

# *Shipshape Shores and Waters*

**A Handbook  
for Marina Operators  
and Recreational Boaters**





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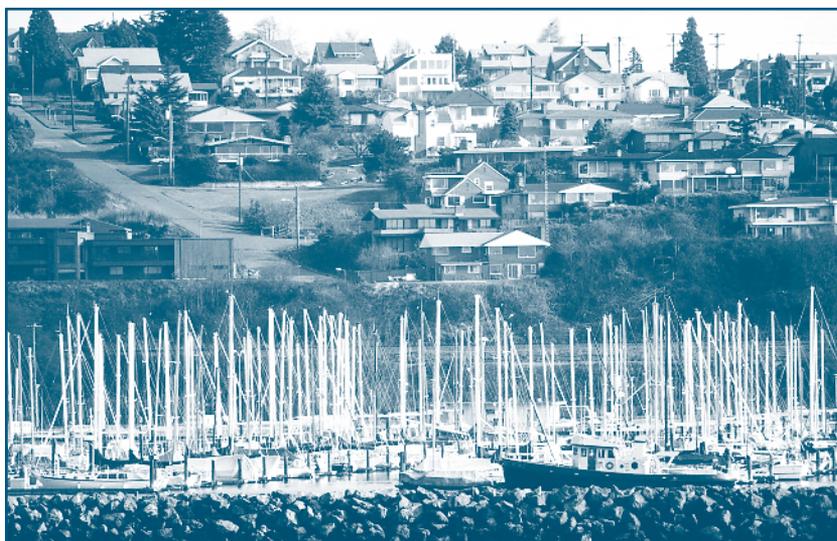
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## Why Be Concerned?

Nearly 17 million boats and more than 11,000 marinas and boatyards<sup>(1)</sup> are in use today across the United States. The growth of recreational boating and related activities like swimming and fishing has led to an increasing awareness of the need to protect the quality of our nation's waterways. It's up to all of us who recognize the value of clean and clear waters to be conscientious stewards who protect and maintain healthy water quality. Through such awareness we'll be able to ensure that boating remains good, clean fun and is sustainable well into the future.

### Marinas in the Watershed

Many of the activities we do on the water and at marinas contribute to nonpoint source pollution—polluted runoff that occurs when rainfall or snowmelt washes over land, picks up pollutants, and deposits them into receiving waters. Because marinas are located right at the water's edge, there is a strong potential for marina waters to become a recipient of pollutants, generated not only by boats and the marina itself but also from upland areas in the watershed. A watershed comprises all the land that drains into a single stream, lake, or estuary, and such waterbodies are the most common marina locations.



Each marina is located at a shoreline—and within a larger watershed setting.

<sup>(1)</sup>National Marine Manufacturing Association, 2001.

## What are the potential pollutants from boats and marinas?

- Oil and gas, hydrocarbon by-products
- Boat sewage and pet waste
- Trash such as plastic rope/line, sheeting, cans, bottles
- Toxic metals, chemicals
- Solvents
- Antifreeze
- Detergents
- Sediment, nutrients

Boat cleaning products and toxic chemicals used in cleaning boats and in boat engine and hull maintenance that are not cleaned up after the work is completed can be carried away during rainstorms and washed directly into marina basin waters. The effect of a single boat or marina on a waterbody might seem insignificant, but when multiplied by the millions of boats and thousands of marinas in use today, such effects become apparent and significant.

## Benefits of Clean Marinas and Boating

Operating marinas and boats in an environmentally friendly way can result in many benefits.

- Better water quality
- Cleaner, safer marinas for boating, fishing, and swimming
- Healthier fish and shellfish
- Reduced marina maintenance costs
- Higher marina profits
- Increased waterside property values and economic development
- Investment in a sustainable business and an environmental future
- Marina recognition and rewards for environmental stewardship

The Marine Environmental Education Foundation sponsors the National Clean Boating Campaign to celebrate clean marinas and clean boating through demonstrations of best management practices.

Several states recognize marinas for good environmental stewardship with a special designation. In North Carolina, if a marina meets criteria developed by the North Carolina Marine Trades Services and the Division of Coastal Management, it is designated a Clean Marina. Such marinas are eligible to fly the Clean Marina flag and use the logo in their advertising. The flags signal to boaters that a marina cares about the cleanliness of area waterways. Other states with active clean marina initiatives are Florida, Maryland, and Virginia. The Tennessee Valley Authority promotes clean boating through its 265 marinas throughout the Tennessee Valley.



