Best Management Practices For New Hampshire Marinas

Guidelines for Environmentally Proactive Marinas

New Hampshire Department of Environmental Services
Pollution Prevention Program

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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Best Management Practices for New Hampshire Marinas

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Acknowledgements

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In 2002, NHPPP will follow-up with the marinas to measure implementation of the suggested BMPs and pollution prevention opportunities. In addition, NHPPP will follow-up with marinas to which the manual was distributed, but were not visited. This will also include assessment of the usefulness of the manual, and number of P2 projects or BMPs implemented at each marina.

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A Reminder

The information provided in this document is intended to give only a very basic idea of the rules, regulations, and management options that must be considered by service facility owners and managers in order to be in compliance with applicable state and federal regulations. While every attempt has been made to make this document accurate and comprehensive, the fact remains that its format requires information to be excluded and simplified. We strongly urge you to contact the appropriate program to provide copies of the actual rules and regulations referred to in this document to insure that you are in compliance.

An "official" hard copy of all DES-related rules may be obtained from the DES Public Information and Permitting Office at (603) 271-2975 or by visiting http://www.des.state.nh.us.

DES is continually gathering information on new BMPs, so this manual is a "work in progress." Your input is welcome. If you have information that you think should be included in this document, if you can suggest corrections, or if you need additional information, please contact NHPPP at DES at (800) 273-9469 or e-mail nhppp@des.state.nh.us.

What is Pollution Prevention?

Pollution Prevention (P2) means the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source, or minimize their release into the environment prior to recycling, treatment, or disposal. Stated more simply, P2 avoids or minimizes generation of waste from the start. P2 also avoids the transfer of pollutants or wastes from one medium (such as air, water or land) to another.

The benefits of pollution prevention are many. They include but are not limited to:

- Lowered waste management and disposal costs
- Reduced operating costs
- Reduced regulatory burden
- Improved production efficiency
- Reduced chemical purchases
- Enhanced company image
- Lower liability risks
- Healthier work place

Introduction

As a marina owner you may wonder why so many regulations affect you. The answer is that there are more small businesses in the United States than large businesses, and collectively the sum of the pollutants generated by small businesses has exceeded the pollutants generated by large businesses. In order to maintain a healthy environment, it has become essential to reduce and regulate the pollutants generated by small businesses. DES wants to help you understand and comply with New Hampshire environmental rules and regulations.

Environmental regulations are necessary to control the amount of pollution potentially released to the environment and to ensure a clean, healthy world for everyone, now and in the future. However, environmental regulations must be implemented in a manner that will protect the environment yet not be an undue financial burden on small businesses. EPA, DES, and the Small Business Technical Assistance Program (administered by DES) are attempting to strike a balance between protecting the environment and ensuring your business remains profitable.

The key to success at your level is getting your employees involved. It is essential that you and your employees become familiar with the environmental requirements affecting your business and take action to remain in compliance. Special emphasis should be placed on employee awareness and seeking to **reduce or eliminate pollutants** from your operations. By becoming more efficient in your usage of raw material, you will reduce the amount of money needlessly being spent to purchase products and dispose of wastes.

Environmental regulations have historically been viewed as a costly intrusion in business operations. Although this may have been true in the past, a proper understanding of the current regulations and accessing the assistance available to you can result in less government intrusion in your business and an increase in the likelihood of economic success. DES has long realized that effective environmental health can only be achieved through a partnership with the business subject to regulations.

Foreword

This manual represents a cooperative effort between DES and the New Hampshire Marine Trades Association (NHMTA). The intent of this document is to protect the quality of New Hampshire's lakes, rivers and estuaries by providing management guidance to the state's marinas. The best management practices (BMPs) discussed in this manual will help marina owners and operators minimize land, air, and water quality impacts associated with marina operations.

New Hampshire is fortunate to have some of the best quality waterways in the United States. Water based recreation is one of the state's primary industries, and its economic success is dependent upon a healthy environment. Marinas are a valuable part of this industry, providing important services such as maintenance and repair, fueling for boats, and winter storage. More importantly however, is that marinas allow reasonably priced water access to those who cannot afford shoreline frontage.

Since the fall of 1992, biologists have been monitoring the water quality at three marinas on Lake Winnipesaukee. During this period an intensive chemical and biological sampling program was developed to identify marina activities that may degrade lake quality. After almost two years of continuous sampling, several water quality trends have become apparent. Each marina studied showed indications of decreased water quality during the summer when boat usage was at its greatest. Also, benthic organisms subjected to toxicity tests using the sediments from each marina showed reduced growth rates at two of the three marinas tested when compared to the control site.

It is likely that the organism toxicity and decreased lake quality observations at the marinas are a result of two primary pollutant pathways. The first source, and probably the most difficult to correct, is the problem of fuel entering the water. Although vessel fueling is a convenient and essential service provided by marinas, there are several inherent risks created when a highly toxic compound such as gasoline is dispensed within close proximity to a water body. Unlike land based fuel stations where a small spill can be easily cleaned up, one gallon of fuel spilled into the water can cover as much as one square mile of the surface if not immediately contained. Common sense and the use of proper safety procedures will reduce this risk, but the problem of overboard fuel vents can only be corrected with the cooperation of the marine manufacturing industry and boat owners. Many boats with inboard fuel tanks discharge excess fuel into the water when the tank is filled. Although new designs are needed, recent technological advances have provided new vents that do not discharge into the water and older boats need to be retrofitted with these new vents.

The second pollutant pathway identified in the study is the funnel effect created by boat ramps. At most marinas, boat ramps act as a conduit, linking the parking lot and maintenance areas directly to the water. Storm water runoff from rain events as well as boat wash runoff can pick up a wide variety of contaminants that include petroleum products, heavy metals, bacteria and nutrients. These pollutants are generated from vehicles and equipment in parking areas and are flushed into the lake via the boat ramp.

Nonpoint Source Pollution

An example of erosion

During the environmental movement of the 1960s and '70s, a more environmentally educated and aware society began taking a closer look at pollutants that were destroying our nation's water quality. Most of these pollutants were easy to detect and restrict, since they were usually discharged into the water through point sources. Point sources are direct inputs such as pipelines and combined sewer overflows (CSOs). In the years to follow, most of the point source pollutants discharged by these means were either eliminated or permitted with toxic limits. Unfortunately, many of the water bodies that had all point source discharges eliminated are still exhibiting impacts.

With this in mind, environmental agencies began to shift their focus from point source pollution to more diffuse sources. *Nonpoint* source pollution (NPS) has become a primary topic in environmental circles during the past decade. NPS pollution can be defined as pollution that is "caused by rainfall or snowmelt moving over and through the ground and carrying natural and manmade pollutants into lakes, rivers, streams, wetlands, estuaries, and other coastal and ground waters" (EPA, 1990).

Another example of erosion

Sources of NPS pollution include construction activities, septic system infiltration, agricultural and forestry practices, marinas and recreational boating, and highway and parking lot runoff.

Erosion at a boat ramp

These sources typically introduce contaminants such as nutrients, petroleum products, biochemical oxygen demand (BOD) loading, suspended solids, and bacteria into lakes, rivers, and estuaries. Water quality impacts caused by NPS pollutants will not only alter the biological integrity of a water body, but can also decrease the recreational and property value in and around the area, leading to a socio-economic decline in the region.

Fortunately, NPS pollution can be reduced with little difficulty if BMPs are used to reduce the targeted contaminant source. Most BMPs are relatively simple, requiring only common sense and a little planning, while others may use low technology treatment devices. A combination of the two can effectively reduce or even eliminate NPS pollution.

An example of a BMP: silt fencing

Lakes and Ponds

A lake ecosystem is a community of interactions among animals, plants, and microorganisms living in a common environment. New Hampshire's lakes and ponds provide the public with a wide variety of outdoor recreational opportunities that are extremely important to New Hampshire's economy and the quality of life offered to those who visit or live in the state.

In order to protect the state's lakes and ponds, DES uses a "watershed approach" method to help reduce impacts associated with human activities. A lake's watershed consists of all the surrounding land that drains into the lake. The lake/watershed relationship is similar to a funnel, where the top of the funnel is the drainage area and the bottom of the funnel is the lake. Watersheds can extend several miles beyond a lake's perimeter, and usually include a wide diversity of land use practices. Some of these practices can have a negative impact on the water body.

Impacts associated with poor land use practices include algae blooms, fish kills, and obnoxious odors, and are often a result of increased phosphorus inputs. Nonpoint source phosphorus pollution is a major threat to New Hampshire's lakes and ponds. Phosphorus is a natural element found in soils and rainfall, but can be artificially placed in the watershed by human activities, which can accelerate a lake's aging process.

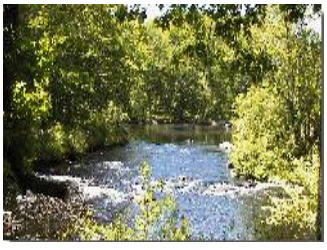
Lake aging is a natural process by which a lake fills in over geologic time with materials carried in from the surrounding watershed, the atmosphere, and the organic mass produced within the lake itself. Although New Hampshire's lakes were formed during the same chronological period (around 8,000BC), they age at different rates because of the differences in runoff and watershed characteristics.

It is important to realize just how fragile a lake is. In most cases, lake flushing rates are low and water retention times are long. Because of this, lakes are large settling basins for nutrients, metals, and sediments. Most of the pollutants that enter a lake will never leave, and increased use of a lake and its shoreline can strain the delicate ecosystem and accelerate the aging process.

Because of their close proximity to a lake's shoreline interface, marinas can play an important role in reducing these processes. The implementation of BMPs will not only reduce the impacts associated with the marina itself, but can serve as a last defense against nonpoint source pollution entering the lake from throughout the watershed.

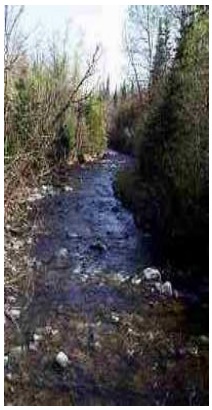
Rivers and Streams

Rivers are another one of New Hampshire's greatest resources. Not only do they harbor a wide variety of wildlife and provide visitors with great scenic beauty, they also support many types of recreational and economic uses. In fact, as one travels from source to sea, the number and types of uses increase proportionally to the rivers volume.



DES is strongly committed to protecting the state's rivers and their many uses. During the past twenty years, a cooperative effort between federal, state, and local officials focused on the cleanup of point source discharges throughout the state. This effort resulted in vast improvements in both chemical and biological quality, especially in the larger rivers where industrial discharges fouled many river miles during the 1950s and '60s. Unfortunately, nonpoint source pollution eluded

many of our cleanup efforts primarily because it was difficult to pinpoint.



Rivers and streams are extremely complicated ecosystems, relying on physical, chemical, and biological processes to determine both its course and productivity. As the volume of a river increases downstream from its source, it undergoes many biological and chemical changes that are shaped primarily by its physical habitat. In the initial reaches of a stream, the principal changes that occur involve shifts in macroinvertebrate and periphyton community structures. These shifts can be attributed to habitat changes that alter the canopy cover and the type of organic matter entering the water. It is in these reaches that productivity levels are less than the respiration rates. There is little sunlight penetration and the organic input is primarily leaf litter, which cannot be directly used by the algae or periphyton that are responsible for productivity.

Marinas comprise a very small percentage of a river's shoreland use, but NPS pollution generated by their operations can significantly alter the delicate ecosystem. Algae blooms can be caused by the use of detergents containing the nutrient phosphorus. As the algal cells decay, oxygen is consumed in the decomposition process, which can stress both macroinvertebrate and fishery populations. Other types of pollution generated at marinas include petroleum products, solvents, acids and bacteria. In addition to reducing oxygen levels, these pollutants can cause long term contamination, and decrease the overall aesthetic and recreational value of a river.

Estuaries

Estuaries are coastal areas where there is an interaction, or mixing, of fresh and salt water. In and around these embayments, which have at least one opening to the ocean, are many kinds of habitats including mud flats, beds of submerged aquatic vegetation, and open water. In addition, many estuaries are flanked by salt marshes and rocky intertidal areas. The influx of ocean water, combined with the nutrient rich river runoff from inland areas, helps create these diverse habitats that are home to a myriad of plants, animals, birds, and fish. In fact, approximately two thirds of the commercially harvested fish and shellfish live in estuaries for part or all of their lives.

Estuaries are also attractive to humans. Scenic views and protected waters of estuarine areas make them a prime location for development. The adverse effects of shoreline alteration, chemicals and sewage from marinas and boats, and the polluted runoff from parking areas degrade estuarine water quality, especially in areas with poor tidal flushing. Loss of habitat, closure of shellfish beds, and degradation of water quality all point to the need to wisely manage and guide marina operations.

Shellfish are extremely vulnerable to NPS pollution because of their inability to migrate from a contaminated area. Also, they are filtering organisms and contaminants that are present in the sediments and water column are filtered and stored in the shellfish's tissue. This is a concern not only to other aquatic life but to humans as well.

Section I.

Siting Considerations for New and Existing Marinas

Natural plant and animal communities serve many purposes. Wetlands provide habitat for fish and fowl. They also form a natural buffer against incoming storms and act as a filter to purify stormwater from the land. In addition, wetlands minimize erosion and support tourism, hunting, and fishing. Because of the ecological, economic, recreational, and aesthetic values wetlands provide, it is important that shoreland development not diminish these features.

Best Management Practices

Redevelop existing sites rather than developing open space.

Identify habitat types and seasonal use by the type of organisms that inhabit the areas.

Minimize disturbance to wetlands and submerged aquatic vegetation. It may be necessary to obtain a permit from the DES Wetlands Bureau. Information can be obtained by calling (603)271-2147 or by visiting http://www.des.state.nh.us/wetlands/.

Follow natural channels.

Marina Design and Maintenance

Land management decisions, operating procedures, and structural improvements may all contribute, or detract from, the quality of the land and water surrounding your marina. Roads and parking areas may convey polluted stormwater directly into adjacent waterways. Dredging may resuspend toxic compounds such as heavy metals, hydrocarbons, and synthetic chemicals. Hazardous chemicals may be leached into the water from piers and other similar structures. Broken or degraded floats may release buoyant debris, which birds and fish mistake for food. Finally, the location and installation of shoreside and in-water structures may lead to accelerated coastal erosion and sedimentation. This may bury bottom dwelling organisms, block sunlight, and clog fish gills.

Best Management Practices

Used fixed or floating piers to enhance water circulation.

- Piers should be placed to enhance, rather than obstruct, water circulation.
- Select an open design for new or expanding marinas. Open marina designs have no fabricated or natural barriers to restrict the exchange of ambient water within the area.
- Install wave attenuators to reduce the force of incoming water, if protection is necessary. Wave attenuators do not restrict water exchange nor do they interfere with bottom ecology or aesthetic view. They are easily removed and do not interfere with fish migration and shoreline processes.

Use environmentally neutral materials.

- For structures that are in or above water, use materials that will not leach hazardous chemicals into the water and will not degrade in less than ten years time (reinforced concrete, coated steel, recycled plastic, plastic reinforced with fiberglass).
- Contain shavings when cutting plastic pilings and timbers.
- Avoid pressure treated wood for pilings and similar structures that are in or above the water. Pressure treated timbers may contribute to water pollution.
- Avoid exotic timbers harvested from tropical forests.
- Purchase floatable foams that have been coated or encapsulated in plastic or wood. As these floats age, degraded foam is contained by the covering.

Minimize the need for dredging.

- Extend piers and docks into naturally deep waters.
- Locate slips for deep draft boats in naturally deep water.
- Dredge channels to follow the course of the natural channel.
- Provide storage for smaller boats.

Best Management Practices for Protecting Sensitive Areas

Minimize impervious surfaces, keeping paved areas to a minimum.

Expand Upward.

- Rather than adding wet slips, extend storage capacity by adding dry-stack storage. Boats stacked in this manner do not accumulate marine growth. Toxic anti-fouling paints are not necessary and the associated need to wash, scrape, and paint is eliminated. Additionally, dry-stacked boats are less likely to accumulate water in their bilges, and are less likely to discharge oily bilge water.

Conserve sensitive land by placing sensitive land in a conservation easement.

Practice water-wise landscaping. Save on water bills, reduce your maintenance activities, and protect water quality by minimizing your water use.

