The Use of Non-Mowed Fine-Leaf Fescue Grasses on Golf Courses

Fine-leaf fescue is a versatile candidate for use in many areas around the golf course.

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Palo Alto G.C. Superintendent Joe Vallaire inspects the fine-leaf fescue research trial.

The recent increase in demand for low-maintenance, low-input, and environmentally friendly turf makes fine-leaf fescue species prime candidates among "grassy" ground covers for slopes, bunker surrounds, roughs, clubhouse landscaping, and other non-trafficked sites on golf course grounds.

Fine-leaf fescue species have been available for mowed turf use since the 1930s, but most did not come to market in large colume until the 1960s. Several improved cultivars were introduced after 1970. Recently, due to the low-input, low-maintenance nature of these versatile species, many new cultivars of fine-leaf fescue have found their way to market and are becoming popular low-maintenance choices for a variety of uses.

The most common botanical categorization of fine-leaf fescues, all of which are perennial, cool-season grasses, includes four distinct species: creeping red fescue (*Festuca rubra*), Chewings fescue (*F. rubra ssp. fallax [comutata]*), sheep fescue (*F. ovina ssp. hirtula*), and hard fescue (*F. longifolia [brevipila]*). Of these four, creeping red fescue, a native of Europe, is the most widely used for mowed turf purposes. It encompasses two distinct types: the first includes fine-leaved, low-growing grasses with short, thin rhizomes. Grasses of this type are weak creepers and therefore are slow to fill bare areas. However, these slender creepers are known for their ability to maintain color during drought periods. They are commonly known as slender creeping red fescue (*Festuca rubra var. littoralis*).

The second type of creeping red fescue (*Festuca rubra ssp. rubra*) is a strong creeper with long, spreading rhizomes and wider leaves. This type is not as tolerant of close mowing and grows less densely than the slender type; however, excellent seedling vigor accelerates its early establishment.

Both types of creeping red fescue are adapted to well-drained, dry, and moderately shaded sites; they are especially intolerant of wet conditions. They require minimal levels of nitrogen and a pH of 5.5 to 6.5. Cutting heights of 1 to 2.5 inches are common, with the higher heights preferred under shady conditions.

Chewings fescue, native to Europe, is low-growing and without rhizomes. It is a bunch-type grass that spreads very slowly, even under mowing, by basal tillering. It tolerates mowing as close as 1 to 1.5 inches where summers are cool; in warmer areas, mowing heights of 2 to 3 inches are best. Chewings fescue forms a denser turf than creeping red fescue, especially under close mowing. It does not tolerate extremes in temperature but does tolerate shade and drought well. It is adapted to well-drained, coarse-textured, acidic, and infertile soils.

Sheep fescue, a non-creeping bunch-type grass with tufted, stiff, bluish-green leaves, is indigenous to North America and Eurasia. It forms a relatively low-quality turf and has not been widely used for turfgrass purposes. Its main use is stabilization of well-drained, droughty, coarse-textured soils of low fertility. It is not adapted to either close mowing or intensive culture.

Hard fescue, a native of Europe, is also a non-creeping bunch-type grass similar to sheep fescue but with tougher, wider, and greener leaves. Its drought tolerance is less than that of sheep fescue but better than that of creeping red fescue. It is quite deep-rooted and has a high root-to-shoot

ratio, a major factor in its drought tolerance. Hard fescue is shade tolerant but does not adapt to close mowing. Non-mowed hard fescues are attractive ground covers and often are used for soil stabilization on roadsides and ditch banks, and for minimum maintenance and non-use areas.

Fine-leaf fescues are used as mono-stands (i.e., not in a mixture with other turf species) in several regions of the northern United States, but are often unsuccessful as mono-stand mowed turf in southern and western states, especially in regions with hot summers. Being shade tolerant, they are often used in seed mixtures (with bluegrass and ryegrass) in shady or semi-shady sites. As mowed mono-stands of turf, with the exception of the mountainous and the cool coastal regions, they do not produce a quality stand year-round in most parts of the southern and western United States, especially in full sun.

