Agricultural Extension Service
The University of Tennessee
PB956

# Managing Lawn Weeds:

## A Guide for Tennessee Homeowners

Lawns and Weed Management (PB956)

# Acknowledgments of Contributors

Although only the primary authors of this manual are listed, several key individuals contributed to the creation and completion of this manual that we trust you will find very useful. The authors wish to express sincere gratitude for the efforts provided by the following individuals:

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# Managing Lawn Weeds: A Guide For Tennessee Homeowners

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*Managing Lawn Weeds: A Guide for Tennessee Homeowners* is provided by The University of Tennessee Agricultural Extension Service to assist residents of Tennessee with managing weeds in their home lawns. This manual provides information on cultural methods to minimize weed problems, in addition to the use of herbicides. Thus, this manual and the recommendations herein are intended to assist homeowners in developing cultural and/or herbicidal control programs for weeds. For specific herbicide recommendations, this manual is meant as a reference and is not intended to replace the actual herbicide product labels. Be sure to read, understand and follow the actual herbicide product label directions.

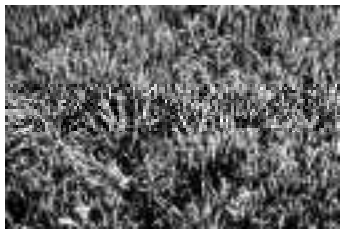
The use of example brand or trade names in this publication is intended to aid in clarity of information. It does not imply approval of the product to the exclusion of others which may be of similar or suitable composition. It does not guarantee or warrant the standard of the product. Should the registration of a herbicide be later canceled prior to revision of this manual, it would no longer be recommended by The University of Tennessee.

# Contents

# INTRODUCTION

## Publication Purpose

The purpose of this publication is to explain why you have weeds in your lawn, and to provide you with the information on how to, and encourage you to, adopt a total lawn care approach (in addition to herbicides). This complete approach will help you achieve a pleasing lawn with minimal weeds.



## Weeds in Your Lawn, and Why

"What do I do about the weeds in my lawn? Is there something I can spray?" These are common questions asked by homeowners each year. A better question would be, "Why do I have weeds in my lawn?" Weeds invade your lawn because at some point there is room or space (along with other growth requirements) available for them to grow. Healthy lawngrasses compete against weeds by forming a closed canopy that limits light and space for weeds to germinate and establish. Thus, the number of weeds present can be an indicator of the competitive health of your lawn.

## An Herbicide Is Not a Quick Fix

"Is there something I can spray?" A better question may be, do you really want to remove the weeds in your lawn? With weeds present, at least your lawn is green. An herbicide can be used to remove weeds by making conditions unfavorable. However, unless you put effort into having this available space covered by competitive lawngrass, you will have bare patches. If conditions do not favor lawngrass growth, weeds will often be the first to return. Thus, to reduce weeds in your lawn, you have to put some effort into providing an environment that favors the growth of your lawngrass vs. weeds. An herbicide application is not a quick fix. Herbicides only aid in this plant selection process.

## What Are Your Expectations for Your Lawn?

Balance your expectations (or desired level of appearance) with the time, effort and money you have available or are willing to devote to achieving this desired level. Your effort level may depend on your enjoyment for yard work and how much free time you have available. Many people love to relax by beautifying their lawn and landscape. Others may not enjoy yard work or, more commonly, have limited free time. Generally there are three levels of lawn maintenance: high (immaculate lawn, requiring significant inputs of time, expertise and money); medium (pleasing lawn, requiring moderate inputs of time, expertise and money); and low (satisfactory lawn, requiring low inputs of time, expertise and money). Depending on your desired level of lawn quality and available time, you may consider employing a professional lawn care service.

## Considering Professional Lawn Care Service

A professional lawn care service may help you obtain the lawn quality you desire. Certain lawn maintenance practices require expertise or specialized knowledge on product choice, application equipment and timing.