- Select plants that are suited to existing soil, moisture, and sunlight conditions so they will require less care.
- Water deeply and infrequently in either early morning and early evening.
- Select equipment that delivers water prudently, and delivers water directly to the roots of vegetation with minimal loss to evaporation.
- Use mulch around plants to maintain soil water, prevent weeds, and reduce the amount of sediment picked up by stormwater.
- Group plants with similar needs together to ease maintenance burden and conserve water.
- Replace lawn with groundcover, shrubs, and trees.
- Collect rainwater by directing downspouts into covered containers. Use the collected water on your landscaped areas.

Best Management Practices for Creating Habitat Areas

Maintain and/or develop vegetated areas. Vegetation filters and slows the flow of surface water runoff, stabilizes shorelines, and provides wildlife habitat, flood protection, and visual diversity.

Maintain vegetated buffers (grassy or wooded) between all impervious areas and the water

- Plant native and naturalized shoreland plantings. These require minimal care since they are adapted to the local climate and soil types.
- Select perennial plants instead of annuals. They only need to be planted once, tend to shade out most weeds, and few require additional water or maintenance.
- Choose plants that bear flowers, fruit, nuts, and seeds to attract birds, small mammals, and other wildlife.
- Compost leaves, branches, grass trimmings, and other organic matter. Use the mature compost to nourish your soil.

Section II.

Employee Health & Safety

Best Management Practices

Train employees to use equipment and chemicals according to established rules and regulations.

Keep emergency postings near all phones in case of a spill.

Keep all Material Safety Data Sheets (MSDS) in an easily-accessible and localized area.

Have an eyewash station and fire extinguisher in all work areas.

Post "No Smoking" signs in all work areas.

Keep spill kits nearby in case of an emergency.

Maintain a minimum of two-feet aisle space to allow for inspection of at least one side of each container at or near each hazardous waste storage area.

A spill contingency plan should be developed for each area where oil and hazardous materials are used or stored. Such plans should specify potential spill sources, oil and hazardous materials used or stored in the area, prevention measures (security, inspection, containment, training equipment), and spill emergency procedures, including health and safety, notification, and spill containment and control measures. A drainage plan should be included as part of the plan. Emergency telephone numbers should also be included in the plan and posted at critical locations.

Section III.

Waste Streams & Waste Stream Reduction Recommendations

There are different types of waste streams generated in marinas. Waste streams may be generated from cleaning up the maintenance area, painting, or cleaning parts to do repair work. Waste streams may also be generated during maintenance and repair.

Vessel Maintenance and Repair

Hull and deck maintenance and repair are important services offered by most full service boat yards and marinas. Many of these operations are time consuming, tedious, and dangerous, and most boat owners don't have the time, patience or skill to tackle these jobs themselves. However, when these jobs are performed by boat owners, it is the management's responsibility to ensure that all BMPs are followed.

Heavy metals (such as aluminum, iron, lead, nickel, zinc, cadmium, copper, tin and chromium) are contained in paint particles from sandblasting and boat washing, metal shavings from engine oils, bilge water, and runoff from maintenance and repair areas. Metals are also contained in some wood preservatives commonly used in marina construction, such as chromated copper arsenate (CCA). Metal contaminants are also commonly found in urban runoff and some sewage treatment plant and industrial discharge effluents.

Many heavy metals are known to absorb into particulate matter and accumulate in bottom sediments. These pollutants pose an environmental concern because of the potential for bioaccumulation, bioconcentration and, in the case of mercury, biomagnification in aquatic organisms (Connell and Miller, 1984). In addition, mobilization of these pollutants into the water column may result in acute or chronic toxicity to aquatic life.

Best Management Practices

Designate work areas.

- Collect all debris. Clean work areas and remove sandings, paint chips, fiberglass, trash, etc.
- Locate the maintenance area as far from the shore as possible.
- Vessel maintenance areas should have an impervious surface, and, where practical, a roof. Sheltering the area will prevent stormwater from carrying debris into the surface waters.
- If asphalt or cement is not practical, perform work over filter fabric or over canvas or plastic tarps.
- Surround maintenance area with a berm or retaining wall.
- Clearly mark the work area with signs.
- Post signs describing BMPs that boat owners and contractors must follow.

Contain dust from sanding.

- Do not let dust fall onto the ground or water or become airborne.
- Require tenants and contractors to use vacuum sanders.
- Conduct shoreline sanding on the water to the least extent possible.
- When sanding on the water is unavoidable, use a vacuum sander. These tools collect dust as soon as it is removed from the hull.
- Use a damp cloth to wipe off small amounts of sanding dust.

Periodic hull sanding is required for wood vessels and to prepare hulls for both anti-foulant and spray paint applications. Airborne dust generated from sanding operations can contain heavy metals from old paint. If the dust is allowed to enter surface waters and settle to the bottom, benthic organisms can ingest and accumulate the pollutants in their tissue. This can result in bioaccumulation and magnification as the pollutants travel up the food chain (D'Itri, 1990).

The best method to eliminate airborne dust particulates from entering the surface water is to use dustless sanders. These sanders use a vacuum collection system connected to a special housing on the sander. The devices not only collect the sanding dust, but also keep the sanding disk from clogging and losing efficiency.

Do-it-yourself marinas should consider purchasing several dustless sanders and renting them to tenants. Hourly, daily, or by the job rates can be charged, and sales of sanding disks can offset the initial purchase costs.

Contain debris from blasting.

- Prohibit uncontained blasting.
- Perform abrasive blasting in the vessel maintenance area within a structure or under a plastic tarp enclosure.
- Avoid dust entirely by using a stripper that allows paint to be peeled off.

Abrasive blasting operations are often used on wood hulled vessels to remove paint and surface grime. Pollutants associated with this activity include: heavy metals from stripped paint, hydrocarbons from petroleum residues on the vessel, and sedimentation from the abrasive sand and water mixture.

This operation should only be conducted indoors or in an appropriate spray containment booth. It is important to conduct this operation in an enclosed area to prevent any waste materials from being carried into surface waters.

Minimize impacts of pressure washing.

- Reuse the wash water. Recycle it through the power washing system or use it to irrigate landscaped portions of the marina.
- Pressure wash over a bermed, impermeable surface that allows the wastewater to be contained and filtered to remove sediments.
- When pressure washing paint, use the least amount of pressure necessary to remove the growth but leave the paint intact. Where practical, use a regular garden-type hose and a soft cloth.

Whenever possible, varnish or oil teak and other weatherable trim when the vessel is out of water.

Accidental spills of varnishes and solvents can have catastrophic effects on the aquatic organisms in the spill's vicinity, so it is important to perform these activities while the boat is out of water. If this is not possible, especially if tenants do most of the varnish work themselves, set up a shore based mixing station for do-it-yourselfers, so that the potential for accidental spills is reduced.

Fiberglass repairs to hull areas below the gunwale should only be performed while the vessel is out of the water in a dedicated area.

To prevent accidental spills of solvents and hardeners, all vessel repairs to be performed below the gunwale should be conducted while the boat is out of the water in a dedicated, well ventilated enclosure. Safety precautions, such as protective clothing, respirators, and dedicated repair stations with proper ventilation, should be incorporated into the facility's BMPs.

Engine and Mechanical Maintenance and Repair

This BMP addresses general engine and mechanical systems maintenance including winterization, routine lubrications, and repair. Some activities can be performed while the vessel is in the water, but those involving disassembly of outboard engines or lower drive units should be conducted in designated shore based facilities.

Most pollutants associated with these types of operations are generated from accidental spillage. The only exception is winterizing outboard engines, in which the engine is "fogged out". This operation can introduce petroleum hydrocarbons and heavy metals into the water column in both particulate and dissolved forms. These pollutants are generated when lubricating oil is injected into the cylinders of a running engine. The fuel/oil ratio decreases until only oil is being injected. Large quantities of blue smoke caused by incomplete combustion of oil and fuel exit the exhaust port located below the waterline. Contaminants in this smoke can dissolve into the water column and inhibit the growth of aquatic organisms.

BMPs for winterization techniques and other types of maintenance operations are listed in the following section. Most of the items presented only require common sense, but proper implementation can effectively reduce the potential of a serious accident.

Best Management Practices

Ensure that there are adequate absorbent materials in place when performing any type of inboard engine maintenance and repair.

The main risk associated with engine maintenance and repair is accidental spillage of fuel or oil. In many cases, spills originate from changing oil and fuel filters, and since many marine inboard engines have poor access, even a small spill may be very difficult to clean up. Eventually, the

accumulation of oil and fuel residue can end up in the bilge, where it becomes a threat to the surface waters because of automatic bilge pumps.

Prevention is the keyword in these types of operations. Always use absorbent pads when doing any engine work, even if the vessel is out of the water. Absorbents act like a selective sponge, absorbing only petroleum hydrocarbons, but no water. Absorbent materials are available in a wide variety of shapes and sizes including ropes, pads, donuts, booms, and pillows. Special care should be taken to avoid placing these materials in hot places because absorbents do not reduce the volatility of oil and fuel.

Major outboard engine or stern drive maintenance and repairs should be performed out of the water in a designated work station.

Maintenance and repair of outboard engines and stern drive units that require disassembly should always be conducted out of the water. There is a high potential for accidental spills while performing these types of operations. Dedicated repair areas should be used in conjunction with adequate spill control equipment.

Repair and maintain engines with care.

- Store engines and engine parts under cover on an impervious surface like asphalt or concrete.
- Do not wash engine parts over the bare ground or water.
- Use dry pre-cleaning methods, such as wire brushing.
- Avoid unnecessary parts cleaning.

Engine Test Tanks

Test tank wastewater may contain benzene, MtBE, and other harmful constituents. Test tanks should be managed properly to avoid contamination of both surface and ground water.

Best Management Practices

Test tank wastewater should have a hazardous waste determination before being properly disposed of.

For indoor test tanks, consider placing a vent or fume hood above the tank for the health of employees.

If indoors, nearby floor drains should be sealed in case of a leak or spill.

For outdoor test tanks, consider covering the area so no rainwater can get into the wastewater. This would cause water levels to rise, and the test tank to rust.

If outdoors, wastewater should not be drained onto adjacent land. The harmful constituents in the wastewater would eventually contaminate groundwater.

Test tank drain pipes should be permanently closed, so wastewater does not drain into a waterbody.

Test tank wastewater should be cleaned and replaced routinely.

Test tanks should be checked frequently for leaks.

Winterization and Storage

Boat storage may contribute to nonpoint source pollution through the use of heavy equipment (fork lifts and cranes), as well as through various storage procedures (the use of antifreeze, battery storage). One type of storage is the traditional storage of boats within the upland area of the marina, either within closed structures or outdoors, under a shrink-wrap cover. This practice is typically used for winter storage.

The other type of storage is "dry rack storage," in which boats are routinely removed from the water between uses, cleaned, and placed in racks until the next use. These types of facilities may reduce the need for in-water structures. In addition, because vessels are not constantly sitting in the water, the accumulation of fouling organisms on the hulls is minimized, reducing the need for washing, scraping, and painting. Thus, dry-rack storage can help reduce nonpoint source pollution.

Best Management Practices

Use propylene glycol antifreeze for all systems. It's much less toxic than ethylene glycol antifreeze and use the minimum amount necessary for the job.

Part of the winterization procedure for most vessels includes anti-freeze protection for systems that use water for various processes. These systems include raw water heat exchangers, water intake lines for MSDs, and raw water sink pumps. Ethylene glycol should not be used to protect these systems. Not only is it toxic to aquatic organisms, its sweet taste can attract dogs and other pets, who can become sick or even die if enough is ingested. Fortunately, propylene glycol can be used as a substitute because it is an effective antifreeze and is non-toxic. In fact, it has almost totally replaced ethylene glycol because it is less expensive to produce and there are no negative environmental impacts.

- Be sure fuel tanks are 85-90 percent full to prevent flammable fumes from accumulating and to minimize the possibility of condensation leading to corrosion.
- Use the highest rated octane recommended by the engine manufacturer.
- Be sure the gas cap seals tightly.

Absorbent devices provide excellent protection against accidental discharges of contaminated bilge water. Encourage or require your tenants to keep them in their bilges and/or engine compartment to ensure that there are no accidental petroleum discharges. Inspections of these devices should be conducted periodically.

Promote reusable canvas or recyclable plastic covers.

Recycle shrink-wrap covers.

Shrink-wrap is difficult to dispose of and generates a large volume of waste. Fortunately, some areas have begun shrink-wrap recycling programs for marinas as companies are cropping up that will collect used shrink-wrap and recycle it. Dr. Shrink offers a shrink-wrap recycling program. They can be contacted at 1-800-968-5147 or visit http://www.dr-shrink.com. Dockside Boat Reconditioning, Inc. also offers a similar program and can be contacted at 1-401-351-7130.

Bilges should be inspected and cleaned prior to extended vessel storage. All water, oil, or foreign materials found in the bilge should be cleaned using approved absorbent materials to remove contaminated bilge water.

Section IV.

Hazardous Waste Management

What Is A Small Quantity Generator?

As per New Hampshire Hazardous Waste Rules (Env-Wm 503.01), a small quantity generator (SQG) is any generator who, in each and every month, generates less than:

1. 100 kg (220 lbs.) of total hazardous wastes.
2. 1 kg (2.2 lbs.) of an acutely hazardous waste.
3. 100 kg (220 lbs.) of any materials resulting from a spill of an acutely hazardous waste.

Many marinas qualify as small quantity generators. SQGs who **never accumulate greater than 100 kg (220 pounds) on site at any one time** are subject to only the core management requirements outlined below (nor are other wastes listed under Env-Wm 503.03).

Oil Waste Streams

There are numerous potential sources of hydrocarbons within marinas, including fueling docks, engine repair or maintenance activities, dredging, urban stormwater runoff, and boat operation.

During fueling operations at fueling docks, hydrocarbons (in the form of dripping gasoline or diesel fuel) may be discharged into the water, onto the dock, or onto adjacent land areas. Accidental spills or releases during fuel delivery may result in the discharge of hydrocarbons directly to the receiving water or via surface runoff or groundwater transport. Leaking storage tanks may also result in such discharges.

The drippings and drainings from marine repair and maintenance may contain fuels, oil, or other oil-based lubricants. If not properly contained, these drippings and drainings may enter the receiving water via surface runoff or groundwater transport from work areas.

Urban stormwater runoff also contains petroleum hydrocarbons (Athayde et al., 1983). Therefore, runoff from parking areas, boat ramps, and other impervious areas may contribute hydrocarbons to the freshwater and marine environments.

Used Oil

Generally, used motor oil contains additives and metals such as lead, zinc, arsenic, and cadmium. Used motor oil may have high concentrations of chromium resulting from wear of metal parts in the engine, and can also be contaminated by fuel, water, antifreeze, and chlorinated solvents.

Recyclable used oil can either be on-specification or off-specification, depending on the level of contaminates such as lead, cadmium, PCBs, and other criteria, such as flashpoint and the presence of chlorinated solvents. The quality of used oil determines the type of burner in which the oil can be burned. Therefore, most generators are required to conduct an initial used oil determination for

certain contaminates, unless the used oil is comprised solely of automotive oils, including motor, engine, gear, and transmission oils. Motor oil from marine vessels is considered part of the category that does not require an initial used oil determination, provided that the oil has not been mixed with any other types of oil or hazardous waste. Additionally, if the oil is transferred directly to a person who burns the used oil, the marina is considered a used oil marketer and will be subject to specific requirements under the hazardous waste rules including analytical testing of each batch of used oil. For this reason, DES recommends that marinas ensure delivery of used oil to an authorized used oil marketer who will blend and test the oil prior to distribution.

Although used oil is a listed hazardous waste in New Hampshire, it is subject to less stringent requirements if it is sent for recycling, by being burned for energy recovery or being re-refined. Otherwise, it must be managed as a hazardous waste. Recycled used oil is regulated under the N.H. Hazardous Waste Rules, Env-Wm 807, and the N.H. Solid Waste Rules, Env-Wm 2605. There are three options for managing used oil which is destined for recycling:

- Work with a marketer who may provide the used oil to end users. If a marketer transports your oil to a waste oil burner, asphalt plant, or industrial boiler, and that used oil is burned to recover energy, recycling requirements have been satisfied. Under this scenario, the generator of the waste oil would be subject to the used oil generator standards at Env-Wm 807.06.

- Provide used oil directly to an end user. Although a generator may give used oil directly to a burner, this option can increase liability, making it imperative to know who is transporting the used oil, and how and where the used oil is recycled. Additionally, either the generator or burner must test each batch of used oil; a financial consideration which is usually taken care of by established marketers. Under this scenario, the generator is subject to the used oil generator requirements of Env-Wm 807.06 and the marketer requirements of Env-Wm 807.09. The burner is subject to the burner requirements of Env-Wm 807.10.

