January 10, 2018

Item E: Staff report on safety around wake sports statewide

Introduction

Following a report to the Board at the October 2017 meeting on the consideration of rulemaking in Yamhill, Marion and Clackamas counties with respect to wake-enhancing devices, the Board requested staff to report on wake sports statewide. This report outlines the staff findings, analysis, and proposal on the subject of wake sports in Oregon.

Sports

01. Since their inception the sports of wakeboarding and wake surfing have evolved and the technology involved has advanced significantly. Wakeboard and wake surf boats incorporate a variety of features which are designed to be able to optimize wave wakes for the sport being undertaken. These features include the design of the hull, the ability to change ballast on the vessel, and devices such as wedges.

02. According to the Water Sports Industry Association's (WSIA) 2015 survey of sales, global annual revenue from retail sales for wake sport products (boats, boots, wakeboards, wakesurfers) were calculated to be $1,065,714,961. The total retail sales for towed water sport products, including wake sport products, were calculated to be $1,572,230,151.

03. Wakeboarding and wake surfing are conducted at different speeds due to the different wave requirements for the sports. The speeds at which these sports are carried out are dependent upon a number of variables including the type of boat being used. While it is possible to wakeboard at faster or slower speeds, wakeboarding will typically be undertaken at speeds between 15-23mph depending on the size, weight, and skill level of the rider. A tow rope of approximately 65-85 feet in length will be used to tow the wakeboarder. The rider is bound to the board and they cross the wake using it to jump into the air.

04. Wake surfing is typically conducted at speeds 8-13mph, no tow rope is necessary for the activity once the rider is stabilized in the surf zone behind the boat, at this point the rider is able to surf the wave produced by the boat.

05. Wakeskating is a similar sport to wakeboarding, however, unlike wakeboarding the participants feet are not bound to the board and the same size wake is not required which means wakeskating can be successfully undertaken behind a personal watercraft.

06. Tubing is typically conducted with a tow rope of 50-65ft in length, and tube manufacturers recommend not exceeding speeds of 20mph for adults and 15mph for children.

Boats

Boats used for wake sports have changed over the years. Specialized boats are being designed specifically to create an improved wake for wake sports. This includes the ability to take on ballast or the use of devices such as wedges or gates that are designed to alter the wake of the boat. Products are also available to modify existing boats by placing wake surf devices on the boats. Boat manufacturers began producing wakeboard specific boats containing features such as internal ballast tanks in the mid-1990s. Wake boats typically range from 20-24ft with those boats at the 20ft range also being capable of crossing over as water ski boats. However, wake sport boats are also beginning to be produced at 25 and 26ft. Table 1 details the total number of active boats from model years 1995-2017 with Oregon registrations expiring in 2017-2019 from manufacturers that make wake sport boats, while figure 1 breaks the data down by the model year. Not all of these boats will be wake sport boats or used for wake sports. Manufacturers included in the table are Axis, Centurion, Gekko, Malibu, Mastercraft, MB Sports, Moomba, Nautique, Regal, Skiers Choice, Supra, and Tige. The average active boat length in Oregon from these manufacturers changes from 20.3ft for 1995 model boats to 21.9ft for 2017 model boats. Figure 2 shows the trend in average boat length of the boats from the above manufacturers that remain currently active in Oregon.

Table 1: 1995-2017 model boats active in Oregon from wake sport manufacturers.