When hiring a lawn care professional, consider the level of assistance you require. Additional considerations include:

- **Reputation** — check with friends and neighbors and ask for references.
- **License and certification** — Tennessee requires lawn care professionals to hold a pesticide applicator's license, liability insurance and charter number.
- **Membership in professional organizations** — such as the Tennessee Turfgrass Association or the Professional Lawn Care Applicators Association, which promote professionalism and education on best management methods.
- **Customized services** — or willingness to customize management techniques to fit your needs and schedule.
- **Willingness to share expertise** — a professional who explains cultural practices, so you can be assured services suit your needs and desire to learn.
- **Cost**

# LAWN CARE FOR OPTIMUM APPEARANCE AND MINIMIZING WEEDS

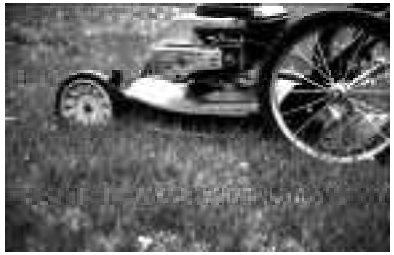
## Introduction

Ideally, you probably want a great-looking lawn with minimal weeds without using up a lot of your free time. Minor additions and/or adjustments in your current lawn care program may go far toward improving the quality of your lawn and minimizing the weeds. The following section provides general suggestions for minor adjustments in how to care for your lawn to optimize quality and minimize weeds. Most anyone with a strong interest, a willingness to learn and the necessary time is capable of using Extension information/ publications to achieve a nice lawn. If you are interested in more information, several excellent references are available at your local county Extension office. Examples of these include, PB1576, *Lawn Care: Selecting, Establishing and Maintaining the Fescues* and PB 1632, *Establishing and Maintaining a Bermudagrass Lawn in Tennessee.*

## Lawn Care Tips

### Mowing

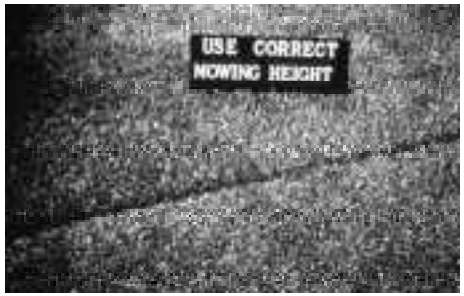
Most of your lawn care time is spent mowing. How and when you mow your lawn can have a great impact on weed growth. To optimize the health of your lawn and reduce weeds, adopt the following guidelines.



**Ideal Mowing Heights For Common Tennessee Lawngrasses**

| TYPE | SPECIES | MOWING HEIGHT (in) Minimum | | Maximum |
|---|---|---|---|---|
| Warm-Season | Common Bermudagrass | 3/4 | to | 1 1/2 |
| | Hybrid Bermuda | 1/2 | to | 1 1/2 |
| | Centipedegrass | 1 | to | 2 |
| | Zoysia | 3/4 | to | 1 1/2 |
| Cool-Season | Fine Fescue | 1 1/2 | to | 2 1/2 |
| | Kentucky Bluegrass | 1 1/2 | to | 2 1/2 |
| | Perennial Ryegrass | 1 1/2 | to | 2 1/2 |
| | Tall Fescue | 2 | to | 3 |

**Mow at the correct height.** Mowing height can drastically affect the space available for weeds. Each type of lawngrass has an ideal mowing height range. Consistently mowing at an appropriate height allows the lawngrass to naturally close in or overlap, forming a closed canopy and reducing the space available for weeds. Lawngrasses have a maximum and minimum mowing height tolerance. Mowing above the maximum tolerance results in bushy growth (opening the canopy and providing space for weeds). Mowing below the minimum tolerance is the most common. Scalping, the removal of too much leaf surface, often results in a weak and weedy lawn. Mowing below the minimum tolerance does not leave enough leaf surface to support optimum growth of roots and new shoots. Repeated scalping often results in short, fine leaves; shallow rooting; and an open canopy. Thus, mowing lawngrasses at the ideal height can greatly reduce the space available for weeds to grow. Refer to the previous table for ideal mowing heights.




**Use the correct mowing frequency.** How often do you mow or how tall do you let your lawn grow before mowing? Generally, you do not want to remove more than 1/3 of the grass height in a single mowing.

For example, if you mow your tall fescue lawn at a 2-inch cutting height, then mow when it reaches 3 inches tall. If you mow your hybrid bermudagrass lawn at a 1-inch cutting height, then mow when it reaches 1.5 inches tall. The frequency at which you mow is dependent on rate of growth, not a set date. Removing more than 1/3 of the height will stress the grass, affecting optimum root and new shoot growth and subsequent canopy closure. If your lawn grows too tall between mowings, gradually remove the excess height by taking 1/3 of the height with several mowings rather than removing an excess amount in a single mowing.

