

September 9, 2022

Cook County Board of Commissioners
Attn: James Joerke
Cook County Courthouse
Grand Marais, MN 55604

Re: Petition requesting an ordinance banning wake boating and surfing
on Caribou Lake, Lutsen Township, Cook County, Minnesota

Dear County Board Members:

The Caribou Lake Property Owners' Assn. (CLPOA) and 71% of the private shoreline ownership on Caribou Lake, Lutsen Township, Cook County, Minnesota petition the Board of Commissioners of Cook County, Minnesota to recommend to the Minnesota Department of Natural Resources that an ordinance be approved and adopted banning wake boats and wake surfing from Caribou Lake. Attached to this letter is a petition signed by 97 individuals representing ownership of 71% of the shoreline on the lake who support the request for an ordinance prohibiting wake boats and wake surfing on Caribou. CLPOA sent notices of the petition to every property owner on the lake. In addition, meetings were held over the Memorial Day and Labor Day weekends at which the issue was discussed and signatures were gathered. Finally, the petition was put on CLPOA's website.¹ During the process of circulating the petition, only three property owners expressed an objection. However, they also did not believe Caribou Lake was an appropriate place for wake boats and wake surfing - one of the three owns a wake boat but keeps it on a lake in the St. Paul-Minneapolis metropolitan area. Basically, they objected to regulations per se and feared that one regulation would lead to another and so forth. Also attached is a completed Water Surface Area Worksheet (Worksheet), a draft Proposed Ordinance, several exhibits that are cited in this letter, and a DNR published map of the lake.

Caribou Lake has a surface area of 721 acres, a maximum depth of 30', and a mean depth of 12' for 60% of the lake. It is an irregularly shaped lake consisting of four distinct bays. The bay where the public landing is located is approximately .5 miles long and has two widths: .19 miles for .2 of the length and .38 miles for .31 miles. The depth of most of the bay is under 10'. The back bay adjacent to the public landing bay is approximately 1.38 miles long and .25 miles wide with a maximum depth of about 12-15'. Most of the bay is less than 10' in depth. The main bay runs at a right angle south from the back bay and is approximately .94 miles long and has two widths: .22 miles off the end of the peninsula in the lake and .5 miles for the remaining .57 mile length of the bay. That bay contains the deepest parts of the lake. The Cathedral of the Pines bay

¹ A spreadsheet with the names and addresses of all signees is attached with the Worksheet. The various original documents containing the collected signatures is available for inspection.

is approximately .63 miles long and .31 miles wide. Most of that bay is less than 10' deep.² Caribou also has “more than 10 docks per mile of shoreline (highest in the HUC-8). (See attached excerpt from “Lake Superior - North Watershed Monitoring Report” by the Minnesota Pollution Control Agency, 2017 attached as Exhibit 2)

As noted in the attached Worksheet, activities such as water skiing and jet skiing are very uncommon on Caribou Lake. The overwhelming use of the lake is by fishermen and pontoon boats with frequent use by kayakers, canoes, and stand-up paddle boarders. It is not and never has been a lake used regularly for water sports that are akin to wake surfing.

The Caribou Lake Property Owners' Assn. has been vigilant in protecting both water quality and shoreline aesthetics. Examples are:

- Established a Lake Management Plan in 2008
- Active in establishing an AUAR in 2004 of a Caribou backlot development.
- Submission of comments on requested building variances affecting either water quality or lakeshore aesthetics
- Involved with water quality testing since the association's inception in 1976³
- Promotion of Septic system inspections and compliance
- Promotion of shoreline improvement programs
- Members participating in the DNR Ambassador program for aquatic invasive species (AIS) education
- Partnering with Cook County on boat inspection at the public landing
- Members completing the U of M extension AIS identification certification
- Harvesting program of invasive Rusty crayfish

The residents around the lake, both seasonal and full-time, are overwhelmingly committed to protecting the water quality and the ordinary, historical uses of the lake. Wake boats and wake surfing pose a threat to the lake by causing shoreline erosion, turbulent disruption of lake bottom sediment, increased risk of the introduction of aquatic invasion species (AIS), and disruption of the normal usage of the lake by fishermen, pontoon boats, and non-motorized watercraft.

² Measurements and data regarding the lake were taken from a map of Caribou Lake published by the Minnesota Department of Administration, Print Communications Division which is attached to this letter as Exhibit 1.