Length (ft)	20	21	22	23	24	25	26
Total	1195	1017	490	482	155	17	6

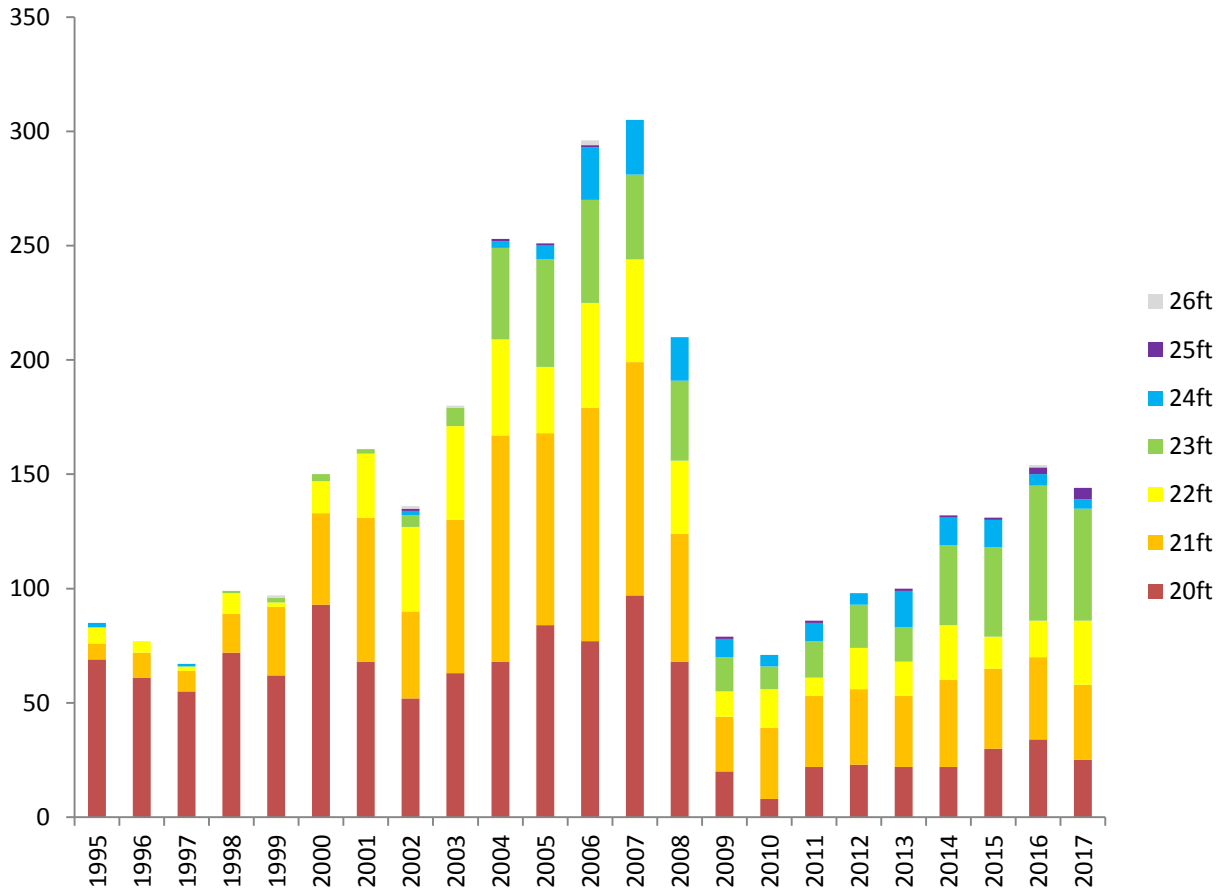

Figure 1: 1995-2017 model boats active in Oregon from wake sport manufacturers.

