



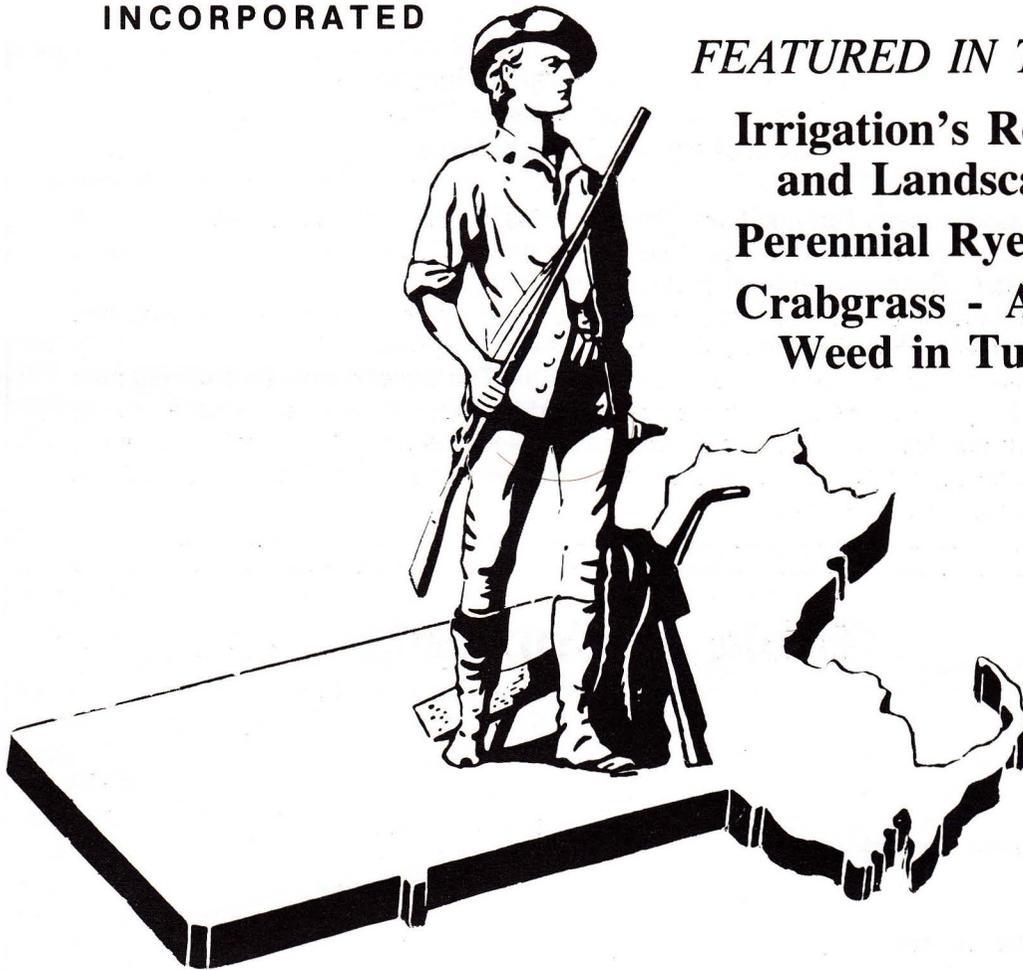
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TURF BULLETIN

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FEATURED IN THIS ISSUE:

**Irrigation's Role for Turf
and Landscape**

Perennial Ryegrass Update

**Crabgrass - A Troublesome
Weed in Turfgrasses**

FALL 1983

BETTER TURF THROUGH RESEARCH AND EDUCATION

EDITOR
 Charles F. Mancino
 Lakeview Road
 Shutesbury, Mass. 01072

SECRETARY-TREASURER & ADVISOR
 Dr. Joseph Troll
 RFD No. 2 Hadley, Mass.

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Table of Contents

	Page
Canada Geese Control Pat Lucas	3
Coloring the Course Ann Reilly	5
Irrigation's Role for Turf and Landscape J.D. Butler and C.M. Feldhake	7
Perennial Ryegrass Update Drs. R.H. Hurley and C. Reed Funk	12
Crabgrass - A Common Troublesome Weed in Turfgrasses Prasanta C. Bhowmik	15
Thatch and Its Control Roy L. Goss	18

CANADA GEESE CONTROL

by Pat Lucas, Golf Superintendent
Innis Arden Golf Club, Old Greenwich, CT. 06870

The purpose of this article is to discuss some of the problems Canada Geese are causing, and to share some of the lessons I've learned in controlling them.

With the onset of fall, migration South of Canada Geese will commence once again. Originally, most Canada Geese were migrators, using corridors or flyways for travel, going South in winter and coming back North in the summer. We here in the Northeast are located on the Atlantic Flyway, where some one million birds migrate annually.

Today, Canada Geese can be placed in two categories. The first are the migrators, or those Canada Geese which still migrate annually. The second category, our "resident" geese, are those geese who have stopped migrating and stay in one location year-round.

The numerous problems caused by large flocks of Canada Geese include eating fine turf to a stubble, making reseeding necessary; the droppings they leave behind are unhealthy, ruin the grass, pack mowing equipment, and make putting impossible; and, they leave feathers in the water. If the lake or pond they are inhabiting is used for irrigation purposes, eventually, their feathers can clog irrigation suction line strainers.

Why are Canada Geese invading our golf courses and public parks? To answer that, let's look at some of the basic requirements of Canada Geese or what I refer to as their "drawing cards". The first is FOOD and what could be more tasty than our fine turf. The second requirement is WATER, needed for drinking, landing, protection, and sleeping. And the last requirement is PROTECTION, or relative safety from being hunted.

Does your course offer these "drawing cards" to Canada Geese. If the answer is yes, then your course can become a resort . . . for Canada Geese.

Your geese removal program must concentrate on altering these conditions which brought Canada Geese to the area in the first place. The most important factor in your geese removal program will be TIMING. The longer Canada Geese are allowed to inhabit an area, the more comfortable they will become, and the harder it will be to get them to leave.

Let's look at water, remembering that water is necessary to Canada Geese for:

- a. Drinking
- b. Landing
- c. Protection
- d. Sleeping

Your goal will be to make your lake or pond look unwelcome from the air. Some of the ways in which this can be achieved are:

WIRE GRIDS: Wires can be strung across the lake in a grid-like patterns about 14 to 18 inches above the water level. This will effectively deprive Canada Geese from using the water. If the span is great, use floats as needed for mid-way support.

ROPE OBSTACLES: Yellow rope can be strung between high trees, across favorite flight paths near the body of water. Keep the ropes somewhat loose to sway in the wind. This will create obstacles in what used to be favorite landing or taking off flight paths.

Consider using the various scarecrow devices:

BLACK FLAGS: The Fish & Wildlife Service reported on the use of a flag-like device made from a black plastic trash bag fixed to a tall pole to deter geese from feeding at their ease. It is said to work especially well in grain fields in the midwest. The Services notes that geese don't like to feed in areas where they sense a threat from overhead, which is what the fluttering "flag" represents to them. These could be installed in out of play areas, or even in the pond itself.

