

The Problem of Marine Engine Pollution

New England has thousands of miles of shoreline coastal water and hundreds of lakes and ponds. These water bodies provide outdoor enthusiasts with many opportunities to enjoy boating.

Until recently, most outboard engines and personal water craft were powered by conventional carbureted two-stroke marine engines. These traditional engines have adverse impacts on the environment. Up to 30% of the fuel passes through the combustion chamber unburned or partially burned, thereby being released directly into the water and air as pollution.

- **In the air**, unburned gasoline results in hydrocarbon emissions, which contribute to the formation of ground-level ozone or smog. Smog can irritate the respiratory system and aggravate existing respiratory conditions such as asthma.
- **In the water**, gasoline elevates concentrations of benzene, MTBE, and other toxics.

Low-Pollution Marine Engines are Now Available

The **GOOD NEWS** is that cleaner, low-pollution outboard and personal watercraft marine engines are available from Rhode Island marine dealers. These engines are better for the environment, easier to maintain, and more fuel efficient. They generally cost more, but the benefits are substantial for the environment, for your boating enjoyment, and for saving money in the long run.

Two Types of Low-Pollution Engines

• 4- Stroke Engines

This technology prevents unburned fuel from escaping through the exhaust valve, which significantly reduces hydrocarbon emissions. No oil mixing with gasoline also improves overall engine performance.

**Reference Source- The New Hampshire boaters pamphlet "Marine Engines and the Environment", March 2001*

• 2-Stroke Direct Fuel Injection Engines

New technology two-stroke engines feature direct fuel injection which directly introduces the fuel into the combustion chamber. As a result, the up to 30% fuel loss experienced with the traditional technology is eliminated, with an overall fuel economy improvement.

Eco-Friendly Boating Tips

The following are some commonly known fueling and engine maintenance practices:

Fueling

Proper fueling reduces the introduction of gasoline into the water.

- Ensure boat stability when fueling
- Use a spill-proof gasoline container
- Use fuel collars to capture splash/drips
- Use bilge pillows and engine pads to absorb oils and fuels, and dispose of them properly
- Close the vent on portable gas tanks when the engine is not in use or when tank is stored
- Do not rely on automatic nozzle shutoffs, the fuel filling nozzle should be attended at all times
- Avoid topping off gas tanks

Engine Maintenance

Good engine maintenance improves operating efficiency and reduces emissions.

- Limit engine operation at full throttle, and eliminate unnecessary idling
- Repair gas and oil leaks immediately
- Check, clean and flush engine away from the water
- Keep engine properly tuned
- Prepare engines properly for winter storage
- Do not fog the engine in the water
- Contain all waste and recycle or dispose of properly

Low-Pollution Marine Engines A Cleaner Way to Enjoy Boating



Benefits of Low-Pollution Marine Engines

- Burn 35% to 50% less gas
- Use up to 50% less oil
- Save money over the life of the engine
- Reduce air emissions by 75% or more
- Reduce water pollution by reducing the amount of gasoline released into surface waters
- Are easier to start
- Have a more precise throttle response
- Are quieter
- Reduce smoke and fumes
- Are better for New England's environment!

Get on Board!

If you are in the market for a new outboard motor or personal watercraft, ask your dealer about the four-stroke or new direct fuel injection two-stroke engines.

Help Make New England's Air and Water Clean!

For further information call
EPA New England at 617-918-1836
RI Marine Trade Association at 401-885-5044
DEM Customer Assistance at 401-222-6822



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With the cooperation of marine engine manufacturers, U.S. EPA has issued regulations designed to significantly reduce the amount of pollutants released from outboard and personal watercraft engines. From 1998 to 2006, average air emission standards for outboard and personal watercraft engine manufacturers will become increasingly more stringent. Controlling these exhaust emissions will result in an unprecedented 75% reduction in hydrocarbon emissions from these engines by the year 2025. To achieve the yearly emissions reductions required by the regulations, it is anticipated that manufacturers will each year build increasing numbers of lower emission engines.