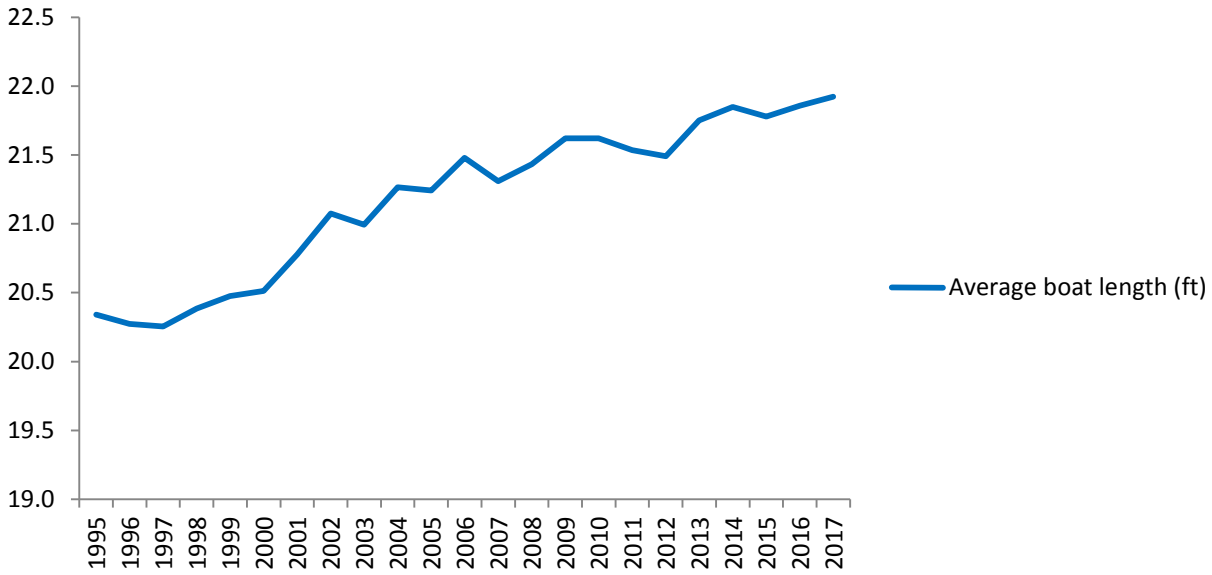

Figure 2: Graph of average boat length of 1995-2017 model boats, from wake sport boat manufacturers, which are currently active in Oregon.

Waterbodies

The triennial survey shows a snapshot of recreational boater activity in Oregon. Table 2 shows the total number of days that survey responses indicated watersports were carried out during April, May, and June, for waterbodies with ten or more days of activity. This does not mean that wake sports were carried out during those days merely that watersports of some description were engaged in.

Table 2: Total days spent engaged in watersports using cabin cruisers and open motorboats by all triennial survey responses for the period starting in April and ending June 30, 2017, on waterbodies with ten or more days.

Waterbody	Total # days
Willamette river (in Portland)	321
Columbia river (Westport Slough to Bonneville)	276
Willamette river (Newberg pool)	208
Lake Billy Chinook	149
Multnomah Channel	147
Detroit lake	128
Prineville reservoir	86
Fern Ridge lake	78
Dexter reservoir	65
Columbia river (outside Westport Slough to Bonneville)	59
Lake of the Woods	52
Green Peter lake	45
Foster lake	43
Crescent lake	42

Lake Owyhee	41
Lake Oswego	31
Triangle lake	28
Lost Creek lake	28
Willamette River (Yamhill River to Corvallis)	28
Emigrant lake	23
Upper Klamath lake	21
North Fork reservoir	16
Umatilla river	13
Mercer lake	13
Dorena lake	13
McKay reservoir	13
Odell lake	12
Wallowa lake	12
Phillips lake	12
Devils lake	10
Cottage Grove lake	10

Waves

01. Studying waves in water can be complex and there are a number of factors that can affect wave creation and behavior. A vessel's attributes such as its speed, length, design, and loading, as well as environmental factors influence its wake. A number of studies from Australia have attempted to look at predicting boat wakes on inland waterways. One particular study by Ruprecht, Glamore, Coghlan, & Flocard, 2015, looked to compare wave heights, wave periods, and wave energy from wake boats operating at optimal wakeboard, wake surf, and water ski speeds.

02. The study used three wake boats ranging from 21.5-23ft in length. Full ballast was used at each speed, with the exemption of empty ballast at 34.5mph and biased ballast at 11.5mph undertaken to simulate sport specific operation. The trials were conducted in deep water, with limited wind and water current present in order to limit, and control for, environmental impacts.

03. Each vessel created a similar wave for a given speed. Table 3 presents findings from the 2015 report, showing the average maximum wave height 72ft from the sailing line. At 72ft the wave train is fully developed, thus ensuring each wave's height and period can be measured. The wave period is thought to remain relatively constant as the wave disperses. Glamore's 2008 paper states that equations indicate the wave height measured at 72ft from the sailing line to be 36% of the originally generated wave height. The 2015 report also highlighted that the wave energy associated with the highest wave, 72ft from the sailing line and when operating at typical speed and ballast conditions, for wake surfing is roughly four times that of the wakeboarding.

Table 3: Wave height in inches at 72ft from sailing line for different watersports as presented in a 2015 report by Ruprecht, Glamore, Coghlan, & Flocard.

