

FIVE-PLEX RING

Triplex ring, once the scourge of putting greens, has been replaced by its first cousin. "Five-plex" ring has become a serious problem on fairways at many courses.

by DAVID A. OATIS



*On this fairway, the difference in grass populations is striking. *Poa annua* is the dominant species in the full width of the cleanup pass, while bentgrass is the dominant species just outside of it.*

IN THE November/December 1980 issue of the *Green Section Record*, USGA agronomist Jim Snow wrote an article entitled "The Triplex Ring." Nineteen years later only the location of the problem has changed. Today the "triplex ring" problem on putting greens and tees has been so well publicized and understood that it is fairly rare. However, a number of courses are experiencing a similar problem on fairways. It is called "Five-Plex Ring."

Historical Background

The 1970s was a decade of speed and efficiency in turfgrass management. Most of the new equipment used during that period was designed to be bigger, faster, and more efficient in terms of manpower. Triplex putting green mowers, large 7- to 9-gang hydraulic fairway mowers, and mechanical sand raking devices all were used on courses in the 1970s. Unfortunately, this labor-saving equipment caused a tremendous amount of damage to the turf, and in the 1980s, golfers and superintendents alike began paying more attention to turf quality.

The value of lightweight fairway mowing systems became obvious at many courses during the late 1970s and 1980s. But for most courses, using triplex putting green mowers to mow fairways was cost prohibitive since it entailed the use of as many as six to eight machines and the same number of equipment operators. Nonetheless, many courses initiated lightweight fairway mowing programs with triplex putting green mowers. The following are a few observations courses commonly made after doing so:

- The use of triplex putting green mowers on fairways led to improved turfgrass vigor, reduced disease incidence, and significant increases in creeping bentgrass populations at many transition- and northern-zone golf courses.

- The benefit derived from the smaller mowers was believed mainly to be a result of decreased compaction and clipping removal. Compacted tire ruts from the large mowers often were visible on the perimeter of fairways (in the cleanup pass), and this supported the theory that compaction was a big part of the problem. *Poa annua* was often very pronounced in these zones of compaction.

- The tire ruts usually disappeared after several years of triplex usage, and many fairways quickly developed increased levels of thatch. This demon-



Above: Grooming attachments can be beneficial in encouraging a more upright growth habit, but they add weight directly to the cutting unit and can increase wear injury. Below: Some superintendents have reduced five-plex ring problems by altering the cutting units. In this instance, the original front (Wiehle) and rear rollers have been replaced with lighter solid rollers from a putting green mower. A weight bar has also been removed.



strated the reduced injury caused by the smaller, lighter units. The increased accumulation of thatch also indicated the need for more effective cultivation programs.

Fortunately, the equipment manufacturers responded to the lightweight movement and introduced the first truly "lightweight" five-plex machines in the late 1980s. These new mowers were more efficient and put lightweight fairway mowing programs within the financial reach of many more courses. These lighter five-plexes performed admirably and collectively had a tre-

mendous impact on fairway management programs. Clearly, the new five-plexes were not as light as the triplexes, but the benefits still were undeniable.

- The five-plexes provided an excellent quality of cut and their usage clearly favored creeping bentgrass.

- The five-plexes represented a substantial increase in efficiency over the putting green triplexes. Courses that once required six to eight triplexes found they could mow all of their fairways with just two or three five-plex machines. This also saved labor costs.

- Thatch development on fairways continued with five-plex mowers; however, the rate of accumulation was less when compared to triplexes.

The Problem

The compacted tire ruts caused by the 7-gang mowers did not reappear at courses that switched to five-plexes, and the improved efficiency over triplex units was a tremendous advantage. However, after several years of five-plex usage, courses that had been using triplexes began to experience a very gradual change in grass populations in the cleanup pass. Annual bluegrass populations became higher here than elsewhere in the fairways. This was understandable, since the mowing pattern of the cleanup pass really cannot be altered. This phenomenon became especially apparent in fairway perimeter areas where annual bluegrass was already favored, such as shady, wet, compacted, high-traffic areas. The five-plexes eventually began to cause turf-grass thinning and loss in these types of areas, a problem that was exacerbated by increased mowing frequency. Sharply contoured fairway perimeters and perimeters with severe topography also were affected. Five-plex ring was born!

