



Kezar Lake

WATERSHED ASSOCIATION

Consequences of Slow Speed Power Boat Activities

A presentation to enlighten boaters on the effects of slow speed power boat
wake generation and operations in shallow water

Presented by the Kezar Lake Watershed Association

Executive Summary August 2019

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Each slide has a "Notes" page with explanatory information.

The Threat to Our Lake Environment

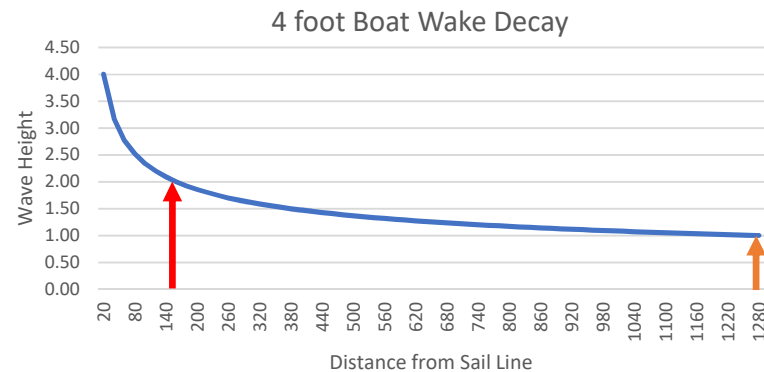
- We have become very concerned about the impact large boat wakes and slow speed boating activities are having on our lake
 - Erosion of the shore line
 - Safety of other boating activities – kayaks, paddle boards, canoes
 - Damage to docks and moored boats
 - Scouring of the lake bottom
- We are contacting other lake associations to get their observations and opinions about these problems
- We are seeking ways to mitigate/control inappropriate boating activities
 - Establish guidelines for responsible boating
 - Education
 - Legislation

What is the Threat from Boat Wakes?

- We are especially concerned about Large wakes – 3 feet or more which cause:
 - Shore line erosion and degradation of water quality
 - Danger to small craft on the water – kayaks, canoes, paddle boards small sail boats
 - Cause upset and possible serious safety issues
 - Injure boaters
 - Cause damage to water craft
 - Damage to water craft at dock or anchor
 - Slamming boats into docks damaging boat and/or dock
 - Break mooring lines, leading to further damage
 - Upset or damage to aquatic life – especially nesting loons
 - Danger to Swimmers
 - Other boat operators and property owners irritation to the point of confrontation or taking counter actions

The Nature of Boat Wakes

- Wakes are formed by 2 actions of a boat
 - Displacement wakes – boats “plowing” the water with the bow
 - Planning wakes – Transverse waves from the stern and propellers
- For Classical Wakes, Once formed –
 - Wakes decay as the distance from the “sail line” as $d^{-0.33}$
 - Wakes decrease by half for every 8 fold increase in distance from the sail line



Boat Speed vs Wave Height

This chart shows the wake height versus boat speed
Note that the maximum wake generation occurs at a relatively slow speed—6 to 12 mph