To encourage consumers to purchase cleaner-burning marine engines before the final standard goes into effect in 2006, EPA New England is teaming up with the RI Department of Environmental Management, the RI Marine Trade Association, the Marine Retailers Association of America, and the National Marine Manufacturers Association in launching a New England-wide Clean Marine Engine Initiative. These new engines deliver improved performance, reduced fuel usage and reduced emissions. Although the new marine engines cost about 15% more than traditional ones, savings from decreased fuel consumption help offset the higher purchase price, resulting in a "win-win" situation for both consumers and the environment.



TIPS FOR BOATERS

Ways to Keep Your Boat in Tip Top Working Condition and Enjoy Your Day on the Water While Protecting the Underwater World Around You

CLEANING:

When washing a boat's deck and hull surface, people often use products that contain toxic ingredients such as chorline, phosphates and ammonia. Just as these chemicals act as degreasers on the boat, they also act as degreasers on fish -- drying the natural oil fish need for their gills to take in oxygen. To reduce your need for toxic products, follow these tips:

- Rinse your boat only with fresh water after each use. This will reduce your need for cleansers and heavy-duty products.
- Use old-fashioned cleaning methods, including baking soda, vinegar, lemon juice, borax and "elbow grease".

SANDING:

Sanding and scraping your boat can release noxious paint and varnish particles into the air and water around you. Always sand and scrape on shore, away from the water and preferably in a dedicated work area. Use a vacuum sander, a tool that collects and stores the dust before it can get into the water or into your eyes and lungs!

PAINTING:

To reduce organism growth, many boat owners apply anti-fouling paints to the boat bottom. However, most of these paints contain toxic metals such as copper, mercury, arsenic or tributyltin (TBT). All have severe impacts on human health and the underwater ecosystem; the use of some, such as TBT, has even been banned by federal law. To learn more about laws regulating bottom paints, as well as alternative painting products, contact your state boating agency and your local marine supply store.

FUELING:

Take precautions not to overfill your fuel tank. If you overflow onto the boat or dock, wipe up the spill with a rag; do not hose it into the water. If you do spill fuel or oil into the water, do not disperse it with detergent or soap! That only sends the problem down to the seafloor where it becomes more toxic and more difficult to clean up. If the spill is large or if it discolors the surface of the water, you must report it to the National Response Center at 1-800-424-8802 or to the U.S. Coast Guard on VHF channels 16. Failure to do so is illegal and can cost you civil penalties and/or criminal sanctions.

MOTORING:

If you become grounded, do not attempt to motor your way out. This could cause serious damage not only to your motor and propellers, but also to the seafloor and local marine organisms. If you sight a marine mammal such as a manatee, dolphin or whale, slow down and keep a safe distance of at least 100 yards. It is illegal to feed, harass, molest or injure a marine mammal.

TRASH:

Stow all loose items, plastic bags, drink cans, and other articles properly so they do not blow overboard. Never discard your garbage overboard. Whatever you take aboard, bring back. Under the Marine Plastic Pollution Research and Control Act, and the international agreement MARPOL Annex V, it is illegal to dispose of plastic, or garbage mixed with plastic, into any U.S. waters. The discharge of any garbage is prohibited in the Great Lakes and connecting tributary waters.

For more information, write to:

Commandant (CG-3PCP-1)
U.S. Coast Guard
Sea Partners Campaign
2100 Second Street, S.W.
Washington, DC 20593

or e-mail the [Sea Partners Program](#) and request "BOATERS PAMPHLETS".

Eco-Friendly Boating



Fact Sheet

CHECKLIST FOR GOOD BOATING AND CLEAN WATER

Clean water is the foundation for enjoyable boating; every action from an individual boater has a major impact on the water, marine life, and the near-shore and shoreline ecosystem and inhabitants. Some boating activities that impact the environment are: boat sewage, litter, and fish waste disposal; fueling and bilge care; boat repair and maintenance; engine servicing, hull cleaning and painting; and boat operation.

The information in this publication serves as a guide for boaters to review their own responsibilities and identify potential areas in which boating-related activities could be improved to protect our precious and fragile environment. As you implement pollution prevention ideas, you and your fellow boaters will identify more ideas. Your success is only limited by your willingness to try something different, and the payoff could be immense!

General Pollution Prevention Activities and Waste Reduction Tips

- ↓ Separate paper, metals, glass, plastics, cardboard, shrink wrap, and other recyclables from solid waste and implement a recycling program. Debris such as plastic can choke and suffocate aquatic life such as fish and turtles. Don't litter on land or water.