SWAN SCARECROWS: Swan families with their babies or cygnets as they are called are vicious to Canada Geese and most Canada Geese are aware of this. Consider using replicas of swan families as "floating scarecrows" to deter Canada Geese from landing.

Lastly, consider the aspect of safety and security. Canada Geese are smart, staying close to metropolitan areas to avoid being hunted. This protective "comfort zone" which they enjoy must be removed.

If you have Canada Geese, you can remove their "comfort zone" and get them to leave at the same time by using what I call the HUNTER AMBUSH APPROACH. Your goal is to make the Canada Geese feel they are genuinely being hunted and that their welfare is being threatened. A point to remember, this is *not* a form of harassment which probably the geese have had to contend with in the past. This is an entirely different approach which makes them feel their very survival is threatened. Here's how to do it.

You will need a loud blank gun and a trusted member of your crew as your "hunter". Have the hunter stalk the feeding geese either early in the morning, or at dusk, slowly creeping up on them, inch by inch. It may take the hunter 15 or 20 minutes to cover say about 200 yards as he approaches the flock, during which time several things will begin to happen.

The first and most obvious is that the sentinel of lookout geese will begin to look in the direction of the approaching hunter. Next, the majority of the flock will begin to stop feeding and "aim" in one direction. All this time the hunter is getting closer to the geese. As they become more nervous, the geese will begin to squawk and flap their wings, because someone or something is approaching them in a way which is strange and unfamiliar. It is exactly at this point that they are ready to go and the hunter (very close now) should begin firing. Or, at any time during the day that the geese are observed attempting to land, the hunter should begin firing when their wings are locked-in on their approach.

The library of Natural Sounds, Laboratory of Ornithology at Cornell University in Ithaca, New York has available a cassette audio tape of a Canada Goose distress call. Consider using it in conjunction with your "HUNTER AMBUSH APPROACH" for greater effect.

Once properly done, you will receive another bonus besides getting the geese to leave. Research has shown that Canada Geese are unlikely to return to a spot where they have been ambushed.

Remember, when Canada Geese fly over they look for "signs", signs below telling them everything is all right, it is okay to land. Other waterfowl (ducks, igrets, kingfishers, etc.) are such signs and must also be frightened away. We want our lake or pond to look unwelcome from the air.

Clean out all brush areas which have been favorite nesting grounds in the past. Once the geese have nested in the spring, it is very difficult to get them to leave.

In closing, success can be achieved by a combination of understanding the basic requirements of Canada Geese and implementing a program of action.

Anyone wishing further information, your local library is an excellent source along with your State Fish & Wildlife Bureau.

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COLORING THE COURSE

Ann Reilly, Executive Director
NY State Turfgrass Association

"Ah, Spring", they say, "the time of year when young man's fancy turns to love". Right? Wrong! Spring seems to be the time that men turn to the Stanley Cup playoffs, the opening of baseball season, sharpening mower blades and Helminthosporium. But why not color? Color is nature's way of saying "The start of a new year is here", and the golf course should not be excluded from that.

Spring Bulbs

Spring flowering bulbs are still the best way to bring early color to the course. Although planted in fall, their planting design should be laid out in spring so color and placement can be considered in relationship to other plants.

Among the best bulbs for spring color are crocus, glory of the snow (*Chionodoxa*), Siberian squill (*Scilla siberica*) and pushkinia. All are easy care and, except for the crocus, will never need any maintenance or dividing. Daffodils are perfect choice for slopes, open spaces and at the edge of wooded areas, but they will need dividing every 4-5 years. Also, daffodils, like all bulbs, cannot have their foliage removed until it has completely browned, which can cause a problem as the daffodil foliage can hang on until June. Daffodils therefore must be planted where they do not have to be disturbed for several months.

For formal beds, tulips and hyacinths are good choices, but keep in mind that the bulbs are not long-lived and will have to be replaced often. Wildlife also loves to feast on tulips, and can be stopped to some degree by chicken wire or repellent sprays.

When trees and shrubs need to be added or replaced, choose those with either colorful spring flowers or striking fall foliage. The golfer also seems to appreciate not only the color but also the reference points created while lining up a shot.

Annual Color

Nothing says summer more than picnics, baseball games and beds of colorful annual flowers. There are many considerations to be made when designing an annual flower bed - location; color and color harmony; plant height; contour of the bed; style; shape of the plant; flower and leaf textures; and accents. In addition to all of these, plant selection is critical. If you don't choose annuals suitable to your growing condition, all of your design efforts will be for naught.

Even if Mother Nature doesn't cooperate with much rain and there is no irrigation system to work with, annuals can still color up the landscape provided you choose the right types. For a touch of blue in a low growing plant

suitable for massed bed rock gardens or as an edging to larger plants, select the tiny and fluffy flowered ageratum. One of the best annuals for ease of maintenance, ageratum will bloom non-stop in sun or light shade without having to have its faded flowers removed. It is an excellent complement to another drought tolerant annual, the zinnia, which is available in almost any color of the rainbow except true blue.

Zinnias are a world unto themselves. There are single, double, cactus and pom-pom flowers available in solid, multi or zoned colors that bloom in full sun from early summer through frost. Faded flowers will need to be removed, however, to keep bloom at its maximum; clip stems as blooms open and zinnias make perfect and long lasting cut flowers. Different varieties of zinnias grow anywhere from 6-inches to 3½-feet tall, so are useful as edgings, in massed beds, or as screens, hedges and backgrounds.

One precaution must be taken when thinking of zinnias; make sure the location being considered has good air circulation as zinnias are very susceptible to powdery mildew. A spritz of Tersan 1991 onto the zinnias when the turf is being treated will assist in alleviating this problem.

Think of dry, sandy soil and one annual immediately springs to mind — the petunia. Select the large flowered grandiflora or the smaller (but more of them) flowered floribunda petunia for an easy to grow massed or edging effect. Where conditions of poor and alkaline soil also exist, choose single rather than double flowered varieties, and if your weather conditions are extremely adverse, take the multifloras over the grandifloras.

About the only maintenance a petunia will need is a cutting back after the first flush of flowers fade to induce a heavy second flowering and forestall leggy plants.

An excellent companion to petunias is the heat-resistant verbena. Its colors cover the rainbow, so it is easy to choose a variety to complement one of the many solids, stripes or picotees of the petunia. A relatively new variety of verbena called "Sangria" is a deep wine red and good choice for dry spots with red, white or blue petunias. Verbena can also be effectively used alone in beds, borders or rock gardens, especially where soil is poor.

For a touch of the bizarre and a bolt of strong color in a dry location, the celosia is the answer. Available in eight plumed or crested varieties, celosia withstands poor soil and has a variety of uses in annual beds. Use celosia with care and discretion and don't plant it outside until spring weather is reliably stable or it will bolt to seed and not bloom.

Where "hot spots" exist, shy away from geraniums and marigolds and instead try spider flower (*Cleome*) or

gazania. Kochia is another annual that is useful as a hedge and background that tolerates extreme heat and dry soil, but it is rather nondescript until fall when its lacy foliage turns brilliant red. Flowers are all but invisible.