## Management Measures and Practices

To help boaters and marina operators manage their activities in a manner that reduces nonpoint source pollution, EPA published a set of national guidelines and recommended practices in its *National Management Measures to Control Nonpoint Source Pollution from Marinas and Recreational Boating* document.<sup>(2)</sup> The national guidelines are based on a voluntary approach to the operation and management of marinas and recreational boating, recognizing that they operate in different waters all over the country. Management measures are goal-oriented measures to control pollution from nonpoint source runoff at marinas. These management measures are intended to protect water resources, enhance the aesthetic appeal of the marina basin, and protect boaters and aquatic habitat from toxic and other harmful substances. (See box below.)

Specific actions, called best management practices, are used to fulfill the management measures. These practices identify what boaters and marina operators can do to address polluted runoff from marinas nationwide. This handbook introduces many of the practices for clean marinas and clean boating, which are based on the experience and knowledge of marina operators throughout the United States.



Throughout the handbook, keep an eye out for *Commodore Pelican*, who will point out important details and tips not to miss!

### Management Measures for Marinas and Recreational Boating

Marina Flushing

Water Quality Assessment

Habitat Assessment

Shoreline Stabilization

Storm Water Runoff

Fueling Station Design

Petroleum Control

Liquid Material Management

Solid Waste Management

Fish Waste Management

Sewage Facilities

Maintenance of Sewage Facilities

Boat Cleaning

Boat Operation

Public Education

<sup>(2)</sup> See Web site: [www.epa.gov/owow/nps/mmsp/index.html](http://www.epa.gov/owow/nps/mmsp/index.html).



The San Juan Bay Marina in Puerto Rico provides dry stack storage.

## Best Practices

The best management practices discussed in this handbook are organized by activities typical in ship and shore management. Ship and shore management covers good dockside housekeeping, boat operation and maintenance, and marina services and amenities. An additional section on marina design considerations discusses water circulation and quality in marina basins. Many of the practices in this handbook are already in use by marina managers and environmentally aware boaters who value clean waters and healthy aquatic habitat.



For numerous fact sheets for both boaters and marina operators on the topic of boating for fun with an eye on the environment, visit [www.cleanboating.org](http://www.cleanboating.org).

## Education Is the Key

Boater education is one of the most effective ways to prevent and reduce pollution in and around marinas and to keep both marinas and boats shipshape. Because the measures and best practices recommended in this handbook ultimately rely on individual actions, it's important that marina managers, their customers, and employees become educated on the causes and effects of water pollution in marina waters.

# Ship and Shore Management

## Keeping Shipshape

Regular boat maintenance is essential for keeping boats in good operating condition. But some products used to maintain, clean, polish, and paint boats can threaten the health of marina waters. Many of these products contain ammonia, phosphates, chlorine, or hydrocarbon by-products, which are harmful to aquatic life. Boaters can prevent these products from making their way into marina waters with the best practices listed below.

## Boat Cleaning and Maintenance

Recommended best practices for boaters:

- Wash boat hulls above the waterline by hand. Where feasible, remove boats from the water and clean them where debris can be captured and disposed of properly, to prevent runoff into the marina basin.
- Buy and use biodegradable detergents and cleaning products that will have a minimal impact on the aquatic environment.
- Avoid in-water hull scraping or any abrasive process done underwater that could remove paint from the boat hull.
- Thoroughly wash boats taken from the water before transporting them to another body of water to prevent the spread of exotic or nonnative plants and organisms.



Metals and metal-containing compounds are used in boat maintenance and often end up in the water with harmful results. Some of the most toxic metals are:

- Arsenic: used in paint pigments
- Zinc: used to prevent corrosion of engine parts and metal hulls
- Copper: used as an antifoulant in hull paints
- Chromium: used in wood preservatives
- Lead: found in batteries



A new sanding technology is used on hulls at Associated Marine Technologies in Florida—a plastic-medium-blasting dry stripper that captures debris and separates the plastic material from the paint dust. The technology prevents dust from getting into the water and reduces the cost of cleanup and disposal.