- ↓ Participate in a hazardous waste collection program – include antifreeze, paint, thinner, oil, oil filters, bilge water, batteries, gasoline, fluids, solvents, and oily rags. Keep used solvents separate from used oil. Never mix different wastes. Never pour hazardous materials down the drain, on the ground, or into the surface water.
- ↓ Observe state and federal marine toilet rules. Keep disease-carrying bacteria out of the water by using holding tank pump outs, and always pump out on shore. To locate a pump out station near you, call the Michigan Department of Natural Resources District or Field Office.
- ↓ Purchase a reusable canvas cover for boat storage. This will reduce waste generated by using shrink wrap; however, if you do use shrink wrap, participate in a shrink wrap recycle program.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL ASSISTANCE DIVISION
PO BOX 30457
LANSING MI 48909-7957
www.deq.state.mi.us



Environmental Assistance Center

1-800-662-9278

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY



⚓ Look for marinas offering a closed-loop hull-blasting system for hull servicing. Use only dustless vacuum sanders. Always perform boat repairs at an off-site location away from the water to avoid potential environmental harm to coastal waters. Cover the ground with tarp and skirt the hull while servicing. When done, properly dispose of paints and paint chips.

⚓ Know and use environmentally friendly bottom paints such as those containing vinyl, silicone or Teflon, or containing organic ingredients such as cayenne pepper. Protect the paint surface regularly with a coat of slick bottom wax. Avoid ablative, non-ablative (sloughing), and hard anti-fouling paints containing toxic metals such as copper, mercury, arsenic, or TBT, pesticides, or biocides. State and federal regulations prohibit the use of toxic organotin anti-fouling paints such as tributyltin (TBT)-based paints.

⚓ Use drip pans or trays when changing fluids or working on engines. Keep motors finely tuned to increase fuel efficiency, reduce consumption, and discharge fewer pollutants into waterways. Prevent boat repair waste from contaminating stormwater runoff.



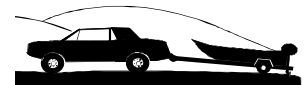
⚓ Locate a marina that offers a bottom wash recycle system. Use a phosphate-free, biodegradable cleaning agent. Nutrients such as phosphorus and nitrogen contribute to algae blooms and other nuisance plant growth, making lakes and streams harmful to fish and limiting boating and other water recreation

activities. Careful use of cleaning substances is essential to keep them from entering the surface water. Avoid cleaners that emulsify or contain phosphates, ammonia, chlorine, caustic soda, surfactants, or potassium hydroxide; and eliminate in-water hull cleaning. Read the labels and be aware of what they mean.

⚓ Properly maintain the engine; use non-toxic bilge cleaners and/or bilge pillows that digest hydrocarbons. You may also use untreated bilge pillows or oil-absorbing sponges. Properly dispose of any oil-absorbing sponge or pillow after use. Control accidental losses of oil or other polluting materials. One quart of oil can contaminate up to two million gallons of water. Control bilge water to keep oil from being pumped overboard. Avoid bilge cleaners that emulsify or contain phosphates, ammonia, chlorine, caustic soda, surfactants, or potassium hydroxide, or cleaners that break down oil into microscopic fragments. Never use detergents or degreasers to clean the bilge.

⚓ Prevent gasoline and diesel fuels from entering the surface waters and creating toxic slicks in the water. Never top off tanks when fueling.

⚓ Zebra mussels, ruffe, spiny water fleas, and Eurasian milfoil are four destructive and aggressive invader species looking for a ride to a new lake or stream. People, boats, and fishing gear easily transport these pests. Prevent the spread of exotic species, which cause severe



habitat alteration and degradation, with a thorough inspection of your boat and fishing gear. Clean all mud and plant debris from your boat's hull, trailer, propeller, motor, bilge, live well, and anchors before leaving the boat launch. Properly dispose of collected material.

- ↴ Boat wakes contribute to shoreline erosion and can stir up bottom sediments reducing light essential to submerged aquatic vegetation. Stirring up sediments will cause the water to become cloudy, or turbid, damaging fish gills and making it difficult for fish and aquatic insects to see, breathe, and feed properly. Avoid wakes and propeller washes by reducing boat speed before reaching speed buoys.



