

Clean Waters

Starting in Your Home and Yard



Clean Waters is a collaboration of the Connecticut Sea Grant Extension Program and the University of Connecticut Cooperative Extension System's NEMO Project, educating individuals about the impacts of everyday activities on water quality and simple techniques that help protect water resources from the home well to Long Island Sound.

What's the Big Deal About Water Quality?

It used to be that no one really thought much about water. It came out of the faucet, went down the drain and that was the end of that. If you wanted to go fishing or swimming, you went to the local stream, swimming hole or maybe even took a trip down to Long Island Sound. Nothing to worry about – there's clean water to spare, right?

There are plenty of reasons to worry about water and water quality. We expect to have crystal-clear, pure water for drinking, food production, and recreation AT THE SAME TIME we use our waters for waste disposal. The old slogan, "the solution to pollution is dilution" typified the feeling that anything dumped down a drain, into a river or even into the ocean was going to disappear without a trace. We now know that NO aquatic system, even an ocean, can absorb unlimited human pollution. Just ask someone with a contaminated well, clambers in a town where shellfishing is prohibited due to pollution, residents of a town where a water conservation emergency has been declared, or sailors who find rafts of plastic trash in the middle of the ocean. They'll tell you that water, both in terms of quantity and quality, is not to be taken for granted.

The need to prevent water pollution has been recognized for years. The federal and state Clean Water Acts were passed in the early 1970's specifically to clean up discharges from industry and sewage treatment plants. We now know the problem is much more complicated than simply ordering a plant to stop discharging pollutants. Factories and sewage treatment plants are two examples of "point source pollution", where pollution enters the water from a specific source. All other types of water pollution are lumped together in a category called "nonpoint source pollution" or "polluted runoff." These pollutants fall from the sky, wash from the land during rain storms, travel across the state in streams and rivers, and even get dumped into storm drains or directly into the water by the thousands of individuals who don't realize that what they are doing causes water pollution. The Environmental Protection Agency now considers nonpoint source pollution the NUMBER ONE threat to water quality in the United States.

Through our everyday activities, we all cause water pollution without realizing it. The exhaust and oil from driving cars, materials washed down drains or flushed down the toilet, pet wastes, fertilizers and pesticides used in yards, all contribute to water pollution. Making simple changes in our everyday activities can help reduce some types of pollution. For example, conserving water both saves money and helps septic systems or the local sewage treatment plant remove pollutants more effectively. Choosing non-toxic alternatives for household cleaning products reduces water pollution, cleaning bills, and our exposure to hazardous materials. Rethinking landscaping and gardening practices reduces the need for pesticides, fertilizer, and irrigation, thus reducing the potential for contaminating local waters.

These are just a few examples of personal efforts that protect water quality. There are many written materials available, including this fact sheet series, with information on different ways to help prevent water pollution. Please take some time and find out how you can help protect our most important natural resource - clean water.

WHAT POLLUTES WATER?

There are six major types of pollutants that affect water quality. Some are primarily a human problem, but others can damage the entire ecosystem.

Sediment: Dirt and sand are natural substances that become pollutants when they end up in the water in excessive quantities. Sediment changes the shape of streambeds, smothers feeding and nursery areas of aquatic animals, and carries other pollutants into the water. Erosion from poorly managed construction sites, agricultural fields, or suburban gardens are major sources of sediment pollution. Another major source is road sand applied to improve winter driving conditions.

Debris: Non-degradable trash, mostly plastic, when carelessly disposed of, will often end up in a

1

Fact Sheet

December 1999



Susan Stone



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Fact Sheet #1

nearby water body. Humans find it ugly, as well as hazardous when it entangles boat propellers. Aquatic animals can also become entangled, or mistake plastic for food, and strangle or starve.

Pathogens: Pathogens are the bacteria and viruses that cause disease. They generally come from fecal material from humans and their pets, or from wild animals and birds. When the potential concentration of pathogens in the water exceeds certain limits, areas must be closed to shellfishing or swimming in order to prevent infections or disease outbreaks. Major sources of pathogens include: failing septic systems, leaky sewer lines, and concentrations of animal waste from pets, farm animals or wildlife.

Toxic Contaminants: Many of the tens of thousands of chemicals in use today are harmful to both humans and aquatic organisms. Some of these chemicals can be passed through the food chain and concentrate in top predators (like humans). Extremely small concentrations of some toxic materials in the water can kill the eggs and larvae of many animals. Sources of toxic contaminants range from the exhaust and fluids that come from automobiles to the cleaning and disinfectant products used in homes to the pesticides used in yards, farms and parks.

Nutrients: Materials that are necessary for plant growth, primarily forms of nitrogen or phosphorus, are known as nutrients. When too many nutrients end up in an aquatic system, they alter the natural

plant community and can cause massive plant growth known as algal "blooms" which deplete oxygen concentrations in the water. Excess nitrates in drinking water have been linked to human health problems, including heart conditions and birth defects.

Thermal Pollution: During summer months, thermal pollution can make the water in critical aquatic habitats too warm for sensitive native plants and animals to survive, as well as allowing the spread of non-native species. Overheated water can result from the removal of vegetation that shaded the stream, runoff from hot roofs and parking lots, or the collection of water in shallow unshaded ponds.

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Other Fact Sheets in this Series:

- Managing Your Hazardous Household Chemicals
- Caring for Your Septic System
- Conservation Landscaping for Water Quality
- Integrated Pest Management for the Homeowner
- Animal Waste and Water Quality
- Backyard Biodiversity: Selecting Plants for Habitat and Water Conservation
- Environmentally Friendly Lawn Care
- Seasonal Yard Care Tips
- Boating for a Better Environment
- Household Water Conservation

For more information contact: Connecticut Sea Grant,
1084 Shennecossett Rd. Groton, CT 06340
www.seagrants.uconn.edu

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Managing Your Household Chemicals

Your Home Contains Hazardous Chemicals

Household products are potentially hazardous if they pose risks to people, animals or the environment. Many of the chemicals that are used in everyday activities can be poisonous when they enter aquatic systems (lakes, ponds, streams or estuaries such as Long Island Sound) and can also contaminate area drinking water supplies. The U.S. Environmental Protection Agency estimates that the average household in America generates 20 pounds of hazardous household wastes annually. The typical home also stores 100 pounds of hazardous wastes.

How Do You Know if a Product is Hazardous?

Hazardous chemicals fit into one of the following categories:

CORROSIVE – able to eat through other materials;
FLAMMABLE – can ignite or burn readily;
REACTIVE – will undergo rapid chemical change such as bubbling or explosion if improperly used;
TOXIC – poisonous, can cause severe illness or death if inhaled or swallowed.

Many household products have cautionary labeling. The purpose of cautionary labeling is to alert consumers to potential human health hazards resulting from improper use. The Federal Hazardous Substance Act requires household cleaning products to be labeled by manufacturers as follows:

CAUTION or WARNING – Risk is minor; permanent damage not likely to result with first aid treatment

DANGER – Risk is substantial; typical for flam-

mable, corrosive or toxic products
POISON – Extremely risky; a severe hazard; (uncommon on household products).

Cautionary labeling does not apply to environmental hazards resulting from improper use. Some products with no or low-level cautionary labeling may cause significantly more harm to the environment than they would to human health.

Protect Yourself, Your Family, Your Community

You can prevent human health and environmental problems, and save some time and money by making wise choices in the purchase and use of hazardous household products.

At the Store:

- Read labels thoroughly.
- Select products with the least cautionary labeling.
- Compare products.
- Seek the least hazardous products to accomplish the job.
- Products mixed with water are better for the environment.
- Select the right products.
- Buy products with safety closures.
- Choose products with environmental friendly packaging (i.e., recyclable symbols).
- Look for concentrates, which use less packaging.
- Purchase the smallest amounts needed.

At home:

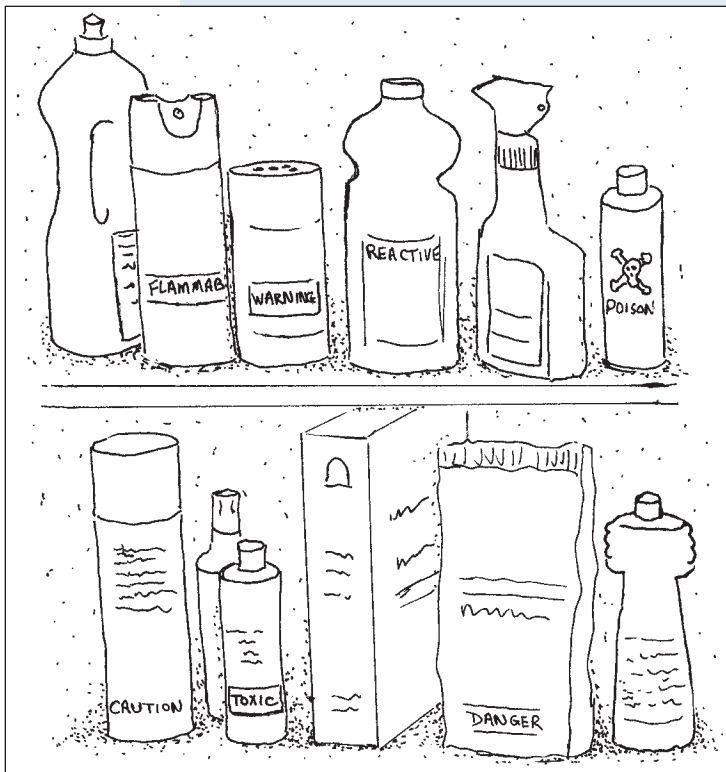
- Follow directions on products.
- Consider using all-purpose products to accomplish multiple tasks.
- Discover safe, tested, alternative products that may also save you money.
- Store cleaning chemicals safely in locked cabinets in the kitchen, garage and hobby areas, away from children, the sun, heat, and ignitable sources.

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2

Fact Sheet

December 1999



- Store pressurized containers away from heat sources and moisture to prevent explosion and rusting.
- Use products in well-ventilated areas.
- Store products only in original containers.
- Dispose of containers when empty; don't reuse.
- Do not mix commercial chemicals.
- Use appropriate landscaping techniques to reduce chemical applications.
- Do not use septic system additives. Some may actually damage your system.
- Wear protective clothing – long pants, long sleeved shirts, gloves, goggles, closed shoes and hats (in some cases) as recommended on the label.
- Dispose of cleaning rags in a safe manner to avoid spontaneous combustion.
- Keep fire extinguishers handy throughout your home. (Check with your fire department for recommended type.)
- Do not burn or bury leftover oil, chemicals, paints, pesticides or containers.
- Do not pour leftover products down storm drains or on the ground.
- Do not wash chemicals down impervious

- surfaces (paved driveways and sidewalks).
- Never pour chemicals down the sink or storm drain .
- Do not apply pesticides on windy days.

If chemical spills do occur, clean up with an absorbent material like kitty litter or sawdust to avoid dispersion.

You can reduce the amount of cleaners used by following some practical household tips:

- Clean up messes when they occur. Stronger cleaning products may be required to remove stains once they set.
- Use water or a dampened cloth whenever possible to polish or eliminate spills.
- Reduce mildew in bathrooms by installing an exhaust fan. Squeegee shower walls after bathing.
- Pour fat/grease in metal containers, not down the drain.
- Wipe up oven spills promptly after cooking.
- Vacuum rugs frequently to reduce the necessity of shampooing.
- Regularly bathe pets and comb with a flea comb.

In Your Community:

- Follow your community recycling guidelines.
- Share unused products with others (in a clearly labeled container).
- Participate in community hazardous chemical collection days.
- Think about how your actions could affect others.
- Be a neighborhood advocate for safe home management and product practices.

Make Your Own Non/Low Toxic Household Cleaners

By making your own cleaning products, you can: promote a healthy environment, reduce chemicals going to landfills or incinerators, save money, eliminate cluttered cabinets, and easily prepare the right amount of cleaner for any job.

Follow these safety tips when making and using homemade cleaners:

- Ventilate the area.
- Wear gloves.
- Wear protective clothing and shoes.
- Avoid contact with skin and eyes.
- Store cleaners in labeled, non-food containers.
- Lock cleaners in a cabinet out of children's reach.
- Rinse surfaces thoroughly with water before applying a different product.
- Do not mix different products.
- Keep products away from heat, cigarettes, and flammable sources.
- Keep the telephone number of the nearest poison control center handy.
- Dispose of empty containers by following recycling instructions in your community.

Cleaning Supply List

These items can be purchased at most super-markets and discount or hardware stores.

Products	Supplies
Baking Soda	Aluminum Foil
Chlorine Bleach*	Bucket
Lemon Oil	Cleaning Cloths
Mineral Oil	Gloves
Salt	Measuring Cups
Soap Flakes	Measuring Spoons
White Vinegar	Non-food Containers
Whiting**	

* Chlorine bleach compounds are toxic to aquatic organisms in very low concentrations but are less toxic than many other cleaning products. Consider using chlorine as a cleaning agent only when necessary for heavy cleaning jobs.

