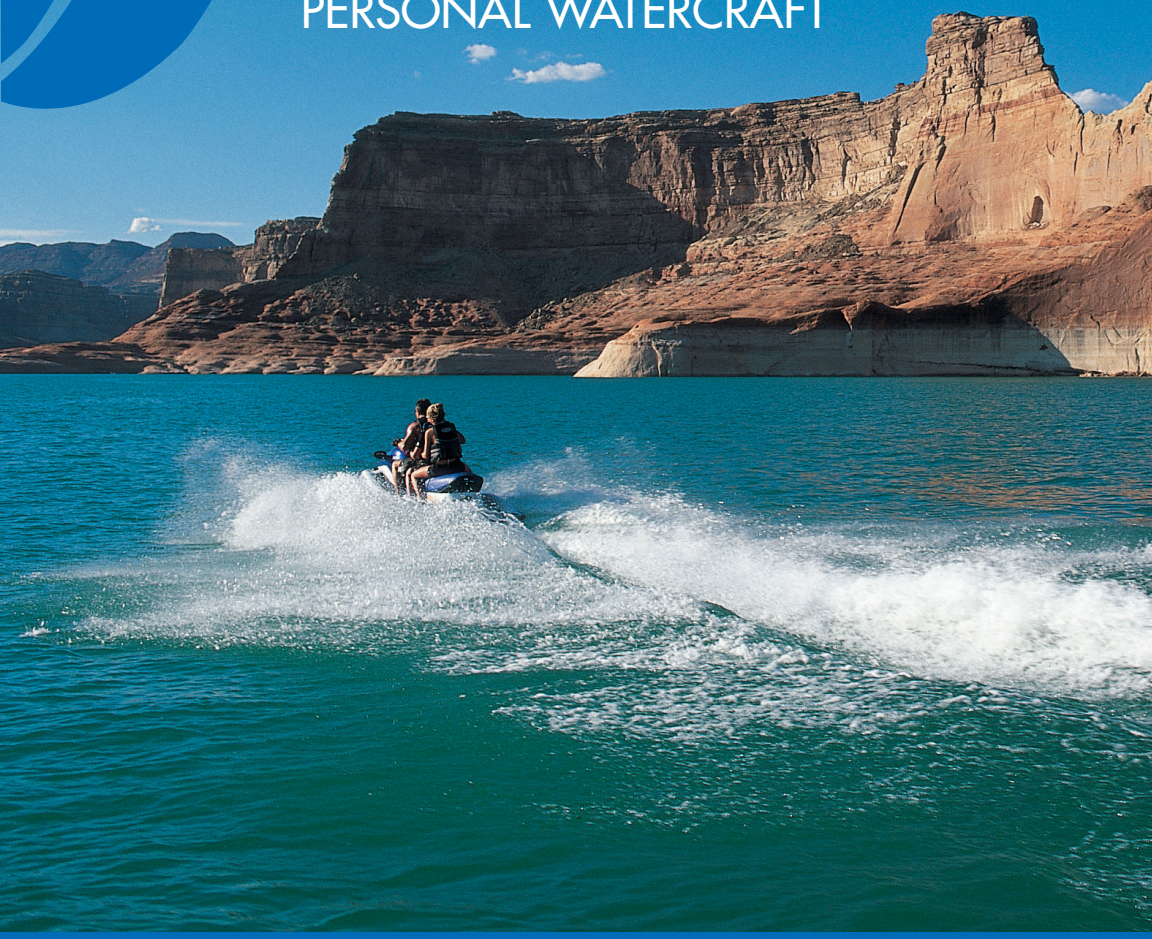
THE HISTORY, EVOLUTION, AND PROFILE OF PERSONAL WATERCRAFT



A Report by the
Personal Watercraft Industry Association

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PWIA

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This publication has been created to describe the history and technological evolution of personal watercraft, or PWC, which are small boats more commonly known by the manufacturers' brand names: JET SKI®, WaveRunner®, Sea-Doo®, or AquaTrax®. This document explains how, in an effort to meet consumer demands in the past decade, personal watercraft have evolved from the single-person stand-up vessels of years gone by to innovative, multi-passenger family boats offering state-of-the-art features and functions. Additionally, and contrary to false rhetoric, this publication describes in detail the enhancements made to PWC engine and design technology since the 1998 model year that have catapulted today's PWC into one of the most environmentally-friendly motorized recreational vessels on the water.

In 2000, a handful of national parks were unfortunately forced to prohibit the use of PWC because of alleged harmful environmental impact, despite evidence to the contrary. Today, 15 of these parks have completed environmental assessment studies and every one has concluded PWC present no significant unique environmental impact compared to other boats. The preferred rule is consistent in all 15 parks – PWC should no longer be banned.

More information can be found at www.pwia.org or by calling PWIA at 202-737-9768.

THEN

NOW

I. EVOLUTION OF THE PERSONAL WATERCRAFT (PWC)

The personal watercraft (PWC) concept originated in the 1960s, combining the elements of self-power, small size and a maneuverable, active vessel.

