WINTER WEED CONTROL

Northern style

Turfgrass that is established and maintained properly, is healthy turfgrass and doesn't provide "room" for weeds to compete and spread.

By FRANK S. ROSSI, Ph.D.

Ground ivy control research finds timing is more important factor.

The coexistence of turfgrass and weeds is the basis of the age-old tip for controlling weeds in turf: maintain a healthy, dense stand of turf that prohibits weeds from establishing.

This is based on two important ecological concepts space and competition. Therefore, the foundation of a turfgrass weed management program must be to implement management programs that favor the competitive advantage of turf, while minimizing bare areas where weeds can invade.

Understanding the ecological concepts then aids the turfgrass manager when addressing the aesthetic and functional expectations. For example, while we understand the environmental benefits of a well managed lawn turf, essentially lawn management is focused on a high aesthetic demand; the lawn has to look good! In contrast, sports turf or golf turf is focused equally on aesthetic and functional quality, in that, not only does it have to look good, put it must sustain regular surface disruption that results in gaps where weeds can invade.

It follows then that a lawn turf should be easier to keep weed free because less gaps should occur, yet, it seems almost the opposite. Lawn managers and homeowners spend much more time managing weeds than a sports or golf turf manager. Why? Most likely it is related to the regular attention paid by sports and golf turf managers to maintain a dense vigorous stand under regular surface disruption. In contrast, many lawn managers visit the lawn intermittently, and often, do not have direct control over the key cultural practices like mowing and watering that sustain a dense healthy turf.

Where Does Weed Management Start?

These ecological principles will always work in your favor as a turf manager if the proper decisions are made during turfgrass establishment regarding site preparation, soil modification, turf selection, and establishment procedure. Visualizing an integrated weed management program as a triangle (see next page), it becomes clear that proper site assessment, soil modification, and species selection form a solid foundation for the life of the stand. Whereas, mistakes at establishment, limits options to pesticide use and consequently an unstable foundation, evident in the inverted triangle.

Continuing to visualize an integrated weed management approach, the primary cultural practices of mowing, watering and fertilizing should focus on maximizing root growth. The ability to establish and sustain a healthy root system will always make the turf more forgiving of environmental, biological and traffic stress. For example, maintaining a higher than usual height of cut (3" or greater) will promote deep rooting and shade the soil surface. Irrigating judiciously, so as to avoid a moist soil surface

that will encourage weed seed germination. Finally, the most efficient fertilization programs for cool season turf is focused in the fall. This approach is based on maximizing energy production under cooler temperatures without the surge in top growth associated with spring conditions. Still, if turf density is low in spring, a fertilization will be needed to increase density (to fill the space with turf!).

Characterize Your Weed Management.

In keeping with traditional Integrated Pest Management (IPM) programs, it is vital to map and monitor weed populations (as well as turf species). Maintaining records of populations over time provides unique insight into the response of the turf and the weeds to different environmental conditions and management programs. For example, you may have decided to change a fertilizer program to a more water soluble source and notice from your mapping that patches of annual bluegrass have become established. Following a dry year, you may notice increase in clover populations. Over time this information can assist with weed management programs.

Still, the cornerstone of an IPM approach is the establishment of thresholds. Weed thresholds are slightly different than for other pests, in that we must have an aesthetic and a functional threshold. An aesthetic threshold for weeds could be defined as the point at which the number of weeds in a turf reduces the visual quality below an acceptable level. Subsequently, the functional weed threshold is the point at which the number of weeds present reduces the functional quality (soil stabilization, traction, elasticity, etc.) below an acceptable level.

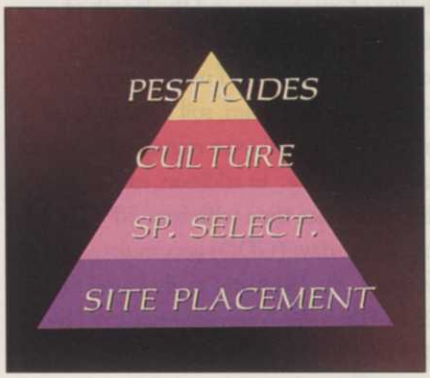
As you might imagine establishing thresholds can be subjective. Do you establish visual weed thresholds with "curb appeal"? That is do you evaluate the visual quality from a distance, or by standing over the turf? What season do you determine threshold? Is there any tolerance for weed invasion or must the turf be 100% weed free? The same questions arise for functional quality. How many dandelions or prostrate knotweed plants can you have in a soccer field before the players game is affected? How many patches of clover are tolerated in a golf course rough area before you hear complaints of playability? How many crabgrass or broadleaf plantain plants can a lawn tolerate before soil movement is increased?

Viewing weed management from this perspective will challenge the turf manager to communicate with their clientele to assist in establishing thresholds. It has been my experience that this dialogue with our clientele (homeowners, athletes, coaches, and golfers) is rarely conducted. We assume it must be 100% weed free and do not share the responsibility of establishing thresholds with the persons who receive our service. It follows then that when questions regarding pesticide use arise, we are unprepared to explain how we conduct an IPM program for weeds. Furthermore, we must have a realistic basis for decision making prior to implementing a management program designed to reduce or eliminate weed populations. This will become more important as chemical pesticide use becomes more restrictive.