**Whiting (calcium carbonate) is available at hardware and paint stores.

Air Fresheners

- Open windows
- Circulate air with a fan or air conditioner
- Place cut lemons or baking soda in a dish
- Boil cinnamon and cloves in water

All Purpose Cleaners

- Mix 1/4 cup baking soda and 1 quart warm water. Wipe surface with sponge, then dry.
- Soap Jelly can be made by adding 1 cup of shaved soap flakes or leftover soap pieces to 1 quart of boiling water. Stir until dissolved. Pour into jar and let cool. Mix with water as needed.

Aluminum Cleaners

- Soak in a solution of 1/4 cup white vinegar to 1 quart water; boil if necessary.
- Soak in a solution of 2 teaspoons cream of tartar in 1 quart of water; boil if necessary.

Bathroom Cleaners

- Mix 1/2 cup chlorine bleach and 1 cup water. Spray on tile to remove mildew. Let stand for ten minutes. Rinse with water.
- Mix 1/4 cup baking soda and 1 quart water. Wash with sponge, wipe dry.
- Remove tub stains by scrubbing with a paste of cream of tartar and hydrogen peroxide.
- Remove copper stains (green) by using salt and vinegar or salt and lemon juice.
- Remove lime deposits with vinegar.

Brass and Copper Cleaner

- Mix 2 tablespoons salt, 1 tablespoon lemon juice and 1 tablespoon vinegar. Rub with sponge and let dry. Rinse with hot water, then dry with soft cloth.

Chrome Cleaner

- Mix 1/4 cup baking soda with enough water to make a paste. Rub on, rinse with water, then dry.
- Apply whiting on a damp cloth.

Disinfectants

- Mix 1/4 cup bleach to 1 quart water
- Mix 1/2 cup borax to 1 gallon hot water.

Drain Cleaners

- Use drain traps.
- Pour boiling water down the drain.
- Use a plunger or plumber's snake.
- Mix 1/2 cup baking soda, 1/2 cup vinegar and 1/2 cup boiling water. Pour into drain. Let stand.



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Floor Wax Remover

- Mix 3/4 cup dry detergent, 1 gallon hot water and 1/3 cup ammonia. Spread solution on a small area and let stand a few minutes. Scrub to remove wax. Rinse floor thoroughly. Let dry.

Furniture Polish

- Mix 1 teaspoon lemon oil and 1 pint mineral oil. Spray on furniture; wipe clean with soft cloth.
- Mix 1/4 cup linseed oil, 1/4 cup vinegar and 1/2 cup lemon juice. Rub into wood with soft cloth.

Household Insecticides (For Plants)

- Mix 1/2 teaspoon shaved soap flakes and 1 quart water. Wash leaves with soap solution, rinse with water. Large plants can be rinsed in the shower. (Do not use on plants located in low light.)

Household Pests

- Contact the UConn Home and Garden Center (toll free) @ 1-877-486-6271.

Marble

- Mix 1 tablespoon baking soda and 1 quart water. Wash with sponge, wipe dry.

Mothballs

- Store clean clothing in airtight chests or containers.

Oven Cleaner

- Make a paste of equal parts of salt, baking soda and water. Apply to walls of oven. Let stand for five minutes, wipe clean with a damp cloth. (Use a brush on heavy spills). Do not allow baking soda to touch wiring or heating elements.

Paint Brushes

- Place hardened paintbrushes in a bowl of hot vinegar for ten minutes. Rinse thoroughly.

Painted Surfaces

- Dust and vacuum surface before applying liquid solutions. Use a well-wrung cloth dipped in the cleaning solution. Starting from the baseboard, work upwards toward the ceiling to prevent streaking. Clean small areas at a time. Rinse with water, then dry.

- Mix 1/4 cup soap jelly (see all-purpose cleaners) and 1 gallon hot water. Wash walls with cloth dipped in this mixture.
- Mix four parts whiting to one part soap jelly to clean heavily soiled areas. Rub carefully on soiled areas. Rinse with water and let dry.

Refrigerator

- Mix 1/2 cup bleach and 1 gallon water. Wash refrigerator interior, wipe dry.

Silver Cleaners

- Line an aluminum pan with a piece of aluminum foil.
- Mix 1 teaspoon baking soda, 1 teaspoon salt and 1 quart hot water. Add silver and boil for three minutes. Remove silver, wash with detergent, rinse and dry. (Do not use on silver jewelry).

Toilet Bowl Cleaner

- Add 1/2 cup bleach to toilet. Let stand for a half-hour. Scrub bowl with brush and flush.

Upholstery Shampoo

- Mix 2 teaspoons mild detergent, 1 teaspoon water softener and 1 pint warm water. Whip into a foam with electric beater. Vacuum furniture. Test foam for color fastness in an inconspicuous area. Apply foam gently with a sponge or soft brush in a circular motion. Rub until foam disappears. Do not saturate fabric. Dry rapidly with fans.

Whiting

- Sprinkle whiting on surface. Rub with soft damp cloth to polish chrome or porcelain and remove metal marks on stoneware.

Window Cleaner

- Add 2 tablespoons vinegar to 1 quart warm water. Spray on windows and wipe dry.

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Caring for Your Septic System

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When you flush your toilet, or pour something down your drain, do you know where it goes? If your home is not on a municipal or community system, your wastewater probably goes into an on-site sewage disposal system, commonly called a septic system. A septic system is designed to collect, treat and dispose of wastewater on site so that it can percolate into the ground without clogging the soil or contaminating ground or surface waters.

In Connecticut, nearly 40% of homes use some form of on-site sewage disposal system to treat and dispose of household wastewater. When properly sited, designed, installed and maintained, a septic system can be a cost-effective method of wastewater treatment. However, since wastewater disposal is something most of us don't spend much time thinking about, many systems are out of date, not functioning properly, or clearly failing.

Domestic wastewater contains several kinds of pollutants. The major pollutant is the pathogens (disease-causing microorganisms) like the bacteria and viruses that cause dysentery, hepatitis, and typhoid fever. Fortunately, soil and soil bacteria can effectively remove most pathogens from wastewater treated by a properly functioning septic system.

When nutrients such as nitrogen and phosphorus are discharged from septic systems into the groundwater, they can contaminate drinking water supplies, and also represent a potentially important nonpoint source of pollution to ponds, streams, and estuaries such as Long Island Sound. In freshwater systems, phosphorus causes excessive aquatic weed growth that can limit the uses of ponds and lakes. In the Sound, excess nitrogen fuels massive algal blooms, which in turn die, using up oxygen as they decompose.

The improper use of septic systems has been

shown to contribute to contamination of groundwater by toxic chemicals. Contaminants that may enter groundwater through septic systems include heavy metals and toxic chemicals from small commercial establishments, toxic household products, and organic chemicals typically found in septic tank cleaning products.

How Does A Septic System Operate?

Most systems have two main components: the septic tank and the leach field. A distribution box is often found between these two components to distribute wastewater to all parts of the leach field.

The septic tank receives the wastewater and provides a site for the solids to separate and settle and for some decomposition of solids and contaminants to occur. Heavy solids settle to the bottom of the tank forming a layer of sludge. Lighter solids, like grease, float to the top forming a layer of scum. The wastewater in the middle is pushed out into the leach field as more wastewater moves into the tank. Solids need time to settle to prevent them from being pushed out into the leach field and they also need to be periodically pumped from the tank. A properly sized tank will hold 2-3 days worth of wastewater to allow for proper settling. A two-chambered tank allows for more complete settling of solids because there is less turbulence in the second chamber, resulting in cleaner water leaving the tank.

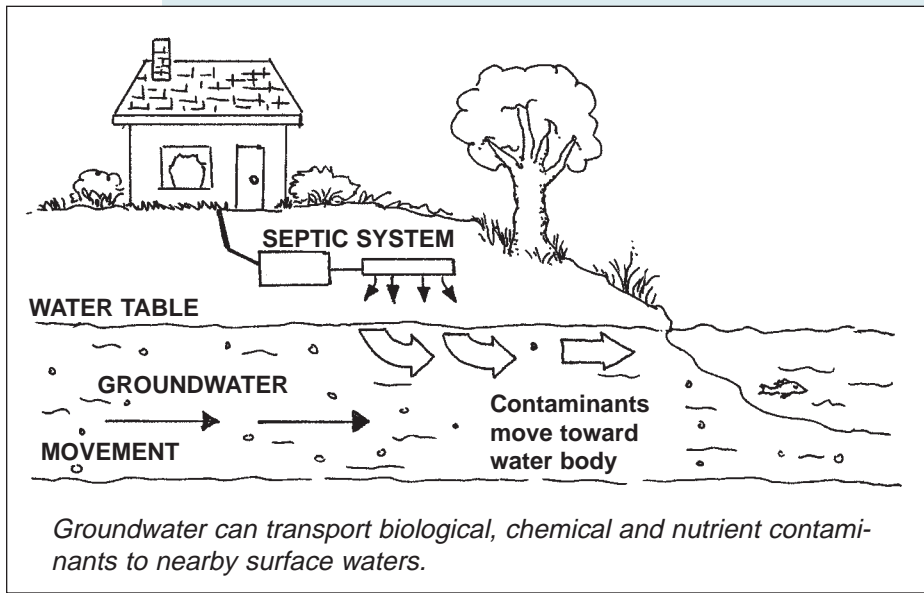
The leach field consists of trenches or a bed, often lined with gravel or coarse sand, and is buried one to three feet below the surface of the ground.

Perforated pipes or drain tiles run through the trenches. Wastewater trickles from the perforat-

3

Fact Sheet

December 1999



water entering the system, the less turbulence and better settling that will occur. For example, decrease the amount of water going into the tank by spreading out water-using activities (like laundry) during the course of the week. Install low-flow shower-heads, use a "toilet tummy" or a half-gallon milk jug filled with water in the toilet tank and encourage short showers in the household.

Lastly, protect the leach field. Avoid compacting the soil or crushing the pipes. Don't let heavy vehicles or animals cross

the leach field; don't place heavy objects like swimming pools or storage sheds over the field. Also, avoid planting trees within the leach field as the roots can cause damage to the system. Grass is the best thing to grow over the leach field.

Maintenance means inspection and pumping of the tank. An inspection should include checking sludge and scum levels as well as checking baffles to be sure that they have not been damaged.

Care and Maintenance of the System

Proper siting, design and installation are all critical to the proper functioning and long life of a septic system. The owner/user of that system plays an equally important role. Using preventive practices, maintaining the system and watching for signs of failure are key.

Preventive practices include (a) improving the quality of wastewater; (b) reducing the amount of wastewater, and (c) protecting the leach field. Simply put, use care in what you put into the system. It was designed for one purpose and one purpose only...to treat wastewater exiting the home.

Do not use the wastewater disposal system as a wastebasket, household chemical disposal site, or use unnecessary additives in your system. Also, the use of a garbage disposal further taxes the system. IF you use a garbage disposal, your septic tank should be pumped more frequently.

Conserve water where possible. The less

Tank pumping is needed to remove the solids that cannot be broken down by bacteria and which should not enter the leach field. Frequency of pumping will depend upon the number of members in the household as well as the tank size. The state of Connecticut Department of Public Health recommends pumping every 3-5 years. Some towns in Connecticut require routine pumping. Keep maintenance records, using something like the attached record-keeping chart, to avoid the "out of sight, out of mind" problem.

A failing system can result in the spread of disease from improperly treated wastewater/sewage. You should be able to recognize the signs of a failed system and be prepared to act to correct problems. If you experience sewage backup in drains or toilets, slowly draining sinks, tubs and toilets, foul odors, repeated intestinal illnesses in household members, standing waste-

water or soggy areas on the ground above or near the septic system, or excessive growth of lush, green plants over the leach field even during dry weather, your septic system is probably failing.

Use of Additives

There are several types of septic system additives available. Generally, additives are marketed to: digest or "liquify/gasify" the solids in a septic tank; rejuvenate stressed bacterial populations in the tank; and/or increase "settleability" of solids in the tank. Though some of the products may do what they suggest, the necessity of such additives is not proven. Others, though harmless to the system, are ineffective. Others still may actually prove damaging, particularly to the leach field and the soils.

In Connecticut, the State Department of Public Health does not recommend the use of additives. The U.S. Environmental Protection Agency also does not recommend the use of these products.

If you have questions about the location of your septic system, contact your local health department. Also, be sure to maintain records of location, pumping, maintenance or repair should you decide to sell your property. A savvy buyer will want to have confidence in the status of your home's septic system.

Use the record sheet on the back page to keep track of your septic system's location and maintenance.