**Raise the cutting height prior to periods of environmental stress.** Mowing height determines the amount of leaf surface to support growth. In periods of environmental stress, such as dry weather, raise the cutting height to the maximum tolerance. For warm-season grasses, raise the cutting height in early fall to insulate soils against extreme low temperatures. For cool-season

grasses, raise the cutting height in late spring to promote root growth for improved summer drought tolerance and to help insulate against extreme high temperatures.

**Mow with a sharp blade.** Mowing with a dull blade usually tears the grass blade, exposing a large, jagged edge that is prone to moisture loss and disease entry. A clean cut allows the grass to recover quickly, maintaining a healthy canopy and neater appearance.

**Alternate the mowing direction.** Try not to mow in the same direction every time. Alternating mowing direction encourages upright growth in addition to distributing wear and reducing soil compaction.

**Recycle clippings.** Allowing small leaf clippings to drop, rather than bagging, cycles nutrients essential for lawngrass growth and survival. For more information on recycling clippings, refer to Extension PB 1455, *Lawn Care to Reduce Landscape Waste*.

## Fertility and Liming

If lawngrasses are to achieve optimum growth and compete against weeds, the soil must be fertile, supplying the required mineral nutrients in appropriate amounts at the proper time. Through the year, lawngrasses have periods of active growth and periods of slowed growth, or dormancy. Nutrient demand is dependent on growth rate. Nutrients applied in excess or at the wrong time may be lost or captured by weeds. Soils in Tennessee may require additions of the primary nutrients nitrogen, phosphorus and potassium. Nitrogen is often soluble in water and mobile in soil. Nitrogen is also the nutrient required in the greatest amount by lawngrasses. Applied excessively or at the wrong time, nitrogen may weaken your lawn. Test the soil before applying fertilizer.

In addition to nutrients, your soil may need amending with lime. Most soils in Tennessee become acid (or sour) unless lime is applied. As a result, lawns become less hardy and weeds become more prevalent as the lawngrass is gradually thinned.

Assessing soil fertility, the need for lime and fertilization schedules for lawns are explained in Extension PB1038, *Fertilization and Management of Home Lawns.*

## Need for Additional Water

Water, whether provided by rainfall or supplemental irrigation, is essential for lawngrass health and survival. Generally, 75 percent or more of the weight of a lawngrass plant is water. Actively growing lawngrass usually requires 1 to 1.5 inches of water per week. In Tennessee, the total annual rainfall distribution is generally insufficient to meet this demand. You may decide to add additional water to your lawn by irrigating.

Irrigate your lawn early in the morning (e.g., 5:00 to 10:00 a.m.) to reduce disease potential and waste by evaporation. Irrigating in the afternoon increases the loss by evaporation. Irrigating in the evening increases the period of leaf wetness, often promoting disease. For best results, water deeply and infrequently. Irrigate until the soil is moistened to a 4- to 6-inch depth. Do not irrigate again until the appearance of the first symptoms of drought stress (e.g. rolled leaves and bluish-green color). This promotes deep rooting. Irrigating frequently for short durations often results in shallow roots, reducing your lawn's tolerance to drought and other stresses.

Irrigation may also promote the germination and growth of summer annual weeds. Summer annual weeds germinate on or just below the soil surface. Light, frequent irrigation may provide needed water for summer annual weeds and may not penetrate deep enough to benefit lawngrass growth.

## Remove Fallen Leaves

Fall is the period when cool-season lawngrasses have the opportunity to recover from summer stresses. Fallen tree leaves may restrict light and limit recovery. Timely leaf removal will improve the availability of

light for optimum recovery. When a dense mat of leaves is not removed in a timely manner, lawngrass growth is weak and plants may die. After leaves are removed, the weakened health of your lawngrass provides space for fall-germinating weeds.

### Selecting Lawngrasses for Open Areas

When establishing or renovating your lawn, select a lawngrass species or variety appropriate for your specific site and needs. Considerations include the level of care, soil type, exposure and location requirements. Tennessee is located in a transitional zone between northern cool-humid and southern warm-humid climates. Within the state, certain locations favor warm-season lawngrasses; others, cool-season grasses. Bermudagrass, zoysia and centipede are perennial warm-season lawngrasses. Warm-season grasses grow best during the spring and summer (optimum growth between 80 to 95 F). These lawngrasses lose color during winter dormancy. Perennial cool-season lawngrasses include Kentucky bluegrass, fine fescuses and tall fescue. Cool-season lawngrasses grow best during the spring and fall months (optimum growth between 60 and 75 F) and maintain color during the winter.

