

In less than 20 years, turf-type perennial ryegrass has grown from obscurity to become perhaps the most important turf species used in the U.S.

Prior to the mid-1960's, ryegrass was a derogatory term reflecting cheap seed mixtures and poor turf performance. Today, some of the finest turf in America is composed of pure stands of turf-type perennial ryegrass.

The ryegrass revolution began in the mid-1960's when NK100 was developed by Howard Kaerwer of Northrup King. Acceptance was slow to develop, except in Long Island, NY, where Bob Russell of J. L. Adikes found NK100 to be well adapted as a turfgrass. A strong local market developed.

Pelo, a Dutch variety originally bred to be a pasture grass, was found to have improved turf properties and became the second turf-type variety. Work by Kaerwer showed that Pelo and NK100 made an improved combi-

nation for southern overseeding. This blend became Medalist 2 and started the winterseeding revolution which has since converted most of the south to perennial ryegrass for use as a fine winter turf, particularly on golf courses.

Next came Manhattan developed by Dr. Reed Funk of Rutgers. Manhattan was the first modern turf-type and represented a giant advancement. The parent material was selected from old turf areas in Central Park, NY in 1964.

Pennfine, developed by Dr. Joe Duchich at Penn State, quickly followed and became the first turf-type perennial ryegrass protected under the U.S. Plant Variety Protection Act. Pennfine was a huge and immediate success and has since become the most widely used variety ever developed!

The success of Manhattan and Pennfine led to increased public and private breeding efforts in the U.S. and Europe which quickly led to the development of Derby, Yorktown, Citation, Regal, Omega and Diplomat in the early to mid 1970's. Breeding has continued undiminished since then and has led to the abundance of improved types now available.

In 1983, perhaps 50 million pounds of turf-type perennial ryegrass seed was planted in the U.S.

In northern areas the improved cultivars form a dense, low-growing, fine-leaved perennial turf. When overseeded on dormant Bermudagrass, improved varieties establish rapidly and form a dense, attractive turf during the winter months. In the spring and summer the renewed growth of the Bermudagrass overwhelms the perennial ryegrass. Each fall the ryegrass must be reseeded.

The rapid establishment and attractive, but tough, turf formed by improved perennial ryegrass cultivars make them an ideal species for athlet-

Landscape Manager's Guide to **Perennial Ryegrasses**

by **Gerald W. Pepin**, Director of Research, Pickseed West Inc., Tangent, OR



ic fields and parks. Many sports fields are now wholly or partly perennial ryegrass.

Although ryegrass is a bunch grass and doesn't spread by stolons or rhizomes, it does tiller well and the rapid germination and establishment characteristics of the species make overseeding a very viable solution to bare or worn spots.

Perennial ryegrass mixes well with Kentucky bluegrass. Their similarity in color, texture, and appearance often makes them difficult to distinguish.

Differing resistance to common turf diseases is another big advantage gained by mixing the two species. Perennial ryegrass is rarely damaged by *Fusarium* blight, stripe smut, and *Helminthosporium* leaf spot—three of the more serious bluegrass disease problems. Conversely, Kentucky bluegrass is rarely affected by *Rhizoctonia* brown patch, *Pythium* blight, and *Corticium* red thread—three of the more serious ryegrass disease problems.

Improved cultivars are generally winterhardy well into Canada, but also are tolerant of heat and summer stress conditions deep into the transition zone.

Establishment

The rapid germination and establishment characteristics of ryegrass have been the most important factors in their remarkable success. Good quality seed from all ryegrass cultivars appear to germinate quickly into vigorous seedlings that rapidly establish a mowable turf. Under warm soil and air temperatures and adequate moisture, it is possible to mow ryegrass two weeks later.

There appears to be only small differences in the germination and establishment rates of improved cultivars.

Leaf texture and mowing quality

Most of the modern ryegrasses have a pleasing moderately-fine texture and mow cleanly. The older varieties released before Manhattan and Pennfine were characterized by broader, often coarse leaf texture and poor mowing quality, particularly during warm, dry weather. Most of the newer cultivars are characterized by fine to

Overseeded perennial ryegrass green, at Inverrary Country Club, Lauderhill, FL, during the winter.

Southern winterseeding and northern use of perennial ryegrass consumes more than 50 million pounds of seed per year.

moderately fine leaf texture and mow even more cleanly than Manhattan and Pennfine, particularly during hot dry weather.

