

The Perceived Environmental Impact of Car Washing

Jen Oknich

Ramsey-Washington Metro Watershed District

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Introduction

Washing a car may impact the environment in ways vehicle owners have never realized. A recent article in *Stormwater*, a surface water quality journal, has raised interest over the possible affects of domestic car washing. Many particles and chemicals have been found in wash waters, but the concentration and severity of these in a diluted state are usually extrapolated, or not considered. A peer-reviewed study on the contents of domestic car wash waters cannot be found. Instead, studies such as those on commercial car wash or highway runoff contaminants are commonly applied. Little information exists to substantiate claims, but nonetheless many cities in the USA and Canada have taken action, especially against detergents. Concerned governments and organizations hope to minimize or eliminate potential aesthetic, physical, chemical and biological threats of car washing.

What Has Some Cities and Agencies Concerned

Assuming hand washing in a car wash facility can be likened to hand washing in a driveway, a 1999 Environmental Protection Agency (EPA) study on Class V Injection Wells is applicable. EPA found many washed-off pollutants to be in excess of primary and secondary maximum contaminant levels (MCLs). This study is very similar to residential washes, as they are manually operated, and no undercarriage or engine cleaning usually happens (see Figure 1).

Figure 1: EPA Concerns with Car Wash Waters

Item	Exceeds Primary MCL	Exceeds Primary HAL	Exceeds Secondary MCL
Antimony*	Yes	Yes	-
Arsenic*	Yes	Yes	-
Beryllium*	Yes	Yes	-
Cadmium*	Yes	Yes	-
Lead*	Yes	Yes	-
Thallium*	Yes	Yes	-
Aluminum	-	-	Yes
pH	-	-	Yes
Iron	-	-	Yes
Manganese	-	-	Yes
Chloride	May exceed	May exceed	-
Naphthalene	May exceed	May exceed	-
TDS	May exceed	May exceed	-
Tetrachloroethene	May exceed	May exceed	-

* All six of these elements are considered toxic (Phoenix College, 1998).

L. Soerme and R. Lagerkvsitb, in a study on urban wastewater, determined commercial car washes were a major contributor of lead, cadmium, chromium, and zinc to the water treatment plant in Stockholm. D. Pak and W. Chang found commercial car wash waters contained high phosphorus levels, a COD and low organic content. EPA raises awareness of the following list from vehicle and equipment wash waters: TSS, pH, salts,

particulate matter, oil, grease, organics, COD, chlorinated solvents, detergents, lubricants, additives, heavy metals, antifreeze, and acid/alkaline wastes (EPA, 1995). The National Water Research Institute (NWRI) of Environment Canada in a study on highway runoff toxicity found many of the same chemicals running off roads are discovered in car wash waters (T. Mayer, 2002).

Many of the aforementioned pollutants are simply washed off of vehicles. For example, the lead in the Soerme study was attributed to break linings and tires, and the zinc to tires and brakes. The City of Durham, NC found zinc and copper to be higher than water quality standards (488ppb and 20ppb, respectively) when a car is privately washed (J. Cox, 2002). With 55-70% of households washing their own cars, there is a chance for quite a large amount of break linings and chemicals to wash down the drain. Especially considering 70-90% of domestic car washers see wash waters flowing into their streets and storm sewers (T. Schueler, 2000).

When not washing contaminated water down storm drains in residential areas, washed cars leave behind degreasers, detergents and other chemicals in commercial washes. Degreasers, commonly applied in a commercial wash before detergents and waxes, are present but not prevalent in residential washes (M. Miyama, 1996; EPA 1999). When present, however, the four most common degreasers are petroleum solutions, micro-emulsions of petroleum solutions, alkaline degreasing agents, and vegetable degreasing agents (Miyama, 1996).

Petroleum is an ingredient of detergents used to clean vehicles, specifically in the surfactant composition. Petroleum is the basis of the most commonly used surfactant, LAS, or linear alkylbenzenesulfonates (KMS, 2001; Ecosol, 1997). LAS, commonly synonymous with anionic surfactants, are very slow to biodegrade, and have carcinogenic and reproductively toxic by-products (KMS, 2001; Minnesota Pollution Control Agency, 2000).

Surfactants move pollutants into storm sewers with every wash. A potential aesthetic problem lies in the ability of detergents to make suds, and the probability of them containing nutrients, such as nitrogen and phosphorus. Phosphates (or their chemical replacement NTA) is a standard component of most car wash detergents (K. Mercer, 2002). Therefore, detergents used to make a vehicle's exterior more appealing may have the opposite effect on natural surroundings. Suds could persist in lakes and streams, while the nutrients could provoke an algae bloom. Detergents in general are attributed to COD and organic matter in car wash waters (Pak, 2000). Biodegradable soaps are no exception – they have the same impacts (A. Chapman, 2002; Ecosol, 2002). They also create a bacterial population increase, transmitting through the food chain to protozoa, which are more sensitive to car wash toxins than other aquatic organisms, such as fish (Ecosol, 2002). NWRI found in the concentrations studied, highway runoff contaminants (determined to be similar to car wash waters) were toxic to *Daphnia, sp.*, nematodes, and other organisms (Mayer, 2002). A study of detergents common to Seattle residents showed “no detergent is safe [for trout] to be discharged to a storm drain at any working concentration” (D. Waddell, 1992).

