BETTER GRASSES FOR ROADSIDES

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The growing importance of maintenance costs and environmental aesthetics dictates the need to develop better roadside grasses. More than a thousand varieties or strains of 36 species were established in 4-yd^2 (3.3-m^2) plots along 8 roadsides throughout New Jersey and 3 experiment station sites over 5 years. Coarse grasses, including Kentucky 31 tall fescue and redtop, consistently produced conspicuous, persistent seed heads that detract from the appearance of the grassy landscape. Finer turf grasses, including certain varieties of Kentucky bluegrasses and 4 fine fescues, established readily and produced fewer and less objectionable seed stalks. Perennial ryegrass varieties initially produced an abundance of foliage and seed stalks, excessively crowded associated grasses, and disappeared after 2 years of low-intensity management. Outstanding performance of spreading fine fescues at several locations prompted the development of a new variety, Fortress, synthesized from locally collected elite plants. Commercial production of Fortress and a superior Chewings variety, Banner, is anticipated. Such grasses should improve the quality of roadside mixtures, particularly when used with common varieties of Kentucky bluegrasses such as Kenblue. The importance of seed-free mulch is shown. It appears inappropriate to try to keep down vigorous species with frequent mowing or to tolerate their coarse appearance when unmowed. Better appearance with less mowing can be achieved with properly established mixtures of superior varieties of fine fescues and Kentucky bluegrasses.

•IMPROVEMENT of grasses has been oriented toward either their agricultural use or their ornamental value, particularly for lawns. The call for grasses suited specifically to roadsides or comparable low-management situations has not been heeded. Roadside seeding contracts typically state the species rather than the variety of grasses to be used. Hottenstein (2) listed components of roadside mixtures used throughout the United States, and only rarely was the variety of a grass species designated. The most frequently used variety of any species was the Kentucky 31 variety of tall fescue (Festuca arundinacea L.). In some instances, differences between varieties can be as important as differences between species.

In the past, high productivity of coarse grasses used for erosion control was not a problem because grass commonly was used for hay or pasture. To keep down vigorous, coarse grasses by conventional roadside mowing requires more energy and machine maintenance than would be required to mow finer turf grasses. To leave coarse grasses unmowed would present a less attractive and possibly more hazardous roadside.

Current roadside maintenance budgets are being strained because of recent increases in road construction, labor, and equipment costs. But increased public awareness of environmental quality dictates that roadsides be aesthetically acceptable.

Tall fescue dominates productive sites along most of New Jersey roadsides sown since 1955; fine fescue components persist on sites characterized by droughty, acid soils. Common Kentucky bluegrasses frequently are seen on productive sites of older New Jersey roadsides.

Identification of superior varieties of adapted grass species through roadside testing should lead to the formulation of better grass mixtures. More specifically, these grasses should provide the best appearance for the most months of the year with the

smallest amount of maintenance. At the same time, they should provide sufficient certainty of establishment in variable situations. These grasses should be serviceable for erosion control and weed exclusion and should provide support for vehicles leaving the pavement. They should be tolerant of roadside environments and not constitute hazards by obstructing vision, causing snow to be deposited on roads, or burning readily.

MATERIALS AND METHODS

Grasses currently specified for roadsides in New Jersey were compared with commercially available grass varieties, plant introductions, experimental seed of various sources, and more recently, seed of our own development. More than a thousand grass varieties or strains of 36 species were sown in 4-yd^2 (3.3-m^2) plots and were replicated 4 times. Including mixtures, this totaled 6,472 plots along 8 newly constructed roadsides throughout New Jersey and 3 experiment station sites over 5 years. Establishment conditions were according to New Jersey Department of Transportation specifications except that rate of seeding was at 40 lb/acre (45 kg/hm^2) rather than the standard 100 lb/acre (112 kg/hm^2) and no legumes were added. Legumes, under certain conditions, can dominate grasses and thereby make comparisons of grasses uncertain. Plots along roadsides were mulched with seed-free hay. Other plots were unmulched. Management was minimal in the first years, but in later tests single nitrogenous topdressings were applied to hasten the transition from seedling stage to mature sod for critical evaluation.

Superior strains of fine fescues were tested as spaced plants in cultivated nurseries. More than 19,000 such plants were screened in the field and greenhouse and an additional 6,000 were involved in the production of breeder seed of newly developed cultivars Fortress (spreading fescue) and Banner (Chewings fescue).

DISCUSSION OF RESULTS

Roadside Tests

Test plots of species, varieties, and combinations that are used at present or might be considered for roadside mixtures were established under conditions simulating roadsides and were rated for quality at various seasons. Completeness of soil cover and uniformity in color, texture, and topography (microrelief) quality were overseen. The data given in Table 1, which are typical of many observations, indicate that additions to the vigorous, dominating, widely used K-31 tall fescue made relatively slight changes in quality ratings. Such plots still looked like tall fescue.