Perhaps the most intriguing part of the five-plex ring phenomenon is that the damage virtually always appears in the full width of the machine rather than primarily in the tire print. In fact, the tire prints are rarely apparent in five-plex rings, and this suggests some interesting possibilities. Most importantly, compaction is not the primary culprit; if it were, the tire prints would be clearly visible in most cases. Therefore, it appears that the damage is primarily being caused by wear and abrasion injury. Clearly, there are other factors exacerbating the effects of five-plex ring. Some have already been mentioned, but there are others. The effects of tree shading and root competition play an important role that must be accounted for. Also, realize that new courses are especially susceptible to five-plex ring, since the turf is immature and the soil's structure often is severely damaged during construction.

In reviewing the history of five-plexes, it is quite apparent that the units have gotten progressively heavier in the years since their initial introduction. Innovations and superintendents' desires for more power, increased durability, and operator comfort prompted many of the design changes. The

newest five-plexes have bigger engines, four-wheel drive, power steering, and other helpful features. Some have grooming attachments that add weight directly to the cutting unit. This can translate into more wear damage, even when they are not engaged. Finally, consider the rollers on the newest machines. In some cases, the grooves in the Wiehle rollers are considerably farther apart than they were initially. This causes the weight of the cutting unit to be supported by less surface area. The damage attributable to Wiehle rollers is magnified when their edges are sharply cut.

The Cure

The first step in solving any problem is clearly identifying the causal agent. This is especially true in the case of five-plex ring. Examine the perimeters of your fairways and determine if there is any wear injury or if there is a difference in grass population of the cleanup pass. Assuming you have some degree of five-plex ring, consider one of the following options as a solution for the affected areas:

- Reduced mowing of the cleanup pass is a good place to start, especially for courses mowing fairways four to five times per week or more. For courses that mow fairways only three days per week to start with, reduced mowing frequency may result in unacceptable definition.

- Although your first inclination might be to go out and aerify the perimeters of your fairways, aerification alone likely will not cure the problem. Work on relieving soil compaction but try not to increase abrasion injury. Remember, five-plex ring is caused more by abrasion injury than compaction, and traditional core cultivation will increase the former.

- Prune tree roots in the rough areas and prune or remove trees to increase sunlight penetration.

- In the short term, increasing fertility in the cleanup pass will help with turfgrass wear recovery. One pass around the fairway perimeters with a walk-behind rotary spreader, once or twice annually, may be all that is required. Use a slow-release, non-burning nitrogen source and apply it at $\frac{1}{2}$ to $\frac{1}{2}$ lb. N per 1,000 sq. ft.

- Since the heavy, sharp-edged grooved rollers are a major contributor to wear injury, experiment with different front rollers on the five-plexes.

- A number of superintendents are now using solid or "smooth" rollers

(both in the front and back) on the cutting units. Solid rollers cause less abrasion injury and encourage more lateral growth. Ultimately, solid rollers can help increase bentgrass populations; however, solid rollers increase the effective cutting height of the mower. Height adjustment may be necessary to compensate.

- Other options include obtaining alloy or nylon rollers, which are lighter and potentially less damaging.

- One superintendent has experienced success by replacing the factory-supplied five-plex rollers with solid rollers from a triplex putting green mower. The rollers from the triplex are considerably smaller in diameter and lighter in weight.

- Some superintendents have successfully modified the cutting units on their five-plex mowers, making them lighter and less damaging. Weight bars can be removed on some units, but be cautious not to remove safety devices or do anything that might invalidate the warranty or present greater risk to the operator or mechanic.

- Down pressure can be regulated on some five-plex machines, so experiment with reducing down pressure, where possible.

- Avoid using groomers and/or verticutters on the cleanup pass.

- Mow the cleanup pass around the fairways as a separate operation with a different machine. A triplex putting green mower is a good choice.

- Finally, be sure to shift the interface between the approach mowers and the five-plex machines. Failure to do so will lead to more wear injury and high populations of annual bluegrass in this critical area.

Conclusion

Fairways at many of the courses I visit have some degree of five-plex ring. The five-plex ring at your course may be so insignificant that no corrective action is warranted, and the only sign may be a faint difference in grass populations in the fairway perimeters. However, it makes good sense to thoroughly evaluate the fairway perimeters and mowing programs on your course and prevent five-plex ring from becoming a problem.

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Five-plex ring will be the most severe on sharply contoured fairways and where the topography is severe.