³ In fact, Caribou Lake has one of “the longest citizen collected data records in the state.” See email correspondence from Jesse Anderson of the Minnesota Pollution Control Agency attached to this letter as Exhibit 3.

Risk of lakeshore erosion

A study conducted by the University of Minnesota College of Science and Engineering St. Anthony Falls Laboratory (<https://twin-cities.umn.edu/news-events/university-minnesota-researchers-study-waves-created-recreational-boats>)(a copy of the study is attached to this letter as Exhibit 4) examined the propagation of waves generated by wake boats and the distance between the boat and shoreline needed to reduce the potential damaging effects of the waves on shoreline. Among the important findings from the study were the following:

- “When researchers compared the wake waves of the four boats during their most typical mode of operations, the data indicated that wakesurf boats require distances greater than 500 feet from the shoreline/docks and other boats (or the distance of a little less than 1.5 football fields) to decrease their wake wave characteristics to levels similar to the non-wakesurf boats.
- In both modes of operation, the suggested distance from shoreline/docks for wakesurf boats is more than twice the distance of the 200 feet currently recommended by Minnesota guidelines for common recreational boats.
- Under both slow and fast speed conditions, the wakesurf boats produced the largest waves in terms of height, energy, and power when compared to the non-wakesurf boats.
- Larger, more energetic waves need to travel a greater distance to decrease in wave height, energy, and power.”

Because of its irregular shape and bays, much of Caribou is unsuitable for wake boats and wake surfing. For example, a wake boat traveling down the exact center of the back bay would barely be 500’ from either shoreline.⁴ That scenario ignores the probability that it would not be 500’ from fishing boats, pontoon boats, and non-motorized craft which routinely use the bay. Moreover, a wake boat yielding to an oncoming boat obviously would be much closer than 500’ to one shoreline and to the oncoming boat. It is unrealistic to imagine that a wake boat would not encounter other water craft on Caribou. Even the wake boating industry recommends that a wake boat stay at least 150’ from other watercraft. (Booklet prepared for Michigan Chapter, North American Lake Management Society (McNALMS) by Marlena Smith and Erin Jarvie in FW 868 Water Policy and Management, Michigan State University, Fall 2015, attached as Exhibit 6) If a wake boat observed that industry recommendation, it would be well inside of 500’ from the shoreline in the entire back bay. As such, the waves it generates would be more damaging to the shoreline because they would not have had space to diminish.

The same circumstances are true for many other parts of the lake. As the Worksheet describes, it is common for a variety of watercraft to use the lake on any given day. A single wake boat with

⁴ A Report by the University of Quebec in Montreal found that a distance of 300 meters, or 984 feet, was required. The report is attached as Exhibit 5.

a wake surfer trying to stay at least 150' away from other watercraft would almost always be within 500' of a shoreline. Because of its irregular shape, it's useful to visualize Caribou Lake as four separate, smaller lakes. None of those smaller lakes would be suitable for a wake boat or wake surfing. Because none of the individual bays, or "smaller lakes", would be suitable for wake boating and surfing since the boat would almost always be well within 500' of a shoreline, it follows that wake boating and surfing are not suitable on Caribou Lake.

It is true that a good deal of Caribou's shoreline is rocky. Some might argue that it's rocky shoreline makes it immune or much less subject to erosion from large waves generated by wake boats and wake surfing. Admittedly, all things being equal, a rocky shoreline is less likely than a dirt or earthen shoreline to suffer serious erosion. However, to be clear, not all of Caribou's shoreline is rocky and even the "rocky" portions are not the equivalent of "rip rap" often seen to prevent erosion. A rocky shoreline doesn't guarantee there will not be erosion from large waves. For example, when water levels are lower there is an enhanced risk of erosion. Attached is a photo submitted by a property owner on Caribou showing the exposure of tree roots and gravel areas to erosion. (Exhibit 7) This property is located along the shoreline of the Cathedral of the Pines bay. Often, Caribou, like other lakes, has lower water levels later in the Summer that expose areas like those in the photo. Large waves from wake surfing and wake boats would cause erosion to the shoreline under those low water conditions. Moreover, as indicated, Caribou has a number of docks. Large waves are a concern of dock owners. Attached is a photo of a dock section provided by property owner on Caribou who said he must take special precautions during high water to secure sections of this dock from wave action created by weather and recreational boats. (Exhibit 8) He is concerned about damage to his dock from the larger waves generated by wake boats and wake surfing. His dock is located along the west end of the back bay. So, while it is true that rocky shorelines may suffer less erosion damage than earthen shorelines, it is far from true that shorelines like those on Caribou Lake would not suffer unacceptable damage from the large waves that are generated by wake boats and wake surfing. Indeed, Caribou rarely if ever has 3-5 waves. For much of Caribou's shoreline, 3-5' waves would simply override any rocks and cause erosion. Even a cursory tour of Caribou would demonstrate that the large waves created by wake boats and wake surfing would threaten both the shoreline and docks.

