



Green Lawns

*Promoting
environmental
stewardship*

This publication was developed and distributed in cooperation
with USDA-CSREES, Environmental Protection Agency,
Regional IPM Centers and the Land Grant Universities.

For more information about environmentally friendly lawn
care management, please visit [http://www.csrees.usda.gov/
Extension/](http://www.csrees.usda.gov/Extension/) to locate your local Extension office.

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This publication was developed and distributed in cooperation with USDA-CSREES, Environmental Protection Agency, Regional IPM Centers and Land Grant Universities. For more information regarding this publication, contact Susan Ratcliffe at sratclif@uiuc.edu or by phone at (217) 333-9656.

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www.lawnsandenvironment.org.

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Introduction

This document contains a set of guidelines and tips for homeowners/consumers creating and maintaining environmentally friendly lawns and landscapes. Working outside on landscaping projects can

- Teach you about the local environment.
- Introduce you to the beauty of nature.
- Improve your physical and mental health.
- Add value to residential property.

Irresponsible landscape practices impact water resources, wildlife, and environmental health and pose risks to homeowners, children, and pets. For example, irresponsible lawn care and landscaping practices can

- Create erosion and storm water runoff problems for neighboring properties and waterways.
- Destroy wildlife habitat and contaminate wildlife food and water.
- Harm soil microorganisms, pollinators, and other beneficial insects.
- Waste water and deplete supplies for drinking sources and wildlife.
- Result in chemical and nutrient runoff into waterways and in groundwater contamination.
- Result in pesticide drift and bystander exposure.
- Introduce invasive plants into the landscape.
- Cause injury, accidents, and health problems for people and animals.

Responsible lawn care and landscaping practices that are sensitive to the environment and to public health can provide a variety of environmental benefits to our homes and communities. For example, healthy, environmentally friendly lawns and landscapes can

- Reduce dust and air pollution.
- Reduce high temperatures and noise levels in urban areas.
- Create critical shelter and food for wildlife.
- Reduce energy use for heating and cooling of buildings.
- Filter pollutants.

- Reduce erosion, stream sedimentation, flooding, and runoff of pollutants into local waterways.
- Provide a safe play area for children.
- Reduce the risk of pesticide exposure to children, adults, pets, and wildlife.
- Build healthy soils.
- Attract wildlife and beneficial insects.

You can use these guidelines as a general guide to decision making for yard maintenance activities as well as landscape planning and design. By using this guidance, you will learn to make a variety of choices related, but not limited to

- Plant selection and care;
- Managing and using water;
- Pest management;
- Fertilization;
- Potential effects of landscape decisions on children, neighbors, and wildlife.

These recommendations do not address every issue or cover the differences in landscape conditions that exist from region to region. Plant selection and landscape practices in southern Florida are different from those in Arizona or Montana, but most of the basic guidelines of stewardship concerning pollution prevention, wildlife protection, and human safety do apply and should be followed. Environmental stewardship and pollution prevention goes beyond simply attempting to reduce risks. It also involves the adoption of analytical techniques to prevent pest problems by creating healthy soil and plant conditions, the avoidance of overfertilization, or the application of unnecessary pesticides. Stewardship includes the idea of taking responsibility for our individual actions and being aware of how they may affect others. It also relies on the basic concept of responsible, personal choice where doing the least harm to the environment or other individuals is always the best policy.

Recognizing that regional differences are important and that homeowners and gardeners need site-specific guidance, we recommend that you contact your local cooperative extension service, government agencies, nurseries, garden centers, garden clubs, or lawn and landscape companies. To obtain a variety of opinions and perspectives on local and regional landscape issues, you also could contact professional associations and environmental groups.

Getting To Know Your Site

Knowing the unique needs and circumstances of your site is the first step in planning and maintaining a healthy and environmentally friendly landscape. Understand that landscapes are dynamic and as they mature, maintenance requirements change.

Take the following actions to get familiar with your site. Then, continue to PART II: LANDSCAPE DESIGN AND INSTALLATION.

GROWING CONDITIONS

Observe your yard during each season and note areas of shade, sun (follow the shadow for a day), areas of wetness or dryness, and areas exposed to wind to assist in the proper placement of plants and to make other landscape decisions.

PLANTS

Identify individual existing species of plants and their particular needs for sunlight, water, soil, and nutrient conditions. You also may want to consider the time when the plants flower, and the color and texture of their leaves, branches, and bark. Plant information is available on the internet, at your local library, a local nursery, from your cooperative extension service, or local plant and garden societies. Do not use plants that are on the invasive plant list for your area or region. Remove invasive plants from your site. Using plants that grow locally makes your job of raising them easier as they are already accustomed to your local growing conditions.

WILDLIFE

Learn about local wildlife by observing natural visitors to your yard. Identify species of birds, mammals, insects, and other organisms and their habitat needs from local wildlife agencies and organizations, or visit your library, or on-line information sources. Consider what natural plant community and wildlife existed on your site before development. This kind of information will help you decide how best to protect or manage certain kinds of wildlife in your yard or which species of wildlife might visit or live in your yard if the appropriate habitat was provided for them.

SOILS

Understand basic soil characteristics. This information can help in plant selection, irrigation, and fertilization planning.

Dig a one-shovel-depth hole to examine soil texture and composition. For example, clay soil can be rolled into a marble-sized ball when damp (or a shiny ribbon when pressed out) and sandy soil just falls apart. Also note the presence of living organisms in the soil such as earth worms.

Test your soil regularly so you can learn about your soil and can add the appropriate fertilizers and amendments to correct any imbalances, deficiencies, or toxicities and adjust the pH as needed.

WATER AND DRAINAGE

Examine your yard during a heavy rainstorm to determine how your yard handles runoff; note areas of maximum flow, puddling, or erosion. Also note whether there are wet or swampy areas and any high, dry exposed areas or uneven areas. These landscape features can affect drainage or cause puddling and influence the location and types of landscape plantings, surfaces, and irrigation, or drainage planning.

PESTS

Evaluate conditions that contribute to pest problems and plant disease such as poor drainage, thatch, or soil compaction

MAP

Know the square footage of your yard and prepare a map. (1 acre = 43,560 square feet). Square footage is generally a factor for accurately calculating inputs that may be needed in pest management and fertilization. To determine square footage, measure the size of your yard by using a tape measure. Don't forget to subtract out hard surfaces such as driveways, decks, patios, and walls. As a substitute, you also can measure your typical stride and pace off width and length to get the dimensions of your yard. From a bird's-eye view, use your measurements to map out your property on graph paper to scale. Note the presence and proximity to bodies of water such as lakes, streams, rivers, or wells. Be aware that many urban and suburban properties drain to storm water systems that feed directly into local water bodies. Also note the location of any structures and utilities (both overhead and underground wires) and septic fields. Identify existing plants on your map.

Landscape Design & Installation

How should I analyze the site before landscaping begins?

Site analysis is necessary to identify both problems and opportunities for landscape decisions. Knowing about soils, plants, and drainage will help you decide what changes you need to make in your yard to create a more attractive and healthy landscape. Knowing about your yard will help you avoid costly mistakes later.

- Start with the site map you prepared in the previous section.
- Evaluate the types of activities and functions you would like to enjoy on the property and the appropriate size and location of each, taking into account site characteristics such as topography, neighboring land uses, site orientation, and existing vegetation.
- Design outdoor areas and facilities to be modified easily with the changing needs of your family.
- Visit natural areas and demonstration gardens and landscapes at nurseries, botanical gardens or state and local agencies in your area to get ideas for regionally appropriate landscape designs and plant choices for water conservation, wildlife, and low maintenance. Keep in mind that not all plants on display may be appropriate for your site.
- Planting deciduous, shade trees on the south and west side of the house can reduce summer cooling costs and lower energy consumption. Trees are also valuable in shading paved areas (streets, driveways, and terraces) to help reduce the heat in your landscape.
- Shrubs and trees in the home landscape can serve as barriers to unwanted noise and screens to protect privacy or block undesirable views.
- In homes exposed to winter winds, a tall evergreen windbreak planted on the windward side of the home can reduce heating bills and energy consumption.
- If your property has a lot of paved surface or is sloping, rain gardens, grassy swales and other landscaping solutions can help reduce storm water impacts to local water bodies.
- In areas where wildfires are a concern avoid dense trees and shrubs close to buildings. Consult with a nursery or your local Cooperative Extension Service about appropriate fire suppression planting and methods.