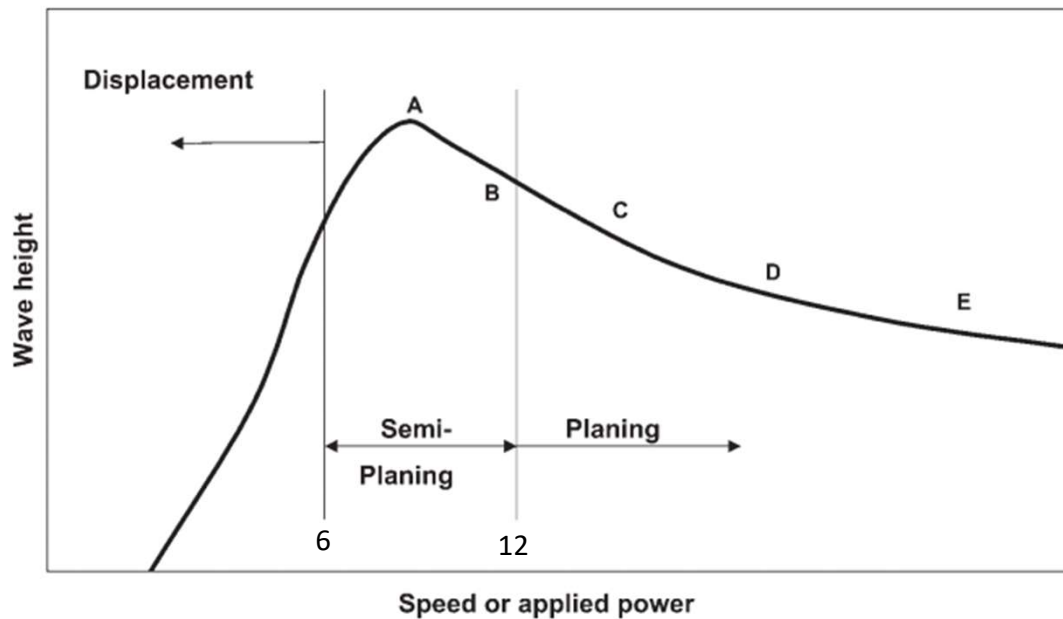


Figure 1. Wave height versus speed trends in small planing boats

How Much Wake do we Get?

Initial Wave Height Ft.	Height at 200 ft.	Height at 300 ft.	Height at 400 ft.	Height at 500 ft.	Distance to 1 Foot Height
5	2.32 ft.	2.03 ft.	1.84 ft.	1.7 ft.	2,500 ft.
4	1.86 ft.	1.62 ft.	1.48 ft.	1.37 ft.	1,280 ft.
3	1.39 ft.	1.22 ft.	1.11 ft.	1.03 ft.	540 ft.
2	0.93 ft.	0.81 ft.	0.74 ft.	0.68 ft.	160 ft.
1					20 ft.

So How about Selecting 500 feet as the stand off distance for very large wake activities?
 The Current Maine law of 200 feet for wakes starting at 2+ feet is reasonable.

What should we do about addressing large wakes?

- Create boating Guidelines concerning large wakes on Kezar Lake
- Educate boaters
 - Signs at public launch sites
 - Instructions by Lee at the Marina
 - Use the Lake Patrol to encourage wake surfer and wake board boaters and anyone creating large wakes to abide by our (KLWA) Guidelines
 - Publish News Letter articles
- Seek the support of LEA, MLS and LSM (VLMP) and other lake associations to petition Maine legislatures to establish wake surfing regulations

KLWA Guidelines for Boating Activities Causing Large Wakes in Kezar Lake

- Wake surfing activities should be operated at least 500 feet from shorelines, vessels that are underway, anchored or moored and persons in the water. Other boating activities that create large wakes (2-3 feet), especially wake boarding, slow speed tubing and touring (boats “plowing the water” at slow speed of 6 to 12 mph), should be operated at least 300 feet from shorelines, docks and anchored swimming floats, navigation buoys, vessels that are underway, anchored or moored and persons in the water.

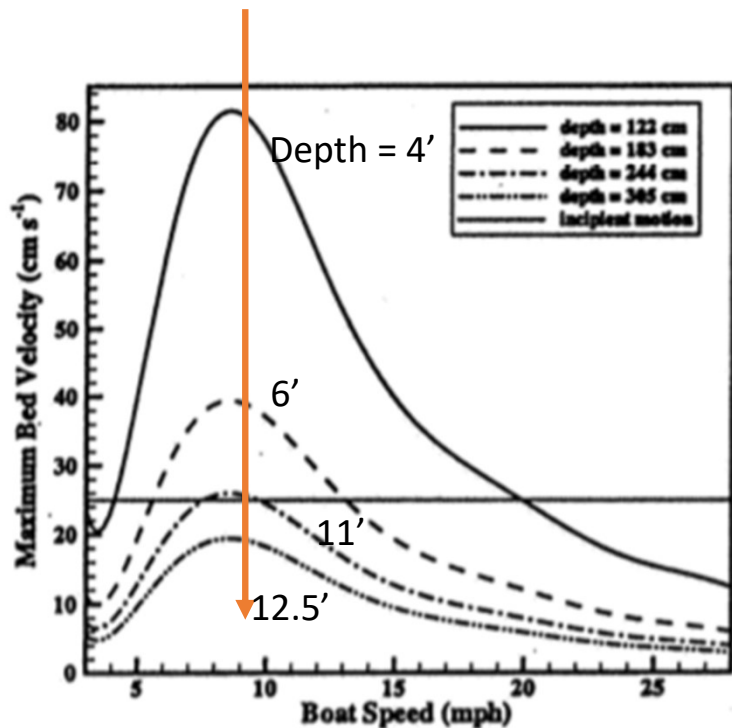
Now Consider the Related Threat - Propeller Wash Impact on Lake Bottom

- Propeller wash (or water jet wash) in shallow water can have a devastating effect on the lake bottom
 - Scouring of the bottom
 - Resuspending sediment – especially phosphorus
 - Destruction of aquatic vegetation and water critters and their habitats
- Wake Boats have a 20° angle on the propeller shaft and another $10 - 15^{\circ}$ in a bow up posture so thrust of prop wash is about 30° down.
- The velocity of the jet wash is proportional to the prop pitch and prop rpms and the jet wash speed decays linearly with distance.