- The oil may be burned on-site in a suitable space heater or waste oil burner. The used oil fuel burner shall notify DES of their used oil management activities using a form provided by the department (Env-Wm 807.10)

- Disposal of any waste oil, or any liquid in a sanitary landfill is unlawful. Use of used oil as a dust suppressant is also prohibited.

Used Oil Regulations are included within the DES Hazardous Waste Rules, which can be accessed from www.des.state.nh.us/hwrb/hwrules.pdf. The Used Oil Regulations can be found under Chapter 800. Inquiries to the Hazardous Waste Compliance Section may call (603) 271-6424 or 1-888-TAKEOIL. Non-oil hazardous waste inquiries can be forwarded to the DES Hazardous Waste Hotline at (603) 271-2942, or by e-mailing hwcomp@des.state.nh.us. The DES *Registration for Aboveground Bulk Storage Facilities* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/orcb/doclist/astreg.pdf.

Absorbents that have been soaked with used oil are regulated under Env-Wm 401.03(b)(21), which states that the following materials shall be exempt from regulation under the hazardous waste rules:

- Petroleum-contaminated media and debris that fail the test for the toxicity characteristic of hazardous waste codes D018-D043.

- Or are generated from releases of underground storage tanks.

Best Management Practices

Ensure that used oil is stored in U.S. DOT approved containers, or in structurally sound tanks in conformance with local ordinances and state fire codes.

Proper containment of used oil is an important step in reducing the potential for a serious spill. Either U.S. DOT or structurally sound containers should be used. It is also recommended that used oil containers have some type of secondary containment device with 110 percent capacity. A bermed impermeable surface provides satisfactory secondary containment at an economical cost.

Used oil storage containers should be located in an area so as to minimize the potential for a release into surface waters.

While used oil storage containers should be both structurally sound and have secondary containment devices, the location of the containers is also important when assessing potential impacts to surface waters. Used oil containers should be located as far as possible from surface waters, storm drains, floor drains, or any other structure that could cause a ruptured tank to rapidly drain into a water body.

All containers or tanks storing used oil should be clearly labeled with the words "USED OIL FOR RECYCLE."

This BMP was established to eliminate any confusion when used oil is added to bulk storage containers. Proper labeling will reduce the potential for other hazardous wastes to be mixed with used oil and will eliminate the need to hire a hazardous waste transporter when disposal is required.

Containers and tanks should be closed and sealed except when used oil is being added or removed from the container or tank.

Unless a used oil container is closed and sealed, it cannot be considered structurally sound because the potential for a spill is greater if it tips over. Additionally, care should be taken to ensure that no used oil is spilled on the ground surrounding the container or tank, and appropriate spill absorbent materials should be readily accessible in the event of a spill.

Used oil cannot be mixed with any other hazardous wastes.

DES prohibits used oil from being mixed with any other hazardous wastes. If such mixing has occurred, the used oil must be managed, transported, and disposed of as "Hazardous Waste" at a much greater cost and liability. For this reason, DES strongly suggests that marinas be cautious of contaminating their used oil with any other wastes such as gasoline, parts cleaners, and antifreeze.

It is the marina's responsibility to ensure that used oil is delivered to an authorized burner or marketer.

When used oil is to be taken off-site, it must be transported by a permitted New Hampshire hazardous waste transporter on a bill of lading. A marina owner or operator may also choose to self-transport less than 110 gallons of used oil to an authorized used oil burner or marketer, provided a bill of lading is used and proper records are kept.

Best Management Practices for Preventing Spills at the Source

Avoid waves and wakes.

- Locate fuel docks in areas protected from wave action and boat wakes when constructing new or upgrading existing facilities.
- Provide a stable platform for fueling personal watercraft (PWC).

Protect petroleum storage tanks.

- Install double-walled or vaulted above ground fuel tanks. All fuel tanks must be registered with DES. For a registration form please call (603)271-3503.

Maintain fuel transfer equipment.

- Inspect transfer equipment regularly and fix all leaks immediately.
- Maintain transfer equipment and hoses in good working order.
- Replace hoses, pipes, and tanks before they leak.

Install environmental controls at the pumps.

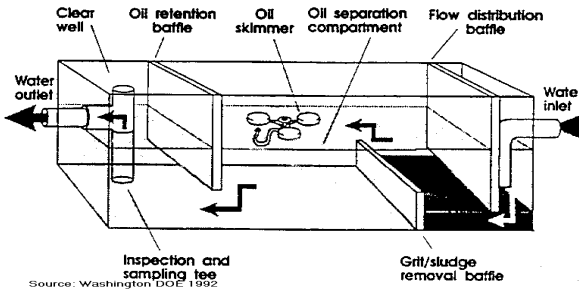
- Install automatic back pressure shut-off nozzles on fuel pump discharge hoses to automatically stop the flow of fuel into a boat's fuel tank when sufficient reverse pressure is created.

Supervise fueling.

- Always have a trained employee at the fuel dock to oversee or assist with fueling.
- Train employees to hand boaters oil absorbent pads with the fuel nozzle.
- Advocate the use of oil absorbent materials.
- Encourage boaters to fill their fuel tanks just before leaving on a trip to reduce spillage due to thermal expansion and rocking.
- Encourage boaters to fill their tanks no more than 90 percent of the capacity.
- Instruct boaters to slow down at the beginning and end of fueling.
- Require boaters to stay with their craft during fueling.

Provide an oil/water separator.

- Invest in a portable or stationary oil/water separator to draw contaminated water from bilges, capture hydrocarbons in a filter, and discharge clean water.



Oil-grit separator

Offer spill-proof oil changes.

- Purchase a non-spill pump system to draw crankcase oils out through the dipstick tube. Use the system in the boat shop and rent it to boaters who perform their own oil changes.

Pour collected oil from drip pans into used oil containers. Store drip pans carefully to avoid spills.

Drip pans

Place oil-laden parts on a drip pan and place drip pans under leaking vehicles to collect dripping oil.

Used Oil Filters

Used oil filters represent a significant waste stream in New Hampshire, and although marinas are not a major generator of used oil filters, state and federal agencies regulate their disposal. Automotive and marina oil filters are exempt from these regulations, provided that the filter materials have been purged of used oil as completely as possible.

Filters should be drained of free liquids prior to final disposal. This is best accomplished by tipping the filters at an angle to allow remaining oil to drain into a collection tray. To empty a filter properly, the filter should be hot drained, crushed, punctured at the anti-drain valve, or emptied in an equivalent fashion. Although gravity draining for over one hour is acceptable to meet this regulation, the State of New Hampshire strongly recommends crushing and recycling as the preferred method of disposal. Ideally, filters should drain 2-3 days so free-flowing oil can be recovered.

Oil filter presses crush the filter canisters and help facilitate oil removal. These presses can be purchased at a reasonable cost. With presses, approximately 85 percent of the remaining oil can be recovered.

These regulations do not refer to lead plated (Terne) filters that are considered to be a hazardous waste regardless of draining.

Best Management Practices

Recycle used oil filters through a scrap yard or used oil filter recycler.

Used oil filters should not be disposed with solid waste unless they are properly drained.

DES recommends that the crushing method be employed because the process appears to be the most efficient for oil removal, and also prepares the filter for recycling. Most permitted waste transporters will accept used oil filters for recycling if they are properly drained.

The DES fact sheet WMD-OIL-1 *Used Oil Filters* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/oil/oil-1.htm. Almost all fresh and saltwater marinas generate some used oil during the course of operation. The proper management of used oil is extremely important considering the fact that spillage of used oil is toxic to both human health and the aquatic environment. It takes just one quart of oil to create a one-acre oil slick on a body of water and one gallon of fuel to contaminate one million gallons of fresh water.

Solvent Waste Streams

Various vessel maintenance and repair activities involve the use of solvents, such as methylene chloride, tetrachloroethane, trichloroethane, and trichloroethylene. These activities include engine repair and maintenance, as well as vessel painting and cleaning. Most solvents are mobile in groundwater and may enter the receiving water via groundwater transport, or in surface runoff from work areas.

Solvents such as tetrachloroethylene, tetrachloroethane, trichloroethylene, trichloroethane, and methylene chloride are used as degreasing agents and in varnishes, paint removers, and lacquers. These generally stable compounds are insoluble in water and may accumulate in deep aquifers due to their high density. These solvents may be entrained in lateral groundwater flow, but will generally sink in water until an impermeable layer, e.g., bedrock, is reached. Many solvents are known carcinogens.

Solvents, which are usually highly volatile and flammable, include alcohols, esters, ethers, ketones, amines, and aromatic and halogenated hydrocarbons. The 1984 RCRA amendments specified five categories of solvent waste (F001 to F005) to be banned from land disposal. Since solvent waste can no longer be disposed of at landfills, it has become necessary to either reduce the amount of solvent waste being generated, recycle the waste, or ship off-site as hazardous waste.

In the service industry, solvent wastes are generated from parts cleaning operations and carburetor cleaners. If paint or paint waste contains solvents, it would be regulated as a hazardous waste.

Absorbents/Shopwipes

Oil spills and other chemical leaks commonly occur in vehicle maintenance facilities. Absorbent materials that absorb through capillary action can contain and absorb oil spills quickly and safely. Traditionally, absorbents can be pads, blankets, pillows, or particulates. They can be used for minor spills or final clean-up sweeps for thin slicks. Similarly, they can be cut into various sizes, or spread over a spill and retrieved by a vacuum, depending on the type of absorbent.

Absorbents may be made of various materials, including sand, clay, and paper.

Absorbents have also been developed from corncobs and peat moss. Absorbents that have been soaked with used oil are regulated under Env-Wm 401.03(b)(21).

Best Management Practices

Use non-hazardous cleaning solvents whenever possible.
Select cloth absorbents that are wringable and reusable to reduce raw materials, disposal costs, and clean up time.
Make sure no saturated or dripping towels are placed in drums.
If excess liquid collects at bottom of drum, decant into waste solvent collection drum; manage the liquid appropriately.
If collected liquid meets RCRA criteria (listed, characteristic, etc.) manage as a hazardous solvent waste.
Always collect, store, and transport in closed containers in accordance with local fire department standards.
Consider a laundry service.

Do Not:

- Air dry soiled shop towels.
- Pick up spills of hazardous liquids with towels.
- Dispose of excess chemicals by pouring onto towels.
- Put towels with free liquids in collection system.
- Allow towels in drum to contact excess liquid (liner should always hang high enough to prevent this).
- Rewash or launder shop towels on your own or at your home.

Rags contaminated with solvents or other substances that may be RCRA hazardous are not considered hazardous waste if they are laundered by a commercial service and are managed in accordance. They are hazardous wastes if they are disposed. Contaminated rags must be stored in properly labeled, lidded or sealed containers and stored away from sources of ignition.

The DES fact sheet WMD-HW-6, *Contaminated Cloth Wipers for Laundering* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/hw/hw-6.htm.

Carburetor Cleaners

Carburetor cleaners contain chlorinated compounds. Carburetor cleaner compounds have been reformulated to exclude the use of 1,1,1, trichloroethane which is a skin irritant. There are substitutes for hazardous carburetor cleaners.

Most solvents currently being used as carburetor cleaners are regulated as hazardous waste. Some are regulated because of ignitability and others are "F listed" due to toxicity. These wastes may be incinerated or reclaimed by a treatment storage and disposal facility (TSDF).

Best Management Practices

- Determine if non-hazardous carburetor cleaners can be used as opposed to traditional ones.
- Carburetor cleaner should be segregated from other wastes.
- Use sparingly, and don’t use spray (VOCs).
- Save that cleaner and add to heavy parts cleaner.
- Distill with other solvents.

Parts Washing Solvent Wastes

Solvent parts washers are used to clean parts that are needed for repair work. They operate by continuously recirculating the solvent from the solvent drum to the solvent wash tray. The solvent in a parts washer is usually replaced with fresh solvent when the solvent becomes too dirty to provide adequate cleaning.

Solvent parts washers produce solvent wastes that are subject to RCRA reporting, minimization, and disposal requirements. The D001, F001 - F005 solvent wastes, and TCLP listed wastes are generated from parts washing and paint gun clean-up operations.

Because petroleum distillates, mineral spirits, and naphtha have flashpoints less than 140 degrees F, these wastes are hazardous and must be D001 manifested.

Best Management Practices

- Never mix or add spent or fresh solvents to used oil.

More efficient use of parts washing can help eliminate some of the solvent wastes. These are simple, inexpensive procedures that minimize your use of solvents and increase the life span of solvents resulting in reduced waste generation. Before using a solvent for cleaning, try to remove heavy grime manually so as to reduce the amount of solvent needed. Try to reuse the same solvent as much as possible. Solvent used from a final cleaning that is not too contaminated may be used for "dirtier" parts. Finally, allow dirty solvent to settle for a while. Often times heavier contaminants will settle to the bottom allowing "cleaner" solvent to be carefully poured off for reuse.

Never use gasoline as a cleaner or solvent.

Use solvents as little as possible to minimize the generation of hazardous waste. Operators should only clean parts that need to be cleaned. Careful conservation of solvents could reduce the purchase of new solvent.

Look for alternative cleaning methods. Consider switching to a less toxic solvents such as citrus-based (turpene) cleaners, aqueous cleaners, or high-pressure hot water and steam cleaning.

Aqueous washers are commonly being used to replace solvent degreasers. These are essentially commercial dishwashers which have been designed for parts cleaning. Aqueous washers may use a variety or combination of cleaning agents in combination with cleaning enhancers such as ultrasonic agitation.

Never dispose of solvents into drains, the ground, or the air. Disposal by evaporation violates the New Hampshire Hazardous Waste or Air Toxics Rules.

Consider the use of a solvent supplier who will pick up and recycle the solvents.

Parts washer

Always keep lids of cleaning tanks tightly closed and away from heat and drafts when not in use to help minimize product loss and keep release of emissions into the air at a minimum.

Many waste solvents can be recycled with a distillation unit. A distillation unit employs a separation technique that relies on boiling point differences of the components of the waste. There are small distillation units available which could permit reuse of solvents.

Section V.

Aqueous Waste Streams

Aqueous cleaning methods are a substitute for parts cleaning operations that use solvents. The aqueous methods use water, detergents, acids, and alkaline compounds to displace oil rather than dissolving it in organic solvent. Aqueous wastes are water-based detergent wastes and waste sump solids. They are generally considered hazardous because they contain caustics, high levels of metals, and oily dirt.

Sumps and Floor Drains

Sumps and floor drains are found throughout many marinas. Collection sumps are designed to store wastewater that results from cleaning and shop floor spills. The sumps may collect grit, dirt, grease, oil, soap, water, and solvents. These contents are subject to hazardous waste determination (TCLP test) prior to disposal.

The nature of the sludge will determine the disposal method. Sludge samples should be TCLP tested. If it passes a TCLP test and does not contain any other characteristic or listed wastes, then it may be disposed as a nonhazardous waste.

DES prohibits floor drains in marinas unless:

1. The floor drain is connected to a municipal sanitary sewer in accordance with federal, state and local regulations.

2. The floor drain is connected to an alarmed, underground holding tank which meets DES requirements and is registered with DES.

3. The floor drain is connected to an above ground holding tank that meets all federal, state and local requirements.

If you cannot or choose not to connect your floor drain in one of these methods, then the floor drain must be permanently closed. This should be performed under the direction of a consultant who is familiar with the proper closure procedures or, if you are positive that no contaminants were ever released into the floor drains, you may seal the drain by filling it with concrete.

Best Management Practices

Prevent spills by properly maintaining equipment.

Clean up any spills using drip pans and absorbents.

Use drip pans to contain drips when changing fluids or working on damaged vehicles. It is extremely important to keep solvents and cleaners out of drip pans to avoid creating hazardous waste through the mixture rule. Oils and fluids from these vehicles may contribute to sump contamination as well.

When cleaning bays use a non-toxic, biodegradable soap.

Keep oil/water separators maintained at all times.

Oil/water separators remove free-floating oils and grease. Implementation of this recommendation may allow wastewater to be discharged to POTWs. Oil and grease must be disposed by TSDFs if they fail the TCLP test.

The DES fact sheet WD-WSEB 22-9, *Protecting Groundwater from Floor Drains and Other Typical Discharges* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/ws/ws-22.9.htm.