How should I plan or design my landscape?

Proper planning and design requires the integration of many factors, including functionality, safety, cost, site limitations, and opportunities, local regulations, maintenance, and the environment. By proper planning you can create conditions that will protect the environment and help you avoid issues of pollution, pest infestations, and other long-term problems.

- Consider different landscape types or approaches such as xeriscaping; low-maintenance or native plants; wildlife-friendly flower, fruit, and vegetable gardens; or other landscape concepts that meet your individual needs while protecting the environment.
- Include elements of ecological balance such as healthy soils, proper plant selection, proper drainage, and other measures that can reduce the need for pesticides and fertilizers.
- Consider the changing needs of your family and life style and the changes in your landscape as plants grow and mature. This foresight will help you avoid costly redesigns and landscape renovations in the future.
- Consider the labor and costs of adequately maintaining your landscape over time and make sure it is consistent with your available time, budget, and goals.
- On your own, or with the help of a landscape architect or designer, draw up a landscape design plan on the base map that shows new construction of walks, patios, decks, and other structures. List new plantings by plant species and designate conservation and wildlife areas and other measures to protect natural resources.

What landscape techniques will conserve water?

By conserving water you help your community meet the needs of all residents as well as helping wildlife that may depend on the same water supplies. Because relatively large quantities of water are used for home landscaping, this is an area that you can make a real difference through conservation.

- Consider a water-efficient landscaping approach with the use of locally adapted, low-maintenance native or drought-tolerant plants that thrive under existing climate conditions and soils. By using locally adapted or native plants you can reduce water needs to a minimum

and eliminate the need for some irrigation systems in certain areas.

- Different plants need different amounts of water. If you irrigate, divide your yard and landscape areas into separate irrigation zones so that you can water grass separately from groundcovers, shrubs, and trees. Both sprinkler and drip irrigation systems can be incorporated to achieve more efficient use of water. When designing and installing plants, group plants together that have similar water requirements.
- Shaded areas of a planting of a given species may require less water than the same species in full sunlight.
- Using a 2–3-inch layer of organic mulch such as pine bark, shredded cedar, pine straw, or compost around your plants can help keep the soil moist and deter weeds.
- Design irrigation systems to minimize water use through drip systems, automatic rain sensing shut-off devices, and appropriate sprinkler components to meet—but not exceed—the needs of the plants.
- Consult a qualified professional to determine appropriate irrigation schedules and total water needs for the planned landscape.

What landscape techniques are wildlife-friendly?

As urban development expands over existing farmland and natural habitat, birds and other wildlife must move elsewhere or adapt to new conditions. By providing native plants, water, and cover in your yard many wildlife species can find necessary shelter and food to survive. By providing habitat in your landscape you can make a difference for some species and also enjoy watching them in your yard.

- Trees, shrubs, wildflowers, and other plants in the residential landscape can provide food, shelter, and nesting sites for wildlife. Add diversity with locally native plants, fruit or berry producers, or evergreen species for year-round cover. Avoid planting invasive species.
- Flowering annuals, perennials, shrubs, and trees can add color to the yard and attract birds, bees, and butterflies by providing nectar, pollen, seeds, or fruit. The use of native species is encouraged. Annuals and perennials have the added benefit of attracting and providing habitat for beneficial insects that help keep pests under control. Be aware that if you attract butterflies, you also attract their young—caterpillars—and they might eat plant leaves.
- Provide nest boxes for cavity-nesting birds, roosting boxes for bats, nesting blocks and bare ground for native bees, and host plants for butterflies and caterpillars.
- Consider adding a backyard pond, water garden or birdbath to provide water for wildlife. Because mosquitoes are a potential problem and a health issue, check

with your local health officials or cooperative extension service on the best methods to control them.

- Help wildlife find shelter from weather and predators by providing areas with evergreens, ground cover, brush piles, thicket or bramble patches. Log piles for wildlife habitat are an option you can consider in certain circumstances. Check with your local municipality to ensure there are no restrictions against brush and log piles.
- Mimic natural habitat by grouping plants in same-species clusters and creating overlapping layers.
- Connect vegetated areas to create habitat corridors for wildlife travel.
- Preserve existing native vegetation through sensitive site planning and proper construction techniques.
- Plant well-adapted species that can provide wildlife food in different seasons.
- Permanently remove invasive plants. These plants reduce biodiversity and can pose a threat to wild areas and wildlife habitat.
- If you have problems with deer, consider deer fencing or choose plants that are resistant to deer foraging. Check with your local cooperative extension service office for recommendations for how best to deal with “problem” wildlife such as rats, snakes, moles, skunks, groundhogs.
- Encourage healthy populations of natural predators such as birds, bats, and beneficial insects, i.e., ladybugs, praying mantises, lacewings, or parasitic wasps to enhance ecological balance and pest management.

What environmentally friendly materials should I consider?

By choosing environmentally friendly products you help support recycling programs and markets that conserve energy and materials. Environmentally savvy shoppers help protect the environment through their purchasing decisions.

- Consider biobased, recycled content, and other environmentally preferable aspects in making your purchasing decisions. Products such as plastic lumber made from recycled bottles and bags or hoses and lawn edging made from recovered plastic and old tires help sustain recycling efforts, conserve resources, and reduce waste.
- Save bedding trays and plant containers from annuals and other plants and send them to a recycler for processing or ask your nursery if they can reuse them.
- Consider landscape materials such as gravel, bark mulch, pavers, or crushed or flat stone for walks, driveways, and patios that create a porous surface for easy water penetration and reduction of storm water runoff.

How do I prepare the site for landscaping?

Proper preparation of the site will help ensure that your landscape plantings will survive and thrive. You also can avoid potential problems with drainage or erosion.

- Ensure an adequate depth of quality soil in all plantings areas. This may require the importation and spreading of quality topsoil or incorporation of composts or manures to areas that have been scraped or so heavily compacted by construction activities that they cannot support landscape planting. Use top soil and compost that is high quality (some soils may contain excessive weed seeds or other materials that can result in poor growing conditions or others problems).
- Prepare your soil with the appropriate grading, soil amendments, and conditioning to give new plants the best growing potential. Remember to have the soil tested before planting.
- Prevent soil erosion and sedimentation in surface waters and storm water systems by installing erosion barriers, fences, turfgrass sod, groundcovers, or mulches at appropriate locations. Create rain gardens in natural or artificial depressions to trap, filter storm water, and help recharge groundwater. If possible, landscapes should be designed to hold water on-site with the use of swales, dry creek and ponds and water recharge areas.
- Check with your local utilities or state's utility locator service before digging more than 6 inches below the surface. Know the location of all above and underground cable, phone, gas, water and electricity lines, and septic fields.
- When removing unwanted turf and other plants, consult your local solid waste disposal authority for alternative disposal methods.

How do I choose plants for the site?

The type of plants you have in your yard will determine to a great extent the amount of water, fertilizer, or pest control methods you have to use for a healthy landscape. Plants are also the means to beautify the yard and create comfortable places to enjoy the outdoors. Your decisions on plant selection affect wildlife habitat and other environmental considerations.