Degradation of water quality

As the attached Worksheet indicates, 60% of Caribou has a mean depth of 12.6'. Most of the public landing, back, and Cathedral of the Pines bays are not deeper than 12-14'. Only the center part of the main bay is consistently deeper than 15'. As the U of M study stated, wake boating and wake surfing generate waves with far greater energy than other watercraft. Because the boat rides low in the water and generates waves with significant energy, sediment on the lake bottom is disturbed in areas that are shallower than those depths. A report by the University of Laval in Quebec, Ontario found that water depths of less than 5 meters, or 16', were subject to significant turbulence and disruption of lake bottom sediment. (Report of Universite Laval in Quebec, Ontario, Canada attached to this letter as Exhibit 9) A report by New Hampshire Dept. of

Environmental Services states that a wake boat generates waves with 4.7 times more energy than a water ski boat at slower speeds. (http://gencourt.state.nh.us/statstudcomm/committees/1434/documents/Wake%20Boats-%20AIS%20and%20Water%20Quality_NHDES%20Presentation.pdf; the report is attached as Exhibit 10). The Report noted the following “Direct Water Quality Concerns” from wake boats and wake surfing:

- “Shoreline erosion as a result of boat wakes
- Turbidity/reduced clarity from erosion and suspended sediment
- Nutrient loading from erosion and suspended sediment
- Disruption/damage to aquatic plant beds from direct boat contact and wave damage”

Another study conducted at the request of a water district in Canada concluded that “The wake vertical turbulence from the wake-surf boat was observed causing major disturbances in water 3 m deep or shallower. Sediment re-suspension was clearly documented as deep as 4 m and the impact of the wake was measured as deep as 8 m.” (Kalamalka Lake Boat Trials, August 27, 2019, Regional District North Okanagan (RDNO), Greater Vernon Water (GVW), District of Lake Country (DLC) and Larratt Aquatic Consulting Ltd. (LAC)(a copy of the report is attached as Exhibit 11). That study used both aerial and underwater cameras to demonstrate what was described as “very intense plume of sediment that clouded the entire water column” following the path of a wake boat.

The dangers to water quality and to lake flora and fauna from major disturbance of sediment on the lake bottom are manifold. They include “silting in fish spawning habitat and smothering aquatic vegetation” and “churn[ing] up nutrients such as phosphorus that could increase algal growth”. (Exhibit 5) CLPOA has worked hard to reduce the phosphorus count in the lake through programs previously outlined.⁵ Over the years, the total phosphorus has gone from over 25 ppb in the 1970’s to under 15 ppb in recent years. (See attached chart showing Caribou Lake Phosphorus History attached as Exhibit 13; also see Exhibit 11) Any churning up of the phosphorus laden lake bottom sediment would undo the years of work CLPOA has done to improve water quality.

⁵ The MPCA has recognized the efforts of the CLPOA in monitoring and improving water quality in Caribou: “Caribou has an extensive water quality dataset with annual transparency data collected since 1976. A robust total phosphorus dataset has also been collected, primarily by the Caribou Lake Property Owners Association. The Association has done extensive work to monitor the lake and the health of its watershed for many years, including working with Cook County on septic system inspections and improvements.” (“Lake Superior - North Watershed Monitoring And Assessment Report” attached as Exhibit 12)

Because Caribou is a largely shallow lake, water quality will be degraded by any wake boating and wake surfing activity. The entire public landing, back, and Cathedral of the Pines bays are, at most, 12-14' deep. Many areas in those bays are less than 10' deep. A single wake boat making multiple passes with a wave surfer would churn up the bottom of the lake and send 3-5 foot waves toward the shorelines where some erosion would occur. More than one wake boat at a time and multiple days of wake boating and wake boat surfing would degrade water quality for days, if not weeks.