In addition to choosing between a warm- or cool-season lawngrass, choose a variety or a blend of varieties that are known to be adapted to your area. Contact your county Extension office for more information on recommended lawngrass species and varieties for your area.

### Selecting Lawngrasses for Shade Areas

Within your landscape, there may be areas with different growth conditions. Some areas may receive full sun, while others receive very little if any light. Shaded lawns are often weak and thin due to low light intensity and limited energy reserves. This weak growth often results in an open canopy, favoring the invasion of shade-tolerant weeds.

In light- to moderate-shaded areas, choose a species or mixture of species that are shade-tolerant. To maximize light penetration, prune the lower limbs of trees and large shrubs as much as feasible (Refer to Extension PB 1163, *Pruning Shrubs In The Landscape*). In areas of intense shade, landscape with mulch or establish a shade-tolerant ground cover. (For more information refer to Extension PB 713, *Landscape Mulching Materials,* and PB1585, *Annual and Perennial Flower Shade Gardening in Tennessee*).

In general, cool-season lawngrasses are more shade tolerant than warm-season grasses. Cool-season grasses shaded during morning may wilt very quickly when exposed to full sunlight in the afternoon. Fine fescues (like red, hard, chewings and sheep fescues) are often tolerant of shade. For example, red fescue tolerates medium shade. However, this species has limited heat tolerance. Although tall fescue is usually more heat-tolerant than red fescue, this species is less tolerant of shade. Kentucky bluegrass is more tolerant of high temperature than red fescue. However, Kentucky bluegrass has poor shade tolerance when maintained in dense stands (For more information refer to Extension PB 1213, *Managing Cool-season Lawngrasses in Shade*).

Among the warm-season lawngrasses, bermudagrass is essentially intolerant of shade. Zoysia is able to tolerate light, open shade; however, shoot density may decline and color may fade.

## DEVELOPING WEED-MANAGEMENT STRATEGIES

Even under the best of lawn care, the potential for problems with certain weeds is continual. Optimum lawn care can go far to minimize weeds. However, certain weeds have growth habits similar to lawngrasses that enable them to establish in the presence of competitive lawngrass. Such weeds can be continual problems requiring preventative strategies. Other weeds may initiate during stress periods (may be indicators of lawngrass health), requiring control after establishment.

Implement best management strategies by first assessing the extent of your weed problems. Assessment includes the identification of existing and anticipated problem weeds. Best management strategies may include adjusting your lawn care program and/or the development of an effective herbicide program (involving product selection, application type and timing).

### Assessing Weed Problems

Your lawn may have diverse environments or microclimates, with variations in soil type, condition (fertility and traffic or compaction) and sun exposure. As a result, weed problems may not be uniform throughout your

landscape. The appropriate weed control strategies will be determined by the weed species present.

Begin your evaluation by drawing a map of your property. Section your map into easily identified zones (e.g. front, back, sides or areas bordering shrubs, walks and driveways). With this map as a reference, walk your property and record what you see.

Note the following;
a. Weed species present
b. Weed stage of growth
c. Weed population
d. Previous control measures
e. Health of lawngrass
f. High traffic or low traffic areas
g. Degree of sun exposure
h. Dry areas or water-logging areas

Separate weed species according to plant type (e.g. broadleaf, grass and sedges) and stage of growth.

In assessing the size of the weed(s) population or the health of your lawn, use a percentage rating. For example, in a particular zone, winter annual broadleaf weeds may account for 30 percent of the ground cover and your lawngrass 70 percent. Using this technique, you could formally assess the health of your lawn twice each year, in the spring and again in late summer or early fall. The early fall assessment will be the most extensive, as summer annuals, winter annuals, biennials and perennials should be present, in different stages of growth, but identifiable. Summer annuals will be near the end of their life cycle, but will indicate control needs for the next spring. Winter annuals will be young and easier to control. Perennial broadleaf weeds are also easier to control in the fall. Use the spring assessment to evaluate the success of fall herbicide treatments and gauge the health of your lawn prior to summer stresses.

Recorded assessments are management tools that will allow you to measure the success of your efforts and the need for adjustments in control strategies. Use them to develop and fine tune your control strategy. At a minimum, these assessments will identify areas requiring treatment, the weed species present and your subsequent choice of herbicide and timing of application.