- Putting the right plant in the right place will contribute to a plant's healthy and productive life and reduce the need for fertilizers, pruning, water, pesticides, and the necessity of replacing it. For example, select plants for the soil moisture and light conditions at each potential planting site; then, select the plant that will be the desired mature height and width for that site.
 1. Plants scattered throughout the lawn look unorganized. They also create maintenance problems in

terms of mowing, raking, and giving plants the amount of water they need.

2. Young trees and shrubs are often planted too close together to get a "full" look. The result several years later is a crowded landscape. Plants must be removed or drastically pruned to reduce competition.
 3. Consider mature height and width of the plant and select plants with an ultimate (mature) size that fits their location. When plants grow too tall, they cover windows and no longer enhance the home's appearance. Homeowners sometimes try to compensate for this "misplanting" by shearing to control the plant size. This constant shearing weakens and disfigures shrubs. It also creates extra work and yard wastes. Plants too close to the house create a maintenance nightmare when it is time to repair or paint the house, and they can provide access for pests to enter your home.
- Choose turf and other plant varieties suited to your conditions i.e., sun exposure, moisture requirements, climate, and soil. Consider native or locally adapted species with pest and disease resistance and drought tolerance.
 - Avoid plants with invasive growth or seeding habits.
 - Do not overplant by crowding trees, shrubs, or perennials. Overplanting causes further problems such as poor air circulation and stunted growth. Consider the mature size of each plant and its space requirements during landscape planning and installation.
 - Consult city arborists, foresters, or public utilities if selecting tree species for public rights-of-way. Consider mature tree height when planting under utility lines.

What should I know about drainage?

Managing storm water and preventing it from causing erosion, impacting surrounding properties, or polluting water supplies is an important aspect of being a good environmental steward and being a good neighbor. When storm water remains on site and slowly percolates into the soil, ground water is replenished.

- Drainage systems are water collection devices to control the movement of water. Components of drainage systems occur in various forms such as swales (natural or constructed), area drains, and street inlets connected to sub-surface pipes that direct concentrated surface runoff into an underground network connected to the city's storm water system.
- Other forms of drainage, wetlands and sediment basins, serve to recharge the groundwater table or aquifer. Areas prone to landslides should be identified and avoided.

- Design landscapes to eliminate or reduce the amount of runoff entering storm sewers. Keeping water on site will help recharge the groundwater.
- Consider creating rain gardens in depressions and plant with native wetland plants or plants that can take wet and dry conditions, if your site experiences both.
- Ensure that the runoff from your property does not negatively impact a neighboring property. You may be liable for any damages created by water leaving your property.
- In addition, consider taking the following actions to provide adequate drainage on the site:
 - ▶ Conform to natural drainage patterns.
 - ▶ Minimize alteration of natural drainage patterns around existing vegetation that you want to preserve.
 - ▶ Provide opportunities for surface runoff to replenish the groundwater table such as rain gardens or other landscape features that slow the rate of runoff, allowing water time to soak into the soil.
 - ▶ Minimize soil erosion by designing for even water flow across the ground surface.
 - ▶ Reduce water velocity and increase soil permeability by adding organic matter to the soil with plantings and mulch.
 - ▶ Do not install permanent irrigation systems in landslide hazard areas. On steep slopes or areas that are prone to landslides, avoid using plants that require supplemental irrigation.
 - ▶ Implement erosion control devices as a form of preventative maintenance, e.g., protective material on slopes, protective berms, or silt fences.
 - ▶ Ensure plans for the drainage system include a maintenance schedule.

What can I plant in wet or low areas?

Carefully choosing plants that will grow and thrive in wet areas will save you from having to replace poorly adapted plants later.

- Wet areas provide a great benefit to the environment and an ideal habitat for a variety of plants and animals. However, wet areas have for years been considered problematic for gardening. With a little research, these wet areas can turn out to be the best and most interesting gardens that you have and certainly the most unique. First you will need to determine how wet the soil is. Does the area stay wet, all year long, during the winter, spring and summer, or just the spring? How often and for how long does water stand on the surface? Visit wetlands near your home to see what is growing in similar conditions or

contact local wildlife or conservation areas for advice on what to plant. There are beautiful native wetland plants growing in all parts of the country but remember to never collect these plants from the wild.

How do I plant a new lawn and/or landscaping plants?

There are many different species of turfgrass used in home lawns. Whether you choose fescue, rye, St Augustine, bluegrass, or other turf varieties will depend on your site and growing conditions. Choosing the right turf for your yard is the first step in maintaining a healthy lawn.

- Choose a turfgrass adapted to your site (e.g., soil, sunlight), climate, and family needs. Consider as an alternative a lawn made of low-maintenance grasses or groundcover. Consider daily sunlight needs (5–6 hours) and the pest, disease, and drought tolerance of the turfgrass variety. Consult your local cooperative extension service or qualified horticulture professional.
- Consider the best time to plant. Some turf varieties are best planted in late summer or early fall when competition with annual weeds is low. Other varieties are best planted in the spring.
- Make selection of plant species appropriate to intended use and desired aesthetic effect.
- Sod has been shown to greatly reduce soil erosion in new lawn establishment. Sod is especially beneficial when establishing areas with steep slopes that are subject to erosion.
- Soil structure can be damaged if you cultivate the soil when it is wet. Keep heavy equipment and foot traffic off wet soil.
- Mix soil, amendments, and fertilizers together before planting as recommended by a soil analysis or landscape professional.
- Create a smooth surface free of dirt clods, pebbles, and stones that are larger than an inch across.
- After seeding, cover the soil with a light mulch cover to help it hold moisture, slow weed growth, and prevent wind and water erosion.
- Maintain good soil moisture for new lawn and plants but do not water excessively. Contact your local professional or cooperative extension service or water utility for recommended irrigation practices and amounts. Check the soil for moisture before irrigating to make sure it is needed. It is also important to check the soil to see how far down the moisture is going to make sure you are getting water to the depth of the plant's root system.

Landscape Maintenance

SOIL

Is my soil healthy?

Living soils with adequate microorganism activity, drainage, and oxygen flow are the basis of a healthy lawn.

- A healthy soil should have good drainage so moisture can move down through the soil structure and sufficient nutrients to support healthy plant growth. A healthy soil also includes beneficial organisms, which play an important role in plant nutrition, pest resistance, and soil permeability.
- Determine the pH of your soil through a soil test and follow recommendations for adding needed soil amendments. Allow enough time for the soil to fully react after an amendment application before testing again.

If needed, how do I choose what fertilizers and supplements to use?

Fertilization decisions should be based on the nutritional and growth requirements of plant and the soil conditions. Adding unneeded fertilizer in the yard does not benefit plants and could end up in the storm water system or polluting streams, lakes, and aquifers.

- Not all lawns need to be fertilized. A soil test will tell you whether your lawn is deficient in nutrients needed for optimal growth.
- If a fertilizer is needed, choose one that meets the specific needs of your soil and plants. The cooperative extension service can provide advice and recommendations for optimum lawn and landscape fertility management.
- Organic fertilizers include products such as compost or dried manures, whereas conventional chemical formulations usually contain different combinations of nitrogen, potassium, and phosphorus. Organic fertilizers are more likely to enhance soil microorganisms and earthworms that contribute to soil health. Chemical formulations are more varied, and they can be selected to meet specific nutritional needs of site conditions and plants.
- Always read the label and consult your local cooperative extension service, a nursery, or landscape professional if you have questions.
- Choose “slow release” fertilizers to increase the efficiency of nutrient uptake and reduce nutrient runoff and

leaching. However, there may be situations when more fast-acting sources are appropriate. Fertilizers need to be used carefully to prevent contaminated runoff, possible leaching to ground water, burning plant roots, or harming soil organisms.

- There are also organic-based fertilizers that contain both organic and non-organic materials.

How do I use organic or inorganic fertilizers and supplements?