Although most plants that tolerate heat are also drought resistant, salvia is not, requiring a rich, moist soil. Used as an edging, massing or background plant, salvia has spikes of red, white or purple that do equally well in full sun or part shade. Use red salvia with caution as too much of it will be distracting to the overall design.

Where flower beds are "normal", regularly watered and fertile, one of the favorite annual choices is the marigold. Shades of cream, yellow, orange, bronze and red cover plants anywhere from 6-inches to 3-feet high from early summer to frost, especially if faded flowers are picked off. Don't be surprised if the tall "African" marigolds don't bloom until late summer, for they are photoperiodic and need short nights. It would be best to pick another annual than African marigold as a background to a marigold planting for season-long bloom.

The fragrant white, pink and purple blooms of the sweet alyssum are a good selection for edging marigold beds and have the same soil, light and water requirements. They're better than marigolds in one respect — faded flowers fall off cleanly and don't need to be removed manually.

The flowering tobacco (nicotiana), especially the recently introduced "Nicki" series that comes in a variety of colors, fits well in massed beds or borders in sun or light shade where watering is regular activity as it prefers moist soil. Nicotiana grows easily from seed that drops from the flower; if you're lucky some of these plants will live through the winter and give you a head start on next year's flowers.

If you can provide frequent watering and fertilizing, deadheading of faded flowers and enjoy full sun, warm days and cool nights, geraniums can be used effectively. They're often best left for container accents, although some of the new hybrid grown from seed make effective bedding plants.

Shade is a problem in many golf course situations with dense and mature trees and large buildings, but is one successfully overcome with the right choice of annuals. Wax begonias in tones of white, pink or red are about the best of the shade annuals because they are more drought tolerant than the others. Their neat, mounded appearance is desirable in formal borders and beds.

The impatiens is one of the favorite shade annuals for its ease of care. Where soil is dry or sun hits the beds for long periods of time, impatiens will need watering to prevent wilt. Be cautious when choosing impatiens varieties as there are some with strong orange, coral or fuchsia hues that do not blend well with other colors. Not well known but nevertheless useful is vinca (periwinkle), not to be confused with the perennial groundcover of the same name. Flowers of pink, white or violet are often highlighted with a contrasting red eye.

The three favorite flowering shade annuals share common characteristics: all will tolerate some sun; all

prefer a rich soil kept moist; and all have flowers that do not need to be removed as they fade, lowering maintenance.

For something different in the darker shaded areas try the bright foliage markings and variegations of coleus. As flower spikes form in late summer, they should be pinched off to keep the plant from going to seed and dying.

Perennial Color

In certain situations, the use of perennials will lower maintenance requirements and still provide color to the course. Some of these low maintenance perennials include astilbe, daylilies, hosta, black-eyed Susan, evening primrose and phlox (where good air circulation exists). The back bones of the perennial border, such as poppies, iris and peonies, are spectacular but will require staking, dividing and other attention and may not be desirable if maintenance is a consideration.

When a plant is needed to cover the ground, select one of the flowering ground covers such as ajuga, hosta or vinca instead of monotone ivy or pachysandra for an added carpeting of interest.

Before you send a crew member out with a new plant and a shovel, plan your planting first, with an eye for exposure, soil type, plant height, color, texture and bloom date. Pick the proper plant for the proper place and the result will be a more attractive and more appreciated course.

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IRRIGATION'S ROLE FOR TURF AND LANDSCAPE

By J.D. Butler, Department of Horticulture,
Colorado State University, Fort Collins, Colorado
and
C.M. Feldhake, Department of Agronomy
Colorado State University, Fort Collins, Colorado

Most turf and landscape irrigation interests center on meeting immediate needs. That usually involves producing higher quality than can be had under normal growing conditions. But, for a better understanding of the present role that irrigation plays in urban or general "non-production" agriculture a brief look at the past is in order.

THE PAST

Only a few decades ago, not only was the U.S. population relatively low, it was mostly agriculturally oriented. Thus, the keeping of high quality turf, which was quite common on estates and country clubs, received little attention from the general populace, nor did it carry the social and economic status that it began to achieve with the coming of suburbia. As migration from rural areas to cities and towns increased, and as more and more time and money became available, increased attention was given to producing luxuriant home lawns, recreational turf, etc. Facilities that used turf only for aesthetics and erosion and pollution control began to routinely mow, fertilize and irrigate for fine turf. As people pressures and the social status of having the "best lawn on the block, or the best golf course in town" increased, irrigation's role in landscape maintenance grew by leaps and bounds. As a part of this it became fashionable to water everything, not just the front of a home lawn, or a golf course green. Fence to fence irrigation of golf courses, parks and even roadsides seemed to become more than an option—they seemed to become a requirement.

Now let's look at the present turf and landscape irrigation situation. Reflection on immediate past practices and developments in the turfgrass industry reveals that one of the most rapid areas of advancement has been in irrigation. However, this has not come about without some major costs and problems in the industry. Factors such as energy costs, and water waste must now be seriously considered and solved.

THE PRESENT

Although there are gradual improvements, there is a general need for more attention to proper design and

installation of turf and landscape irrigation systems. Even though there is a wide array of sophisticated equipment available for making delivery of water and for measuring soil moisture, some common problems—improper watering of trees and shrubs by irrigating them only along with the turf, or by "double" watering them with drip or bubblers along with lawn sprinklers—exist. Great differentials in water application also result from heads in low spots on the same valve or time setting as those on a knoll. Plans done in the office from an aerial or topographic map, because of site factors—trees, gravelly areas, etc., are more likely to have major problems than those laid out after intensive on-site inspection.

No matter how good the irrigation is, for best results, precise control must be exercised. Too often the person who determines irrigation practices seems to be a slave to the system, not vice versa. In areas of high precipitation for example, one with a rather evenly distributed 70 inches per year, it is not unusual to find irrigation done every day or two even though it had just rained. Questioning the person who oversees irrigation scheduling provides little (if any) information on the principles and practices of irrigation. Is the irrigation done every day to justify having an expensive system, because the people who put in the system provided little or no training in its use, etc.? Regardless, unless irrigation is done properly, it can have an adverse effect, just as it can have a positive effect in keeping a good landscape when used properly. Irrigation scheduling, unfortunately, for turf and landscape areas still often seems to be done by guesswork. Often it is not even proper to call irrigation (practices) an art. Frequently, the people charged with this important maintenance practice do not have a basic understanding of soils, plants, and climatic conditions and how these relate to irrigation programming.

Moisture sensing devices, evaporation controllers, etc. may not yet perform up to expectation under many turf and landscape conditions. However, they are quite valuable in calling attention to considerations necessary for proper application. The irrigation manufacturer's, designer's, and installer's duties do not end with the selling and putting in of a system. Those who make installation decisions should do as much as possible to see that a system performs up to its full potential. More acute

energy and water shortages will cause an even greater pressure for providing better education and training for more efficient operation.

Irrigation systems used today for turf and landscapes are primarily sprinklers; although flood and subsurface do receive limited use. Bubblers are sometimes used for trees and shrubs. And, more recently, we are seeing an increased use of drip systems for irrigating individual ornamental plants.