- ↴ Use suitable facilities for fish wastes. Recycle fish wastes by using in compost and gardens. State regulations prohibit the dumping of fish wastes into surface waters.
- ↴ Pet wastes left on the ground are carried away by storm water, contributing harmful bacteria, parasites, and viruses to our waters. Therefore, pet owners should use designated dog runs and disposable bags for clean up after pets.

Pollution Prevention Resources

Publications and Information Sources:

- ↴ Michigan Department of Environmental Quality
Environmental Assistance Division
Environmental Assistance Center
P. O. Box 30457
Lansing, MI 48909-7957
1-800-662-9278



- ↴ Michigan Department of Environmental Quality
Office of the Great Lakes
P. O. Box 30473
Lansing, MI 48909-7973
517-373-3588

- ↴ NMMA
Water Watch
200 E. Randolph Drive, Suite 5100
Chicago, IL 60601-6528

Write to receive a complimentary copy of "Water Watch."

- ↴ Michigan Sea Grant College Program
2200 Bonisteel Boulevard
Ann Arbor, MI 48109-2099
(313) 764-1138

Web Sites:

- ↴ www.deq.state.mi.us/ead
*Michigan Department of Environmental Quality
Environmental Assistance Division*



Oversees a number of assistance and information activities leading to improvement in environmental quality, with an emphasis on pollution prevention.

- ↴ www.MEEF.org
Marine Environmental Education Foundation Inc.

Creator and national organizing sponsor of the National Clean Boating Campaign. Provides educational information which result in cleaner water for the boating public.

- ↴ www.pacific.ccg-gcc.gc.ca/Epages/offboat/pae/pme.htm
Canadian Coast Guard's "Protecting the Aquatic Environment: A Boater's Guide"

Highlights boat maintenance, garbage, fueling, antifreeze, paint, batteries, introduced species, and spill reporting.

↙ www.cmc-ocean.org/search.html
Searchable for “boats” on clean up campaigns, youth educational activities on boats and the environment.

↙ ceres.ca.gov/coastalcomm/web/boatbib.html#FACT
“Annotated Bibliography of Marina and Recreational Boater Pollution Education Material”

↙ www.dnr.state.oh.us/odnr/watercraft/laws/opsguide/envir.html
“Boating and Environment”
Ohio Department of Natural Resources; clean boating tips and information.

↙ [seagrant.gso.uri.edu/riseagrant/Rhode Island Sea Grant](http://seagrant.gso.uri.edu/riseagrant/Rhode%20Island%20Sea%20Grant)
Offering publications on-line about marina and boating environmental management, including fact sheets on sanding and painting, vessel sewage, bilges and fueling, engine maintenance, and vessel cleaning and fish waste.

↙ nsgd.gso.uri.edu
National Sea Grant National Depository
Searchable archive of all Sea Grant funded documents since 1967, including hundreds of studies on boating, marinas and the environment, plus brochures and fact sheets.

↙ www.dot.gov/dotinfo/uscg/hq/g-m/nmc/seapart.htm
US Coast Guard Sea Partners
Environmental education and outreach program focused on communities to develop awareness of maritime pollution issues and to improve compliance with marine environmental protection laws and regulations.

↙ www.dnr.state.mi.us
Michigan Department of Natural Resources (DNR)
The DNR offers a variety of brochures, fact sheets, guides, newsletters, and reports designed to inform the media, public, educators, and business people about Michigan's natural resources.

↙ www.greatlakesportsocall.com
Link to boating on the Great Lakes featuring several ports on the Great Lakes.

↙ www.MidwestConnection.com
Helpful and free Internet guide to the public containing information on state and private harbors and ports of call, lighthouses, scuba diving and shipwrecks, fishing, and additional related items throughout the Great Lakes region.

The Michigan Department of Environmental Quality (MDEQ) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability, or political beliefs. Questions or concerns should be directed to the MDEQ Office of Personnel Services, PO Box 30473, Lansing, MI 48909.