Bombardier Recreational Products, known for its Ski-Doo® snowmobiles, introduced a personal watercraft slightly resembling what we know today as a PWC in the late 1960s, with limited success. This craft is credited for being the first sit-down style PWC. In the early 1970s, Kawasaki Motors Corp. U.S.A. introduced the JET SKI® watercraft, the first commercially successful standup PWC.

There are currently four major companies currently active in the personal watercraft market. In the mid-1980s, Kawasaki's JET SKI® watercraft was joined by Yamaha Motor Corp. U.S.A. Their product line of the WaveRunner® model created a market shift from the stand-up to the sit-down style PWC with one- and two-person capacity. Shortly thereafter, Bombardier Recreational Products re-joined the market with their Sea-Doo® line. Most recently, in 2002, American Honda began selling its version of a PWC, the AquaTrax®.

Along the way, two-person sit-down craft quickly took over from the single person stand-up model. Today, three-person family models are the most popular. Multi-person family craft currently make up approximately 99 percent of personal watercraft sales.

PWC popularity grew very rapidly in the early 1990s and what was once a small portion of the recreational boating market became the fastest growing sport in this category. Simultaneously, the PWC industry was for a time the fastest growing segment of the marine business.

Personal Watercraft Sales

U.S. sales of PWC peaked in 1995 with approximately 200,000 units sold. Sales of personal watercraft declined from 1996 through 2001, but began to level off in 2002 with sales of 79,300 units. The industry saw sales in 2004 of more than 79,500 units.

According to the National Marine Manufacturers Association, there were approximately 1.48 million PWC owned in 2004. The average retail price of a PWC in 2004 was $9,226. Since the mid-1990s, sit-down style, multi-passenger watercraft have made up around 99 percent of all PWC sales, with three-person family models being the fastest growing segment. According to the 2000 National Survey on Recreation and the Environment (NSRE), approximately 20 million Americans ride personal watercraft each year.

2004 U.S. PWC Sales

PWC Sold:	**79,500**
Total Retail Value:	**$733,454,700**
Average Unit Cost:	**$9,226**
PWC Owned:	**1,480,000**

Source: NMMA Recreational Boating Statistical Abstract, 2004

PWC owners spend millions on the sport annually. In addition to purchasing the vessel, they spend money on boating registration fees, launch fees, trailers, fuel, insurance, clothing, accessories, food, travel, and watercraft-oriented vacations.

Employment in the PWC Industry

Nearly 6,000 people are employed in the United States by PWC manufacturers in at least 11 states. Other financial impacts of the sport include employment in more than 2,000 retail businesses servicing and selling PWC, aftermarket and related small businesses manufacturing components and accessories, corporate tax revenues from PWC-related businesses, local and state sales taxes, and gas tax revenues.

The Personal Watercraft Consumer

Today's personal watercraft are affordable family boats with clean, quiet, fuel-efficient engines and no exposed propellers. Manufacturers have responded to customers' desire for environmentally-friendly recreation, and have created cleaner, quieter and more versatile personal watercraft.

Additionally, PWC manufacturers have focused their new model designs on today's consumer base — families — thus, continuing to perfect and produce more of the three-person models. These models now account for more than 75 percent of today's PWC market. Recent data shows the average purchaser of a new PWC in the last five years is 41 years old. About 85 percent are male, 71 percent are married, 69 percent have owned a powerboat prior to their most recent PWC purchase, and 66 percent have taken or completed college-level course work. Forty-two percent of those PWC owners have owned waterfront property, and over 60 percent have access to a home on the water, whether it is their primary home or the home of a close friend or relative. Today's consumer is likely more diverse with the broader selection of models currently available, which appeal to many different people.

Who is the Average PWC Customer?

- **41 years of age**
- **71% married**
- **69% previous boat owners**
- **66% college educated**

Source: Survey by Bowe Marketing Research Consultants

In 2001, Leisure Trends Group, a national consumer research firm, surveyed consumer attitudes towards personal watercraft. Ninety-three percent of the respondents had positive attitudes towards the safety of personal watercraft, particularly if the vessels were operated properly.

Surveys have also found that the most common ways PWC are used (over 80 percent) involve rides with family and friends, short cruises, towing skiers, exploring, and entertaining friends.

II. NEW TECHNOLOGY

Personal watercraft manufacturers are constantly investing in research and development, leading to new technology that improves their product lines. Since 1998, PWC have evolved substantially to meet consumer demands. Today's PWC are larger, seat up to three people, offer storage space, and are capable of towing a water skier. They are also equipped with new, environmentally-friendly engine technology.

Since personal watercraft were invented, these vessels have been equipped with the same two-stroke engine technology that powers marine outboard motors. It was only in the past decade that marine engine designs changed dramatically. Today, many PWC are fuel-injected and the vast majority of units sold feature state-of-the-art four-stroke engines.