## Control Strategies

The best control strategy may include altering your lawn care practices and/or application of appropriate herbicide(s). Choice of control strategy will depend on the weeds present and population density or distribution. Certain weeds that can be anticipated (like crabgrass and goosegrass) are best controlled with preventative or preemergence herbicides. For established weeds, two options are physical removal (which is essentially ineffective towards perennials, especially if only the top growth is removed) or treatment with curative or postemergence herbicides. If annual weeds are few and in a localized area, physical removal may be your easiest choice. If weeds are annuals that are abundant and spread over a large area, or perennials, a herbicide treatment may be required. The herbicide may be applied broadcast over the problem area or the entire yard (dependent on assessment results). Choice of an appropriate herbicide is dependent on weed susceptibility and lawngrass tolerance. Herbicide application timing is dependent on the growth stage of the weed(s) and weather conditions. Generally, weeds are easiest to control early in their life cycle.

Your choice of a best control strategy will depend on weed type(s) and life cycle(s).

# WEED TYPES AND LIFE CYCLES

For control purposes, weeds can be divided into three types: broadleaf weeds, grass weeds and sedges. Within each type, weeds may have one of three basic life cycles: summer annual, winter annual or perennial.

## Types

### Broadleaf Weeds

Broadleaf weeds are generally easiest to identify. Broadleaf weeds (like dandelion and clover) are distinctive from and are not botanically closely related to grasses and sedges. Broadleaf weeds have leaves that are broad, and are generally produced in pairs or multiples. Leaves are detached from the main stem

by a sub-stem or petiole. Leaves may be simple (having one leaflet, like dandelion) or compound (having more than one leaflet, like clover). Veins within the leaf give a netted appearance in most cases.

Selective herbicides for controlling broadleaf weeds generally are not effective for controlling grass weeds and sedges.

### Grass Weeds

Grass weeds (like crabgrass and goosegrass) are botanically related to lawngrasses. They have a similar appearance and growth habit. Leaves of grasses are not detached from the main stem. Leaves of grasses are narrow, with a blade-like appearance. Leaves are produced one at a time in two vertical rows. Veins within leaves run parallel. Stems are usually round or flat.

Grass weeds are often very difficult to control once established in the lawn. Thus, grass weeds are generally best controlled with preventative or preemergence herbicides. Preemergence herbicides need to be applied prior to germination, as they act by preventing establishment.

### Sedges

Sedges (like yellow nutsedge) are not grasses ,but have leaves that are similar in appearance and are thus often mistaken for grasses. Since herbicides used to control grass weeds are generally not effective on sedges, it is important to distinguish between the two types. Sedges have two key identifying characteristics: leaves arranged in three vertical rows and a triangular stem. Stems of grasses are commonly round or flat with leaves in two vertical rows.

## Life Cycles

### Summer Annuals

Annuals complete their life cycle within 12 months. Summer annuals generally germinate in the spring, grow or develop during the summer, produce seed and die by the fall or after the first hard frost.

### Winter Annuals

Winter annuals complete their life cycle in 12 months but generally overlap two calendar years. Winter annuals germinate in late summer to early fall and begin to develop. Winter annuals are dormant or semi-dormant through the winter, and flower the following spring. Winter annuals mature and die in late spring or early summer.

Summer and winter annuals reproduce and spread by prolific seed production, serving as a ready source of infestation and establishment when conditions are favorable.

### Perennials

Perennials live for more than two years and may regenerate indefinitely. A simple perennial, like dandelion, may germinate from seed, but produces a tap root that, when severed, can produce a new plant. A complex perennial can spread by seed in addition to creeping above- or below-ground vegetative structures (such as stolons, rhizomes or nutlets) capable of initiating a new plant.

Perennial weeds are often the most difficult to control. You are usually trying to control an established plant that has already produced considerable vegetative reproductive structures which may require repeat control measures. Removal of the above-ground shoot growth does little towards long-term control. Long-term control usually requires herbicide treatments that act on the above- and below-ground structures.

Your choice of a best management strategy, including appropriate herbicide(s), is dependent on weed type and life cycle. The "Weed Identification" section provides pictures to help with identification. This section separates weeds common in Tennessee lawns according to type and life cycle.