FINE-LEAF FESCUE PERFORMANCE EVALUATION

The results of a 1988 University of California study in the San Francisco Bay area revealed superior performance by several cultivars of fine-leaf fescue, when non-mowed. In particular, several hard fescue cultivars performed very well, were introduced to the landscape market, and subsequently were recommended as non-mowed, low-maintenance turfgrass ground cover. Since then, large acreages of hard and other fine-leaf fescues have been planted throughout California, particularly in the central and northern regions.

Observations of hard fescue performance in California and elsewhere have revealed its very low maintenance requirements, when grown as a non-mowed ground cover. In a multi-year, non-replicated study in Santa Clara, California, a plot of the hard fescue cultivar Scaldis was mowed at either 1.5 inches or non-mowed, received 2 pounds of nitrogen per 1,000 sq. ft. per year or less, and was irrigated with one-half the water received by the adjacent mowed cool-season turf-grasses. The mowed section thinned out considerably and was infested heavily with weeds. The non-mowed half, however, consistently rated high for color and quality. With drooping leaves attaining not more than 12 inches in length, and thinned seed heads, the non-mowed Scaldis cultivar appeared natural and attractive. Since its leaves stay green throughout the year, it was assumed that the stand would not be a fire hazard. It must be noted, however, that in California and other regions where summer rains are non-existent, summer irrigation is essential if hard fescue is grown as ground cover and green color is desired.

The most notable disadvantage of hard fescue (and almost all other fine-leaf fescues) is very slow germination and seedling growth. These traits delay stand development, making direct seeding impractical if quick cover is needed or weed invasion is anticipated. Sodding could bypass this limitation of fine-leaf fescue use. Until recently, higher costs of sodding these species were an obstacle to their widespread use. By the late 1990s, however, many customers (especially golf courses) were willing to pay a premium for a low-maintenance, environmentally friendly grass that provided a quick cover and avoided the early weeds associated with seeding. Nevertheless, sod producers remained reluctant to produce hard fescue sod due to its slow establishment and long growing season for a single harvest, uncertainties about the market, lack of information on successful techniques for sod harvest, and lack of data on sod establishment/rooting after placement in the landscape.

Although non-mowed fine-leaf fescues significantly reduce maintenance costs, they are best suited for sites with little human and vehicular traffic.

FINE-LEAF FESCUE SODDING RESEARCH

In 1996, a University of California study was undertaken in Santa Clara, California, to address some of the sod producers' concerns. The objectives of the study were to determine if hard fescue could produce harvestable sod and, if so, the length of time from planting to harvest; if thick sod rooted and established faster than thin sod;

Table 1
Combined Four-Year Mean Overall Turf Quality (Turf Score) for Mowed and Non-Mowed Fine-Leaf Fescue Cultivars/Species

Cultivar	Species	Mowed		Non-Mowed	
		Turf Score	Rank	Turf Score	Rank
Fortitude	STC	7.3	1	7.3	8
Cardinal	STC	7.2	2	7.7	4
Epic	STC	7.2	2	7.8	3
Wendy Jean	STC	7.0	3	8.1	1
BMXC-S02	STC	6.9	4	7.9	2
C-SMX	STC	6.9	4	7.8	3
Compass	C	6.9	4	7.5	6
Celestial	STC	6.8	5	7.1	10
Dawson E	SLC	6.8	5	7.7	4
DP 77-9885	C	6.8	5	6.6	15
DLF-RCM	STC	6.7	6	7.8	3
Garnet	STC	6.6	7	7.4	7
J-5	C	6.6	7	7.6	5
Musica	C	6.6	7	7.2	9
C03-4676	STC	6.5	8	6.9	12
Class One	STC	6.5	8	7.8	3
IS-FRR 23	STC	6.5	8	7.5	6
Jasper II	STC	6.5	8	7.5	6
Lacrosse	C	6.5	8	6.6	15
Razor	STC	6.5	8	6.9	12
Shademaster	STC	6.5	8	7.6	5
Cascade	C	6.4	9	7.3	8
DP 77-9360	STC	6.4	9	7.3	8
DP 77-9578	STC	6.4	9	7.8	3
Longfellow II	C	6.4	9	7.5	6
Oracle	STC	6.4	9	7.0	11
Pathfinder	STC	6.4	9	7.3	8
Shoreline	SLC	6.4	9	7.4	7
Splendor	STC	6.4	9	7.2	9
SR 5130	C	6.4	9	6.7	14
TLI	STC	6.4	9	7.3	8
Zodiac	C	6.4	9	7.0	11
Ambassador	C	6.3	10	6.8	13
Columbra II	C	6.3	10	7.4	7
DP 77-9579	STC	6.3	10	7.4	7
Seabreeze	SLC	6.3	10	7.3	8
7 Seas	C	6.2	11	6.9	12
Boreal	STC	6.2	11	7.4	7
DP 77-9886	C	6.2	11	6.6	15
PST-8000	STC	6.2	11	6.7	14
Reliant IV	H	6.2	11	7.3	8
Treazure II	C	6.2	11	7.0	11
Spartan II	H	6.1	12	6.1	18
Audubon	STC	6.0	13	7.0	11
Berkshire	H	6.0	13	6.7	14
Oxford	H	6.0	13	7.2	9
Predator	H	6.0	13	6.1	18
SR 3000	H	6.0	13	7.0	11
SRX 3K	H	6.0	13	6.7	14
Firefly	H	5.8	14	6.3	16
Scaldis	H	5.8	14	6.1	18
Quatro	S	5.6	15	6.2	17
Gotham	H	5.5	16	6.2	17
LSD (0.05)	—	0.8	—	0.7	—