Increased risk of aquatic invasive species

Wake boats are equipped with ballast tanks typically holding thousands of pounds of water. (https://en.wikipedia.org/wiki/Wakeboard_boat) It is common for factory ballast to be designed to hold approximately 4,000 pounds of water. In all probability, wake boats would be trailered to Caribou from other lakes. Without knowing where the boat has been used or how effectively the ballast tanks have been cleaned of potential AIS, there is a greatly increased risk of AIS introduction to Caribou via wake boats. The New Hampshire Dept. of Environmental Services has published a document highlighting the risks of introducing AIS via wake boat ballast. (See Exhibit 10). As the report stated, "a drop (about a milliliter) of water can contain hundreds of microscopic organisms and larvae." The ballast on wake boats "are not fully drained between water bodies or portions of waterbodies, allowing for spread of AIS." In a study done by the Department, 13 ballast bags were sampled. The residual water in the ballast ranged from 1 to 86.8 liters per bag. Live organisms were found in nine of the 13 bags, two of which included zebra mussel larvae. The organisms had been alive in the bags for at least 7 days by the time they were sampled. To date, Caribou is free of milfoil, spiny water fleas, and many other AIS. The only known AIS in the lake is the Rusty Crawfish which has entered through Bigsby Lake and the Murmur Creek watershed. Allowing wake boats on Caribou Lake would significantly increase the risk of new AIS being introduced to the lake.

A graduate student at the University of Minnesota performed research in connection with his thesis looking at the risk of transporting zebra mussel veliger, or the larvae of zebra mussels. He collected over 300 samples of residual water in an array of recreational watercraft, including wake boats, on lakes in Minnesota. (Occurrence and Survival of Zebra Mussel (*Dreissena polymorpha*) Veliger Larvae in Residual Water Transported by Recreational Watercraft, A THESIS SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA BY Adam Doll IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE, December 2018)(a copy is attached as Exhibit 15) He noted that "Overland transport of adult mussels by recreational watercraft and equipment related to boating (e.g. trailers, docks, boat lifts) is viewed as the primary route for spread." That also would be true for milfoil, spiny water fleas and other aquatic invasive species (AIS). He found that ballast tanks on wake boats ranked the highest in the percentage of "veliger presence" among all the watercraft. He also found that ballast tanks had the highest median count of "[T]he number of veligers recovered per compartment," where "compartment" is a reference to any part of the watercraft or motor that might contain water, and that ballast tanks created the "greatest

likelihood of transporting at least 1 veliger” from one body of water to another. He noted that “Ballast tank pumps are capable of pumping large volumes of water in short periods of time, with the pump used for this study pumping at 74 kg/minute. It appears as though the systems that pull large volumes of water from deeper in the water column have a greater likelihood of collecting larger numbers of veligers.”

Both the study by the New Hampshire Dept. of Environmental Services and the study in support of U of M Masters Thesis confirm that wake boats pose a high risk of transporting AIS into Caribou Lake. No doubt that all boats launched in Caribou carry the risk of transporting AIS. However, all of the evidence suggests that wake boats pose an extraordinarily high risk because of their ballast tanks and the amount of water typically leftover in the ballast tanks from the last lake the boat was on.

There are lakes where wake surfing and wake boating are appropriate. Large, deep lakes with open expanses of water are clearly suitable for wake boating and surfing. However, an irregularly shaped lake like Caribou that is largely shallow and with very confined, limited spaces for a wake boat to operate is not suitable. Under normal operating conditions with other watercraft on the lake, it would not be possible for a wake boat or wake surfer to operate more than 500’ from a shoreline all while steering clear of other watercraft on the lake. In addition, wake boats would pose a serious threat to the water quality of Caribou both by creating turbulence that disturbs sediment on the lake bottom and increasing the risk of introducing AIS. The property owners around Caribou have worked diligently trying to protect the water quality and peaceful use of the lake. It would be a shame for that work to be undone by wake boating and wake surfing on the lake. Finally, Caribou Lake historically has been used mostly by fishermen, pontoon boats and non-motorized watercraft. Wake boats and wake surfing, generating 3-5’ wakes, would pose a hazard to many small boats and non-motorized watercraft and would disrupt the ordinary and historical uses of the lake.

The Caribou Lake Property Owners’ Assn. and the residents who have signed the attached petition respectfully request the County Board recommend to the Minnesota Department of Natural Resources that an ordinance be adopted prohibiting wake boats and wake surfing on Caribou Lake in Lutsen Township.

Respectfully submitted,

Caribou Lake Property Owners Association

By Frederick W. Morris, President