Sprinklers, whether pivot with standard or "turf" heads such as those used on many sod farms or small heads that deliver only a few gallons a minute, are well adapted for use on short cut turf. The turf cover can slow runoff and allow for use of application rates that would not be adaptable for bare ground irrigation. Although flood irrigation is occasionally employed for turf areas, it is not well adapted to turf situations where a varying topography is common and even desired, or where continuous play or traffic is desired.

Subsurface irrigation has found some use as a tool for turf management. It is sometimes used where the water table can be manipulated by opening and closing flood gates, or for golf greens and football fields where gravitational water losses are prevented by a layer of plastic. Subirrigation is sometimes considered as a water saving device in areas where water is a very valuable commodity.

As water and energy become more and more scarce, irrigation system selection will receive increased attention. Systems with greater capacities—so that all needs can be satisfied during times (night, windless periods, etc.) of low evaporative losses, or when energy is more readily

available—will likely occur. Also, pressure requirements to do the job will no doubt receive even more scrutiny than is given at the present time.

On-site influences upon irrigation requirements are of great concern in turf management. Microenvironmental influences of south and west facing slopes, concrete pads, shade, etc. can greatly influence turf and landscape water requirements. An area partially shaded by trees may require much more water than an open area when the needs of the trees are considered. Thus, irrigation design, installation and watering practices should take such conditions into consideration.

Soil conditions that influence irrigation installation and watering procedures are of *great* concern to landscape horticulturists. Soil quality in most landscape situations, because of cuts, fills and inversions, is usually very poor. It is difficult to compare these soils, from an irrigation standpoint, with undisturbed soils that exist for crop production. Infiltration rates, drainage and aeration of heavy, often compacted, soils are greatly reduced on most landscape sites. Note soil component differences illustrated in Figure 1.

Both air and water in the soils have a great influence on plant growth, as well as on irrigation—need for slower precipitation rates, more frequent applications, etc. Because of extensive rooting in porous, well-aerified soils, root development may more than compensate for reduced water holding ability. Thus, irrigation frequency may not need to be nearly as often as practiced. Figure 2 is a diagrammatic illustration of this.



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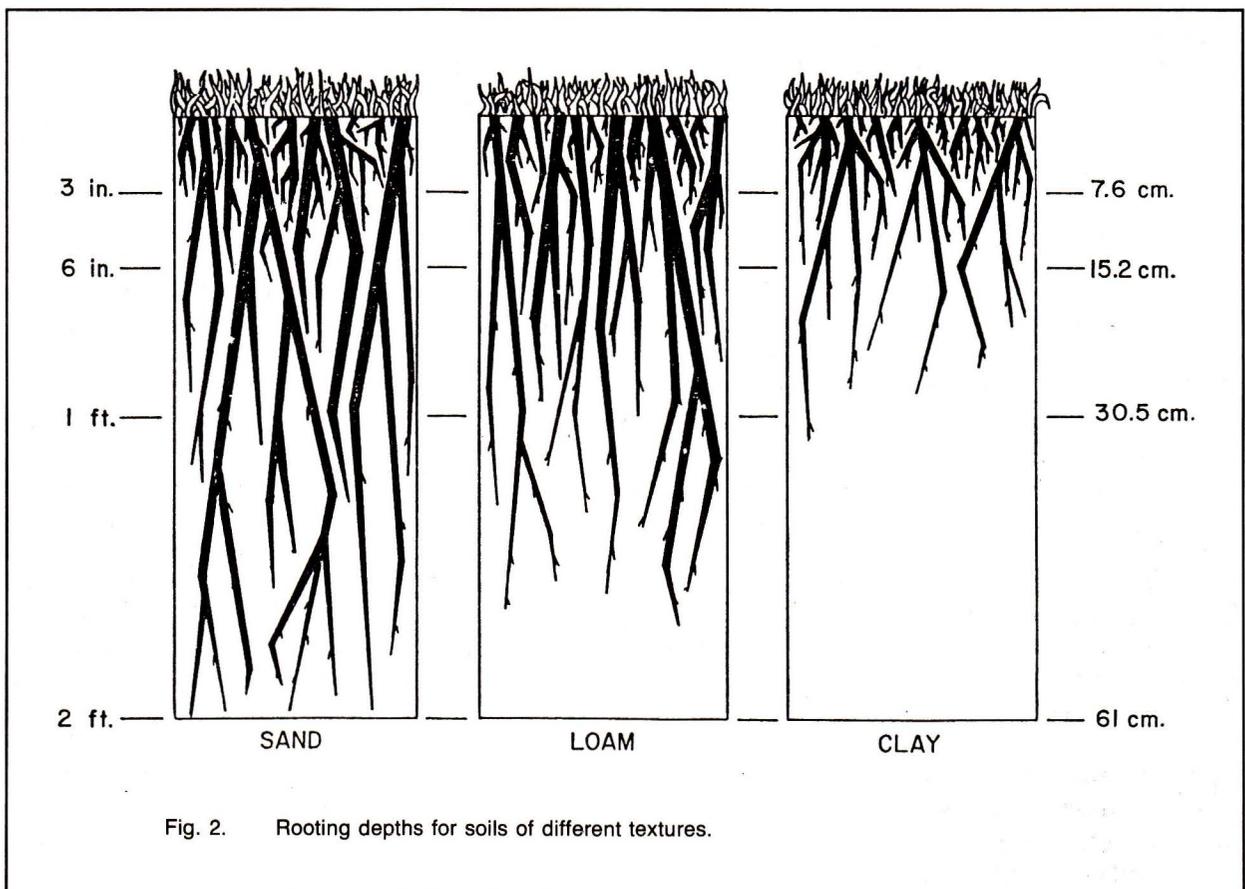
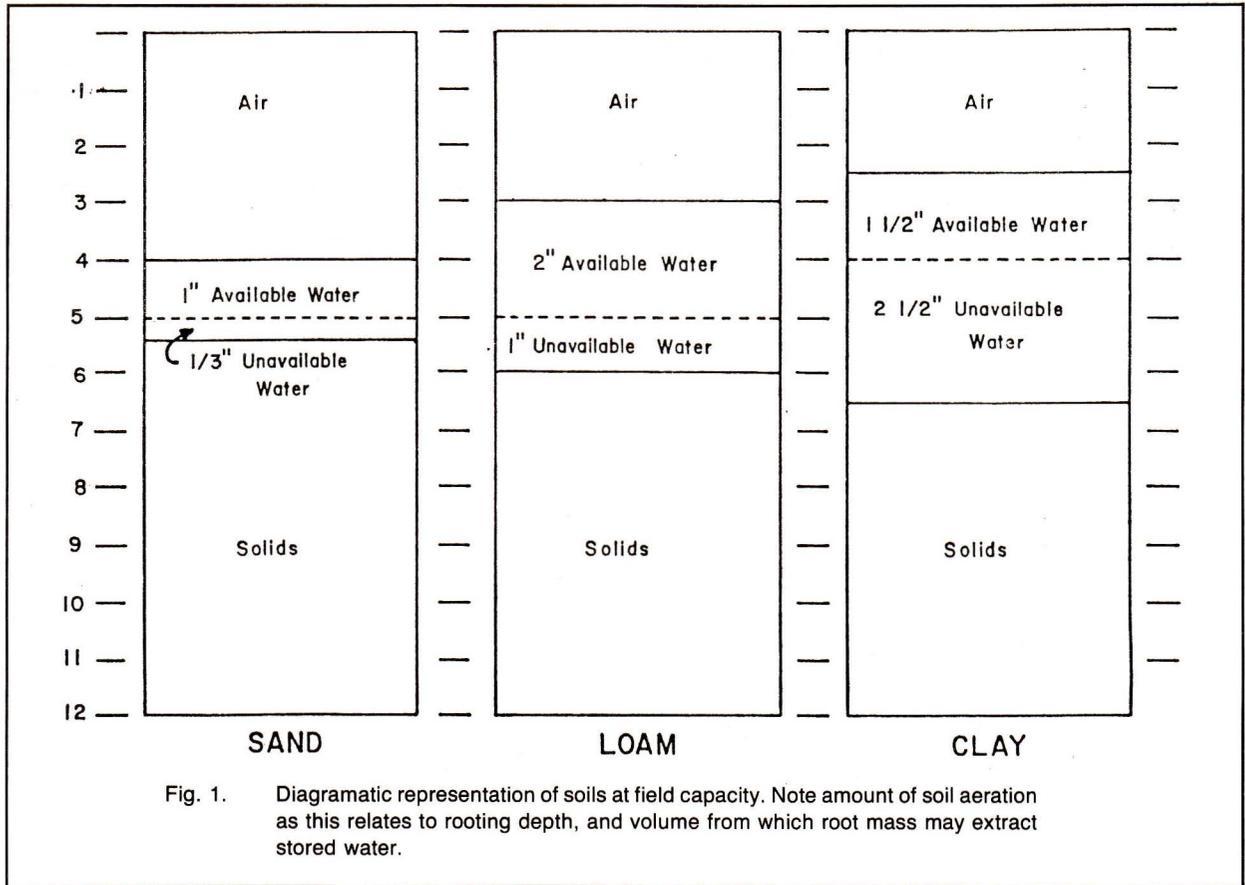