Recommended best practices for marinas:

- Promote the use of cleaning compounds that have minimal impact on aquatic habitat.
- Locate pressure washing in a separate area where wash water can be filtered and recirculated.
- Make available and encourage the use of long-lasting, low-toxicity or nontoxic antifouling bottom paints.

### *Good Housekeeping*

Marinas are gateways to the open water, but they also provide a home base for boaters to dock, unload their boats, clean fish, purchase supplies, pump out their holding tanks and portable toilets, and dispose of trash. Boaters also refuel and service their engines at marinas. The following best practices can prevent dockside activities from contributing to water pollution.



Decomposing fish waste in the water robs the water of oxygen, making it difficult for fish and other aquatic organisms to breathe. In addition, floating fish waste is unattractive and foul-smelling.

### **Fish Waste**

Nearly 34 million American anglers take to the water every year to pursue their sport, and at the end of each day, they bring their fish in to clean them at docks or marinas. Fish waste can cause water quality problems at marinas where large quantities of fish are landed, such as places where fishing tournaments are held, or during peak fishing seasons.

Recommended best practices for boaters:

- Clean fish offshore where the fish are caught. Otherwise clean fish at designated cleaning stations where fish waste can be properly disposed of or composted.
- Practice catch-and-release or tag-and-release fishing, which does not kill the fish and produces no fish waste. Through tag-and-release programs, anglers can assist scientists and fishery managers in gaining knowledge about the fish, which helps protect fishing resources.

Recommended best practices for marina operators:

- Install fish cleaning stations at the marina and at boat launch sites.
- Compost fish waste where appropriate.
- Display posters along the docks to remind anglers to properly dispose of fish parts in clearly designated containers.

### Trash Disposal

Garbage in the water looks bad and can cause problems for both wildlife and boaters. Victims include turtles, which often mistake plastic bags for jellyfish; birds, which feed plastic debris to their young; and the thousands of marine animals that die each year because they become entangled in plastic trash like six-pack rings. In addition, intake valves, propellers, and other moving boat parts can become clogged by trash, fishing line, and other debris.

Recommended best practices for boaters:

- Bring your bottles, cans, garbage, and all plastic items back to shore for disposal or recycling.
- Make sure trash is deposited in the properly designated containers.
- Clean up after your pet.

Recommended practices for marina operators:

- Provide covered trash receptacles in convenient locations along the docks and at boat launch sites.
- Install containers for collecting recyclable materials clearly marked for nonhazardous waste materials such as cans, glass, plastics, and fishing line and for hazardous waste such as lead-acid batteries, antifreeze, and used oil and oil filters.
- Encourage patrons to clean up pet waste and provide plastic bags for the waste at specific pet walking areas at the marina.
- Provide boaters with trash bags so that they can bring back what they take out on the water.



It is illegal to discard any garbage into the water from a vessel that is on a lake, river, stream, or any coastal waters up to 3 miles offshore. In the Great Lakes, this no garbage law applies everywhere.





## Engine Maintenance

Maintaining an outboard or inboard engine can pose problems for water quality because of the materials involved—cleaners, oils, transmission fluid, and anti-freeze, to name a few. Oil can be a particular problem because a single spilled cup can contaminate an area the size of a football field.

Pollutants known as petroleum hydrocarbons are found in fuel, oil, grease, and lubricants. These products contain toxic elements and metals harmful to aquatic animals. Bottom-dwelling or bottom-feeding aquatic organisms ingest these contaminants and transmit them up through the food chain until they accumulate in sometimes dangerous concentrations in fish that humans consume.

Hydrocarbons also damage fish directly; damaged fish eggs may not develop properly.

Recommended best practices for boaters:

- Keep engines well tuned. Routinely check for engine fuel leaks, and use a drip pan under engines.
- Avoid overfilling fuel tanks. Use absorbent “doughnuts” or small petroleum absorption pads while fueling to catch splash-back and the last drops when the nozzle is transferred back from the boat to the fuel dock.
- Do not use detergents and emulsifiers on fuel spills. They just help the oil settle into the bottom sediment.
- Avoid pumping any bilge water that has an oily sheen. Use absorbent “biosocks” or pads that capture or digest oil, and dispose of or recycle this material.
- Use vacuum-type systems to change engine oil and suction oily water from bilges.



Locating fueling stations at a separate site away from the concentration of moored boats makes for a safer marina.

