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best time to seed is the fall. The fall (8 to 9 weeks before frost) or early spring is the best time for northern states. The temperature and light regimes during these periods are also usually optimal for germination and growth because these are the natural germination times for wildflowers.

If a dry period occurs or the seeds are planted during a less optimal period, supplemental irrigation is recommended for satisfactory performance.

Wildflowers are often mixed with grasses to add soil stabilization and erosion control.

Fertilization is not recommended for wildflowers unless the soil is extremely sterile. Fertilization primarily encourages weed growth. If weeds are a problem, till the soil and water to encourage weed germination, then spray with a non-selective contact herbicide such as "Roundup" at least one week prior to planting.

Try not to disturb the soil again because this will just bring more weed seeds to the surface. Ample moisture and high germination of your wildflowers is your best tool against weeds.

Seeding rate

A minimum seeding rate is 4 to 8 pounds per acre or 1 ounce per 250 square feet depending on the mix used. This will provide 40 to 72 seeds per square foot. If a denser stand is desired, especially for more color the first year or in a smaller area, it is recommended to at least double this seeding rate.

You must also have patience with wildflowers. Although some will bloom within 6 to 8 weeks of planting, many must mature much longer before they can flower. This is especially true of the perennials which may require a few years before an optimum stand is achieved. After establishment wildflowers require minimal care.

For optimal growth and flowering under drought conditions, supplemental irrigation is recommended. Even under these conditions, if no irrigation is available, they will persist and bloom when natural rainfall is available. Often they have more extensive root systems than many traditional flowers so they will perform with much less water.

Many landscapers and highway departments will mow wildflowers once a year in July, after the seeds have set, to improve the appearance and scatter the seeds for reseeding. Wildflowers will tolerate additional mowings, but should not be mowed after March or bloom will be reduced. Mowing, however, is not necessary!

As interest in wildflowers has increased so has the research. In 1983, Mrs. Lyndon B. Johnson and associates founded the non-profit National Wildflower Research Center in Austin, TX, to investigate and promote research on wildflowers. (See related story, this issue.)

The states of Texas and Massachusetts have both performed extensive studies on establishment of wildflowers on roadsides. Massachusetts has even experimented with utilizing wildflower sods for steep slopes.

Some of the perennials may require a few years before an optimum stand is achieved.

Seed companies have been researching improved establishment procedures, as well as improved methods of growing and harvesting the seed to increase the supply and reduce the costs of the seed. In addition they hope to make additional varieties of wildflowers available.

If you are only going to seed a small area with wildflowers, you can buy small packets of mixtures or single species from your local garden center. However, for larger areas it is recommended you contact one of the companies listed on the preceeding page for larger seed quantities (this list is not intended to show all companies that may market wildflowers).

Most of these companies market wildflower mixtures adapted to certain regions or conditions in quantities of one pound or greater for $20 to $48 per pound. Quantities greater than one pound are often sold at a discount. A few of the companies sell as little as one ounce for $5 to $6. It is recommended you write or call the companies that have products that interest you.

Whatever the cost, wildflowers will bring a profit to you—first due to decreased maintenance cost, and second from the pleasure they bring to others. **WT&T**

Dr. Leah A. Brilman is research director, Jacklin Seed Co.

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Warm-Season Turf

by Ray Dickens, Auburn University, Auburn, AL., and **Euel Coats**, Mississippi State University, MS.

No turf or landscape will remain weed-free without the intervention of man and his technology. This fact of nature has provided, and will continue to provide, work for the landscape manager.

Manmade landscapes, left alone to heat, drought, poor soil, shade, and traffic, will surrender to weeds.

The landscape manager's job is to shift the balance in favor of the desirable species and keep it that way. He does this by putting stress on the weeds and reducing the stress on the desirable plants.