Notes:

STC: Strong Creeping Red Fescue / SLC: Slender Creeping Red Fescue
C: Chewings Fescue / H: Hard Fescue / S: Sheep Fescue

LSD: Least Significant Difference. To determine statistical differences among cultivars, subtract one cultivar's turf score from another's turf score. Statistical differences occur when this value is greater than the corresponding LSD value. If the difference between the turf scores for two cultivars within the same column is not greater than the corresponding LSD, then the two cultivars are statistically the same, regardless of their ranking.

and if different rates of nitrogen fertilization before and after sod placement enhanced sod establishment, overall turf quality, and biomass production of a non-mowed hard fescue stand.

Results from this study demonstrated that hard fescue sod production was culturally feasible and led to rapid stand establishment when transplanted. The main obstacle to sod production remains the relatively long growing period; hard fescue (and quite possibly other fine-leaf fescue species) may require up to nine months before it is ready for harvest as sod. Other cool-season grasses, like tall fescue (*Festuca arundinacea*), are ready for market as sod in less than half the time, and thus are more economical for growers unless demand for fine-leaf fescue is high enough to support higher prices.

Long production time notwithstanding, hard fescue (and most other fine-leaf fescue) sod can be rapidly established (within two months) in the landscape. Because fine-leaf fescues remain an option for landscapers looking for low-maintenance turf, the speed of sod establishment may justify the higher price. Direct seeding, by comparison, can take up to two years for a full cover. The 1996 study showed that hard fescue establishment is more rapid when sod is harvested at 1.5 inches thickness than at 0.75 inch, and when at least 1 lb. per 1,000 sq. ft. of nitrogen is applied topically right after the sod is laid.

Because of these results and other studies and field observations elsewhere, several mixtures of fine-leaf fescues are currently available in sod form and are marketed as non-mow or optional-mowing type "lawns."

SELECTING FINE-LEAF FESCUE SPECIES/CULTIVARS

Many new and improved fine-leaf fescue species/cultivars have come to the market in recent years. A University of California trial, co-sponsored by the National Turfgrass Evaluation Program (NTEP) from 2004 to 2007,

Table 2
Soil Chemical and Physical Characteristics at the Beginning and Conclusion of the Trial, Palo Alto Municipal Golf Course Experimental Area*

	pH	ECe	Chloride meq/l	Bicarbonate meq/l	SAR	ESP	CEC	Sand %	Silt %	Clay %
2003	7.9	2.41	8.4	1.5	3	3	19.6	57	28	15
2008	7.5	1.43	2.7	3.5	3	4	24.6	55	26	19

*ECe: Electrical Conductivity of saturated paste extract in dS/m
SAR: Sodium Adsorption Ratio
ESP: Exchangeable Sodium Percentage
CEC: Cation Exchange Capacity

studied these low-maintenance and drought-tolerant grasses to evaluate their suitability and performance in California's Central Coast climate and under recycled water irrigation.