Tank size (gals.)	Household Size (number of people)					
	1	2	3	4	5	6
500	5.8	2.6	1.5	1.0	0.7	0.4
750	9.1	4.2	2.6	1.8	1.3	1.0
900	11.0	5.2	3.3	2.3	1.7	1.3
1000	12.4	5.9	3.7	2.6	2.0	1.5
1250	15.6	7.5	4.8	3.4	2.6	2.0
1500	18.9	9.1	5.9	4.2	3.3	2.6
1750	22.1	10.7	6.9	5.0	3.9	3.1
2000	25.4	12.4	8.0	5.9	4.5	3.7
2250	28.6	14.0	9.1	6.7	5.2	4.2
2500	31.9	15.6	10.2	7.5	5.9	4.8

*Estimated septic tank pumping frequencies in years.
These figures assume there is no garbage disposal unit in use.
(Source: Pennsylvania State University Cooperative Extension Service)*

Sources:

Long Island Sound Study, "The Impact of Septic Systems on the Environment," Fact Sheet #13, September 1991.

The University of Rhode Island Department of Natural Resources Science, "Maintaining Your Septic System", Fact Sheet 88-2, April 1988.

"Small Flows" Newsletter, Spring 1997, Vol. 11, No. 2, 'Septic Tank Additives', page 10.

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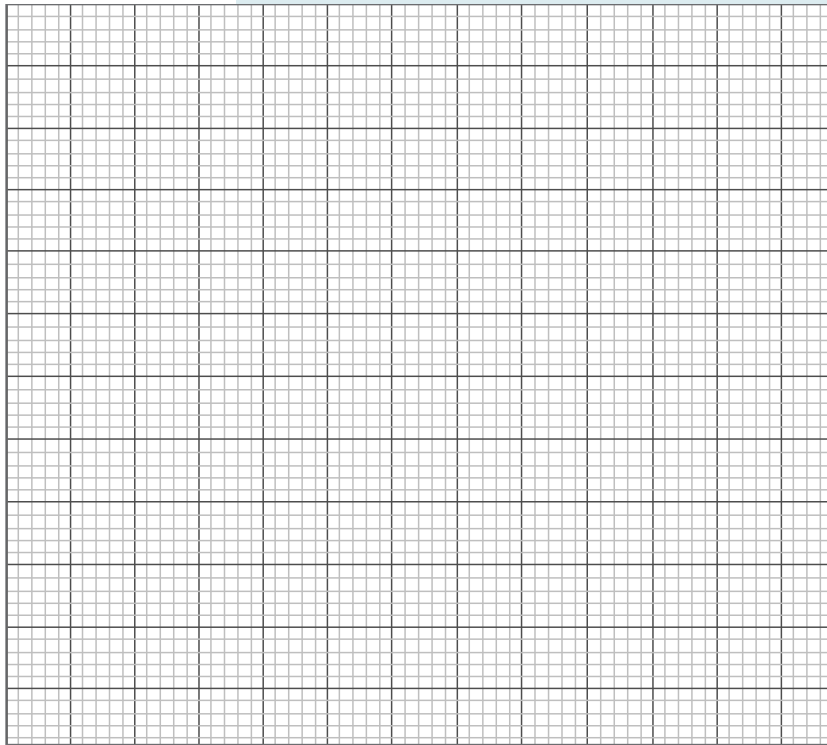


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Record Sheet



Septic System Layout

If you do not have a sketch of your septic system to place in this file, you should fill in the space provided, showing the relative location of your septic system components in relation to your house.

Date	Work Done	Firm	Cost

Preventive Maintenance Record

Keeping a record of your septic system maintenance experience will help you anticipate when the next cleaning may be needed.

If you should move, leaving a copy of this record will help the new homeowner.

Your Septic System Pumper

Name _____

Address _____

Date Installed _____

Phone _____

Your Septic System Installer

Name _____

Address _____

Date Installed _____

Phone _____



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Integrated Pest Management and Biological Controls for the Homeowner

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Does the word "pest" bring to mind your little sister or a nosy neighbor? A pest, by definition, is any unwanted organism. In garden, landscape or lawn management, insects, animals, bacteria, fungi, viruses and weeds may all be pests. Integrated pest management, or IPM, is a pest management strategy that has received increased attention in recent years. As a homeowner, you can practice IPM on your own property, whether you are growing and maintaining trees and shrubs, turfgrass, herbaceous perennials, flowering annuals, or a fruit and vegetable garden.

What is IPM?

IPM is a decision-making process that uses biological, chemical and cultural practices to manage pest problems in the production and maintenance of plants, in a way that minimizes risks to human health, society and the environment.

- Biological control is the use of naturally occurring predators, parasites and pathogens to manage pests. A common example is using lady beetles to reduce aphid populations before they cause plant damage.
- Chemical control is the use of commercially available pesticides to protect plant material.
- Cultural control involves selecting the appropriate plant material for the growing conditions on your property, and then maintaining the plant's health through proper fertilization, irrigation and pruning practices. Healthy plants are less susceptible to insect and disease attack.

as the only pest control method. A more intelligent use of these products reduces their negative impacts on the applicator and the overall environment. An example of the IPM approach is to spot spray only the problem plants, rather than treating the entire area.

Homeowners taking care of their property, whether it is the lawn, landscaping or gardens, can have a significant impact on the overall health of the landscape. Many people may not be aware of simple cultural practices that can prevent or reduce their most troublesome pest problems without using chemicals. The following information will assist with pest control, while also protecting the environment and water quality.

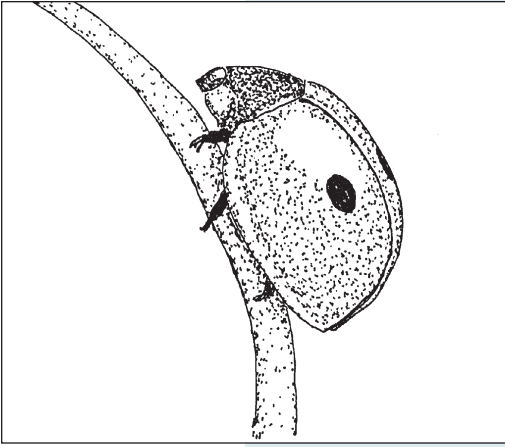
Accurate pest identification is needed for successful pest management, especially if you want to use biological control organisms that are host specific. First, determine if there is really a problem. Most insects have no negative effect on plants and many provide important services like pollination. Frequent inspections or scouting of valuable plants, once every one to two weeks, will enable you to catch pest problems early when they can be more easily treated. If you cannot diagnose the problem, have a sample analyzed for correct identification. For example, it is completely ineffective to treat unusual leaf spots with a fungicide if bacteria, insects, or poor environmental conditions are actually causing the problem. Your local Cooperative Extension office or Agricultural Experiment Station can help you make proper identification of your pest problems.

Where Do I Begin? – Cultural Practices

IPM begins with the establishment of the proper growing environment. Soil preparation and cultural practices such as proper mowing, pruning,

The most common misconception about IPM is that it does not include chemical pesticides, which would be an "organic" approach. This is not true. IPM may involve the use of chemical pesticides, but in a way that minimizes the overall reliance on them





fertilization and irrigation are extremely important to plant health. If a plant is not in the correct growing conditions (improper soil, too much or

too little moisture, and excessive or inadequate sunlight), it will be prone to problems. Also, try not to wound plants unnecessarily. Mow and prune correctly and avoid mower and other mechanical injury to healthy trees and shrubs. It is also necessary to recognize the fact that plants, like other living organisms, age.

Plants that are old and

dying, or stressed, are more susceptible to pest problems.

Do not allow pests to become established. Purchase plant material that is free of disease or insect problems. You may never have a problem with certain insects if you do not introduce them into your landscape. Given the opportunity, use pest-resistant plant varieties to reduce pesticide usage in your landscape.

Proper sanitation will help prevent many pest problems. Many pests survive the winter among weeds or in plant debris. Remove weeds and any decaying plant material. If possible, when a plant has died due to a pest problem, replace it with a pest-resistant variety of the same species or with a different species to prevent repeating the problem. Exclusion barriers, such as plastic netting for birds and Japanese beetles, or plastic or woven landscape fabric for weeds, can also prevent or reduce pest damage. Soil solarization, the practice of covering soil with clear plastic to raise the soil temperature for two to three weeks, will kill many weed seeds.

Calling in Reinforcements – Biological Controls

Landscapes and gardens have natural populations of helpful organisms at work. These “workers” are the beneficial predators, parasites and pathogens that naturally target pest organisms in

the environment. Beneficial organisms include a wide assortment of organisms such as: bacterial and/or fungal diseases; spiders; mites; centipedes; nematodes; various lady beetles; ground beetles; rove beetles; lacewings; predatory bugs (minute pirate bugs, big-eyed bugs, damsel bugs, stink bugs); and numerous parasitic wasps. Most pest management practices are designed to manage **against** the pests; instead, manage **for** beneficial organisms that are already providing valuable pest control.

Why is biological control important? The preservation and use of common beneficial organisms ensures that the natural ecological balance is maintained and promotes a safe home landscape by reducing pesticide use. The misuse of pesticides can impact directly on beneficial organism/pest interactions. Pesticide resistance develops in pest organisms that were once killed by a specific application of pesticide and through genetic evolution can now survive the application. Increased rates of application may not provide greater control either, making a once reliable pest control weapon useless. Pest resurgence occurs when natural biological control organisms are reduced by broad-spectrum pesticides, either by one that persists in the environment for long periods of time or by numerous applications of chemicals with short residual times, to a level where they can no longer keep the pests in balance. This causes an increase in the pest populations.

A disruption of natural enemies can also lead to **secondary pest outbreaks**. Pesticides reduce the natural enemy populations and a pest insect, that was not causing the original problem, increases in population to a damaging level. Pesticides also affect non-target organisms such as wildlife, pets and humans.

One method of biological control is **augmentation**. This practice involves the purchase and release of beneficial organisms, usually insects, into the infested area. In order for this practice to be effective, the correct organism must be purchased and released at the appropriate time. Many beneficial insects choose specific hosts or prey as food sources. Anyone considering this

tactic must have the knowledge to select the proper beneficial insects.

Conservation of natural enemies present in the environment is the easiest and most cost-effective method of biological control available for gardeners. Conservation involves changing and improving management practices to either reduce harmful effects on beneficial organisms or to improve the environment to increase their populations. Reducing pesticide impacts would be the first and most important change to conserve natural enemies. Many insecticides and some fungicides directly affect natural controls by killing them at the time of application. Others have long residual activity and harm beneficial organisms that later move into the treated area. Pesticides can also indirectly harm beneficial organisms by causing lengthened development time of the immature stages, reduced prey consumption, reduced reproductive capability, and repellency, where beneficial organisms are driven away from the treated plants by the chemical pesticide. An easy and colorful method of promoting beneficial insects is to grow a wide variety of plant materials in the home landscape or garden. An herbaceous perennial border, with a variety of species that flower at different times during the growing season, will provide alternate food sources (i.e. pollen) for some beneficial insects when there are no prey insects available.

The Last Resort: Chemical Pesticides

If you have a pest problem serious enough to require the use of a chemical pesticide, check the product label to be sure both the plant and pest are listed. **Read The Entire Label Carefully** and, above all, **Follow The Directions Exactly**. Remember that **The Label Is The Law**, literally, for pesticide application. By using higher application rates than the directions call for, you will only waste money and risk contaminating the environment without eliminating any more of the pests.

The following recommendations can reduce pesticide impacts.

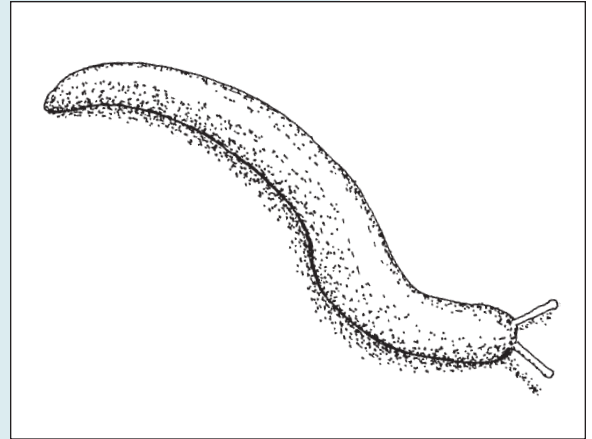
- Use the fewest number of applications possible, and use only when necessary.
- When possible, use insecticidal soap or

horticultural oil rather than a longer residual synthetic insecticide.