Wastewater and Stormwater

Stormwater Runoff

Studies have shown that stormwater can create mass disturbances in aquatic communities by introducing a wide variety of toxic contaminants into surface waters.

Most of the pollutants generated by stormwater runoff are caused by rainfall scouring upland areas and flowing unchecked into surface waters. Parking lots and roads may be significant sources of heavy metals from engine wear, as well as hydrocarbons from oil and grease drippings. Nutrients, sediments and bacteria are often washed into surface waters from unstabilized soil areas and can result in swimming restrictions, algal blooms, and increased sedimentation.

Sediments may enter freshwater and marine waters from numerous marina activities. These activities including erosion during construction, vessel scraping and sanding, and stormwater runoff.

Sediments discharged to surface waters in stormwater, rinse water runoff, or via other sources, ultimately accumulate in depressions. Movement of accumulated sediments may occur, resulting in resuspension and tidal circulation. Sediments may be inorganic or organic in nature, ranging in size from fine silts and clays to coarse sands and gravels.

Regardless of their source, sediments may present the following direct environmental impacts: burial of food organisms and habitat; increases in turbidity, which may reduce production EPA, 1993) as well as affect feeding efficiencies of visual feeders; clogging of the gills of fish; and increases in sediment oxygen demand, resulting in dissolved oxygen depletion. In addition, numerous other contaminants, such as heavy metals, hydrocarbons and nutrients, may be associated

with sediments. These contaminants may find their way into the water column from the sediments through resuspension or dissolution. The impacts of these associated contaminants are discussed below.

Marinas can play an important role in this issue because of their close proximity to surface waters. Also, large areas of pavement connected to a boat ramp are common sights at many marinas and contaminated stormwater can easily enter the surface waters via the "conduit effect." The elimination of this effect can significantly reduce many of the impacts associated with stormwater runoff.

The "conduit effect" is one of the main problems associated with marinas and stormwater runoff and can be likened to a conical funnel, with the boat ramp being the bottom and the rest of the paved marina located along the top edge. This effect occurs at many marinas because the boat ramp is located at the facilities center of activity, and concentrates polluted runoff from the parking and maintenance areas.

Best Management Practices

Minimize the amount of impervious area.

- Pave only those areas that are absolutely necessary.
- Minimize the length of new roadway required to serve new or expanding marinas.
- Plan roads so they do not cross sensitive areas.
- Consider alternatives to asphalt for parking lots and vessel storage areas (such as dirt or gravel).

Implement effective runoff control strategies.

An **infiltration trench**, installed on the leading edge of the ramp will disrupt the conduit effect by redirecting the runoff into the ground. The trench design incorporates a steel grate and concrete sidewalls with PVC weepholes. As the stormwater enters the trench through the steel grate, it percolates through an oil absorbent barrier, and then a layer of 1-2 inch crushed stone before it exits through the bottom and into the water table. PVC weepholes in the sidewalls provide an additional outlet if the volume of runoff entering the trench exceeds the percolation rate beneath the trench.

Installing **water bars** to divert stormwater away from boat ramps and surface waters is another method that can be used to help mitigate NPS pollution effects. Water bars are essentially speed bumps positioned to capture and divert stormwater. They are often used on unpaved roads to prevent washouts, but can be easily adapted for marinas.

Gravel parking areas can help contain stormwater and reduce its movement during a rain event. In fact any type of porous surface is more desirable than impervious paved surfaces, because they allow ground penetration and percolation.

Install and maintain adequate vegetative buffer strips between surface waters and upland areas.

Recent research has shown that different types of vegetation can effectively remove contaminants from stormwater. It is not unusual to see small **constructed wetlands** adjacent to large parking areas and in highway median strips. These wetlands act as a filter, removing nutrients, hydrocarbons and sediments from runoff. While wetlands are very effective filters, they are "land intensive", and because of shoreline real estate value, very few marinas have the means to support a wetland project.

Fortunately there are other types of vegetative filters that can also help reduce surface water contamination caused by stormwater runoff. **Vegetative strips** (greater than 10 feet) of low bushes and grasses planted between surface waters and upland areas can effectively remove many contaminants by slowing the velocity and causing sediment bound contaminants to settle out of the runoff.

Vegetated swales are broad, shallow channels, lined with dense vegetation. They promote infiltration through the soil and trap pollutants by filtration through the vegetation. The combination of low velocities and vegetative cover promotes the settling of particulates and some degree of treatment by infiltration. They are most effective when the impervious area which drains into them is small and when the flow depth is shallow and velocities are low.

Vegetative swales should be mowed frequently to maintain a growth of vigorous, dense vegetation. Grass should not be trimmed extremely short, as this will reduce the filtering effect of the swale. The cut vegetation should be removed to prevent the decaying organic litter from adding pollutants to the discharge from the swale. Routine maintenance should include the immediate repair of newly formed channels or gullies; re-seeding bare spots; removing trash, leaves, and accumulated sediments; and the control of woody or other undesirable vegetation. Routine fertilization and/or use of pesticides is strongly discouraged.

Many types of plants are efficient at removing nutrients from stormwater runoff and when used in conjunction with water bars and infiltration trenches, stormwater pollution can be significantly reduced. See appendix IV for list of Native and Naturalized Shoreland Plantings for New Hampshire.

Control sediment from construction sites. Use devices such as siltation fences in combination with hay bales, storm drain filters, sediment traps, and earth dikes to prevent sediments from leaving construction areas.

Stencil storm drains with the words "Don't Dump" and "Goes to Lake" (if appropriate). Be sure to get permission from the county or city department that maintains storm drains in community. Generally, it is the Department of Public Works.

Many of the traditional stormwater BMPs, such as retention ponds and constructed wetlands, are not viable options at many New Hampshire marinas due to space restrictions. Marinas are not alone in this predicament as heavily urbanized areas are also faced with the same challenge. Several companies recognized the need for technologies that can treat stormwater while using a

limited amount of space. This led to the development of "innovative" stormwater BMPs.

The innovative **stormwater BMPs** treat the polluted runoff at varying stages of the stormwater flow, with some being end-of-the pipe solutions while others are designed for installation at individual storm drains. They are also designed to address varying pollutants, with some focused on trash, oil and grease, and sediment, while others broaden the treatment scope to include nutrients and bacteria.

"Vortechs" oil-grit separator

Oil-grit separators, as the name implies, are an end-of-the pipe technology designed to remove hydrocarbons and other automobile related pollutants, trash, and sediments from stormwater. The "Vortechs," "Stormceptor," and the "Downstream Defender" are a few examples of this type of technology. Oil-grit separators have several advantages. They are usually located underground so that they minimize use of valuable space; they are compatible with storm sewer systems; they can pretreat runoff before it is delivered to other BMPs; and are easily accessed for maintenance. A few disadvantages are that they do not effectively remove nutrients and metals from the runoff and they require frequent cleanings.

The "StormTreat" and "Aquashield," and "Stormfilter" are tertiary type alternative technologies. These technologies use physical, chemical, and biological treatment methods to reduce hydrocarbon, oil, grease, sediment, nutrient, bacteria, and heavy metal pollutant loads. They also can be used as end of the pipe technologies, but are commonly used only to treat the first flush, or the first 0.3 inches, of the stormwater runoff. They do effectively treat a wider range of pollutants than the oil grit separators, but they require a sediment-box or similar structure upstream to eliminate the larger sediment particles.

The "Ultra Urban Filter," "Fossil Filter," and the "Steam Guard" are also tertiary level technologies, but are used as storm drain inserts. This technology effectively reduces hydrocarbon, oil, grease, trash, and some heavy metal pollutant loads, but their nutrient removal capabilities haven't been documented. The inserts decentralize the maintenance of the stormwater BMP, but they may prove cost effective depending on the pollutant loading of the site.

More information on innovative stormwater technologies can be found at the EPA's Center for Environmental and Industrial Technology website:
http://www.epa.gov/region01/steward/ceit/tech_cos/stor.html.

Vessel Cleaning

Surfactants, which act to reduce surface tension, are present in most detergents and other cleaning agents. Surfactants occur in a wide variety of chemical formulations of both natural and synthetic origin. Surfactants may accumulate in sediments and undergo microbial degradation in soils. Some surfactants, such as alkyl benzene sulfonate (ABS), may exhibit acute and chronic toxicity to aquatic organisms. In aquatic environments, surfactants that accumulate may form a surface film and reduce oxygen transfer at the air-water interface. Indirectly, surfactants may alter the hydraulic characteristics of soils, thus affecting the movement of

contaminants through soils and into groundwater. Surfactants and detergents may also cause foam on the receiving waters, which is aesthetically unacceptable (Connell and Miller, 1984).

Vessel cleaning not only preserves a boat's aesthetic integrity, it also maintains the value by minimizing depreciation. Unfortunately, vessel cleaning may impact water quality if wasteful and improper practices are used.

Detergents are probably the most common type of pollutant associated with vessel cleaning practices and if used improperly, they may cause water quality degradation. Detergents are defined as synthetic cleaning agents that emulsify oil and hold dirt (Lapedes, 1978). Surface-active agents (surfactants) are used in detergents to reduce the surface tension in liquids and cause oil and grease to loosen their bonds with surfaces and become water soluble.

The ingredients of many cleaners are extremely toxic and once they are used in the bilge, emulsified oil, fuel and organic matter can add to the cleaner's toxicity. If allowed to enter the surface waters, the emulsified petroleum products in the waste will not separate and float to the surface as in a conventional spill. They will dissolve into the water column and sediments, making them bioavailable. These cleaners should only be used if the waste can be collected and disposed of properly. A thorough pre-season cleaning before the vessel is in the water is probably the best and easiest way to clean and dispose of contaminated bilge waste.

Other types of pollutants that may enter the water when a vessel is cleaned can also affect aquatic organisms. Acids and alkalis are commonly used as stain and mildew removers, and are extremely toxic. Solvents such as methylene chloride, trichloroethane and tetrachloroethane are generally used as degreasing agents and are hazardous to humans as well as aquatic life. Nutrients from detergents and vessel bottom growth, especially phosphorus, can cause algal blooms and increased aquatic weed growth.

Best Management Practices

Use environmentally friendly cleaners.

Encourage tenants to use environmentally responsible counterparts to traditional cleaning products. Use products that are phosphate free, non-toxic and biodegradable when cleaning boats and equipment at the facility. Carry environmentally compatible products in your ship's store, and ensure that the sales people understand and can explain the differences between toxic and non-toxic products.

Seasonal vessel cleaning should be conducted in clearly marked designated wash areas.

Although it is a necessary part of boat maintenance, cleaning should be performed at a designated wash area that either slopes away from the surface water, or uses an infiltration trench or vegetated swale to help remove particulates, nutrients and other pollutants from the wastewater.

If space is limited and these devices cannot be effectively installed, more care should be taken to reduce the amount of cleaning agents and water used. Washing above the waterline by hand instead

of using a pressure washer can reduce the amount of water used. Applying detergents conservatively with spray bottles instead of buckets will reduce the volume of cleaner used.

> Ensure that wastewater from pressure washing is not performed over surface waters and the effluent is contained.

Bottom scum is not technically considered a pollutant, because it is actually a buildup of algae that can be found on anything that is in the water for an extended period of time. Their organic mass does however, contain essential nutrients, and when concentrated, these nutrients can cause algal blooms. Also, fragments of paint and hull material, which contain heavy metals, are usually found in the waste stream.

There are several methods for reducing surface water contamination using pressure washers. The first incorporates a settling basin that allows particulates to settle out of suspension. This method is only effective at removing large particulates. A more effective device builds on the settling basin method but includes a filtration system at the basin's discharge. A hay bale will suffice, but there are also commercially made systems that are easier to maintain.

The most effective (but the most expensive) systems to remove contaminants from the waste stream use mechanical and chemical treatment schemes that may include oil water separators and polymer feed systems for colloidal particulates. These systems can be used in a closed loop format by reusing the treated water. While these types of systems are extremely effective, their use and maintenance is often cost prohibitive. The first two methods are usually all that is needed to achieve a significant waste reduction.

> When bilges are cleaned, wastewater should not be discharged overboard unless it is free of any contaminants. A clean bilge is rare since oil, gas, and other pollutants often accumulate in this area.

Bilges have and will continue to be "one of the most miserable places on earth" (Hescock, 1995). Located at a vessel's gravitational low point, everything from engine oil and fuel to rotten food waste can find its way to the bilge. The resulting odors can be staggering and it's no wonder that commercial bilge cleaners use extremely potent solvents and detergents.

Bilge Socks

In many areas, it is common to see fuel sheen on the water surface near boats. Although it may only be a tiny amount from a few boats, the cumulative impacts can be damaging. Once in the marine environment, oils and fuels have a tendency to accumulate in bottom sediments and concentrate in organisms. These harmful substances commonly enter the marine environment through bilge pumping, fueling, and improper response to spills.

Never add bilge-cleaning detergent or emulsifiers to your bilge and then pump bilge water overboard. These compounds do not eliminate oil, they simply break it up so it mixes with water and spreads over a wider area. Federal law prohibits this. Instead, use oil absorbent bilge socks or pillows to capture oil and fuel in bilge water and dispose of them properly. Examine and replace oil absorbent materials as needed.

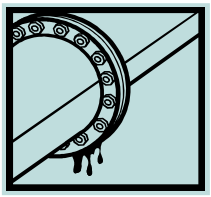
Prior to bilge pumping, inspect the bilge to ensure that no fuel or oil has been spilled. Do not discharge the bilge water if there is a sheen on the surface. Check and fix all leaks. Replace oil-saturated bilge pillows and socks. If dirty bilge water cannot be sufficiently cleaned to allow legal discharge, make arrangements with a marina capable of properly disposing of tainted water.

Oil and fuel absorption pads and pillows are now readily available from numerous manufacturers. Have these materials in your bilge and inspect them monthly. If there is more bilge water than usual, find and rectify the fault. When pumping bilges, be aware of the environment because polluting waterways is an offense. If there is oil or fuel in the bilge water, use absorbent pads to clean up the chemicals and dispose of the pads properly.

During the past decade, increased enforcement of contaminated vessel discharges by federal and state agencies has resulted in fines of up to $10,000 for non-compliant vessels. These tough penalties have created a market for non-toxic, environmentally safe bilge cleaners that can be discharged directly into surface waters.

Three distinct types of bilge cleaning products are becoming popular. Oil absorbent pads and oil water separators capture oil and fuel before it can be discharged. Non-toxic, biodegradable cleaners use a citrus-based extract d'limonene as an active ingredient. These products are very effective and can be discharged overboard if there are no petroleum products in the waste. The third and most exciting new type of product now available uses bacteria to eliminate petroleum and other organic waste from bilge water. These bacteria produce enzymes that break down complex organic molecules (petroleum products) and reconfigure them into smaller compounds such as carbon dioxide and water (Naranjo, 1995). Several manufacturers now market these products, and they are an excellent alternative to the toxic cleaning products discussed previously. These types of products should be used whenever possible, and be available in your marina for sale to tenants.

Vessel Sewage



Untreated sanitary waste discharged from boats is a significant problem in our nation's lakes, rivers and coastal waters . Sanitary waste contains bacteria and viruses that can, when waterborne, cause a variety of diseases such as hepatitis, typhoid, cholera, and acute gastroenteritis (Milliken and Lee, 1990).