Of the perennial ryegrasses (Lolium perenne L.), Linn, which typifies common types, was stemmier than Manhattan, a turf type. Both proved unsightly on maturing, competed severely with associated grasses under no-mow management, and left a more sparse turf when they died after 2 years. Neither redtop (Agrostis alba L.) nor Canada bluegrass (F. compressa L.) exhibited quality characteristics by themselves or in mixtures. Pennlawn (F. rubra subsp. rubra), the only fine fescue, and the Kentucky bluegrass varieties, alone or in combinations, were usually rated high.

Along many New Jersey roadsides good stands of tall fescue are found where growing conditions are favorable, particularly at the toe of a bank or at original grade at the top of a cut. On the face of steep banks, tall fescue is frequently sparse or missing. Here fine fescues typically provide most of the cover. Such a slope may reveal spots of bare soil from loss of other species from the mixture and the failure of remaining plants to spread.

A trial of 6 commercial varieties of tall fescue under low-intensity management failed to show real differences among varieties of this species. This gave impetus to concentrating research attention on fine grasses like those that persist along old roadsides.

Table 1. Quality ratings of roadside grasses in mature (2.5-year-old) stands in central New Jersey.

Variety	April 7	June 3
K-31[a]	5.0	4.0
Pennlawn[b]	6.7	5.3
Linn[c]	3.6	3.3
Newport[d]	8.2	5.3
Kenblue[e]	8.7	7.0
Redtop	5.4	5.5
Canada[f]	5.7	4.4
Manhattan[g]	3.4	4.4
K-31[a] + Pennlawn[b]	5.0	3.9
K-31[a] + Pennlawn[b] + Linn[c]	4.8	4.1
K-31[a] + Pennlawn[b] + Linn[c] + Newport[d]	6.0	4.0
K-31[a] + Pennlawn[b] + Linn[c] + Newport[d] + redtop	5.7	4.3
K-31[a] + Pennlawn[b] + Linn[c] + Newport[d] + redtop + Canada[f]	5.8	4.2
Pennlawn[b] + Newport[d]	6.9	5.3
Pennlawn[b] + Kenblue[e]	8.2	6.1
Pennlawn[b] + Manhattan[g]	4.5	5.6
Pennlawn[b] + Linn[c]	4.2	5.1
Kenblue[e] + Manhattan[g]	6.9	6.5
Kenblue[e] + Manhattan[g] + Pennlawn[b]	7.2	6.8
Least significant difference at 5 percent	0.7	0.6

Note: Scale is 0 to 9; 9 = best turf grass.

[a]K-31 tall fescue.
[b]Pennlawn creeping fescue.
[c]Linn ryegrass.
[d]Newport Kentucky bluegrass.
[e]Konblue Kentucky bluegrass.
[f]Canada bluegrass.
[g]Manhattan ryegrass.

Table 2. Quality ratings of 36 grass entries.

