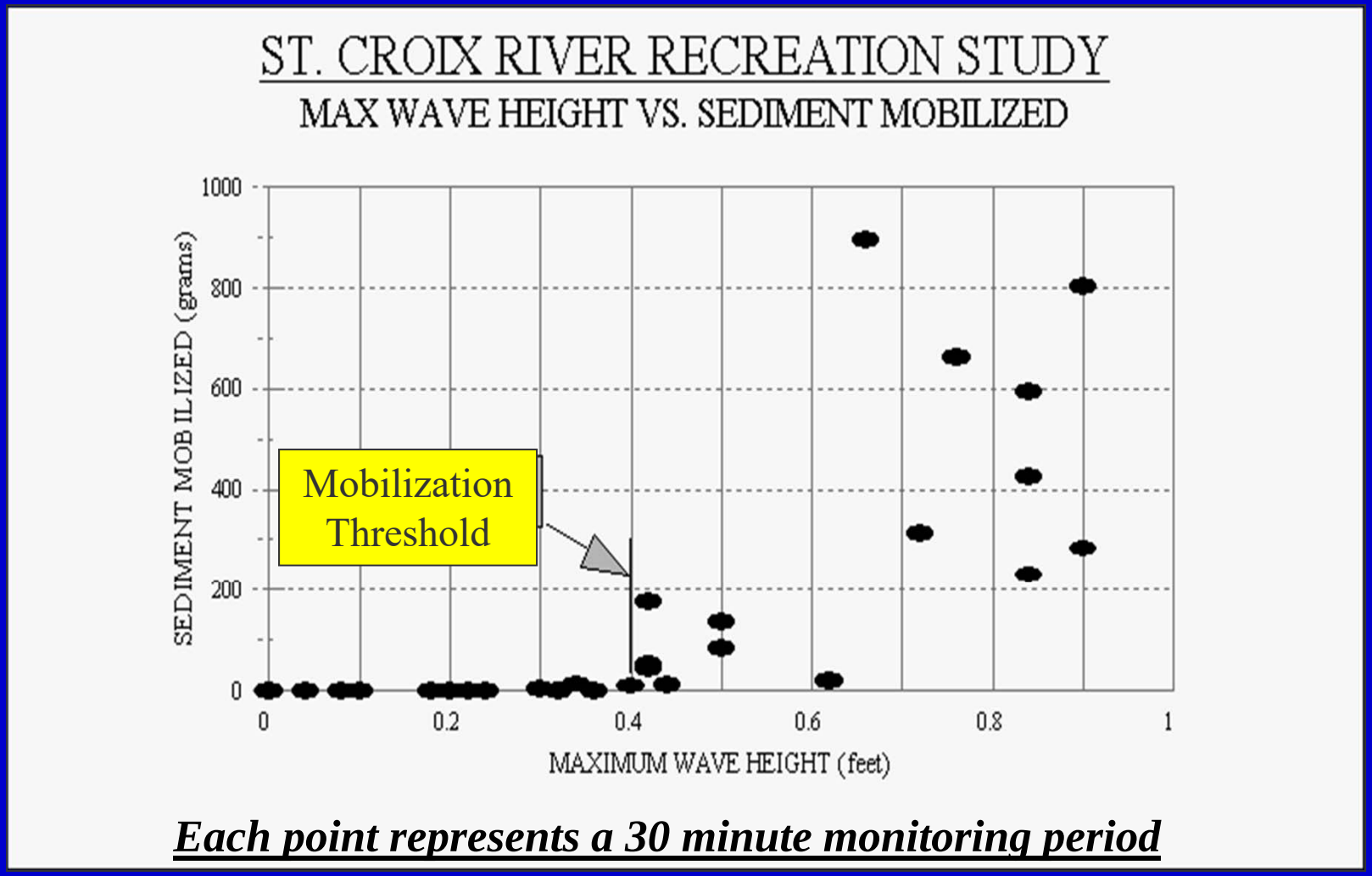


Maximum Wake Wave Heights

Vessel Type	Distance from Sailing Line		
	0 to 100 ft	100-300 ft	300-500 ft
Sailboats	N/A	N/A	N/A
Jet Skis	8 cm	4 cm	0
Fishing Boats	16 cm	8 cm	4 cm
Pontoon	8 cm	4 cm	4 cm
Medium Power	24 cm	20 cm	10 cm
Large Cruisers	50 cm	40 cm	20 cm
House boats	8 cm	4 cm	4 cm

