

determine the presence of hydrocarbons in Lake Powell. Samples were taken over a 4-day period from June 29th through July 2nd. This period was selected because it represents a high-use period by watercraft, including PWC.

The persistence of gasoline and oil in lake waters depends on the temperature of the water and the amount of mixing. Fuel components volatilize (evaporate) more quickly at warmer temperatures. High rates of mixing increase exposure to the air and accelerate volatilization. The greatest amount of boat use on Lake Powell generally occurs during the hot summer months. The lake's water temperature reaches up to 80 degrees Fahrenheit during the summer and high rates of mixing is proportional to the high rate of visitation on the lake. Therefore, gasoline volatilizes quickly on Lake Powell.

Emissions of gasoline and exhaust associated with PWC operation were compared to existing water quality conditions and to state water quality standards to determine their effects. The method used to evaluate the water quality used basic steps to determine the degree of impact a waterbody would experience based on the exceedence of water quality standards/toxicity benchmarks for PWC and outboard engine-related contaminants.

Analyses were performed by the State of Utah, The Woods Hole Group, Inc., and the U.S. Geologic Survey research laboratories. Samples were tested for benzene, toluene, ethyl benzene, and xylenes; five gasoline additives, including methyl tertiary butyl ether (MTBE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), diisopropyl ether (DIPE), and tertiary butyl alcohol (TBA); and 24 polycyclic aromatic hydrocarbon (PAH) compounds. These test results are included within the environmental impact statement.

The maximum concentrations detected from the most heavily used test site, Bullfrog Marina, were below the treated drinking water standard or advisory level for all three compounds (benzene, benzo(a)pyrene, methyl tertiary-butyl ether) for which a standard exists as determined by the U.S. Environmental Protection Agency. Based on this information the impacts associated with PWC on water quality were found to be not significant.

Based on the estimated Glen Canyon National Recreation Area boating hour statistics for 2001, PWC represented 17 percent of the total boating hours on Lake Powell. Of the PWC using Lake Powell; 87 percent were carbureted, 2-cycle engines, 6.5 percent were direct

injection, 2-cycle engines, and 6.5 percent were 4-cycle engines.

The remaining 83 percent of boating hours on the lake for 2001 involved all other watercraft; house boats, powerboats, and fishing boats. Of the other vessels using Lake Powell, 78.6 percent were 4-cycle engines, 12.6 percent were carbureted, 2-cycle engines, 6.4 percent were fuel-injected 2-cycle engines, and 2.4 percent were diesel or sail powered vessels.

Of all the vessels using Lake Powell in 2001, 75 percent of the motorized vessels on Lake Powell were 4-cycle engines or fuel-injected, 2-cycle engines. It is estimated that these engines have emission rates that are 75 to 90 percent lower and thus emit about one-tenth the pollutants of carbureted, 2-cycle engines.

On October 4, 1996, the U.S. Environmental Protection Agency (EPA) issued a final rule to regulate emissions for new spark-ignition gasoline marine engines, including outboard engines, PWC engines, and jet boat engines. The rulemaking was conducted under Section 213 of the Clean Air Act. The EPA had determined that these engines contributed to ozone air pollution, and that the technology was available to manufacture cleaner operating engines. The rule stipulates that by the 2006 model year, the entire fleet of marine engines produced by each manufacturer, including those for PWC, must have a 75 percent reduction in hydrocarbon emissions compared to the average for the fleet produced by that manufacturer prior to the rule. It also established intermediate target dates for emission reductions.

In contrast to outboard engines that are used on boats, the average useful "life" of a 2-cycle PWC is 9 years (California Air Resources Board 1998b). As a result, by around 2015, most of the PWC used on Lake Powell will have low-emission engines. By 2005, the emissions from the fleet of watercraft using Lake Powell would be reduced by 25 percent compared to emissions in 1996; and in 2012, the emissions from the fleet of watercraft using the lake would be reduced by 50 percent compared to emissions in 1996. Therefore, water quality conditions associated with the use of PWC and other watercraft will improve, regardless of the management actions identified within this proposed rule.

#### Air Quality

Glen Canyon NRA is designated as a class II air quality area under the Prevention of Significant Deterioration provisions of the Clean Air Act and meets or exceeds all EPA standards for

ambient air quality. The air quality of the Glen Canyon region is in attainment of the national ambient air quality standards. The sources of air pollutants come primarily from outside the park and can concentrate, especially during periods of atmospheric inversion, in the park, causing visible smog on occasion. There are sources of air pollutants that are generated within the park, including pollutants contained in the exhaust of motorized vessels. The combustion process of motorized vessels results in emissions of air pollutants such as volatile organic compounds (VOC), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM), and carbon monoxide (CO) (EPA).

Although there is existing data showing that carbureted 2-cycle engines emit pollutants into the air, there is little data that shows specifically what impacts PWC emissions have on air quality. On Lake Powell, the current impacts from carbureted 2-cycle engines, including PWC, occur intermittently in high-use areas such as marinas, primarily between May and October. These impacts include visible smoke and the smell of exhaust and gasoline fumes. These impacts are considered moderate and have not been shown to exceed the national ambient air quality standards under the Clean Air Act or the EPA air quality index. The PWC industry reports that the highest volume selling models today are the cleaner-burning PWC (PWIA 2002, [www.pwia.org](http://www.pwia.org)); therefore, there is expected to be some beneficial impacts through 2012 as older models are replaced by the newer models. Once the proposed 2006 requirement is in place, air quality is expected to improve in the high use areas where carbureted two-cycle engines are currently heavily used. The EPA expects a 50% reduction in hydrocarbon emissions from marine engines from present levels by 2020, and a 75% reduction by 2025 (EPA 1996).

#### Soundscapes

Most visitors to Lake Powell have expectations of some noise from motorized vessels. Noise is generally considered appropriate if it is generated from activities consistent with park purposes and at levels consistent with those purposes. Engines are a primary source of human-caused sound at the recreation area. These include engines on PWC and other vessels, cars and trucks, off-road vehicles, aircraft, generators, and other miscellaneous sounds from electronic devices and humans. However, the opportunity to experience the natural soundscape is an important part of a positive park