Proper application of fertilizer and/or supplements by a homeowner helps prevent pollution and reduces the cost of landscape maintenance.

- Maintain proper soil pH and fertility. Test the soil. You may take soil samples yourself or hire a private contractor. If necessary, the pH should be adjusted.
- Always read and follow the label directions of all fertilizers. Do not exceed recommended applications—excess fertilization can damage plants and contribute to runoff and water pollution. Applying at the wrong time of the year can do more harm than good. Contact your local cooperative extension service for recommended fertilizer application times and amounts for your area.
- Unless otherwise directed on the label, water your lawn after fertilizing. Do not allow water to run off into streets or surface waters.
- Avoid spreading fertilizers on driveways, roads, and sidewalks and promptly clean up any fertilizer spilled on these hard surfaces.
- Never apply fertilizer to frozen ground or snow.
- Wellheads and the edge of streams, ponds, lakes, and other bodies of water must be protected from nutrient rich runoff. Designate a zone around these areas where plants will slow down runoff, take up nutrients, trap sediments, and reduce erosion. The best height, width, and overall size of this zone will depend on climate, soil, slope, type of plants, and the type of fertilizers and supplements you are applying. Check your local regulations for the recommended width of buffer strips in your area.
- Some combination products, such as “weed and feed,” contain both fertilizers and herbicide. The need for fertilization and pest control should be determined

separately based on plant needs and site conditions. Do not apply pesticides if you do not have a pest problem. Always follow the label instructions for specific grass species and application information.

- Check to see that your fertilizer spreader/applicator is working properly and can be adjusted to apply the right amount of fertilizer. Calibrate your spreader for each type of product you apply. Consult your spreader manufacturer's instruction book for details.
- Properly store fertilizer products away from water sources, children, and pets.

How do I use compost, manures and/or organic amendments?

Like conventional fertilizers, compost and manures should not be allowed to contaminate water systems. By building a compost pile or using a composting bin for yard waste you can reduce waste, conserve resources, and produce a valuable organic fertilizer.

- Follow all preceding guidelines for fertilizer application.
- Organic fertilizer options include compost, animal manures, cottonseed meal, blood meal, bone meal, fish emulsion, and corn gluten. Apply and store properly to avoid attracting unwanted pests.
- Leave grass clippings on your lawn to decompose, which will contribute to soil nitrogen content without causing thatch. As an added bonus, the clippings reduce water evaporation from the lawn and keep the soil temperature cooler.
- Compost and manure contributes organic matter and essential plant nutrients to most soils. Compost and manure improves soil structure and increases soil aeration, moisture, and nutrient holding capacity. Quality compost is alive with beneficial soil organisms and it contains constituents that stimulate beneficial soil organisms already present in the soil.
- Grass clippings, leaves, vegetable and fruit scraps, and most garden waste can be composted and (re)applied to your landscape to save expensive landfill space. Consult your local gardening source on how to start your own compost and check local regulations concerning composting guidelines. Do not compost pet waste or meat products.
- Organic mulch (such as wood or bark chips, grass clippings, leaves, pine needles, and compost) are best used in the landscape or garden to cover bare soil and help control weeds, retain soil moisture and structure, and add nutrients. A 2–3-inch layer is sufficient. Do not pile mulch against tree trunks or stems.

When should I aerate the lawn?

Aeration is a valuable lawn maintenance practice that can improve the health of the lawn and avoid problems associated with soil compaction and thatch build-up.

- Soil compaction problems are often the root cause of insect, pathogen, and nematode damage. Sometimes compaction is confused with improper watering, or a lack of fertilizer. The problem starts when the top 4 inches of the soil becomes compressed, impeding the movement of air, water, and nutrients to the grass roots. This stresses the grass, making it less able to compete with weeds and slow to recuperate from injury.
- Soil compaction can be corrected with aerifying by core aeration, which physically remove cores of soil and leave holes or cavities in the lawn. Core aeration promotes root development through reduced soil compaction, improves nutrient and moisture absorption, and discourages thatch development.
- For small areas, purchase a sod-coring tool that removes cores of soil from the lawn. For larger areas, rent a power-driven core aerator, or hire a professional to do it for you.

WATER CONSERVATION

What landscaping features can help me conserve water?

Landscape features such as drought-tolerant plants and use of mulch can save water over conventional landscape designs.

- Select and group plants together that have similar water requirements for ease of irrigation scheduling. This will improve irrigation efficiency and make plants healthier and better able to resist pests.
- Consider choosing native, noninvasive, or drought-resistant ground covers, beds of perennials, trees, shrubs, or landscape features composed of porous materials (e.g., mulched or crushed stone walkways, sitting areas) rather than irrigated turf.
- Mulch bare soil to reduce evaporation, erosion, and weed growth.

How can I water my lawn responsibly?

Watering responsibly means applying water efficiently only when needed. You can make a big difference in water consumption by following these easy tips.

- Rainfall in some areas is often enough. Most lawns need about 1 inch or less of water per week to thrive, and they can weather short periods of drought without supplemental water.

- Contact your local cooperative extension service for advice and recommendations for irrigation schedules and amounts.
- Water your lawn when the color dulls and footprints stay compressed for more than a few seconds. This will not weaken the health of the turf, because most turf species tolerate periods of drought or dormancy. Not all lawns require supplemental irrigation.
- Depending on the grass variety, during extended periods of drought or low rainfall, do not irrigate and let some or all portions of the lawn go dormant.
- Water deeply when necessary. Wet the soil to 1 inch below existing root zone or 6 inches, whichever is less. If there is a danger of runoff, water a few times for shorter periods and take 15-minute breaks between each watering session (instead of watering for one long session). This process will allow water to soak in while minimizing runoff.
- Aerate and hand water brown or dry spots (from drought stress) in an actively growing lawn. Do not overwater the entire lawn to take care of a few problem areas.
- Water before 10:00 a.m. when the sun is low, winds are calm, and temperatures are cool to reduce evaporation and disease problems. Irrigation should not be applied late in the day. The turf leaves and crown should be dry when the sun sets. Wet leaves or crown creates ideal environmental conditions for disease organisms to invade and flourish.
- Do not allow irrigation water to run onto paths, sidewalks, driveways, and roads. Runoff from hard-surfaced areas that have not been swept clean of pesticides and fertilizer can cause nutrient load in water bodies, pollute drinking water sources, and damage ecosystems and aquatic life.
- Adjust automatic irrigation controllers with the seasons, and turn off or use manual override when it is raining and in winter. If possible, use evapotranspiration-based scheduling in automatic irrigation controllers.

When irrigating my lawn, what should I do to conserve water?

Poorly maintained or out-of-date systems can waste water and result in unnecessary expense. You can save water and money through proper and regular maintenance of your system.

- Make sure sprinklers or sprinkler heads are adjusted properly to avoid watering sidewalks and driveways. A properly adjusted head should spray large droplets of water instead of a fine mist to minimize evaporation and wind drift.
- Install a rain shut-off device on automatic sprinklers; the device will turn off the system when it detects rain or

moisture. These devices are inexpensive and enable you to take advantage of rainfall without having to pay for it.

- Periodically check your sprinklers to make sure everything is working properly. A clogged head or a leaking line can wreak havoc on your landscape and water bill.

What other approaches can I adopt to conserve water?

There are many ways to conserve water that will benefit the environment and the homeowner. Here are some additional ideas.

- Use low-volume drip irrigation systems for watering individual trees, flowerbeds, gardens, potted containers, or other nongrass areas. Because water is only applied to the individual plant root zone, 30–50% less water is used compared with sprinklers, and weeds do not grow in the dry areas between plants.
- In some regions collecting water from rooftops through a system of rain gutters and properly screened rain barrels can provide additional water for irrigating flowers and shrubs during low water periods. Make sure rain barrels are childproof.
- You can use gray water (household wastewater from sinks, bathtubs, and showers—but not toilets), or condensate from air conditioners for landscape irrigation, in certain parts of the country. Check local regulations or guidelines to find out whether there are gray water use restrictions in your area.
- Apply a layer of mulch to plants and shrubs to help conserve water during hot windy summer months.