All detergents will destroy fish mucus membranes and gills to some degree (B. Camp, 2002). The gills may lose natural oils, interrupting oxygen transfer (Chapman, 2002).

Damaged mucus membranes leave fish susceptible to bacteria and parasites. Detergents are toxic to fish near 15ppm, killing fish eggs at 5ppm. A concentration of 2ppm will lower the surface tension of water enough for fish to absorb double the amount of organic chemicals, such as pesticides and phenols. (Camp, 2002) In 2002, the Surfactant Research Institute, Brooklyn College of the City University of New York, found a linear correlation between a surfactant's chemical behavior and the rotifer toxicity and bioconcentration in fish.

Many surfactants are known to either contain or break down into highly toxic, hormone-mimicking and environmentally persistent compounds "causing abnormal growth and development of young fish, and perhaps abnormal behavior as well" (R. Male, 2002; Chapman, 2002; MPCA, 2000). Nonylphenols and nonylphenol ethoxylates have the attention of Environment Canada and the United States Geological Survey (USGS) as they relate to endocrine disrupting and estrogenic effects in fish. These common detergent surfactants have been shown to be present in the environment and have various estrogenic responses in aquatic organisms. They are considered toxic and are known to be capable of disturbing fish health.

How Cities and Agencies Have Taken Action

Fort Worth, Texas has found detergents to be the most common pollutant in storm and stream water (Fort Worth Environmental Management, 2002). The city began requiring permits for outdoor cosmetic cleaning activities, but there are no restrictions on residents (Camp, 2002). The city is, however, promoting commercial car washes, avoiding soap, using less water, and washing vehicles on lawns (Fort Worth, 2002). The campaign has resulted in a decrease of detergent-contaminated storm sewer outfalls, from 33% of outfalls containing detergent to 4%. The presence of fertilizers and pesticides was also reduced (Camp, 2002).

Federal Way, Washington specifically prohibits "soaps, detergents or ammonia" from entering surface and stormwaters. This includes commercial, community/charity, and residential car washing. Car washing kits are available to charity car washing events to direct flows to the sanitary sewer system. The city enforces the 1999 code on those discharging without the proper precautions. (D. Smith, 2002)

The City of Calgary has a by-law (28M98) that states no soap is to be used when washing a car unless the water is going to the sanitary system (M. MacIssac, 2002). By-law 28M98 is enforced by an anonymous tip line.

The Federal Highway Administration (FHWA) acknowledges the pollutants of highway runoff and states if no measures are taken to remove contaminants, receiving waters may be adversely affected. Measures include detention ponds, wetland systems, swales and filter systems. (FHWA, 2002) MPCA suggests usage of holding tanks, on-site treatments, sanitary sewers and recycling water when washing vehicles (MPCA, 2000).

The Bay Area Water Pollution Prevention Agencies (BAWPPA) of California promotes environmentally responsible car washing measures, such as encouraging citizens to bring vehicles to commercial car washes and keeping soapy water out of the storm drains (BAWPPA, 2002). Car washing is seen as a source of pollution by the EOA (Santa Clara

Valley Urban Runoff Pollution Prevention Program) in the Bay Area of California (C. Goulart, 2002).

King County and Kitsap County in Washington have promoted car wash programs to keep Puget Sound healthy. King County, as well as the Puget Sound Car Wash Association and a local radio station, promoted a “Suds Free Saturday” to encourage residents to use a local car wash. Part of the profit was donated for salmon populations. (Washington Department of Natural Resources, 2002) The Puget Sound Car Wash Association has earned honors for their services in promoting environmentally responsible commercial car washes, as well as the industry in general as a better alternative to residential washes. (King County Washington, 2002)

Kitsap County loans out Bubble Busters and Drain Plugs free of charge to car wash facilities. These and other best management practices (BMPs) are suggested by the Sound Car Wash Program, developed by the County’s Surface and Storm Water Management Program to keep soap and dirt from entering Puget Sound. BMPs include use of commercial car washes, less soap, less water, and avoiding phosphates, chlorine, and nitrates. (Public Works, Kitsap County Washington, 2002) Washing vehicles on lawns, rather than on pavement may be the simplest BMP suggested to keep soap from storm sewers. The Hawaii State Department of Health and the City and County of Honolulu Department of Environmental Services concur with these BMPs (Protecting Water, 2002).

Though many cities and organizations see car washing as a non-point source of pollution, the EPA has no promulgated restrictions on car washes. Promulgation had been mandated for EPA consideration in 1967, but was excluded from regulation in 1982. (EPA, 1999) It is interesting to note several things provided by the EPA: a number of car washes made the EPA’s Superfund Site status (Unicar of IL and Route 309 of PA, for example), the wealth of information on vehicle washing BMPs, and that separate National Pollution Discharge Elimination System (NPDES) permits are required for industries to wash vehicles (EPA, 2002; EPA, 1995).

Conclusion

Numerous metals and other chemicals exceed EPA standards in hand wash stations, highway runoff studies and commercial car washes, and common detergents are known to harm and alter aquatic organisms. Solutions range from simply using little to no detergents while washing vehicles on lawns to borrowing equipment from the local government for water filtration. Though no enforcement has been promulgated by the EPA, many cities, environmental organizations and government units have taken action in the USA and Canada. Enough evidence exists for the West Coast, Texas, Canada and the EPA to see the metals, detritus and detergents from car washing as a threat to waters in North America.

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