CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

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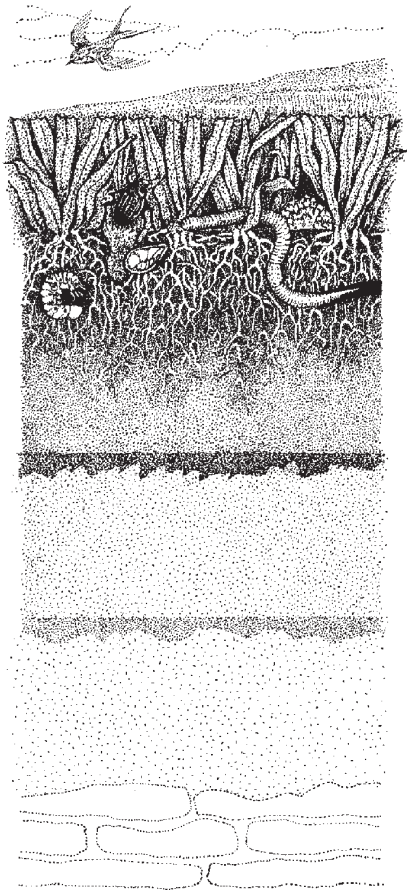

Annual Bluegrass Biology and Control

Annual bluegrass (*Poa annua* L.) is one of the most persistent and troublesome weeds of high-maintenance cool season and warm season turfgrasses. It is well adapted to close mowing, high nitrogen fertilization, frequent irrigation, and compacted soils, and is a primary invader in damaged or open areas. Consequently, it is sometimes maintained as a monoculture (if you can't beat it—join it?) but requires intensive maintenance and frequent fungicide treatments. It is generally considered a weed in intensively managed turf because it is a prolific seedhead producer, susceptible to heat, drought and many diseases, and is unsightly when mixed with other grasses. ■

The climate, location, level of the infestation, and management of the turf infested with annual bluegrass will determine the most appropriate and effective methods for managing this pest. The first and most important step in attempting to control any weed is to first identify it and understand its life cycle.

Biology and Life Cycle

Poa annua is classified into two major plant types or subspecies: annual (*Poa annua* ssp. *annua*) and perennial (*Poa annua* ssp. *reptans*). The primary differences between the subspecies are the root system, growth habit, seed production and, of course, the life cycle (Table 1). Within each subspecies, are biotypes which differ in subtle ways. For example: a biotype collected from fairway turf may not survive the close mowing on a green; whereas, the biotype from the green will survive fairway conditions but may be less competitive at the higher mowing height. Clearly, the most important difference affecting control decisions is the difference in the life cycle—annual vs. perennial. The perennial subspecies is more difficult to control because of its ability to survive summer heat and drought, which would kill the annual subspecies, by entering a summer dormancy and resprouting when weather is more conducive to growth. Another difference worth noting is seed dormancy. Seed of the perennial subspecies have no dormancy requirement and can germinate at any time of year. In contrast, seed of the annual biotype must go through an after-ripening period which delays germination to the late summer or early fall (and sometimes in early spring).

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This Times

Short Cutts

1993 Cornell Turfgrass Field Day

June 10, 1993, at the Turfgrass Research Field Laboratory in Ithaca, NY

Dr. Joe Neal 1993 Award Winner "Outstanding Applied Research in Turf, Ornamentals, and Conservation Crops"

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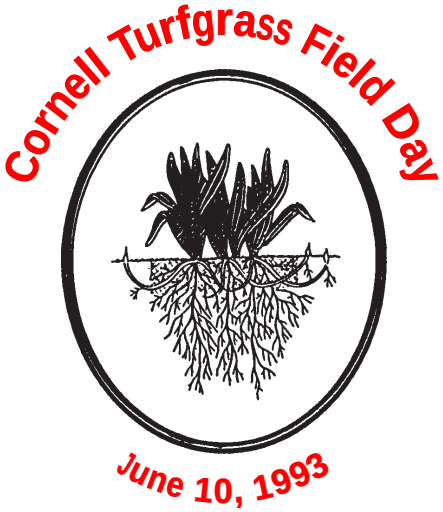
1993 Cornell Turfgrass Field Day *June 10 in Ithaca*

Come one, come all, to the 1993 Cornell University Turfgrass Field Day. Hoping we can avoid the intense heat of the past three Field Days, we're having it a little bit earlier this year, Thursday, June 10 to be exact. The Field Day is a great opportunity for you to see the turfgrass research ongoing at Cornell—research that you have supported, and research addressing the immediate and future needs of our industry.