Stress can come from many sources: poor soil; excessive shade, slope, moisture, wind; improper plant selection; and even maintenance practices such as mowing too low or too much at one time, using unnecesarily heavy machinery on turf areas, overirrigating, and overfertilization. Beneficial practices such as aerification or cultivation at the wrong time increase weed pressure.

Correction of stress factors is an important component of a weed control program. If stress can't be corrected, plants tolerant to the stress should be selected and planted in the area.

In this Guide, weed control is divided into four categories; turf, ornamental, rights-of-way and aquatic. Each area requires a separate approach, even though many of the chemicals and weeds are the same. It's important that a landscape manager approach each in the proper way.

Bermudagrass is the dominant turf species in warmer climates. In general, herbicides that can be used on bermudagrass can be used safely on zoysiagrass. However, special attention should be paid to herbicide labels regarding applications to centipedegrass and St. Augustine, which are similar to each other in their tolerance to herbicides.

Summer Grass Weeds. Large crabgrass and dallisgrass invade more turf acreage in the southern United States than any other grasses. Germinating seeds of both can be satisfactorily controlled with benefin, bensulide, DCPA, pendamethalin, atrazine, and simazine. Certain formulations of atrazine are labelled for use on St. Augustine, zoysia, and centipede for sod production while other commercial products containing atrazine are labeled for homeowner use. A combination of acetamide (Dual) and either atrazine or simazine is currently being tested for effectiveness.

Golf courses *present a wide assortment of weed control challenges.*

Only asulam is used for postemergence control of crabgrass and dallisgrass in St. Augustine. MSMA and DSMA are effective postemergence herbicides for these weeds in bermudagrass. The arsonates are used almost exclusively for dallisgrass control in bermuda and zoysia.

Goosegrass is the most difficult summer grass to control in the South. Timing of application of preemergence herbicides is of paramount importance if control is to be achieved. We generally think goosegrass starts germinating in significant quantities four to six weeks after crabgrass. However, this can and does vary.

If application of a preemergence is delayed, large crabgrass will escape because it germinates earlier than goosegrass. In bermudagrass and zoysia, large crabgrass can be controlled quite effectively with postemergence applications of the arsonates. Use of preemergence herbicides would appear to be a better approach to goosegrass control than postemergence control with arsonates.

Oxadiazon (Ronstar) gives excellent season-long control of goosegrass. Research has shown postemergence applications of MSMA plus metribuzen (Sencor) gives good control of goosegrass.

Sandbur and bahiagrass in bermuda and zoysia can be controlled with arsenicals. There is no selective control of torpedograss in southern turf at the present.

Both annual and perennial sedges are problems in the South. Purple nutsedge and, to a lesser degree, yellow nutsedge are the most severe problems. Multiple applications of arsenicals or an arsenical/phenoxy combination are generally recommended for purple nutsedge, only on bermuda or zoysia. Basagran can be used for yellow nutsedge control.

Summer Broadleaf Weeds are a problem throughout the South in turf, but not to the extent of the grassy weeds, such as dallisgrass, large crabgrass, and goosegrass. Prostrate spurge and Virginia buttonweed are important and difficult to control broadleaf weeds. Multiple applications of 2,4-D plus dicamba, Trimec, or Trex-San are almost always necessary. Researchers suggest the use of a nonionic surfactant with the herbicide.

Winter Grass Weeds. Annual bluegrass is by far the most severe grassy weed infesting southern turf

continued on page 50

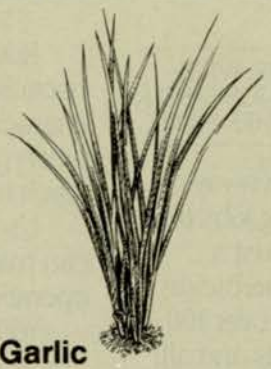
Grassy Weeds

One of the biggest challenges a landscape manager has is to remove undesirable grass from a desirable one. The following grasses have become notorious for being difficult to control.