Timing is everything

The old adage that "timing is everything for a successful life" rings true when considering chemical weed control. First, we must decide whether we will chose a preventative approach with preemergence herbicides, or a curative approach with postemergence herbicides. Clearly the preventative approach requires less labor and knowledge, as monitoring and mapping efforts are not used reveal threshold populations. This approach is widely used, primarily as a result of the "zero threshold" that exists for weed populations. The curative approach might be more labor and

Think of weed management as a triangle. At its base it starts with proper site and species (or variety) selection. Then comes



necessary cultural practices like watering, fertilizing and mowing. Finally, if weeds remain a problem, we use herbicides as tools.

knowledge intensive, in that it will require timely monitoring (you'll have to know when weeds might emerge or flower) as well as knowledge of how to identify the major cool season weeds. Additionally, research has indicated that effective postemergence control relies on proper timing, often based on the growth stage of the weed.

Effective preemergence control, usually of summer annual grass weeds such as crabgrass and goosegrass, relies on understanding the seed germination and emergence time. In essence, this can be viewed as "seed bank management". Regarding germination, not all weed seeds in the soil will germinate every year. Plants have de-

veloped dormancy mechanisms for a percentage of their seeds that keep them viable for many years (waiting for the right time and space). For example, research indicates less than 50 percent of the crabgrass seed produced in the previous fall will germinate in the spring. However, turf areas with a history of crabgrass invasion will have a high percentage of seed viable from several years of production. The management question is then, how long do you have to use a preemergence herbicide before the seed bank is depleted? I am unaware of research that might address this question.

Emergence time has recently been investigated by researchers at the University of Maryland and currently here at Cornell. This research provides new insight into the timing of emergence and the length of time that **crabgrass** seeds germinate in a season. In a dense turf under a medium maintenance program, soil temperatures greater than 73^0 F were required for significant emergence. In addition, monitoring the emergence time with base 50^0 F growing degree days (GDD) accumulated from March 1, the Maryland study found that 25% of the total emergence occurred by 200 GDD, 75% by 600 and 100% by 1100. This suggests that under average turf density, germination and emergence can occur for 10 to 12 weeks depending on the season. This has enormous implications on timing of preemergence applications in the early spring. Simply, if applied to early, the effectiveness of the preemergence herbicide may dissipate and allow breakthrough.

Postemergence timing has received increased attention over the last decade as new materials have become available, hard to control weeds have emerged, weed tolerance levels have declined, and the use of preemergence herbicides come under question. First and foremost, the key to effective postemergence control is proper identification, followed by understanding weed biology so as to time applications for maximum effectiveness.

Interesting research on yellow nutsedge control has indicated that effective long term control requires a systemic herbicide to eliminate the surface vegetation (the leaves) and to be translocated to the forming nutlet (perennial storage organ), thus preventing it from emerging the following year. Consequently, the most effective application timing, based on the information above, is late June, early July when day length begins to shorten. This event apparently triggers the translocation of energy in the nutsedge plants from the leaves to the nutlets. Effective materials such as Basagran and Manage will provide long term control applied at this time.

Successful control of **perennial broadleaf weeds** is best accomplished in the late summer, early fall. Certain materials such as Confront, have been shown to provide activity on broadleaf weeds down to 37^0 F. Still, most of our clientele is not willing to wait until this time of year for control. Therefore, effective timing of spring applications is needed. Researchers at Purdue University have reported that spring control of **dandelion** is most effective when based on a simple growing degree day (GDD) model. They concluded that formulation of Weedone and time of application were critical for maximizing control. If using the ester formulation of Weedone, it is best applied around 100 to 150 base 500 F GDD, while the amine formulation should be applied much later at 250 to 300 GDD. This is useful not only for control, but also for minimizing potential vapor drift resulting from applying the ester formulation later in the spring when conditions could favor volatilization.

Historically hard to control weeds such as **ground ivy** (creeping charlie, gill-over-the-ground, etc) could also be more effectively controlled using some research on improved timing. A three year study at the University of Wisconsin-Madison indicated that any herbicide formulation that included 2,4-D as an active ingredient would control ground ivy if applied at full bloom in the spring or immediately following the first frost in the late summer early fall. The results were dramatic, however,

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there does not appear to be an easy explanation. Unfortunately, wild violet, another hard to control weed, in the plots was not controlled using the same approach.

Developing an integrated approach

Turfgrass managers should regularly strive for more resource efficient management programs that incorporates a knowledge-based approach of biology and ecology to maximize turf health and maintain adequate density. This information is then utilized through effective monitoring and mapping of plant populations and taken together serve as the basis for weed control decisions. As the industry continues to improve our overall communication skills, we will have a more open dialogue for establishing thresholds and making more cooperative decisions regarding weed management that will include herbicide use and possibly biological/organic based approaches as well. **LM**

Frank Rossi is an assistant professor of turfgrass science and extension turfgrass specialist at Cornell University