Fifty-three fine-leaf fescue cultivars (supplied by NTEP) were rated monthly for overall quality (turf score) under both mowed and non-mowed regimes. The study included several cultivars each of strong creeping red fescue, slender creeping fescue, Chewings fescue, hard fescue, and sheep fescue. Plots were established at a dedicated spot at the Palo Alto Municipal Golf Course in full sun. All cultivars were planted on native soil at the rate of 4.4 lb. seed per 1,000 sq. ft. Seed was broadcast by hand and raked in. Soil chemical and physical characteristics of the experimental area are summarized in Table 2. A starter fertilizer was applied at seeding to provide 1 lb. each of nitrogen (N), phosphorus (P), and potassium (K) per 1,000 sq. ft. Cultivars were planted in a randomized, complete-block design on 24 sq. ft. plots with 3 replications. Half of each 24 sq. ft. plot was mowed weekly at 2 inches, and the other half was left non-mowed for the entire trial period. Turf quality ratings were recorded separately for each plot, for both the mowed and non-mowed turf.

To reflect the increased use of municipal recycled water for irrigation in urban settings, these plots were irrigated with a 50/50 blend of domestic and recycled water (Table 3 summarizes the irrigation water chemical character). Due to environmental restrictions at the golf course, no pesticide of any kind was applied to the plot. Weed control was limited to occasional hand pulling of weeds. Seasonal application of fertilizer provided approximately 2 lbs. of N, 1 lb. of P, and 1 lb. of K per 1,000 sq. ft. per year. Plots were irrigated as needed.

Table 1 presents overall results at the end of the fourth year. Ratings are the averages of four years of monthly ratings (2004-2007). Ratings fall on a scale of 1-9, with 9 representing superior cultivars for overall quality. Cultivars are ranked in Table 1 from highest overall quality to lowest.

The data reveal the following about the use of fine-leaf fescues as mono-stand, mowed or non-mowed turf grown in full sun in Central Coastal California and irrigated with municipal recycled water:

- All cultivars remained green throughout the year. None experienced dormancy at any time during the year.
- Collectively, non-mowed fine-leaf fescue cultivars received higher turf scores (6.1 to 8.1) than the same cultivars mowed (5.5-7.3). A turf stand receiving a turf score below 6.0 is generally considered unacceptable.
- In past trials, hard fescue cultivars were top performers among the fine-leaf fescues. This trial countered that trend, as many strong creeping red fescues appear at the top of the performance list, under both mowed and

Table 3
Irrigation Water (Recycled Blend) Quality at Palo Alto Golf Course

Parameter	Unit	Value*
Electrical Conductivity (EC)	micromhos/cm	1573
pH	—	6.9
Sodium	ppm	197
Calcium	ppm	51
Magnesium	ppm	36
Chloride	ppm	307
Boron	ppm	0.33
Chlorine (Residual)	ppm	4.9**
Nitrate Nitrogen (NO_3-N)	ppm	22
Phosphate (PO_4)	ppm	12
Sulfate (SO_4)	ppm	96
Sodium Adsorption Ratio	—	5

*2005-2007 average
**2007 average

As a shade-tolerant species, fine-leaf fescues often are used as a component of seed mixtures for shady or semi-shady sites.

non-mowed regimens. Hard fescue cultivars (plus the lone sheep fescue) received the lowest turf scores under both mowing regimes.

- No disease activity was evident on any of the cultivars during the course of the study.
- Although fine-leaf fescue cultivars were planted on clay soil and irrigated with moderately saline recycled water (EC of 1.57 dS/m), they generally performed well. With the exception of a few mowed hard fescue cultivars and the sheep fescue, they all produced an acceptable turf score (i.e., 6 or higher). Although the recycled irrigation water was moderately saline and sodic (SAR of 5) and had high levels of sodium (197 ppm) and chloride (307 ppm), soil test results at the conclusion of the study (Table 2) indicate only moderate soil salinity (ECe of 1.43) and sodicity (SAR of 3). It appears that the leaching requirement on this site was met by the annual precipitation, in addition to the irrigation. In a dry year, when natural precipitation and irrigation frequency may be limited and recycled water contains elevated salts, some of these cultivars may not perform as well as they did in this study.