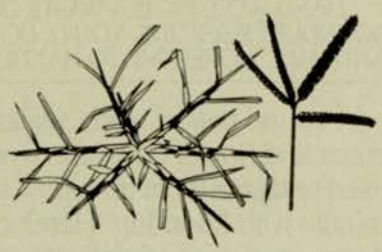
Annual Bluegrass (Poa Annua)

Crabgrass

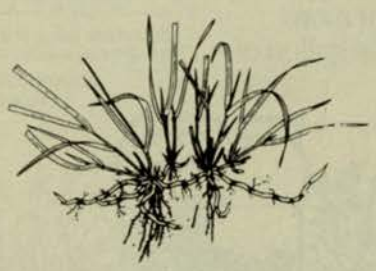
Nutsedge



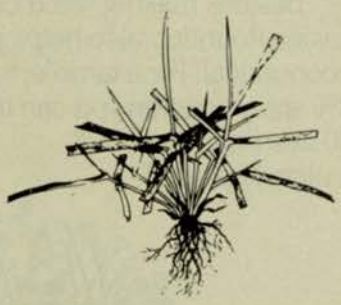
Wild Garlic



Goosegrass



Quackgrass



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*Cost of one gallon of 2% spray solution of Roundup to treat low-growing vegetation.

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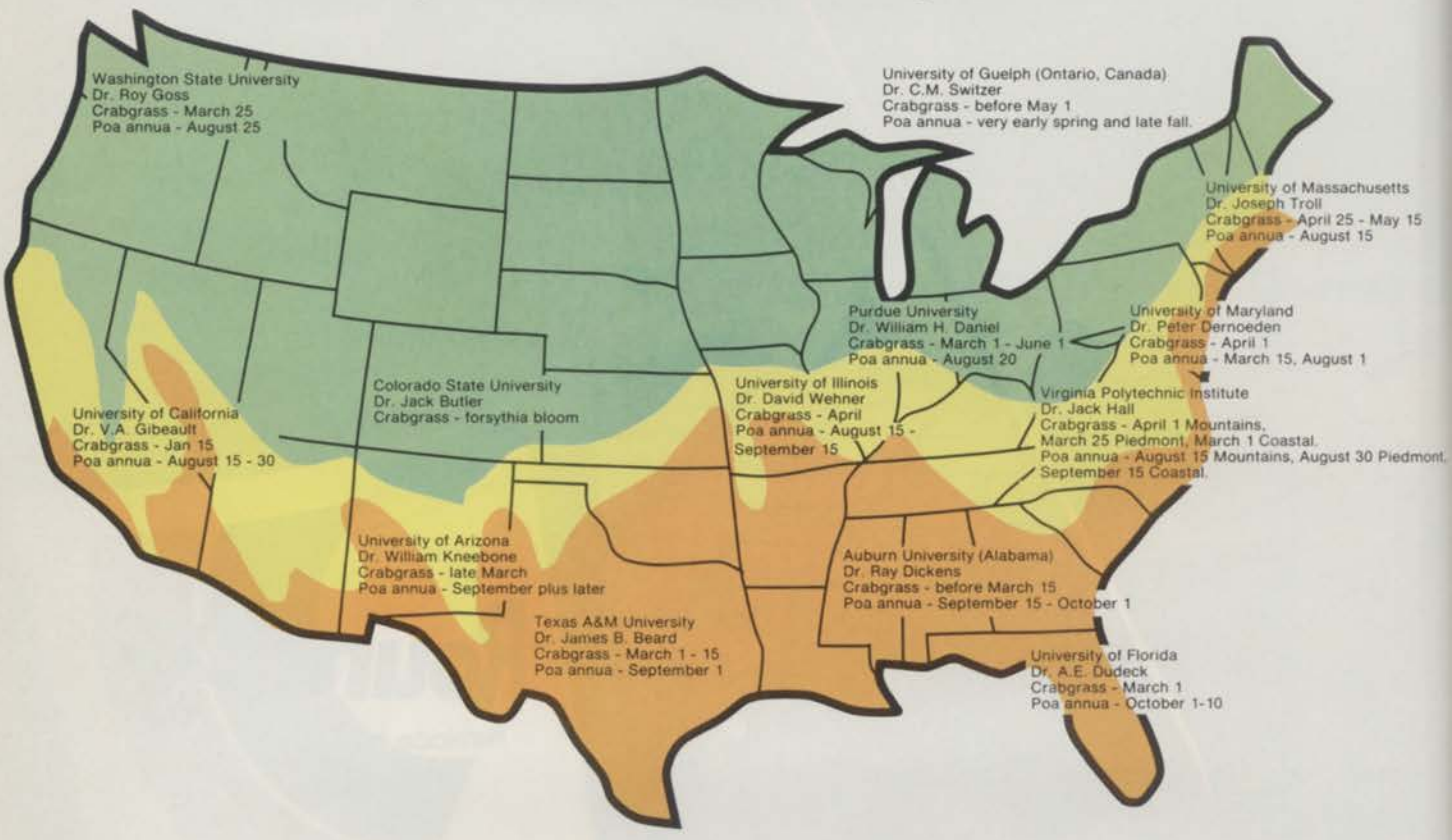
Suggested Timing for Preemergence Herbicides to Control Crabgrass and Annual Bluegrass