The Field Day is held at the Turfgrass Field Research Laboratory in Ithaca. As in the past, most of the day will involve a tour of selected research projects at the "Plots". A trade show and noon feed will be included as well.

Tour highlights will include: biological control of weeds and diseases; variety trials, including the latest buffalograss and zoysiagrass tests (for those of you who like the unusual); leaching studies, including a new study on the affect of amendments on leaching, and core cultivation effects on leaching; chemical control of weeds; an IPM lawn demonstration; compost utilization studies; a greens rolling study; and much, much more. Pesticide recertification credits will be offered.

While plans are still pending, there may be a golf tournament June 9. You will receive a separate mailing with registration information on the field day and golf tournament sometime in early May. We hope to see you there.



Joe Neal Receives Award (and More)

We are pleased to announce that Dr. Joe Neal, turf and ornamentals weed scientist in the Department of Floriculture and Ornamental Horticulture, was the recipient of the 1993 Award for "Outstanding Applied Research in Turf, Ornamentals, and Conservation Crops". The award was presented by the Northeast Weed Science Society at their annual meetings in January. Those of you who have worked with Joe know how deserving he is of this recognition.

Joe and his wife Brenda are also the proud new parents of a baby girl, born February 16. Be sure to congratulate Joe the next time you see him.

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Smooth Crabgrass Control With Low-Rate Fenoxaprop

Fenoxaprop applied at the usually recommended rate for smooth crabgrass control (2.8-5.7 oz ai/A) is toxic to sensitive turfgrass species such as creeping bentgrass and bermudagrass. These species can, however, tolerate low rates (0.6 oz ai/A) of the herbicide. Researchers at the University of Maryland conducted a 2-year field experiment using perennial ryegrass plots to determine if the low rate of fenoxaprop would provide adequate smooth crabgrass control. The workers found that rates of 0.5-0.65 oz ai/A were indeed effective when applied every 2-3 weeks. However, to be successful, treatment must begin early, when smooth crabgrass is in the 1 to 2 leaf stage and continue without interruption until emergence has ceased in mid to late summer. Further research is necessary, nevertheless, to discover whether or not bentgrass and other sensitive species will tolerate such frequently repeated applications of fenoxaprop, even at the low rate.

(From: P.H. Dernoeden, M.J. Mahoney, and M.J. Carroll. 1992. Smooth Crabgrass Control in Perennial Ryegrass with Repeated Low Fenoxaprop Application Rates. HortScience 27(9):1001-3.)

A New Turfgrass Disease in Southeastern PA

A severe foliar disease of perennial ryegrass was observed on fairways in southeastern Pennsylvania during late summer 1991, coincident with overseeding work on many golf courses in the local area. Symptoms are similar to gray leaf spot of St. Augustine grass and blast of annual ryegrass. Initial symptoms include small, oval, brown lesions or spots (1-3mm) with a darker brown border. On mature plants, the spots are enveloped by chlorotic tissue, which subsequently spreads to the rest of the leaf. Leaves may become tan and appear blighted, but crowns are not usually damaged. Diseased seedlings appear blue gray, with a flaccid, water soaked look. Many seedlings collapsed 4-5 days after disease onset and survivors showed extreme leaf necrosis. Within a single week of symptom expression, chlorotic and blighted fairway turf could be seen in large irregular areas several meters in diameter.

Researchers at Penn State University determined the causal agent to be the fungus *Pyricularia grisea.* This organism is known to cause blast of annual ryegrass and gray leaf spot of St. Augustine grass in the south, but has not previously been reported on perennial ryegrass. Both diseases are exacerbated by warm and humid weather and high rates of N fertilization, and are more dangerous to seedlings than to established plants. It is not known whether resident populations of *P. grisea* caused the outbreak or if the pathogen was seedborne or even airborne, carried from the south by a passing tropical storm.

