PERENNIAL RYEGRASS MANAGEMENT

John E. Kaufmann and Jack Eaton
Department of Crop and Soil Sciences
Michigan State University

In Michigan, perennial ryegrasses are usually short-lived perennials. Perennial ryegrass is a bunch grass having rapid germination, rapid establishment from seed and rapid vertical shoot growth rates compared to Kentucky bluegrass and fine fescues. Comparative germination times are shown in Table 1. Because of these characteristics, it has been recommended to never put more than 20% perennial ryegrass in a mixture.

With the advent of the new perennial ryegrass cultivars, many of these undesirable characteristics are no longer valid. Some of the improvements of the new cultivars are listed in Table 2. However, as the use of ryegrass increases, other undesirable characteristics are becoming important concerns. These are listed in Table 3.

Table 1. Approximate Germination Time of Three Cool Season Turfgrass Species.

TIME	SPECIES
1 Week	Perennial Ryegrass
2 Weeks	Fine Fescues
3 Weeks	Kentucky Bluegrass

Table 2. Some Improvements of the New Perennial Ryegrasses.

1) Slower vertical growth rate.
2) Finer texture or leaf width.
3) Choice of colors to blend with other grasses.
4) Improved mowing quality.
5) Reduced seedling competition.
6) Greater tolerances to environmental extremes.

Table 3. New Problems With Perennial Ryegrasses

1) Susceptibility to diseases including brown patch, red thread rust, and snow mold.
2) Lack of ability to creep and fill in void areas.
3) Non-uniform establishment and this eventual tufted appearance when overseeded into deteriorated turf areas.

As a result of these problems, an investigation was initiated to search for proper methods of establishing and managing the new perennial ryegrasses. The site chosen was seeded in September of 1977. Two separate areas were established which included 8 perennial ryegrass varieties and 8 mixtures of perennial ryegrass, Kentucky bluegrass and fine fescue. One area was later maintained at 3/4 in. (2 cm) mowing height.

In the mixtures, the Kentucky bluegrass component was made up of equal parts of Parade, Baron, and Touchdown, while the fine fescue component was equal parts of Pennlawn and Wintergreen. Manhattan was used as the perennial ryegrass in mixtures.

When choosing relative amounts of perennial ryegrass to place in a seed mixture, the number of seeds per pound must be considered. The approximate number of seeds per pound is given in Table 4. A 33, 33, 33 percent mixture by weight of perennial ryegrass, red fescue and Kentucky bluegrass, respectively, would have eight times as many Kentucky bluegrass seeds as perennial ryegrass. Thus, Kentucky bluegrass should have eightfold edge in determining the number of plants on a site. However, because of the more rapid germination rate of perennial ryegrasses, this eightfold advantage is usually not realized.

Table 4. Approximate Number of Seeds Per Pound in Three Cool Season Turfgrass Species.

SEEDS	SPECIES
2 Million	Kentucky Bluegrass
1/2 Million	Fine Fescues
1/4 Million	Perennial Ryegrass

Species count analysis was conducted ten months after seeding. Three plugs were cut from each replication of each treatment. The total number of plants of all three species were counted and recorded for each plug.

The results indicated that cutting height has no influence on percent distribution of species. At the lower cutting height of 2 cm, perennial ryegrass competition with red fescue and Kentucky bluegrass was equal that found at 4 cm. However, overall plant density was greater at 2 cm. compared to 4 cm.

Each plot received 240 seeds per square decimeter. Ten months later, a range of 8.4 to 16.7 percent of the original seed count, or 20 to 40 plants per square decimeter remained on the site. In all cases where red fescue was included in the mixture, a higher plant density occurred. Variation in percentages of Kentucky bluegrass and perennial ryegrass appeared to have no effect on plant density.

Table 5 shows the original seed mixtures and percentages on a seed number basis compared with the percent distribution of plants ten months later. In each case where Kentucky bluegrass was seeded at a high percent of the mixture, the respective percent of plant population was considerably lower. In all cases perennial ryegrass was found to be a higher percentage of the final plant population than in the original seed mixture percentage.

Table 5. Percent Distribution Comparison Between % by Seed Number of Seed Mixture and Plant Population.

	Percent by Seed #			2 cm - cutting height -			4 cm		
	KB	FF	PR*	KB	FF	PR	KB	FF	PR
1.	97	0	3	71	4	25	65	8	27
2.	54	40	7	21	60	19	29	50	21
3.	92	0	8	58	4	38	71	5	24
4.	48	36	16	26	41	32	25	39	36
5.	84	0	16	35	4	62	31	6	63
6.	40	30	30	15	30	55	21	26	53
7.	67	0	33	23	0	77	32	4	64
8.	27	20	53	7	24	69	9	20	71

* KB = Kentucky Bluegrass
FF = Fine Fescue
PR = Perennial Ryegrass

Table 6 shows the relationship of original seed mixture percentages expressed by weight to the final percentages of plants found on the site. In nearly every mixture, the final plant distribution of percentages are very similar to the percentages by weight. Thus the percent distribution of plants on a site can be better predicted by percent of weight rather than percent of seed number. The data also indicates that PR percentages above 20% do not crowd out Kentucky bluegrass and red fescue, but survive in proportion to the percent by weight of the original seed mixture.