Table 1: Salinity Hazard of Irrigation Water		
Hazard	Dissolved Salt Content	
	ppm	EC × 10⁶
1. Waters for which no detrimental effects will usually be noticed	500	750
2. Waters which may have detrimental effects on sensitive plants	500-1000	750-1500
3. Waters that may have adverse effects on many plants and require careful management practices	1000-2000	1500-3000
4. Waters that can be used for salt tolerant plants on highly permeable soils with careful management practices and only occasionally for more sensitive plants	2000-5000	3000-7500
SOURCE: Franklin.		

Water conservation in recent times has become a major concern throughout most of the U.S. Thus, soil factors—save good soils, improve existing soils, etc.—as well as design and application techniques must be considered in devising methods of making our limited, but renewable water resources meet an ever increasing need. Questions such as how deep to water landscape materials need to be more thoroughly researched.

Water quality, especially as influenced by soluble salts, is often a major concern to the ornamental horticulturist. Good internal soil drainage, which often does not exist in turf and landscape situations, may allow for the use of rather poor quality water. It has been demonstrated that in a sandy media, alkaligrass may be grown by watering with a 50% sea water solution (1).

A test of water for irrigation purposes and the following general criteria (Table 1) for water quality can be useful tools in deciding whether or not to use water from a particular source, and how best to manage it. Also, in turf and other landscape materials, tolerant species can also be utilized to combat salt problems.

Existing landscape materials as well as choices for new plantings can greatly influence water requirements and irrigation practices. In more arid regions, because of water shortages and costs, there is a strong trend away from high water requiring landscape plants. Such infor-

mation can be utilized in choosing plant materials to reduce water requirements.

The shift to totally natural landscapes, except for a few areas of the U.S., will likely not occur. However, increased attention is being given in landscape design to providing for only occasional watering (or mowing, for that matter).

Not only are summer drought problems of concern, winter desiccation—especially of bentgrass and annual bluegrass—must be considered in irrigation design and utilization.

Turfgrass maintenance practices such as fertilization, aerification, topdressing and mowing are important in determining irrigation practices. Recent trends in fertilization—less fertilizer, and application at reduced amounts fairly frequently—would tend to produce less succulent and more hardy turf plants. These should subsist with less water. Mechanical aeration of the soil can reduce runoff, and cause deeper rooting of the grass. This can influence watering practices. Topdressing, often done on golf greens in the north just before winter, can provide a mulch for some desiccation protection. Although Kentucky Bluegrass turf that is cut at 2.0 inches may have greater evapotranspiration than that cut at ¾ inches it has been demonstrated under drought stress that turf cut high will have improved appearance over that cut at fairway height.

THE FUTURE

Turf and landscape irrigation in the future will see great improvements in equipment and its use. Water availability and social pressures associated with its use for non-food crops will greatly influence landscape irrigation happenings. Little, if any, turf will be produced for aesthetics alone. Water quality will become of much more concern as the dependency on effluent and even sea water for irrigation increases. Good soils will be saved, new drought tolerant and pollutant tolerant cultivars will be developed and widely used. People will become highly skilled in using irrigation water. In general, it seems that the problems in landscape irrigation are great, and that the future for those in research and education can be even greater.

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PERENNIAL RYEGRASS UPDATE

Dr. R.H. Hurley
Vice President, Director of Agronomy and Research, Lofts Seed Inc.

Dr. C. Reed Funk
Professor, Soils and Crops Dept., Rutgers University

The improved turf-type perennial ryegrasses (*Lolium perenne* L.) of today are a great improvement over the ryegrasses available just a few years ago. Compared with common perennial ryegrass, they have finer leaves and greater density. They are much more attractive, more persistent, more resistant to many diseases, more shade tolerant, lower growing, easier to mow, and have much better turf forming properties. They are more tolerant of close mowing, cold winters and warm summers. They are also quick to germinate, easy to establish, highly wear tolerant, and will grow on a wide range of soils. Turf-type ryegrasses currently available include: Palmer, Prelude, Yorktown II, Manhattan, Pennfine, Birdie, Citation, Omega, Derby, Diplomat, Regal, Fiesta, Dasher, Blazer, Loretta, Pennant, Delray, Premier, Barry, and Elka. All*Star, Gator and Manhattan II will also be available in quantity following the 1983 harvest. Experimental varieties presently under development show promise of continued improvements in mowability, disease and insect resistance, stress tolerance, attractiveness, ease of maintenance and turf performance.

The rapid, easy establishment of the turf-type ryegrasses has been a prime factor in their popularity with both home owners and turf professionals. With favorable conditions, germination can be expected within five days. A mowable turf can be produced within three weeks with favorable fertility, moisture and temperature. They can provide a quick temporary turf in heavily shaded areas. Their excellent seedling vigor, tillering ability and wear tolerance make them very useful on school grounds, play areas, tees, cart paths, and sports fields that receive heavy use especially during cool weather. Manhattan perennial ryegrass is very widely used on soccer fields in Northern Europe because of its excellent wear tolerance, rapid recovery from injury, ability to compete with *Poa annua*, and good winter performance. The ryegrasses are most vigorous during the cool, moist periods of spring and fall and are most wear tolerant during these seasons. They have a tough leaf and a low crown. However, areas receiving excessive wear should receive regular overseeding. Like other turfgrasses, the turf-type ryegrasses show their best wear tolerance under conditions where they are best adapted. Wear tolerance is reduced by disease, shade, insect injury, poor management, or unfavorable environmental conditions.