(From: P.J. Landschoot and B.F. Hoyland. 1992. Gray Leaf Spot of Perennial Ryegrass Turf in Pennsylvania. Plant Disease 76(12):1280-2.)

Control of *Poa annua* in Kentucky Bluegrass

Researchers at the University of Guelph, Ontario, investigated the use of linuron for post-emergent control of *Poa annua* in Kentucky bluegrass (KBG). In 3 years of trials using 16 KBG cultivars established for 1 year or longer in field plots, the Canadian workers found that linuron applied at 1.3 to 1.8 lb/A controlled *Poa annua* with little or no damage to KBG. Newly seeded KBG cultivars, however, were severely damaged at similar rates, but nevertheless made a complete recovery 6-7 weeks following treatment.

Linuron was most effective when applied in mid May to early June. Summer applications are not recommended due to the greater potential for damage to KBG when heat or drought stressed, as well as the reduced efficacy of the herbicide on established *Poa annua*.

Before you rush out to buy this product, however, take note that linuron is currently not labeled for turf in either Canada or the U.S.

(From: J.C. Hall and C.K. Carey. 1992. Control of Annual Bluegrass (Poa annua) in Kentucky Bluegrass (Poa pratensis) Turf with Linuron. Weed Technology 6(4):852-7.)

Scanning the Journals

A review of current journal articles

Researchers at the University of Maryland asked if a low rate of fenoxaprop would provide adequate smooth crabgrass control. They found that rates of 0.5-0.65 oz ai/A were effective when applied every 2-3 weeks.

In 3 years of trials on established Kentucky bluegrass plots, Canadian workers found that linuron applied at 1.3 to 1.8 lb/A controlled* Poa annua *with little or no damage to KBG.

Annual Bluegrass

continued from cover

Annual bluegrass* (Poa annua *L.) is one of the most persistent and troublesome weeds of high-maintenance cool season and warm season turfgrasses.

The climate, location, level of infestation, and management of the turf infested with annual bluegrass will determine the most appropriate and effective methods for managing this pest.

Control Methods

After annual bluegrass has been correctly identified as the annual or perennial subspecies, control methods can be considered. Three methods employed to control annual bluegrass are cultural, chemical and biological. To achieve satisfactory control a combination of these methods may be necessary. Cultural control methods utilize management practices that favor the growth of desirable turfgrasses while reducing the vigor and competitiveness of annual bluegrass. These management practices which may be adjusted include fertilization, mowing height and equipment, irrigation, and aerification. The primary chemical control methods, herbicides and plant growth regulators, either kill or suppress the weed. The biological control method uses a bacterium, *Xanthomonas campestris* pv. *poannua*; however, it is still in the research and development phase.

Table 1. Comparison of *Poa annua* ssp. *annua* and *Poa annua* ssp. *reptans*.

Annual Subspecies	Perennial Subspecies
shallow root system	strong fibrous root system
erect growth	prostrate growth
produces seedheads in May and June	produces seedheads several times per season
one life cycle in one season	one life cycle in several seasons