PESTS

What is the first step in pest management?

How you manage pests (e.g., insects, weeds, disease) will have an impact on the appearance, quality, and environmental conditions of your landscape. The first step is to realize that there are a variety of tools and alternatives from chemical products to simple weed pulling or organic methods to deal with pests.

- Not all insects are pests. Many insects are beneficial, feeding on pests as part of their diet. In fact, less than 5% of all insects are harmful, and most of these have natural predators such as other insects, birds, bats, and toads that can help keep them in check. Learn to identify the insects in your garden so that you can protect the natural predators that contribute to ecological pest management. Encourage the beneficial insects that may already be in your garden by learning the conditions they prefer. It is also possible to purchase beneficial insects such as ladybugs from some garden supply companies.

- Accurately identify the problem or suspected pest and try to identify the conditions that contribute to the pest infestation. For example, poor drainage can contribute to fungal problems and soil compaction can contribute to weed problems. Work with your local cooperative extension service to get assistance in identifying the cause of the pest problems.
- Pesticides can provide effective control of serious pest problems, but they should not be used routinely or indiscriminately. Improper use of pesticides can result in pest resistance, and they can harm humans, pets, beneficial organisms, and the environment. If you are considering using a pesticide, read the product label and make sure it is intended for the pest you want to control and that you understand how to use it.

How do I control pests by using integrated pest management (IPM)?

By eliminating favorable pest conditions and using mechanical, biological, or cultural means to manage pests you can avoid or reduce the need for pesticides. Effective pest control does not necessarily require the use of pesticides. By applying pesticides only when other measures are ineffective and by following label directions homeowners can protect the environment and reduce exposure to themselves and others. The idea of a “perfect lawn” with zero pests may be unrealistic and create unnecessary environmental risks. The concept of IPM offers an approach to lawn and landscape management that balances several approaches to the control of pests without relying on one technique or control method only.

- IPM is a pest management strategy that focuses on prevention or suppression of pest problems through a combination of practices that include proper plant care, regular pest population monitoring through site or pest inspections, an understanding of how much pest threat can be tolerated without action versus when pest management is needed and what method of pest management to undertake. Pest management techniques include structural, mechanical, cultural, biological, and chemical controls. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. To implement IPM, follow these simple procedures:
- Make sure you actually have a pest problem and determine what the pest is and whether it is still active. Many things can cause spots or damage in lawns that look like they are pest damage but are not (e.g., gas spills, buried objects, drought conditions).
- Evaluate whether the pest problem is large enough to cause unacceptable damage to the plant before taking measures to control the infestation. Contact your local

cooperative extension service for information on threshold levels.

- Physical removal of pests (handpicking insects and weeds), use of traps, lures, and mechanical barriers (netting or landscape fabrics) can keep pest populations in check and reduce the need to use chemical control.
- Explore the use of horticultural spray oils, insecticidal soaps, microbial pesticides, biological control (e.g., beneficial insects such as ladybugs) and traditional pesticides with your local cooperative extension service. These individuals can assist you in better understanding how and when to use these techniques.
- Encourage beneficial insects and other natural predators in your yard by providing the food, water, and shelter that toads, dragonflies, ladybugs, bats, and other natural pest predators need.
- Maintain healthy soil and plants by correcting soil pH, proper watering, fertilization, mowing, and using management practices that encourage healthy plant growth. Healthy plants are more resistant to pest attacks than plants under stress.

What should I know about chemical and organic pest control products before choosing to use them?

Pest management methods and products vary widely in their effectiveness; ease of use, and in their potential risks to health and the environment. Knowledge of these different qualities is necessary to make informed decisions about the type of control needed and level of risk you are choosing.

- Before purchasing any pesticide product, thoroughly read the label. Make sure the product is intended for the type of pest problem you have. Also read all the precautionary information and use the instructions. All pesticides are potentially hazardous if not used strictly in accordance with the directions on the label.
- EPA is responsible for registering—or granting licenses—for the use of pesticides. In recent years, EPA has stepped up its program to register reduced-risk pesticides, making them more widely available on the consumer market.
- Reduced-risk pesticides may offer an alternative to traditional pesticides for certain approved label uses. When used properly, they are generally less hazardous to humans and the environment.
- Possible hazards of pesticides can include their potential to harm or kill beneficial organisms and to pollute waterways resulting from runoff associated with nontarget application, over application or other improper use and disposal of the product. These hazards can create potential risks to humans, pets, and wildlife through direct exposure or cumulative impact.

- Pesticides registered by EPA have been tested extensively to determine potential acute (short-term) and chronic (long-term) risk. For most pesticides, this testing process takes into account potential risks to “sensitive” populations, including infants and children. Information about potential acute risk to human health and other potential risks to the environment are included on pesticide product labels along with safety precautions and instructions for use. EPA’s risk assessment procedures have undergone significant changes as a result of new legislation that raised the bar for evaluating potential risks. As a result, some pesticides that were previously in widespread use for lawns and gardens have been or are now being phased out.
- EPA has developed an extensive set of requirements for evaluating risks associated with pesticide use. A pesticide registration—or license—is granted only when it can be determined the product does not pose an unreasonable risk to human health or the environment when used according to label instructions. Even with these requirements, it makes sense to use pesticides with care, because the chronic long-term effects of pesticides have not been comprehensively evaluated, and they can never be known with certainty.
- The pesticide’s potential acute risk is indicated by the signal word on the label explained below.

“Signal” words, such as **Danger**, **Warning**, or **Caution**, are part of the precautions found on pest control product labels. The labeling of the most toxic products will use “Danger-Poison,” but most of these products can only be bought and used by trained professionals. Except for “Danger-Poison,” signal words, although indicating level of hazard, do not in themselves identify what hazard may be associated with a product; so, all label precautions should always be read.

Danger: A signal word of “Danger” alone means the product can be corrosive (causes burns) to skin or to eyes. Read the label to know what the hazard is. Take extreme care in handling corrosive products, to keep them from getting in your eyes or on your skin. Always be sure to store products properly.

Warning: A signal word of “Warning” means there is a moderate hazard associated with the product, although you need to read the rest of the precautions on the label to know what it is. The product may be moderately toxic, or it may not be toxic at all and instead pose a different hazard, such as being very irritating to eyes or skin. The label will tell you what the hazards are and what precautions to take.

Caution: “Caution” as a signal word means that it is in the lower category of toxicity and that care should be taken in using it. Again, read the label to see whether the product has specific precautionary statements.

Even if there are no specific hazards, a signal of Caution may still be in the label. Always read the label first and follow directions.

EPA requires pesticide manufacturers to include information about the products’ potential hazards to humans and domestic animals. Pesticide product labels do not include detailed information on possible long-term health effects. In rare cases, according to laboratory tests and epidemiology studies, exposure to some pesticides has been associated with potential reproductive effects, including birth defects in offspring, cancer, and neurological damage; but when label directions are followed, the exposure to them is expected to be lower than the threshold that causes these effects. If home pesticide users or applicators have specific health questions or experience adverse symptoms, reliable information is available from local poison control centers, the National Pesticide Information Center hotline (an EPA-funded service) 1-800-858-7378, website www.npic.orst.edu, and product manufacturers.