Recommended practices for marina operators:

- Recommend the use of fuel/air separators, and install them on air vents or tank stems on inboard fuel tanks to reduce the amount of fuel spilled into surface waters during fueling.
- Recommend and use antifreeze and coolants that are less toxic to the environment. Use propylene glycol-based antifreeze (pink) instead of ethylene glycol-based antifreeze (blue-green).

### *Boating Practices*

Excessive wake from personal watercraft and boat motors can cause damage to both shorelines and aquatic habitats found in shallow waters and along shorelines. Additionally, propellers or jet drives dig visible furrows across the vegetation and sediment on the bottom of waterways, which can take years to recover. Individual boating habits also influence the spread of nonnative species to waters.

Recommended best practices for boaters:

- Pay attention to channel markers and buoy warnings to avoid running aground and stirring bottom sediments.
- Modify speeds in no wake zones to prevent inducing wave energy and shoreline erosion.
- Use appropriate and safe anchoring areas, away from sensitive habitat. Be aware of marine animals that graze in shallow waters.
- Thoroughly rinse out boats with fresh water on land and allow them to dry before moving them into a new body of water. This will help prevent the accidental transfer of plants and animal species from one waterbody to another.

Recommended practices for marina operators:

- Establish no wake zones near the shorelines and shallow channels. Display navigation charts showing sensitive habitat areas and channel depths.
- Alert boaters to sensitive areas containing submerged aquatic vegetation, marine species, and other important aquatic habitat.



White pencil buoys mark slow speed zones near the shore in Biscayne Bay, Florida.



Dumping untreated sewage into the water can:

- Spread disease! Sewage contains bacteria, viruses, and parasites that make humans and animals sick.
- Contaminate shellfish beds! While feeding and breathing, oysters, clams, and mussels filter tiny particles, including bacteria. Pathogens associated with these bacteria can contaminate the seafood we eat and make us sick. Shellfish bed closings can cause significant economic loss to communities.
- Lower oxygen levels in water! Sewage requires oxygen as it decomposes in the water, robbing aquatic organisms of the air they need to breathe. It also acts as a fertilizer for algae, creating nuisance algae blooms.
- Make boating unpleasant for everyone! Unsightly floating sewage can ruin a day out on the water.

## *Boat Sewage and Disposal*

Keeping our waters clean depends on preventing the direct discharge of sewage from boats into the water. It is illegal to discharge untreated sewage into waters designated as “no discharge zones.” No discharge zones are designated for the Great Lakes and in most northeastern states, California, Florida, and areas of the Gulf of Mexico.

Recommended best practices for boaters:

- Before heading out on the water, use the restroom facilities at the marina.
- On recreational boats with a holding tank equipped with a Y-valve and through-hull fitting, the valve should always be kept closed and locked within the 3-mile limit from shore.
- Use the marina’s sewage pumpout station and dump station to empty holding tanks or portable toilets after a day on the water.

Recommended practices for marina operators:

- Install pumpout stations at an accessible location, and provide pumpout service at convenient times and at a reasonable cost by trained marina staff.
- Provide portable toilet dump stations near launch ramps and docks for smaller boats.
- Provide clearly marked signs showing the location of pumpout stations and dump stations at the marina and launch ramps.



- Inspect and regularly maintain pumpout systems, disinfect all suction connections, and ensure that septic receptacles are emptied when full.
- Make clean restrooms available and inspect them regularly.

## Marina Services and Amenities

### *Maintenance Areas*

Marina operators can be especially instrumental in preventing the entry of harmful chemical compounds from cleaning and maintenance products into marina waters. Because marina operators provide maintenance services, rent equipment, and sell cleaning materials, they can determine where and how maintenance is done. Most important, marina operators have an opportunity and the responsibility to educate boaters and employees on protecting water resources by following environmentally friendly maintenance practices.

To maintain clean marinas and clear waters that continue to attract patrons, marina operators could follow these management practices:



A hull maintenance area can be lined with tarps to collect and dispose of debris. Trash cans and recycling bins can also be kept close at hand.