Table 6. Percent Distribution Comparison Between % by Weight of Seed Mixture and Plant Population.

	Percent by wt.			2 cm - cutting height -			4 cm		
	KB	FF	PR*	KB	FF	PR	KB	FF	PR
1.	80	0	20	41	4	25	65	8	27
2.	20	60	20	21	60	19	29	50	21
3.	60	0	40	58	4	38	71	5	24
4.	15	45	40	26	41	32	25	39	36
5.	40	0	60	35	5	62	31	6	63
6.	10	30	60	15	30	55	21	26	53
7.	20	0	80	23	0	77	32	4	64
8.	5	15	80	7	24	69	9	20	71

* KB = Kentucky Bluegrass
FF = Fine Fescue
PR = Perennial Ryegrass

Table 7. Relative Tolerance of 12 Selected* Perennial Ryegrass Varieties to Winter Injury, Primarily Snow Mold.

Relative Tolerance	Variety
Good	Norlea
	NK-200
Medium	Diplomat
	Manhattan
	SYN D-1
	Citation
	Derby
	Omega
Poor	Pennfine
	Regal
	Yorktown
	Loretta

* Excerpts of 1978 data from Northern Michigan Turfgrass Plots, Traverse City.

In June of 1978, the Turfgrass plots in East Lansing were invaded with rust. The perennial ryegrasses, with the exception of Loretta, were very susceptible. Table 8 indicates the relative tolerance to rust. Increased use of perennial ryegrasses may introduce rust as a serious problem in Michigan.

Table 8. Relative Leaf Rust (Puccinia) Resistance of Eight Selected* Perennial Ryegrass Varieties.

Relative Resistance	Variety
Best	Loretta
Medium	Omega
	Citation
Poorest	Manhattan
	Derby
	Diplomat
	NK-200
	Yorktown

* Excerpts of 1978 data from Turfgrass Research Plots, East Lansing

A great improvement in the perennial ryegrasses is the reduced seedling competition and a reduced vertical shoot growth rate. Because of reduced vertical shoot growth rates of the new varieties, it will no longer be necessary to mow the ryegrasses in a turf area even though the fescues and bluegrasses haven't grown much. Table 9 shows that there is much variation

in the vertical growth rate of the perennial ryegrasses.

Table 9. Relative Vertical Shoot Growth Rates of Twelve Selected* Perennial Ryegrass Varieties.

Relative Shoot Growth Rate	Variety
Slow	Derby
	SYN D-1
	Diplomat
	Loretta
	Manhattan
Medium	Omega
	Citation
	Pennfine
	Regal
	Yorktown
Fast	NK-200
	Norlea

* Excerpts of 1978 data from Northern Michigan Turfgrass Plots, Traverse City.

Ryegrasses generally have good wear tolerance. However, once worn out, the ryegrasses are slow to recuperate because they do not have horizontal growth capability of rhizomes or stolons. In order to re-introduce the ryegrasses on an area, it must be done through inter-seeding or over-seeding programs. When ryegrasses are considered for use, an annual or bi-annual overseeding program should be considered, especially where the turfgrass is expected to receive excessive wear. Golf course tees and football fields are areas where a minimum annual overseeding program must be considered. Because of rapid germination, however, overseeding programs are feasible with perennial ryegrasses.

In a research project at Traverse City, various methods of overseeding were investigated. Table 10 outlines these overseeding treatments. The coring unit was a Ryan Greensaire and the slicing unit was the Rodgers Model 524 Thatching-seeding machine. Plots receiving seed only were seeded with the 524 with the power thatching unit not engaged. The data indicates the coring machine exhibited more rapid establishment of Manhattan perennial ryegrass. This allowed for better seed-soil contact and thus germination of the seed.

Table 10. Ryegrass Overseeding Evaluation

Entry	Treatment	Establishment Rating (1-best; 9-poorest)	
1.	Seed Only	8.8	c
2.	Verticut-seed, 1 direction	7.3	b
3.	Verticut-seed, 2 directions	7.0	b
4.	Core 1 direction, plus Treatment 3	5.0	a
5.	Core 2 directions, plus Treatment 3	5.5	a
6.	Verticut deep 1 direction, plus Treatment 4	5.5	a
7.	Verticut deep 2 directions, plus Treatment 4	5.3	a

The data in Table 10 was taken six weeks after establishment. Approximately one year later, there was no significant difference among the plots. The area receiving seed only was established equally well as those that received the various cultivation techniques.

In summary, the ryegrasses provide us with a new option, that of rapid establishment from seed and additional wear tolerance. Use of the ryegrasses must include an overseeding program especially where wear is excessive. Extensive use of ryegrasses will likely bring new or, in some cases, more extensive disease problems. One must carefully consider the options before using large amounts of the new improved ryegrasses.