FINE-LEAF FESCUE ESTABLISHMENT AND MANAGEMENT

Based on several years of field research, field observation, surveys, and input from industry personnel throughout California and elsewhere, it is clear that the turf and landscape industry (in particular golf courses) now have the option of using many high-performing fine-leaf fescues for low-maintenance, non-mowed grassy ground cover, even when irrigation water is moderately saline. Elimination of mowing or only occasional mowing reduces maintenance costs and at the same time addresses air and sound pollution concerns. Compared to mowed cool-season turfgrasses, non-mowed fine-leaf fescues are less prone to injury from water deficiency stress during droughts, and generally require less water, fertilizer, and pesticides. They are also more tolerant of shade and low pH than many other mowed grasses. Non-mowed fine-leaf fescues are aesthetically pleasing and can significantly reduce costs related to labor, fuel, water, fertilizers, and pesticides. Nevertheless, non-mowed fine-leaf fescue (or any other non-mowed grass) is not suitable for sites where human or vehicular traffic is common.

The following establishment and management recommendations are based on many years of field research and field observation. As new species/cultivars come to the market, more research occurs, and more field experience accumulates, these recommendations may require modification.

ESTABLISHMENT

For both seeding and sodding of fine-leaf fescue, best results are achieved if planting occurs in fall, from mid-

September through October in California or similar temperate climates. In colder, northern climates where fine-leaf fescue is well adapted, seeding from mid-August through late September is preferred. Seeding fine-leaf fescue from November through February is not recommended, as rain is likely to wash out the slow-germinating seed. Seeding in March and April is the second-best choice. Seeding from May through mid-August is generally not recommended, as slow-growing seedlings will be subjected to heat/drought/disease stress during these warm months. However, in northern locations, later spring/early summer seeding of fine-leaf fescue can be successful if proper establishment management is used.

Spring is also the second-best choice for sodding. However, fine-leaf fescue sod could also be laid during winter (recognizing that growth will be slow due to low temperature) or summer (accommodating increased water need and increased likelihood of disease).

A seeding rate of 4.5 lb. per 1,000 sq. ft. is recommended. Application of a starter fertilizer containing 1 lb. each of nitrogen, phosphorus, and potassium is required at seeding; topical application (and a thorough watering in) of the same kind and rate of fertilizer is appropriate after sod is laid.

Seeding fine-leaf fescues on slopes can be challenging. With slow germination and seedling growth, the young seedlings are prone to wash out from rains or even irrigation. If possible, prepare a good seedbed with tilling an organic amendment and a balanced starter fertilizer to speed seedling growth. Depending on slope steepness, hydro-seeding/mulching or even erosion-control blankets are advisable. On slopes where neither good seedbed preparation nor the use of an erosion-control blanket is practical, seeding a fast-growing "nurse" crop (such as annual ryegrass [*Festuca multiflorum*]) along with fine-leaf fescue seed is an option, although only in fall. Annual ryegrass germinates quickly in fall/winter and grows fast to protect the soil from erosion from rain. One disadvantage of this method is that annual ryegrass should be either mowed before seedhead production or after fine-leaf fescue establishment during the second or third season after planting. Furthermore, pre-emergent herbicides must be applied to prevent the perpetual presence of annual ryegrass. In addition, the fairly heavy biomass left on the stand after annual ryegrass dies in summer will slow down the fine-leaf fescue stand establishment and should be removed, if practical.

Soil preparation for both seeding and sodding is similar to that for any type of turfgrass seeding or sodding (e.g., tilling, organic matter, and chemical additions, leveling, raking, rolling, etc.). Perennial weeds must be eliminated as much as possible, by any means (non-selective herbicides are the most effective tools in this effort).

After seeding and sodding, a site must be irrigated immediately. The top quarter or half inch of soil must be kept moist until the grass is well established.

IRRIGATION

Although non-mowed fine-leaf fescues have a lower water requirement than typical mowed turf, they nevertheless must be irrigated during summer months (in regions with high air temperatures and sporadic or non-existent summer rains) to survive. Field observations suggest that at any location, non-mowed fine-leaf fescue stands will do well and exhibit an acceptable green color when irrigated at about 70% of what is needed to keep a mowed tall fescue or bluegrass turf stand green in the same area. That translates to a watering requirement of roughly 60% of Reference Evapotranspiration (ET_0). Although there is no research to substantiate these figures, field experience

suggests they are good starting points at any location. Stands established on flat ground, in the shade, in areas subjected to minimal wind, or in foggy areas may actually need less water than 60% ET_0.