- If synthetic insecticide is to be used, try to use one with a short residual activity.
- Use granular formulations or systemics (which are absorbed into the plant through the roots or leaf surfaces) instead of long-lasting foliar sprays.
- If possible, time pesticide applications for when natural enemy populations will not be harmed, such as during pupation or when they are on another host plant.
- Use reduced rates whenever possible and treat only infested plants, not entire areas. When selecting and using chemical pesticides, keep in mind that low toxicity does NOT mean non-poisonous! It means that these pesticides pose the least environmental risk, as they tend to break down rapidly into non-toxic components when exposed to air, high temperatures, and sunlight.

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WEED MANAGEMENT

Control Method	Target
Soil solarization	most weed seeds
Hand pulling	all weeds
Mulch, plastic or fabric barriers	all weeds
Repeated cutting back	all weeds
Boiling water	all weeds
Glyphosate	all weeds

DISEASE MANAGEMENT

Control Method	Target
Soil solarization	club root, corky root, some fusarium and verticillium wilt, crown gall
Bordeaux mix	brown rot, shot hole (tree fruit), some grape diseases, apple scab, apple black rot, anthracnose, early blight, and late blight
Fungicidal soap	brown rot, peach scab, apple scab, powdery mildew, downy mildew
Horticultural oil	powdery mildew
Lime sulfur	powdery mildew, anthracnose, apple scab, brown rot, peach leaf curl
Sulfur	brown rot, peach scab, apple scab, powdery mildew, and downy mildew
Terramycin	some bacterial diseases

INSECT, MITE AND SLUG MANAGEMENT

Control Method	Target
Physical barrier (row covers, etc.)	a wide variety of insects
Hard stream of water	mites
Hand picking	all visible insects and eggs
<i>Bacillus thuringensis</i> "BT"	Colorado potato beetle, elm leaf beetle, many moth larvae, and mosquitoes
Diatomaceous earth	household pests, slugs, many crawling insects
Insecticidal soap	mites, aphids, mealy bugs, thrips, fungus
Horticultural oils	aphids, psylla, scale, mites, mealy bugs, leafhoppers
Pyrethrum	many flying insects
Neem	beetles, moth larvae, whiteflies, leafminers, gypsy moths, and mites
Rotonone	beetles, weevils, slugs, loopers, mosquitoes, thrips, flies
Nematodes	borers, grubs, cutworms
Ryania	codling moth, thrips, corn borers
Sabadilla	bugs, leafhoppers, striped cucumber beetles, caterpillars, thrips

The materials listed above are registered for use on specific pests, plants, or areas of the country. Information is for educational purposes only. The recommendations on this fact sheet are based on available knowledge at the time of printing. Any reference to commercial products, trade names or brand names is for information only; no endorsement or approval is intended. Registrations change frequently.

USE PESTICIDES ONLY IN ACCORDANCE WITH CURRENT FEDERAL AND STATE LAWS.

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Clean Waters

Starting in Your Home and Yard

Conservation Landscaping for Water Quality

Most gardeners want to be good "citizens of the Earth" but also want great-looking gardens that don't take full-time help or a fortune to maintain. Can they have it both ways? Conservation Landscaping promotes landscape management techniques and philosophies that work with nature to reduce pollution and encourage wildlife habitat. It encourages yard care practices that include using less fertilizers and pesticides, reducing lawn areas, and utilizing native plants. The results are less overall maintenance and less water use in the suburban landscape. This fact sheet suggests practical techniques to assist in evaluating your landscape and maintenance practices. Simple changes may be all that is needed to help your landscape contribute to the health of our environment and the protection of water quality.

WHY IS CONSERVATION LANDSCAPING IMPORTANT?

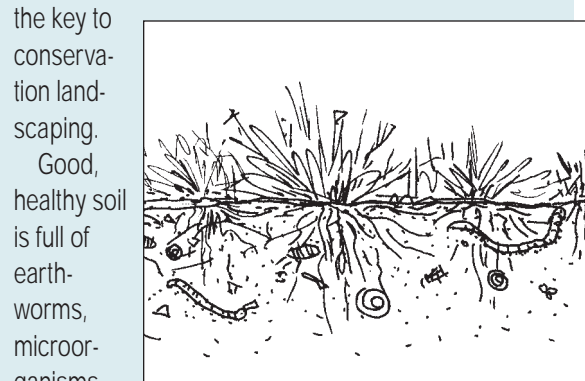
A great majority of plant culture or gardening in the United States is devoted to growing ornamental plants and turf. More than 90 million households in the United States are involved in some form of gardening. Every gardener is a landscape manager, even if they never knew it. On a cumulative basis, the landscaping practices of these home landscape managers can pose a huge threat to naturally functioning ecosystems. The excessive use of fertilizers and pesticides, and irrigation practices that wash these and other chemicals, as well as pathogens (bacteria and viruses) from animal waste and eroded soil from the home landscape to local waters, create polluted runoff or non-point source pollution.

Traditional landscaping and gardening practices, along with suburban land development in the United States, have increasingly impacted the remaining natural ecosystems. To reconnect plant and animal

species in the remaining natural areas and rebuild ecosystems requires restoring the ecology of individual back yards. Conservation landscaping techniques and practices are systems of gardening that use many of the same principles that natural ecosystems follow. Conservation landscaping is about reducing waste, energy use and materials. It is about observation of nature at work. Its purpose is to design and create systems that imitate nature and turn problems into solutions.

LAYING THE GROUNDWORK

Conservation landscaping begins with understanding the soil. Soil quality affects nearly everything that is part of the landscape – trees, flowers, shrubs and lawn areas. Creating and maintaining good soil quality through thoughtful management is the key to conserva-



tion landscaping. Good, healthy soil is full of earthworms, microorganisms, bacteria and other forms of life. This life feeds on organic matter, which it decomposes into humus, a rich, dark material that holds both moisture and nutrients in the soil. Soil pH (acidity/alkalinity levels) and fertility (nutrient availability) can be evaluated by analyzing soil samples from different soil locations throughout the landscape. Together they determine what plants will thrive in a particular landscape. Soil pH can be adjusted by the addition of limestone or gypsum (to raise pH) or iron sulfate (to lower pH for

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5

Fact Sheet

June 2000

Judy Ricketts-White

acid-loving plants). Soil fertility can be improved by incorporating organic matter such as grass clippings or leaves into the soil. Applications of compost, which includes all the organic nutrients to keep soil life healthy, also helps plants thrive. As a natural fertilizer, compost has its own time release feature – nutrients are dispensed slowly, feeding the soil and plants gradually and preventing water pollution from nutrient runoff.

ON-SITE ORGANIC RECYCLING

Most gardeners know the value of recycling their grass clippings, plant prunings and leaves by com-

posting, but many people still buy commercial fertilizers because they don't have enough compost. Other people give their leaves away in the fall by taking advantage of municipal leaf pick-ups or paying landscaping

companies to clean off their lawns because they think they have no room for a leaf compost pile. Then they pay for bags of bark mulch to spread under shrubs and trees and in garden beds. Instead, they could chop the leaves with a mulching mower and rake them into the landscaping beds to use as mulch. Natural forest ecosystems function this way. They were the first "organic gardeners", recycling their own leaves and fallen twigs or branches.

Another way to recycle organic matter, eliminate large compost piles and save yourself a lot of time is to create beds or areas in your landscape where materials can be recycled right where you are mowing or raking. Increasing the size and number of land-

scape beds helps decrease the size of the lawn (and the need to mow, rake, fertilize, or water). These beds can be planted with groundcovers that add landscape interest but still require less maintenance than grass or true gardens.

PREVENT BARE SOILS

An important part of protecting the soil and the environment is maintaining a healthy vegetative cover on the land surface. Bare, unvegetated land areas are often eroded by wind and water, leading to soil and nutrient loss and water pollution problems down slope. Vegetative covers can consist of grasses, vines, groundcovers, mulches, or vegetables and herbs, as long as the soil surface is completely covered.

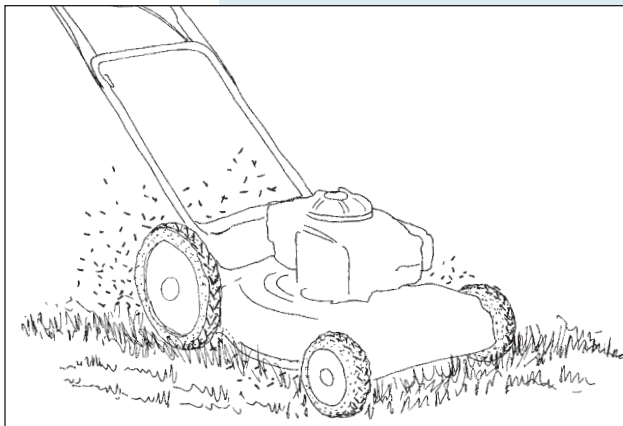
LAWN ALTERNATIVES

In many landscape situations, grass may not be the best choice as a vegetative cover. It may have a hard time growing successfully or it may be hard to mow and maintain, so a different ground cover may be more suitable. Excellent locations for alternative ground covers include areas with steep slopes, wet or shady areas and sites with easily erodible soils. When carefully selected and planted, ground covers can improve infiltration of water

into the soil, slow stormwater runoff and reduce landscape maintenance needs. Ground covers come in a variety of textures and colors, many with beautiful blooms. In addition to ground covers, other land-

scaping techniques help reduce total lawn area, including:

- Plant a wildflower meadow to provide a colorful, low-maintenance alternative to lawns while creating habitat for birds, butterflies and small animals.
- Wood decks and brick-on-sand patios offer



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cozy outdoor seating while allowing water to filter through to the underlying soil.

- Flowing water features introduce sound and texture into the landscape and attract wildlife.

TREE AND SHRUB SELECTION

Selecting proper trees and shrubs for the home landscape can seem a daunting task, but it can be simplified with a little research and some time spent walking through nurseries, garden centers or arboretums. Traditionally, trees and shrubs were chosen for such characteristics as seasonal bloom intensity, bloom duration, or fall leaf color. While these characteristics are still important, today's environmentally sound, or conservation, landscapes include trees and shrubs selected for drought tolerance, disease resistance, ease of maintenance, and wildlife benefits, in addition to year-round appearance.

Conservation landscapes should incorporate plantings of native species – those that have thrived under local conditions without human help for thousands of years. Properly situated native plants require little in the way of water, fertilizers or pesticides to provide a beautiful, natural-looking landscape. Even when using native plant species, choose those that are best adapted to your particular landscape. Dwarf conifers are a better choice in a dry, windy site, for example, than roses, while plants from the sand plains should not be planted in moist, highly organic soils. Another advantage to selecting native species is that they attract and provide habitat for beneficial insects, birds and animals that in turn help control problem pests, reducing the need for pesticide use in landscape maintenance.

CONSERVE WATER

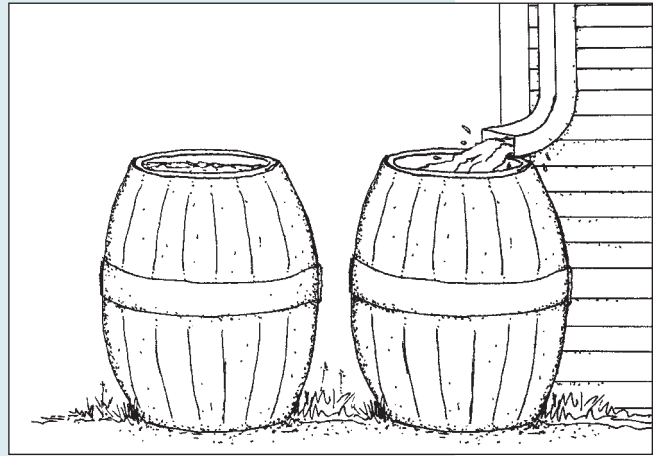
Water has become a limiting factor in many communities, especially during hot, dry spells. Landscaping to minimize watering, also referred to as "xeriscaping" ("xeri" is the Greek prefix meaning "dry") includes careful planning, using drought-resistant plant varieties, and improving soils or using mulches to help retain moisture in the soil.

Many varieties of native or non-invasive non-native ornamental plants are adaptable to dry landscapes

– sedums and potentillas, for instance. Many grasses and herbs also have low water needs.

Other sites have an abundance of water, or problems with excessive stormwater runoff causing flooding or erosion, and almost every home has gutters or some other system to direct roof runoff away from the foundation. Many of these situations can be changed from problems to benefits or attractive landscape features. Roof runoff can be stored in rain barrels for later use in watering nearby lawns and gardens. A larger conservation landscaping project would be changing landscape contours to create infiltration swales or rain gardens. These shallow basins or channels are planted with moisture-loving plants and roof or driveway runoff is directed into them so the water will filter into the ground rather than running off the property into the nearest storm drain or water body, creating new habitat areas and preventing water pollution problems.