# WEED IDENTIFICATION

## Broadleaf Weeds

### Summer Annuals

Prostrate knotweed[1]

Prostrate spurge[1]

Spotted spurge[1]

Ragweed[1]

Carpetweed[1]

Kochia[1]

Lespedeza

Horsenettle[1]

Hairy Galinsoga[1]

Bedstraw

### Winter Annuals

Henbit[1]

Deadnettle

Field Madder

Common chickweed[1]

Mouse-ear chickweed[1]
(can be perennial)

Buttercup

Carolina geranium
(can be perennial)

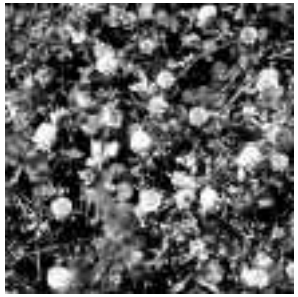
[1] Photo Credit to Arlyn W. Evans

### Perennials


Wild onion/Wild garlic[1]


Dandelion


White clover


Hop clover


Broadleaf plantain


Narrowleaf plantain


Ground ivy


Curly dock


Broadleaf dock[1]


Virginia buttonweed[1]


Oxalis[1]


Wild strawberry


Wild violet

## Grass Weeds

### Summer Annuals


Large crabgrass[1]


Smooth crabgrass[1]


Goosegrass

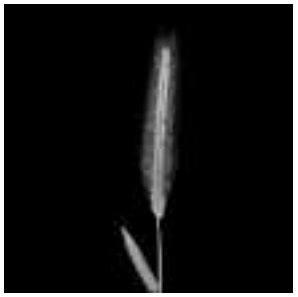

Yellow foxtail[1]


Green foxtail[1]

[1] Photo Credit to Arlyn W. Evans

### Winter Annuals

Annual bluegrass



Little barley[1]

### Perennials

Dallisgrass[1]

Bermudagrass

Nimblewill[1]

## Sedges

### Summer Annuals

Annual sedge[1]

### Perennials

Yellow nutsedge[2]

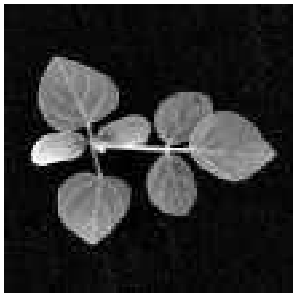
Purple nutsedge

Leaftips,[3]
Left - Yellow Nutsedge,
Right - Purple Nutsedge

Kyllinga[2]

## Other Yard Weeds

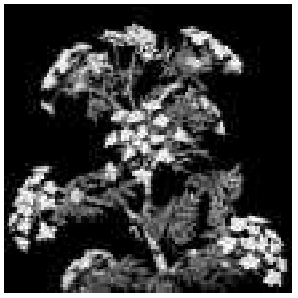
Moss and Algae



Kudzu[1]

Honey suckle

Poison Ivy[1]



Poison hemlock[1]

[1] Photo Credit to Arlyn W. Evans
[2] Photo Credit to Jimmy R. Summerlin
[3]Photo Credit Joe C. Neal

# HERBICIDE APPLICATION

## Herbicide Types

For controlling lawn weeds, there are generally two herbicide application types: preemergence and postemergence. Pre-emergence herbicides prevent weeds from becoming established. Postemergence herbicides are applied after weeds are established. Once established, certain weeds may be difficult to control. For example, trying to control an established grass weed in an established lawngrass can be very difficult. Herbicides with such a margin of selectivity are limited. Selectivity with a preemergence grass herbicide is achieved by application timing (applied to established lawngrasses, preventing grass seedlings from establishing). Postemergence herbicides are generally used to control emerged, broadleaf weeds in established lawns.

### Preemergence (PRE)

Preemergence herbicides are applied to the soil and act as seeds germinate. These herbicides can act on summer and winter annuals, and some perennial weeds starting from seed. Preemergence herbicides need to be applied prior to germination. The time of germination for each weed species is life-cycle dependent. Preemergence herbicides generally provide some residual activity (meaning the weed control may last for several weeks after initial application). Preemergence herbicides may provide excellent grass weed control and have limited activity on broadleaf weeds. Except where specifically noted, do not apply preemergence herbicides to newly established or reseeded lawns for at least three months.

To ensure best performance with preemergence herbicides:

1. Remove trash, leaves and thatch to allow the herbicide to directly contact the soil.
2. Apply the preemergence herbicide uniformly over the treatment area (as directed on the product label).
3. After application, apply one-half inch or more of irrigation. This activates the herbicide by moving it into the soil. Preemergence herbicides will not be as effective if not immediately activated by irrigation (unless otherwise noted on the product label).

### Postemergence (POST)

Postemergence herbicides act on weeds after they have germinated and are applied to the above ground plant tissue. Weeds are generally easiest to control when young (early in their life cycle). Postemergence herbicides may be contact or systemic. Contact herbicides only kill the top growth contacted by the herbicide. Systemic herbicides applied to the top growth, move within the plant to control below ground reproductive structures not contacted in the initial application. Systemic herbicides are preferred when treating established perennial weeds.