Variety	Allentown[a]	Fairlawn[b]	Fairlawn[c]	Millville[d]	Millville[e]	Stanhope[f]	Stanhope[g]	Stanhope[gb]	Stanhope[i]	Stanhope[hi]
Turf Kentucky bluegrass										
Merion	7.0	6.2	2.5	2.2	2.2	4.5	2.7	3.7	1.5	2.0
Newport	5.7	5.2	2.5	3.0	1.0	6.2	3.0	4.0	1.7	2.5
Fylking	6.7	7.0	3.0	1.2	1.5	5.7	3.0	4.0	1.0	1.7
Nugget	7.7	5.0	2.7	2.2	1.2	5.5	2.0	2.7	1.0	1.5
P-114	6.5	4.0	1.5	0.5	0.7	4.5	2.0	3.0	1.2	1.7
P-69	5.5	4.7	2.7	1.7	1.5	4.0	1.7	2.5	0.7	0.7
P-107	5.7	5.5	2.0	1.7	1.0	5.5	2.2	3.2	1.0	1.5
P-113	5.7	5.5	1.7	0.2	0.0	4.5	1.7	3.2	1.0	1.7
P-77	6.7	4.5	2.5	0.5	0.0	4.0	2.0	2.7	1.5	2.0
P-72	6.0	3.7	1.7	0.7	0.7	4.2	1.5	2.5	0.5	1.0
P-123	5.5	5.7	1.7	2.2	1.0	4.7	1.7	2.7	1.2	1.5
P-84	6.0	6.5	2.5	1.0	1.5	4.7	2.0	2.7	1.2	1.5
P-57	5.5	5.7	2.7	0.7	0.0	5.0	2.2	4.0	1.0	1.5
P-29	7.0	6.5	3.0	2.2	1.0	4.7	2.5	3.5	1.0	1.2
P-106	6.7	5.0	2.2	0.7	0.0	5.2	2.5	3.0	1.2	1.7
Common Kentucky bluegrass										
Kenblue	6.5	6.0	3.5	2.2	2.0	7.0	3.7	4.5	3.5	4.2
Arboretum	8.2	6.0	3.2	3.2	1.5	6.0	3.5	5.0	3.0	3.7
Minnesota	8.2	5.2	4.2	3.5	1.2	5.5	3.0	4.5	3.0	3.5
Creeping fescue										
Pennlawn	5.5	5.2	3.2	1.0	1.5	7.7	4.0	4.5	3.0	3.5
Ruby	6.0	6.2	2.7	2.5	1.5	8.0	3.7	4.7	2.2	3.2
Golfrood	7.0	6.0	2.7	0.7	0.2	6.2	2.7	3.0	0.7	1.5
Chewings fescue										
Highlight	6.2	5.2	3.7	3.5	3.5	8.0	3.7	5.7	3.0	4.2
Jamestown	5.7	3.0	3.0	1.0	2.0	4.0	2.5	3.5	2.2	3.0
Wintergreen	7.0	5.0	3.7	2.5	2.5	7.5	3.0	5.0	2.2	3.0
Fort McHenry	8.0	6.2	4.5	3.5	3.2	8.0	4.0	6.0	3.2	4.7
C-26 hard fescue	7.2	8.0	6.5	2.0	3.2	6.7	4.0	6.7	5.5	6.5
Tall fescue										
K-31	4.7	5.0	4.2	0.0	0.2	5.2	2.5	3.5	3.0	3.7
Kenwell	4.2	4.2	3.2	1.5	0.7	4.7	2.2	3.2	2.7	3.2
Perennial ryegrass										
Linn	0.5	0.7	2.5	1.0	0.7	2.0	0.0	0.0	1.0	1.0
Manhattan	1.5	4.0	2.2	3.5	1.0	3.0	0.0	0.0	0.7	1.0
Pennfine	3.0	3.0	1.7	3.5	1.2	3.0	0.0	0.0	1.5	2.0
Mixtures										
Kenblue + Ruby	6.5	5.2	3.5	2.5	2.2	8.0	3.7	5.2	3.2	3.5
Fylking + Ruby	5.5	7.0	3.5	2.2	2.0	7.0	3.2	4.5	2.0	3.0
Kenblue + Ruby + Manhattan	5.7	6.2	4.5	3.5	0.7	5.7	3.2	4.5	2.5	3.2
Fylking + Ruby + Manhattan	6.0	5.2	3.5	3.5	2.0	5.7	3.0	3.7	2.5	3.0
Newport + Highlight + Linn	6.2	6.0	3.5	2.5	3.2	6.5	3.5	4.7	3.5	3.7
Least significant difference at 5 percent	2.1	1.9	1.3	1.5	1.2	1.3	1.1	1.0	1.1	1.3
Least significant difference at 1 percent	2.9	2.6	1.7	2.0	1.6	1.8	1.5	1.4	1.5	1.8

Note: Scale is 0 to 9; 9 = best turf grass.

[a]Sown September 17, 1970; rated June 8, 1972.
[b]Sown September 30, 1970; rated June 16, 1972.
[c]Sown September 30, 1970; rated June 18, 1972.
[d]Sown September 26, 1971; rated March 26, 1972.
[e]Sown September 26, 1971; rated October 18, 1972.
[f]Sown September 23, 1970; rated June 28, 1972.
[g]Sown September 23, 1970; rated May 29, 1973.
[h]Fertilized October 17, 1972.
[i]Sown September 23, 1970; rated June 18, 1974.

Subsequently, a series of 36 grasses, including simple mixtures, were sown at 4 roadside locations. Entries were primarily commercial materials, but they did include experimental low-growing turf-type Kentucky bluegrasses (Poa pratensis L.). Sites ranged from a productive soil at the Allentown interchange to a particularly infertile droughty roadside near Millville in southern New Jersey. At the latter site, none of the entries given in Table 2 fared well. At the productive site, even the low-growing Kentucky bluegrasses established and covered the soil adequately. On less productive sites, emergence and initial establishment of turf-type Kentucky bluegrasses were barely adequate, and complete soil coverage never materialized even with further fertilization. The common-type Kentucky bluegrasses, such as Kenblue, Arboretum, and a Minnesota strain, established themselves more quickly, and coverage was more complete than with turf types as indicated by the data given in Table 2. Although the perennial ryegrasses began with great vigor, plants at all locations died by the second year under no-mow management. The fine fescues, either alone or in mixtures, provided better coverage at all sites for the duration of the trials. The 2 tall fescues established themselves well enough but thinned to individual clumps and eventually were rated rather low in quality. The tall fescues failed completely on the poorest site. The 1 hard fescue (F. longifolia Thuill.), C-26, was slow to establish itself but eventually provided the highest quality cover in most ratings.