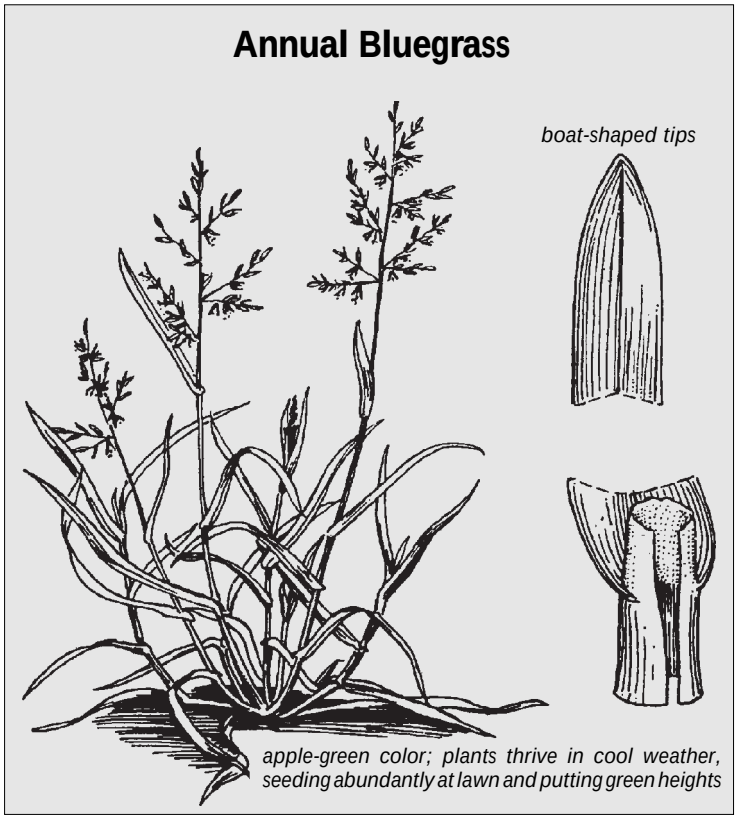
Cultural Control

Weed management via cultural methods requires careful planning, close observation and patience. The key to managing turf is to keep the desirable species as healthy as possible in order to favor its growth over the weed (Table 2). The five steps for reducing annual bluegrass competition include:

1. Prevent or reduce compaction,
2. Avoid excess irrigation,
3. Avoid excess N fertilization,
4. Clipping removal, and
5. Proper mowing height.

Excess moisture and traffic induce compaction and shallow rooting, conditions which favor annual bluegrass. Lightweight mowers and traffic reduction reduce compaction while core cultivation relieves compaction. Good soil structure will provide better drainage and water and air penetration. This encourages better root growth and competition in the desirable turfgrass species.

Proper irrigation alleviates excess moisture, providing better soil aeration and consequently better root growth. Also less irrigation in the spring and fall may reduce annual bluegrass seed germination.



Reduced nitrogen (N) fertilization is the key to reducing annual bluegrass competition. Creeping bentgrass, a desirable turfgrass, grows best under lower fertilization, in comparison to annual bluegrass which grows best under high fertilization (Table 2). In some situations, iron (Fe) may be used for turf "greenup" instead of higher N rates. Other advantages of lower N fertility are increased green speed and reduced clippings. Under certain conditions, low phosphorus rates have been observed to reduce annual bluegrass growth by reducing its ability to compete with desirable turfgrass species.

Mowing height may also serve as a *Poa annua* L. management tool. Annual bluegrass is a very "plastic"

species; in other words, it can adapt to a wide variety of conditions, including mowing heights from 1/8 inch to 3 inches. In a mixed stand of annual bluegrass and creeping bentgrass, close mowing, less than 3/16 inch, will promote annual bluegrass. Higher mowing heights will tend to favor the more desirable turfgrasses over annual bluegrass; however, annual bluegrass can persist at most any mowing height as long as the desirable turfgrass is not growing vigorously. The key here is to select the optimum mowing height for the desirable turfgrass.

Clipping removal may reduce annual bluegrass competition by reducing its seed reservoir. It may also reduce nitrogen fertility by removing that nitrogen released by the decomposition of grass clippings.

Chemical Control

Chemical control of annual bluegrass includes the use of plant growth regulators and pre- and postemergence herbicides. Plant growth regulators provide *Poa annua* suppression, cover reduction, and reduced competition to allow conversion to a more desirable turfgrass. Paclobutrazol, Scott's TGR, is the only plant growth regulator registered in New York state for annual bluegrass suppression in creeping bentgrass turf (Table 3). When annual bluegrass is suppressed, the resulting irregular growth may reduce playing quality. Paclobutrazol may also discolor desirable turf when applied incorrectly or at the wrong time of year. Injury has also been observed when heavy rain or irrigation have moved the granules to puddles, thus concentrating the herbicide in a small area. Research in New York has found that using the lower labeled rate at the spring application will minimize discoloration.