Swales and rain gardens should be no more than twelve inches deep so that storm water will soak into the ground within a day or two (preventing mosquito breeding problems), and they should be sized to contain the runoff from a fairly large storm. For example, to create a rain garden using the runoff from a roof gutter, first determine the area of the roof that drains to that gutter by measuring the roof's length and width in feet. Then multiply the length by the width to determine the area and multiply that result by 0.05. This calculation determines the approximate volume (cubic feet) of water that will come down the gutter in a large storm. So, if the roof



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is 30 feet long and 15 feet wide, the calculation is $15 \times 30 \times 0.05 = 22.5$, so the rain garden needs to have a

volume of 22.5 cubic feet. Rounding that up to 24 cubic feet, the rain garden would need to be 4 feet by 6 feet and one foot deep.

Beyond conserving water and

native habitats, conservation landscaping can help conserve energy. Careful placement of selected trees and shrubs around a home can provide shade from summer sun and shielding from winter winds, reducing cooling and heating costs for years to come. Smaller lawn areas require less mowing, and the associated burning of fossil fuels that cost money and create air pollution.

"BAMBI-PROOF" LANDSCAPING?

With the spread of the suburban landscape into former woodlands and fields, and the extensive use of highly edible plant species in traditional landscaping plans, white-tailed deer have become a major problem for homeowners in many areas. Some have resorted to physical (streamers, flashy objects or noisemakers) or chemical (soap, predator urine or other strong scents) repellents. Others wrap plants in mesh or erect fences, even electrical ones. Most of these control measures are at least partially successful, but many are expensive or time-consuming to maintain, and some only work for short periods until the deer becomes acclimated to the sight or smell of the repellent.

An alternative approach is to reduce the landscape "edibility rating" by selecting plants deer prefer not to

eat. As deer will browse on any shrub or low-growing tree if the conditions are bad enough, no list of plants can have an absolute guarantee of being "deer-proof". However, deer do tend to avoid plants with thorny stems or prickly leaves and those with strong aromas, making plants like bayberry, boxwood, potentilla, roses, and hollies good choices.

RESTORE THE BALANCE

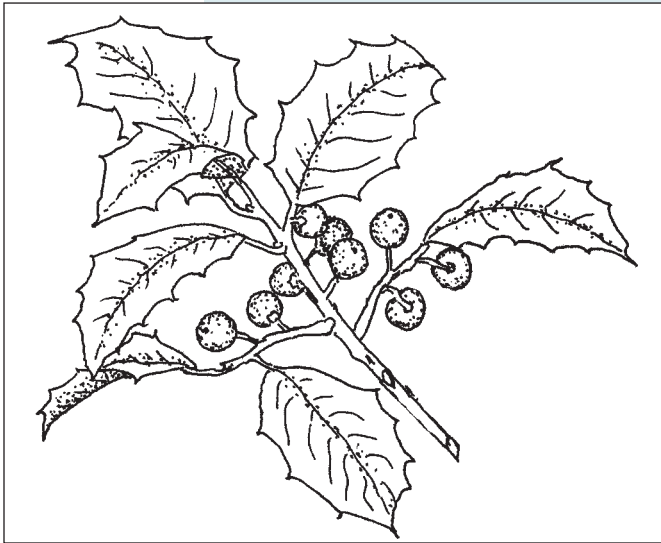
Tending to one small piece of Earth with all of nature in mind has benefits that go well beyond reducing the time, labor and money spent long-term on landscape management. Natural forest and meadow ecosystems have been around for thousands of years. Their plants have experienced and survived a host of environmental changes. By making some changes in our own backyards, it is possible to work with the natural systems rather than imposing an artificial system that requires constant maintenance and inputs of water, fertilizer and pesticides. One small plot of land may not seem significant, but as more home landscape managers choose to make these sort of changes, the overall effect will have a very positive effect, both in the local neighborhood and the environment as a whole.

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Clean Waters

Starting in Your Home and Yard

Animal Waste and Water Quality

Clean Waters is a collaboration of the Connecticut Sea Grant Extension Program and the University of Connecticut Cooperative Extension System's NEMO Project, educating individuals about the impacts of everyday activities on water quality and simple techniques that help protect water resources from the home well to Long Island Sound.

It's first thing in the morning and the dog wants to go out right NOW, the cats are standing by their litter box waiting for some fresh kitty litter, and your toddler is demanding a trip to the park to feed the ducks. While none of these activities may sound like a major threat to the environment, animal waste is one of the many little sources of pollution that can add up to big problems for water quality and may cause human health problems as well. While most people connect animal waste problems to agriculture, studies have shown that pets, waterfowl and other urban wildlife waste can cause significant water pollution problems.

Animal waste contains several types of pollutants that contribute to water quality problems: nutrients, pathogens and a naturally toxic material, ammonia. When animal waste ends up in a lake, stream, or Long Island Sound, it decomposes, using up oxygen and releasing its pollutant load. During summer months when the water is warm, the combination of low oxygen levels and ammonia can kill fish and other aquatic organisms. The nutrients cause excessive growth of aquatic weeds and algae. When these conditions make the water murky green and smelly, or when the surface of the water is completely covered with a thick mat of vegetation, the area becomes unattractive or unusable for swimming, boating or fishing.

Pathogens, the disease-causing bacteria and viruses associated with animal waste, can also make water unsafe for human use. If pathogens or the indicator bacteria associated with animal waste are found during water testing, shellfish beds may be closed to harvest, beaches may be closed to swimming and drinking water supplies may require expensive filtration or disinfection.

Fortunately, there are some simple practices everyone can do to help prevent pollution by keep-

ing animal waste out of the water. While it may seem easier to ignore the problem of animal waste, remember that you are protecting not only the environment but also your own health.

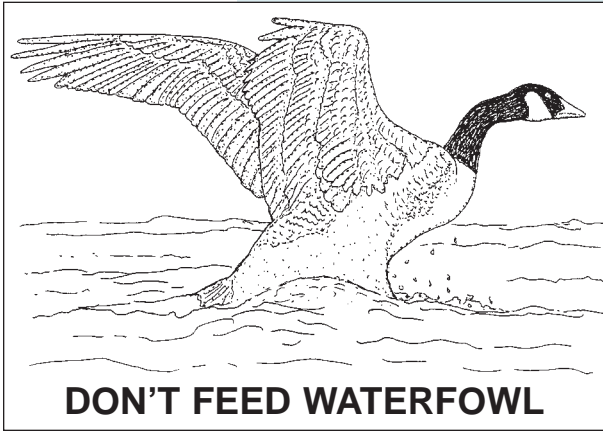
Keeping Animal Waste Out of the Water

1. **Pick up after your pet.** Preventing water pollution can be as simple as remembering to take along a plastic bag or pooper scooper when you walk your dog. For both "quality of life" and public health reasons, many communities actually have laws requiring anyone taking their animal off of their property to immediately clean up the waste after the pet relieves itself. Your choices once you have picked up the waste include:

- Flush it down the toilet so the septic system or sewage treatment plant will treat it in the same manner as human waste.
- Put it in the trash. This is less effective, as waste that ends up in a landfill may still cause pollution problems. Putting animal waste in the trash is actually against the law in some communities.
- Bury it in your yard. The microorganisms in the soil will

break down the waste and release the nutrients to nearby plants. Make sure the hole is at least five inches deep and located away from vegetable gardens, children's play areas, or any lake, stream, wetland, well or ditch. CAUTION: Don't bury waste in your compost pile. The pile does not get hot





enough to kill the pathogens and using the compost could cause illness.

- Install an underground pet waste digester. These function like small septic tanks. Before buying one, check for local laws that

may restrict their use or location.

2. **Keep your yard clean.** While there are no laws requiring you to clean up animal waste on your own property, there are good reasons to be careful where you leave it to decay. Some diseases can be transmitted from pet waste to humans through soil contact. Children who play outside and adults that garden are most at risk for infection, so cleaning up waste from play and garden areas is especially important. Washing hands with anti-bacterial soap and water after working or playing in the dirt is the best protection from disease.

Some of the more common waste-borne diseases and their symptoms are the following. *Campylobacteriosis* causes diarrhea in humans. *Salmonellosis* has symptoms including fever, headache, vomiting and diarrhea. *Toxocariasis* is a roundworm that may cause a rash, fever, and cough or vision loss. *Toxoplasmosis*, a protozoan parasite that can cause severe birth defects if a woman becomes infected during pregnancy, is the reason pregnant women are told to avoid handling used kitty litter. This parasite can also cause problems for people with weak immune systems. Symptoms include headache, muscle aches and lymph node enlargement.

3. **Don't feed waterfowl.** While one of the pleasures of a trip to the park has always been taking stale bread to feed the ducks, the environmental and health impacts of this activity for both humans and birds can be serious. While ducks, geese and swans all love bread, it lacks in the nutrients and roughage of their natural diet. Feeding these birds bread is similar to feeding a small child a diet of candy and soda; they may love it, but it

does them no good and may cause long-term health problems.

Feeding waterfowl also tends to cause the birds to concentrate in numbers higher than can be supported by the natural food supplies. This can cause problems in the winter months when fewer people come to the park or shore with food. There have been cases along the Connecticut shoreline where swans were so used to being fed at a particular location that they remained in the area long after the feeding stopped, became too weak to fly someplace with a better food supply, and eventually died of starvation. These large flocks of birds also create large quantities of waste and the serious water pollution problems described earlier in this fact sheet.

4. **Dispose of kitty litter properly.** When cleaning out the litter box, a two-step approach is most effective. Cat waste may be scooped out and flushed down the toilet, and the used litter should be bagged, sealed and placed in the trash. Dumping the entire contents of the litter box down your toilet will cause plumbing problems and prematurely fill up your septic tank or sewer system with indigestible material, but sending untreated cat waste to the landfill can cause pollution problems.

While it may not seem like a big deal if one more dog, cat or bird "contributes" some waste to the neighborhood environment, think about how many animals there are out there. Animal waste may not be the biggest or most toxic pollutant going into your local waters, but it is one of those little problems that, when all the pieces are added together, leads to serious environmental and health problems. So please think twice about your pet's bathroom habits and do your part to help keep our waters and environment clean.

Reference: J.A. Hill and C.D. Johnson. *Pet Waste and Water Quality.* Wisconsin Nonpoint Source Water Pollution Abatement Program. January 1992.

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Clean Waters

Starting in Your Home and Yard

Going Native – Rethinking Plant Selection for the Home Landscape

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When the first European colonists arrived in what is now the United States, they brought from their homelands many plants and landscaping designs with which they were familiar and comfortable. Nearly three hundred and fifty years later, the American yard is still dominated by expansive lawns, symmetrically placed and shaped trees and shrubs, and flower beds of exotic plants typical of the English landscape tradition.

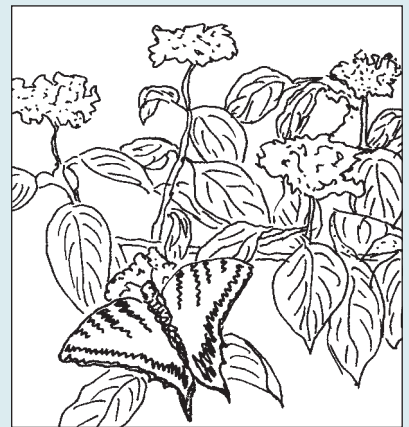
The native plants of North America have rarely been popular in American gardens. Early gardeners preferred the clipped yew hedges and tidy flower beds of Europe to the wild and untamed trees and flowers of nearby forests. However, native plants did have some supporters. Nearly a century and a half ago, while living on the shores of Walden Pond in eastern Massachusetts, Henry David Thoreau came to know the forest and meadows, trees and herbs in all their seasonal moods. His writings celebrated the beauty of native plants and the natural landscape. Jens Jensen, a landscape designer from the northern Midwest, strove in his work to recreate the "tapestry of living colors" beheld by early pioneers in the region. He loved the native dogwoods, crabapples and hawthorns of the Midwest. His designs for public parks and private estates included many natural woodland landscapes utilizing native plants.

Despite such support, when an era of worldwide plant exploration blossomed in the late 1800's, exotic trees and shrubs from the far corners of the earth became featured attractions in American gardens and parks. In recent years, changes in taste and environmental awareness have led to some sharing of garden space by native species and exotic favorites of years past,

but many of the most popular American landscaping plants still have their roots in distant countries.

WHAT ARE NATIVE PLANTS, NON-NATIVE PLANTS, AND WEEDS?

Native plants (also called indigenous plants) are plants that have evolved over hundreds or thousands of years in a particular region. They have adapted to the geography, hydrology and climate of the region and to the other species of plants and animals inhabiting the region. As a result, native plants are part of a community that provides habitat (food and shelter) for a variety of native wildlife species such as songbirds and butterflies. Native plants, when used in home landscaping, provide the ecological benefits of supporting local wildlife while requiring minimal maintenance due to their adaptation to local climate and soil conditions.