Sport that typically corresponds with operating speed	Speed (mph)	Average maximum wave height 72ft from sailing line (inches)	Average peak wave period (seconds)
Wake surf	9.2	10.6	2.02
Wake surf, with biased ballast	11.5	15.0	2.02
Wakeboard	16.1	9.4	1.85
Wakeboard	21.9	8.7	1.75
Waterski	34.5	5.1	1.57

04. A 1980 study edited by Zabawa and Ostrom looked at the role of boat wakes in shore erosion in Anne Arundel County, Maryland. As part of the report they conducted limited trials with surface wave gauges approximately 24ft from the shoreline and at a water depth of 2.2ft. The results from these trials are not directly comparable to Ruprecht *et al*'s 2015 trial results due to being conducted in shallow water and varying environmental conditions. The trials conducted by Zabawa and Ostrom were done with a 26ft Uniflite cruiser with a deep-V planing hull and a 16ft Boston Whaler with a 3-point planing hull. Two passes were done at each speed by each boat. Table 4 summarizes the average results for the 26ft Uniflite cruiser and table 5 summarizes the average results for the 16ft Boston Whaler.

Table 4: Summarized results for 26ft Uniflite cruiser at 76ft from surface wave gauge.

Average Speed (mph)	Average maximum wave heigh at 100ft from shoreline (inches)	Average time period (seconds)
6.8	8.7	1.85
11.4	16.2	3.20
21.0	13.3	2.10
29.6	11.9	2.30

Table 5: Summarized results for 16ft Boston Whaler at 76ft from surface wave gauge.

Average Speed (mph)	Average maximum wave heigh at 100ft from shoreline (inches)	Average time period (seconds)
7.1	6.8	1.85
10.8	6.0	1.80
22.1	4.6	1.75
33.3	3.5	1.55

05. While there are multiple factors that affect a boat's wake, both the 1980 and 2015 trials demonstrate that speed is one of the factors which influence the size of wave a boat produces. Figure 3 taken from the 2017 report by the Scientific and Technical Advisory Committee to the Chesapeake Bay Program displays an approximate relationship between a boat's speed and the height of the wave it produces. Different planing vessels will produce different curves under different conditions but a similar pattern will be observed.

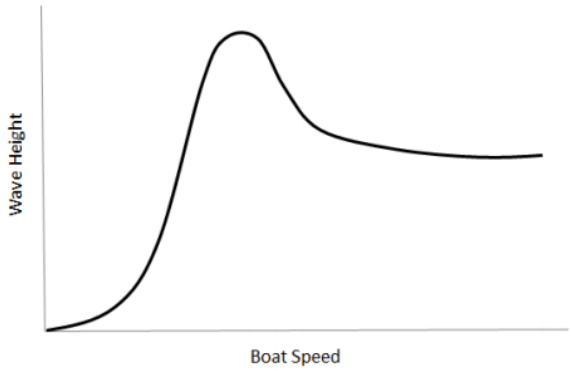

Figure 3: Graph of wave height as a function of speed in planing hull vessels taken from the 2017 report from the Scientific and Technical Advisory Committee to the Chesapeake Bay Program, and adapted from a figure in Maynord's 2001 paper

06. The Oregon State Marine Board's publication 'Experience Oregon Boating: Safety, Regulations and How-To's for Fun Boating' details the risks associated with wakes, which include, but are not limited to, the creation of dangerous conditions for swimmers and small boats, along with having the potential to damage docks if they are thrust against their moorings. Table 6 shows accident data, from 2010-2017, for a number of waterbodies that according to table 2 are popular for watersports. The table shows the number of injuries and deaths associated with those accidents where the primary cause or contributing factor of the accident was the force of the wake or wave.

Table 6: Accident data reported to the Oregon State Marine Board from 2010-2017.

Waterbody	Total Accidents	Accidents where primary cause or contributing factor = force of wake	Number of people injured	Number of people dead
Prineville Reservoir	8	2	0	0
Lake Billy Chinook	28	4	4	0
Foster Reservoir	15	4	2	0
Multnomah Channel	8	0	0	0
Willamette River	101	7	4	2
Detroit Reservoir	5	2	1	1

07. Boater conflict may stem from a number of different factors and result in displacement of an activity either temporally or spatially. How stressful boater conflict is may depend on the recreational goals of the boater. It is thought that prior knowledge regarding boating conditions can allow people to anticipate conflict before entering a stressful environment, thereby managing that stress more effectively. When looking at conflict in terrestrial recreation situations, similar themes occur with user-group conflicts often occurring as a result of differing social values and expectations. Studies suggest that management of terrestrial areas to reduce user conflict can be done, in part, through managing the distribution of individuals and education efforts, though these efforts may not fully alleviate issues of conflict. One of the 2017-2022 Oregon State Marine Board Strategic Plan's objectives is to "reduce causal factors for boater conflict taking into account areas, activities and competing interests on Oregon's waterways".

