Figure 1. Prograss-missed strips, following a fall overseeding.

The Continuing Saga of *Poa annua*

by STANLEY J. ZONTEK
Director, Mid-Atlantic Region, USGA Green Section

OF ALL THE PUZZLES in turfgrass management, the one involving *Poa annua* and whether to live with it or attempt to control it, is perhaps the most enduring. It has been on the minds of turfgrass managers since at least the early 1920s, when one writer recommended removing it from greens by continual hand weeding. The practice is still being followed today.

With modern equipment, new chemical tools, and a better understanding of the plant itself, golf course superintendents are in the best position ever to decide whether to live with annual bluegrass or to control it. The game has come a long way since Dr. Fred V. Grau wrote his memorable article "*Poa annua* — Friend or Foe?" for the Green Section, in 1948. Golf course superintendents in the northern sections of the United States now have a choice.

Poa annua Control

Realistically, *Poa annua* can be controlled by two methods. First, certain chemicals can either kill the plant or control its germinating seeds, or they can do a combination of both. A second method uses cultural practices such as aeration, irrigation, and fertilization. A single chemical or management practice rarely controls *Poa annua* by itself. The best results are obtained when all those programs are meshed together.

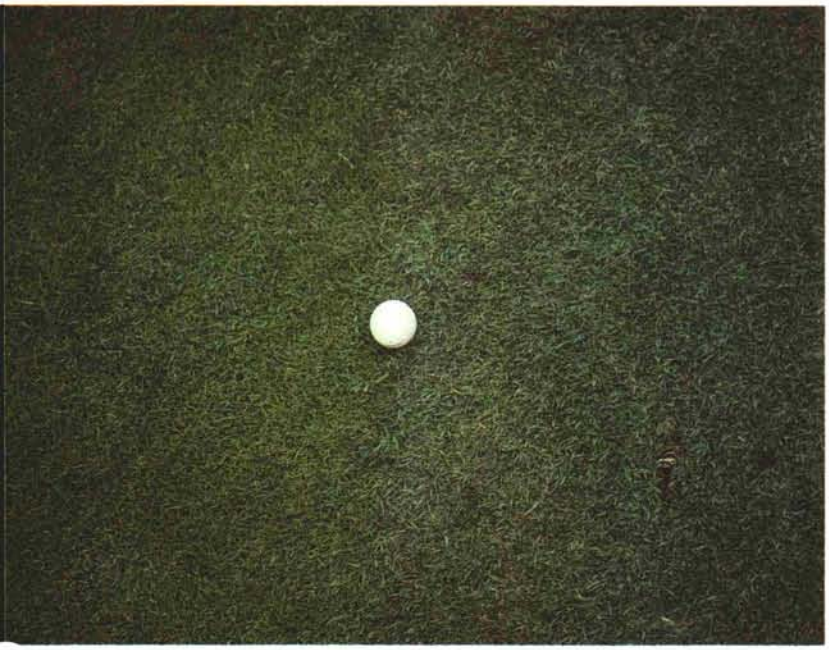
Which program to use should be governed by what is best for you and your course and what materials are registered for use in your state. As always, be sure to follow the labeled rates and suggested timings. Keep up to date. Continuing field and university testing provides new information all the time.

Finally, before you begin these chemical control programs it is always a good idea to see how they will work

(Below) Figure 2. Effect of a PGR on the turf. Note the amount of bentgrass established next to the check and the color of the grass.

(Right) Figure 3. Seedhead control using Embark.

(Opposite page) Figure 4. Lightweight mowing effect. Note the line where the bentgrass stops with lightweight mowing and clipping removal and where the Poa annua *begins without this mowing and management program.*



by testing them first on a limited area of the course. Besides, it is also a good idea to demonstrate to the golfers themselves how these chemicals are used and what they can expect from their application. This experience and exposure is valuable for the success of the program.

