

FILE UNDER AB 2019 - 383
DATE RECEIVED: July 23, 2019
SUBMITTED BY: James Wilson
 COUNCIL MEETING
EXHIBIT: A COMMITTEE

Boatnotes: A Handbook for Boaters on Lake Whatcom

A publication of the Lake Whatcom Management Program



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Environmental Resources

Special thanks to all City of Bellingham, Whatcom County, and Lake Whatcom Water & Sewer District staff and watershed residents who helped develop the content and organization, provided information and references, and reviewed the handbook.

***Disclaimer:** This manual is intended as an educational tool for boaters. It does not constitute a complete reference to federal, state, or local laws. While the Lake Whatcom Management Program has taken great care in identifying and offering environmentally sound products and procedures in Boatnotes, neither the Lake Whatcom Management Program nor any contributing agencies, organizations or individuals assume any liability for the accuracy or completeness of the information presented in the handbook. Inclusion in this handbook is not an endorsement of the companies listed.*

Revised 2006

FUEL, OIL AND BOATS

The operation of boat and *personal watercraft* (PWC) engines impact air and water quality. As the popularity of recreational boating has increased, more research has been done to determine the impacts. Results from the U.S. Environmental Protection Agency (EPA), indicate that the pollution from boat

one pint of spilled oil can create an oil slick over an acre of a lake's surface. Petroleum products that end up in water don't just disappear with time. They may evaporate, drift to other areas, sink into the sediments, dissolve in the water, or be absorbed by living organisms. Wind and waves push residual gasoline and oil into the shallows

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Collection of Whatcom Museum of Art and History



engines has been underestimated for a long time.

One visible impact of boating on lakes is the presence of petroleum products on the water surface. The iridescent sheen on the water's surface layer comes from spills, leaks and the operation of conventional carbureted two-stroke engines. In calm conditions, just

where it can accumulate in the sediments and enter the food chain.

Gasoline and oil contain chemical compounds that can be harmful to living organisms. The level at which a particular chemical is harmful varies with the compound and the tolerance of the affected organism. The ability to detect

*A 100-horse,
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PWC, operated
for seven hours
emits more
smog-forming
emissions than
a 1998 car
driven more
than 100,000
miles.*

compounds at extremely low levels has improved as more sensitive analytical methods have developed. Therefore, chemicals, such as those found in petroleum products, are more easily detected at extremely low levels in the environment. Because a compound has been detected does not mean it has exceeded established water quality standards or been proven to cause harm; however, more work is needed to further evaluate potential health risks.

PETROLEUM PECULIARITIES

Scientists have been investigating the effects of motorized watercraft use on Lake Tahoe, another multi-use drinking water reservoir. The presence of petroleum compounds in the lake appear directly related to motorized watercraft use. There are three primary groups of petroleum compounds associated with motorized watercraft including BTEX, PAH, and MTBE.

BTEX

Benzene, toluene, ethylbenzene and xylene (BTEX) are potentially harmful compounds found in gasoline. Research at Lake Tahoe detected low levels of BTEX compounds in the water column after periods of intense boating. The City of Bellingham has also detected low levels of BTEX compounds in Lake Whatcom.

PAH

Polycyclic aromatic hydrocarbons (PAHs), another detrimental byproduct of gasoline combustion, were also found to persist in the water column in Lake Tahoe. PAHs were present in sufficient enough concentrations to cause negative impacts to *aquatic* organisms. PAHs react with the ultraviolet portion of sunlight, becoming more toxic as they break down. This process is known as *phototoxicity*. This is bad news for organisms living at the surface of the lake and in the shallows, like fish and plankton.

MTBE

Methyl tertiary butyl ether (MTBE) is an fuel oxygenate used in areas with poor air quality to allow gasoline to burn more cleanly. MTBE has been tentatively classified by the EPA as a possible human carcinogen. High levels of MTBE during the boating season have raised concerns in California, leading to several bans and restrictions on boating in reservoirs. MTBE is not currently in use in Whatcom County and has not been detected in Lake Whatcom.

NEW BOATING RESTRICTIONS

Whatcom County and the City of Bellingham enacted ordinances to restrict the use of two-stroke carbureted engines on Lake Whatcom. The City's Ordinance took effect in 2006 and the County's Ordinance takes effect in 2009.

The ordinances implement a recommendation from the Lake Whatcom Motorized Watercraft Citizen's Advisory Committee. Engine restrictions are one of many actions taken to implement the Lake Whatcom Management Program to protect Lake Whatcom,

the drinking water reservoir for over 85,000 residents of Bellingham and Whatcom County.

ENGINE POWER

Air Pollution

Traditionally, gas-powered boat engines have not been subjected to the same pollution standards that car engines have. Consequently, most boat engines have no emission controls and contribute significant amounts of air pollution. The U.S. Environmental Protection Agency has determined that boat engines contribute hydrocarbon (HC) and oxides of

Summary of Boating Restriction Timelines

January 1, 2006—The operation of all carbureted two-stroke engine powered watercraft is prohibited on the portion of Lake Whatcom in the City limits, except: Watercraft powered by a two-stroke engine whose engine is certified and labeled as meeting the 2006 or later model year US EPA emission standards and two-stroke carbureted engines of 10 horsepower or less.

January 1, 2007—The operation of all carbureted two-stroke engines including 10 horsepower or less is prohibited on the portion of Lake Whatcom in the City limits.

