MEMORANDUM

Prepared for: Rep. Marsh
Date: Feb. 24, 2022
By: Eliot Crafton, Oliver Droppers
Re: Senate Bill 1589 (2022)

LPRO: LEGISLATIVE POLICY AND RESEARCH OFFICE

SUMMARY

Your office requested that Legislative Policy and Research Office (LPRO) staff review publicly available information to assess if altering the current 10,000-lb maximum weight restriction of a watercraft participating in wakesurfing and wakeboarding in the Newberg Pool Congested Zone (Newberg Pool) will potentially impact the effects of wakes created by watercraft currently certified to operate in the Newberg Pool. You also requested LPRO provide some examples of the maximum loading weights for a selection of boats and review the factors the Oregon State Marine Board (OSMB) used to establish the current 10,000-lb threshold.

Watercraft weight, wave height, and power

Based on an unstructured internet search, a review of several published studies, and public testimony, given the complexity of interacting factors in the generation and characteristics of wake, including wake height and power, boat weight is **only one contributing factor** among others: speed, distance from shore, hull design, and the use of wake enhancement technologies and devices.

Average weight for wake sport and non-wake sport watercraft

Based on review of industry data for dry weights and factory ballast capacities for watercraft manufactured for wakeboarding and wakesurfing, the average dry weight for wake sport and non-wake sport boats is 5,117 lbs., which does not include factory ballast options, with an average ballast capacity of 3,287 lbs. (see Table 2, pgs. 5-6). Currently, the average loading weight (combined dry weight and factory ballast capacity) of the 500+ boats certified in Oregon is 5,070 lbs. (see Figure 2, pg. 3).

Oregon State Marine Board's 10,000-lb maximum weight requirement

OSMB communicated with LPRO staff that the agency is not aware of where the 5,000-lb weight-limited proposed in Senate Bill 1589 (2022) is derived from.[1] As of May 2021, slightly more than half (232) of the certified boats had loading weights between 5,000 and 10,000 lbs, with the remaining (205) weighing less than 5,000 lbs. According to OSMB testifimony, the 10,000 lbs. weight restriction was based on existing weight standards for boat launch ramps on state waterways. [2]

This memo offers a brief history on regulation of watercraft on the Newberg Pool and highlights available research that have examined the generation of boat wakes.

[1] Email from Josh Mulhollem, Environment and Policy Program Manager, Oregon State Marine Board to Erin Pischke, Legislative Analyst, Legislative Policy and Research Office (Feb. 24, 2022).
[2] Josh Mulhollem, Environment and Policy Program Manager, Oregon State Marine Board testimony to House Committee on Agriculture and National Resources (March 4, 2021). (Accessed on Feb. 24, 2022 at: https://olis.oregonlegislature.gov/liz/mediaplayer/?clientID=4879615486&eventID=2021031114)

LEGISLATIVE HISTORY

2019

In 2019, the Legislative Assembly enacted House Bill 2351 (2019), authorizing OSMB to adopt special regulations to manage boat wake energy within the Willamette River Greenway from river mile 0 to 26. House Bill 2352 (2019) also created a towed watersports program within OSMB, requiring motorboat owners to acquire and display a certificate decal if engaged in towed watersports and an individual to carry a towed watersport endorsement if engaged in wakesurfing or wakeboarding in the Newberg Pool Congested Zone. The Newberg Pool Congested Zone refers to the portion of the Willamette River beginning at river mile 30 and ending at river mile 50.

In October 2019, OSMB adopted rules establishing a 10,000-lb maximum loading weight (MLW; OSMB defined motorboat loading weight to be “the sum of the boat's dry weight and the boat's factory ballast capacity”) limit for applicants seeking certification to engage in towed watersports.[3] Any boat with a loading weight over 10,000 lbs is ineligible to receive the decal and therefore cannot be used for wakesports in the Newberg Pool. Starting in January 2020, OSMB began issuing Towed Watersports Motorboat Certificates for watercraft under 10,000 lbs. In May 2020, OSMB adopted rules restricting wakesurfing to approximately three miles of the Newberg Pool in a section without any residential docks (referred to as Yellow Zones 1 and 2; Figure 1).

Figure 1. Newberg Pool Special Rules Map

Source: Oregon State Marine Board, Special Rules for Newberg Pool, accessed February 24, 2022, at https://www.oregon.gov/osmb/boater-info/Pages/Towed-Watersports-Education-Program.aspx.