- Be aware the risks of some pesticides may be different for humans, birds, bees, butterflies, aquatic organisms, and other wildlife. Under “environmental hazards,” the label will tell you whether the product can cause environmental damage—if it is harmful to birds, bees, fish, endangered plants or animals, wetlands, or water. The absence of an environmental hazard statement does not necessarily mean there is no risk to an organism.
- The lawn and garden industry, U.S. Department of Agriculture, and EPA stand by the pesticide registration process and the accuracy of risk determinations and appropriate safety precautions as stated on the product label. Most products, including reduced-risk pesticides, carry some risk to the environment.
- Many wildlife and environmental groups are concerned about the impact of pesticides on wildlife, including endangered species and pollinators. There is some evidence to suggest that endocrine-disrupting pesticides may undermine neurological and behavior development in mammals, fish, amphibians, reptiles, and birds. The decline of pollinators is a major threat. A growing body of evidence indicates these beneficial pollinators are in serious decline, due to loss, modification, and fragmentation of habitat, and the excessive use of pesticides. The risk of losing the essential role of pollinators required for the successful propagation for native plant communities, wildlife habitats, and a range of food crops, is real.

If I choose to use pest control products, how do I use them properly?

The misuse of pesticides can create serious health risks for people, animals, and local water supplies. The effectiveness and safety of applying pesticides requires knowledge of pest problems and strict adherence to label directions.

- Read the entire product label and follow instructions for all products, whether natural or synthetic before purchase and before use. Labels are carefully written and precautionary statements are there for a good reason and should not be ignored. When EPA registers a pesticide, its decision on the products' safety is based on its use in accordance with label instructions.
- Use only the amount directed under conditions specified on the label. More or less of a product is NOT better and can result in reducing effectiveness or may create other, more severe problems.
- Teach children that pesticides can be harmful and should not be touched or consumed. Keep pesticides stored in a locked cabinet and out of the reach of children.
- If possible, purchase only the amount of pesticide needed for treatment.
- Store and dispose of pesticides and their containers according to label directions and any local, state, and federal regulations.
- Wear protective gear and clothing such as chemical resistant gloves, long sleeves, and/or boots when using pesticides and as indicated on the label.
- Do not smoke, eat, chew gum, or drink when handling pesticides. Always wash your hands as soon as possible after handling pest control products.
- Apply "ready to use" materials whenever possible. If a concentrate is selected, dilute the product according to the label directions, mixing the smallest quantity that will do the job and use it completely. When mixing or measuring pesticides use a dedicated set of spoons or cups, then mark them and store them individually with each pesticide so they will not be used for any other purpose.
- If possible, consider a product that is least hazardous to wildlife and humans. Some examples of reduced-risk products include corn gluten or biological controls such as milky spores, vegetable based oils, or fatty acid soaps, and they should be tried as part of IPM before stronger chemical agents are used. Carefully read environmental hazards labeling can indicate a variety of birds, mammals, bees, and aquatic organism concerns. For more precise pesticide decisions use products recommended by your cooperative extension service or a licensed pesticide applicator.
- Never remove labels or transfer pesticides to other containers. Pesticides in unmarked containers can be mistaken for other products and ingested accidentally. They are also missing important information on proper use, safety precautions, storage, and disposal.
- Do not give or purchase pesticides for individuals who cannot read or understand the label (e.g., those who cannot read English).
- Because liquid pesticides can drift when used, do not spray pesticides on windy days. When using pesticides ensure that they do not drift beyond the application area.
- Use consideration and judgment when handling pesticides and do not apply when people, pets, or wildlife are in the area of application. Alert family, guests, and neighbors before you begin a significant application of pesticides. Some communities require prenotification and signage before pesticide application.
- Pesticides applied outdoors may drift inside the home or be tracked in on shoes. Remove shoes and contaminated clothing before going inside, close windows and doors, or take other appropriate precautions. Wash pesticide-contaminated clothing separately from other laundry.
- Review first aid information and know the signs of pesticide exposure provided on the label before using a pesticide.
- Be aware some pesticides are non-specific and may pose a risk to beneficial organisms. Many organisms are beneficial and help control pests that are problems. Read the label to select the product for the pest you have identified and to understand possible risks to other organisms.

If I choose to use pesticides, what pollution prevention techniques can I use?

By being aware of the risks of pesticides and using common sense you can prevent these products from entering waterways or creating other pollution problems.

- Spot treat for pest control whenever possible.
- Use water to rinse out a sprayer or other application equipment. Apply rinse water to the site with the same precaution you used for the pesticide.
- Do not apply a pesticide in or near water sources unless the product label specifically indicates that it has been approved for that use.
- Do not reenter an area treated with pesticides until the spray has dried, dust has settled, and as directed on pesticide label.
- Discard old, poorly labeled, or discontinued pesticide products in accordance to the law. The most responsible disposal method is to take products to a hazardous waste site where they can be disposed of without causing harm to water sources in the community. Do not pour pesticides labeled for outdoor use down toilets, drains, storm sewers, or place in trash receptacles. Contact local solid waste management, municipal agencies, or your cooperative extension service for disposal guidelines.

If I choose to use pesticides, how can I protect my children and pets?

Because children and pets are not aware of pesticide risks and also may be more sensitive to pesticide exposure than adults, special precautions should be followed to protect them. Generally, keep children and pets away from pesticide products and their containers.

- Children's developing organs and defensive systems, proximity to the ground, and normal hand-to-mouth child behavior, make them more vulnerable to pesticide exposure than an average adult. Therefore, special precautions should be taken around children. Likewise, pets are low to the ground, lick their fur, and may track pesticides into the home on the bottoms of their paws. The best technique to protect your family and pets from the potential hazards of pesticides is to avoid exposure, limit pesticide use, and always follow label directions.
- Never apply pesticides when children or pets are in the yard or nearby—they could be exposed during the application or if the pesticide drifts off the application site.
- Follow label directions and precautions regarding reentry into areas treated with pesticides. Children and pets should stay away from the application site until spray has dried, dust settled, and as directed on the label.
- Remove toys, feeding bowls, bird feeders, water dishes, and cover birdbaths, sandboxes, or other play equipment before pesticide application.

MOWING AND PRUNING

What are good practices for mowing?

How you mow your lawn affects the health of the turf. By following a few easy tips, you can reduce the waste of grass clippings, conserve water, and have a more healthy lawn.

- Mow when grass is dry and never cut more than one third of the height of the grass. Use a mulching mower and leave short clippings on the lawn (grasscycling) to add nitrogen and minerals back in the soil and reduce the need for fertilizer.
- If you choose to collect grass clippings, do not put them down the storm drain or blow grass clippings into the street for street cleaning trucks to pick up. Instead, compost on site.
- Mow your lawn at the highest recommended height leaving it about 3 inches long for lawns in the north and 1–2 inches for lawns in the south to retain moisture and prevent weeds. Check with your local cooperative extension service for recommended mowing heights for your variety of turfgrass.

- Keep your mower blades sharp; dull blades tear the grass and make it more vulnerable to pests and disease and cause increased water loss and reduce plant vigor.

What are my equipment choices?

Some types of lawn and landscape equipment are more environmentally friendly than others. Equipment that is lower in air emissions, energy consumption, and noise levels is generally a better choice.

- A mulching lawnmower commonly available in garden and hardware stores will help maintain a healthy lawn by providing natural fertilization from grass clippings.
- Consider using a manual (reel) mower for small lawns. A manual reel mower is quiet and pollution free—not to mention great exercise!
- Consider new technologies now available for mowers and garden equipment, such as electric and/or battery powered machines that are quieter and less polluting than gas-powered machines.

What should I do to service my mower?

Proper maintenance practices for lawn mowers and other garden equipment can cut air emissions, enhance equipment performance, and provide a greater level of safety for equipment users.

- Properly tune your mower which can add years to a mower's life and reduce mower emissions by up to 50%.
- Change the engine oil after 20–25 hours of use, and recycle the old oil according to your community guidelines.
- Fill the fuel tank outdoors, in an open area, and when the engine is cold. Wipe up any gasoline that spills. Purchase and use a leakless or vapor recovery nozzle for the gas tank.
- Clean or replace the air filter every 3 months or after 25 hours of use.
- Do not fill the fuel tank completely full. Allow some space for the gasoline to expand.
- Never smoke when handling gasoline, and stay away from an open flame or where a spark may ignite the gasoline fumes.
- Store gasoline in a non-spill fuel container and keep it out of the reach of children.