- Provide indoor work space for boat repair and maintenance work and tarp covers for abrasive blasting and sanding.
- Minimize dust and debris when performing boat hull maintenance. When sanding, work in an enclosed space away from the water or use dustless sanders. Use permeable tarps, screens, or filter cloths to capture debris when cleaning, sanding, or painting, and then dispose of it in designated containers.
- Require that hull maintenance areas be cleaned immediately after any maintenance to remove debris. Require that all debris be disposed of properly to prevent rainwater or wash water from carrying contaminated debris into the marina basin.
- Regularly vacuum and sweep service roads, driveways, and parking lots; use porous pavement where feasible.

### *Storing and Handling Liquids*

Marinas are responsible for storing, handling, and disposing of many of the liquid products used on boats and at marinas. It's important to ensure that liquid materials do not become contaminants when in use or being stored. Adequate and safe containment facilities are important in proper recycling and disposal of liquid wastes.

Here are some tips for marina operators:

- Locate storage and disposal areas for liquid materials in or near repair and maintenance areas. Make sure these areas are covered to prevent polluted runoff and are situated on an impervious

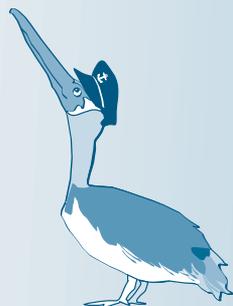
Each type of liquid waste requires a separate, covered disposal container that prevents rainwater from washing the wastes down storm drains or directly into the water. These waste should be removed from the marina for recycling by a permitted hazardous waste material contractor, and receipts should be retained for inspection.

**Waste oils:** waste engine oil, transmission fluid, hydraulic fluid, gear oil

**Waste fuels:** gasoline, diesel fuel, and water contaminated with them

**Maintenance liquids:** antifreeze/coolant, solvents, acetone, paints, thinners, lacquers

**Restaurant liquids:** edible cooking oils, fats



surface (with berms or secondary containment, and away from flood areas and fire hazards).

- Use, and offer for rent, vacuum-type systems for oil changes and bilge water draining.
- Prepare a hazardous materials spill response plan and update it regularly. Keep adequate spill response equipment on hand where liquid materials are stored.
- Provide clearly labeled containers for recycling used oil and oil filters.



Prominently displayed signs help prevent careless handling of used oil at marinas.

### *Fueling Stations*

Spills of gasoline and diesel fuel during boat fueling are common but can be avoided. Usually these are very small spills, and boaters might



As a convenience for boaters, some marinas offer multiple functions at the dock, including fueling and sewage pumpout. An essential step in spill prevention at fuel docks is to identify and locate sources of leaks at joints in piping systems or between pipes and storage tanks.

have the impression that one small spill is not significant. Marina operators can reinforce the message that many small spills accumulate to create a large pollution problem. By using best management practices for fueling stations, marina operators can also send a message that the marina is well prepared to deal with accidents and hazards related to safety and health.

- Install easy-to-read signs on the fuel dock that explain proper fueling, spill prevention, and spill reporting procedures.
- Install personal watercraft floats at fuel docks to help drivers refuel without spilling.
- Locate and design boat fueling stations so that spills can be contained and cleaned up easily.
- Provide automatic shutoffs on fuel lines and at hose nozzles to reduce fuel spills and loss.
- Develop and implement a fuel spill recovery plan. Make sure spill containment equipment storage, such as a locker attached to the fuel dock, is easily accessible and clearly marked.
- Train fuel dock staff in spill prevention, containment, and cleanup procedures.
- Provide absorbent pads and have them available at the fuel dock.

### *General Use Areas at the Marina*

Hull maintenance areas can and do generate potential pollutants (paint chips, sanding dust). However, pollutants from other marina property, including parking lots, restaurants, and swimming pools, should not be ignored. These areas can generate debris, trash, grease, oil, and other chemicals. If left lying around, these pollutants can be washed into the marina basin and negatively affect water quality.

To effectively prevent runoff pollution, it's important not only to prevent debris and spills around the marina, but also to capture or filter the runoff water before it reaches the marina basin. A basic strategy to minimize runoff includes increasing pervious surfaces at the marina to promote water infiltration into the ground rather than allowing the water to run off into the basin. Other strategies include increas-

ing vegetative cover such as grass buffers and biomass beds, which can absorb runoff water effectively.