## Herbicide Formulations and Application Equipment

Herbicides for use in home lawns are available in several formulations. Generally there are two main types: granular- to be applied in a dry form using fertilizer-type spreaders, and liquids- powders or wettable granules formulated to be mixed with water and applied as a spray.

### Granular

Granular herbicides are the most convenient and easiest to use. Many preemergence herbicides are marketed as granular formulations. These products may also be available in combination with granular fertilizers.

Fertilizer/ herbicide combinations have several advantages:

1. Convenient, saving one additional trip over the lawn.
2. Can be conveniently applied with a common fertilizer spreader (no specialized equipment needed).
3. Spray drift is avoided that may occur with foliar spray.
4. The fertilizer may stimulate lawngrass growth and may reduce any ‘stunting’ effect of the herbicide.

Fertilizer/herbicide combinations have several common misuses and disadvantages:

1. Fertility rate, especially with nitrogen, may be too high, depending on lawngrass type and time of year.
2. Use around or underneath trees and shrubs that are not tolerant of the herbicide.
3. An additional pass around or underneath trees and shrubs to give them extra fertilizer, resulting in herbicide overdose that can injure or kill trees and shrubs.
4. More expensive than products used separately.
5. Fertilizer/herbicide combinations containing postemergence broadleaf herbicides (like 2,4-D and dicamba) applied preemergence are less effective than foliar sprays. Also, these products may injure desirable plants by root uptake.

### Liquids

Most postemergence and some preemergence herbicides are sold in formulations meant to be mixed with water and applied as liquids. The actual product may be in a solid form, such as a powder or water-dispensible granule that mixes well with water. These formulations are meant to be applied using a sprayer or water hose-end attachments.

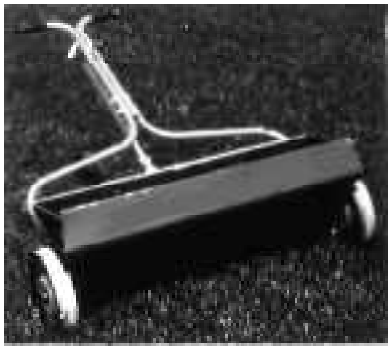
Sprayers may be pressurized by air, using a hand pump or by water pressure during filling, as in the case of hose-end sprayers. Avoid spray drift to desired plants by using low pressure (to maximize droplet size) and by not applying when the wind is greater than 5 mph. Hose-end attachments force the herbicide into the water flow. The accuracy of herbicide application is low with this equipment. A more appropriate use of hose-end attachments is the application of fungicides, insecticides and liquid fertilizers.

Many postemergence herbicides are packaged as liquids ready to use for spot treatments in squirt bottles or aerosol cans. Be cautious with aerosol cans. They can be misdirected and the herbicide may contact your face and eyes. For spot treatments, many postemergence herbicide labels may provide directions for use with a brush and can. The liquid herbicide mixture can be "painted" with a brush (or cloth or sponge) onto undesirable plants. This method is convenient for treating individual plants or a few plants in small problem areas.

## Equipment Calibration

### Spreaders

Granular spreaders (gravity drop or spinner types) usually provide an easy gauge for selecting the approximate setting for the desired application rate. In addition, usually the package for granular herbicides or herbicide/ fertilizer combinations provide specific directions on application rate and equipment calibration.



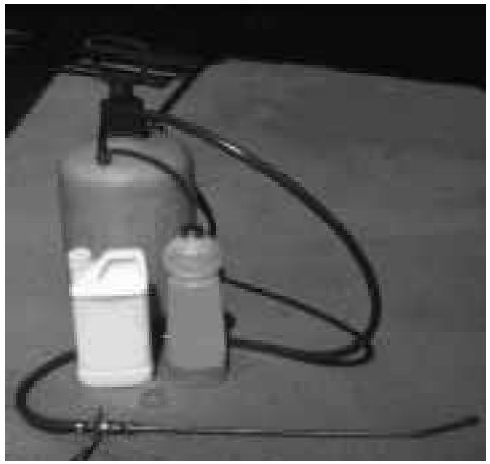
To ensure uniform coverage, or to avoid misses, more even distribution will be achieved by applying one-half the total rate in each of two passes in opposite directions (total rate to be applied is generally given as pounds per 1000 square feet).

