

## **APPENDIX F**

### **NONPOINT SOURCE POLLUTION FROM MARINAS AND RECREATIONAL BOATING**

## **Appendix F: Nonpoint Source Pollution from Marinas and Recreational Boating**

Marinas, large or small scale, can generate a wide array of pollutants, which can accumulate in the water column, sediments, and aquatic organisms. These include nutrients and pathogens (from pet waste and overboard sewage discharge), sediments (from parking lot runoff and shoreline erosion), fish waste (from dockside fish cleaning), petroleum hydrocarbons (from fuel and oil drippings and spills and from solvents), toxic metals (from antifoulants and hull and boat maintenance debris), and liquid and solid wastes (from engine and hull maintenance and general marina activities; EPA 2001). The effects of these pollutants on waterways and aquatic plants and animals are discussed in this section.

### **Debris and Litter**

The numerous activities that occur at marinas—vessel and engine repair and maintenance, recreation on and off boats, fueling, dock maintenance, and building and grounds maintenance—are sources of a variety of debris and litter. Paper towels and cups, plastic bags, plastic and glass bottles, fish netting, fishing line, discarded oil filters and engine parts, discarded rags, debris from sanding or pressure washing, pet droppings, aluminum cans, and other forms of trash all find their way into surface waters if not disposed of properly (EPA 2001).

### **Dissolved Oxygen**

Sewage discharged from recreational boats, trash tossed into surface waters, pet waste carried to waterbodies in storm water runoff, and fish waste disposed of into surface waters contain organic matter that consumes dissolved oxygen as it decomposes. Consumption of oxygen by decomposing organic matter leaves less oxygen for fish, crabs, clams, and other aquatic organisms. Decreases in dissolved oxygen in several northwestern marinas have been noted in the late summer and early fall, the peak times of marina use (EPA 2001).

### **Metals**

Metals and metal-containing compounds have many functions in boat operation, maintenance, and repair. Arsenic is used in paint pigments, pesticides, and wood preservatives. Zinc anodes are used to deter corrosion of metal hulls and engine parts, and zinc is often a constituent of motor oil and tires. Copper is used as a biocide in antifoulant paints. Chromated copper arsenate (CCA) is used in wood as a preservative. Mercury is contained in many float switches for bilge pumps and shower water storage tank pumps and in air conditioning/heating thermostats. Nickel is a component of brake linings and pavement material, and cadmium is present in batteries and brake linings. These and other metals (aluminum, iron, and chromium) are used in various components at marinas or by recreational boaters and can wash from parking lots, service roads, and launch ramps into surface waters with rainfall (EPA 2001).

### **Petroleum Hydrocarbons**

Sources of hydrocarbons at a marina include fueling stations; operation, maintenance, and repair of boat engines; and storm water runoff from the marina property and off-site upland areas. Petroleum hydrocarbons are contained in fuel, oil, grease, lubricants, finishes, and cleansers. Petroleum can be spilled directly into surface waters when fuel drips from fueling nozzles or a fuel tank is overfilled at a dock. Storm water runoff or seepage can deposit oil, fuel, paint, antifreeze, or other liquids dripped from engines or paint brushes (EPA 2001).

### **Solvents**

Vessel and engine maintenance (painting, cleaning, and repair activities) at marinas utilize solvents that are contained in degreasing agents, varnishes, paint removers, and lacquers. If not properly contained, solvents can potentially enter marina waters through surface water runoff or through ground water transport from hull maintenance areas. Solvents are stable compounds that are insoluble in water, which makes them very mobile in ground water. They are usually heavy, longchain organic compounds, so they sink to an impermeable bottom layer in the ground (like bedrock) and accumulate. Many solvents are known cancer-causing compounds (carcinogens; EPA 2001).

### **Antifreeze**

Antifreeze is used at marinas in dry storage of boats and engine maintenance. It contains either ethylene glycol or propylene glycol. Propylene glycol antifreeze is reported to be much less toxic to aquatic organisms than ethylene glycol and is therefore preferred for use in boats. Both types of antifreeze, however, are considered toxic and should be poured, stored, and drained carefully to avoid spillage. Used antifreeze should be taken to a hazardous waste collection center and recycled if possible (EPA 2001).

### **Acids**

Battery acid is very corrosive and often contains high levels of toxic metals like lead. Cleaning compounds and detergents often contain strong acids or lye. These materials can be washed into the marina basin with the next rain along with the petroleum hydrocarbons, solvents, paint chips, and other material spilled on the ground. Many hazardous waste collection stations accept used batteries (EPA 2001).

### **Surfactants**

Surfactants are compounds used in detergents and other cleaning agents to reduce surface tension. Some are known to be very deadly to aquatic organisms. Surfactants can also accumulate at the water surface and create a barrier against the transfer of dissolved oxygen across the air-water interface, resulting in lowered dissolved oxygen concentrations in the water. For these reasons, surfactants are best not used on boats that are in the water or on upland areas where runoff washes into surface waters (EPA 2001).

### **References**

USEPA. 2001. National Management Measures Guidance to Control Nonpoint Source Pollution from Marinas and Recreational Boating. EPA 841-B-01-005. U.S. Environmental Protection Agency, Office of Water, Washington, DC.