Cleaner and Quieter

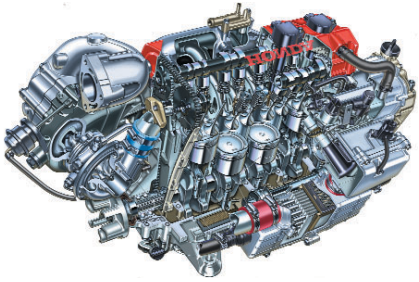
PWC manufacturers are meeting and exceeding Environmental Protection Agency (EPA) standards for emissions requirements. Furthermore, all PWC product lines have always complied with all applicable federal and state sound and emissions requirements.

In California, manufacturers are required to go above and beyond EPA standards and also comply with the emissions standards of the California Air Resources Board (CARB). Technological enhancements made to PWC engines have resulted in one of the most environmentally-friendly motorized vessels on the water.

Most of today's personal watercraft utilize four-stroke, direct-injection and catalyst two-stroke technology allowing up to 90 percent fewer emissions than models manufactured in 1998. Traditional, obsolete technology two-stroke engines in PWC have evolved into high technology catalyzed, direct-injection and four-stoke engines. The older carbureted two-strokes are less efficient because it flushes out or scavenges its cylinders and refills with a mixture of air and fuel after each combustion. This process leads to higher emissions and less fuel efficiency. Because of these inefficiencies, new direct-injection two-stroke designs were developed that scavenge the cylinders with pure air containing no fuel at all. The fuel is then directly injected into the cylinder after the exhaust port is closed.

Beginning with the 2003 model year, all PWC manufacturers produced models with four-stroke engines, universally rec-

ognized as the cleanest and most fuel-efficient engines on the water. Today, these four-stroke engines account for the majority of sales and are ever gaining in popularity.

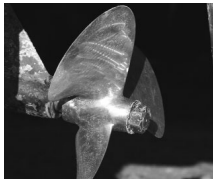


Environmentally-friendly PWC 4-stroke engine.

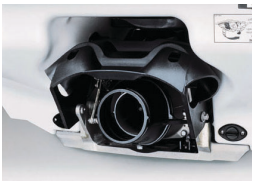
In addition, hull insulation, exhaust system sophistication, materials selection, and other muffling technologies have resulted in personal watercraft that are 70 percent quieter than models produced in the late 1990s.

No Exposed Propeller

PWC engines drive a jet pump that draws water from the bottom of the craft into an impeller, which pressurizes the water and forces it out a nozzle at the rear of the craft. There is no exposed propeller. This "jet" of pressurized water propels and steers the craft when the throttle is engaged.



Traditional powerboat propeller



PWC jet nozzle – no exposed propeller

Steering Enhancement

All boats, including PWC, require power to steer. Each PWC manufacturer tells users to apply throttle to steer. In addition, all new sit-down PWC are equipped with technology that assists the operator in turning the vessel by continuing to supply thrust or activating small fins while the watercraft is decelerating. However, an operator can turn more sharply if the throttle is applied while turning the handlebars.

Speed-Limiting Systems

The development and incorporation of new-technology engines and the sophisticated engine management systems that accompany today's PWC have allowed for new features to be added to personal watercraft. One such system limits engine speed, thus reducing the maximum speed of the vessel. All PWIA member companies produce vessels with this feature.

Additional Features

In addition to engine and design enhancements, many PWC models today include added comfort and convenience features that were not offered previously on personal watercraft. Such features now include tow hooks, boarding steps, GPS units, side mirrors, increased storage, reverse throttle, and engine cut-off lanyard cords that attach to the operator's wrist or life jacket. The engine cut-off lanyards automatically

turn off the PWC's engine in the event the operator falls off.

PWC cockpit with rear-view mirrors

PWC storage

III. ENVIRONMENTAL IMPACTS

As a result of remarkable technological advancements, today's PWC are among the most environmentally-friendly motorized boats on the water. Compared to those models manufactured before 1998, modern PWC are up to 90 percent cleaner and 70 percent quieter. In fact, individual scientific studies conducted in 15 separate National Park Service (NPS) units over the past three years all conclude that PWC present no unique impact compared to other motorized boats, and its use should be allowed.

Air Quality

Through new technology, personal watercraft manufacturers now offer greatly reduced exhaust emissions as well as outstanding fuel efficiency. Marine engines, including outboards and PWC, are subject to regulation by the EPA and the California Air Resources Board (CARB). Emissions have been rapidly declining in recent years, due largely to the EPA standards that became effective in early 1999 and CARB standards that became effective with the 2001 model year.[1,2]

Under the EPA standards, outboard and PWC hydrocarbon + NOx emissions for 93 kW engines must be reduced from a baseline of approximately 150 g/kW-hr in the 1998 model year to 46.1 g/kW-hr in the 2006 model year. This constitutes approximately a 75 percent reduction. The CARB standards are three-tiered, and require 93 kW engines to comply with (a) the 46.1 g/kW-hr level by the 2001 model year; (b) a 36.9 g/kW-hr level in 2004; and (c) a 16.1 g/kW-hr level in 2008. This constitutes approximately a 90 percent reduction. With the onset of the CARB and EPA emissions regulations, new technologies already in development have accelerated to be used in PWC applications. The PWC companies have been rapidly converting from carbureted two-stroke engine models to models using catalysts, direct-injection two-stroke, and