1. Arsenical compounds (lead arsenate, tricalcium arsenate). These compounds are old and proved materials for *Poa annua* control. Some states allow them and others do not. Obviously, check this detail before you implement this program. Generally, when care is exercised in the use of arsenical compounds, good and safe control is achieved. Problems arise when these materials are applied under situations where their activity is accelerated and these products work too well, *i.e.*, controlling *Poa annua* in less time than prudence dictates. Too much is lost too fast. Nonetheless, the arsenicals are still available, and if they are applied carefully, they can be effective.

Arsenicals basically work by replacing phosphorus in a most important chemical reaction within the photosynthetic cycle, the conversion of adenosine diphosphate (ADP) to adenosine triphosphate (ATP). This is the "light reaction," requiring sunlight and one phosphorus molecule. The "light reaction" is the reason grass will not grow well in the shade . . . not enough sunlight! Molecularly, arsenic is nearly identical to phosphorus. Thus, when the arsenical is absorbed instead of phosphorus, this important metabolic pathway is blocked, and the *Poa annua* becomes weakened.

Annual bluegrass is controlled at higher arsenical levels, and as the arsenical compounds accumulate in the soil, they also control crabgrass, goosegrass, and soil insects, including earthworms.

Experience shows these materials must be applied carefully. The most successful programs center around slow, gradual accumulations over several years. It is generally found, also, that sandy soils need less arsenical material to effect control (because sand has a lower CED), and clay and other heavy soils need more. The arsenical compounds truly are multi-purpose chemicals, which, in selected areas, continue to be used and remain effective.

2. Prograss. This is a relatively new compound (initially labeled for use on sugarbeets) that has shown quite good results when it is used as labeled for *Poa annua* control in perennial ryegrass. The label is now being expanded to include other grasses. Follow the manufacturer's directions. *(Figure 1.)*

3. Plant Growth Regulators (PGRs). Included in this category are materials such as Cutless and "PGR." For con-

venience, these materials have been grouped together primarily because their method of action is nearly the same to the observer. Basically, these chemicals stunt *Poa annua*'s growth, allowing the non-stunted, desirable grass species to continue growing and eventually crowd the annual bluegrass out of the stand. These are relatively new materials that hold good promise in controlling *Poa annua*, principally on bentgrass fairway turf. Eventually, their use may be suggested on other areas of the course, but their primary use now is on fairways.

The only negative effect of PGRs seems to be some discoloration of the turf, which some people find objectionable. *(Figure 2.)*

4. Rubigan. At higher application rates, Rubigan shows similar plant growth regulating effects as we discussed above. Because this chemical is also labeled as a fungicide and has some preemerge effect on controlling *Poa annua* seed, it is included as a separate item. Some users believe this is an advantage. Gradual suppression of *Poa annua* (especially the annual types) and disease control are notable qualities. To date, the best results with Rubigan have been achieved where it has been used in a continuing, long-term program. This includes applications in the fall, when some preemerge control of *Poa annua* seed can also be achieved. One should not expect results after only one or two applications. A Rubigan program requires some patience.

5. Roundup/Paraquat/Kerb/Sencor/Simazine. Although different compounds, these are grouped together for convenience. They all offer almost complete *Poa annua* control in bermudagrass when they are applied at the correct rate and properly timed. Many superintendents wish bermudagrass grew in the far north. Products like these would make *Poa annua* control much easier for them.

In a few instances, total vegetation control on northern courses is achieved with Roundup, and the area is then replanted to the desired grass species. This effects *Poa annua* control and regrassing in a short time but with obvious inconvenience to the golfers. Results, however, have been excellent.

6. Embark. This compound is included in the control portion of this article even though Embark does not, *per se*, control *Poa annua*. It does, however, control *Poa annua* seedheads *(Figure 3.)* when the material is properly timed and applied in the spring.

Embark has worked well so far, although it has caused some discoloration early in the spring. Many superintendents consider this a minor inconvenience, however, when they compare it to eliminating the nuisance of profuse seedhead production of annual bluegrass each spring.