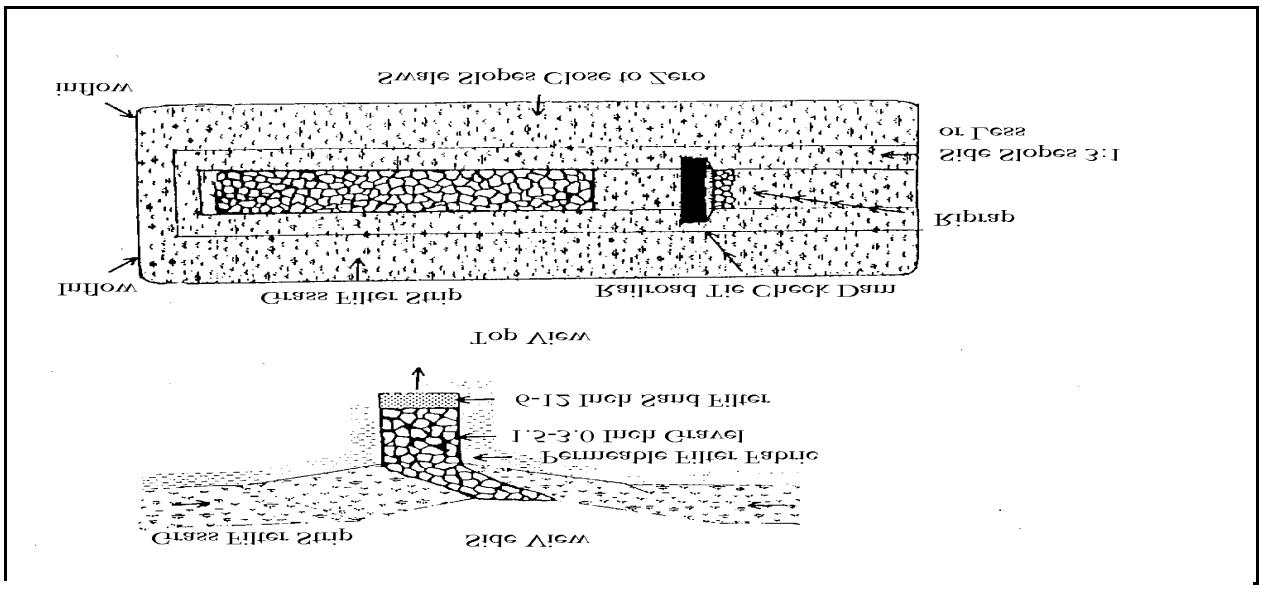
Fortunately, New Hampshire is among fourteen states in the nation that have no-discharge regulations in place (Dickinson, 1994). RSA 487:2 states that "No marine toilet on any boat operated upon inland fresh waters of the state shall be so constructed and operated to discharge any sewage into said waters either directly or indirectly..." Although this RSA does not apply to New Hampshire's tidal waters, boat sewage, gray water, and sink waste of any type cannot be discharged into the state's lakes or rivers. In fact, any boat located on inland waters that is equipped with a marine toilet must disconnect all sewage lines from through hull fittings.

DES is responsible for enforcement of RSA 487:2, and at this time there are two seasonal staff members conducting all inland boat inspections. While compliance has been very good, thanks to the help of marina operators, the same cannot be said for the state's tidal waters, which fall under

federal jurisdiction. The federal law that governs the discharge of sewage is the Clean Water Act, enacted in 1972 and amended in 1987. In 1980, rules regulating Marine Sanitation Devices (MSDs) went into effect. These rules do not require that a vessel have an installed toilet, but if it does, it must have a Coast Guard certified MSD (Dickinson, 1994).

There are currently three types of MSDs; types I, II, and III (Stuphan, 1994). A Type I MSD discharge must not discharge wastes containing a fecal coliform bacteria count of no more than 1,000 per 100 milliliters of waste. Sewage treatment for Type I toilets is generally achieved by maceration followed by disinfection. Type II MSDs are similar to Type I systems, although the fecal coliform counts cannot be more than 200 per 100 milliliters of sewage, and are required for vessels larger than 65 feet. Type III systems are the most widely used MSD. Holding tanks are used to store the sewage until it can be pumped out, either on shore or beyond the three mile territorial water limit. Only Type III devices are allowed on New Hampshire lakes provided that there is no overboard discharge value. However, porta-potties are still commonly used, and are not classified as Types I, II or III.

Unfortunately, Type III systems are often abused, and in many cases, the holding tank is bypassed, and all sewage is pumped directly overboard. Boat owners claim that there are not enough pumpout stations available, and when one can be found, the marina charges too much for the service. The Clean Vessel Act of 1992 was created to increase the number of pumpout stations available to the



Swale areas can help remove nutrients, pollutants, and can reduce runoff velocity.

public. "Pumpout grants" are now available to marinas to install boat pumpout facilities. A 25 percent match is required. When additional pumpout stations are in place, states can file a petition to EPA requesting that a particular tidal water body be declared a "no discharge zone." However, both new and existing pumpout stations must be made more attractive to boaters.

Clean Vessel Act

New Hampshire has a "no discharge policy" which means that it is illegal to discharge raw sewage and gray water from a boat in inland waters or to discharge raw sewage within 3 miles of the coast in tidal waters. Properly located pumpout and dump station facilities are important tools in keeping New Hampshire waters free from nutrient and bacterial contamination. As of 2001, New Hampshire has 24 pumpout and/or dump station facilities located at three of our lakes and at the coast (all 24 are listed below).

Lake Winnipesaukee

Robert's Cove Marina
Fay's Boat Yard
Silver Sands Marina
Lakeport Landing
Irwin Marine
Southdown Boat Club (members only)
Meredith MarinaMeredith Town Docks
Quayside YC (members only)
Wolfeboro Corinthian Yacht Club
West Alton Marina
Mountainview Yacht Club
Gilford YC (members only)
Paugus Bay Marina
Channel Marine
Spinnaker Cove YC (members only)
Shep Brown's Boat Basin
Weirs Beach/Anchor Marine

Lake Winnisquam

Winnisquam Marine

Lake Sunapee

Sunapee Harbor (dump station)

Coastal

Rye Harbor Marina
Great Bay Marina
Hampton River Marina
Wentworth By The Sea

DES is constantly working towards educating recreational water users about the effects of discharging raw sewage into the waters. Discharging sewage can result in increased nutrients in the water and waterborne disease spreading to humans via contaminated swimming areas. Too many nutrients can cause algae to grow out of control. The increased production of algal cells will result in decreased transparency and as cell decomposition occurs, decreased oxygen levels can impact the biota.

While pollution caused by boating activities may not have the same impact as a commercial discharge, every source contributes to the problem, and each source eliminated helps improve the environment and water quality that we recreate in. Awareness and action on the part of the recreational water users are the keys to keeping New Hampshire's waters clean and safe.

Best Management Practices

Provide a pumpout system.

- Select an appropriate system.
- Choose an accessible location.
- Decide if the pumpout system will be staffed.
- Handle and dispose of collected waste with care.
- Maintain the pumpout system.
- Do not allow waste to drain into receiving waters.
- Post signs.
- Educate staff.
- Decide whether a fee will be charged.

Ribbon cutting at Fay's Marina for newly installed pumpout station

In order to encourage pumpout station use, access must be provided at times convenient to boaters. A pumpout schedule should coincide with fuel dock hours, which are generally busiest during weekend mornings and evenings. Hours should be clearly posted at the pumpout station and the fuel dock (if separate), so boaters can avoid the frustration of missing the designated hours of operation.

Pumpout station

Although it has been documented (Ross and Amaral, 1992) that stations with no fee have the highest pumpout use, it is reasonable to charge a nominal fee. In 1992, EPA found that boaters were willing to pay between $3-$7 for the pumpout service (Amaral, 1994). Marinas are encouraged to charge a fee as long as the cost does not make their use prohibitive, and is used only to help defray operational costs. If the marina is participating in the Clean Vessel Act Pumpout program, a fee of greater than $5 must be justified in the written grant proposal since the federal government is providing 75 percent of installation costs.

If the pumpout station is self-serve, ensure that operating instructions are clearly posted and all equipment is labeled properly. Regular cleaning and maintenance will help prevent noxious odors from developing and will encourage use and improved safety.

Provide restrooms and showers for marina tenants and users to help reduce the burden on the pumpout station and surface waters.

This is the most effective way of preventing unlawful sewage discharges into surface waters. Many marine toilets and holding tanks emit noxious odors when used, so a tenant is likely to avoid using his/her own toilet or shower if the marina can provide clean, safe and convenient facilities. If these facilities can be provided, they should be well marked, handicap accessible, and open during high use periods such as weekends and holidays.

A regular inspection schedule should be developed to inspect tenant MSDs. The following activities can be performed to ensure that each vessel is in compliance with no discharge regulations.

- Dye tablets can be added to the holding tanks that will color the water surrounding the vessel if the tank is discharged overboard.
- Type III devices with Y valves should be secured and locked, if possible to prevent any through-hull discharge capability.
- Inspect MSDs for proper installation and working condition.
- Through-hull fittings on vessels located on inland waters should also be inspected to ensure that all overboard discharge hoses are disconnected, including sink discharges.

- If your marina has vessels with on-board MSDs, consider installing a pumpout facility.

Although not every marina facility is required to have a pumpout station, each facility that stores boats greater than 25 feet in length is encouraged to install one. Pumpout stations, when used, are the most efficient means for removing sanitary waste from boats. Pumpout stations can also attract customers who want to keep their vessels moored or docked in areas where they can easily pump out their holding tanks.

EPA Region I (New England) has identified two types of harbors, transient and nontransient. For harbors that are deemed transient, one pumpout is required for every 300 boats over 25 feet in length or with an installed MSD. If information about boat size is unavailable, the state counts all boats in the harbor. Nontransient facilities require one pumpout for every 600 boats. In order for a pumpout to be included in the count, it must be a fixed unit connected directly to a sewer or holding tank. The purpose of this requirement is to ensure that there is a continuous means of disposing of the waste once it is collected (USEPA, 1991).

Pumpout stations are manufactured by several companies. While there are several types of pumpout stations available, the basic criteria needed for selection must include pumping distance (height and length) and its overall capacity. All pumpout systems include four functional systems: hose and coupling nozzle; pump systems; pipe lines; and sewage storage and disposal.

In addition to the type of pump utilized, consider location and disposal techniques. Can the system be directly connected to a municipal sewer line, or does the sewage need to be temporarily stored and subsequently pumped out and disposed of via a septage hauler?

Pumpout stations can either be fixed, mobile, or remotely operated. Mobile pumpouts can be attached to a pumpout vessel and used in harbors with large mooring fields, or they can be attached to a cart and used within the marina. Fixed stations are permanently mounted in an accessible location, usually on an existing gas dock. Remote stations provide multiple coupling locations on slips. While these are the most convenient type of system, especially for live-aboards, they are also the most expensive.

Fish Cleaning

Although fish parts are completely biodegradable, and are eaten by birds, other fish, and aquatic mammals, water quality problems may occur if too many fish parts are discarded into the surface waters at one time. As the fish decompose, oxygen decreases, phosphorus is released, odors are emitted and fish kills may occur. Proper cleaning practices should be adhered to in order to preserve both the aesthetic and ecological integrity of a water body.

Cleaning the fish offshore and scattering the parts over a wide area will help increase the natural food base for wildlife. Centralized fish cleaning stations with cutting boards and covered trash bins can be installed at marinas where fishing is common (Amaral, 1994). Create a composting area at the marina by mixing peat moss and lime with fish scraps in a chicken wire enclosure.

Section VI.

Other Waste Streams

Routine use of dangerous materials is a common practice at most full service marina facilities. Improper handling can introduce hazardous substances to the environment and can cause both chronic and acute toxicity to humans as well as aquatic life. An effective waste management plan can help marina owners and operators track hazardous materials from initial delivery to eventual disposal. Additionally, proper waste management can reduce costs associated with waste generation by eliminating non-essential activities.

The first step required when implementing a waste management plan is to inventory all the activities at your facility. A waste itemization of each activity will help identify the types of pollutants generated. Eliminate non-essential waste generating activities from the inventory, and when a final waste generation list is compiled, it can be compared to New Hampshire's hazardous waste classification list. Determine what waste is hazardous and what is non-hazardous, then proper management techniques can be implemented.

Aerosol Cans

Many landfill authorities are limiting or rejecting aerosol cans due to their explosion hazard or contamination hazard. Aerosol cans must be completely empty for disposal. Some scrap metal dealers will accept empty aerosol cans.

Best Management Practices

Use all of the material in the can.

Recycle empty cans or dispose of in a landfill.

Rather than use aerosols, hand apply paint or degreaser with a brush to eliminate aerosol fumes and spent cans.

Replace disposable aerosol cans for degreasing or lubrication by using refillable spray containers, or portable parts wash units equipped with basins to catch overspray.

To increase the shelf-life of aerosol cans, keep them away from moisture, sunlight, and extreme heat and cold. It is also important to keep the protective caps on the containers when not in use. This helps prevent contamination, rusting of the container top, and nozzle damage.

Antifreeze

Antifreeze that contains ethylene glycol is toxic to aquatic organisms. Antifreeze is used as an engine coolant and to prevent freezing during winter storage. Both dry storage and engine maintenance involve the use, storage, and disposal of antifreeze. Improper use, storage, or disposal may result in the release antifreeze to the freshwater and marine environments via surface runoff or groundwater transport. Antifreeze is also released to the surface water by direct discharge, particularly in the spring when boats are launched after winter storage.

Propylene glycol is reportedly significantly less toxic then ethylene glycol to aquatic life and is generally preferred over ethylene glycol for use in boats (CT DEP, undated).

All wastes, including waste antifreeze, must be evaluated to determine if they are hazardous wastes and, if so, managed in accordance with the equipment of the N.H. Hazardous Waste Rules. These requirements may include use of a hazardous waste manifest, and delivery by a licensed hazardous waste hauler to an authorized hazardous waste facility.

Alternatively, waste antifreeze may be handled under the DES universal waste policy, adopted October 14, 1998. This policy eliminates burdensome regulatoy requirements and promotes the recycling and proper management of waste antifreeze. Universal wastes, when recycled are not subject to the generator fee. Handlers are not required to use a licensed hazardous waste hauler to transport universal waste and are not required to complete a hazardous waste manifest.

For more information on universal wastes and their handling requirements call Paul Lockwood at (603) 271-2956.

Best Management Practices

Minimize the amount of waste antifreeze by replacing it only when necessary. Visually check antifreeze for contaminants and test for freeze point and pH. Fresh ethylene glycol or corrosion inhibitors can be added to adjust these parameters without disposing of the anitfreeze.

Use propylene glycol instead of ethylene glycol.

Consider using propylene glycol instead of the traditional antifreeze ethylene glycol, especially if there are no means for on-site recycling. It is less toxic to the environment and is usually identified by its pink color.

Although use of the traditional antifreeze ethylene glycol should not be used because of its toxicity, ethylene glycol is not a listed state or federal hazardous waste unless it is contaminated during use. The primary hazardous waste contaminants found in used antifreeze are benzene, lead and

tetrachloroethylene (TCE).

If ethylene glycol is used, it should be stored in a well marked, structurally sound container or tank. If it is stored on-site, it can be reused until diluted to the point where the anti-freeze protection is no longer sufficient.

If good antifreeze needs to be removed for repairs only, save it in a clean container and reuse it in the system after repairs are completed.

Used anti-freeze should be stored in structurally sound, clearly marked containers or tanks with the words "USED ANTI-FREEZE FOR RECYCLE."

Do not mix used anitfreeze with other waste streams, gasoline, or solvents.

The DES Environmental fact sheet WMD-HW-4 *Waste Antifreeze: Management Requirements for Handlers and Transporters* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/hw/hw-4.htm.

Batteries

The primary potential sources of acids and alkalis from marinas are batteries and compounds used for cleaning vessels. Battery acid is extremely corrosive and often contains high concentrations of heavy metals, especially lead. Spilled battery acid may be transported to the freshwater and marine environments via surface runoff or groundwater transport. Cleaning compounds and detergents often contain strong acids or lye. These acids and alkalis may enter freshwater and marine waters via direct discharge if cleaning takes place over the water, or via surface runoff or groundwater transport from upland work areas. Acids may solubilize other contaminants, such as heavy metals, resulting in indirect toxicity to aquatic organisms. Acids may also lower the pH of the receiving water, particularly on a localized basis, resulting in the loss of aquatic life.

Batteries contain sulfuric acid and are made of 50 percent lead by weight. Recovery of lead from the more than 70 million automotive batteries scrapped annually accounts for nearly 40 percent of the lead produced in the U.S.

In New Hampshire, it is illegal and wasteful to throw away lead-acid batteries. Batteries should be returned for recycling.

Best Management Practices

Store all spent batteries on an acid-resistant surface, under cover, away from flammable liquids, ignition sources, and drains.

Recycle spent batteries with a licensed transporter.

The DES Environmental fact sheet WMD-SW-4 *Management of Used Motor Vehicle Batteries* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets.sw/sw-4.htm.

Mercury Containing Lamps and Devices

A number of lamps and devices contain mercury, such as fluorescent and HID lamps, thermostats, thermometers, switches, and relays. This mercury poses a severe hazard to human health or the environment when improperly managed.

Best Management Practices

Waste mercury-containing lamps and devices may be handled under DES's universal waste policy. DES believes that recycling is the preferred option and will promote the recycling and proper management of waste mercury-containing lamps and devices.

Under this policy, hazardous waste generators are not required to include universal wastes in their calculation of generator status. Universal wastes, when recycled, are also not subject to the generator fees. Handlers are not required to use a licensed hazardous waste hauler to transport universal waste and are not required to complete a hazardous waste manifest.