CAUTION: If you are applying hormone-or phenoxy-type herbicides (such as 2,4-D, MCPP or dicamba), do not use the same spreader to later apply fertilizer to desirable plants other than lawngrasses. There may be enough herbicide residue remaining in the spreader to injure desirable plants. Thoroughly rinse the spreader with soapy water and then rinse with clean water and let dry.

### Sprayers

Herbicide applications with pressurized sprayers require accurate calibration. When treating large areas, proper calibration and consistent application are essential to avoid overdosing and/or missing areas.

To calibrate a liquid pressure sprayer, use the following steps:



1. Fill the tank full or to a marked level with water.
2. Spray an area 10 feet wide by 10 feet in length (or 100 square feet). Pay attention to your walking speed. A consistent walking pace is essential for consistent application.
3. Record the amount of water needed to refill the tank to the marked level. This is the amount of water required to treat 100 sq. ft. Multiply this amount by 10 to get the total amount of water required to treat 1000 sq. ft.
4. Empty out this water or add water until the tank is half full.
5. Then add the quantity of herbicide appropriate for the amount of water the tank holds.
6. Refill the tank with water (the action of the water during fill will aid in uniform mixing of the herbicide with the water). Shake the tank for 15 seconds.
7. During application, it may be necessary to stop and shake the tank to ensure continued uniform mixing. This is particularly true for wettable powder or water-dispersible granular formulations of herbicides.

# *a UT Extension Reminder…*

**Common Weights and Measures**

## Length

Inch = 1/12 or 0.083 foot = 2.54 centimeters = 25.4 millimeters
Foot = 12 inches = 0.3048 meters = 30.48 centimeters
Yard = 36 inches = 3 feet = 0.9144 meters
Rod =16.5 feet = 5.5 yards = 5.03 meters
Furlong = 220 yards
Mile = 1,760 yards = 5,280 feet =1.61 kilometers = 8 furlongs = 80 chains

## Area

Square inch = 0.007 square foot = 6.45 square centimeters
Square foot = 144 square inches = 929.03 square centimeters
Square yard = 9 square feet = 0.836 square meters
Square rod = 30.25 square yards
Acre = 4,840 square yards = 43,560 square feet = 160 square rods = 4,047 square meters = 0.405 hectare
Hectare =10,000 square meters = 2.47 acres
Square mile = 640 acres = 2.59 square kilometers = 1 section
Section =1 square mile = 640 acres = 2.59 square kilometers

## Liquid Measures

Teaspoon = 0.1667 fluid ounce = 80 drops = 4.93 milliliters
Tablespoons = 3 teaspoons = 0.5 fluid ounce = 14.8 milliliters
Fluid ounce = 2 tablespoons = 29.58 milliliters
Cup = 8 fluid ounces =16 tablespoons = 236.6 milliliters
Pint = 2 cups =16 fluid ounces = 473.2 milliliters
Quart = 4 cups = 2 pints = 32 fluid ounces = 0.946 liters
Liter = 2.113 pints = 1,000 milliliters =1.057 quarts
Gallon = 4 quarts = 8 pints =128 fluid ounces = 3.785 liters
Cubic foot of water = 7.5 gallons = 62.4 pounds = 28.3 liters
Acre inch of water = 27,154 gallons = 3,630 cubic feet

## Dry Measures

Teaspoon (level) = 0.35 cubic inch = 5.74 cubic centimeters
Tablespoon (level) = 1.05 cubic inch = 3 level teaspoons = 17.21 cubic centimeters
Cup = 16 level tablespoons 16.8 cubic inches = 275.3 cubic centimeters
Pint = 2 cups = 32 level tablespoons = 33.6 cubic inches = 550.6 cubic centimeters
Quart = 2 pints = 64 tablespoons = 67.2 cubic inches = 1.101 liters
Peck = 8 quarts =16 pints =538 cubic inches = 8.8 liters
Bushel = 4 pecks = 2,150 cubic inches = 32 quarts = 3 liters

## Volumes

Cubic inch = 0.00058 cubic foot = 16.4 cubic centimeters
Cubic foot = 1,728 cubic inches = 0.037 cubic yard = 0.028 cubic meter
Cubic yard = 27 cubic feet = 0.765 cubic meters

## Weights

Gram = 15.43 grains = 1,000 milligrams
Ounce = 28.35 grams = 437.5 grains
Pound = 16 ounces = 7,000 grains = 454 grams
Kilogram = 1,000 grams = 2.205 pounds
Ton (short) = 2,000 pounds = 0.907 metric tons

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