VESSEL MAINTENANCE AND REPAIR

What it is and Where it Comes From

In the *Good Mate* program, *vessel maintenance* is considered to be surface cleaning, washing, waxing, and other maintenance such as regular inspections of through-hull fittings. *Vessel repair* is considered to be sanding, grinding, painting, repairing plastic, and hull scrubbing. This discussion applies to marina and boat cleaning activities that take place in or out of the water, but are not of an industrial shipyard nature. Engine maintenance activities such as changing oil and oil filters and fuel line repair are discussed in the oil and fuel section.

Traditional antifouling paints rely on copper to prevent fouling. Typically, copper makes up 40 to 75 percent of the active ingredients, in the form of cuprous oxide. The paint works because it is “contact leaching.” That is, because the paint is semi-porous it allows the copper to chemically leach out as water comes into contact with it, thus preventing the growth of algae, barnacles, and other organisms on the boat’s hull. More copper tends to be released when the paint is new; the release rate gradually tapers off as the paint ages, which leads to more fouling problems. To prolong the life of this type of paint, more copper is added to the mix.

The environmental impact of small quantities of copper leaching from antifouling paints is far from clear, but it is known that copper in high concentrations is toxic. At this time, the most that can be said is that copper in paint may affect the environment adversely in the long term.¹ Copper causes galvanic corrosion on aluminum hulls, so paints using tin compounds often are substituted.

Tin compounds have been found to prevent fouling on all types of hulls, but these materials also have environmental and health side effects.² Tributyltin (TBT), one of the most highly effective and environmentally dangerous antifouling agents, was used on hundreds of thousands of recreational vessels before regulatory controls were put in place in 1989. TBT is believed to be responsible for deformed and dying oyster beds. The Environmental Protection



Agency eventually classified these compounds as restricted-use pesticides in the United States.³ Regulations in the United States and Europe now prohibit the application of most types of tin paints, except to aluminum hulls, and then only by trained and certified professional technicians. TBT paints are still available in some parts of the world.⁴ A draft resolution up for review before the International Maritime Organization Marine Environment Protection Committee would ban all new TBT applications on commercial ships by 2003 and would prohibit the compound completely by 2008.⁵

Congress regulated the use and application of TBT with passage of the 1988 Organotin Antifouling Paint Control Act, which restricts the method of application, type of applicator, and size of vessel that may use antifouling paints containing TBT. In response, paint manufacturers have tried to reduce the toxicity of marine paints while preserving antifouling and textural benefits. The search for new materials that will both improve antifouling performance and longevity, and be kind to the environment, has led companies to add compounds called biocides or algacides to their paints as well as other antibiotic compounds, pre-ceramic coatings, and even chili pepper extract.⁶

Normal maintenance goes beyond painting your boat. It includes keeping your boat in good, safe operating condition, cleaning it regularly, replacing and properly recycling your battery, inspecting emergency flares yearly to ensure they work properly, and regularly inspecting for leaks of your vessel's through-hull fittings.

Impacts

Impacts on the Environment

Depending on the method used, vessel sanding and cleaning can lead to increased particulate matter entering the water column. Such material inhibits the ability of sunlight to penetrate the water column, which inhibits photosynthesis and the ability of aquatic grass beds to grow. Reduced aquatic grass beds reduces the ability of many small organisms that depend on the grasses to thrive and grow, while also reducing the grasses' ability to hold sediment in place. The net effect is overall poor quality water that is practically devoid of aquatic life.

Cleaners and detergents may add nutrients (e.g., phosphorus, nitrogen) to local waters. Excess nutrients degrade water quality and promote excess algae growth that leads to algal blooms. An *algal bloom* is the massive reproduction of tiny, single-celled algae. Increased algal growth leads to increased competition for oxygen. An overpopulation of algae eventually leads to a great decrease in oxygen in the water that can literally lead to the suffocation of fish and other aquatic animals.

Impacts on Species

Many cleaning products are safe to use in our homes because household wastewater is usually treated at treatment plants before being discharged into local waterways. However, when used on boats, those same cleaners can be discharged directly into the water without any treatment, and hence may be lethal to aquatic life.

Cleaning products often contain ingredients such as ammonia, phosphate, chlorine, and hydrocarbon byproducts that can be toxic to aquatic life. The most damaging pollutants are those that persist and tend to increase in concentration as they are transferred through the food chain.⁷ Any substance that is hazardous to our health can be deadly to an aquatic organism. Burning eyes and irritated skin are indications that the product is hazardous.