In time, most entries were rated lower in quality. This was more serious for the turf types than for the common types of Kentucky bluegrasses. Deterioration over time occurred among the commercially available fescues also, but the hard fescue, C-26, retained quality better than any other entry in the test. The final stand of the mixtures generally was dominated by the fescue component.

The Stanhope site consists of a sandy subsoil with 2 to 6 in. (5 to 15 cm) of loamy topsoil added. Initial establishment was good, but deterioration of the stand over time was noticeable. Approximately 2 years after seeding, half of each plot was fertilized with 500 lb/acre (550 kg/hm^2) of 10-6-4. The improvement persisted into the following spring and was still detectable on most grasses at last observation, 21 months after application.

In a supplemental variety trial on the sandy soil at Millville several fine fescues improved with time. The data given in Table 3 indicate that Banner Chewings fescue (F. rubra subsp. commutata Gaud.), Fortress spreading fescue, and K-114 sheep fescue (F. ovina L.) were among the best entries initially, continued to improve their ground cover, and produced fine foliage relatively free of unsightly seed stalks.

Poor grass performance along roadsides may be attributed frequently, in part, to soil conditions that can be changed. At Millville, on soil that was 96 percent sand, the problem was primarily that of establishing a stand on soil with a low moisture-holding capacity. Better establishment of grasses was obtained at this location in supplemental plots amended with 2 in. (5 cm) of silty clay tilled into the surface soil. Intense grazing by rabbits on the small plots of superior vegetation (in contrast with surrounding pine barrens vegetation) further limited grass development.

Seedling Vigor

Quick emergence and growth of sown species are usually desirable, particularly when erosion is of concern. At the outset of these field trials, difference in seedling vigor among grass species was readily apparent. Somewhat less striking, but nevertheless quite consistent and significant, were differences among varieties within species. An appreciation for the extent of the differences was not found in turf-grass literature, for mowing minimizes these differences. Data given in Table 4 typify results of several trials. Measurements in the spring of seedlings that emerged the previous fall and were unmowed indicate great vigor of coarse species such as meadow fescue, (F. pratensis Huds.), intermediate height of the spreading fescues, and smaller stature of Chewings varieties and a hard fescue. Differences among varieties of a species are apparent when one compares the Kenblue and South Dakota Certified Kentucky bluegrasses with the low-growing Merion and Sydsport Kentucky bluegrasses.

Table 3. Quality ratings of a supplemental variety trial established at Millville.

Variety	March 26, 1972	October 18, 1972	June 1, 1973
Bluegrass			
Baron Kentucky	2.0	0.7	1.5
KO-174 Kentucky	1.7	2.2	1.7
KO-175 Kentucky	1.5	1.0	2.0
Fescue			
Arctared Chewings	0.0	0.5	1.5
Banner Chewings	2.7	3.5	3.5
K8-149 Chewings	2.7	1.5	2.5
F. rubra var. commutata	1.5	1.7	3.2
Fortress spreading	2.5	2.5	3.5
F. rubra var. rubra	2.0	1.0	2.7
Alaska station sheep	0.7	1.5	3.5
K-114 sheep	2.5	3.2	4.2
Fine-leaved sheep	0.7	2.0	3.5
C-26 hard	0.7	2.5	3.2
Least significant difference at 5 percent	1.3	1.5	1.3
Least significant difference at 1 percent	1.7	Not significant	1.8

Note: Scale is 0 to 9; 9 = best turf grass.

Table 4. Seedling height of selected fescues and Kentucky bluegrasses.

Variety	Height (cm)
Fescue	
Meadow	34.0
130-16 spreading	17.2
130-17 spreading	18.3
Atlanta Chewings	11.7
Wintergreen Chewings	13.5
C-26 hard	8.0
Bluegrass	
Kenblue Kentucky	12.5
South Dakota Certified Kentucky	10.0
Merion Kentucky	5.5
Sydsport Kentucky	5.2
Least significant difference at 1 percent	5.0

Table 5. Incidence of seed stalks in mature stands of Kentucky bluegrass.

Variety	Rating*
Newport	1.4
Merion	3.6
South Dakota Certified	4.2
Delta	4.6
Kenblue	4.9
Belturf	7.4
Fylking	8.7
Least significant difference at 1 percent	1.0

*1 = most stalks; 9 = no stalks.

Table 6. Incidence of seed stalks in fine fescues.

Variety	Rating*
Highlight	2.4
Pennlawn	4.8
Golfrood	6.2
Atlanta	7.0
Ruby	7.8
Least significant difference at 1 percent	1.5

*1 = most stalks; 9 = no stalks.

Figure 1. Seedling vigor of Chewings fescue and spreading fescue 6 weeks after seeding.