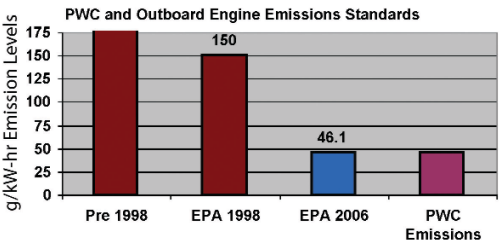
1 EPA, "Emission Standards for New Gasoline Marine Engines," EPA420-F-96-012, August 1996.
2 California Air Resources Board (CARB), "California Regulations for 2001 and Later Model Year Spark-Ignition Marine Engines," Regulatory Action #99-1022-05S, October 22, 1999.

four-stroke engines. Because of manufacturing and distribution efficiencies, most new PWC units meet the more stringent CARB standards.

The new direct-injection two-stroke engines being installed in PWC use nearly 50 percent less oil, and provide up to a 75 percent reduction in hydrocarbon + NOx emissions as well as improved fuel economy. It is expected that as the technology matures emissions reductions will be even greater. Four-stroke PWC also offer quiet, fuel-efficient operation and greatly reduced exhaust emissions. These engines are a proven technology, similar in design to those used in automobiles and motorcycles, but optimized for marine use.

In addition to four-stroke and direct-injection two-stroke engines, personal watercraft manufacturers are also utilizing variable oil injection and catalyst systems. These systems greatly reduce exhaust emissions, smoke and oil consumption.[3]

The following chart demonstrates the significant reductions in emissions PWC manufacturers have achieved.



Direct-injection and catalyst-equipped PWC have been in production since 1999. In 2002, three PWC manufacturers introduced models powered by four-stroke engines; with the 2003 model year, all manufacturers offered four-stroke models, making the personal watercraft fleet one of the cleanest and quietest on the water.[4] For the 2003 model year, Kawasaki introduced a four-stroke model compliant with CARB 2008 emission standards (the most stringent in the country requiring 90 percent emissions reduction), five years ahead of schedule.[5]

Water Quality

The primary water quality concern that has been identified regarding two-stroke engines is the discharge of unburned gasoline and gasoline additives from these conventional carbureted engine types as well as the spilling of such components during refueling.[6] The EPA has confirmed that studies showing most unburned gasoline and gasoline additives emitted from carbureted two-stroke marine engines evaporate from the water within the first hour and 15 minutes after being released.[7] More specifically, at an air temperature of 86 degrees Fahrenheit, which approximates a minimum daily temperature during the summer peak use period, 84 percent of the unburned gasoline/additive mix released into the water evaporated within 75 minutes.[8] Water quality testing conducted in Orange County, California, at Donner

3 Cameron, Kevin, "Fichtoid," Personal Watercraft Illustrated, December 2000.

4 Yamaha USA and Bombardier/Sea-Doo Press Releases, July 2001.

5 Kawasaki Press Release, January 7, 2003.

6 67 Fed. Reg. 56,790-91 (September 5, 2002).

7 Revelt, Jean M., The Effects of Marine Engine Exhaust Emissions on Water Quality, Summary of Findings of Various Research Studies (EPA 1994).

8 Ibid.

Lake in California, and on Canandaigua and Keuka Lakes in New York further confirm the EPA's findings. [9, 10, 11, 12]

Moreover, the progression by manufacturers to four-stroke and two-stroke direct-injection PWC engines to meet the requirements of the EPA 2006 and CARB 2008 emission standards is occurring more rapidly than the EPA estimated. Sales of these newer models overtook conventional two-stroke PWC in 2002[13] and comprised 80 percent of units sold by 2004. As a result, the amount of unburned fuel released will continue to decline rapidly, achieving a reduction of approximately 90 percent from the 1998 baseline levels by 2012.

Lake Mead National Recreation Area in Nevada is one of the largest and most popular motorized recreational boating lakes in the country, and upon completing an environmental assessment study and public rulemaking process in 2003, the NPS concluded that continued PWC use would not impair water resources.

In conjunction with NPS, the U.S. Geological Survey (USGS) conducted water quality samplings and took measurements from a number of high-use boating areas on Lakes Mead and Mohave to determine the impact of two-stroke engines on water quality. The measurements were taken in June 1999, during the height of the boating season, and essentially represented the 1998 "baseline" condition. The tests showed that concentrations of key unburned fuel components benzene, toluene, ethyl benzene and xylene (BTEX) were present in surface water samples but at levels substantially below any federal or state water standards. The highest value measured for benzene was 1.25 ug/l (micrograms per litre), which is substantially lower than the maximum contaminant level for drinking water of 5 ug/l established by the EPA.[14] The measured values for the three other BTEX compounds were from two to four orders of magnitude below the EPA maximum contaminant levels.[15]

Thus, the data corroborates the NPS conclusion that there is no potential for the buildup of concentrations of BTEX compounds from PWC use that could impair the aquatic systems in Lake Mead and Lake Mohave.[16] It is important to consider that this test analyzed the impact of the older two-stroke technology. Today's high-tech fuel-injected two-strokes, as well as the four-stroke designs increasingly used in PWC, produce up to 90 percent fewer emissions than the older technologies used in this 1999 test.