The irrigation of non-mowed fescues may be stopped after the first significant rain of the fall-winter season and restarted only after the chance of further rain disappears in spring. In regions where soil freezes in winter, non-mowed fine-leaf fescue (like all other cool-season grasses) will be dormant and brown. Irrigation is not needed during this dormancy period.

During summer months, if fine-leaf fescue stands are irrigated at deficit irrigation (i.e., less than 60% ET_0), fine-leaf fescue stands may induce dormancy (browning), the severity of which depends on the extent of the deficit. At very low or no irrigation, a stand may turn completely brown. Under severe, prolonged water deficit stress, fine-leaf fescue may die. However, at least a couple of severe water deficit summer seasons may pass before the entire stand dies. Since fine-leaf fescues produce relatively deep and extensive root systems, non-mowed stands are able to tolerate longer periods of drought stress compared to their mowed counterparts. As long as individual plants remain alive, they can often recover from severe drought once water (from irrigation or rain) is again available.

Irrigating fine-leaf fescue stands on slopes is a challenge. Overhead irrigation water often runs off the surface of foliage/thatch downhill (before reaching the soil) and accumulates at the bottom of the slope, resulting in very wet areas at the bottom and dry ones at the top of the slope. As a result, grass is prone to drought-induced injury (dormancy) at the top and diseases on the lower areas of the slope. The most effective solution to this problem is installing low-volume sprinkler heads at the top of the slope and running them longer while applying water at a low rate. Another option is to lay several parallel lines of drip tubes (such as Leakey Pipe) perpendicular to the slope on the surface of the soil at the time of planting. After the grass is established, these irrigation lines will disperse water at low rates right on the soil (at the base of turf plants). While water is slowly rolling downhill, it will have a chance to percolate into the rootzone. Calculating duration and frequency of irrigation for both of these approaches would be up to local maintenance personnel.

Another challenge in irrigating non-mowed fine-leaf fescue is operation of pop-up irrigation heads as grass grows taller. At maturity, a non-mowed stand may have a 6- to 12-inch turf canopy; most traditional pop-up irrigation heads do not rise to that height. Irrigation volume and uniformity can be significantly disrupted as progressively taller grass interferes with the throw of water leaving sprinkler nozzles. It may therefore be necessary for the irrigation design to specify high-rise irrigation heads at the outset, or to specify conversion of low-rise heads to the high-rise type after stand establishment.

Fine-leaf fescues are not recommended for planting on sites where soil stays wet for a long time. They cannot tolerate standing water for more than a couple of consecutive days, and they are prone to diseases if wet for an extended period.

This non-mowed fine-leaf fescue stand enhances the area by presenting a more naturalized aesthetic.

MOWING

The recommended mowing height for fine-leaf fescue lawns, in shady sites under trees on golf courses, and elsewhere is 2.5-3 inches. Mowing once every two to three weeks may be sufficient. Most fine-leaf fescue species/cultivars left unmowed will grow to a height of 6-12 inches, with most leaves drooping to one side or the other.

Some species/cultivars may produce seed heads, though these tend to be inconspicuous and low in number and generally add to the "natural" look of the stand. Seeds are generally non-viable and will not reseed a thinned spot; nor will they significantly contaminate adjacent landscaping. If seed heads are objectionable, they can be removed annually using handheld string weeders. If, for either practical or aesthetic reasons, it is necessary to keep a shorter turf canopy than that of a completely unmowed grass, the site may be mowed once or twice per year with the mower set at the highest setting. In this case, the abundant clippings must be removed in order not to interfere with regrowth of the stand. Also, the aesthetic value of the stand after such drastic mowing events may not be high for two to four weeks, until new green growth masks the scalped grass. The best time to do seasonal mowing is in the fall; the second-best time is early spring. Where annual weeds are plentiful, it is advisable to apply a pre-emergent herbicide following seasonal mowing to prevent weed establishment while the fescue plants are recuperating from drastic mowing.

Non-mowed fine-leaf fescue growing near and around landscape trees and shrubs may create a problem. Tall, dense grass abutting trees or shrubs may provide a thick layer of continuously moist (or at least damp) mulch that can promote fungus and crown rot. To prevent disease, keep grass at least three feet from tree tunks or shrubs. Similarly, remove already established grass that is less than three feet from tree trunks.