When exposed to chemical degreasers, finfish lose the natural oils required for oxygen exchange along their gills, and the fish may suffocate. Detergents reduce the amount of oxygen in the water, impair gill function in fish, and reduce the ability of seabirds to stay warm and dry.⁸ Metal ions, such as zinc and copper, can attach themselves to gill membranes and inhibit oxygen exchange. The result is reduced appetite, poor swimming performance, slow growth rate, and reduced reproductive capability.

The leaching of toxins from antifouling paints on a vessel's hull kills biological organisms that attach themselves to the hull.⁹ However, the toxins may also be absorbed by oysters, worms, and other aquatic life and be passed up the food chain to fish, birds and mammals, including humans. Toxins may also accumulate in bottom sediments,¹⁰ where they have the potential to remix with the water during subsequent bottom disturbances, such as channel dredging or storms.

In addition to cleaning and painting activities, marine vessels often use batteries that should be replaced yearly to ensure they will operate properly and pyrotechnics (flares) that need to be inspected annually to insure their use in an emergency. Most batteries contain lead and/or cadmium, both of which are detrimental to the environment. Cadmium is potentially toxic and may accumulate in fish tissue, and lead is known to have severe and chronic effects upon humans, especially on children. Flares contain phosphorus and may degrade after numerous "sweatings," so they should be stored in a dry, airtight, but easily accessible container. Because of their toxicity, flares and batteries should be disposed of only in approved containers and locations (see Best Management Practices, below).

Impacts on the Economy

The closure of any inland or coastal aquatic area due to chemical contamination can have a devastating impact on local economies and hurt future tourism trade. Chemical pollution can take years to clean up and can cost millions of dollars.



What Can I Do About It?

Marinas, as well as individual boaters, must play a role in reducing the pollution associated with vessel maintenance and repair. One way is to incorporate best management practices (BMPs) into daily marina operations and boating activities. BMPs are management measures that ensure environmentally responsible behavior. The following are some BMPs that boaters and marinas can implement to reduce vessel maintenance and associated vessel repair pollution.

Best Management Practices for Boaters

WASHING AND CLEANING YOUR BOAT

To stop toxic cleaning products from entering the nearshore waters, boaters should:

- Rinse their boat only with fresh water after each use. A good, freshwater rinse can help stop organism growth and will extend the life of the boat's protective paint coating. Rinsing after each use also reduces the need for cleansers and heavy-duty products.
- Look for catch basins or other collection systems at the posted wash areas of your marina, and use them. Such systems stop paint resins, chips and other hazardous products from entering the aquatic environment. If your marina does not have such a system, encourage them to install one.
- Use old-fashioned and less harmful cleaning methods, including baking soda, vinegar, lemon juice, borax, and "elbow grease."

Selecting soaps and cleaning products:

- Ask your marina store to stock environmentally friendly cleaning products as alternatives to harsh cleansers. Boaters should purchase the least toxic product available to do the job. Examine the warning label. If it is hazardous to humans, it is hazardous to the aquatic environment.
- Look for the words "phosphate-free" and "biodegradable" on the product label.
- Buy only what you need. The smaller the product container, the smaller the potential spill.
- Keep open cleaning products away from the open deck.
- Clean spills with a rag (instead of hosing); make sure you dispose of the rag safely or stow it to clean other spills.
- Share your leftover supplies with other boaters or dispose of them safely and properly onshore according to product labeling or the marina operator.

SANDING AND SCRAPING YOUR BOAT

Sanding and scraping a boat can release paint and varnish particles into the air and water around you. Toxic dust particles can irritate a person's lungs and eyes and can also affect the health and reproductive systems of fish, birds, crabs, and other sea life. It is important boaters contain their mess as much as possible. The following are some tips for do-it-yourself boat scrapers:

- Conduct all sanding and scraping on shore, away from the water and preferably in a dedicated work area.
- Use a vacuum sander, a tool that collects and stores paint particles before they get into the water or into your eyes and lungs.
- Lay tarps under the work area to catch loose particles and use a vacuum to remove the loose material. If a vacuum is not available, lift the tarp, collect the scrapings into a sealed container, and dispose of it on shore.