The USGS sampling data also showed the presence of the gasoline additive methyl tertiary butyl ether (MTBE). While this contaminant has been of concern at several reservoirs in California, the federal government has not established standards or maximum contaminant levels for MTBE. However, the EPA has adopted an advi-

9 Orange County Water District, Jet Jam '97 Water Quality Testing. August 27, 1997.

10 Alpha Analytical, Inc. Analytical Report, Deloro Water Co./Donner Lake Division. July 7, 1999.

11 Canandaigua Lake, NY, City of Canandaigua, 1999.

12 Landre, Peter and Barkley, Amy, Keuka Lake Water Quality Testing Program. Keuka Lake Association. Hammondsport, NY, 2000.

13 Ehlert Powersports Business,2002 Market Data Book, p. 25-26.

14 40 C.F.R. § 141.61.

15 United States Geological Service, Water Resources Data, Nevada, Water Year 1999 (Report NV-99-1), p.108.

16 67 Fed. Reg. 56,790 (September 5, 2002).

sory level of 20-40 ug/l for drinking water. The highest sample measured by USGS was 4.16 ug/l, well below the EPA advisory level. Indeed, it is below even the most stringent potential benchmark – the secondary maximum contaminant level of 5.0 ug/l for drinking water in California. Once again, given the reduction in PWC engine emissions (as well as emissions from other marine engines) at Lake Mead since the sample was taken in 1999, this result is unlikely to be repeated, much less exceeded. Many states have either banned MTBE, or are considering doing so. In addition, the EPA is considering banning MTBE in the near future.[17]

Sound

PWC are no louder than other motorboats, and in many instances are quieter. There are two components creating the sound heard from PWC: (1) the engines during normal operation of the PWC; (2) the water splashing against the hull and resonating.

The personal watercraft industry has reduced engine sound pressure levels up to 70 percent since 1998. These reductions have been achieved, in part, by lowering the sound made as well as the pitch of the engine. Loudness of sound is a quantifiable term, measured in decibels (dBA). Pitch is a measurement of the frequency that the sound wavelength vibrates. Methods employed by manufacturers to absorb or block the wavelengths of sound greatly lessen both the loudness and the pitch attributed to personal watercraft.[18]

To reduce sound levels, the newest models of personal watercraft utilize air intake resonators with multiple maze-like chambers. These chambers eliminate a direct path for the sound waves to escape.[19] The resonators employ several different length tubes attached to the exhaust pipe. As sound waves pass into these tunnels, they bounce back and cancel out incoming identical but opposite "crest" waves.[20] Baffles are also used for counter frequency and to quiet vibration.

Manufacturers also employ noise-absorbing materials between the liner and the hull, so the boat is quieter and more durable. Additionally, some manufacturers have increased the thickness of the crankcase wall to muffle noise and vibration. Rubber is also used as padding around the jet pump dampers to absorb the shock loads and quell driveline noise.[21]

Critics of PWC claim that PWC repeatedly leave the water, leading to increased sound and annoyance levels. The majority of today's PWC do not leave the water at all, let alone with any frequency. This is in large part due to the design: newer models are longer, wider, heavier, and have additional seating capacity. Because of these features, newer models leave the water much less regularly than older craft. Three-person PWC – which account for more than 75 percent of new sales – can

17 65 Fed. Reg. 16,094 (March 24, 2000).

18 Personal Communication, Harry Klemm, Group K, Mohave, Arizona, 2001.

19 Yamaha Watercraft. "The Yamaha Sound Suppression System and the Yamaha Platinum Plus System" Brochure, 1999.

20 Bombardier Recreational Products, "Bombardier Announces Quieter Watercraft for 1999," Press Release, 1997.

21 Kawasaki Motor Corporation. "Kawasaki Marine Engine New Technology for Year 2000 and Beyond," Press Release, 2000.

weigh as much as three times more than first generation single-person, stand-up models and are much less apt to leave the water.

The sound created from water hitting the hull is a considerable portion of the overall sound of any running watercraft. In 1994, the International Council of Marine Industry Associations (ICOMIA) Marine Environment Committee (IMEC) tested the sound levels of boats without the engine running to quantify the level of sound generated by the water splashing against the hull of the boat as it moves through the water. The IMEC test results showed that a PWC towed by a 150 meter (492 feet) rope without the engine running measured 68 dBA when measured from 25 meters (82 feet) at a speed of 70 k/mh (44mph).[22] When tested with a running engine at full throttle, the sound of the engine plus the sound of water hitting the hull registered between 72 and 78 dBA, well below the SAE J34[23] standard of 86 dBA, measured from 50 feet at full speed. The U.S. Coast Guard recommends states adopt 86 dBA as a maximum sound-level.