FERTILIZATION

One of the advantages of leaving fine-leaf fescue unmowed is the decrease in their nutritional needs. Depending on soil fertility, a non-mowed stand of fine-leaf fescue may never need fertilization. Unless the turf stand is planted on infertile soils (e.g., sub-soils of roadside slopes) or on high-sand soils, non-mowed fine-leaf fescue may need no more than 1 lb. of nitrogen per 1,000 sq. ft. per year. Fertilizers containing both the slow-release and fast-acting (soluble) forms of nitrogen are preferable. The best time to fertilize is fall, when high daytime temperatures are consistently below 70°F., before the rain arrives. Only on high-sand soils should other nutrients such as phosphorus and potassium be applied at 1 lb. per 1,000 sq. ft. per year each.

Many new and improved fine-leaf fescues have come on the market. A co-sponsored University of California and National Turfgrass Evaluation Program trial investigated these grasses to evaluate their performance in California's central coast climate and under recycled water irrigation.

Neither of the latter nutrients is necessary if non-mowed fine-leaf fescues are grown on fertile soils, although inclusion of them in most marketed turf fertilizers should not cause a problem.

While application of additional nitrogen may provide a greener appearance on non-mowed fine-leaf fescue, excessive nitrogen will also encourage excessive and unnecessary growth and thatch. Excessive thatch is undesirable, as the stand will become progressively puffy and clumpy, and it will be more prone to disease development and harder to irrigate effectively.

WEED CONTROL

Slow seed germination and seedling growth create challenges in weed control at early stages of turf establishment. With limited competition from slow-growing fine-leaf fescue seedlings, local weeds can easily dominate the stand for the first year or sometimes two. If full ground cover is not achieved during the first six to eight months after seeding, application of either pre- or post-emergent herbicides may need to be postponed due to possible herbicide injury. The most effective way to slow the spread of weeds during the first or even the second season of growth is mowing. Setting the mower at a height just above the average height of a fine-leaf fescue stand will stop weeds from seed head production (and further infestation) and will reduce their shading effect. As a fine-

Incorporating grasses that require only occasional mowing or eliminating mowing reduces maintenance costs and also addresses air and sound pollution concerns.

leaf fescue stand becomes established, most annual weeds are eliminated because seeds have a hard time getting established. Eventually, as the fine-leaf fescue grows taller and becomes more dense, many perennial weeds are also crowded out. Any remaining weeds can be dealt with from the third season after seeding with pre- or post-emergent herbicides. On established non-mowed fine-leaf fescue stands, spot application of broadleaf herbicide is effective and preferable to blanket application. To get the best results (and for plant, animal, and human safety), one must follow the directions given on the pesticide label.

The biggest advantage of sodding fine-leaf fescue over seeding is the elimination of weed invasion. Fortunately, growers are increasingly producing fine-leaf fescue sod. Although initially more expensive, sod may be a better economic choice, considering all the seedling establishment problems: weed infestation, seedling disease, seed washout, etc.

DISEASE MANAGEMENT

Fine-leaf fescues are susceptible to most common local turfgrass diseases when mowed. When unmowed, the incidence of disease development is relatively low; even where disease infects an unmowed stand, the infestation is often localized as the disease is not spread through the sward by mowers or human traffic. If a localized disease area is large and cannot be ignored, then spot application of an appropriate turfgrass fungicide may be required. It may also be prudent to "wait and see" before applying chemical treatment. If a disease kills the grass (i.e., the spot does not recover), remove dead tissue, till the soil in that spot shallowly, and re-seed or re-sod with fine-leaf fescue.

INSECT PESTS

Presently, no significant insect damage of non-mowed fine-leaf fescue stands has been reported. As fine-leaf fescue plantings increase, such infestations may develop and should be dealt with accordingly.

RODENTS

Rodents (gophers, moles, squirrels, rats, etc.) do not appear to be a problem in non-mowed fine-leaf fescue stands. It may be that the dense thatch layer that eventually develops in non-mowed stands discourages rodent activity. Or, although minor infestation may occur, symptoms (e.g., soil mounds) are not visible.

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