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Non-native plants (also called non-indigenous, invasive or exotic plants) are plants that have been introduced into an ecosystem in which they did not evolve. Some of these plants are introduced deliberately, as with our many exotic landscaping plants. Others are introduced accidentally, through the spread of seed by wildlife or by their inadvertent inclusion in seed mixes being sent from one area

of the world to another. Some of these introduced, non-native plant species do not grow well in their new environment or do not reproduce easily so they are easily controlled and pose no threat to the native ecosystem. Other introduced species find their new home much to their liking and reproduce prolifically, even in natural, minimally managed landscapes. These aggressive, or invasive plants often have no natural enemies or controls to limit their spread. Invasive non-native plant species can be a serious threat to native plants and communities, out-competing local species for available sunlight, water and nutrients, and do not provide the wildlife

HOW CAN USING NATIVE PLANTS HELP THE ENVIRONMENT?

Landscaping with native plants has many positive factors that relate to conservation landscaping and to sustainable landscapes.

- Native plants save energy. Native plants have evolved and adapted to local conditions. They are vigorous and hardy, able to survive winter cold and summer heat. Once established, they require little or no irrigation or fertilization. They are resistant to local pests and diseases. Thus, native plants suit



Judy Ricketts-White

habitat benefits of the plants they replace.

Weeds are plants that are growing in places where they are not wanted. Both native and non-native plants can become weeds in a managed landscape like a garden or agricultural field. Non-native species tend to become invasive weeds in natural landscapes due to the lack of natural controls.

today's interest in "low-maintenance" gardening and landscaping.

- Native plants stay put. Native species are members of a community that includes other plants, animals and microorganisms. A natural balance keeps each species in check, allowing it to thrive in suitable conditions but preventing it from running amok. Native species rarely become invasive unless a

Landscaping with Native Shrubs

Tim Fleury, Coordinator Forestry Stewardship Program

SHRUBS FOR DRY, SUNNY AREAS

Bayberry (*Myrica pensylvanica*)
Lowbush Blueberry (*Vaccinium augustifolium*)
Ground Juniper (*Juniperus communis*)
Jersey Tea (*Ceanothus americanus*)
Sweet Fern (*Comptonia peregrina*)

SHRUBS FOR MOIST SITES

Dogwoods (*Cornus spp.*)
Elderberry (*Sambucus canadensis*)
Highbush Blueberry (*Vaccinium corymbosum*)
Inkberry (*Ilex glabra*)
Pussy Willow (*Salix discolor*)
Shadbush Serviceberry (*Amelanchier canadensis*)
Spirea (*Spirea latifolia*)
Swamp azalea (*Rhododendron viscosum*)
Sweet Pepperbush (*Clethra alnifolia*)
Viburnums (*Viburnum spp.*)
Winterberry (*Ilex verticillata*)
Witch Hazel (*Hamamelis virginiana*)

SHRUBS FOR SHADED SITES

Hazelnut (*Corylus americana*,
C. cornuta)
Mountain Laurel (*Kalmia latifolia*)
Swamp Azalea (*Rhododendron viscosum*)
Viburnums (*V. acerfolium*,
V. cassinoides, *V. alnifolium*)

WILDLIFE FOOD — SUMMER

Black Cherry (*Prunus serotina*)
Choke Cherry (*Prunus virginiana*)
Red Mulberry (*Morus rubra*)

WILDLIFE FOOD — FALL

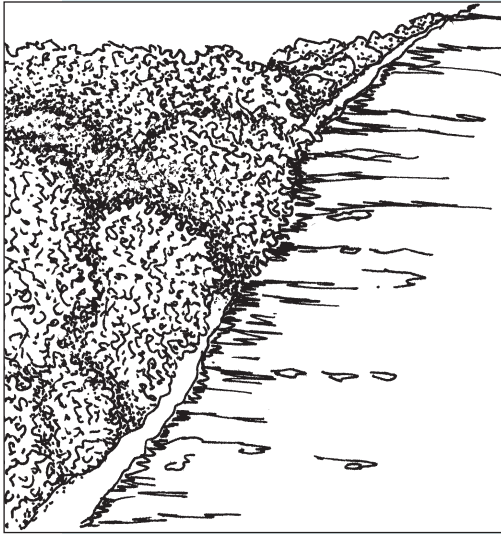
Eastern Red Cedar (*Juniperus virginiana*)
Flowering Dogwood (*Cornus florida*)
Hackberry (*Celtis occidentalis*)
Hawthorns (*Crataegus spp.*)
Hickories (*Carya spp.*)
Oaks (*Quercus spp.*)
Walnuts (*Juglans spp.*)

WILDLIFE COVER — WINTER

Atlantic White Cedar (*Chamaecyparis thyoides*)
Black Spruce (*Picea mariana*)
Eastern Hemlock (*Tsuga canadensis*)
Eastern Red Cedar (*Juniperus virginiana*)
Northern White Cedar (*Thuja occidentalis*)
White Pine (*Pinus strobus*)

major disturbance disrupts the natural balance of the community.

- Native plants support the local ecosystem.



Judy Ricketts-White

Native plants provide food and shelter for birds, butterflies and other desirable wildlife.

- Native plants are interesting. The diversity of native plants includes

interesting flowers and foliage. Native trees and shrubs provide a variety of heights, shapes, and textures in the landscape. Many provide winter interest with their bark or seedpods. Native plants also have historical and cultural interest. Some of these plants played a significant role in Native American culture or in European exploration and settlement of the continent. Many species have value as food or medicine. Others have been used for rope and twine, fabrics and dyes, and other domestic purposes. Native plants provide the people of today with a tangible link to the past.

HOW CAN I BEGIN LANDSCAPING WITH NATIVE PLANTS?

If you are planning a landscape on an undeveloped lot, first examine the existing plants to determine which habitat type you will be working within. Identify native trees and shrubs and see how many could be incorporated into your new landscape. Protecting existing native plants in a new landscape

reduces the number of plants to be purchased and provides an instant "mature landscape". Also identify invasive species for removal to prevent future problems. In an existing landscape, replace plants that are lost to disease or storm damage with native species. Lists of native and invasive plant species, and books and pamphlets describing how to use them in home landscaping, are available from a number of sources, including the Connecticut Department of Environmental Protection, the University of Connecticut, and Connecticut College Arboretum. The brief list included on page 3 is only to spark your imagination.

As the natural landscape is developed, a general decline in both plant and wildlife habitat diversity occurs, leading to an overall decline in many species and a population explosion of "pest" species best suited to backyard living (including squirrels, house sparrows, and white-tailed deer). To help offset this loss, consider planting native trees, shrubs and perennials around your home and yard.

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Starting in Your Home and Yard

Lawn Care the Environmentally-Friendly Way

Americans devote an amazing amount of time and money to cultivating the "perfect" lawn. Literally BILLIONS of dollars are spent each year to re-seed, irrigate, and de-thatch lawns. Tons of water, lime, fertilizers and pesticides are applied, with potentially serious environmental and human health consequences, in order to create an expanse of green without the biodiversity or ecological structure of the plant community it replaces. While lawns have roles in the home landscape, including covering septic fields and serving as play areas, they do not have to be meticulously managed to be healthy and look good. Understanding a lawn's environmental needs and tailoring lawn care practices to suit local conditions allows for a dense, healthy, environmentally friendly lawn with less work and expense.

KNOW YOUR GRASSES

Cool-weather turfgrasses flourish in the spring and fall and some can spread by growing lateral stems across and below the soil surface. These grasses, including bluegrasses, fescues, ryegrasses and bentgrasses are not native to New England but have adapted to this environment through three hundred years of natural selection. These grasses still grow best with cool temperatures and adequate moisture and tend to go dormant or semi-dormant during hot, dry weather.

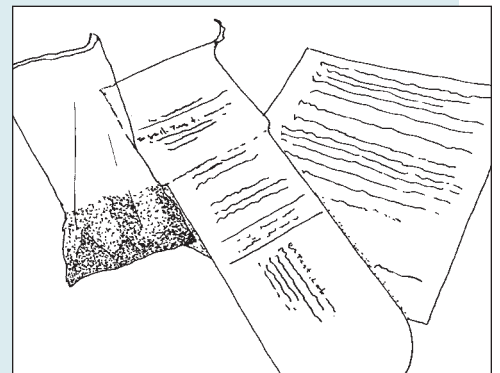
New England's native grasses include both cool-weather grasses and warm-weather grasses, which "green up" later in the spring and grow as a slowly expanding bunch or clump. Zoysia grass, a non-native, warm weather grass, grows best in hot temperatures, providing a green summer lawn, but it browns out early in the fall and is VERY slow to "green up" in the spring.

Different grass species have varying tolerances to the range of growing conditions found even within

one yard. Conditions that can affect turfgrass growth include shade, excessively well-drained or poorly-drained soils, low pH or acid soils, low nutrient availability, high salt concentrations, and heavy foot, play, or animal traffic. The major reason for lawn failure is the improper match of selected grass species to site conditions. An evaluation of the lawn area before selecting a grass seed mix or sod type can go a long way toward preventing lawn problems.

KNOW YOUR SOIL

A soil test is one of the most important steps in maintaining a healthy lawn. Soil pH, organic matter and fertility (or nutrient availability) all affect grass growth. Proper soil pH (6.2 to 6.5) enhances the ability of grass to use available nutrients, tolerate drought, and resist diseases. Most soils in New England are more acidic (lower pH) than is optimal for grass, so soil pH is adjusted by applying limestone, in powder or pelletized form.



Limestone can be applied, at a rate of no more than 50 pounds per 1,000 square feet, at any time the ground is not frozen.

Organic matter in the soil helps the soil hold water and provides some nutrients. If soil is low in organic matter, compost can be spread in a very thin layer over the surface or tilled in to gradually increase the organic content. Leaving grass

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Fact Sheet

June 2000

ALL GRASSES ARE NOT CREATED EQUAL

	Shade Tolerance	Drought Tolerance	Wet Soil Tolerance	Low pH Acid Soil Tolerance	Low Fertility Tolerance	Salt Tolerance	Traffic Wear Tolerance
Fine Leaf Fescues	XX	XX	☹️	X	XX	☹️	☹️
Roughstalk Bluegrass (M)	XX	☹️	XX				☹️
Supina Bluegrass (M)	XX	☹️					XX
Tall Fescue	X	XX	XX	XX	X	XX	XX
Zoysia grass	X	XX	X	X	X	X	XX
Kentucky Bluegrass	☹️	X	X	☹️	☹️	☹️	X
Canada Bluegrass (C)		XX					
Redtop (C)		XX	XX				
Perennial Rye Grass	☹️	X	X	☹️	☹️	X	X

Key XX = Excellent (M) = moist conditions required
 X = Good (C) = for conservation or erosion control areas
 ☹️ = Poor

clippings on the lawn after mowing also adds organic matter to the soil.

Lawn health can be affected by soil compaction, as when heavy equipment is driven over the lawn area. Compacted soils prevent water infiltration and deep root growth. Soil coring or aeration helps correct this problem by loosening soils. Spring or Fall is the best time to address compaction. Check for soil compaction by cutting both ends off a large can – like a coffee can. Pound one end at least two inches into the ground. Fill the can with water and measure the water height, then time how long it takes for the water to filter into the ground. A minimum infiltration rate for Connecticut soils would be 0.5 to 1 inch per hour. Anything slower would indicate the soils are probably compacted. [Example calculation: If a full can has 5 inches of water and the water takes 12 hours to completely empty from can, the infiltration rate is 5/12 or 0.42 inches per hour.]

KNOW YOUR FERTILITY

Before adding ANY fertilizer to the lawn, consider all the “free” sources of nutrients. Rainfall provides about one-half pound of nitrogen per 1,000 square feet every year. Lesser amounts of phosphorus and sulfur also come with the rain. Lawns that have clover in their plant mix require less nitrogen since the clover “fixes” nitrogen and makes it available to the surrounding plants. Leaving the grass clippings on the lawn after mowing is the best kind of fertilizer.

Research at the University of Connecticut shows that recycling clippings in place reduces the need for supplemental fertilizer applications by 50 to 100 per cent!

If you must fertilize, avoid over-fertilization by following soil test recommendations. Choose a fertilizer formulation that most closely matches what the soil lacks. Slow-release fertilizers improve the chances

that nutrients will remain in the root zone until the grass can use them. For additional water quality protection, use organic fertilizers if possible. Organic formulas combine the benefits of slow nutrient release with the addition of organic matter to the soil. Organic fertilizers may also help reduce some turf disease problems.

Turf type will determine the annual amount of fertilizer required for a healthy lawn. Never apply more than one pound of nitrogen per 1,000 square feet at one time. To determine what is one pound of nitrogen, divide the first number on the fertilizer bag into 100. The result is the amount (in pounds) of fertilizer that should be applied to 1,000 square feet of lawn. Fine and tall fescue-type lawns require only one (September) or two (May and September) applications per year. Bluegrass lawns generally require three applications. Recommended application times coincide with three holidays: Memorial Day, Labor Day and Columbus Day.