7. Other chemicals. Included in this category are sulphur, preemerge herbicides such as Bensulide, Dacthal, Balan, and Pendimethalin, and post-emerge herbicides, like Endothal. All of these materials can be used in *Poa annua* control programs. In the final analysis, the choice depends upon how you wish to use the strengths of each of these materials to suppress and control annual bluegrass under the unique conditions found on your course. Some of the products have dual purposes. You may use sulphur to lower soil pH while at the same time suppressing *Poa annua*. You may be using a preemerge herbicide to control crabgrass or other weeds and also suppress germination of *Poa annua* seed as well.

8. Management. No discussion of *Poa annua* control would be complete without discussing good management. You may have the best chemical program in the world to control *Poa annua*, but if a compatible management program is not in place, the chemical approach will not be as successful. Such factors as proper timing of aeration (*Poa annua* grows better than other grasses under compacted soil conditions), frequent topdressing, proper nutrient balance in the soil, proper *total* amounts of nutrients applied, proper soil pH, good water

control (never overwatering), and even the physical removal of annual bluegrass, whether by plugging or by resodding an area, are all included in the management category.

Lightweight mowers and removal of clippings must also be included in management. Research at Michigan State University shows what many golf course superintendents have observed for years, that on bentgrass/*Poa annua* fairway turf maintained with lightweight mowers and with the clippings removed, bentgrass predominates with time. It literally crowds out the *Poa annua*. This phenomenon seems hard to believe, but it works. All of the mechanisms to explain what is occurring are not thoroughly understood (thus the University research), but one of *the* most effective means of *Poa annua* control in fairways (cut at ⅜- to ⅝-inch) is a lightweight mowing and clipping removal program. In fact, if there is a single program to follow for reducing the total amount of *Poa annua* in bentgrass fairways or tees, this is it. *(Figure 4.)*

Lightweight mowing and clipping removal as an ongoing program also contributes to keeping the *Poa annua* alive during the summer. In many ways, this is almost a perfect combination. The fairways look good and play well while there is an ongoing conversion from annual bluegrass to bentgrass. The only negative aspect is the cost of the machinery and the extra manpower necessary to operate it and dispose of the clippings.

These, then, are the *Poa annua* control programs seen most often in the field today. No one program is a panacea. The choice of what control program you should choose depends on your individual situation: what you have to work with, what your golfers want, and what they are willing to pay for and tolerate.

Poa annua Maintenance

Over the past decade, a number of good golf courses and good golf course superintendents have made the decision to encourage, cultivate, and generally live with *Poa annua* as their principal golf turf, whether it is on greens, on tees, or on the fairways. Years of research (largely supported by the USGA) has uncovered a great deal about the strengths and weaknesses of annual bluegrasses. In order to keep *Poa annua* alive, the superintendent must accent the strengths of the grass and minimize its weaknesses. It is clear now also that annual bluegrass encompasses a whole range of different bio-types, which include true annuals, biennials, weak perennials, strong perennials, types that produce profuse seedheads, few seedheads, or no seedheads at all. Therefore, when you speak of maintaining *Poa annua*, you may be maintaining any number of different grass types collectively called *Poa annua*, even though a percentage of the turf species are true perennials. Obviously, the more perennial types, the easier and more successful will be the *Poa annua* maintenance program. Since there are great differences in this plant we call *Poa annua*, these differences may be the reason why some golf courses can live with *Poa* and others may not be quite as successful.

Part of the USGA Green Section turf research effort is aimed at identifying perennial types and hopefully improving them to the extent that one day *Poa annua* may be a desirable species, not a noxious weed.

The following observations and management programs can be used to help *Poa annua* survive the summer and winter stress periods.

A. Lightweight mowing and clipping removal. The same program that, in the long term, encourages bentgrass over *Poa annua* also helps to keep annual bluegrass alive in the short term. This is achieved by reducing physical mower stress with lighter equipment. The plant is less prone to wilt decline in the summer. Lightweight mowing makes a difference; it is one of the most important management programs the superintendent can follow for keeping the grass alive, healthy, good looking, and playable during the golf season.