08. The Scientific and Technical Advisory Committee to the Chesapeake Bay Program produced a report in 2017 analyzing the effect of waves from boats on shorelines. The review of existing literature indicated a connection between boat wakes and shoreline erosion, sediment resuspension and nearshore turbidity. However, it was also noted that the extent and effect of boat wakes on erosion is dependent on a number of factors including the environmental conditions of the site. Depending on the site, boat wakes may only be a part of the total wave energy in an area. The Oregon State Marine Board relies upon the advice and expertise of other State agencies when it comes to the impacts of recreational boating on wildlife and water quality, and these agencies have authority over the associated issues.

Education

01. In 1999 the Oregon Legislature required operators of powerboats greater than 10 horsepower, and youth 12-15 years of age operating any size powerboat, to take a course on basic boating skills and/or pass a test to demonstrate basic boating knowledge. The goals were to reduce accidents, injuries, deaths, property damage, and conflict on Oregon's waterways. The age-based phase-in began in 2003 and was fully implemented in 2009. In 2010, the National Association of State Boating Law Administrators in partnership with, and by the approval of, the American National Standard Institute created the American National Standards for recreational boater education. The national standards do not specifically list the effect that wakes have and how to minimize them as required content. However, the standards do list refraining from reckless or careless boat operation and safety practices for towed watersports as required content. States are capable of inserting specific guidance or regulations into their education courses.

02. Connecticut is the only State that has a specific watersports education course which complements their boater education. Fresh Air Educators developed the 'Safe Waterskiing Endorsement Course' for the State of Connecticut. The course takes a minimum of one hour to complete and is free to students unless they wish to receive a certificate, in which case the student pays $9.

Regulations

01. Waves generated by vessels can create issues for other users of the waterway and increase boater conflict. There are a number of measures that can be employed in an attempt to mitigate the issues associated with boat wakes. Regulating boat operations is a common tactic. States in the US have adopted various speed and proximity regulations for motorboats, some specific to towed sports others to all motorboats. 38 states in total have some form of speed and proximity restriction. Table 7 outlines the number of states that have adopted the equivalent of a "slow-no wake" rule at certain distances from different structures or features in and on the water.

Table 7: Number of States that have adopted the equivalent of a “slow-no wake” speed restriction on motorboats and at what distance.

Distance (ft)	Person in water (includes diver-down flag, swimmer/bather)	Anchored/moored vessels	Non-motorized vessel	Docks, structures, or embarkation point	Shoreline
50	1	0	0	1	0
100	10	10	2	9	8
150	4	4	2	4	1
200	3	2	1	5	3
250	0	0	0	0	0
300	1	0	0	0	0

02. The States of Maryland and Pennsylvania have a 200ft regulation specific to wake surf boats or the boats engaged in wake surfing. The Maryland regulation specifies that wake surf boats “must be operated at least 200 feet from shoreline, all marine structures (including piers, docks, bridge structures, abutments, and anchored swimming or water-skiing floats), navigation aids such as regulatory buoys and channel markers, other vessels that are underway, anchored or moored and persons in the water.” This was put in place following a public comment period and trials with professional wake surfers and wake boarders to assess the size of a wake surf boat’s wake at different distances. The Pennsylvania’s regulation limits boats engaged in the activity of wake surfing to slow-no wake speed when within 200ft of the shoreline, docks, launch ramps, swimmers or downed skiers, person wading in the water, anchored, moored or drifting boats and other marked areas.

03. Oregon already has in place one local area rule restricting the use of wake enhancing devices. However, comments from one law enforcement agency identify challenges with enforcing the wake enhancing device prohibition as they see it. One challenge is that law enforcement officers cannot search boats (enclosed compartments like ballast tanks) to see if wake enhancing devices are deployed without probable cause. Modern boat design makes detection of wake enhancing devices even more difficult as waves can be shaped by the boat’s hull or underwater tabs and gates and the boats do not operate bow high or list to one side. Even on boats that are not designed as wake board or wake surfing boats, the motors and trim tabs can be used to modify the boat’s bow position, effectively acting as “wake enhancing devices.”