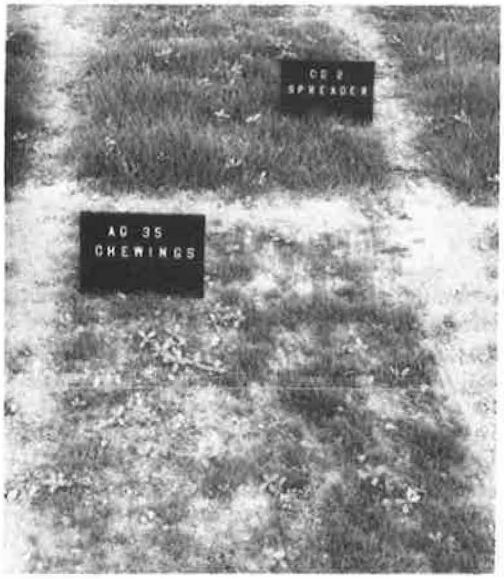
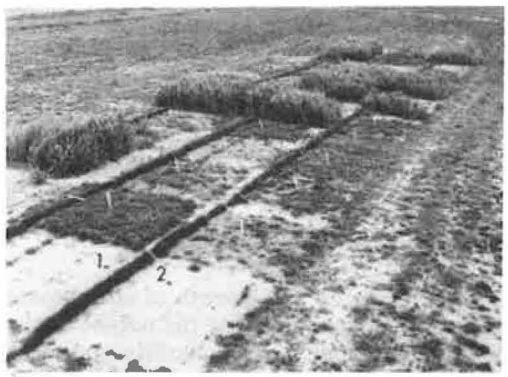


Figure 2. Volunteer grasses from various hay mulches.



In all field trials, except 1 on soil that was 96 percent sand, initial establishment of petite types such as Merion Kentucky bluegrass and C-26 hard fescue was satisfactory in pure stands.

The data in Table 4 indicate the height advantage of spreading fescues over Chewings fescues. Figure 1 shows the vigor of another spreading fescue compared with that of a Chewings fescue in the seedling stage. A separate but similar study of perennial ryegrass varieties indicated that Linn, a common ryegrass, was 41 cm tall and Manhattan, a turf ryegrass, was 23 cm tall. Perennial ryegrasses were observed to persist only 2 or 3 years under no-mow, low-fertilization management. But their initial competition with less vigorous seedlings resulted in appreciably weaker stands of the truly perennial fine fescues or Kentucky bluegrasses. Excessive vigor in the seedling stage of a mixture component is therefore undesirable. Considering that the persistence of a good straw mulch is generally observed to be quite intact 6 months after seeding, one may question the need for fast vegetative cover at the expense of good later coverage.

Mulch

The importance of seed-free mulch was shown in a test of 6 hay samples intended for mulching roadsides. The samples were obtained from several contractors. These typical hay samples were applied at 1 and 2 tons/acre (2.2 and 4.5 Mg/hm^2) on 4-yd^2 (3.3-m^2) plots of methylbromide-treated soil. This treatment killed viable seeds in the soil. Numerous weed and grass seed heads were readily identifiable in the bales, and many of these species established themselves in the plots as shown in Figure 2. One hay sample known to be seed-free ensured establishment of rows of slowly developing grasses sown across plots. Most samples contained seed of coarse forage grasses that eventually suppressed most sown species. Plots 1 and 2 were unmulched.

Volunteer rye (Secale cereale L.) stands tall in Figure 2, and dense stands may compete severely enough to seriously reduce stands of perennial grasses even before elongation begins in the spring. Properly threshed cereal straw should not present this problem.

Domination of roadsides by coarse forage grasses volunteering from seed in hay mulches is common. This is particularly conspicuous when fine grasses are sown. Specifying a straw mulch rather than a hay mulch is particularly important. Most broadleaf weed species can be removed selectively from turf-grass mixtures with herbicides, but perennial grasses cannot be removed. Although specifications typically prohibit seed in the mulch, perennial grass seeds often are overlooked. The seed of cereal crops in straw is easier to detect, and, if excessive, the straw should be rejected for mulch purposes.

Seed Stalks

Seedling characteristics foretell subsequent plant development, particularly in unmowed turf. Grasses with vigorous seedlings may attain sufficient size in a fall seeding to produce seed stalks the following spring. Spreading fescues and common Kentucky bluegrasses sown in the fall generally produce seed stalks the following spring; Chewings fescues and turf type Kentucky bluegrasses under the same conditions typically produce none. Other species of roadside grasses that flower the first spring after a fall seeding include the ryegrasses, Canada bluegrass, tall fescue, and sheep fescue.

Seed stalks affect appearance, and, therefore, are important quality characteristics. With regard to seed stalks, varieties within species differ. Among the Kentucky bluegrasses (Table 5 and Figure 3), Newport annually produced a large number of seed stalks even when not mowed for 5 years. These stalks remained upright and conspicuous for most of the year.