Propeller Wash Impact on Lake Bottom



Water Jet Velocity vs Boat Speed



- Max prop jet speed is at about 9mph
- At very slow speed and high speed the jet speed is much less and not so much of a problem
- So, we focus on boating activities in shallow water where boat speed is 6-12 mph

➡ Jet Velocity from an outboard boat that will disturb 0.33mm sand on the bottom

Figure 11.-Model predictions of V_{max} variation with boat speed for several water depths for the outboard boat.

KLWA Guidelines for Boating Activities Causing Large Wakes and Bottom Scouring in Kezar Lake

- Wake surfing activities should be operated at least 500 feet from shorelines. Other boating activities that create large wakes (2-3 feet), especially wake boarding, slow speed tubing and touring (boats “plowing the water” at slow speed of 6 to 12 mph), should be operated at least 300 feet from shorelines, docks and anchored swimming floats, navigation buoys, vessels that are underway, anchored or moored and persons in the water. Further, no such slow speed (6 -12mph) activities should occur in water less than 20 feet deep due to propeller wash scouring of the lake bottom.



CONCERNS

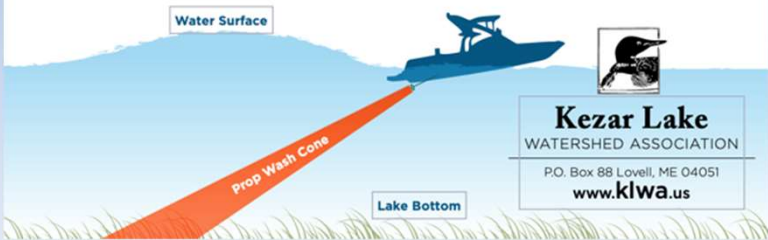
Wake surfing and wake boarding have increased substantially in recent years. While the challenges and excitement of these sports are undeniable, they do require large wakes which can have side effects on Kezar Lake.

SIDE EFFECTS

Large wakes can damage docks, moored boats, loon nests and limit enjoyment of small watercraft like paddleboards, canoes and kayaks. Large wakes also erode the shoreline and stir up bottom sediment which often has a high phosphorous content. Phosphorous can cause algae blooms. Sediment can clog fish gills and suffocate fish eggs.

CAUSES

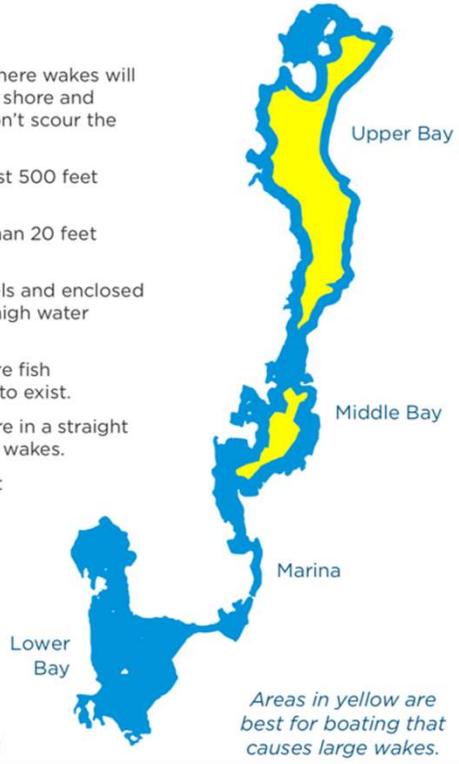
While large wakes are often associated with high speed boating, you may be surprised that slow-speed boating (6 to 12 mph) creates the largest wakes. Off plane, a boat's bow angles up and the propeller angles down which creates large wakes and stirs up bottom sediment in shallow water. This is known as "plowing the water" as shown below.



PROTECT WATER QUALITY. BE CONSIDERATE OF OTHER BOATERS. RESPECT AQUATIC HABITAT AND WILDLIFE.

HOW TO HELP

- Find large water areas where wakes will diminish before reaching shore and where propeller wash won't scour the bottom.
- Operate your boat at least 500 feet from shore.
- Operate in water more than 20 feet deep.
- Avoid small bays, channels and enclosed areas, especially during high water periods.
- Avoid marshy areas where fish and loon habitat is likely to exist.
- Leave and approach shore in a straight line. Turning makes large wakes.
- Operate at least 500 feet from small water craft.





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