04. Oregon’s Personal Watercraft Rules, established in 1990, contain speed and proximity rules, put in place to improve safety and reduce conflict between boaters, these are outlined below.

250-021-0030:
(7) A person must not operate a personal watercraft in excess of a slow-no wake speed:
(a) Within 200 feet of a boat launch ramp, dock, swim float, pier, marina or moorage, floating home or boathouse, or locations where persons are working at water levels on floats, logs or waterway construction;
(b) Within 200 feet of a swimmer, surfer, diving flag, bank or wading angler;
(c) Within 100 feet of any anchored or non-motorized vessel;
(d) Except on safe take-offs and landings, a person must not operate a personal watercraft in excess of a slow-no wake speed within 200 feet of shoreline on all lakes, bays and reservoirs. A safe take-off or landing will not be considered "safe" unless it can be accomplished without risk to any swimmer or craft within 200 feet from shoreline.

Rivers were purposefully excluded from the 200ft shoreline restriction to ensure some rivers remained open to personal watercraft use. Consideration at the time of the adoption of the personal watercraft rules was given to adopting speed and proximity rules for all motorboats, but rules were only adopted for personal watercraft on a statewide level.

05. Oregon used to have statutes that detailed speed and proximity style regulations. In 1953 ORS 488.030 contained required operational speeds that limited motorboat operation to 10mph within 100ft of a dock and the shores of any bathing or wading beach. ORS 488.030 also required motorboats passing within 100ft of a canoe, rowboat, or sailing boat to slow to a speed "that will not endanger the occupants of the latter vessel". These statutes were removed in the 1957 version of the statutes. ORS 488.100 regarding reckless navigation and speed was put into the statutes in 1957. Oregon still has a reckless operation and speed statute (ORS 830.315 formerly 488.100).

ORS 830.315 Reckless operation; speed.
(1) A person commits the crime of reckless operation of a boat who operates a boat carelessly and heedlessly in willful or wanton disregard of the rights, safety or property of others.

(2) No person shall operate any boat at a rate of speed greater than will permit that person in the exercise of reasonable care to bring the boat to a stop within the assured clear distance ahead.

(3) Nothing in ORS 830.005, 830.015 to 830.050, 830.175, 830.210 to 830.420 and 830.475 to 830.490 is intended to prevent the operator of a boat actually competing in an event which is authorized as provided in ORS 830.375 from attempting to attain high speeds on a marked racing course. [Formerly 488.100]

In 1981 ORS 488.099 regarding unsafe operation was put in place, in the current statutes this is 830.305.

830.305 Unsafe operation. A person commits the crime of unsafe operation of a boat if the person operates a boat in a manner that endangers or would be likely to endanger any person or property.

06. The WSIA commissioned their own research on the wave energy of boats carrying out towed water sports. This research appears to have led to the recommendations outlined in their 'Wake Responsibly' campaign, which advises wake boat operators to stay at least 150ft from the shoreline, docks, or other structures while taking part in wake sports. In addition to the 150ft recommendation the executive summary states that "the maximum wake/wave height associated with wakeboarding and wakesurfing drops 27-56% in the first 100-150ft of its travel from the boat path". The executive summary goes on to state that "wakeboard and wakesurf wakes/waves dissipate more slowly in deep water (greater than 15ft) and operating at least 250ft from shore can reduce the effects of deep water wakes". The full research report was not made available to OSMB preventing a comparison of the methodology and results of the Australian and WSIA trials.

Enforcement

Table 8 outlines violations (warnings and citations) statewide and on select waterbodies for 2015, 2016, and 2017. The violations listed are for local area speed regulations; unsafe boat operation; and the waterskiing, surfboarding and similar activity statute. These violations are for all boats and not specific to wake sports.

Table 8: Citations and warnings related to speeding, unsafe operation, and towed watersports as of October 24, 2017.

	Statewide			Detroit Reservoir			Lake Billy Chinook			Prineville Reservoir			Foster Reservoir			Newberg Pool			Multnomah Channel		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
830.175 Speeding (excess speed/wake)	95	90	80	0	1	0	4	2	2	5	3	5	21	17	8	1	0	2	1	1	8
830.305 Unsafe operation	30	25	48	0	1	0	3	2	8	0	2	1	3	1	0	0	0	0	0	1	0
830.365 Waterskiing, Surfboarding or Similar Activities	55	52	63	0	1	1	7	7	11	2	3	0	3	9	7	3	5	5	1	0	1

Rulemaking authority

The following statutes provide the authority for OSMB to make rules for specific areas or to regulate specific boating activities.