What about pruning?

Proper pruning practices can minimize plant diseases and remove unsightly dead material. Healthy trees and shrubs improve air quality, provide wildlife habitat, and improve neighborhood and community image.

- Proper selection of plants for the size of the area they will grow in will reduce the need for pruning in the future.
- Generally, the less you prune your trees and shrubs the better because every time you cut into the bark you risk introducing disease or attracting damaging insects.
- The main reasons for pruning are to remove dead, diseased, or damaged wood; to control growth and keep trees and shrubs from becoming too big or overgrown; to increase flowering by removing spent flowers after they bloom; and to rejuvenate declining plants.
- Proper pruning should always retain a tree, shrub, or plant's natural form and reduce hazards. Good pruning does not show.
- There are two basic types of pruning cuts: heading cuts and thinning cuts. Thinning cuts remove a branch back to its origin. Plants usually do not respond to proper thinning by producing vigorous new growth. The goal of thinning is to produce a more open branching structure. Heading cuts remove shoots or branches back to stubs. Plants respond to heading cuts by producing vigorous new growth from buds growing below the cuts. The goal of heading cuts is to produce denser growth.
- When you remove a branch from a tree you do not want to leave a stub, but cut it back to what is called the branch collar, a ridge or bulge where the branch attaches to the trunk. Never cut a branch flush with the trunk, leave the branch collar intact so the cut can heal over properly.
- Clean, sharp tools make healthy pruning cuts. Clean your pruning tools with rubbing alcohol or a mild bleach solution to prevent spreading disease from one plant to another. Dull blades crush plant tissue, making healing more difficult and providing greater opportunity for insects and diseases to move in.
- Consult your cooperative extension service or other professional for proper pruning techniques or for help in dangerous situations such as removing limbs that are too high to reach from the ground, branches or trees near utility wires, or those that could fall on a building or into the street.

YARD WASTE AND DEBRIS

What should I do with yard waste and debris?

Reducing yard waste and recycling nutrients is an important environmental principle that you can implement by composting waste and using the mulch in the landscape. Composting also reduces the amount of waste sent to local landfills for disposal.

- Burning yard waste is not a recommended disposal method. Not only is it a fire hazard, but also it can create

toxic fumes and ash that can aggravate respiratory conditions such as asthma.

- Compost excess yard waste on site if allowed in your neighborhood.
- Composting excess yard waste can turn organic matter into valuable soil amendments and mulch for garden and landscape use. Decomposing microorganisms need four key elements to thrive: nitrogen, carbon, moisture, and oxygen. For best results, mix materials high in nitrogen (such as fresh grass clippings) and those high in carbon (such as dried leaves). Sprinkle the pile with water to keep it damp and turn or mix the material to supply the oxygen. More turning yields faster decomposition.
- Where appropriate, chip woody shrubs and tree prunings into mulch that you can apply to the landscape.
- Use caution when using yard clippings from an area that was recently treated with pesticides. Pesticide residues may still be present in the mulch.
- Generally, avoid adding severely diseased or invasive plants or weeds to a compost pile where disease or seeds may eventually be transported to other areas in the landscape.
- Compost can be used as mulch, soil conditioner, and potting mix. If these, or other beneficial uses, are not an option dispose of your yard waste according to local laws and regulations.

P E T S

Can pet waste harm the environment?

If not properly taken care of, pet waste can end up as a serious pollutant in streams and rivers. Pet owners can help prevent pollution by properly disposing of pet waste.

- Droppings from dogs and cats and from other commonly kept animals, such as exotic birds, rabbits, lizards, goats, and chickens, may contain bacteria, parasites, nutrients, or viruses that are a health risk to other pets and people, especially children. If pet waste is washed into a storm drain, it can end up in a lake, river, creek, or coastal waters.
- Pet waste is a contaminant in many streams and rivers. Keep pet waste away from gardens, ditches, storm drains, and waterways. Dispose of pet waste by placing it in the garbage can or pet waste digester (available at pet stores). Do not use pet waste for compost.
- Always carry a bag and scooper when walking a pet to clean up after them.
- Do not leave pet waste on driveways, sidewalks, or impervious surfaces where it can wash into storm drains, streams, or waterways.

GARDEN SERVICES

What lawn & garden services are available?

By selecting a qualified and environmentally competent professional to help with managing your yard, you can ensure that environmentally responsible lawn care and landscape practices will be used. Check credentials and ask informed questions.

- If you hire a lawn care company, select a company that advocates and follows state recommended best management lawn practices and IPM techniques. Ensure the

company is legally licensed to apply pesticides, has good references, and is a member of a professional lawn care organization.

- Consumers should ask companies to explain their pest management and other maintenance practices and to identify the products they use.
- For tree problems use a certified arborist or check with your local cooperative extension service.
- Good record keeping helps schedule future activities and saves money.

Community Issues

- Each community has characteristics that are unique and may present special challenges concerning architecture, water use, pest control, and landscaping. It is the responsibility of every citizen to learn and attempt to address the unique characteristics and special challenges of their community.
- Consider neighbors when planning or modifying drainage from your property. Reducing storm water runoff from your property will help all your neighbors downstream by reducing erosion and recharging ground water.
- Avoid stagnant water or other places for mosquitoes to breed. Clean gutters regularly and make sure they drain properly. Empty and refill bird baths every 3 days. For ponds, add mosquito fish or a mosquito control product.
- Consider neighbor's sunlight needs, views, property lines, and points of access when planting trees and shrubs.
- Consider reducing noise from lawn and landscaping equipment, especially between 5:00 p.m. and 8:00 a.m., or when neighbors might appreciate quiet time. Be considerate.
- If using leaf blowers, do not blow leaves and other yard debris onto the street, on a neighbor's property, or in storm drains. This is important because decomposing leaves can be a significant source of phosphorus water pollution.
- Be considerate and allow no drift or movement of materials from your yard to neighboring yards.
- Consider leaving standing dead or dying trees in your yard for wildlife habitat unless they pose human safety or property hazard. Consult your cooperative extension service or a tree professional to insure tree is safe to keep. Also consult local regulations. Cooperate with neighbors to create larger patches of wildlife habitat or to connect vegetated areas to create habitat corridors for wildlife.
- Most landscapes, if well maintained, are aesthetically pleasing and contribute to the appearance of the overall neighborhood. If you create a more natural landscape on your property, having a distinct, neat edge between this area and more traditional landscapes will indicate the area is being maintained. Research shows that landscaping has a significant positive effect on the selling price of a home.
- Help to educate neighbors and your community about the environmental and safety benefits of responsible landscaping practices.