To ensure best plant use of fertilizers and to reduce potential water quality problems, New England lawns should never be fertilized before April 1 or after October 15. Always check the weather and avoid applying fertilizer before heavy rainstorms or during long, dry spells.

KNOW YOUR WATERING SCHEDULE

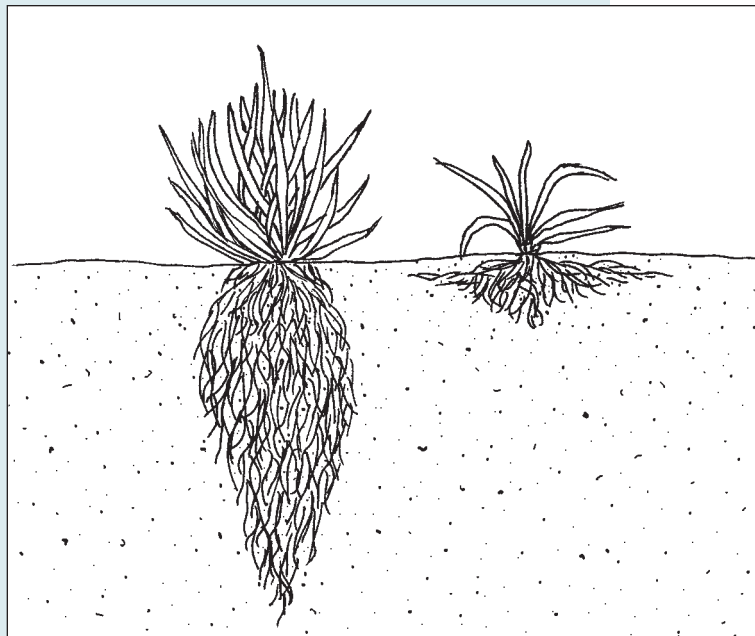
Most lawns require about one inch of water per week, either from natural rainfall or irrigation. Some homeowners like to water their lawn for a few minutes several times a week, but this practice actually weakens the grass by discouraging deep root growth. To promote deep root growth and drought resistance, use a rain gauge to keep track of rainfall. If Mother Nature has not provided an inch of rain in a week, then apply an inch of water. Measure watering levels by placing a tuna fish or other shallow can under the sprinkler system. Don't apply water faster than the ground can soak it up. If water runs off the lawn, slow down the watering.

During prolonged dry spells, it is better to let the lawn go dormant than to stress the grass by watering and forcing it to grow. Stressed grass is susceptible to pest and disease problems. Fine fescues and turf-type tall fescues are the more drought-tolerant of the common lawn grasses. Bluegrasses,

ryegrasses and bentgrasses may require supplemental water to survive drought conditions.

KNOW YOUR PESTS

The best tool for pest management is to plant grass varieties suitable for the site's growing conditions, and then to avoid stressing them with poor lawn care practices. Weeds have a hard time invading a dense, healthy lawn. When establishing a new lawn or overseeding an old one, take advantage of a natural pest control by looking for "endophyte-enhanced" seed vari-



Judy Ricketts-White

eties. Certain fescues and ryegrasses contain a fungus that produces compounds that reduce certain insect and disease problems. As these varieties also tend to be more drought-tolerant, water and pesticide use can be reduced at the same time.

Scout your lawn for pest problems frequently; catching a problem early makes it easier to correct. If you find a problem, take time to determine:

- What is causing the problem?
- What is the potential for damage?
- What is the best approach to solve the problem?

Correct identification of pest problems is CRITICAL. It does no good to spray grub control pesticides on brown spots in your lawn if they were actually caused by a fungus or dog urine.

Reduce your use of, and exposure to, pesticides by only treating the problem area. Avoid the use of

combination fertilizer-pesticide products, which force you to treat your entire lawn. You should also avoid applying pesticides according to a calendar UNLESS you have had a problem for several years and a pesticide is the ONLY means of control. When pesticide use is necessary, ALWAYS READ THE ENTIRE LABEL! Products should be chosen and treatments timed to be most effective in dealing with the pest and least likely to damage natural controls or be carried to other parts of the environment.

KNOW YOUR LAWN MOWER

How a lawn is mowed can help or hurt lawn health. Even the choice of lawn mower and its maintenance can make a difference. Gas-powered lawn mowers produce the same amount of air pollution in one hour as driving a car for 350 miles. Consider electric power or reel-type push mowers if you have small lawn areas to manage. Keep the mower blade sharp so grass blades are cut cleanly, reducing moisture loss and limiting disease spread. A mulching blade cuts grass clippings into very small pieces so they can be left on the lawn without clumping.

Always try to mow when the grass is dry to prevent spreading disease problems. Mow the lawn to the recommended height for the grass variety but never less than two inches. Grass plants have a hard time recovering from mowing if they have little blade left with which to photosynthesize. Reduce plant stress by never removing more than one-third of the blade at a time. Recommended mowing heights are:

- Tall fescues: 2.5 - 3 inches
- Perennial ryegrass/fine fescues: 2 - 3 inches
- Kentucky bluegrass: 2.5 inches
- Zoysia grass: 1 inch (an exception)

UNDERSTAND THATCH

Thatch is a dense layer of dead grass stems and roots that develops between the soil surface and the green grass blades. Contrary to popular belief, grass clippings do NOT contribute to thatch problems. Heavy thatch reduces water infiltration into the soil. Some grasses (fine fescues, Kentucky bluegrass) are prone to thatch problems; others (tall fescues, perennial ryegrass) are not. Serious thatch problems are usually a sign of poor lawn care practices, such as

over-fertilization and improper mowing. De-thatching, best done in the fall, is recommended for lawns with more than one inch of thatch build-up. Top-dressing the lawn with a thin layer of good topsoil will also help control thatch.

ADDITIONAL RESOURCES

There are lots of excellent fact sheets available from The University of Connecticut Cooperative Extension System that cover lawn and pest problems in great detail. Call the University's Home and Garden Education Center, toll-free, at 877-486-6271 or check out the website at <<http://www.lib.uconn.edu/canr/HomeGard/>> (case-sensitive).

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Clean Waters

Starting in Your Home and Yard

The Four Seasons of Water Quality Protection

Clean Waters is a collaboration of the Connecticut Sea Grant Extension Program and the University of Connecticut Cooperative Extension System's NEMO Project, educating individuals about the impacts of everyday activities on water quality and simple techniques that help protect water resources from the home well to Long Island Sound.

A yard provides a very personal place to observe the four seasons. The first blooming bulbs of spring, tomatoes or corn of summer in the garden, fiery colors of autumn or the first winter snowfall are all important, annual events. Each season also has its own landscape maintenance needs.

Home landscape management activities have impacts far beyond the individual property lines, neighborhoods, and town boundaries because of the way landscapes are linked together by water moving through the environment. By recognizing how each home landscape is connected to the environment as a whole and managing the landscape with this connection in mind, everyone can make a contribution to protecting and restoring all natural resources, especially local water quality.

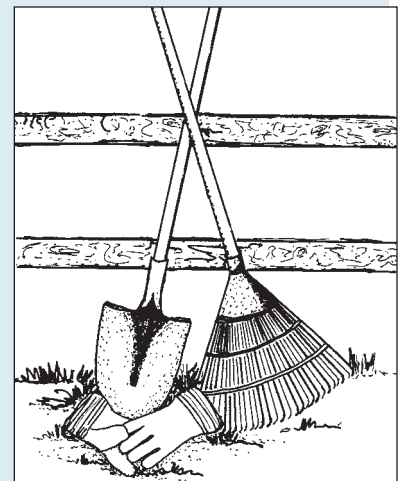
Where does one start in creating an environmentally friendly home landscape? It can seem like an overwhelming project, but it doesn't have to be. Very small changes in everyday landscape management activities in every season of the year can add up to very big changes in water quality protection.

SPRING

- Recycle winter debris. Lawns and gardens need to be raked out to remove the leaves, twigs and branches deposited during winter storms. Use this material as the base for a new compost pile OR chop it up (with a lawn mower or shredder) and use it to re-mulch around foundations, under shrubs and trees and in groundcover beds rather than going out and buying bags of bark mulch. Don't dump brush and leaves into streams or wetland areas. They add excess nutrients to the system and may cause flooding by blocking water flow.
- Sweep up leftover sand from the road or driveway to keep it out of storm drains and local water

courses. This sand will contain salt and other pollutants, so don't use it in vegetable gardens or sand boxes, or dump it in a pile "out back". Sift it and store it in buckets for next winter.

- Rethink the early dose of lawn fertilizer. Avoid "weed and feed" type products that mix pesticides and fertilizers. Why pay for chemicals that you don't need or that force you to start mowing earlier and more often? Put off the first dose of fertilizer until mid-May or apply a thin layer of compost to add organic material to the soil while providing a more balanced dose of nutrients for healthy lawn growth.



Judy Ricketts-White

• Cover bare soil. If lawn areas are bare or plantings have died over the winter, don't leave exposed soil. Re-seed or mulch to prevent soil erosion. Consider dead plants an opportunity to add native species with multiple season interest to the landscape.

- Start a landscaping log. Spending a few minutes a week writing down what plants are growing well or having problems, what got eaten, and what yard chores take too much time will help when you are making plans for next year.

SUMMER

- Avoid wasting water. Invest in a rain gauge and keep track of weekly rainfall. Most plants and the lawn are happy with one inch of water a week, so



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keep the hose coiled up when the rain has been coming down.

- A thick (at least two inches) layer of mulch in gardens, around shrubs and under trees prevents evaporation of water from the soil, keeping the ground cooler and plants happier. Thick mulch layers also inhibit weed seed germination. Just don't mulch heat-loving vegetables like tomatoes and squash until the soil temperature is high enough or they won't thrive. Organic mulches provide some nutrients as they decompose, reducing the need for fertilizers.
- Avoid lawn stress. Keep the lawn mower blade sharp, mow often enough that no more than one-third of the grass blade is cut off at a time, and try to mow when the grass is completely dry. A mulching mower blade recycles grass clippings while mowing, returning moisture and nutrients to the soil and reducing the need for fertilizer. (Fact Sheet #8)
- Cut down on chemicals. Cut down on or eliminate fertilizer use. Upgrade your soils by adding composted organic matter rather than chemicals that may damage the natural microbial communities in the soil and promote pest problems. Use "Integrated Pest Management" or IPM strategies to reduce the need for toxic pesticides. (Fact Sheet #4)

AUTUMN

- Gardens need bedcovers. When cleaning out vegetable and flower gardens, don't leave the soil bare for the winter. Use chopped leaves as mulch or plant a "green mulch" to add nutrients and organic matter to the soil.
- Plant things! Early autumn is the best time to transplant shrubs and other perennials and to re-seed lawns. Choose grass seed mixes that match your site. Consider adding a little clover seed for a free source of nitrogen fixation. Early autumn is the best time for a single dose of fertilizer for good grass root growth and a healthy lawn next spring. Slow-release or organic fertilizers stay where plants can use them and out of the local waters and wells. Keep watering all new plantings until the ground is frozen to give the roots plenty of opportunity to grow.

- Save the leaves. Leaves have lots of landscaping uses. Make a compost pile, chop them and mulch all the landscaping and garden beds, or create new beds under the trees from which they fell. If your property is just too small and the town has community leaf composting, use it, but go back for your leaf mulch next spring.

WINTER

- Rethink snow control. Sand and salt from snow removal are two major sources of water pollution and they aren't exactly good for the lawn or other plants either. Use them sparingly, if you must. Consider sweeping up sand between storms to re-use, cutting down on the total amount used over the winter.
- Dream and plan. Winter is the time to plan for next spring. If one doesn't exist, create a master yard plan and map out what areas are doing well and what needs improvement or replacement (a new play area? better foundation plantings?). Read magazines and booklets, visit garden centers or call extension centers to research interesting native plants that meet your needs and are suited to your specific site characteristics. Identify any invasive landscaping plant species that are taking over the natural ecosystem around your property and learn how to control them. A little planning in the quiet of winter can prevent wasted money and stressed out plants and people in the heat and hurry of summer. (Fact Sheets #5 & 7)

Each idea here is a tiny twist on "gardening as usual". Protecting water quality and the environment just requires a little thought and a little care from individuals and provides big benefits for everyone.

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Clean Waters

Starting in Your Home and Yard

Conserving Water at Home

Water is a precious natural resource that benefits all living things. It provides nourishment for people, animals and plants, and serves as the living environment for aquatic life. Maintaining a safe and adequate water supply is everyone's responsibility. The daily actions of individuals and communities directly impact water supplies. By making sensible choices, people can preserve and protect household water.

