TURFGRASS SPECIES SELECTION FOR A LINKS-STYLE GOLF COURSE IN PIERCE COUNTY

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The Pierce County-owned Chambers Creek Properties encompasses approximately 600 acres on Puget Sound near University Place, WA (west Tacoma). The site is a former gravel mine, and is comprised of well-drained sandy gravelly soils. The Chambers Bay Golf Course is currently under construction on the site, occupying approximately 200 acres. It is a link-style design, common in Scotland and the British Isles, the birthplace of golf. Elements of design include wide, open spaces, few if any trees, surface terrain features formed by wind-blown sand, and grass species (primarily fescues [*Festuca* sp.]) that are not often used as primary species on U.S. golf courses.

Most golf courses west of the Cascade Mountains are planted with perennial ryegrass (*Lolium perenne* L.) as the predominant species, and creeping bentgrass (*Agrostis stolinifera* L.) for greens. The use of fine-leaf fescues (*Festuca* sp.) as the predominant species is rare, even though this grass is well-adapted to this region. Since the fall of 2004, WSU has been working with Pierce County in evaluating various species mixtures to find the most suitable ones for different areas of the golf course. The golf course architecture firm Robert Trent Jones II and KemperSports Management have also cooperated in the project.

Methods

Sand from the golf course site was used to build a sand-based plot area at the R.L. Goss Turfgrass Research Facility at WSU-Puyallup. The plot area was constructed and planted during May 2005. The area measured approximately 7000 sq ft with a depth of approximately 12 inches. The sand was not amended with organic matter. Experimental treatments were mixtures of colonial bentgrass (*A. capillaris*), velvet bentgrass (*A. canina*), dryland bentgrass (*A. castellana*), chewings fescue (*F. rubra* ssp. *commutate*), slender creeping red fescue (*F. rubra* ssp. *littoralis*) and/or hard fescue (*F. trachyphylla*) (Table 1). Four mixtures were evaluated for putting green use; five mixtures for fairways, tees, and other playable turf (hereafter referred to as "playable turf"; and two mixtures for tall grass areas. Seeding rates were 6.6, 5.5, and 3.3 lbs per 1000 sq. ft., respectively. Varieties were selected primarily based on performance in National Turfgrass Evaluation Program (NTEP) trials conducted in Puyallup.

The major differences between the mixtures can be summarized as follows. For putting greens, mixtures 1 and 2 had different varieties compared to mixtures 3 and 4. Mixtures 2 and 4 had higher bentgrass contents (10%) than mixtures 1 and 3 (5%). For playable turf, mixtures 1 and 2 contained colonial bentgrass, while mixtures 3 and 4 contained velvet bentgrass. Fescue varieties in these four mixtures were the same. Mixtures 2 and 4 had higher bentgrass contents (10%) compared to mixtures 1 and 3 (5%). Mixture 5 contained colonial and dryland bentgrass. For tall grass, the two mixtures contained different varieties selected for lighter (Mix 1) versus darker (Mix 2) turf.

Table 1. Turfgrass species mixtures for putting greens, playable turf, and tall grass areas. Percent composition is indocated on a weight basis.

	Putting greens		Playable turf		Tall grass
1	5% Heriot colonial bentgrass 70% Bridgeport II chewings fescue 25% Barcrown II slender creeping red fescue	1	2.5% SR 7100 colonial bentgrass 2.5% Tiger II colonial bentgrass 30% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Seabreeze slender creeping red fescue	1	15% SR 3150 hard fescue 15% Seabreeze slender creeping red fescue 35% Sandpiper chewings fescue 35% Tiffany chewings fescue
2	10% Heriot colonial bentgrass 65% Bridgeport II chewings fescue 25% Barcrown II slender creeping red fescue	2	5% SR 7100 colonial bentgrass 5% Tiger II colonial bentgrass 25% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Seabreeze slender creeping red fescue	2	15% Reliant II hard fescue 15% Barcrown II slender creeping red fescue 35% Shadow II chewings fescue 35% SR 5100 chewings fescue
3	2.5% SR 7100 colonial bentgrass 2.5% Tiger II colonial bentgrass 30% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Seabreeze slender creeping red fescue	3	2.5% SR 7200 velvet bentgrass 2.5% Vesper velvet bentgrass 30% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Dawson E+ slender creeping red fescue		
4	5% SR 7100 colonial bentgrass 5% Tiger II colonial bentgrass 25% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Seabreeze slender creeping red fescue	4	5% SR 7200 velvet bentgrass 5% Vesper velvet bentgrass 25% Shadow II chewings fescue 20% Sandpiper chewings fescue 20% Tiffany chewings fescue 25% Dawson E+ slender creeping red fescue		
		5	5% Heriot colonial bentgrass 5% Highland dryland bentgrass 35% Bridgeport chewings fescue 30% Shadow II chewings fescue 25% Barcrown II slender creeping red fescue		

Plots were planted on May 6, 2005, and following establishment were maintained at three different mowing heights representative of putting greens (0.19 inch), fairways/tees (0.5 inch), and roughs (2 inches, and unmowed). Treatments were replicated three times, with plot sizes of 8 ft x 10 ft for fairway/tee turf, and 10 ft x 10 ft for greens and tall grass plots. Plots were managed to approximate practices on the golf

course. Since planting, plots have been evaluated for establishment rate, color, density, and overall turfgrass quality.