PAINTING YOUR HULL

Keeping a boat bottom free of algae, barnacles, and other growth ensures smooth, fuel-efficient boat operation. Consider using some of the less damaging boat paint alternatives mentioned on page 28. They effectively protect the hull without harmful pesticides and metals. Some contain ingredients such as silicone or Teflon, while others contain intense concentrations of organic ingredients, such as cayenne pepper. All paintwork should be conducted on shore in a dedicated work area using a tarp to capture drips and spills.

Encourage other boaters to learn more about the laws applying to boat bottom paints as well as alternative painting products by contacting the EPA, their state boating agency, and their local marine supply store.

Other ways to slow organism growth:

- Rinse and wipe the hull with fresh water after each use.
- Apply a good coat of wax with "elbow grease" each season.
- Dry dock or haul the boat after each use; this may totally eliminate the need for antifouling paints.

MAINTAINING BOAT OPERATIONS

Performing routine maintenance on a boat and its engine can improve boat and engine operation. A clean, well-operating boat lasts longer and reduces the amount of pollutants entering the water. Boaters can keep their vessels in top working condition by:



- Tuning the engine regularly. In turn, the engine will operate more cleanly, increase its fuel efficiency, and last longer.
- Steam cleaning the engine in a dedicated service area, rather than using harmful engine cleaners.
- Inspecting the fuel lines routinely. **Failure to properly maintain a fuel system can lead to a catastrophic explosion.** Unleaded fuels can contain alcohol, which corrodes rubber hoses. If there are signs of deterioration – dry, cracked areas or soft, tender spots – replace the hoses immediately with fresh ones marked “USCG Type A.” The Coast Guard has also approved an alcohol resistant fuel hose: SAEJ1527.
- Regularly inspecting its through-hull fittings, such as the depth finder transponder and cooling water intakes, for leakage. A sinking vessel not only poses a great safety risk to its passengers but an unmanned vessel sinking at its dock or anchorage can introduce a substantial amount of fuel, oil, and chemicals into the water.
- Using non-toxic bilge cleaners. Many bilge cleaners are harmful to the environment since they merely break down oil into microscopic fragments that are pumped out in the bilge water. Several non-toxic

bilge cleaners actually contain microbes that digest hydrocarbons rather than emulsifying them. A marine dealer should have more product information.

- Disposing of all maintenance products and chemicals properly. Do not throw them in the water or down a storm drain.
- Learning more about hazardous waste disposal by contacting the city, county, or state boating agency and department of environmental quality.

MAINTAINING SAFETY EQUIPMENT

Take care when disposing of batteries and flares. Lead acid batteries should be delivered to a lead acid battery retailer or wholesaler for proper disposal, or to a collection or recycling facility authorized by the Environmental Protection Agency or your state’s department of environmental quality. Expired marine flares can be kept on board as a back-up for new flares (but new flares should be kept separate from the old flares), or donated to vessel safety training programs. If they must be disposed of unused, they should be treated as hazardous waste. Contact the appropriate agency in your state for proper disposal requirements. For more information see Appendix C.

Best Management Practices for Marinas

Common management strategies that are relatively easy to implement include the following:¹¹

- Conduct all repair work and maintenance in designated work areas. These areas should be surrounded by berms, and have an impervious floor to contain spills and make sweeping up easier. Sweep the work area frequently. Operations such as pressure washing, steam cleaning, sanding, painting, repairing and constructing fiberglass, varnishing, and woodworking are best suited for these areas.
- In outdoor work areas the work must be performed over tarpaulins if there is no hard surface to aid cleanup. Sweep and vacuum the tarps frequently. Cover storm drains near the work area to prevent waste from being carried into marina waters by the storm water. Vacuum hull maintenance areas regularly to remove trash, sanding, paint chips, etc.
- Install water catch basins or other collection systems in boat wash areas.
- Scrubbing and using abrasives on boat bottoms while in the water create pollution. *A plume of blue or red when a bottom is being scrubbed means that copper particles are being released into the water column.* Scrub only hard finish bottom paints in the water. Gently sponging soft painted bottoms will not release as much paint, and the paint job will last longer.
- Pay special attention to traditional teak cleaners, which are caustic. They contain strong chemicals for bleaching the teak. *Any product that recommends the user to wear rubber gloves or take special safety precautions is harmful to the environment as well.* Mild soaps, scrub brushes, and water washdowns will keep teak decks non-skid and clean.
- Reuse thinners and solvents whenever possible. Let the particles settle, and then drain off the clear solvent for reuse. The sludge is hazardous waste and should be disposed of according to local regulations.
- Plastic sheeting used to protect surfaces should also be dried out and reused rather than discarded.
- Encourage boaters to read the product warning labels and wear appropriate clothing and equipment to protect their skin, lungs, and eyes from injury.