"Low mercury" lamps still contain mercury and may be rejected by your solid waste facility. Recycle all lamps under Universal Waste Rules regardless of their designation.

The DES fact sheet WMD-HW-7, *Waste Mercury-Containing Lamps: Management Requirements for Handlers and Transporters* may be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/hw/hw-7.htm.

Painting Wastes

Tributyltin (TBT), an antifouling additive in paints, came into considerable popularity because of its ability to keep boat hulls clean (CT DEP, undated), and because it does not react chemically with aluminum hulls. TBT inhibits the growth of organisms by slowly releasing from the paint. However, TBT is generally nonspecific in the organisms it affects. Therefore, while it effectively controls the growth of algae and barnacles on boat hulls, it may adversely affect other non-target organisms.

The EPA has restricted the use of antifouling paints with release rates greater than 4.0 micrograms per square centimeter per day. TBT, with a release rate of 4 micrograms or less, may only be used on vessels larger than 82 feet (25 meters), or aluminum hulled vessels regardless of size. Additionally, TBT (4 micrograms or less) may be used in a spray can to paint outboard or lower drive units. Primarily, painting wastes result from overspray and paint gun cleaning operations.

Waste paint thinner is generated when paint guns and other equipment are cleaned. Paint thinners may contain solvents such as xylene, methyl ethyl ketone, toluene, and acetone. Waste thinner is frequently collected and mixed in drums with waste paint. The drums are sent to a RCRA permitted solvent recycler or fuel blender.

Solvent-based waste paint is regulated as a hazardous waste if it demonstrates one of the characteristics of a hazardous waste, i.e., reactive, corrosive, toxic, ignitable. Some paints contain heavy metal compounds such as lead, cadmium and chromium and demonstrate the characteristic of toxicity. In all cases, waste paints with heavy metals and solvents must be managed as a hazardous waste.

Solvents used as paint thinners are considered hazardous due to toxicity and ignitability characteristics. Most of these solvents have EPA waste codes of F003, F005 and D001. Solvents that demonstrate the EPA hazardous waste characteristics are banned from landfill disposal or discharge to a POTW.

Best Management Practices

There are several different ways that painting wastes can be reduced. The methods discussed below include improving operating procedures, utilizing different equipment and paints, investigating a more efficient inventory control, and reducing overspray.

All painting operations, other than anti-foulants, should only be conducted by yard personnel. If the painting is to be applied using a spray method, it should be performed using the same procedures as abrasive blasting operations. All spray operations should also conform to regulations governing the emissions of volatile organic compounds (VOC), solvents, and objectionable odors.

Mixing

- Closely follow the mixing instructions on the coating cans. The instructions specify the quantities of coating, reducer, and hardener required to meet "as applied" standards. Do not create your own mixtures. "Cocktailing" may result in inferior finishes that exceed the VOC standards.

Operating Procedures

- Keep paint and paint thinner wastes separate. Thinners can be reclaimed and reused. Thinners should be used until their cleaning capabilities have been exhausted. Thinner used as a gun cleaner should be saved and reused to thin the next batch of same color paint.

Latex Paints

- Buy only the amount of paint you need.
- Store paint so it lasts. Cover the opening with plastic wrap and tightly replace the lid. Make sure the lid fits securely so the paint doesn't leak. Then, store the paint upside down. The paint will create a tight seal around the lid, keeping the paint fresh until you need it again. Store the paint where it won't freeze over the winter.
- Use up all your paint. Leftover paint can be used on touch-up jobs and smaller projects. You can also blend and mix smaller quantities of similar colors of latex paint to use on larger jobs, or as a primer for jobs where the final finish is not critical.
- Donate or exchange your paint. If you can't use leftover paint, donate it to community groups, schools, churches, and others who can use it. Call your community to see if they maintain a paint swap shop or if they'll organize a paint swap with their next household hazardous waste collection event.
- Recycle your paint. Some communities collect paint for recycling. Buying recycled paint helps increase the demand for recycled paint. Recycled paint can be just as good as new.
- Air dry leftover latex-based paint and discard it in your trash. Make sure you do this away from children and pets. One method is to pour the latex paint onto a sheet of plastic and let it dry. Then you can roll it up and toss it out with your regular trash.

Solvent Based Paint

- Liquid solvent-based paint should not be discarded with the normal trash. Instead, save it for a special paint collection program or a household hazardous waste program in your community. Contact DES or your town office for details.
- Air drying liquid solvent-based paint is generally not recommended, but if the paint has already solidified in a closed can, you can dispose of it in your regular trash.
- Replace solvent-based paints with water-based paints to eliminate the use of solvents and thinners as cleaners. Using paints without metal pigments or paints with a high solid and low volatile organic compound content will also help reduce waste.

Overspray Reduction

- Use equipment with low overspray. High volume low pressure (HVLP) and air assisted airless guns to provide the high transfer efficiencies.
- Clean spray gun nozzles regularly. Be sure to clean needle valve well.
- Replace damaged nozzles.
- Keep spray gun perpendicular to the surface.

Prep Coats

- Use versatile products such as epoxy primers or self-etching primers. These may alleviate the need for additional surface coating operations such as primer-surfacing or primer-sealing.
- Use a wash primer or metal conditioner conversion coating system.

Primer

- Use a properly operating primer gun with the correct fluid tip/air cap combination for your particular type of primer-surface.
- To reduce VOC emissions, limit material costs and achieve a better quality product, perform body work using a minimal amount of primer-surfacer.
- If a clear sealer is to be used, make sure the primer-surfacer is a color that can easily be covered with the desired topcoats.

Topcoats

- Mix color coats in-house, making sure the formula for the proper shade of the specific color code is used.
- Keep good records of paint match information, including spray-out cards and detailed notes.
- When available use waterborne basecoats.

Topcoats (continued)

- Avoid the issue of laquer-based topcoats.
- Choose low VOC topcoats that require fewer than three coats to achieve adequate coverage (polyurethane or urethane).
- Apply only the number of coats needed to achieve a quality finish.

The DES fact sheet WMD-HW-14, *Pollution Prevention Tips for Paint* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/hw/hw-14.htm. The brochure titled *Low VOC Paints* is also available.

Scrap Metal

Stainless steel, iron, and chromium plated metals can be found in service facilities. These metals are usually removed from damaged mechanical parts.

Currently, lead soldered metal plates, chromium plated metals and other plating chemicals that can be listed or characteristic hazardous wastes are required to be TCLP tested. Normally, with the exception of lead soldered metal plates, the plated metals listed above pass the TCLP and can be managed as non-hazardous solid wastes.

Best Management Practices

If scrap metal contains oil or grease, outside storage may lead to contaminated rain runoff if the metal pile isn't covered or bermed.

Consolidate and maintain scrap metal in one designated area.

Scrap metal can be stored outside for long periods with no significant deterioration or loss of value, and many municipalities stockpile scrap metal for a year or more before moving it to a processor.

The DES fact sheet WMD-SW-19, *Scrap Metal Management* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/factsheets/sw/sw-19.htm.

Storage Tanks

Underground tanks- Env-Wm 1401 requires registration for single or aggregate tanks that are:
- more than 110 gallons of a regulated substance (oil or hazardous waste) or
- more than 1,100 gallons of fuel oil.

Aboveground tanks- Env-Wm 1402 requires registration for single or aggregate tanks that are: more than 660 gallons of oil combined to greater than 1,320 gallons oil.

All steel underground storage tanks were required by law to have a cathodic protection system installed or permanently closed by December 22, 1998.

The DES *Application for the Construction of New and Substantially Modified Underground Storage Facilities* can be obtained by calling (603) 271-2975 or by visiting www.des.state.nh.us/orcb/doclist/ustappli.pdf.

Solid Waste Recycling and Disposal

The easier and more convenient recycling is for boaters, the more cooperative they will be. The marina management is best able to determine how to make recycling receptacles adequate and convenient, but following are some general recommendations.

Best Management Practices

Provide facilities for the recycling of materials, such as glass, aluminum, plastic, newspapers, and batteries. Inventory recyclable material in your facility, and identify what outlets exist for removing recycled material once it is collected, and design your program around those materials. Check your local municipality to see what materials are recycled in the local transfer station.

Waste disposal and/or collection bins, dumpsters, and containers should be clearly marked, and accessible to patrons.

Solid waste disposal areas should have signs that clearly spell out the rules and regulations for disposal, including information about which materials are not acceptable for disposal at the site.

The area surrounding solid waste collection facilities should be inspected daily by marina personnel, and any waste should be cleaned up from the surrounding grounds.

Any waste receptacles placed on docks or near the water's edge should be secured to prevent them from tipping over.

Nutrients

Nutrients, particularly nitrogen and phosphorus, are essential to aquatic plant and algae growth. However, in excessive concentrations they may stimulate nuisance growths of these plants. Excessive plankton growth and decay can lower dissolved oxygen concentrations and reduce light penetration, which in turn can cause declines in aquatic vegetation, such as eelgrass, and aquatic animals. Marina activites that may result in the discharge of nutrients to receiving waters include urban storm water runoff, sanitary wastewater disposal, dredging, and vessel cleaning. Also, fertilizers applied to lawns at marinas can be transported to the water resource by air and stormwater.

Exotic Aquatic Plants

Milfoil infestation at a marina

Milfoil: This exotic aquatic plant is an aggressive colonizer of disturbed sediments and areas of high boat ingress and egress. This and other exotic plants are quick colonizers of disturbed sites. This may include areas common in the marina setting, including areas that are repeatedly or occasionally dredged, areas where nutrients may accumulate, and areas where native vegetation is continuously disturbed or removed. Once introduced, milfoil and other exotics can grow up to an inch a day in the summer months, rapidly forming the long feathery plant stems that can reach lengths of 15 feet or more.

Variable milfoil (*Myriophyllum heterophyllum*) was introduced to New Hampshire in the early 1960s. The plant was first identified in Moultonborough Bay in Lake Winnipesaukee. From this initial infestation, the plant has spread to over 40 waterbodies in about 35 years. Because there are no means of permanent removal, milfoil continues to spread throughout the state and throughout waterbodies unchecked.

There are many important things to know about the plant in order to prevent a large-scale infestation in a new waterbody or in a marina. Following a few simple guidelines should assist marina owners in preventing a permanent problem with these plants.

First of all, because there is no means of eradication once the plants are established, it is very important to find and identify potential exotic aquatic plants immediately. Occasionally scanning the areas around the boat launch, docks, moorings, and boathouses should be sufficient to find new plant growth. It is recommended that highly susceptible areas (like marinas) be monitored every two to three weeks from May through September for potential invasive plants. These inspections can be done from docks or from a boat. Know what the harmful exotics look like! If a suspected plant is found, a plant specimen should be collected and either mailed or delivered to the state Exotic Species Coordinator at DES for immediate identification.

If the plant is in fact an invasive exotic, DES can dispatch divers to carefully hand pull the plants before they spread to the whole marina or out into the waterbody. Hand pulling may then be followed by the installation of a bottom barrier to cover the area where the exotics were found. A bottom barrier is a semi-permeable plastic barrier that is staked to the lakebed to prevent plants from growing.

The proactive approach of monitoring and early detection is, by far, the best bet for preventing a marina-wide or lake-wide infestation. It also is important to have signage placed in plain view at the access site to alert staff and transient boaters as to the presence of exotics in the lake. DES has signs available that instruct the boater how and where to look for exotics attached to boats, trailers, and other water-based recreational equipment. These signs are available to marinas, and are free of charge.

If the marina already has an existing infestation of an exotic aquatic plant, DES can assist in the funding of large-scale management practices, including harvesting (where appropriate) or herbicide applications. If the infestation is new to the waterbody, DES will assume the full cost of the management practice. If the infestation has been previously managed, DES will match the marina or town for 50 percent of the treatment cost.

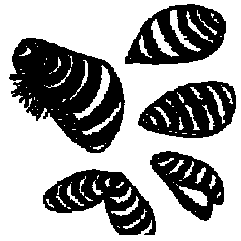


Illustration by Jen Drociak

Exotic animals also pose a threat to marinas. **Zebra mussels** are becoming close neighbors in Vermont waterbodies, and could spread easily to New Hampshire via boating activities. Zebra mussels are about the size of pistachio nuts, have alternating white and brownish-black bands, and have sticky strands that allow them to adhere to surfaces. Adult mussels may be found attached to boats and trailers. Larval forms of the mussels are microscopic, and cause a sandpaper-like feel to boat hulls. Zebra mussels cannot be eradicated, and can cause the water intake on marine engine cooling systems to become clogged when the larvae are entrained in the system, not to mention corroding boat surfaces and marina posts and pilings. Washing boats with high pressure water that is greater than 140^{o}F is acceptable for removing zebra mussels from boats.

For more information, please contact the Exotic Species Coordinator at 603-271-2248 or asmagula@des.state.nh.us. More information on this and other species of exotics is available on line at www.des.state.nh.us/wmb/exoticspecies/.

Lake Eutrophication

Lake aging is the natural process by which a lake fills in over geologic time with erosional materials carried in by the tributary streams, with materials deposited directly through the air, and with materials produced in the lake itself. From the time that a lake is created (by glacial action), the aging or filling in process begins. Although New Hampshire's lakes have the same chronological age, they age (fill in) at different rates because of differences in runoff and watershed characteristics. The natural succession is from lake to pond, pond to marsh, marsh to meadow, and meadow to dry land. Examples of each can be seen today including areas of dry land where past lake basins can still be identified.

Eutrophication is the process of increased nutrient input to a lake over the natural supply. This increased lake fertilization usually results in an increase in the biological production that occurs in the lake. Although the increased production may increase the rate of lake filling, it is incorrect to define eutrophication as lake aging. A lake dies not when it reaches a high state of productivity, but when it no longer exists. Lake filling results both from production that occurs in the lake, which may

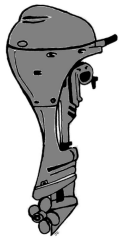
increase with eutrophication, and from organic and inorganic material deposited from outside the lake, which has no relationship with lake eutrophication.

Since eutrophication is increased nutrient input, any activity in the watershed of a lake that increases nutrient input causes eutrophication. Land use changes can result in significant changes in nutrient runoff. Studies in New Hampshire have shown that phosphorus export from agricultural lands is at least five times greater than from forested lands, and urban areas may be more than ten times greater. Other activities that contribute to eutrophication are lawn and garden fertilizers, faulty septic systems, washing in or near the lake, erosion into the lake, dumping or burning leaves in or near a lake, and feeding ducks.

Outboard Marine Engines

New Hampshire has hundreds of lakes and ponds and thousands of miles of rivers, which provide outdoor enthusiasts with many opportunities to enjoy time on the water. Until recently, most outboard boat engines and personal watercraft (PWCs) were powered by conventional carbureted two-stroke marine engines. The problem with these engines is that they are very inefficient in their use of gasoline and oil. According to some studies, in older carbureted two-stroke engines as much as 30 percent of the fuel passes through the combustion chamber unburned, releasing hydrocarbons, nitrogen oxides, and toxic constituents of gasoline directly into the environment.

Low-pollution marine engines are now available that greatly reduce hydrocarbon and toxic air emissions, and reduce the release of gasoline constituents into waterways. These low-pollution outboards come as four-stroke or direct fuel injection two-stroke engines. Although these low-pollution engines may cost more (about 10 to 20 percent more than the old carbureted two-stroke engines), they provide many economic and environmental benefits, and are consumer friendly.



Low-emission engine
Illustration by Jen Drociak

Benefits of Low-Pollution Marine Engines

- Burn 35 to 50 percent less gasoline, which translates into fuel savings.
- Use up to 50 percent less lubricating oil.
- Reduce air emissions by 75 percent.
- Reduce water pollution by reducing the amount of gasoline released into surface waters.
- Are significantly quieter, and reduce smoke and fumes.
- Provide easier starting, faster acceleration, and quicker throttle response.
- Are less disruptive to wildlife and better for New Hampshire's environment!

New Hampshire's Clean Marine Engine Initiative

DES and NHMTA entered into a voluntary agreement in February 2000 to accelerate the phase-in of the low-pollution marine engines in New Hampshire prior to the EPA 2006 mandate. The Memorandum of Understanding between DES and NHMTA can be located in the appendix of this document. For more information on the Clean Marine Engine initiative contact Jacquie Colburn at (603) 271-2959 or e-mail jcolburn@des.state.nh.us.