Preemergence herbicides work well on *Poa annua* ssp. *annua* but have been ineffective in the management of the perennial subspecies, *Poa annua* ssp. *reptans* because (a) no seed dormancy results in an extended season for germination, (b) plants may spread by tillering, and (c) the perennial life cycle does not allow for preemergent control. For these reasons, preemergent herbicides are rarely used for annual bluegrass control in the Northeastern U.S.

Postemergence herbicides control seedling annual bluegrass, reduce seedhead production, suppress established plants, or provide total vegetation control. Ethofumesate, Prograss, is a postemergent herbicide labeled for controlling seedling *Poa annua* in perennial ryegrass, Kentucky bluegrass and creeping bentgrass. It also can suppress established annual bluegrass. Best results have been obtained in perennial ryegrass where higher rates may be used. Rates of application high enough to control established annual bluegrass in one season will injure other turfgrass species. In Kentucky bluegrass or creeping bentgrass multiple applications of $\leq$ 0.75 lb ai/A, applied in the fall and carried out over several years has adequately suppressed annual bluegrass. Some variability in turf and weed responses has been observed.

Calcium arsenate applied at high rates controls established annual bluegrass, but it is currently only registered for use in New York and

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Table 2. Conditions which promote *Poa annua* ssp. and desirable turfgrass species.

	Poa annua ssp.	Creeping Bentgrass	Kentucky Bluegrass	Perennial Ryegrass
Moisture	wet	moderate	moderate	moderate
Soil Conditions	compacted	uncompacted	uncompacted	uncompacted
Core Cultivation	decreases competition relative to desirable species	increases competition relative to annual bluegrass	increases competition relative to annual bluegrass	increases competition relative to annual bluegrass
Nitrogen Fertility	high $\geq$ 4 lbs/1000 ft^2/yr	moderate 2 to 3 lbs/1000 ft^2/yr	low to moderate 1 to 3 lbs/1000 ft^2/yr	high $\geq$ 4 lbs/1000 ft^2/yr
Mowing Height	lower than the recommended height for desirable species	low 5/32 to 5/8 inch	high 2 to 3 inches	moderate to high 0.5 to 2.5 inches
Clipping Removal (*Poa* ssp.)	decreases competition relative to desirable species	increases competition relative to annual bluegrass	generally, no effect	generally, no effect
pH	6.0-7.0	5.5-6.0	6.0-7.0	6.0-7.0

Annual Bluegrass

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Where annual bluegrass comprises greater than 50% of the turf, complete renovation is often the best method of controlling it, though you should determine the underlying reason for the weed's success and correct it first.

Indiana. In the soil the chemistry of the arsenate ion is similar to that of the phosphate ion and the plants cannot distinguish between the two. As levels of arsenate build up, the plants takes up more. When a toxic threshold is reached, the annual bluegrass will die out. Disadvantages include: high rates are necessary for control, sudden loss of *Poa* when toxic levels are reached, and long-term adverse effects on soil phosphate fertility.

Mefluidide (Embark) may be used for annual bluegrass seedhead suppression in Kentucky bluegrass, perennial ryegrass or fescue turf, including golf course fairways. Some discoloration of desirable turf may occur, but can be minimized by using lower rates. Careful rate selection and application is needed to achieve adequate annual bluegrass seedhead suppression without adversely affecting the desirable grasses. Application uniformity is also essential. Avoid skips which may leave conspicuous stripes of seedheads through an otherwise uniform turf.

Where annual bluegrass comprises greater than 50% of the turf, complete renovation is often the best method of controlling annual bluegrass. Apply glyphosate (Roundup), at 2 lb ai/A. Slit seed into the dying turf one week later. Before implementing such a drastic course of action, try to determine the underlying reason(s) for the success

Table 3. Herbicides and plant growth regulators used to control or suppress *Poa annua* L.

