Conversion of Kentucky Bluegrass Rough to No-Mow, Low-Input Grasses

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Golf courses have become a large part of the environmental landscape today. The land area needed for golf is larger than any other sport and the United States alone has nearly 17,000 golf courses with the North Central Region having the highest concentration with 4,238 [6, 11]. There are many scientific studies that have detailed the benefits of turfgrass. However, the use of water, fertilizer and pesticides in maintaining golf courses continues to come under fire for not being environmentally friendly and unnatural to the landscape. Golf courses and their turfgrass managers realize the need for continuing to decrease the inputs needed to run a golf course, not only from an environmental standpoint but also a monetary standpoint. Golf course superintendents have become highly educated professionals that continue to adapt their management practices in order to reduce the environmental impact of their golf course.

Golf course rough is the largest percentage of maintained turf area of a golf course comprising 52% of the total maintained area [8]. Of this rough area, the most common turfgrass species planted in the North Central region of the United States is Kentucky bluegrass, accounting for 63% of the rough area. Under high management, Kentucky bluegrass is very aesthetically pleasing and provides a high quality playing surface that can recover from divots caused by golfers. However, inputs required to maintain playing conditions in golf course settings are often high. Kentucky bluegrass has a large demand for water to prevent dormancy from drought and a high need of fertilizer to maintain turfgrass color and quality [3]. Due to these high inputs of water and fertilizer, golf course rough generally needs to be mowed two times per week which increases labor, machinery costs, and fuel budgets. In addition, weeds are often controlled with herbicides adding to the inputs needed to maintain the quality of the largest area on a golf course. The combination of large amounts of established Kentucky bluegrass rough and inputs required to maintain its playing quality have prompted many golf courses to question the need for heavily maintaining their Kentucky bluegrass rough areas. Many golf courses are now considering the conversion of these high-input rough areas to no-mow, low-input grasses.

There were two objectives to this study: (1) to compare several methods for converting Kentucky bluegrass rough to no-mow, low-input grasses and (2) to then determine the best turfgrass species for use in conversion. Conversion of Kentucky bluegrass rough to no-mow, low-input grasses is a relatively new topic. Although very few studies have focused on converting Kentucky bluegrass rough to no-mow grasses, some have focused on which species may perform well in low-input situations. Studies have found that fine fescues are more drought tolerant, require less fertility, have higher resistance to weed invasion in low-input situations, and have better stand quality in no-mow situations than does Kentucky bluegrass [1,2,4,5,7,12].

Field Trial

Converting Kentucky bluegrass rough to no-mow, low-input grasses is a very practical study. Four conversion methods were chosen based on standard equipment that golf courses would have on hand and the five grass species selected are easily available. The study was initiated in the fall of 2007 with seeding dates of September 5th and 6th. After initial plot establishment, there was not supplemental irrigation used, no fertilizer or pesticide use, and the plot area was only mowed once during each growing season in October with the clippings being removed.

Conversion Methods

" Glyphosate, then seed treatment": Glyphosate was applied at 1.47 oz/1000ft2. After seven days the area was aerified with 5/8" tines and seed was added.

" Seed, then glyphosate treatment": Area was aerified with 5/8" tines and seeded. Five days after seeding, glyphosate was applied to the area at 1.47 oz/1000ft2.

" Fumigation treatment": The area was initially aerified with 5/8" tines. After aerification, the soil fumigant dazomet was applied at 8 lbs/1000ft2 and immediately watered in and covered with 1mm clear plated for seven days. After seven days the plastic was removed and the area was allowed to "air-out" for another seven days before being seeded.

" Sod removal treatment": All turf was removed with a sod cutter to expose bare soil. Bare soil was then roto tilled to disrupt the top 2 to 3" and then the plot area was seeded.

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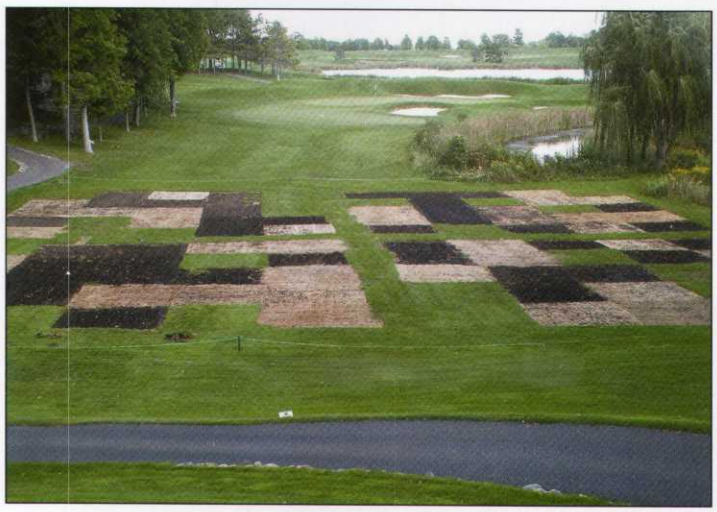
Grass species:

- 'Intrigue' Chewing's fescue
- 'Minotaur' hard fescue
- 'Celestial' strong creeping red fescue
- Common sheep fescue
- 'SR6000' tufted hairgrass

*Fescue species were seeded at 3.5 lbs/1000ft2 and tufted hairgrass at 1 lbs/1000ft2.