Seed bought as common Kentucky bluegrass or with variety not specified is apt to be Newport, or any other high-seed-yielding variety. A true common type, typified

Figure 3. Seed stalks of Newport and Kenblue Kentucky bluegrass unmowed for several years.

Figure 4. Seed stalks of Merion and Fylking Kentucky bluegrass unmoved for several years.

Figure 5. Suppressed seed stalks of Ruby versus those of Highlight in second spring after fall seeding.

Table 7. Effects of mowing on incidence of seed stalks on fine fescues.

	July 20, 1970, Ratings*		June 30, 1973, Ratings*	
Variety	Mowed	Unmowed	Mowed	Unmowed
Pennlawn creeping	3.0	4.0	3.8	6.0
Ruby creeping	2.0	5.3	6.2	8.0
Highlight Chewings	2.0	3.7	4.5	7.0
Wintergreen Chewings	2.7	3.7	3.3	5.3

*1 = most stalks; 9 = no stalks.

Table 8. Color retention by fine fescues during summer drought, group 1.

Variety	Rating*
Pennlawn creeping	2.2
Highlight Chewings	3.2
Wintergreen Chewings	4.2
Ruby creeping	6.2
KO-17 sheep	7.5
Golfrood creeping	8.8
C-26 hard	8.8
Alaska Station sheep	9.0
Least significant difference at 1 percent	1.9

*1 = straw color; 9 = best green color.

Table 9. Color retention by fine fescues during summer drought, group 2.

Variety	Rating*
Jamestown Chewings	4.8
Highlight Chewings	6.0
Pennlawn creeping	5.5
Ruby creeping	7.8
C-26 hard	7.5
Fortress spreading	7.8
C. P. Shade spreading	8.0
Least significant difference at 1 percent	0.9

*1 = straw color; 9 = best green color.

by Kenblue, consistently produced fewer tall seed stalks, but they lodged readily and soon were covered by long leaves. Turf types such as Fylking (Table 5 and Figure 4) produced a few seed heads and maintained good foliar cover in productive sites. Merion annually produces more seed stalks than Fylking does, but it produces fewer than Newport does. Along infertile roadsides, turf Kentucky bluegrasses provided only sparse cover (Table 2).

Although seed-stalk production characteristics of Kentucky bluegrass varieties continue perennially after maturity, those of the fine fescues do not. The first spring after a fall seeding, the size of seedlings (controlled in part by variety) determines the numbers of seed stalks. Vigorous types such as Ruby developed such a dense cover of fall foliage when unmowed that seed-stalk production the following year was inhibited. The data in Table 6 and Figure 5 indicate that Ruby produced fewer seed stalks than did Highlight Chewings fescue, a lower growing bunch grass. The following year, foliage produced by all varieties was sufficient to inhibit seed-stalk production, and differences among varieties were not significant. Fall mowing and removal of a season's accumulation of growth from fine fescues increased the production of seed stalks (compared with those on unmowed plots) the following spring. Data given in Table 7 illustrate the consistency with which varieties increase seed-stalk production after they are mowed. The suppression of seed stalks by unmowed grass is another argument for restricting mowing of roadsides.

Smothering and Persistence

Under no-mow management, smothering of fine fescues and Kentucky bluegrasses has occurred on productive sites. Along roadsides, soil fertility and pH are typically low, and soil moisture also may be limited. Loss of stands of these grasses by smothering has not been a problem in plots located along roadsides. Maintenance of adequate coverage by common varieties of Kentucky bluegrass has been more consistent under low management than it has by turf types. The fine fescues, however, proved even better adapted to infertile dry soils.

Color Characteristics

Colors of grasses vary with seasons. During summer months Chewings fescues develop brown leaves that discolor the unmowed grass on poor sites. C-26 hard fescue and sheep fescue selections retain their color (Table 8). Typically, the sheep fescues are blue green, and the hard fescue varieties are a brighter light green. Ruby creeping red fescue retained color better than Pennlawn creeping red fescue did (Tables 8 and 9 and Figure 6). Ruby and Pennlawn fescues are called creeping red fescues in current seed-trade terminology. Evidence exists that within these varieties many plants may be spreading types and possess 2n = 56 chromosomes (4). The spreading fescue selections (Table 9) were consistent in retaining a good, deep green color during summer drought. Observations such as this stimulated interest in developing an improved spreading variety.

Spring Dormancy

Breaking spring dormancy, or the ability to develop new green leaves, varies among fine fescues and Kentucky bluegrasses. The data given in Table 10 show a few characteristics fine fescue varieties that differed in early spring greenness. Sheep and hard fescues were notably tardy in spring recovery, and creeping fescue varieties were somewhat better than Chewings fescues. Similarly, the data given in Table 11 show that taller growing common Kentucky bluegrasses, such as Delta, were less dormant than shorter growing turf types, such as Newport, were (Figure 7). Increasing the rates of fall-applied soluble nitrogenous fertilizer hastened the production of green

Figure 6. Color differences between Ruby and Highlight during summer drought.