Glossary

annuals • A plant whose natural term of life is 1 year or 1 season; especially, any plant that grows from seed, blooms, fruits, and dies in the course of the same year. (2)

aeration or aerification • The cultural practice of improving air, water, and nutrient movement in soil by making holes or slits in the soil or turf. Specialized machines are commonly utilized to remove cores, cut slices, or pierce the soil. (9)

aquifer • A water-bearing layer of rock or sediment capable of yielding usable quantities of water, composed of unconsolidated materials such as sands and gravel, or consolidated bedrock such as sandstone or fractured granite. (4)

beneficial organism • An animal or plant used to control garden pests. (2) In the soil beneficial organisms include: earthworms, bacteria, and other microorganisms. The garden is a complex ecosystem with many interacting organisms. As we work to control those detrimental organisms that are causing problems in the garden, we must be cognizant of the many beneficial organisms that are working for the benefit of the garden. The beneficial organisms are helping in many ways and some examples of their beneficial activities are:

- Decomposition of organic matter
- Predating or infecting destructive insects, weeds, or pathogens
- Fixation of nitrogen
- Aeration of soil
- Some examples of beneficial organisms are:
- Bees that pollinate garden plants
- Tiny wasps that infest other insects
- Spiders that trap insects
- Mites that predate the destructive mites
- Ladybugs that eat soft-bodied insects and eggs
- Earthworms that mix and aerate the soil
- Bacteria and algae that fix nitrogen
- Fungi that decompose organic matter and release nutrients
- Plants that protect the soil from erosion
- Plants that provide habitats for beneficial organisms
- Birds that feed on insects (14)

biodiversity • The sum of all the plants, animals and other organisms living on Earth. (1) Biodiversity refers to the natural variety of plants, animals, fungi, and microorganisms found in all ecosystems. Increasing biodiversity, whether in a backyard, neighborhood park, or along a regional creek, brings many benefits to landscapes. Planting landscapes that more closely reflect native plant communities can enhance biodiversity. To achieve this, develop understory/overstory vegetation similar to the layering of plants in a natural forest. Biodiversity also assumes plants are placed in conditions and environments where they would naturally grow. Biodiversity also can be increased by:

- using plants that provide habitat for wildlife and year-round aesthetic interest
- considering alternative methods of storm drainage management such as detaining water on-site and allowing it to percolate through porous surfaces, or implementing flood control measures along creeks that are sensitive to existing vegetation and habitat
- preserving existing natural areas in urban settings that provide habitat as well as aesthetic or recreational value (15)

biological control • The use of living organisms—parasites, pathogens or predators—to control an invasive or other pest species. (1)

biobased pest management • The control of pests using one or more of five major tactics: 1) biological control—suppression of pests by using natural enemies (predators, parasites, competitors, and diseases); 2) microbial pesticides; 3) behavior-modifying chemicals; 4) genetic manipulation of pests; and 5) host plant resistance. (16)

compost (garden compost) • An organic matter such as well-decayed leaves, grass clippings, and vegetable waste, added to the soil as an amendment to improve its texture and drainage and to enrich it with nutrients. (2)

Cooperative Extension Service • These offices are staffed by one or more experts who provide useful, practical, and research-based information to agricultural producers, small business owners, youth, consumers, and other in rural areas and communities of all sizes. Log on to the following website to contact the agent in your community. www.csrees.usda.gov/Extension/index.html. Cooperative State Research, Education, and Extension

Service (CSREES) is the federal partner in the Cooperative Extension System. (9)

deciduous • Falling off at maturity or at the end of the season, as petals, leaves, fruit: as distinct from fugacious or caducous organs, which fall soon after their appearance, or from persistent or permanent; not evergreen. Losing the foliage every year; made up of or having deciduous parts: as deciduous trees. (2)

erosion • The wearing away of the land through the action of moving water, wind, or other geological agents. (2)

evapotranspiration • loss of water from the soil both by evaporation and by transpiration from the plants growing thereon. (21)

groundwater • 1) Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. 2) Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust. (6)

impervious surface • A surface through which water cannot penetrate.

integrated pest management • IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

invasive plant • A species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. (8) See website <http://www.invasivespecies.gov/> for list of species profiles. Native species that are now found in areas outside of their traditional areas of occurrence are considered to be non-indigenous species. All exotic or alien species are also non-indigenous in origin. Those native, non-indigenous species and exotics that are able to successfully compete with native vegetation to form dominant growths in natural habitats are considered to be invasive species. It is such invasive plants that are of greatest concern because of their impact on biological diversity and the natural functioning of ecosystems. (17)

locally adapted • plants adapted to local soil and climate conditions, making many of them easier to maintain. By using locally adapted plants, you reduce the risk of introducing invasive plants into your community.

mulch • Any of various organic or inorganic materials, such as leaves, hay, straw, landscape fabric, or rock spread around plants to prevent moisture loss and discourage weed growth. (2)

native • A species that naturally occurs in a particular region, ecosystem and habitat. Species native to North America are generally recognized as those occurring on the continent before European settlement. (1)

natural area • An area of land or water with predominantly native vegetation or natural geological features that is allowed to respond to the forces of nature with minimal human influence. (1)

non-native • A species that, due to direct or indirect human activity, occurs in locations beyond its known historical or potential natural range. Refers to species from another continent, region, ecosystem, or habitat. (1)

organic • A term referring to any material that is derived directly from plants or animals (2). USDA defines “organic” food as food grown and processed without using most conventional pesticides; without fertilizers made with synthetic ingredients or sewage sludge; without biotechnology; and without ionizing radiation. (11)

perennial • In botany, continuing more than 2 years; used specifically of a plant that dies back seasonally, but produces new growth from a persisting part, as a perennial herb. (2)

pesticide • Any substance used to kill, repel, prevent, destroy, or mitigate a pest problem. Pesticides include fungicides, insecticides, herbicides, and bactericides (2).

pest • A plant, animal, or other organism considered harmful or undesirable in a particular landscape setting. (1)

pH • A measure of the relative acidity or alkalinity of a solution. For example, water with a pH of 7 is neutral; lower pH levels indicate increasing acidity, whereas pH levels higher than 7 indicate increasingly basic solutions. (6)

pollution prevention • Pollution prevention consists of any activity or strategy that eliminates or reduces the use of toxic substances, conserves water or energy, and eliminates (or reduces) the generation of nonproductive output, hazardous waste, air emissions, wastewater, or other pollutants. (5)

rain barrel • A container used to store rain collected from a roof.

rain garden • Rain gardens are shallow depressions designed to collect rain—typically from impervious surfaces such as roofs—and let plants, bacteria, and soils clean the water as it seeps its way into the ground. (12) Rain gardens are landscaped areas planted with wildflowers and other native vegetation to replace areas of lawn and to soak up rainwater. The gardens fill with a few inches of water and allow the water to slow filter into the ground rather than running off to storm drains. Holding back the runoff helps prevent pollutants such as fertilizers from washing off the yard into storm sewers and eventually into nearby streams. By reducing the runoff into streams the rain gardens also reduce chances for local flooding. (18)

recharge • The addition of water to the saturated zone of a groundwater system. (10) Aquifer recharge is the process by which water seeps down through the soil into an underlying aquifer. (19)

reduced-risk pesticide • Pesticides that meet reduced-risk criteria: low-impact on human health, low toxicity to nontarget organisms (birds, fish, and plants), low potential for groundwater contamination, lower use rates, low pest resistance potential, and compatibility with IPM. (13)

storm water runoff • Water that rushes off the land and other surfaces during rain events. Storm water runoff often carries erosion sediments and pollutants with it. (3)

sediment • Usually applied to material in suspension in water or recently deposited from suspension. In the plural the word is applied to all kinds of deposits from the waters of streams, lakes, or seas. (6)

swales (grassy swale) • Grassy depressions in the ground designed to collect storm water runoff from streets, driveways, rooftops and parking lots. The grass in the swale removes pollutants from storm water as the water infiltrates into the soil. The treated water recharges groundwater supplies. (7)

topography • The shape of the ground's surface like hills, valleys, plains, and slopes (2).

vegetated buffer zone (adapted from Natural Resources Conservation Service definition) • A strip or small area of vegetated land, maintained in a permanent naturalized state, that is designed to intercept pollutants and manage other environmental concerns.

weed • A subjective word used to describe any plant growing wherever someone wishes it did not; can include native and non-native plants. (1)

This document was adapted from the *Environmental Guidelines for Responsible Lawn Care and Landscaping* as developed by the members of the Lawns and Environment Initiative (L&E). To learn more about the development of the *Environmental Guidelines for Responsible Lawn Care and Landscaping* and the L&E Initiative go to www.lawnsandenvironment.org.