Chemical[1]	Type[2]	Rate (ai/A)	NY[3]	Effect on *Poa annua*	Comments
Flurprimidol (Cutless)	PGR	1/2 to 3/4 lb	N	growth suppression	Apply in late spring and again in early fall. Overseed 2-3 weeks after treatment.
Mefluidide (Embark)	PGR	1/16 to 1/8 lb	Y	seedhead suppression	Apply in spring before seedhead emergence. Use spray marker to avoid skips and overlaps.
Paclobutrazol (Scott's TGR)	PGR	1/3 to 3/4 lb	Y	growth suppression	Apply in fall and spring. Late fall treatments may kill *Poa* too quickly.
Benefin (Balan)	PRE	1 1/2 to 2 lbs	Y	controls germinating seedlings	May affect overseeding or reseeding.
Bensulide (Betasan, Lescosan)	PRE	12.6 lbs	Y	controls germinating seedlings	May affect overseeding or reseeding.
Dithiopyr (Dimension)	PRE	0.38 to 3/4 lbs	N	controls germinating seedlings	May be used on bentgrass greens,tees & fairways. May affect overseeding or reseeding.
DCPA (Dacthal)	PRE	15 lbs	Y	controls germinating seedlings	May affect overseeding or reseeding. Do not use in Suffolk Co. NY.
Isoxaben (Gallery)	PRE	3/4 to 1 lb	N	suppression; no effect on established grass	May increase competitive advantage of bentgrass.
Oxadiazon (Ronstar 2G)	PRE	4 lbs	Y	controls germinating seedlings	Do not apply to greens or tees. May affect overseeding or reseeding.
Pendimethalin (So. Weedgrass Ctl, Pre-M)	PRE	1 1/2 to 2 1/4 lbs	Y	controls germinating seedlings	May affect overseeding or reseeding.
Prodiamine (Barricade)	PRE	1/2 to 1 2/3 lbs	N	controls germinating seedlings	May affect overseeding or reseeding.
Calcium arsenate (Turf-Cal)	POE	28 to 500 lbs followed by 2.8 to 10 lbs	Y	controls germinating & established plants	Rates depend on soil type & history. Apply in early fall and/or early spring. Caution: rapid *Poa* loss & altered P fertility.
Ethofumesate (Prograss)	POE	3/4 to 2 lbs	Y	postemergent control of seedlings & suppression of established annual bluegrass	Use the low rate on Kentucky bluegrass, bentgrass or fescue. The high rate is for use on perennial ryegrass only. Expect some yellowing on desirable turf.
Glyphosate (Roundup)	POE	2 lbs	Y	Total vegetation control	For total renovation. Reseed 1 week after treatment.
Fenarimol (Rubigan)	FUNG	2 3/4 lbs	Y	growth suppression	Apply after flowering & continue applications @ 2-3 week intervals.

[1] Plant growth regulators and herbicides are listed as chemicals.

[2] This column defines the type of chemical: PGR=plant growth regulator; PRE=preemergence herbicide; POE=postemergence herbicide; and FUNG=fungicide with herbicidal properties.

[3] This column defines whether the chemical is labeled for use in New York state; Y=yes, N=no.

These suggestions are not a substitute for pesticide labeling. Read the label before applying any pesticide.

of the weed. If you do not correct the underlying problem, annual bluegrass will return.

Biological Control

Because cultural and chemical control methods have been ineffective, biological control is the next area of exploration. The bacterium, *Xanthomonas campestris* pv. *poannua,* was isolated from diseased turf in Michigan and is currently being investigated as a potential biocontrol agent for this weed. It is thought to be endemic to most stands of *Poa annua* L., but at population levels insufficient to cause disease. Mycogen Corporation of San Diego, California, is developing this bacterium as a biological control agent.

Xanthomonas campestris pv. *poannua* has been found in turf from the West coast of California to New York to the southern states of Texas and Louisiana. This bacterium is a facultative parasite which means that it only kills plants when the conditions are favorable for disease development. Plant death is caused by a vascular wilt; the bacterium plugs the xylem, stopping the flow of water and nutrients.

Xanthomonas campestris pv. *poannua* requires a wound to enter the plant and cause disease. This requirement makes the use of this organism in turf ideal because of frequent mowing.

Xanthomonas campestris pv. *poannua* is more effective on *Poa annua* ssp. *annua* than *Poa annua* ssp. *reptans.* Experiments in the field suggest that its effectiveness is largely dependent on environmental factors, such as temperature and drought stress. Gradual conversion from annual bluegrass to a more desirable species is possible with proper application timing and rates. Good cultural management practices enhance the effectiveness of biological control. Further research is necessary to develop this bacterium as a commercial product for annual bluegrass control.