Several sets of data points were collected to determine how viable each conversion method and turfgrass species was in conversion to no-mow, low-input areas. Treatments were evaluated for initial seedling emergence to determine how well the species were germinating and establishing within each conversion method. Ornamental value of no-mow, low-maintenance areas will play a large role in determining how golfers may accept these transition areas. For that reason, seedhead counts were taken in order to quantify the ornamental value of no-mow, low-input areas. Maybe even more important to a golfer than aesthetic value is the ability to find their golf ball and then have the ability to advance the ball. To get a sort of "playability" rating, biomass collections were taken. Biomass will tell us if the treatments are being over productive which can possibly lead to playability issues and also if a treatment is being under productive which may lead to a stand that is too thin allowing for weed invasion. Overall stand quality ratings were also taken. Overall stand quality took into account four other individual ratings: broadleaf weed invasion, Kentucky bluegrass regrowth, lodging, and rust incidence. Overall stand quality ratings took the treatment as a whole and provided a rating of 1-9 with 9 being the most ideal stand and 1 being the least ideal stand.



Conversion methods prior to seeding.

Initial Results

Biomass production from across conversion methods has had wide variations. The fumigation treatment resulted in areas with a large amount of biomass causing areas that tend to lodge and matte down. This can result in lost golf balls and playability issues if a ball is located in these high production areas. Both seed, then glyphosate and sod removal treatments produced areas with lower biomass production resulting in higher broadleaf weed numbers and greater Kentucky bluegrass regrowth and a lack of desirable species establishment. The seed, then glyphosate treatment have the largest amount of Kentucky bluegrass regrowth within the stand which is clearly not the desirable outcome of conversion. The sod removal treatments have the largest amount of broadleaf weed invasion. This is probably due to the roto tillers disturbance of the soil allowing for dormant seed to move to the top of the soil surface and providing an opportunity to germinate. The glyphosate, then seed treatment seems to provide a stand with the right amount of biomass production that can resist broadleaf weed invasion, does well at eliminating Kentucky bluegrass, and provides a stand that is playable and retains its aesthetic value. Although the fumigation treatment can provide a stand with fewer weeds, the lack of playability with lodging and matting has allowed the glyphosate, then seed treatment to be the better choice at this time.

Lodging of the fumigation treatment

Treatments - July 2008

The fine fescue species have continually risen to the top as a turfgrass that may lend itself to use in no-mow, low-input situations. Their native region of adaptation have naturally made the fine fescues species tolerant to shade, drought, low pH and have a low fertility requirement thus making them a natural low-maintenance grass [2, 10]. Data collected has provided some interesting initial results. Based on overall stand quality, 'Minotaur' hard fescue repeatedly was the best performing turfgrass in no-mow, low-input situations.

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Not all conversion methods have provided acceptable turfgrass stand quality but even in those unacceptable situations hard fescue has provided the best overall turfgrass stand quality. Hard fescue plots across most conversion methods was best at creating a stand that resisted lodging which indicates the species may be ideal for providing a no-mow, low-input area that retains its aesthetic appeal and also its playability.

Without the use of herbicides throughout the study period, weeds in many treatments became a problem. However, 'Intrigue' Chewings fescue plots, regardless of conversion method, had lower amounts of broadleaf weed invasion. Recent research shows that Chewings fescues, especially 'Intrigue', have high allelopathic ability. Allelopathy is defined as any direct or indirect harmful effect by one plant on another through production of chemical compounds that escape into the environment [9]. Although allelopathy is not being tested in this study the results that we are seeing with a lack of broadleaf weeds in the 'Intrigue' Chewing's fescue plots seems to reinforce their allelopathic ability.

This research project is a first step in looking at converting Kentucky bluegrass rough to no-mow, low input grasses. Future studies should investigate seeding rates, other conversion methods, long term maintenance issues with biomass management, broadleaf weed and Kentucky bluegrass regrowth issues, and the use of species mixes. Understandably, not all rough areas are candidates for conversion. Courses still need to provide areas for errant golf shots to be easily playable. However, many golf courses maintain rough that is considerably out-of-play where very little golf traffic is seen. Each golf course is unique, but superintendents know specific areas that are great candidates for conversion allowing for a reduction of inputs and manpower and increasing the golf courses' environmental stewardship.

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