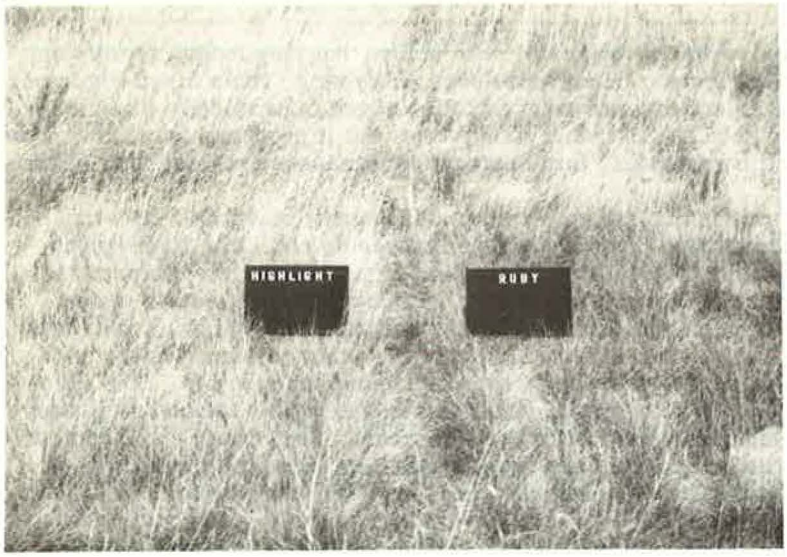


Table 10. Spring dormancy of fine fescues.

Variety	Rating*
C-26 hard	1.3
KO-17 sheep	1.7
Alaska Station sheep	2.0
Golfrood	5.0
Wintergreen Chewings	6.0
Highlight Chewings	6.0
Pennlawn creeping	6.3
Ruby	6.7
Least significant difference at 1 percent	1.9

*1 = straw color; 9 = best green color.

Table 11. Spring dormancy of Kentucky bluegrasses.

Variety	Rating*
Fylking	2.3
Belturf	3.4
Newport	3.4
Merion	3.9
South Dakota Certified	5.9
Kenblue	6.7
Delta	7.9
Least significant difference at 1 percent	1.1

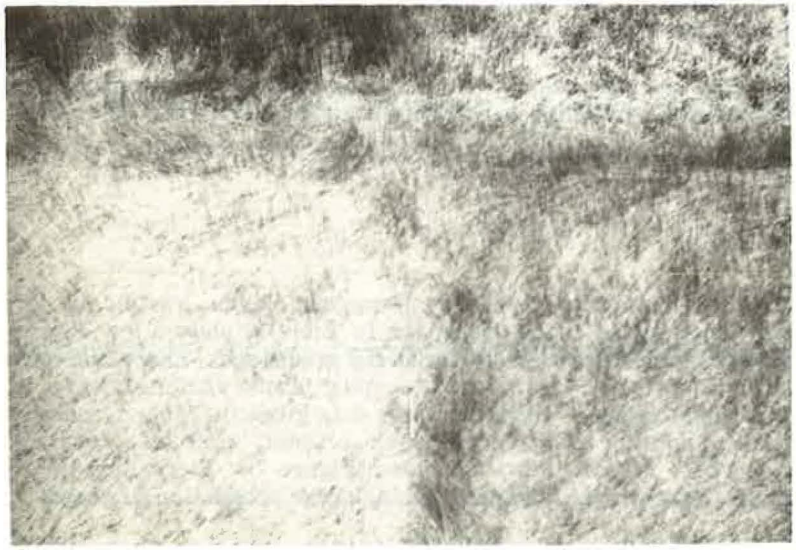
*1 = straw color; 9 = best green color.

Table 12. Effect of fall mowing on breaking of dormancy by fine fescues.

	Rating*	
Variety	Mowed	Unmowed
Pennlawn	9.0	8.0
Ruby creeping	8.7	7.3
Highlight Chewings	9.0	6.3
Wintergreen Chewings	8.0	5.7
Alaska Station sheep	4.0	2.3
KO-18 sheep	4.0	2.7
C-26 hard	3.3	3.3
Least significant difference at 5 percent	0.8	1.6
Least significant difference at 1 percent	1.1	2.1

*1 = straw color; 9 = best green color.

Figure 7. Breaking of spring dormancy by Delta (right foreground) and Newport (left foreground).



color by these varieties in the spring.

Early breaking of dormancy in the spring was enhanced by mowing the previous fall in all fine fescues except C-26 hard fescue as indicated by the data given in Table 12. A cover of foliage, frequently 8 in. (20 cm) deep in unmowed plots, insulates the soil from the warming effects of the sun in the spring and constitutes a barrier to shoots of grass emerging from the soil surface.