From Wilcox et al 2000 (UMRS Navigation Study)

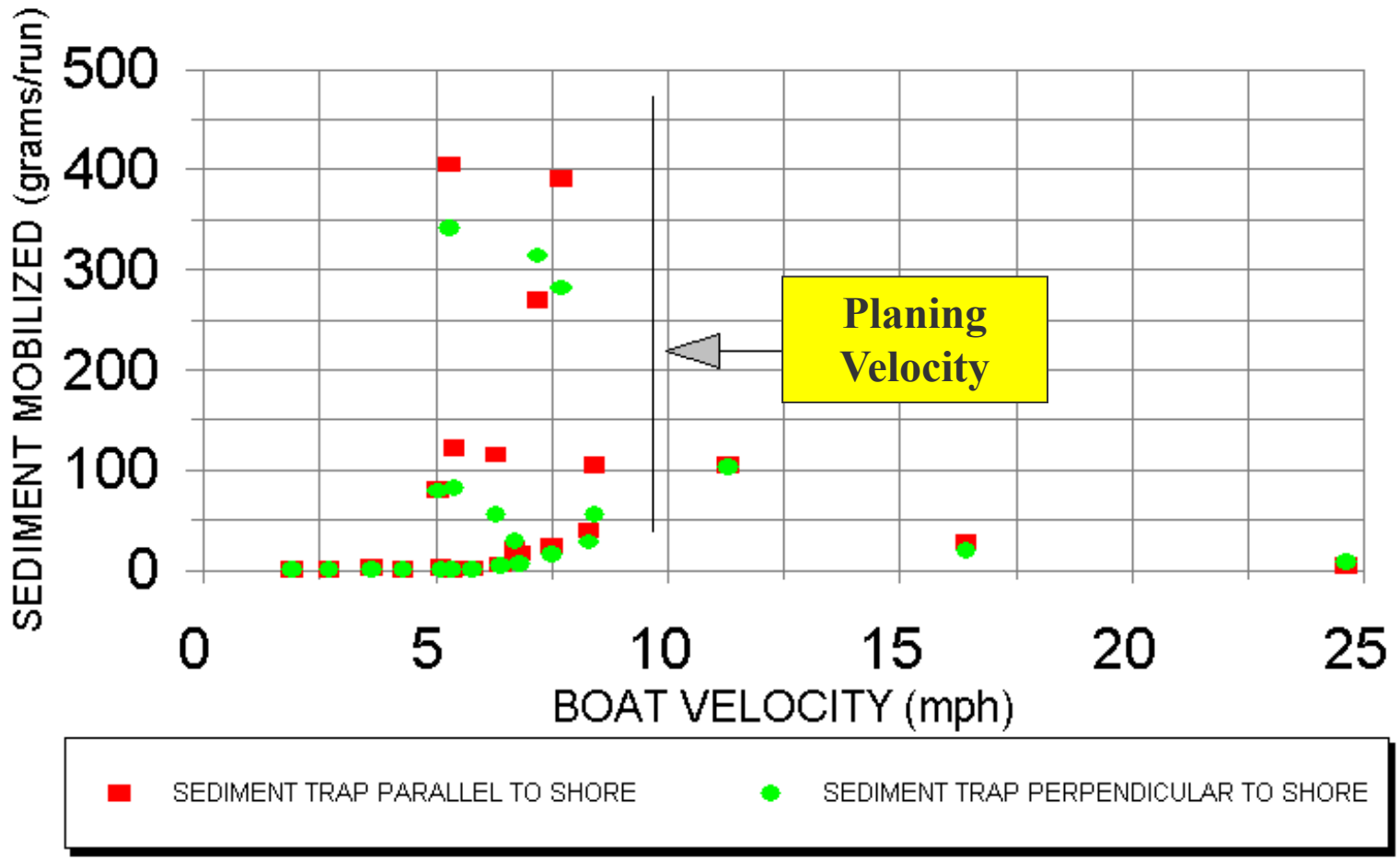
Normal Boating Activity



Each point represents a 30 minute monitoring period

ST. CROIX RIVER RECREATION STUDY

BOAT VELOCITY VS SEDIMENT MOBILIZED



Summary

- Boat wakes contribute to shoreline erosion, especially in areas protected from wind energy
- Prop disturbance greatest at shallow depths or in areas with aquatic vegetation (<10ft)
- Maximum impacts occur at transition speeds (7-12 mph)
  - Varies with boat length, engine size, hull design, etc.