

Boating Pollution Economics & Impacts

WHAT HAPPENS WHEN A LITTLE TRASH, some oil, fuel, cleaning agents or sewage go overboard from your boat? Does it matter which hull paint you choose? Can preventing pollution save money? This page will answer your questions on the benefits of preventing boating pollution.

\$ Even small amounts of pollution become a problem when they accumulate over time. Manufacturing, using and disposing boating products and equipment all contribute to the environmental impacts and costs of pollutants.



\$ Boating pollutants in the water and sediment affect marine life and human health. (see table on page 2 and 3) They may reduce the availability of quality seafood, raise health care & dredging costs and affect industries that need clean water, like tourism, fishing & water sports.

Environmental Health, Human Health and Economics

\$ Some pollutants change water chemistry, so sediment contaminants are easily absorbed by marine life.⁸ Pollution makes marine animals less able to survive other stresses. This may affect fishing & other water uses.⁹

\$ Studies of San Diego Bay & similar bays found fish living in polluted, urban water had more liver tumors and fin rot than fish in clean water.^{9,21,23}



\$ In 2006 California saltwater anglers spent \$3 billion on sport fishing goods and services and generated \$534 million in federal, state and local tax revenues.¹⁴ Of nearly 3 million fish caught by anglers on ocean charter boats in 1989,⁵ five species, or 27%, spend significant time in bays.^{10,12,17} There are also substantial landings from private boats & fishing piers.^{10,14} A decline in these fish could cost millions of dollars.

\$ Quality seafood depends on clean water & sediment.⁹ The commercial value of halibut and white seabass for California in 2009 was \$3.44 million.⁶ These fish live in bays when young.^{12,17}



\$ Several viral, bacterial & parasitic diseases are shared between aquatic animals & humans.⁹ Sediment contaminants accumulate in some fish that live in bays and may be passed to people who consume them often.¹⁰

Pollution, Dredging & Haulout Costs

\$ Hull paint toxicants accumulate in sediments of some harbors, such as San Diego Bay.^{16,28}

\$ Harbors need regular dredging to maintain water depth. Clean sediments are much cheaper to dredge & dispose. Costs may seem modest per cubic yard, but thousands of cubic yards are removed when a typical boat basin is dredged. (see table below)

\$ These costs may pass to marina tenants. Santa Cruz Port District calculated in 1994 that if the 10,000 cubic yards dredged per year were disposed as hazardous waste, slip rental rates would rise by \$1.50/foot.²⁷ Because toxicants from hull paints and maintenance products contaminate harbor sediment,^{8,28} preventing pollution can save you money.

\$ How fast toxicant leaches from hull paint depends on local conditions, paint chosen & hull cleaning practices. The longer toxicant stays on a hull, the less goes to the sediment and the less you spend on haulouts.

For more information, see our publications at <http://ucanr.org/coast>

- ✦ Alternative Antifouling Strategies Sampler
- ✦ Selecting Underwater & Topside Maintenance Services for Your Boat
- ✦ Clean Boating Guide
- ✦ Clean Boating Tips

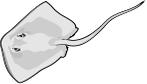
(Unless otherwise stated, material is from Connell and Miller 1984)

Dredge and Disposal Type	Cost/Cu.Yd.	Cost for 25,000 cu.yd.
Dredge / dispose on beach or in ocean ^{1,19,27}	\$5 - \$10	\$125,000 - \$250,000
Dredge / dispose as contaminated waste, e.g. construction fill. ¹	\$17.50 - \$35	\$437,500 - \$875,000
Dredge / dispose as hazardous waste ^{1,19,27}	\$40 - \$60	\$1,000,000 - \$1,500,000

Environmental Impacts of Boating Pollutants

(Unless otherwise stated, material is from Connell and Miller 1984)