Objective, scientifically-based sound testing has always found PWC sound levels comparable to other motorboats. In sound level testing conducted on Lake Powell (Glen Canyon National Recreation Area on the Utah/Arizona border) the test data indicated that the maximum sound levels of PWC were actually lower than the maximum sound levels of other motorized vessels. In particular, the levels for PWC at 82 feet were approximately 68 to 76 dBA, whereas the levels for other motorized vessels at 82 feet were approximately 64 to 86 dBA. The National Park Service standard for sound levels is 82 dBA at 82 feet, and the NPS has correctly recognized that unaltered pre-1998 PWC and current PWC are capable of meeting that standard, as well as the more stringent standard of 75 dBA as measured from the shore, regardless of operation (SAE J1970)[24], which is called for in the National Marine Manufacturers Association's Model Noise Act.[25] Independent, unbiased sound testing conducted for the Tahoe Regional Planning Authority and the New Jersey State Police have found similar results.[26, 27]

Additional sound testing was conducted in France by the International Council of Marine Industry Associations in 2003. These tests were conducted to confirm that PWC could comply with recently enacted European Union regulations, and used the same PWC available for purchase in the U.S. The test results found PWC sound levels were between 70–73 dBA when measured from 82 feet with the PWC traveling at 44 mph. These latest test results are consistent with U.S. test results, and continue to confirm PWC manufacturers have made

22 ICOMIA Marine Environment Committee. "Powered Recreational Craft Sound Level Test Report - Lake X, Florida, 1994." May, 1995.

23 SAE J34 establishes test procedures for the U.S. Coast Guard that measure sound levels from a non-shoreline location of boats operating full throttle at a distance of 82 feet (25 meters).

24 SAE J1970 establishes the procedure for measuring the sound level of pleasure motorboats at a position on the shore under conditions other than stationary mode operation.

25 NMMA Model Noise Act

26 Tahoe Regional Planning Authority. "Environmental Noise Analysis, Lakeland Village Watercraft." Brown-Buntin Associates, Inc. September 1992.

27 New Jersey State Police. "Boat Noise Tests Using Static and Full Throttle Measurement Methods." Noise Unlimited Inc. November 1995.

remarkable advances in sound reduction, making PWC among the quietest vessels on the water today.

Wildlife

Waterfowl:

According to a series of studies by the Florida Fish and Wildlife Conservation Commission, personal watercraft have no greater significant impact on waterfowl than other motorized boats. A comparison of the flush distances, or minimum distance, required to disturb nesting birds, caused by personal watercraft and a two-stroke powered motorboat found personal watercraft are "relatively quiet to the point where [PWC] noise is not the factor, which causes the birds to flush….A fast moving motorboat heading directly at the birds…should produce a flushing response similar to that of a PWC being operated in a similar manner."

Most importantly, only one out of 11 species in the study exhibited a larger flushing distance to the PWC than the motorboat. Five species flushed at farther distances when approached by the motorboat than by the PWC, and 11 species showed no significant difference in flushing distances based on the hull type of the boat approaching. Researchers suggest a single buffer zone for all watercraft should be developed to protect nesting waterfowl. Species type is more important than boat type when determining boundaries that should not be crossed by humans.[28]

Similarly, a separate study in Florida found an average greater flush distance in response to humans on foot than to approaching motorboats or canoes. As a result, the researchers recommended setting back distances for all human activity of 100 meters (328 feet) for wading birds and 180 meters (590 feet) for extremely skittish species such as skimmers and terns. The researchers also cited a report that found no significant effect on breeding success due to disturbance by boats or other methods.[29]

PWC have also been mentioned as a factor in the decline of the loon population in the Northern United States. However, there has been no comprehensive study on the plight of the loon, or the effect of boating and development on its populations. For instance, Sutcliffe (1979) is cited in one article as reporting a 50 percent decline in the loon population in New Hampshire from 1929-1979, prior to any PWC use![30]

It is actually the loss of nesting habitat, increased human interaction, and increased predation by urban animals such as raccoons that have led to the decrease of many populations of birds around the country. In terms of mortality, there are very few reports of waterfowl

28 Rodgers, James A., Jr. and Schwikert, Stephen T., "Buffer Zone Distances to Protect Foraging and Loafing Waterbirds from Disturbance by Personal Watercraft and Outboard-Powered Boats." Conservation Biology, Volume 16, No. 1, February 2002.

29 Rodgers, James and Smith, Henry. Wildlife Research Laboratory, Florida Game and Fresh Water Fish Commission. "Set-Back Distances to Protect Nesting Bird Colonies from Human Disturbance in Florida." 1994.