For best results in controlling or managing *Poa annua* L., use turfgrass management practices that encourage growth of the desirable species and reduce the competitiveness of this pest, annual bluegrass. To obtain acceptable levels of control it is necessary to integrate the cultural and chemical control options. Reduce and alleviate compaction, optimize N fertility and irrigation, collect clippings, choose proper mowing heights, and integrate PGR treatments where possible. Also, with any annual bluegrass management program, it is essential to overseed with the most well adapted desirable turfgrass species and varieties for the site and use.

Nancy D. Williams and Joseph C. Neal
Dept. of Floriculture and Ornamental Horticulture

▲ *A sod installation at Cornell University.*

▼ *Sod covers a picturesque golf course.*

Annual Bluegrass is a troublesome weed on sod farms and golf courses.

Pest Watch

continued from back cover

Weeds

There are a couple of weeds that are best dealt with in the spring. In areas where annual grasses such as crabgrass and goosegrass are a problem, preemergence herbicides need be applied before the grasses germinate in early spring. Consult the Pest Management Recommendations and the product labels for specific recommendations.

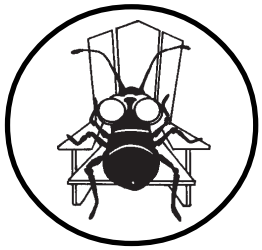
Veronica filiformis is a difficult to control broadleaf weed. The best chemical control is to apply Dacthal when the flower is in full bloom. It may take a month for symptoms to occur.

These are the most likely pests you will have to deal with this spring. As in any pest management program, be sure to properly identify the pest, select a material labeled for the pest, and then apply at the proper rate in accordance with label directions.

Norman W. Hummel, Jr
Dept. of Floriculture and Ornamental Horticulture

For best results in controlling or managing Poa annua L., use turfgrass management practices that encourage growth of the desirable species and reduce the competitiveness of this pest.

Spring Pests to Watch Out For



Pest Watch

Be sure to properly identify the pest, select a material labeled for the pest, and then apply at the proper rate in accordance with label directions.

Spring is a time of the year when turfgrass pest pressures are are not all too bad. There are a few weeds, diseases, and insects, however, to watch out for. Specific control recommendations can be found in the *Cornell 1993 Pest Management Recommendations for Commercial Turfgrass*, available through your local Cooperative Extension Office.

Diseases

The cool, wet weather of a normal spring favors a few diseases. On golf courses and home lawns, watch out for leafspots, especially on bentgrass and susceptible bluegrasses.

Red thread and pink patch may be prevalent during very cool and damp periods, especially on fine fescue and perennial ryegrass.

Pink snow mold may be an early (and sometimes later) spring invader on annual bluegrass, bentgrass and tall fescue.

Low temperature brown patch may be found on bentgrasses and annual bluegrass. Likewise, pythium root rot may have to be dealt with on bentgrass and annual bluegrass.

For a good disease identification book, we suggest the *Compendium of Turfgrass Diseases, Second Edition* (1992), by R. W. Smiley, P. H. Dernoeden, and B. B. Clarke, APS Press, St Paul, MN.

Insects

Sometimes you may not notice the presence of white grubs in a lawn until spring. Generally, spring is not a recommended time to treat for grubs because they are nearing the end of their larval and root-eating stage. If large populations are present to the extent that damage is occuring, treat for grubs as soon as they are at the surface feeding, normally in April.

The presence of moles in a lawn does not necessarily mean grubs are there—moles feed on other soil fauna as well. Applying an insecticide for moles is a waste of the chemical unless you have confirmed the presence of grubs.

Hyperodes weevil is a troublesome insect on annual bluegrass. In areas with a history of Hyperodes, treat with Dursban or Oftanol between forsythia and flowering dogwood “full bloom.”

A good insect identification book is the *Turfgrass Insect and Mite Manual*, by D. J. Shetlar, P. R. Heller, and P. D. Irish, The Pennsylvania Turfgrass Council, Orchard Road, University Park, PA 16802.

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Cornell Cooperative Extension

Cornell University Turfgrass Times
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