Pollutant	Sources and Characteristics	Environmental Activity	Environmental or Human Health Effects
Detergents	<ul style="list-style-type: none"> ❖ Most cleaning agents, detergents and soaps ❖ Oil spill dispersants²⁹ ❖ Breaks down oils and greases on boats¹⁸ ❖ Dissolves according to water conditions 	<ul style="list-style-type: none"> ❖ Accumulates in sediments ❖ Broken down by microorganisms 	<ul style="list-style-type: none"> ❖ Toxic to marine plants and animals ❖ Impairs breathing in fish¹⁸ ❖ Reduces amounts of oxygen in affected waters ❖ Produces unsightly foam on the water surface
Marine debris	<ul style="list-style-type: none"> ❖ Commercial and recreational boating¹¹ ❖ Plastics, food wastes, packaging, lines, nets, fish cleaning wastes³ ❖ Plastics degrade very slowly ❖ Some wastes become nutrients (see "Nutrients") 	<ul style="list-style-type: none"> ❖ Persistent in the environment 	<ul style="list-style-type: none"> ❖ Can choke / strangle sea animals^{3, 11} ❖ Ghosts nets, and traps endanger divers³ ❖ Can transport harmful non native species¹¹ ❖ Snagged by props and engines³ ❖ Ruins recreational beaches¹¹
Acidic & Alkalis Substances	<ul style="list-style-type: none"> ❖ Battery acid, lye and other strong acids or bases in vessel cleaning products¹³ ❖ Dissolves easily in water 	<ul style="list-style-type: none"> ❖ Increases natural acidity or alkalinity of water by decreasing or increasing pH respectively 	<ul style="list-style-type: none"> ❖ Toxic to marine plants and animals ❖ Increases the toxicity of other toxic substances, metals, other pollutants and chemicals ❖ Can irritate or damage skin
Metals	<ul style="list-style-type: none"> ❖ Paint particles from hydro washing, metal shavings from engine wear, and consumer products containing metals ❖ Dissolves according to water conditions 	<ul style="list-style-type: none"> ❖ Accumulates in sediments, marine plants, and animals ❖ Persistent in the environment ❖ Some metals broken down by microorganisms 	<ul style="list-style-type: none"> ❖ Toxic to marine plants and animals ❖ Changes the food web in the marine environment by eliminating certain species 
Copper (Cu)	<ul style="list-style-type: none"> ❖ Used as a toxic agent in antifouling paints ❖ Dissolves according to water conditions 	<ul style="list-style-type: none"> ❖ Accumulates in sediments, marine plants, and animals ❖ Persistent in the environment 	<ul style="list-style-type: none"> ❖ Very toxic to fish when combined with zinc sulfates¹⁶ ❖ Long term toxicity to marine plants and animals
Tributlytin (TBT)	<ul style="list-style-type: none"> ❖ Still used as a toxic agent in antifouling paint on aluminum hulls, outboard motors & lower drive units^{4, 16} 	<ul style="list-style-type: none"> ❖ Accumulates in sediments, marine plants, and animals¹⁶ ❖ Persistent in the environment 	<ul style="list-style-type: none"> ❖ Toxic even in small amounts to marine plants and animals, especially bottom feeders¹⁶ ❖ TBT contaminated shellfish are dangerous to human health¹⁶

Zinc (Zn)	<ul style="list-style-type: none"> ❖ Anticorrosive zincs and paint pigments ❖ Dissolves according to water conditions, which can make Zn more available to marine organisms¹⁶ 	<ul style="list-style-type: none"> ❖ Accumulates in sediments, marine plants & animals ❖ Persistent in the environment 	<ul style="list-style-type: none"> ❖ Toxic to marine plants and animals, even small amounts¹⁵ 
Oil / Fuel 	<ul style="list-style-type: none"> ❖ Normal boat operation, fueling, engine maintenance, spills, runoff, and bilge discharge ❖ Dissolves slowly in water, clings to particles and sediments in marine environments 	<ul style="list-style-type: none"> ❖ Fuels evaporate in air ❖ Broken down by sediment microorganisms²² ❖ Accumulates in sediments, marine plants, and animals ❖ High accumulation in estuaries and intertidal areas 	<ul style="list-style-type: none"> ❖ Some components toxic to marine plants and animals even at low concentrations²⁴ ❖ Some components cause cancer, mutations and / or birth defects ❖ Behavioral changes in shellfish and fish²⁴ ❖ Discoloring and bad taste in flesh of fish^{20, 25, 26}
Dusts and sediments	<ul style="list-style-type: none"> ❖ Vessel scraping and sanding, erosion during construction and urban runoff ❖ Heavy metals, nutrients, hydrocarbons, etc. adhere to dusts and sediments 	<ul style="list-style-type: none"> ❖ Accumulate in sediments near the discharge to water ❖ Sediment bound contaminants released to water if disturbed 	<ul style="list-style-type: none"> ❖ May reduce amounts of oxygen in affected waters ❖ General lowering of water quality ❖ Burial of habitat, food and / or organisms ❖ Increased turbidity can clog gills of fish
Nutrients	<ul style="list-style-type: none"> ❖ Runoff, sewage, erosion, garbage & detergents containing (P)hosphorous or (N)itrogen ❖ P binds easily to water particles 	<ul style="list-style-type: none"> ❖ Used by marine plants and organisms for food (P,N) ❖ Accumulates in sediment (P) 	<ul style="list-style-type: none"> ❖ Increase in algae growth which decreases light and oxygen in the water (eutrophication) ❖ (N) can be toxic in higher concentrations
Solvents	<ul style="list-style-type: none"> ❖ Vessel maintenance & repair activities ❖ Paints, varnishes, paint removers and lacquers as well as degreasing agents ❖ Does not dissolve in water¹³ 	<ul style="list-style-type: none"> ❖ Sink in water until they reach an impervious surface ❖ Acetone lingers in air and is transported to sediment & water 	<ul style="list-style-type: none"> ❖ Many solvents can cause cancer ❖ Large amounts can cause dizziness, disorientation and unconsciousness in the user²
Anti-freeze	<ul style="list-style-type: none"> ❖ Used as engine coolant and freeze prevention during winter storage ❖ Improper use & storage creates leaks or spills¹³ 	<ul style="list-style-type: none"> ❖ Fate similar to solvents¹³ 	<ul style="list-style-type: none"> ❖ Ethylene glycol is deadly to humans, pets & marine organisms in low doses² ❖ Propylene glycol (orange/pink color) is less toxic than ethylene glycol (blue/green color) and is preferred for use in boats⁷

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