830.175 Regulations for specific areas; rules.
(1) The State Marine Board, upon consideration of the size of a body of water and traffic conditions, may make special regulations consistent with the safety and the property rights of the public or when traffic conditions become such as to create excessive congestion, relating to the operation of boats in any waters within the territorial limits of any political subdivision of this state. The regulations may include, but need not be limited to, the establishment of designated speeds, the prohibition of the use of motorboats and the designation of areas and times for testing racing motorboats.

(3) The board may make special regulations relating to the operation of boats, including the establishment of designated speeds and prohibition of the use of motorboats for the protection of game and game fish at the request of the State Fish and Wildlife Commission, or for carrying out the provisions of the federal Wild and Scenic Rivers Act, Public Law 90-542, and the Oregon Scenic Waterways Act, ORS 390.805 to 390.925. Action necessary to implement this section, including but not limited to the operation and manner of operation of boats, shall be by a permit system initiated by the board.
(5) Regulations regarding operation of boats pursuant to this section shall be adopted in accordance with the provisions of ORS chapter 183.
(6) Any speeds in excess of the speeds designated by the board, as provided in this section, shall be prima facie evidence of the violation of ORS 830.315. [Formerly 488.600]

830.195 Board to protect traditional boating uses and prevent user conflicts. *In addition to any other authority to regulate boating activities pursuant to this chapter, the State Marine Board may regulate and restrict boating activities to protect traditional boating uses and to prevent boating user conflicts. [Formerly 488.880]*

Watersports Boat Advisory Group

Research included in this report was presented to the Marine Board's Watersports Advisory Group in order to ground-truth some of the findings and assumptions. The group did not dispute the information presented to them at the meeting but felt that any issues arising with wake sports were local area issues and should be dealt with through local rule making. Following the meeting further research and analysis were conducted by staff.

Staff Conclusion

Based on the research undertaken by staff and the resources available to them the following conclusions were drawn:

a) The activities of wakeboarding and wake surfing use ballast and devices to influence the boat's wake. However, wake surfing results in a larger wave when compared to wakeboarding. The larger wake is due to the speed of the boat, and use of wave creation tactics such as biased ballast and wake surf devices.

b) The safety concerns resulting from boat wakes are not limited to wake sports or to Oregon and other states have attempted remedial measures through speed and proximity regulations to increase safety on their waterways.

c) The watersports industry is aware of the potential for conflict between boaters and property owners and has begun an industry led campaign to provide a buffer between wake sports and the shoreline, docks, and other structures.

d) Watersports using motor boats are popular in Oregon. The triennial survey indicates that watersports in motorboats, when hunting and fishing are excluded, are typically limited to reservoirs, lakes, and a few large rivers.

Staff Recommendation

01. With Board authorization, staff will form a Rules Advisory Committee to assist in drafting **rule language that addresses prohibiting wake surfing within 200ft** of docks, swim floats, floating homes, boathouses, anchored or moored boats, people in the water, non-motorized boats, and the shoreline.

02. The intent of the rules will be to increase the safety of other users of the waterway and reduce conflict by aiming to reduce the effect of the wakes produced during wake surfing. Staff recommends that the Rules Advisory Committee discuss the safety and conflict prevention merits of the same restriction on wakeboarding.

03. Staff will meet with the Advisory Committee, January 2018 – March 2018.

04. Staff will file Notice of Rulemaking in April 2018 and schedule rule hearings at various locations in the state, June – August 2018.

05. The final hearing will be scheduled in August in Salem and be held before the 5-member Board. Public comment will close the end of August 2018.

06. Upon conclusion of the rule hearings and the close of the Public Comment period, staff will compile and review public input and present a written recommendation for consideration of rule adoption at the fall 2018 Board meeting. If adopted, staff anticipates rules would be effective January 2019.

07. Staff recommends that if rules are adopted, the Oregon's recreational boater education course content be reviewed for towed watersport best practice guidance.

08. Staff recommends the Board initiate rulemaking for Chapter 250, Division 010, Statewide Rules, to address wake surfing activities.

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