2021

In 2021, House Bill 2555 (2021), would have established that the maximum loading weight of a motorboat must be less than 4,000 pounds to obtain a towed watersports motorboat certificate. The measure was not enacted. House Bill 2725 (2021), identical to HB 2555 was not enacted. During legislative hearings, OSMB submitted testimony indicating a “potential challenge” around restricting the maximum loading weight (MLW) of boats in that “boat manufacturers are not required to specify the weight of boats that they build. Manufacturers of boats designed for wake sports typically provide these specifications, but it is not as common for other types of

[3] OAR 250-18-0010.

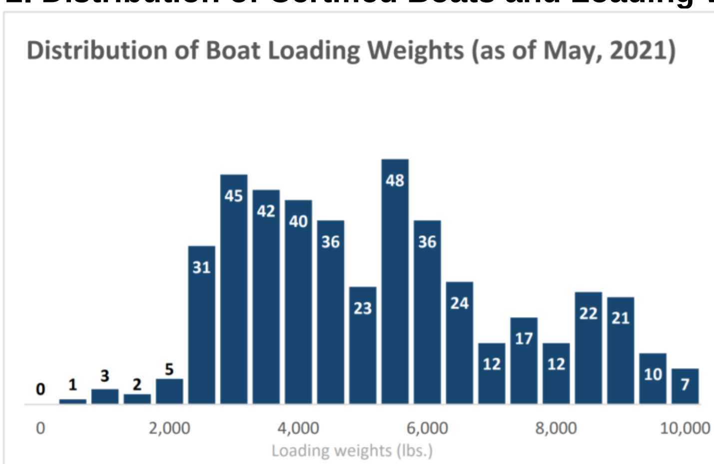
boats and is often unavailable for older fishing boats and runabouts."[4] The State Marine Board was referring to watercraft "other than wake boats" as being used for towed watersports, and that further restricting loading weight could result in a number of boats no longer being eligible for the Towed Watersports Motorboat Certificate" currently required in the Newberg Pool (see Figure 2).

2022

Senate Bill 1589 (2022), as introduced, will establish the maximum loading weight of a motorboat as less than 5,000 lbs. to obtain a Towed Watersports Motorboat Certificate. Currently, OSMB, in rule, has established the maximum loading weight at 10,000 lbs. SB 1589 also will prohibit a person from using a device or individuals to increase wakes and engage in wakesurfing within Newberg Pool Congested Zone. SB 1589 also will redefine the Newberg Pool Congested Zone to begin at river mile 26.6 and end at river mile 55.

According to OSMB, as of February 2022, the *average* loading weight (combined dry weight and factory ballast capacity) of the certified boats was 5,070 lbs. Figure 2 shows the distribution of loading weights for the 437 certified boats as of May 2021. As of that date, slightly more than half (232) of the certified boats had loading weights between 5,000 and 10,000 lbs., with the remaining (205) weighing less than 5,000 lbs.

Figure 2. Distribution of Certified Boats and Loading Weights



Source: Oregon State Marine Board (testimony 2/6/2022)

[4] Manufacturers of wake boats often design watercraft with internal ballast compartments, filled with 1,000 pounds of water, to create waves used to wakesurf or wakeboard. Watercraft can also use wake enhancement devices (WED) to increase the ballast in the vessel (through fillable water bags); increasing ballast increases the watercraft's displacement, which increases wave energy and wave power.

Background

Boats generate wake as they displace water while in motion. The size and power of wake generated by a boat is based on several factors, including “boat size, weight, hull shape, boat speed, boat trim, and water depth.”[5] In general, if other factors are controlled for, “a positive correlation exists between the size of the vessel and the size of its wake.”[6] In other words, under similar conditions, a larger, heavier boat may typically generate larger wakes, though many factors ultimately control the size of a boat’s wake.

Boats generate the largest wake when their stern plows through the water. This can be a factor of boat speed—as boats transition from slow speed to hydroplaning—or boat design. For example, certain wake sport boats are designed to have increased ballast in the stern of the boat or are outfitted with other devices or design features to “manipulate boat-generated wakes,”[7] including technologies and devices, often known as wake enhancement technologies and devices (WEDs), that facilitate or modify the generation of wakes. Further, due to the needs of different activities, boat operators may elect to operate at different speeds to manipulate their boat’s wake. For example, boats towing skiers may operate at faster speeds than boats engaging in wakesurfing. Boats engaged in wakeboarding may elect to operate at faster or slower speeds depending on their recreational goals.