January 1, 2009—The operation of all carbureted two-stroke engine powered watercraft on Lake Whatcom is prohibited, except: Watercraft powered by a two-stroke engine that is certified and labeled as meeting the 2006 or later model year US EPA emissions standards, auxiliary sailboat engines, 10 horsepower or less engines, and all electronic fuel injected two-stroke engines originally purchased before August 2004.

January 1, 2013—The operation of all carbureted two-stroke auxiliary sailboat engines, all carbureted two-stroke engines of 10 horsepower or less, and all electronic fuel injected two-stroke engines originally purchased before August 2004 is prohibited.

City of Bellingham Ordinance 2005-06-045 and Whatcom County Ordinance 2004-02

For every 10 gallons of fuel used in a conventional two-stroke, 2.5 to 3 gallons may go directly into the air and water. A four-stroke engine PWC would save the user about \$1200 over a conventional two-stroke engine during the watercraft's nine-year life.





nitrogen (NO_x) emissions that affect ground-level ozone and acid rain.

Two-Stroke Engines

Conventional, carbureted two-stroke boat engines have long been favored due to their simplicity, longevity, high rpm output, and high power-to-size ratio. Two-stroke engines have been used extensively to propel personal watercrafts (PWCs) due to their high rpm output and ability to operate at any angle because there is no oil reservoir. Currently, PWCs account for approximately one-third of all national boat sales. PWCs have become the subject of intensive national and international research due to public perception that they are more polluting, noisy, and intrusive than most boats.

Conventional carbureted two-stroke engines have been found to be the highest contributors of air

and water pollution due to their design. By design, the intake and exhaust ports on a two-stroke engine are open at the same time during the combustion cycle. Unburned fuel travels through the engine and is released directly into the air and water. Studies conducted by the EPA indicate that conventional two-stroke engines discharge 25-30% of their fuel, unburned, into the environment, when operated at full throttle. For every 10 gallons of fuel used in a conventional two-stroke, 2.5 to 3 gallons may go directly into the air and water. In addition, studies by the California Environmental Protection Agency's Air Resources Board (CARB) show that a 100-horsepower conventional two-stroke PWC, operated for seven hours emits more smog-forming emissions than a 1998 car driven more than 100,000 miles.

	<p>One Star – Low Emission</p> <ul style="list-style-type: none"> ● Meets CARB 2001 and EPA 2006 emission standards ● 75% lower emissions than conventional carbureted two-stroke engines
	<p>Two Stars – Very Low Emission</p> <ul style="list-style-type: none"> ● Meets CARB 2004 emission standards ● 20% lower emissions than Low Emission engines
	<p>Three Stars – Ultra Low Emission</p> <ul style="list-style-type: none"> ● Meets CARB 2008 exhaust emission standards ● 65% lower emissions than Low Emission engines
	<p>Four Stars – Super Ultra Low Emission</p> <ul style="list-style-type: none"> ● Meets CARB 2009 emission standards ● 90% lower emissions than Low Emission engines

What Can Boaters Do?

Engine Pollution

- ◆ Make your next boat one that does not use a gasoline engine for its main source of power, such as a sailboat, kayak, rowboat etc.
- ◆ Use an electric motor.
- ◆ Choose a cleaner and more efficient engine when purchasing a new engine.
- ◆ Limit engine operation at full throttle.
- ◆ Eliminate unnecessary idling.
- ◆ Tune and maintain your engine to increase efficiency and decrease leaks.

New and Improved Technology

Conventional carbureted two-stroke engines are slowly being replaced by more efficient and less polluting four-stroke and fuel-injected two-stroke engines. Both CARB and the EPA have new emissions standards for engines produced, starting 2001 and 2006, respectively. These newer engines, which are already on the market, are 30-40% more fuel-efficient.

CARB estimates that simply switching from a two-stroke to a more efficient four-stroke 90

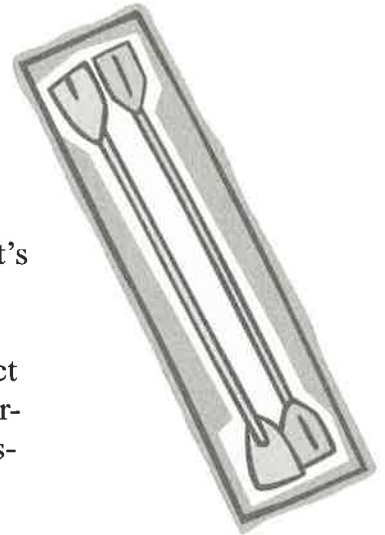
horsepower outboard engine would save the user more than \$2000 in fuel and oil costs over the average sixteen-year life of the engine. A four-stroke engine PWC would save the user about \$1200 over a conventional two-stroke engine during the watercraft's nine-year life.

Recently introduced two-stroke technology uses direct fuel injection to improve performance and decrease emissions. The new engines are approximately 75% cleaner than older two-stroke engines. Even with the improvement in two-stroke technology, most new four-stroke engines are cleaner than the new direct fuel injected two-stroke engines.

As older, less efficient, high-emission engines are phased out, the newer technology will help. Yet, even with cleaner technology, the continued increase of boats and PWC could still result in as much or even more pollution in the long run.

Operation and Maintenance of Your Engine

The way any engine is operated and maintained affects its impact on the environment. "Full throttle" is the least efficient way to operate an engine. Unnecessary idling also wastes fuel and emits additional emissions.



*Ultimately,
the cleanest
engine for
Lake Whatcom
is you!*