



COLORADO STATE PARKS STEWARDSHIP PRESCRIPTION



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Parks Affected: All Reservoir
Parks

PWC and Two Stroke Engine Issue Summary



Personal Watercraft (PWC) are being used in ever-increasing numbers on lakes and reservoirs in Colorado. These crafts and powerboats with two-stroke engines have been shown to cause a variety of problems, including:

- **Decreased water quality**
- **Unightly oil and gasoline slicks in the water**
- **Potential threats to human, fish, and wildlife health**
- **Noise disturbance to humans and wildlife**
- **High rates of injury among users**

The National Park Service has recently said it will ban all PWC in National Parks by September 15, 2002.

Figure 1. Jet skier



Source:
www.earthisland.org

Each year, marine two-stroke engines spill **15 times more oil and fuel into waterways than the Exxon Valdez** (www.earthisland.org/bw/2-strokefacts.shtml). According to Personal Watercraft Illustrated, a 2000 model PWC on average burns **15.1 gallons of gas per hour** at open throttle. With the EPA estimate that PWC two-stroke engines dump between 25-30% of their gas and oil mix unburned, this means that one PWC can dump between **3.79 and 4.53 gallons of fuel into the water every hour** (www.earthisland.org/bw). Therefore, at a park like Cherry Creek, approximately **300 gallons of gasoline and oil per hour are dumped into the reservoir** on an average summer weekend day. This gasoline and oil mixture floats on the water surface, causing the public to perceive the water quality as poor (from Cherry Creek Water Quality Perception Survey, 1997).

Other water quality problems can be linked to additives found in gasoline, and from the combustion process of the gasoline itself. According to the National Park Service year in review, 1999, **MTBE is a chemical added to gasoline** as an oxygenate and has been found to have serious implications for water quality. Concentrations of MTBE's in lakes and reservoirs with heavy PWC use have **exceeded federal health advisory levels and thresholds for taste and odor** (CA). Drinking water reservoirs are of utmost concern because it is uncertain if conventional treatment plants easily remove MTBE's. PAH's are a bi-product of gasoline combustion in two-stroke engines and also have negative impacts for water quality. PAH concentrations in lakes and reservoirs with heavy motorboat activity have been found at levels dangerous to aquatic organisms. This high level of **PAH's can cause adverse effects in fish and zooplankton** through

phototoxicity, and could significantly impact fish numbers. High PAH levels in a reservoir may also **adversely affect humans through drinking water and fish consumption.**

PWC and two-stroke engines exhibit **extremely high noise levels**, in the range of 85-102 decibels per unit. At this noise level, the American Hospital association recommends hearing protection (above 85 dB). There are documented cases of these high noise levels negatively affecting Osprey and other wildlife (www.nonoise.org).

Finally, according to the U.S. Coast Guard, **injury and fatality rates among PWC users are much higher** than those of conventional powerboat users. This causes increased stress for park staff and rangers trying to control boater and visitor safety (<http://www.uscg.mil/d1/newengland/pwcpage.html>).

Here's how to deal with the PWC and two-stroke engine problem:

Encourage park staff to use four-stroke engines. While four-stroke engines are slightly more expensive than two-stroke engines, the benefits greatly outweigh the costs.

- The engine burns cleaner and doesn't release as much oil and gasoline directly into the water.
- Four-stroke engines get much better fuel mileage than two-stroke engines.
- Four-stroke engines already meet stricter EPA 2006 standards.
- The four-stroke engine is much quieter than a similar speed two-stroke engine and causes fewer disturbances to humans and wildlife.
- The four-stroke engine could be used as an interpretive tool to help park visitors realize the benefits of this type of engine, as compared with a two-stroke engine.
- The EPA is banning the production of two-stroke engines by 2006, so the re-sale value of a four-stroke engine will be much greater than that of a two-stroke.

Monitor boat and PWC permit numbers and monitor water quality to see if heavy boat use is affecting water quality. Staff with the City of Westminster has been monitoring gasoline levels in Standley Lake for the past nine years using EPA method 8020. So far, they have been successful in keeping boat permit numbers low enough that water quality is not adversely affected. The following methods have been enacted:

- 600 boat permits are allowed each year for the 1200 surface-acre lake.
- Weekend boat counts range between 50-95 boats/day. Weekday boat counts range between 15-20 boats/day.
- The levels of certain constituents associated with gasoline and oil emissions are sampled once a month between May and the end of September. The cost of taking and analyzing the samples is about \$60 each month. The staff at Standley Lake has not found gasoline levels in the lake to be a problem, most likely because the numbers of boat permits are strictly controlled.

Create signs and/or pamphlets for visitors suggesting ways to reduce emissions.

The following are suggestions that could be displayed for visitors as ways to reduce their emissions:

- Mix gas and oil in the correct proportions
- Use biodegradable or less toxic oil
- Use reformulated gasoline
- Avoid spilling fuel when refueling boats or PWC
- If buying new equipment, strongly consider purchasing a 4-cycle engine

CONTACTS



City of Westminster

Kipp Scott
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Mr. Scott works with water quality at Standley Lake, where significant research has been done to determine the impact jet skis and two-stroke engines have on the water quality in the lake.

Andy Bailey
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Mr. Bailey has researched purchasing 4-stroke engines as opposed to 2-stroke engines for use by park staff.

SELECTED REFERENCES



VanMouwerik, Mark. National Park Service Natural Resource Year in Review, 1999. Water Quality Concerns Related to Personal Water Craft Usage.

www.earthisland.org/news/news_bluewater.html. 2000.

www.foxnews.com/story/0.2933.7755.00.html. Heilprin, John Park Service to Ban Jet Skis, April 13, 2001.

www.nonoise.org/library/drowning/.Noise Pollution Clearing House.

Personal Communication, Jason Trujillo, Cherry Creek State Park, May 29, 2001. Informed that the boating capacity on Cherry Creek Reservoir is 350 boats (including PWC). On a busy day in the summer, 75-100 PWC on the reservoir.

<http://www2.nature.nps.gov/pubs/yir/yir98/chapter01/chapter01pg3.html> Personal Watercraft use to be limited, Chip Davis, *Natural Resource Year in Review--1998*, published by the National Park Service, U.S. Department of the Interior, in June 1999 (publication D-1346)

<http://pwcwatch.org/PWCHazards.htm> Report on Personal Watercraft safety, 2000.

<http://www.uscg.mil/d1/newengland/pwcpge.html> U.S. Coast Guard PWC safety tips and statistics.