While several studies have examined the generation of boat wake as well as the effect of boat wake on aquatic environments and water-adjacent properties, there are relatively few that have examined the direct correlation between boat weight and wake size and power. Marr et al. (2022), conducted a study examining the size and power of wake generated from four different boats (Table 1), two designed for wakesurfing and two designed for other uses. One of the non-wakesurf boats, the Malibu Response, had additional aftermarket wake enhancement devices installed.

Table 1. Weights of Boats in Marr et al. Wake Size Study

Boat (Year)	Purpose	Dry Weight (lbs)	Ballast Weight (lbs)
Larson LXI 210 (2004)	Non-wakesurf	2,925	N/A
Malibu Response LX (2004)	Non-wakesurf	2,450	N/A
Malibu Wakesetter VLX (2019)	Wakesurf	4,200	3,690
Malibu Wakesetter MXZ (2019)	Wakesurf	5,500	4,885

Source: Legislative Policy and Research Office
Data: Marr et al. Marr, J., et al. *A Field Study of Maximum Wave Height, Total Wave Energy, and Maximum Wave Power Produced by Four Recreational Boats on a Freshwater Lake,* SALF Project Report No. 600.

The authors conducted their study under three scenarios examining the effects of boat speed, weight, and wake enhancing devices. They found that the two wakesport boats, which had a heavier dry weight as well as the option of additional ballast, generally created larger, stronger

[5] Oregon State Marine Board, “Wakes,” accessed on February 23, 2022. https://www.oregon.gov/osmb/boater-info/Pages/Wake.aspx.
[6] Bilkovic, D., et al. *Review of boat wake wave impacts on shoreline erosion and potential solutions for the Chesapeake Bay*. STAC Publication Number 17-002, p. 15, Edgewater, MD, 2017. (accessed on February 23, 2022, at <https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=2270&context=reports>)
[7] Marr, J., et al. *A Field Study of Maximum Wave Height, Total Wave Energy, and Maximum Wave Power Produced by Four Recreational Boats on a Freshwater Lake*, SALF Project Report No. 600, St. Anthony Falls Laboratory, p. 16, February 2022. (accessed on February 23, 2022, at <https://olis.oregonlegislature.gov/liz/2022R1/Downloads/CommitteeMeetingDocument/253018>)

wakes under similar conditions (e.g., speed, wake enhancements) than the non-wakesurf boats at certain distances from the boat, but the data was not consistent (e.g., the Malibu VLX had a higher wake at distances beyond 100 feet than the Malibu MXZ, which is the heavier boat, under certain conditions and the Malibu Response had very similar wake height to the Larson despite the differences in weight).

In other tests, the authors examined the effect of wake enhancing attributes, including both ballast and wake shapers. They found that additional ballast had a "relatively small influence…on maximum wave height, total wave energy, and maximum wave power" for the two wakesurf boats outfitted with a ballast option, whereas non-weight wake enhancement technologies, in this case a wake shaper, "may have more influence on the measured wave characteristics than the addition of ballast water at greater operational distances."[8] The authors concluded that "the role of ballast water weight…is an area where more research is needed."[9] As shown in this research, given the complexity of interacting factors in the generation and characteristics of wake, including wake height and power, boat weight is only one contributing factor.

Wake sport and Non-wake sport Boats

LPRO conducted an unstructured internet search to identify maximum loading weight, as defined by OSMB, of selected wake sport and non-wake sport boats currently on the market. Based on this search, most of the boats advertised for wake sports included ballast options, while other boats that were not specifically marketed for wake sports often did not include factory ballast capacity. Of the 43 boats included in Table 2, average dry weight was 5,117 lbs. Of these, 34 boats included factory ballast options, with an average ballast capacity of 3,287 lbs. Most (34) of the boats had a maximum loading weight, as define by OSMB, of over 5,000 lbs., including nine that exceeded 10,000 lbs.