Mowing Characteristics

All ryegrasses presently available may be difficult to mow neatly at certain seasons. The improved turf-types generally mow well during the cool, moist seasons of early spring and fall, but with greater difficulty during their reproductive period in late spring and during periods of heat and drought. Frequent cutting with a sharp, well-adjusted mower is very important in the maintenance of an attractive ryegrass turf. Infrequent mowing reduces turf quality and lowers turf density. Improvement in mowing quality is a prime objective of turfgrass breeders.

The improved turf-type varieties all show very substantial improvements in mowing quality when compared with common perennial ryegrass and varieties such as Linn, Game and Cropper. When conditions are favorable, the better turf-type ryegrasses can be mowed cleanly with little difficulty. Elka, Loretta and Gator normally show the best mowability during cool weather. The more heat tolerant varieties such as Palmer, Prelude, Premier, Manhattan II, Citation and Gator show less loss of mowing quality during hot weather and rank highest during the summer months. Early maturing varieties including Regal, Citation, Derby, Pennfine and Pennant produce an abundance of stemmy reproductive tillers during late spring and often become difficult to mow at this season. The later maturing varieties such as Palmer, Elka, Loretta, Gator, Manhattan II, Yorktown II, and Blazer, are less likely to have an excessively stemmy turf during their reproductive stage.

Summer Performance

Many turf-type ryegrasses including Palmer, Prelude, Yorktown II, Gator, Premier, All*Star, Pennant, Citation, Manhattan II, Pennfine, Omega, Fiesta, Dasher, Blazer, Delray, Derby and Regal show substantial improvements in heat tolerance and summer performance. Increased resistance to the *Rhizoctonia* brown patch disease is an extremely important factor in improved summer performance in warm, humid climates. The newer turf-type varieties developed from germplasm collected from old turfs of the mid-Atlantic region of the United States have shown significantly improved resistance to this disease.

Winter Performance

Most of the improved turf-type ryegrasses are substantially more winter hardy than common perennial ryegrass. Yorktown II, Manhattan and Omega showed the best winterhardiness in Vermont tests. Delray has done well in the upper Midwest. Nevertheless, additional improvements in winter hardiness are needed for the more severe climates. Winter kill is often observed in wet, depresses areas where ice sheets are present for prolonged periods. Improved resistance to winter diseases, including snow molds and a winter leaf spot, is also an objective of ryegrass breeders. Palmer, Prelude, Yorktown II, Manhattan II, Manhattan, Blazer, Omega, Gator, and Premier show improved resistance to the winter leaf spot disease.

Endophyte Enhanced Insect Resistance

Recent studies in New Zealand (Prestidge, Pottinger, and Baker, 1982) have demonstrated a positive association between resistance to the Argentine stem weevil (*Hyperodes bonariensis* Kuschel) and the presence of an endophytic fungus present within the tissues of some perennial ryegrass plants. Scientists at the New Jersey Agricultural Experiment Station have demonstrated that resistance to the sod webworms (*Crambus* spp.) attacking New Jersey turf trials was positively associated with the presence of this *Lolium* endophyte. Of 17 ryegrasses studied, the nine entries containing the endophyte showed high resistance to sod webworms, whereas, the eight ryegrasses not containing the endophyte were severely damaged. Resistance of ryegrasses to billbugs (*Sphenophorus parvulus* Gyllenhal) also appeared to be associated with the presence of the *Lolium* endophyte. This discovery of endophyte enhanced resistance to a number of important insect pests should encourage the development and maintenance of varieties possessing this novel and broad-based system of pest resistance. The insect resistance observed in the varieties GT-II, Pennant and All*Star appears to be associated with their high levels of the *Lolium* endophyte. This concept of endophyte enhanced insect resistance will require important modifications in present methods of breeding for pest resistance and in seed production and seed storage practices. This is due to the observations that the endophyte is transmitted primarily by seed and vegetative propagation. Also, in the absence of cold storage, the *Lolium* endophyte will gradually lose its viability and effectiveness as seed is stored for prolonged periods.

Rust Resistance

Crown rust incited by *Puccinia coronata* Cda. frequently causes discoloration of turf during late summer and early fall. This is most likely to occur if growth is slowed by low fertility or moisture stress. Palmer, Prelude,

Elka, Gator, Loretta, Premier, Fiesta, Delray and Pennant showed the best resistance in recent New Jersey trials (Kopec et al 1983). Dr. William A. Meyer has recently made a very significant breakthrough by developing varieties with good resistance to the stem rust disease incited by *Puccinia graminis*. Manhattan II, Cowboy and a number of new experimental varieties show good resistance to this disease.

Future Outlook

The past 15 years have witnessed the origin and early development of the new turf-type perennial ryegrasses. The first certified seed field of Manhattan was harvested in 1968. All other improved turf-type ryegrasses mentioned were released after 1970. Considerable effort is currently being devoted to the further genetic improvement of ryegrasses in both North America and Europe. A number of exciting new germplasm sources are being discovered in old turfs and in hybridization and recurrent selection programs. The next 15 years will hopefully bring as many new advances in ryegrass improvement as we have accomplished in the past 15.

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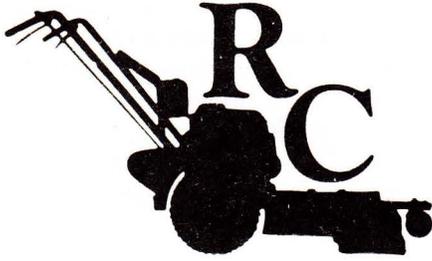
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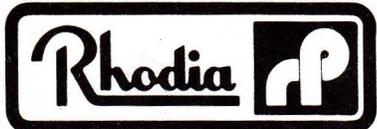
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CRABGRASS - A COMMON TROUBLESOME WEED IN TURFGRASSES

Prasanta C. Bhowmik, Assistant Professor of Weed Science
Department of Plant and Soil Science, University of Massachusetts, Amherst

Crabgrass (*Digitaria* spp.) is an aggressive and persistent summer annual. This grass weed is very common in turfgrasses and poses a serious threat to lawn management practices. Many species such as large crabgrass [*Digitaria sanguinalis* Scop.] and small crabgrass [*D. ischaemum* (Schreb) Muhl.] are common in turfgrasses. These species grow at accelerated rates during the hot, summer days, while cool season lawn grasses grow slowly or even may remain dormant. Thus, they compete effectively with desirable turfgrasses and survive through the undesirable growing conditions. These species are particularly troublesome in thin undernourished lawns. In general, crabgrasses have a competitive edge due to their physiological makeup (C₄ species) over the lawn grasses. Most homeowners, turf managers, and lawn care operators will agree that crabgrass is a problem weed in most lawns.

A single crabgrass plant may produce thousands of seeds. These seeds are dormant during the winter and cool spring. As well, these seeds can remain dormant in the soil for many years and therefore can be expected as an abundant weed for several years following a year of heavy infestation.