Results

Putting greens

Mixtures 3 and 4 established cover more rapidly than mixtures 1 and 2 (Table 2). Increasing the amount of colonial bentgrass in the mixtures from 5% to 10% increased percent cover only on a few dates. Mixture 4 consistently exhibited the highest quality of all the mixtures. Mixture 1 was lowest in quality, and mixtures 2 and 3 were intermediate. Both percent cover and quality declined over the winter (Feb ratings) due to soil saturation, but turf recovered during the spring. Mixtures 1 and 2 never attained quality ratings deemed to be acceptable for putting green turf. Quality differences were related at least in part to density (data not shown). Slower or incomplete germination and establishment for mixtures 1 and 2 carried through into lower turfgrass quality.

Table 2. Percent ground cover and turfgrass quality (1 = dead, 9 = ideal, 5 = acceptable) of fescue/bentgrass mixtures for putting greens, May 2005 – April 2006.

Mixture	May 26	Jun 24	Jul 22	Aug 19	Oct 19	Dec 20	Feb 23	Apr 28
				Percent ground cover				
1	33c	80b	75c	73c	72b	73c	57	75b
2	37bc	82b	82bc	83b	75b	77bc	63	87a
3	40b	88a	88ab	90a	90a	85ab	82	88a
4	47a	92a	93a	93a	92a	93a	83	97a
lsd*	7	6	10	5	10	9	ns	12
				Turfgrass quality (1=dead, 9=ideal, 5=acceptable)				
1			3.3c	3.3c	3.3c	3.0c	3.3	3.7c
2			4.0b	4.0bc	3.7bc	3.7b	3.3	4.7b
3			4.3b	4.7b	4.7ab	4.3b	3.7	5.0b
4			5.0a	6.0a	5.3a	5.0a	4.0	6.0a
lsd*			0.7	1.1	1.2	0.7	ns	0.7

Lsd – least significant difference. Values within a column followed by the same letter are not statistically different. ns = not significant.

Playable turf (fairways, tees, etc.)

All treatments reached nearly full ground coverage by approximately 7 weeks after planting, although mixture 5 tended to lag behind the others (Table 3). Quality for mixtures 1 through 4 was not statistically different for most rating dates, but mixture 5 had lower quality for all ratings except during winter (Feb rating). Quality of all mixtures declined during the winter, as for the putting green. In the spring of 2006, mixtures 1 and 2 (containing colonial bentgrass) recovered more quickly and had better quality than mixtures 3 and 4. Density of mixtures 3 and 4 was higher and color was darker compared to the other mixtures (data not shown).

Table 3. Percent ground cover and turfgrass quality (1 = dead, 9 = ideal, 5 = acceptable) of fescue/bentgrass mixtures for playable turf, May 2005 – April 2006.

Mixture	May 26	Jun 24	Jul 22	Aug 19	Oct 19	Dec 20	Feb 23	Apr 28
			Percent ground cover					
1	33	92	99a	99	100	100		
2	33	93	99a	100	100	100		
3	32	90	98a	100	100	100		
4	37	95	99a	100	100	100		
5	28	88	96b	100	100	100		
lsd*	ns	ns	2	ns	ns	ns		
			Turfgrass quality (1=dead, 9=ideal, 5=acceptable)					
1			6.7a	7.3	7.3a	6.3a	5.0	7.3a
2			7.0a	8.3	6.7a	6.0a	5.0	7.3a
3			6.3a	7.3	7.0a	6.3a	5.0	6.0b
4			7.3a	8.3	6.7a	6.0a	5.0	6.0b
5			4.7b	7.0	5.3b	5.0b	4.3	4.7c
lsd*			1.4	ns	1.2	0.7	ns	1.2

Lsd – least significant difference. Values within a column followed by the same letter are not statistically different. ns = not significant.

Tall grass

Both tall grass mixtures established well and maintained acceptable quality (data not presented). Although varieties were selected based on color ratings from previous NTEP data, there was not a readily detectable color difference between the mixtures.

Conclusions

Final recommendations on the seeding mixtures to be planted on the golf course were developed based on the results of this evaluation. It was determined that thebentgrass content should be intermediate to the two used in this study. The golf course managers want to maintain a stand of grass that is dominated by fescue. A bentgrass content of 10% in the seeding mixture resulted in more bentgrass in the stand than the architects and managers desired. However, since higher bentgrass content aided in quicker establishment, a content of 6% was selected for the final seeding mixture.

For putting greens, the varieties in mixtures 3 and 4 were selected based on better establishment and higher quality compared to mixtures 1 and 2. For fairways, tees, and other playable turf, velvet bentgrass (mixtures 3 and 4) was ruled out due to its color and high density. These characteristics do not fit into the "look and feel" of a links-style design. Mixture 5 was also excluded due to lower quality. The varieties in mixtures 3 and 4 for greens and 1 and 2 for playable turf were the same. This, combined with a desired 6% bentgrass content, meant that the final seeding recommendations were the same for greens and all playable turf including fairways and tees. Species composition of the recommended mixture was 6% colonial bentgrass, 69% chewings fescue, and 25% slender creeping red fescue. For tall grass areas, the managers and architects decided to include more drought tolerant species than we evaluated. The species composition of that mixture was 40% hard fescue, 20% slender creeping red fescue, and 40% sheep fescue *(F. ovina)*. Seeding of the golf course will take place during the summer of 2006, with a planned opening date of July 1, 2007

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