Water conservation has personal and economic impacts. Especially during drought conditions, homeowners can extend their water supply by practicing conservation year round. An extended water supply provides an added measure of safety, protects lawns and gardens, and enables people to enjoy modern conveniences which often are taken for granted, such as a consistent water supply and plumbing that operates as designed. Water consuming appliances may not produce the expected results during drought conditions (e.g., laundry may appear discolored).

Municipal customers save money on water, sewer, energy and potential tax bills by practicing conservation. Municipalities that consume substantial amounts of water typically increase taxes in order to construct sewage treatment plants that can adequately handle the volume and lessen the load on existing systems. It is preferable for communities to improve water treatment technology, rather than build additional treatment plants. Both municipal and household sewage treatment systems require water in order to function. As water consumption increases, costs increase. For homeowners on private septic systems, the tank must be pumped more frequently with increased water use. As septic systems experience greater stress, they are likely to require replacement more frequently, costing thousands of dollars.

DEVELOP WATER SAVING HABITS

Modify your household water usage patterns by involving every person in your home. Children can get really excited if you make it a game and are a source of inspiration for the entire family!

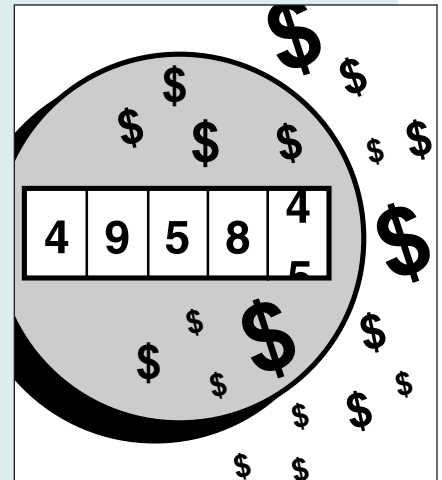
In the bathroom...

- Shorten shower time (use a minute timer) and install low-flow-showerheads (that deliver 1.5 gallons of water per minute) with shut-off valves (for turning water off temporarily while soaping or shampooing) and aerators (screens that introduce bubbles, producing a feeling of greater water pressure). These devices are easily installed and very cost effective.

- Run hot water very briefly before getting in the shower. When taking a bath, close the stopper from the start and then let the water rise in temperature in the bathtub.

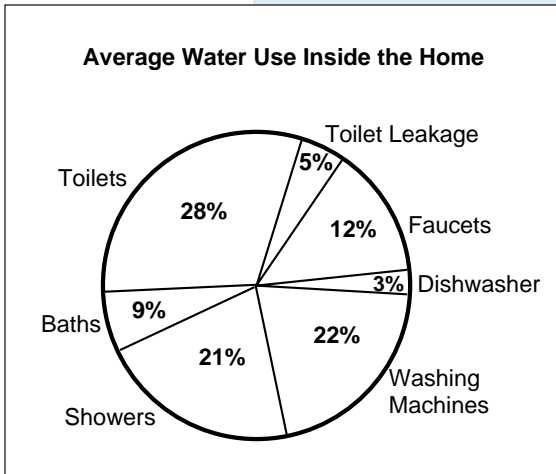
- Install low-flow faucet fixtures and repair leaks promptly. A leaky faucet can result in a daily loss of fifteen gallons of water. Encourage family members to turn faucets off tightly when not in use; turn the water on and off while brushing your teeth or partially fill the basin while shaving to save up to ten gallons of water daily. Continuously running water is very wasteful.

- Toilets are the major water consumers in most homes. Consider replacing older toilets with ultra-low-



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flush (ULF) models. Traditional toilets use about 3.5 to



7 gallons of water per flush, depending upon their age. ULF models use about 1.6 gallons per flush and are characterized by efficient bowl and discharge designs, compatible with existing plumbing fixtures.

If toilet replacement is not feasible, be sure to check all household toilets for leaks by placing three drops of food coloring

inside the tank. If the food coloring appears in the bowl without flushing, a leak is present. The trip mechanism may not be attached properly; or the flushball/flapper may be old and distorted in shape or may not be making the right contact with the ball seat and needs to be replaced. If the valve is not shutting off, the float ball may either need to be adjusted or repaired/replaced if defective. Occasionally, the ball seat may be the source of the problem that can be solved by cleaning, repairing or replacing the seat.

Installing a dual flush mechanism on an existing toilet is another option until the toilet can be replaced. With this mechanism the user can choose between two different water settings.

- Remind family members to dispose of kitty litter, tissues, paper towels, cigarettes and other litter in wastebaskets...not the toilet!

In the kitchen...

- Run the sink for the minimum amount of time necessary to clean dishes, food, pots and pans and other items. Soak dishes in a dishpan, if necessary. Rinse all vegetables at once. Avoid running water continuously when performing kitchen tasks!
- Replace faucets with water-saving devices and check valves for leaks.
- Use the minimum amount of detergent (low-sudsing) to avoid excessive rinsing of dishes and countertops.
- Apply elbow grease and a sponge or scrubber to clean sinks. Do not use lots of water to remove debris from sinks.
- Store a pitcher of cold water in the refrigerator so

you will avoid running water until it gets cold.

- Research has shown that automatic dishwashers use less water than hand dishwashing. Measure detergent, select water and energy conserving cycles, run only full loads and avoid excessive pre-rinsing.
- Boil only as much water as you need in a tea kettle or covered pot (with a lid) and turn it off as soon as it boils to reduce evaporation and waste.
- Dispose of vegetable scraps in a compost pile; the garbage disposal wastes water.

In the laundry...

- Sort clothing, pretreat stains, select the load size which corresponds to the quantity of clothing you are washing, measure detergent, and use the recommended water temperature.
- When purchasing a washing machine, consider new front-loading models that consume only 30 percent of the water of traditional top-loading models.

In the household...

- Inspect your water meter for leaks by reading the meter (number) at night (after family members have stopped using water). The next morning, before anyone uses water, check the number on the meter again. If the number has changed, there is a leak in the system. Assuming leaks in household faucets/appliances have already been corrected, have the piping system inspected to determine the source.
- It is preferable to select household cleaners that do not require rinsing with water. For cleaners requiring hydration, measure and make the minimum amount needed.

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The Connecticut Sea Grant College Program, based at the University of Connecticut, is part of a national network of university-based programs sponsoring coastal and marine-related research, outreach and education.



Clean Waters

Starting in Your Home and Yard



Environmentally Responsible Boating

Bright sunshine, cool breezes, a bit of spray as the bow turns into a wave, the chance to swim or fish – these are the small joys of a day on the water whether aboard a small sailboat or a large motor boat. Smelling sewage, seeing oil slicks on the water, or getting the rudder fouled with floating trash quickly ruins the experience. Boating as a recreational activity is truly enhanced by clean water. Most boaters know they share the responsibility for protecting water quality, but the few thoughtless boaters can cause serious water pollution problems.

If potential water pollutants are commonly separated into six major categories (nutrients, pathogens, sediment, toxic chemicals, floatable debris, and thermal stress), improper or careless boating practices can be linked to four of the six categories. Boaters can make a big difference in protecting the waters they use by making simple changes in the way they handle fuel and motor oils, sewage, garbage, and regular boat maintenance.

GARBAGE

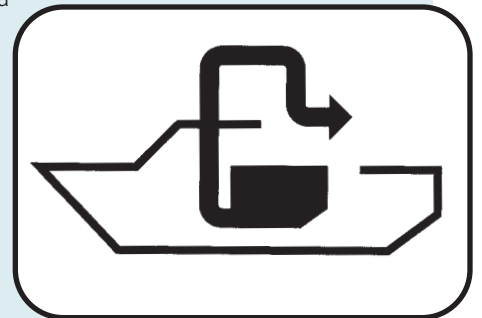
Good boaters and backpackers live by the same motto, “bring back what you take out”. Tossing anything solid over the side of the boat is a “no-no”; that includes paper, plastic, food, cigarette butts, soda cans, and snarled fishing line. It is **ILLEGAL** to dump anything plastic into navigable waters all over the world. If your boat is over 26 feet long, the law requires you to post a sign reminding passengers of this law.

Cut down on the potential for trash going overboard by removing excess wrapping on shore, storing food in reusable containers and using permanent dishes, glasses and utensils on board. Keep trash bags on board and take full bags home or throw them in trash cans or dumpsters with lids. Encourage the marina operator to provide trash and recycling

facilities. Improve your part of the water by picking up trash that floats by whenever you are docked or anchored.

SEWAGE/FISH WASTE

Raw sewage is a major source of pathogens and nutrients. Treating sewage in standard marine toilet systems eliminates the pathogens but can add toxic chemicals and does nothing about the nutrients. It is illegal to discharge untreated sewage into any Connecticut waters. Even treated sewage should not be discharged within three miles of shore. Use the restrooms on shore before setting sail. If the boat doesn't have a toilet, bring a portable toilet that can be emptied on shore, or include regular “pit stops” every few hours.



If the boat has a toilet, follow the manufacturer's recommended maintenance program and post instructions where they are clearly visible. Keep a trash can in the head; **NOTHING** should be flushed into the holding tank but waste and toilet paper. Use fast-dissolving marine toilet paper and environmentally friendly holding tank deodorants and disinfectants. At the end of the day, use a mobile or shore-based pump-out facility to empty the holding tank. Look for the national pump-out logo at marinas, or check cruising guides or boating directories.

Dumping fish guts and bait overboard in restricted waters like marina basins adds to the hypoxia or low dissolved oxygen problem in summer months. Live bait, particularly in fresh water areas, has the

Clean Waters is a collaboration of the Connecticut Sea Grant Extension Program and the University of Connecticut Cooperative Extension System's NEMO Project, educating individuals about the impacts of everyday activities on water quality and simple techniques that help protect water resources from the home well to Long Island Sound.

11

Fact Sheet

January 2000

potential to introduce foreign species, like zebra mussels, into new habitats where they cause big problems. Recycle fish waste and bait either by burying it in gardens as fertilizer or freezing it until your next trip.

FUELS AND MOTOR OIL

Millions of gallons of toxic, petroleum-based fuels and lubricants end up in the water every year as the result of small spills related to overfilling fuel tanks or pumping out oily bilge water. Most of these spills can be avoided or quickly cleaned up with proper planning and keeping a few materials on hand.

Avoid over-filling fuel tanks.

Don't rely on automatic shut-off nozzles; they may not work fast enough to avoid splash-back. Instead, listen to the filler pipe to know when the tank is near full. Remember that fuel expands in the tank as it warms up and leave a safety margin. Keep an oil absorbent pad handy to clean up drips. Portable fuel tanks should have their vents

closed when not in use to avoid fuel vapor loss. Built-in fuel tanks should have a fuel/air separator in the air vent line to prevent spills through the vent.

Keep the engine properly tuned and maintained for best fuel efficiency and to avoid leaks. Keep a drip pan under the engine if possible. Boats with bilges should have an oil absorbent pillow or bioremediation pad with oil-eating bacteria in place to catch stray oil. Dispose of saturated materials at the marina waste oil recycling station. Never pump out bilge water that has an oily sheen. Avoid bilge cleaners with detergents or emulsifiers. They dissolve the oil into the water, worsening the potential pollution problem.

If you do spill fuel or motor oil in the water, stop the spill immediately, contain the spill with absorbent pads or booms, and call the Coast Guard for assistance. The law states that any spill large enough to create a sheen on the water must be reported.

BOAT MAINTENANCE

Whenever possible, do repairs, painting and general maintenance in dry dock to keep paint chips, solvents and other toxic materials away from the water.

Place tarps under boats when sanding or cleaning boat bottoms so debris can be collected and discarded properly. Use dustless or vacuum sanders to keep hull debris under control.

Recycle used antifreeze, oil and batteries. Encourage marinas to provide appropriate recycling facilities.

Choose the least toxic products available for the job at hand, and buy the minimum quantity necessary to avoid storage and disposal problems. Buy "non-toxic" or "phosphate-free" cleaning products. "Bio-degradable" products may still be toxic. Avoid products containing ammonia, lye or petroleum distillates. Pink (propylene glycol) antifreeze/coolant is significantly less toxic than the blue-green (ethylene glycol) version.

Follow product directions and use the least amount of chemical possible for the job. Keep caps on bottles except when pouring to avoid accidental spills. Wipe off cleaner and solvent residues

rather than hosing them over the side. Wash decks with fresh water and wipe down engines frequently to cut down on the need for stronger chemical products. Never dump excess or used chemicals into the water, down a drain or onto the ground. Improperly discarded chemicals make their way back to the water, whether it's your well water or Long Island Sound, and cause serious pollution problems. Solvents and thinners can be used more than once if the solids are allowed to settle out, and the clean product is poured off the top.

Each of these actions may seem so small they won't make a difference, but if every boater and every person who loves the water changes one or two actions, we'll make a big difference in protecting water quality.

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