Crabgrass germination is related to soil temperature. When the soil temperature reaches 65°F, crabgrass begins to germinate. This varies with the local conditions of soil type, rainfall and weather in early spring. In Massachusetts, crabgrass begins to germinate in early May.

Selective control of crabgrass in turf lawns has become a standard practice. Effective crabgrass control can be achieved by the use of a number of selective preemergence or postemergence herbicides. Several registered herbicides are recommended for crabgrass control in Massachusetts (Table 1).

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Table 1. Trade, common and chemical names of herbicides recommended for crabgrass control in Massachusetts.

Trade	Common	Chemical
Preemergence		
Balan	benefin	N-butyl-N-ethyl- α, α, α -trifluoro-2,6-dinitro-p-toluidine
Betasan	bensulide	O,O disopropyl phosphorodithioate S-ester with N-(2-mercaptoethyl) benzensulfonamide
Dacthal	DCPA	Dimethyl tetrachloroterephthalate
Ronstar	oxadiazon	2-tert-butyl-4-(2,4-dichloro-5-isopropoxyphenyl) - Δ^5 -1,2,4-oxadiazolin-5-one
Tupersan	siduron	1-(2-methylcyclohexyl)-3-phenylurea
Postemergence		
Methane arsonate	MSMA DSMA	Monosodium methane arsonate Disodium methane arsonate

Preemergence herbicides are directly applied to the turfgrass before the emergence of crabgrass. Thus, the applied herbicides create a chemical barrier at the top few inches of soil. This barrier prevents crabgrass seedlings from emerging and developing. Timing of the herbicide application is therefore important for effective control. Preemergence herbicides need to be applied before crabgrass germinates in the spring. Treatments made too late (i.e. after crabgrass germination) will not control early germinating crabgrass.

Several preemergence crabgrass herbicides were evaluated at the Turf Research Farm, University of Massachusetts. The field results from the 1982 and 1983 growing seasons are presented in Table 2.

Most of these herbicides are effective in controlling large crabgrass. Bensulide (7G or 4EC) at 7 and 10 lb/A active, oxadiazon at 3 lb/A active, and DCPA AT 10 lb/A active provided excellent crabgrass control in 1982 and 1983.

Table 2. Preemergence control of crabgrass in Kentucky bluegrass - red fescue mixed turf studies conducted at the Turf Research Farm, University of Massachusetts, Amherst, during the period of 1982-1983.

Herbicide	Rate (lb ai/A)	Control ^a	
		1982	1983
		—	(%)
Bensulide (7G)	5	79	94
Bensulide (7G)	7	94	99
Bensulide (4EC)	5	71	98
Bensulide (4EC)	10	99	100
Oxadiazon (50WP)	3	100	100
DCPA (75WP)	10	98	98
Napropamide (5G)	1	71	82
Bensulide (4EC) + Napropamide (5G)	5 + 1	96	99
Check	-	0	0

^a Rated July 27, 1982 and July 8, 1983

Treatment with the combination of bensulide (4EC) and napropamide (5G) at 5 + 1 lb/A active also gave excellent crabgrass control. No turf injury was observed due to these treatments in both years except that oxadiazon at 3 lb/A active resulted in some initial injury to the turf in 1982. However, none of these treatments gave season long (16 weeks or more) crabgrass control. Reinfestation of crabgrass occurred during this period. The results also indicate that treatments did not provide crabgrass control (30-60% control) in the following season. This suggests the need for yearly application of preemergence herbicides for crabgrass control. Another study is in progress

at the Turf Research Farm to determine the rate and frequency of application of several registered preemergence herbicides for crabgrass control.

Postemergence control of crabgrass can be achieved by selective herbicides. At present, DSMA and MSMA are recommended for postemergence crabgrass control in Massachusetts. Treatments are generally applied to the emerged crabgrass seedlings. Success with postemergence herbicides depends on the timing of application, the coverage, and the weather condition. Fair to good control of crabgrass can be obtained with the herbicides available at the present time.

Two new selective herbicides are in the experimental stage at our research farm and other locations. UC-77892 is a selective preemergence herbicide, showing great potential for the future. The 1983 results show excellent crabgrass control without any phytotoxic effect to Kentucky bluegrass. A new postemergence herbicide (HOE A2501) shows great promise in crabgrass control (1983 data). A split application of the new product provided excellent control during the entire season without any injury to the turf. Further research is needed to fine-tune the performance of these two new products.

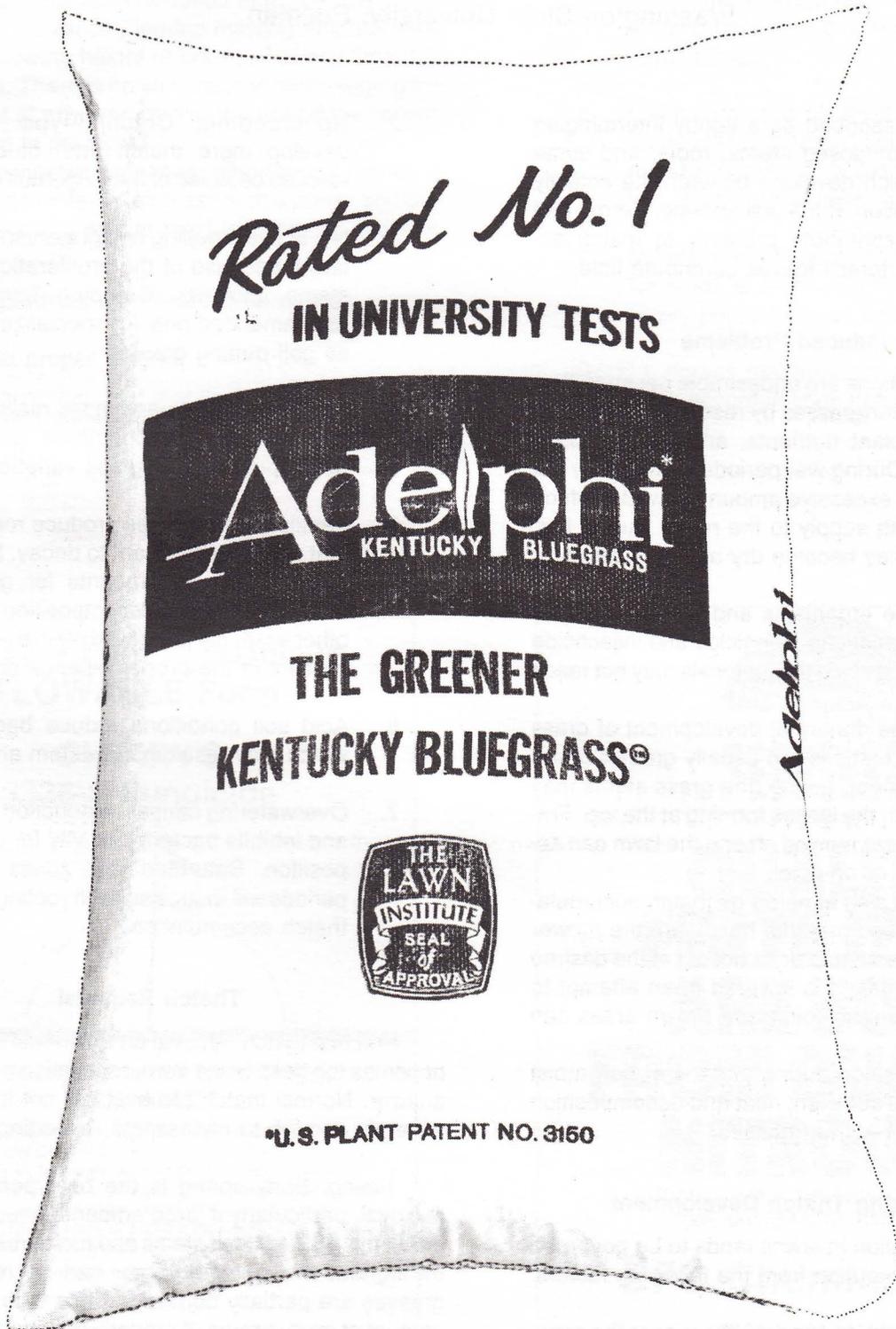
Crabgrass is a troublesome weed in turf lawns. Turf managers should keep in mind that part of the difficulty in controlling crabgrass stems from its seasonal variation in germination. Late germinating crabgrass may appear during the mid-summer. During this period, the residual activity of herbicides in the soil declines. In addition, the potential for high seed production acts as a source of reinfestation.