during the late growing season, through the dormancy period and into the early growing season.

Beside decreasing the aesthetic value of turf, the primary objective to annual bluegrass is its rapid dieback in late spring. Bermudagrass coverage is usually slow following fade out of annual bluegrass leaving large sections of bare ground exposed. Other weeds, such as goosegrass, tend to move into bare areas.

Annual bluegrass control with preemergence herbicides is usually accomplished with either benefin (Balan), bensulide (Betasan), DCPA (Dacthal), pendamethalin, Pronamide (Kerb), simazine (Princep), or oxadiazon (Ronstar). Two applications may be necessary during the dormant season for acceptable control except with Pronamide or simazine.

Pronamide and simazine provide either preemergence or postemergence control of annual bluegrass in bermudagrass.

There are two choices for annual bluegrass control on bermudagrass greens overseeded with perennial ryegrass. Bensulide may be applied prior to overseeding as a preemergence approach. Ethofumesate (Prograss) may be applied 15 to 30 days after overseeding. Check label for timing to avoid delaying spring transition back to bermudagrass.

Another approach employed particularly on golf courses, is to use a postemergence nonselective herbicide such as paraquat, glyphosate or cacodylic acid prior to the warm-season turf breaking dormancy. This usually does an excellent job on annual bluegrass as well as annual broadleaf weeds present. Injury is often encountered if bermudagrass starts breaking dormancy. The degree of injury is dependent upon the amount of green foliage at the time of application.

Winter Broadleaf Weeds. Important warm-season winter broadleaf weeds include common chickweed, henbit, clovers, spurweed, mouse-ear chickweed, lawn burweed, common dandelion, wild onion, wild garlic, plantains, and speedwells.

Preemergence control of some species can be obtained with benefin, bensulide, DCPA, pendamethalin, simazine, and other herbicides.

Henbit, chickweed, and clovers usually require something other than 2,4-D for postemergence control. In dormant bermudagrass and zoysiagrass, dicamba or combinations with dicamba are used often for postemergence control.

The phenoxys are safe on completely dormant turfs. However, actively growing turfs vary considerably in tolerance to phenoxy materials.

St. Augustine will usually tolerate a .5 lbs./acre of 2,4-D with only minimal injury. At rates above .5 lbs./acre St. Augustine is usually injured. This may be unimportant when using phenoxys on dormant warm-season turfs, but invariably application is made during spring transition. All turfgrasses are more susceptible to phenoxy injury during this transition period. The combination of mecoprop plus chlorfurecol is often used, especially by the homeowner on St. Augustine.