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List of Appendices

I. New Hampshire Resources for Information and Assistance

II. Vendors of Marine Systems and Products

III. BMP Assessment Checklist for New Hampshire Marinas

IV. Native and Naturalized Shoreland Plantings for New Hampshire

V. Memorandum of Understanding Between NHDES and NHMTA Regarding Low Pollution Marine Engines

Appendix I

New Hampshire Resources for Information & Assistance

New Hampshire Department of Environmental Services

6 Hazen Drive PO Box 95
Concord, NH 03301
(603) 271-3503 www.des.state.nh.us

New Hampshire Pollution Prevention Program
Sara J. Johnson, Pollution Prevention Program Manager
In State: (800) 273-9469 Phone: (603) 271-6460 Fax: (603) 271-2456
E-mail: nhppp@des.state.nh.us Web site: http://www.des.state.nh.us/nhppp

Provides confidential, non-regulatory multi-media waste reduction assistance for businesses, maintains an in-house pollution prevention technology library, and serves as a clearinghouse for researching waste reduction information.

Small Business Technical Assistance Program
Rudy Cartier, Small Business Ombudsman
In State: (800) 837-0656 Phone: (603) 271-1379 Fax: (603) 271-1381
E-mail: rcartier@des.state.nh.us or stap@des.state.nh.us

Clean Air Act compliance and technical assistance. Features Small Business Ombudsman, regulatory research, site visits, and permitting assistance.

New Hampshire Industrial Pre-Treatment Program
George Carlson, Industrial Pretreatment Coordinator
Phone: (603) 271-2052 Fax: (603) 271-4128
E-mail: gcarlson@des.state.nh.us

Wastewater and water pollution assistance program for businesses. Features regulatory and pollution prevention assistance and site visits.

Limnology Center
Jody Connor, Limnology Center Director
Phone: (603) 271-3414 Fax: (603)271-3414
E-mail: jconnor@des.state.nh.us

Exotic Species & Clean Lakes Program
Amy P. Smagula, Clean Lakes & Exotic Species Coordinator
Phone: (603) 271-2248 Fax: (603) 271-7894
E-mail: asmagula@des.state.nh.us

Watershed Assistance Program
Eric Williams, Supervisor
Phone: (603) 271-2358 Fax: (603) 271-7894

Hazardous Waste Compliance Hotline
Phone: (603) 271-2942

Solid Waste Compliance
(603) 271-2925

Special Investigation Section
(603) 271-3899

Public Information & Permitting Unit
(603) 271-2975

Department of Health and Human Services

6 Hazen Drive
Concord, NH 03301
(603) 271-
www.dhhs.state.nh.us

OSHA Consultation Program
Theresa Ferrara, Industrial Hygiene Supervisor
Phone: (603) 271-4676 Fax: (603) 271-2667
E-mail: tferrara@dhhs.state.nh.us
Website: http://www.dhhs.state.nh.us/

Provides free assistance for business with less than 150 employees. Helps businesses determine/correct workplace hazards and works to create programs to ensure a safe and healthy workplace.

Appendix II

Vendors of Marine Systems and Products

The following is a partial list of vendors and products that provide pollution prevention services to the marina industry. Several buying guides have also been included that may contain a larger selection of products. Because the list is not complete, we suggest that you use it as an information guide to the types of products available and conduct additional research into product options. The listing below are not intended to be a complete listing, nor dies it imply an endorsement by the New Hampshire Department of Environmental Services.

A more comprehensive list of pollution prevention technologies is available at VendInfo, the US EPA's National Database of Pollution Prevention Products and Services. Visit VendInfo at http://es.epa.gov/vendors/.

Please call (603) 271-0878 or e-mail nhppp@des.state.nh.us if you know specific marina vendors and products that should be added to the list below.

Buyer's Guide Websites

www.boatdealer-marina-info.com/1999bguide.htm
www.marinestore.com
www.yotting.com

Antifreeze Recycling

Antifreeze Recycling of N.E.
16 Sage Court
Goffstown, NH 03045
(888) 802-4374

Antifreeze Technology Solutions
One Seasons Lane
Londonderry, NH 03053
(603) 432-4444
off-site

Cycle Solve Corporation
3134 Post Road
Warwick, RI 02886
(401) 781-0808
www.cyclesolve.com
off-site

EcoService
37 Forest Street
Randolph, VT 05060
(802) 728-3435
on-site

Hi-Tech Industries
9418 Irondale Ave
Chatsworth, CA 91311
(800) 553-0505
www.hi-techind.com/ (on-site)

New England Environmental Services, Inc.
339A Farnum Pike
Smithfield, RI 02916
(800) 442-5668
off-site

Safety-Kleen
28A Brigham Street
Marlborough, MA 01752
(508) 481-3116
www.safety-kleen.com/safetykleen.html
off-site

Total Waste Management
142 River Road
Newington, NH 03801
(603) 431-2420
www.totalwaste.com (off-site)

Envirosmart
P.O. Box 1546
Salem, NH 03079-1141
(800) 595-0205
on-site

Bilge Water Filtering and Removal

Master Chemical Corporation
501 West Boundary
Perrysburg, OH 43551-1263
(419) 874-7902
www.masterchemical.com/

Wave International Ltd.
Wave Bilge Water Filters
www.wavestream.co.uk
Distributed by Tides Marine
3251 SW 13th Drive
Deerfield Beach, FL 33442
(800) 554-8299
www.tidesmarine.com

Biodegradable Soaps and Cleaning Agents

Amazon
P.O. Box 2341
Miami Shores, FL 33153
(800) 832-5645

Beckson Marine
P.O. Box 3386
165 Holland Ave
Bridgeport, CT 06605
(203) 222-1412
www.beckson.com/industries

Bio-Kleen
P.O. Box 82066
Portland, OR 97282
(503) 557-0216 (www.bi-o-kleen.com)

Bio Concepts
P.O. Box 374
Kemah, TX 77565
(800) 828-5124

Boat US
880 S. Pickett St.
Alexandria, VA 22304
(703) 823-9550
www.boatus.com

Chemique
315 N. Washington Ave
Moorsetown, NJ 08057
(606) 235-4161
www.chemique.com

E&B Discount Marine
201 Meadow Rd.
P.O. Box 3138
Edison, NJ 08818
(908) 819-4760
www.boater.com/info/geninfo/boatliners.html

Guardsman Products, Inc.
1350 Steele Ave SW
Grand Rapids, MI 49507
(616) 452-5181
http://es.epa.gov/venderinfo/1320.html

Kellogg Marine
129 Mill Rock Rd.
P.O. Box 809
Old Saybrook, CT 06475
(800) 243-9303
www.kelloggmarine.com

Star Brite, Inc.
4041 SW 47th Ave
Fort Lauderdale, FL 33314
(800) 327-8583
www.tackletogo.com/wfp/marinecare.html

Target Enterprises
P.O. Box 1582
Rutherford, NJ 07070
(800) 752-9922
www.targetcoatings.com

Cortec Corp.
4119 White Bear Pkwy.
St. Paul, MN 55110
(612) 429-1100
www.cortecvci.com/cortec/index.html

CRC Industries/
MaryKate Boat Care Products
885 Louis Dr.
Warminister, PA 18974
(215) 674-4300
www.crcindustries.com/

Defender Industries
P.O. Box 820
225 Main St.
New Rochelle, NY 10801
(914) 632-3001
www.defenderus.com/

3M
Marine Trade Building
223-6N-01
St. Paul, MN 55514
(612) 736-2436
www.mmm.com/marine/fam.jhtml;$pageID$-mwm-mcr

West Marine
P.O. Box 50050
Watsonville, CA 95077
(408) 728-4430
www.westmarine.com

Dripless Oil Change Systems

Separ Distribution
Hetfordshire, England
44 (0) 1923 819041
www.separ.co.uk/reverso1.htm

Shurflo Oil Change System
(757) 934-3300
www.yotting.com/18/00018718.htm

Simplicity Marine Drives
c/o Fowler Marine, Inc.
(941) 722-8475
www.simplicity-marine.com

Dustless Sanders

Fein Power Tools, Inc.
1030 Alcon St.
(626) 792-8211
Pittsburgh, PA 15220
(412) 922-8886
www.feinus.com

Hutchins Manufacturing Co.
49 North Lotus Ave.
Pasadena, CA 91107
(626) 792-8211
www.hutchinsmfg.com

Martin Walter Co., Inc.
43 Washington St.
Norwell, MA 02061
(781) 878-1216
www.boatmassachusetts.com/members/martinwalter.html

Fuel Air Separators

Parker Hannifin Corporation
1515 West South St.
Lebanon, IN 46052
(800) C-PARKER
www.parker.com/racor/fas.html

Martin Walter Co., Inc.
43 Washington St.
Norwell, MA 02061
(781) 878-1216
www.boastmassachusetts.com/members/martinwalter.html

Shuster Corporation
4 Wright St.
New Bedford, MA 02740
(800) 343-8409

Hazardous Waste Collection Companies

Clean Harbors
1501 Washington St.
Braintree, MA 02184
(781) 849-1800
www.cleanharbors.com

Safety Kleen
221 Sutton St.
North Andover, MA 01845
(978) 683-1002
www.safetykleen.com

Cyn Environmental Services, Inc.
2382 Boston Rd.
Wilbraham, MA 01095
(413) 599-1900
www.cynenv.com

Mercury-Containing Fluorescent Lamps

Advanced Environmental Recycling Co.
2591 Mitchell Ave.
Allentown, PA 18103
(800) 554-AERC

Bethlehem Apparatus, Co.
890 Front St.
P.O. Box Y
Hellertown, PA 18055
(610) 838-7034

Conservation Lighting Inc.
470 Riverside St.
Portland, ME 04103
(207) 878-5534

Northeast Lamp Recycling, Inc.
250 Main St.
East Windsor, CT 06088
(860) 292-1992

Salesco Systems, USA, Inc.
40 Messina Drive
Braintree, MA 02184
(800) 368-8878

Superior Lamp Recycling
P.O. Box 1323
Fond du Lac, WI 54936-1323
(800) 556-5367

Superior Special Services
218 Canton St.
Stoughton, MA 02072
(781) 341-6080

Oil Absorbent and Spill Control Materials

Ben Meadows Co.
3280 Pchtr Corners Circle
Norcross, GA 30092
(800) 241-6401
www.benmeadows.com

Brockton Equipment Spilldam, Inc.
89 Montello St.
Brockton, MA 02301
(508) 583-7850
www.spilldam.com

Enviro Marine Inc.
100 Lewis Dr.
Greenville, SC 29605
(864) 242-5799

Ergon Environmental
385 Curie Dr.
Alpharetta, GA 30005
(770) 475-3877

New Pig Corporation
1 Pork Ave.
Tipton, PA 16684
(800) 468-4647
www.newpig.com

Oil Dri Corporation of America
630 Campbell St.
Thomasville, GA 31792
(800) OIL DRIP

Spill 911
1017 3rd Ave. SW
Carmel, IN 46032
(800) 474-5911
www.spill911.com

Used Oil Marketers

A. Wentworth Oil Service
141 Rolins Road
Rollinsford, NH 03869
(603) 742-1113

Chesterfield, Town of
P.O. Box 175
Chesterfield, NH 03443-0175
(603)256-3016

Northern Environmental Services
520 Route 10
Piermont, NH 03779
(603) 272-9200

Polar Refrigerant Technologies
89 Exeter Road
South Hampton, NH 03827
(603) 394-8041

Sprague Energy Corp.
One Parade Mall
Portsmouth, NH 03801
(603) 430-7264 (Oil from Total Waste Management only)
www.spragueenergy.com/

Transformer Service, Inc.
74 Regional Drive
Concord, NH 03301
(603) 224-4006 (Oil with PCBs only)

Total Waste Management
142 River Road
Newington, NH 03801
(603) 431-2420
www.totalwaste.com

White Mountain Mack
19 Bridge Street
P.O. Box 501
Lancaster, NH 03584-0501
(603) 788-2504

Used Oil Heater Distributers

Clean Burn

A.R. Sandri, Inc.
400 Chapman Street
P.O. Box 760
Greenfield, MA 03102-0760
(800) 628-1900, Ext. 148
www.sandrisunoco.com/Cburn/CBARS.htm

Orino Waste Oil Heaters
P. O. Box 10
Rumford, ME 04276-0010
(800) 854-6503
www.cleanburn.com

Whitten Heating
P.O. Box 519
Orange, MA 01364-0519
(800) 508-2788
www.whittenheating.com/toc.htm

Black Gold

Norki Energy Systems, Inc.
P.O. Box 446
Poughkeepsie, NY 12602-0446
(800) 676-5101
www.norki.com

Lanair-Factory Direct

Lenan Corp.
P.O. Box 10
Rumford, ME 04276-0010
www.e-heat.com/ordering.html

Shenandoah

Arrow Equipment, Inc.
10 Merry Mont Road
Littleton, NH 03561
(603) 444-3313; (603) 444-0508

DLD Associates
P.O. Box 850
West Ossipee, NH 03890-0850
(800) 338-6284

Paint-Related Products

Apollo Sprayers, International Inc.
(HVLP Sprayers)
1030 Joshua Way
Vista, CA 92083
(800) 578-7606
www.hvlp.com

E Paint Company
19 Research Rd.
East Falmouth, MA 02536
(800) 258-5998
www.epaint.net

Fluid-Air Products Inc.
(Electrostatic Sprayers)
12834 Gravois Rd.
Saint Louis, MO 63127
(800) 365-7565
www.fluidair.com/Electrostatic.htm

The Paint Project, Inc.
(Spray Booths)
19 Willow St.
Natick, MA 01760
(508) 650-0055
www.paintproject.com

SprayTech Systems, Inc.
(Electrostatic Spray Guns)
4631 NW 3rd St.
Oklahoma City, OK 73127
(904) 948-8696
www.spraytechsys.com

Pumpout Manufacturers

Airvac, Inc.
4217 N. Old US 31
P.O. Box 528
Rochester, IN 46975
(219) 223-3980
www.airvac.com

Alex Milne Associates Ltd.
376 Orenda Road East
Brampton, Ontario Canada
(800) 563-5947
www.nemarine.com/ama.htm

Bay Sails Marine
2568 Rte. 6
Box 1455
Wallfleet, MA 02667
(508) 349-3840
www.baysailsmarine.com

Bio Concepts
P.O. Box 374
Kemah, TX 77565
(800) 828-5124

Edson International
460 Industrial Park Road
New Bedford, MA 02745-1292
(508) 995-5021
www.edsonintl.com/edson_marine.html

EMP Industries, Inc.
3284 Morris St. N
St. Petersburg, FL 33713
(800) 355-7867
www.empind.net

Envirovac
4145 Rose Ave.
Lyons, IL 60534
(708) 447-5889
(800) 435-6951

Extar International Corporation
301 E-1 N. Green Meadows Dr.
Wilmington, NC 28405
(910) 452-4737
www.extarinternalcorp.com

Far Products, Inc.
Fremont, OH 43420
(419) 332-8296

Keco Pumps, Inc.
3235 Hancock St., Suite 2
San Diego, CA
(619) 298-3800
www.pumpahead.com

Marine Sanitation, Inc.
1900 N. Northlake Way
Seattle, WA 98103
(800) 624-9111
www.mypid.com/sanitation

Oberdorfer Pumps
P.O. Box 4770
Syracuse, NY 13221
(315) 437-0361
www.oberdorfer-pumps.com

Sealand Technology, Inc.
Box 38 Fourth St.
Big Prairie, OH 44611
(800) 321-9886
www.sealandtechnology.com

Waumbaushene Machine & Welding
Box 99, 111 Coldwater Rd.
Waubaushene, Ontario LOK 2C0
(705) 538-1459
www.wmwpump.com/

Martin Walter Co., Inc.
43 Washington St.
Norwell, MA 02061
(781) 8781216
www.bostonmassachusetts.com/members/martinwalter.html

Shrink Wrap/Recycling

Buffalo Shrink Wrap
11342 Main St.
East Amherst, NY 14051
(800) 792-2218
www.buffaloshrinkwrap.com/

Dockside Boat Reconditioning, Inc.
(401) 351-7130
www.canvaslink.com/cnews.htm

Dr. Shrink
1606 State St.
Mainstee, MI 49660-1855
(616) 723-2685
www.dr-shrink.com

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

BMP Assessment Checklist for NH Marinas

Marina Name:_____
Contact Name:_____
Address:_____
_____
Phone:_____Fax:_____E-mail:_____

Vessel Maintenance & Repair (Page 15)

Do you:

1. Restrict maintenance activities to designated upland work areas?	Y	N
2. Ensure that there are adequate absorbent materials in place when performing any type of engine maintenance and repair?	Y	N
3. Send wastewater from engine parts cleaning (test tank) to a POTW or waste transporter/recycler?	Y	N

Hazardous Waste Management

Used Oil (Page 21)

Do you:

1. Store used oil in structurally sound containers?	Y	N
2. Clearly label with the words "USED OIL FOR RECYCLE?"	Y	N
3. Keep containers closed and sealed except when oil is being added or removed from the container or tank?	Y	N
4. Keep used oil separated from other hazardous wastes?	Y	N
6. Recycle used oil?	Y	N
7. Burn used oil for recovery?	Y	N

Used Oil Filters (Page 25)

Do you:

1. Properly drain and dispose of used oil filters?	Y	N
2. Recycle used oil filters with a scrap metal dealer?	Y	N

Absorbents (Page 26)

Do you:

1. Select cloth or other durable materials that are reusable?	Y	N
2. Use a laundering service?	Y	N

Fueling (Page 23)

Do you:

1. Install environmental controls (locks) at the pumps?	Y	N
2. Allow only trained staff to pump fuel?	Y	N
3. Offer spill-proof oil changes?	Y	N
4. Routinely use oil-absorbent materials at the fuel dock?	Y	N
5. Regularly inspect/repair fuel transfer equipment?	Y	N

Vessel Cleaning (Page 34)

Do you:

1. Perform boat cleaning above waterline in such a way that no pollutants reach the water?	Y	N
2. Use low phosphate, low nitrate, biodegradable cleaning agents?	Y	N
3. Do you sell low phosphate, low nitrate, biodegradable cleaning agents?	Y	N

Parts-Washing Solvents (Page 28)

Do you:

1. Keep parts-washing solvent separate from all other wastes?	Y	N
2. Manually pre-clean parts before placing them in the parts washer to increase the life of the solvent?	Y	N
3. Recycle parts-washing solvent?	Y	N

Sumps & Floor Drains (Page 30)

Are your floor drains:

1. Connected to a municipal sanitary sewer in accordance with federal, state and local regulations?	Y	N
2. Connected to an alarmed, underground holding tank which meets DES requirements and is registered with DES?	Y	N
3. Connected to an above ground holding tank which meets all federal, state and local requirements?	Y	N

Do you:

4. Have a groundwater discharge permit from DES?	Y	N

Wastewater & Stormwater

Stormwater (Page 31)

Do you:

1. Maintain adequate vegetative buffer strips between surface waters and upland areas?	Y	N
2. Have a registered holding tank?	Y	N
3. Do you have a connection to the municipal sewer line?	Y	N
4. Stencil storm drains?	Y	N

Vessel Sewage (Page 37)

Do you:

1. Have a well-maintained pumpout station?	Y	N
2. Allow only trained staff to handle pumpout?	Y	N
3. Handle and dispose of waste with care?	Y	N
4. Educate boaters about pumpout procedures?	Y	N
5. Have clean, functional restrooms available 24 hrs/day?	Y	N
6. Have a connection to the municipal sewer line?	Y	N

Other Waste Streams (Page 42)

Do you:		
1. Recycle empty aerosol cans with a scrap metal dealer?	Y	N
2. Use propylene glycol antifreeze instead of ethylene glycol?	Y	N
3. Store used antifreeze in structurally sound, clearly marked containers that read "Used Antifreeze For Recycle?"	Y	N
4. Keep all hazardous wastes on impervious surfaces and away from floor drains?	Y	N
5. Safely store and recycle lead-acid batteries?	Y	N
6. Safely store and recycle mercury-containing fluorescent bulbs?	Y	N

Employee Health & Safety (Page 14)

Do you:		
1. Train employees to use equipment and chemicals according to established rules and regulations?	Y	N
2. Have an Environmental Health & Safety (EH&S) Plan?	Y	N
3. Have a Spill Prevention Control Countermeasure (SPCC) Plan?	Y	N
4. Keep all Material Safety Data Sheets (MSDS) in an easily accessible and localized area?	Y	N
5. Keep emergency postings near all telephones?	Y	N
6. Have eyewash stations in maintenance bays?	Y	N
7. Have fire extinguishers in maintenance bays?	Y	N
8. Post "No Smoking" signs in maintenance bays?	Y	N
9. Have spill kits nearby in case of an emergency?	Y	N

Education

Do you:		
1. Post signs detailing Best Management Practices?	Y	N
2. Distribute environmental education materials to patrons?	Y	N
3. Host workshops to highlight/demonstrate Best Management Practices?	Y	N
4. Encourage/recognize boaters who try to prevent pollution?	Y	N
5. Publicize environmentally responsible marina actions?	Y	N

Answering "no" to any of the aforementioned questions may indicate that your facility may be out of compliance with one or more requirements. Invite NHPPP to visit your marina. NHPPP is a confidential, non-regulatory assistance program which is available FREE of charge to NH businesses. NHPPP can help you evaluate your waste generating processes to find ways to reduce your waste, liability, and impact on the environment. We can recommend proven, cost-effective options for regulatory compliance while reducing, reusing, and recycling wastes.

If you would like to schedule a visit, the first step is to complete and return the "BMP Self-Assessment Checklist for NH Marinas" so we can assess your processes, existing pollution prevention activity, and waste information. The form can be mailed to:

New Hampshire Department of Environmental Services, Pollution Prevention Program, 6 Hazen Drive, Concord, NH 03301 or faxed to (603) 271-2456.

If you'd prefer, call us at (603) 271-0878 to speak directly with technical staff about pollution prevention questions you may have or e-mail nhppp@des.state.nh.us. Remember, environmental planning makes good business sense because it is cheaper and less time consuming to anticipate potential problems, than to respond to them as they arise.

Appendix IV

Native and Naturalized Shoreland Plantings For New Hampshire

Trees

Common Name	Scientific Name	Height	Habitat/Soil Preference
American Beech	Fagus grandifolia	60-80’	Bottomlands, gentle slopes
American Basswood	Thuia Americana	70-80’	Moist soils of valleys and uplands
Balsam Fir	Ahies balsamea	40-60’	Swamps to well-drained soils, coniferous forests
Black Birch	Betula lenta	Up to 75’	Dry woods, clearings, rocky places
Black Tupelo	Nyssa sylvatica	60-80’	Bottomlands, gentle slopes
Bur Oak	Quercus ncacroearpa	Up to 100’	Exposed sandy soils
Carolina Silverbell	Halesia Carolina	Up to 30’	Moist soils, streambanks, understory
Common Sassafras	Sassafras albidum	3-40’	Welt drained fields and woods
Eastern Hemlock	Tsuga Canadensis	6-10’	Moist cool valleys, acidic soils
Eastern White Pine	Pinus strobes	80-100’	Rock ridges, bogs, sandy loam well-drained soils
Green Ash	Fraxinus pennsylvanica	50-60’	Streams, floodplains, moist alluvial soils
Musclewood	Carpinus caroliniana	Up to 35'	Deep rich moist sites, shade tolerant, understory species
Northern Red Oak	Quercus rubra	6o-80’	Bottomlands, slopes, moist loamy, or sandy/rocky soils
Paper Birch/White Birch	Betula papyrifera	50-70’	Streambanks, lakeshores, moist sandy
Pin Oak	Quercus palustris	70-80’	Deep, moist, rich soils, bottomlands, swamps

Red Maple	Acer rubrum	50-70’	Swamps, bottomlands, moist soils
Rod Pine/Norway Pine	Pinus resinosa	50-80’	Sandy soils, rocky slopes, mixed forests
River Birch	Betula nigra	Up to 80’	Streambanks, ponds, swamps, deep rich soils
Scarlet Oak	Quercus coccinea	70-80’	Dry sandy to gravelly soils Upland edges
Shadbush/ Serviceberry	Amelanchier orcorea	3-40’	Edges of streams,moist woods,ravines
Smooth-leaved Shadbush	Amelanchier laevis	Up to 30’	Damp wooded banks, swamps, thickets low wet areas
Sugar Maple	Acer sacciarum	60-80’	Uplands, valleys moist rich soils
Swamp White Oak	Quercus bicolor	60-70’	Wet sites, areas of flooding Wooded swamps, floodplains, streambanks
White Ash	Fraxinus americana	70-80’	Valleys, slopes, moist soil, well-drained loam
White Oak	Quercus alba	8-l00’	Uplands, sandy plains, rich soils
White Spruce	Picea glauca	60-70’	Streambanks, lakeshores, fiats, slopes
Willow	Salix spp.	Shrub or tree	Wet sites
Wire Birch/Grey Birch	Betula populifolia	Up to 30’	Early success ional tree, uplands
Yellow Birch	Betula alleghaniensis	Up to 100’	Hilly terrain, high elevation, uplands

Shrubs

Common Name	Scientific Name	Height	Habitat/Soil Preference
American Elderberry	Sambucus canadensis		Swamp edges, along fences and roads
American Hazelnut	Corylus americana	3-8’	Borders' of woods, hillsides, thickets
Northern Arrowwood	Viburnum recognitum	3-15’	Wet/dry thickets, borders of woods, understory of forest
Bayberry	Myrica pensylvanica	Up to 6’	Sandy, sterile areas
Beech Plum	Pinus maritirna	Up to 8’	Near coast, sandy soil
Black Chokeberry	Aronia meloncarpa	24’	Rock uplands, thickets
Blackhaw	Viburnum prunifolium	Up to 20’	Valleys, slopes, borders of forests, moist soils
Bog Rosemary	Andromeda glaucophylla	0.5-1.5”	Bogs, peaty to sandy soils
Buttonbush	Cephalantaus occidentalis	5-15”	Swamps, borders of ponds, streams, lakes
Common Witchhazel	Hamamelis virginiana	10-15”	Dry or moist woods, understory of forest
Eastern Red Cedar	Juniperus virginiana	40-50’	Fields, poor dry soils to fioodplains and swamps
Gray Dogwood	Cornus racemosa	Up to 9’	Roadsides, thickets, swamps dry or moist soils
Highbush Blueberry	Vaccinium corymbosurn	5-15”	Swamps or dry upland woods
Hobblebush	Viburnum ainifolium		Shrub layer of cooler New England forests
Hop Hornbeam/Ironwood	Ostrya virginiana	20-35’	Cool moist forests, dense shade, hardwood forests dry rocky slopes and ridges of understory
Juniper	Juniperus corrununis	1-3’	Fields, sandy to rocky flats, slopes
Labrador Tea	Lithrum groeniacdicum	1-3’	Bogs, high mountains

Lowbush Blueberry	Vaccinium angustifolium		Bogs, dry sandy fiats, rock slopes
Mapleleaved Viburnum	Viburnum acerifolium	3-6’	Shrub layer of moist upland forest
Meadowsweet	Spiraea latifolia	1-5’	Low moist ground, meadows, fields
Mountain Holly	Ilex montana	Up to 30’	Mined hardwood forest, moist soils
Mountain Laurel	Kalmia latifolia	3-15’	Open hardwood forests, uplands mountain slopes, dry acidic soils, understory species
Mugo Pine	Pinus mugo	12-15’	Fields, roadsides, wet places
Musclewood	Carpinus caroliniana	Up to 30’	Deep, rich moist soils, shade tolerant understory species
Nannyberry	Viburnum lentago	10-30’	Swamp and forest edges, moist soils of valleys
Pagoda Dogwood	Cornus alternifolia	Up to 25’	Hardwood and coniferous forests, moist soils
Red Chokeberry	Pyres arbutifolia	3-12’	Thickets, clearings, swamps
Red Osier Dogwood	Cornus stolonifera	3-10’	Short thickets, understory of forests, moist soils, along streambanks
Rhodora	Rhododendron canadensis	1-3’	Bogs, wet slopes, rocky summits
St. Johnswort	Hpericum perforatum	1-3’’	Fields, roadsides, wet places
Sheep Laurel	Kalmia angustifolia	1-3”	Fields, bogs, dry/wet soils
Shinning Sumac	Rhus copallina	Up to 25’	Uplands, valleys, grasslands, clearings, edges of forests
Shrubby Cinquefoil	Potentilla fruticosa	1-3”	Wet or dry open ground, meadows
Silky Dogwood	Cornus amomum	Up to 10’	Wooded swamps, low wet woods, shrub swamps
Snowberry	Symphoricarpos albus	14”	Rocky banks and roadsides

Groundcover

Common Name	Scientific Name	Height	Habitat/Soil Preference
Steeplebush	Spirea tomentosa	2’	Old fields, meadows, low grounds
Sweet Pepperbush	Clethra alnifolia	3-10’	Wetlands, swamps, sandy woods
Sweet gale	Myrica gale	Up to 6’	Streams, low wet woods, borders of swamps
Winterberry Holly	llex verticiliata	3-10’	Swamps, thickets, pond and stream margins
Witherod Vibumum/ Northern Wild Raison	Viburnum cassinoides	3-12’	Wet thickets, swamps, clearings
Bloodroot	Sanguinaria canadensis	Up to 10”	Rich woodlands, streambeds
Bunchberry/ Canada Dogwood	Cornus canadensis	3-8”	Cool woods, damp openings
Cranberry	Vaccinium macracarpon	Up to 8”	Open bogs, swamps, lakeshores
Grape	Vistis spp.	Vine	Rich woods
Hay-Scented Fern	Dennstaedria punctiloula	5-15”	Woodlands, hillside pastures
Interrupted Fern	Osmunda daytoniana	~6’	Roadsides, woodlands, stony dry soil
Lowbush Blueberry	Vaccinium angustifolium	3-15”	Bogs, dry sandy fiats, slopes
Marsh Marigold	CaItha Palustris	1-2’	Swamps, marshes, streams, brooks
Partridgeberry	Mitchella repens	vine	Dry or moist woods
Sweet Fern	Comptonia perigrina	Up to 15”	Dry sterile, open sites
Virginia Creeper	Parthenocissus quinquefolia	vine	Woods, rocky banks
Wintergreen/Teaberry	Gaultheria procumbens	2-6’	Oak woods, sandy soils

Appendix V

MEMORANDUM OF UNDERSTANDING
Between the
NH Department of Environmental Services
and the
NH Marine Trades Association
Regarding Low Pollution Marine Engines

The Department of Environmental Services (hereafter "NH DES") and the undersigned members of the New Hampshire Marine Trades Association (hereafter "NH MTA"), in accordance with the vote of the Association at its December 1999 meeting, establish a voluntary agreement to encourage the purchase and use of low pollution outboard marine engines, such as direct fuel-injected 2-stroke and 4-stroke outboard marine engines, by the boating public of New Hampshire. The federal Environmental Protection Agency (EPA) has established that by 2006 all new outboard marine engines must meet new air emission standards that also significantly reduce the release of pollutants into the marine environment. NH DES and NH MTA have entered into this Memorandum of Understanding in an effort to accelerate the phase-in of these low pollution marine engines in New Hampshire.

The undersigned members of the NH MTA agree to make every reasonable effort to sell low pollution outboard marine engines at the following percentage rates of their total number of outboard marine engines sold per year:

2000: fifty percent (50%), or more, of all outboard engines sold, shall be low pollution marine engines
2001: seventy-five percent (75%), or more, of all outboard engines sold, shall be low pollution marine engines
2002 - 2005: ninety percent (90%), or more, of all outboard engines sold, shall be low pollution marine engines

This Memorandum of Understanding assumes that sufficient quantities of low pollution outboard marine engines will be available for purchase by New Hampshire boaters and that these engines will be available from marine manufacturers whose production and delivery capacities will be able to support this agreement. The undersigned members of NH MTA will use their best efforts to obtain low pollution outboard marine engines from the manufacturers of these engines.

The undersigned members of NH MTA agree to make available to the New Hampshire Lakes Management and Protection Program of DES annual reports detailing the percentages of low pollution outboard marine engines sold commencing with the calendar year 2000. These reports will be submitted by the last day of December for each reporting year.

The NH DES agrees to promote the purchase and use of low pollution outboard marine engines by the boating public. The NH DES will develop public educational materials such as fact sheets, a web page, and shall work with the NH Public Broadcaster's Association to develop and broadcast public service announcements. Further, the NH DES will work with other state agencies and municipalities to accelerate the purchase and use of low pollution marine engines by the State of New Hampshire and its communities.

This agreement has been executed as of _____by the NH DES and by each of the undersigned members of the NH MTA.

_____ ____
Date

Robert W. Varney, Commissioner
NH Department of Environmental Services