Crabgrass control in lawn grasses is possible. Choose the most effective herbicide with maximum safety to the turfgrass. Changing the use of one class of herbicide to another class in our weed management program may provide a wide spectrum of weed control in lawn grasses. Turf managers and lawn care operators should emphasize a preemergence herbicide program for crabgrass control with good management practices. This approach will minimize the competitive advantage of C₄ species like crabgrass.

Turf Field Day - 1983

The University of Massachusetts Turfgrass Field Day was held on June 22 at South Deerfield. Field studies exhibited at the Turf Research Station ranged from growth retardant and pesticide studies to fertility and low maintenance turf studies. James Snow, from the USGA Green Section was guest speaker at the box luncheon held on Mt. Sugarloaf.

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THATCH AND ITS CONTROL

Prepared by Roy L. Goss, Extension Agronomist
Western Washington Research and Extension Center, Puyallup
Washington State University, Pullman

Thatch can be described as a tightly intermingled layer of partially decomposed stems, roots, and some leaves of grasses which develops beneath the actively growing green vegetation at the soil surface. Stems and roots of turfgrasses contribute primarily to thatch accumulations, while turfgrass leaves contribute little.

Thatch-Induced Problems

Thatch accumulations are undesirable because they decrease the vigor of turfgrasses by restricting the movement of air, water, plant nutrients, and other applied materials to the soil. During wet periods, thatch may act as a sponge and hold excessive amounts of water which can reduce the oxygen supply to the roots. During hot, dry weather, thatch may become dry and very resistant to wetting.

Turfgrass disease organisms and insects are harbored in thatch accumulations. Fungicide and insecticide effectiveness is reduced since the materials may not reach the pests.

Thatch may cause abnormal development of grass plants. Thatch accumulations are usually greater under high cutting management; hence, the grass stems may become elongated with the leaves forming at the top. Frequently, these leaves are mowed off and the lawn can appear brown, scalped, or off-color.

Mowing height is also affected by thatch accumulations. As undecomposed material builds up, the mower tends to ride on the thatch and does not cut at the desired height. If the cutting height is lowered in an attempt to overcome this problem, scalping and brown areas can develop.

Thatch decomposition during periods of hot, moist weather may generate sufficient heat and decomposition products can injure or kill turfgrasses.

Factors Causing Thatch Development

Thatch accumulation in lawns tends to be governed by the degree of contribution from the following factors:

1. **Mowing Height.** In general, the higher the mowing height, the greater the tendency to produce thatch. Mow grasses for the specific height recommended for each variety and geographic region.
2. Noncreeping, Colonial-type bentgrasses develop more thatch than bluegrasses and fescues because of their vigorous growth habits.
3. Never use creeping bentgrass varieties for home lawns because of the proliferation of creeping stems (stolons). Creeping bentgrasses are recommended only for specialized areas, such as golf putting greens.
4. Stems and roots are more resistant to decay than leaves and contribute most to thatch development in all grass varieties.
5. Fertilizer deficiencies produce roots and stems that are more resistant to decay. Nitrogen is required in ample amounts for growth and to stimulate bacterial decomposition of thatch. The other essential plant food elements must also be present in the proper balance as well.
6. Acid soil conditions reduce bacterial activity which may result in slow stem and root decay.
7. Overwatering causes a reduction in soil oxygen and inhibits bacterial activity for thatch decomposition. Saturated root zones for extended periods will induce surface rooting and enhance thatch accumulation.

Thatch Removal

Practice thatch removal on an annual basis. If thatch becomes too deep in the lawn, renovation may be the only answer. Normal thatch removal will not injure the lawn severely enough to necessitate reseeding.

Timing. Early spring is the best period for thatch removal, particularly if large amounts need to be removed. At this time all dead stems and roots which accumulate throughout the fall and winter can be removed. Turfgrasses are partially dormant at this time and the least amount of injury occurs. If properly thatched, lawn grasses will recover quickly and exhibit their normal beauty when conditions are suitable for growth. If light thatch removal is all that is required, thatching can be done any time of the year.

Power rakes, rotary mower attachments, or other mechanically driven thatch machines are superior to hand rakes. Considerable force is necessary to slice or scratch into the grass mat and remove all of the dead material. Less thorough jobs are done with hand rakes. Operate thatch machines across the turf in two opposite directions. Remove loosened material before changing directions.

After thatch has been removed from the lawn, mow immediately at the recommended mowing height. Never increase the mowing height of lawn turf at any time during the season. There is no valid reason for changing the mowing height at any time during the year if the recommended height is practiced.

If thatch becomes unmanageable (over 2 inches in depth), it is best to remove all grass with a power sod cutter, cultivate the soil, and re-seed to desirable grasses.

Suggestions for Thatch Prevention

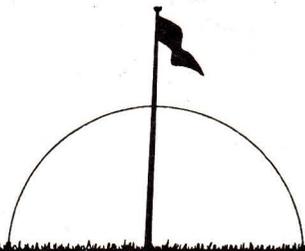
1. Cut at proper height.
2. Maintain adequate fertilization programs.

3. Water thoroughly and infrequently, never light, frequent irrigations.
4. Check the depth of the soil and examine the soil moisture content frequently during the irrigation period.
5. Aerate the soil with hollow-tined aerifiers if they tend to become compacted or if water is not penetrating.
6. Maintain proper pH levels. If the soil becomes too acid (5.5 or lower) light applications of lime may be beneficial to aid in thatch decomposition. Employ soil tests to determine this.
7. Maintain adequate nutrition for normal growth. Nitrogen is especially important to stimulate heavy populations of bacterial organisms.

Good turfgrass management programs will help to prevent thatch accumulations and will aid in maintaining a lawn of beauty.

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