B. Water control. By being able to apply the right amount of water at the right time, good water management will help keep *Poa annua* alive. An automatic irrigation system is an important tool if it is programmed properly. Generally, lighter and more frequent applications of water are preferred for *Poa* management rather than heavy, soaking, infrequent waterings.

C. Drainage. Another form of water control. You cannot successfully grow any grass species under wet and soggy soil conditions. Good surface/sub-surface drainage must exist to eliminate summer wet spots, scald, and disease pockets, as well as reduce winter ice damage that occurs in these same areas. *(Figure 5.)* Proper drainage is as important for *Poa annua* maintenance as for having a good-looking and well-playing golf course regardless of the grass type.

D. Disease control. *Poa annua* is susceptible to a number of turfgrass pathogens. Although by no means an absolute necessity, a preventive approach rather than a curative program is best for controlling turfgrass disease. Diseases to be controlled include dollar spot, brown patch, *Pythium, Anthracnose,* and patch organisms like the *Phialophora* sp., *Leptosphaeria* sp., and snow mold organisms.

Some of the new systemic fungicides like Bayleton seem to have a side effect of altering the way *Poa annua* grows, making it, apparently, less prone to summer wilt and heat stress. Thus, with the use of this type of systemic fungicide, along with other products in a complete disease control program, another important step towards *Poa annua* maintenance seems possible.

E. Insect control. Any time insects are feeding on the grass plant or its root system, control measures are essential. You simply cannot tolerate the outside influence of insects destroying the grass. Insects to be controlled include the *Hyperodes* weevil, black *Ataenius* beetle, white grubs, nematodes, and other insects that may be feeding on the plant or root system. A good preventive control program needs to be exercised where a history of insect problems exists.

F. Management for roots. This encompasses all of the programs important in helping a grass plant with an inherently weak and shallow rooting system to have as deep a system as possible. Heavy accumulations of thatch and soil compaction must be overcome. A good aeration program and topdressing program allows annual bluegrass to develop as deep and as fibrous a rooting system as possible. Grow roots. This equates to healthier, stronger grass. It means grass better able to tolerate stress in summer or winter.

Figure 5. Recontouring an area to provide better surface drainage, eliminating a low spot which holds ice in winter and water on the surface in the summer. Both spell trouble.

G. Fertility. One should not overfertilize nor underfertilize *Poa annua*. A good balanced fertility program should be followed with approximately a 3-1-2 if not a 4-1-4 ratio of N-P-K. Good grass growth means balanced fertility and enough fertility. Good grass growth requires a common sense approach to fertility, never applying too much overall, or at any one time. Whenever soil fertility is discussed, soil tests can be found extremely helpful in planning nutrient applications and pH adjustment. This holds true for both *Poa annua* maintenance or control.

There is also some new research data indicating higher levels of potassium (note the 4-1-4 ratio) contribute to a better rooting system in the grass plant, thicker cell walls for a tougher grass plant, and better summer heat and winter stress tolerance. Keep potassium levels up.

Finally, it may be a good idea to apply carefully light summer applications of fertilizer to the *Poa annua*. Heavy fertilizer applications hurt annual bluegrass during the summer stress period. However, light applications of nitrogen in the range of 1/4 to 1/3 pound actual nitrogen (depending upon the product, granular or sprayable) can contribute to better, stronger grass growth during the peak play of summer. *Poa annua* maintenance does require some summer fertility — fertility carefully applied. This includes applications of iron and magnesium to help maintain a good level of chlorophyll and green color in the grass plant. The idea is to keep the grass plant growing well during the summer. When *Poa annua* yellows and becomes chlorotic, trouble may be on its way. Light rates of fertilizer and micronutrients can contribute to a stronger plant and a better chance of survival.

In Conclusion

Today we have the best tools *ever* to either maintain or control *Poa annua*. We have the best understanding ever of just what is this hodgepodge of grass varieties called *Poa annua*, as well as what is required to maintain or control it. Several common denominators exist: lightweight mowing and clipping removal, a good common sense management program, and a *commitment* to follow these programs. With this in mind, you can look forward to success in either controling or maintaining *Poa annua*. Today there is a choice.