Recommended best management practices to control storm water runoff:

- Plant vegetated buffer strips between impervious areas such as parking lots and the marina basin. They can include shrubs, grass, and flowers.
- Install oil/grit separators to treat excess petroleum spills, coarse sediment, and contaminated bilge waters.
- Add filters to storm drains, near both work areas and parking lots. Capture pollutants and filter them out of runoff water with permeable tarps, screens, and filter cloth.
- Provide landscaping treatment such as Low-Impact Development islands in feasible areas. Low-Impact Development uses vegetation and biomass materials and minimizes use of impervious surfaces to enhance infiltration of storm water into the ground and reduce runoff volumes.



Adding a vegetated island to a paved parking lot helps to filter storm water runoff and adds more pervious surface area.

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## *Marina Design Considerations*

Good boating practices can keep chemicals, fuel, and trash out of the water; however, maintaining good water quality in and around the marina basin also depends on the location and design of the marina. Water circulation to flush out debris and pollutants that can cause stagnant conditions is a key consideration. Other considerations include shoreline and bottom stabilization, preservation of aquatic habitat, and storm water management. They are especially relevant in decision-making on marina expansion, such as building more boat slips, adding parking spaces, or expanding boat maintenance and repair facilities.

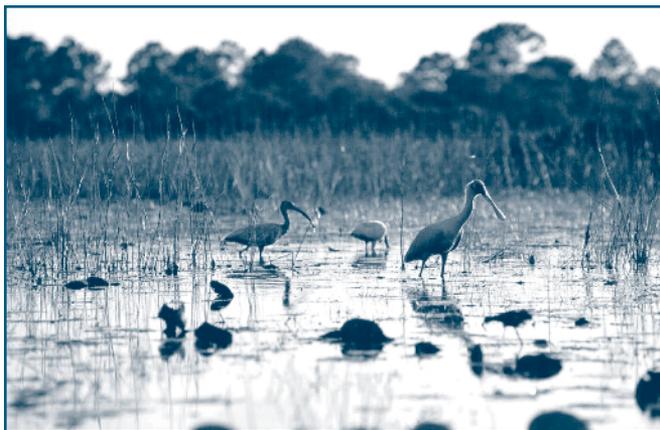
### **Water Quality and Marina Water Circulation**

Water quality in a marina basin depends largely on the circulation of water within the basin. In a poorly flushed basin, pollutants tend to concentrate in the water or collect in the bottom sediment and in tucked-away corners, resulting in stagnant, polluted water. Eventually the marina can be troubled by reduced aesthetic appeal and odor problems.

Conducting a water quality assessment at a marina is important when planning expansion at the marina or evaluating the waters in the marina basin. An assessment provides information on the baseline condition of the water quality in the marina basin. It involves taking samples of water from the waterbody and testing them for dissolved oxygen concentration or pathogens like fecal coliform bacteria. The goal of the assessment is to identify areas that might need protection and ensure that water quality is not impaired because of actions taken at the marina.



Get boaters and other patrons involved in water quality assessments through a volunteer monitoring program. Volunteer monitoring can range from simple visual inspections to water quality sampling. Volunteer monitors increase public awareness of pollution problems, become active in pollution prevention, and help to increase the amount of water quality information available. For more information on volunteer monitoring, check the Web site at [www.epa.gov/owow/monitoring/vol.html](http://www.epa.gov/owow/monitoring/vol.html)



## Aquatic Habitat

Aquatic habitat includes a diversity of submerged grasses, fish spawning areas, plants, and animals. They can be negatively affected by marina-related activities such as construction of boat docks and piers, shoreline erosion, dredging, and speeding boats. Not only can these activities be physically damaging, but they also might introduce non-native plants and organisms that may be harmful.

Recommended best practices for boaters:

- Respect no wake zones and lower boat speeds near shore areas.
- Avoid planting or dragging boat anchors in grass beds.
- Wash boats thoroughly on shore with clean, fresh water before transferring them to another waterbody.
- Avoid dumping of trash, unused bait, and fish waste into the marina basin.

Recommended practices for the marina operator:

- Establish and clearly mark no wake zones.
- Provide a separate area for washing boats on shore away from the water's edge.
- Restrict boater traffic in shallow-water areas.
- Display charts showing shallow-water areas and sand bars near the marina that are to be avoided.

For copies of the technical guidance document  
*National Management Measures to Control Nonpoint Source Pollution  
from Marinas and Recreational Boating,*  
visit: [www.epa.gov/owow/nps/mmisp/index.html](http://www.epa.gov/owow/nps/mmisp/index.html)

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