30 Ballestero, Thomas, PhD., P.E., P.H. "Impact of Motor Boat and Personal Watercraft on the Environment: Bibliography." Environmental Research Group, University of New Hampshire. August 1, 1990.

death directly from motorboats, and no studies cite personal watercraft as the cause of waterfowl mortality.[31]

The regulation of one type of vessel does not address the overall issue that human development. In fact, one study found loons are disturbed more by human activity on lakes with no boating versus lakes with watercraft.[32]

Marine Mammals:

In addition to loons, some critics have claimed PWC are a threat to manatees, dolphins, or other marine mammals. However, marine mammal injuries or fatalities attributable to PWC are non-existent. For example, the Florida Department of Environmental Protection, Bureau of Protected Species Management reported that a review of over 25 years of manatee mortality records indicated no PWC have ever been implicated in a manatee death or injury.[33] In fact, because of the lack of an exposed propeller, which could present a prop-related injury to a startled dolphin or manatee, PWC are regularly used by marine mammal research organizations such as Sea World, Mote Marine Laboratory, and the Harbor Branch Oceanographic Institute.

Seagrasses:

Studies confirm PWC are not a threat to seagrasses. The only comprehensive test evaluating personal watercraft impact on seagrasses (conducted in 1997 in the Florida Keys) indicates personal watercraft use, as recommended by the manufacturers, does not affect seagrass beds or water turbidity, and does not cause scarring of the grassbeds.[34] Because PWC are powered by a water jet utilizing a shielded impeller, it cannot damage submerged aquatic vegetation in the manner that has been attributed to propeller driven vessels.

IV. SAFETY

The personal watercraft industry is committed to ensuring the safety of its products and devotes substantial resources towards promoting safe riding behavior.

According to U.S. Coast Guard statistics, 99.99 percent of all PWC are operated accident free. The Coast Guard reported in 2004 that "the number of reported injuries involving PWC use continued on a downward trend and has decreased every year since 1996."[35]

31 Ibid.

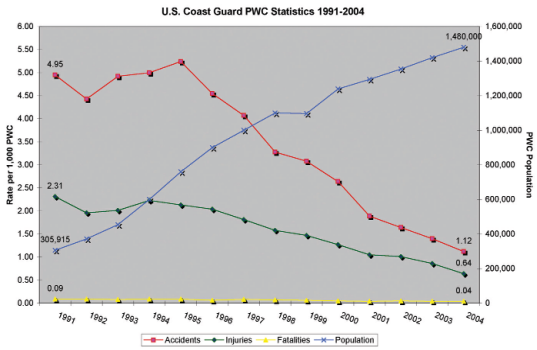
32 Ibid.

33 Letter from David W. Arnold, Chief of the Bureau of Protected Species Management, Florida Department of Environmental Protection, to U.S. Representative David Weldon. March 16, 1999.

34 Continental Shelf Associates, Inc., Effects of Personal Watercraft Operation on Shallow-Water Seagrass Communities in the Florida Keys, 1997.

35 USCG 2004 Boating Statistics, Executive Summary.

PWC Accident Statistics Have Shown Tremendous Improvement



The chart above demonstrates that PWC accident, injury and fatality rates have seen no significant statistical increase; in fact, they are at their lowest levels since widespread popularity of PWC began in the late 1980s.

In 1991:

- 99.6 percent of PWC in use were not involved in an accident of any kind.
- There were an estimated 305,915 PWC in use in the United States.[36]
- There were 1,513 reported PWC accidents nationwide, resulting in an accident ratio of 4.95 per 1,000.
- There were 708 reported injuries and 26 reported fatalities; the national injury/fatality rate was 2.31/0.09 per 1,000 PWC.[37]

In 1994:

- 99.6 percent of PWC in use were not involved in an accident of any kind.
- There were an estimated 600,000 PWC in use in the United States.[38]
- There were 3,002 reported PWC accidents nationwide, resulting in an accident ratio of 5.00 per 1,000.
- There were 1,338 reported injuries and 56 reported fatalities; the national injury/fatality rate was 2.23/0.09 per 1,000 PWC.[39]

In 1999:

- 99.7 percent of PWC in use were not involved in an accident of any kind.
- There were an estimated 1.8 million PWC in the United States.[40]
- There were 3,374 reported PWC accidents nationwide, resulting in an accident ratio of 2.86 per 1,000.
- There were 1,614 reported injuries and 66 reported fatalities; the national injury/fatality rate was 1.37/0.06 per 1,000 PWC.[41]

In 2004:

- 99.9 percent of PWC in use were not involved in an accident of any kind.
- There were an estimated 1.48 million PWC in the United States.[42]
- There were 1,767 PWC accidents reported nationwide, resulting in a reported accident ratio of 1.12 per 1,000.
- There were 1,424 reported injuries and 50 reported fatalities; the national injury/fatality rate dropped to a low of 0.64/0.04 per 1,000 PWC.[43]

36 National Marine Manufacturers Association, "Facts and Figures."
37 United States Coast Guard Boating Statistics – 1991.
38 National Marine Manufacturers Association, "Facts and Figures."
39 United States Coast Guard Boating Statistics – 1994.
40 National Marine Manufacturers Association, "Facts and Figures."
41 United States Coast Guard Boating Statistics – 1999.
42 National Marine Manufacturers Association, "Facts and Figures."
43 United States Coast Guard Boating Statistics – 2004.