Also:

- Make environmentally friendly cleaning and maintenance products available to your customers.
- Provide a place, such as a clearly marked bin outdoors, for boaters to deposit batteries and unusable flares and empty the bin regularly.

- Educate boaters on the potential harm caused by cleaners and detergents that contain ammonia, bleach, sodium hypochlorites, and petroleum distillates.

In addition, post these tips (or insert them with purchases as a flyer) for marina visitors and customers:

- Rinse and wash your boat with fresh water in a contained area every time you take it out of the water.
- If your vessel is in the water, wash it by hand using fresh water. *Remember: more frequent cleaning with less potent materials will be much kinder to the environment.*
- Use phosphate-free, biodegradable detergents and cleaning compounds.
- Wax your boat every year — a good coat of wax will prevent surface build-up.
- Remove the vessel from the water to perform above- and below-waterline scraping, sanding, plastic repair, painting, and barnacle removal. Keep the vessel in a contained area.
- Capture and contain particulate matter when working on your boat.
- Perform maintenance activities in dry-dock or another enclosed area.
- Dispose of batteries and flares properly. Batteries should be given to marina staff or taken to local municipal/government recycling centers. Flares should be given to marina staff or local law enforcement agencies. **Do not discard batteries or flares into a dumpster. They are toxic waste!**

Regulations

The primary regulations governing vessel maintenance activities focus on the use and disposal of cleaning materials and associated paint and repair work. Local solid waste statutes and the 1988 Organotin Antifouling Paint Control Act govern the disposal of used cleaning materials, empty containers, and unused paints. The Clean Water Act prohibits the discharge of harmful quantities of pollution into waters of the United States, and each state has its own specific regulations. Under the Clean Air Act, marinas need to be cognizant of volatile organic compound (VOC) limits for marine paints. Boaters should use and marinas should stock only marine paints that comply with local, state, and federal VOC limits. It is recommended that marina operators contact their respective state and local governments prior to boat painting, as well as city and county governments and local waste haulers, to determine restrictions or limits on waste disposal options.

Resources and Contacts

Waste Disposal Information

Call your local Solid Waste Department if you have questions about solid waste disposal, waste reduction, household chemical disposal, or recycling.

Hazardous Waste Disposal Information

The Environmental Health and Safety Online site, http://www.ehso.com/EHSO_HazWaste.htm, has links to state agencies and contacts.

Air and Water Emissions

Additional information on proper management strategies to reduce particle emissions to the environment may be obtained by contacting your local Department of Environmental Quality.

To Report Pollution

If you observe any boat not complying with water pollution regulations, report it to the U.S. Coast Guard Marine Safety Office (MSO). Call the toll-free Coast Guard hotline at 800-368-5647 to locate the MSO near you.

Visit the following websites for more information on boat maintenance pollution and prevention:

The Ocean Conservancy Website

www.oceanconservancy.org

U.S. Coast Guard Website

www.uscg.mil

U.S. Coast Guard Auxiliary

For information on the Vessel Safety Check (VSC) program, boater education, and other boating safety related issues: www.cgaux.org

U.S. Power Squadron

For information on boater safety and education programs and boating related issues: www.usps.org

References

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- 4 Ibid
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- 7 US Congress, Office of Technology Assessment. *Wastes in the Marine Environment*. Washington, DC, 1987.
- 8 Atlantic States Marine Fisheries Commission. *Protecting Fish Habitat- A Guide for Fishermen and Boaters*. Undated Brochure.
- 9 US Congress, Office of Technology Assessment. *Wastes in the Marine Environment*. Washington, DC, 1987.
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- 11 International Maritime Organization. *An Environmental Guide for Marinas and Boatyards*. no date available.