Fine Fescue Improvement

Large attractive patches of fine fescues are sometimes found along older roadsides (Figure 8), particularly on infertile soils and droughty sites, including steep, unmowed banks. Such plants grew and spread from single superior seeds. They survived natural selection under minimum management conditions and appear to be better adapted than commercially available creeping and Chewings fescues. Named varieties have been developed in the United States, Europe, and elsewhere principally for fine turf or high seed yields or both rather than for minimum-maintenance turf. Although considerable effort has been made to commercialize varieties, the taxonomy of fescue species has not been consistently clear in the literature. According to Hubbard (3), the several fine fescue species are morphologically distinct, occupy different habitats, and perform differently under turf conditions.

In studies involving field plots, space-planted nurseries, greenhouses, and laboratories, we were able to more clearly characterize a number of fine fescue varieties in the seed trade. If a certain fine fescue is not specified for seeding, any of the characteristics given in Table 13 could develop. Height and color of components of mixtures certainly are important considerations in compounding mixtures. Different chromosome numbers and hour of flowering are also very real natural barriers to the development of cross species. The latter aspect is particularly cogent because Schmidt (4) showed that fescue pollen is short-lived.

To develop superior varieties of grass for roadsides, researchers selected for increase outstanding plants collected earlier from low-maintenance parks, cemeteries, and such areas. Six elite, spreading fescue plants were vegetatively propagated in a polycross nursery. Forty-five elite, Chewings fescue plants were similarly established in a field. Seed from intercrosses in each of these nurseries served as breeder seed for the testing of commercial feasibility of seed production in the center for such culture in the Willamette Valley of Oregon. Results to date indicate that the 2 varieties, Fortress spreading fescue, and Banner Chewings fescue, probably will be released for commercial sales in the near future.

Testing of spreading fescue plants collected more recently from roadside sites, and testing of components of Fortress, revealed the opportunity to select superior plants from these populations that vary in earliness of flowering, leaf-spot resistance, color, stemminess, and rhizome production, and the ability to spread. Seed of superior plants is saved for the production of plants to be tested both in roadside plots and as spaced plants in nurseries. Intercrossing of elite plants of successive generations selected for earlier flowering will mean plumper seeds, and resistance to leaf spot will mean less chance of discolored foliage and possible loss of stand from this fungal disease caused by Helminthosporium spp. A much improved variety of spreading fescue thus should be available for roadside and turf use in the future.

CONCLUSIONS

Hay mulches frequently contain sufficient viable seeds of coarse grasses to negate the advantages of fine-textured grasses. Grasses varied appreciably in seedling vigor. Certain fine grasses such as the spreading fescues and the common Kentucky bluegrasses have sufficient vigor to establish themselves well before the protective mulch disintegrates.

Unmowed ryegrasses provided such an abundance of foliage and stems initially as

Figure 8. Dense, dark green, low-growing fine fescue in the median of Route 130 near Robbinsville, New Jersey.

Table 13. Characteristics of fine fescues.

Type	Species	Height	Spread	Leaf Texture	Number of Chromosomes	Hour of Flower	Typical Varieties	Color
Chewings	F. rubra L. subsp. commutata Gaud.	Low	Very little	Fine	42	6 a.m.	Highlight Jamestown Banner	Light green Dark green Medium green
Creeping	F. rubra L. subsp. trichophylla Gaud.	Medium	Little	Medium	42	2 to 4 p.m.	Dawson Golfrood	Medium green Light green
Spreading	F. rubra L. subsp. rubra	Moderately tall	Good	Broad[a]	56	3 to 5 p.m.	Fortress Ruby Boreal	Dark green Dark green Dark green
Hard	F. longifolia Thuill.	Low	Very little	Fine	42	6 to 8 a.m.	C-26	Dark green
Sheep	F. ovina L.	Low	Very little	Wiry	28, 42	Noon	None available	Blue-green
Pseudovina	F. pseudovina	Low	Very little	Fine and wiry			Vendome	Very light green
Fine-leaved sheep	F. tenuifolia	Low	Very little	Very fine	14		Barok	Light green

[a]Similar to Kentucky bluegrass.

to be excessively competitive with associated perennial grasses. Perennial ryegrasses disappeared completely from roadside plots after 2 to 3 years. Tall fescues were stemmy and coarse, became sparse, and provided insufficient cover on poor sites. Stems of these and other coarse grasses were more conspicuous more months of the year than were certain fine fescues and Kentucky bluegrasses. Designation of variety was important also for color characteristics during summer drought and spring breaking of dormancy.

Selected spreading fescues were found to be superior in several of the previously mentioned characteristics. These grasses should provide a more attractive roadside cover with less maintenance than is expended at present for mixtures dominated by tall fescue. Cultivars of spreading fescues should be developed and used as the main component in mixtures for most of the roadsides in New Jersey and similar environments.

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