Table 2. Dry Weights and Factory Ballast Capacities Stated on Manufacturer's Websites for Selected Wakesport and Non-wakesport Boats

Manufacturer and Model	Sport	Dry Weight (lbs)	Factory Ballast Capacity (lbs)	Total Weight (lbs)
Malibu 22 LSV	Wake Sports	4,900	4,170	9,070
Malibu 23 LSV	Wake Sports	5,200	4,250	9,450
Malibu 25 LSV	Wake Sports	6,175	5,180	11,355
Malibu M240	Wake Sports	7,500	4,700	12,200
Malibu M220	Wake Sports	6,200	5,160	11,360
Malibu 23 MXZ	Wake Sports	5,400	4,670	10,070
Malibu 24 MXZ	Wake Sports	6,000	4,885	10,885
Malibu 21 LX	Wake Sports	4,580	3,485	8,065
Malibu 20 VTX	Crossover & Ski Series	3,950	3,585	7,535
Malibu TXI MO CB	Crossover & Ski Series	3,100	N/A	3,100

[8] Ibid, p. 84.
[9] Ibid, p. 100.

Manufacturer and Model	Sport	Dry Weight (lbs)	Factory Ballast Capacity (lbs)	Total Weight (lbs)
Malibu TXI MO	Crossover & Ski Series	3,100	N/A	3,100
Nautique G23 Paragon	Wake and Surf	7,200	2,200	9,400
Nautique G25 Paragon	Wake and Surf	7,400	2,200	9,600
Nautique S21	Wake and Surf	5,200	2,650	7,850
Nautique S23	Wake and Surf	5,500	3,150	8,650
Nautique G21	Wake and Surf	5,800	2,250	8,050
Nautique G23	Wake and Surf	6,000	3,650	9,650
Nautique G25	Wake and Surf	6,400	3,650	10,050
Nautique Gs20	Multi-sport	4,500	1,850	6,350
Nautique Gs22	Multi-sport	4,750	2,950	7,700
Nautique Gs22e	Multi-sport	5,900	1,850	7,750
Nautique Gs24	Multi-sport	5,100	3,200	8,300
Ski Nautique	Ski	2,945	400	3,345
Ski Nautique 200	Ski	3,400	N/A	3,400
MasterCraft NXT20	Wake Sport	3,965	1,770	5,735
MasterCraft NXT22	Wake Sport	4,300	2,150	6,450
MasterCraft NXT24	Wake Sport	5,000	2,600	7,600
MasterCraft Prostar	Ski	3,300	N/A	3,300
MasterCraft XStar	Wake Sport	5,800	4,100	9,900
MasterCraft XStar S	Wake Sport	5,800	4,300	10,100
MasterCraft X22	Wake Sport	5,500	3,550	9,050
MasterCraft X24	Wake Sport	6,100	4,300	10,400
MasterCraft X26	Wake Sport	6,900	4,150	11,050
MasterCraft XT20	Wake Sport	4,500	1,700	6,200
MasterCraft XT21	Wake Sport	4,800	N/A	4,800
MasterCraft XT22	Wake Sport	5,485	3,350	8,835
MasterCraft XT23	Wake Sport	5,250	3,300	8,550
MasterCraft XT24	Wake Sport	5,550	3,600	9,150
MasterCraft XT25	Wake Sport	5,200	2,800	8,000
Yamaha SX210	Bowrider	3,172	N/A	3,172
Bayliner VR6 Bowrider	Bowrider	3,797	N/A	3,797
Formula 240 Bowrider	Bowrider	5,150	N/A	5,150
Tahoe 210 S	Bowrider	4,260	N/A	4,260

Source: Legislative Policy and Research Office
Data: Manufacturer websites, including https://www.malibuboats.com/; https://nautique.com/; https://www.mastercraft.com/; https://www.yamahaboats.com/; https://www.bayliner.com/; https://www.formulaboats.com; www.tahoeboats.com

New Hampshire

Other states have conducted work to study boat wakes as well. For example, a commission established by legislation in New Hampshire in 2019, was tasked with gathering data and information on the effects of wake boats, including shoreline erosion and the economic impact of recreational boating, and safety. The 15-member commission included representatives from the public, nonprofits, environmental organizations, law enforcement, water sports enthusiasts, industry, and shorefront property owners. In 2020, the commission issued its report [10] based on its study of the effects of wake boats. In their final report, the commission found that “waves produced by wake boats, when ballast compartments are full, have the potential to be more powerful than other watercraft of the same general size and shape.” (see pg. 6).

[10] New Hampshire Wake Boat Commission (June 202). *Final Report on the Study of Wave Boats.* (Accessed on Feb. 24, 2022 at <https://nhlakes.org/wp-content/uploads/Commission-to-Study-Wake-Boats-Final-Report-1.pdf>)