PWIA Model Legislation

The most common cause of boating accidents involves operator inexperience, excessive speed and operator inattention. To address these concerns, PWIA has supported mandatory education for all PWC operators. By the end of 2002, 35 states had enacted PWIA-endorsed mandatory education for PWC users in some form. In each of these states, PWC accident rates have significantly declined.

PWIA has actively lobbied states to adopt its model legislation endorsed by the National Association of State Boating Law Administrators (NASBLA).[44]

PWIA's model legislation includes the following provisions:

- **Mandatory minimum age requirement (16)**
- **Mandatory education for all operators**
- **Mandatory personal floatation device and wetsuit use**
- **Mandatory use of lanyard engine cutoff device if so equipped**
- **PWC must be operated in a reasonable and prudent manner**
- **Daylight only time restrictions**

Florida:

The Sunshine State is among the leading states for PWC registrations and has enacted comprehensive PWC laws in recent years, which mirror many of PWIA's recommendations. As a result, while PWC registrations have increased in Florida by over 50 percent since 1995, PWC accidents have declined by 67 percent (from 508 to 169) over that same period of time, a ten year low.[45]

Florida's PWC laws include the following provisions:[46]

- Mandatory boater safety education for all boaters (including PWC) under 22 years of age.
- Each person operating or riding on a personal watercraft must wear an approved Type I, II, III, or V life jacket. Inflatable personal floatation devices are prohibited.
- The operator of a personal watercraft must attach the engine cutoff switch lanyard (if equipped by the manufacturer) to his/her body, clothing, or PFD.
- PWC may not be operated from a half-hour after sunset to a half-hour before sunrise.
- Maneuvering a PWC by weaving through congested vessel traffic, jumping the wake of another vessel unreasonably close, or when visibility around the vessel is obstructed, or swerving at the last possible moment to avoid collision is classified as reckless operation of a vessel (a first degree misdemeanor).

44 PWIA Model Legislation.

45 Florida Fish and Wildlife Conservation Commission "2004 Boating Accident Statistics."

46 http://myfwc.com/boating/safety/law_summary.htm

- A person must be at least 14 years of age to operate PWC.
- It is unlawful for a person to knowingly allow a person under 14 years of age to operate a personal watercraft (a second-degree misdemeanor).
- PWC liveries must provide on-the-water demonstration and a check-ride to evaluate the proficiency of renters.
- PWC liveries must not rent to anyone under the age of 18 years of age.
- PWC liveries must display safety information on proper operation of a PWC. The information must include: propulsion, steering and stopping characteristics of jet pump vessels; the location and content of warning labels; how to re-board a PWC; the applicability of the Navigational Rules to PWC operation; problems with seeing and being seen by other boaters; reckless operation; and noise, nuisance, and environmental concerns.

Since Florida enacted its PWC law:

50% increase in PWC population;
67% decrease in accidents

Other states have enacted similar safety and education legislation and have also seen positive results. Some examples are:

Connecticut:

Since mandatory education was instituted in Connecticut in 1992, the state has graduated more than 200,000 students. As a result, while PWC registrations have tripled in recent years, the rate of accidents has declined.[47]

Pennsylvania:

Since the year 2000, PWC operators have had to attend a mandatory eight-hour education course before being allowed to operate a PWC in Pennsylvania. Starting in 2000, there has been a dramatic drop in PWC accidents and injuries. The state's annual boating accident report lists the number of reported recreational boating accidents for 2004. Officials recorded 14 PWC accidents in 2004, compared to 36 in 1999. These dramatic reductions, causing the lowest figures since 1992, occurred during a time when thousands of new PWC were registered in the state. The analysis also reports the year 2004 was the twelfth straight year that there were no fatalities involving a PWC.[48]

Utah:

Mandatory education became required for all PWC operators between 12 and 17 years of age in 1996. Since 1998, there has been a steady decline in PWC-related accidents. In 1998, there were a total of 56 PWC-specific accidents, 54 in 1999, 45 in 2000, and 33 in 2001. Meanwhile, PWC registrations increased from 9,917 in 1998 to 11,854 in 2001.[49]

47 Connecticut Department of Environmental Protection, Boating Division.
48 Pennsylvania Fish & Boat Commission's "2000 Pennsylvania Boating Accident Analysis."
49 Utah Division of Parks and Recreation.

Wisconsin:
Since mandatory education was instituted in Wisconsin in 1991, PWC accidents have decreased by 68 percent.[50]

A number of factors must be considered when comparing PWC accidents among states, including the existence of mandatory PWC education, number of PWC registered in the state, and the length of the boating season.

V. CONCLUSION

The personal watercraft industry has made tremendous PWC improvements in recent years. The facts in this document clearly illustrate there is no justification for singling out PWC when it comes to management decisions on our nations' waters. PWIA strongly supports regulatory efforts that apply to all recreational motorized vessels equally in order to ensure all motorized watercraft users may safely enjoy equal access to America's public waterways.

For more information, please call PWIA at 202-737-9768 or visit www.pwia.org.

50 Wisconsin Department of Natural Resources.

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