Growth habit

The low growth habit of improved perennial ryegrasses enables them to persist at very low cutting heights. For the last 15 years breeders have been quite successful in producing a lower-

Improved cultivars are generally winterhardy well into Canada, but are also tolerant of heat and summer stress conditions deep into the transition zone.

growing, more dwarf type growth habit in perennial ryegrass.

In many closely-mown golf fairways around the country, improved cultivars are persisting and forming a tough and attractive turf when mown as closely as 1/2- to 3/4-inch.

"Barclay", a Dutch variety, has demonstrated a slight creeping growth habit via prostrate stems that can take root at the stem nodes. Also several selections that "creep" in a similar manner have been found, leaving the possibility that "creeping" perennial ryegrasses are a real possibility in the future.

Color

Most people in the U.S. have a preference for darker green cultivars, such as Citation, Regal, Fiesta, Prelude, etc. Conversely, the preference in Europe is usually for lighter green types, such as Loretta and Elka. Plant breeders now have the genetic resources to produce cultivars ranging from light to very dark green.

Color is much a matter of personal preference so there is no "superior" color. Most agronomists feel that a medium-dark green color that blends well with other cultivars and doesn't contrast sharply with Kentucky bluegrasses is best. Cultivars with a genetically dark color are important to individuals who want a dark green turf with minimum fertilizer usage.

Winter survival

In general, the winter survival of improved turf-type ryegrasses has been very good, and certainly much improved over the older "common" va-

rieties such as "Linn". In the early 1970's there was much concern that turf ryegrasses would be damaged by hard winters in the Northeast, upper mid-West and the Rocky Mountain states. These early fears were largely unfounded. Most of the improved cultivars can form a long lived, perennial, winter hardy turf throughout the U.S. and into Southern Canada. Some cultivars appear to have an extra measure of winter hardiness, including Blazer, Delray, Manhattan and NK200.

Summer survival

Heat and drought tolerance plus resistance to summer turf disease and insect pests appear to be the major factors responsible for improved summer survival of ryegrass cultivars in areas subject to severe summer stress. Many good cultivars are now available that are capable of forming an attractive perennial turf in areas deep in the "transition" zone.

Recent research findings indicate that the presence of a fungus called the *Lolium* endophyte in certain cultivars is strongly associated with improved summer survival. This exciting new development in ryegrass breeding is discussed in greater detail below.

Some of the turf-type ryegrasses that have demonstrated better than average summer survival in stress areas include Pennant, Citation II, Regal, All*Star, and Repell.

Winter seeding

Every autumn millions of pounds of turf-type perennial ryegrass are overseeded into dormant Bermudagrass turf on golf courses in the southern U.S. Blends of improved varieties can form a beautiful, dark-green temporary turf during the winter months in the south.

On some golf courses only the greens and tees are overseeded. On others the entire course is overseeded with turf perennial ryegrass blends.

Most of the better turf type cultivars are good winterseeding grasses. To obtain better genetic diversity, many seed companies blend together two or more ryegrass cultivars and sell the blend under a brand name. Often perennial ryegrasses are mixed with other turf species such as red fescue and *Poa trivialis*. Some of the more popular and widely used winterseeding formulations are CBS, Futura plus, Marvelgreen, Medalist, and PHD.

Disease resistance

Like all other turfgrasses, the perennial ryegrasses are subject to a

TABLE 1
Characteristics of 34 Perennial Ryegrass Cultivars*

Cultivar	Color	Tiller Density	Leaf Texture	Winter Hardiness	Mowing Quality	Brown Patch Resistance	Brown Blight Resistance	Crown Rust Resistance	Stem Rust Resistance	Red Thread Resistance	Endophyte Level
All Star	7	7	7	7	6	7	7	6	4	6	6
Barry	8	7	7	7	7	7	6	5	3	5	1
Belle	7	7	6	8	6	7	7	6	2	6	1
Birdie	7	6	6	7	6	7	5	7	2	6	1
Birdie II	7	7	7	5	7	7	7	8	8	8	8
Blazer	7	7	7	8	6	7	7	6	4	6	2
Caravelle	9	4	6	3	3	4	5	4	3	6	1
Citation	8	6	7	7	6	7	3	5	2	7	1
Citation II	8	6	7	6	7	7	8	8	8	8	9
Cowboy	7	6	7	5	5	6	7	7	8	7	6
Dasher	7	6	6	8	6	7	6	7	2	7	3
Del Ray	6	7	6	8	7	7	3	7	5	7	3
Derby	7	6	6	6	6	7	6	4	2	7	3
Diplomat	7	6	7	8	5	7	7	4	3	6	1
Elka	5	8	9	8	8	5	5	9	5	6	1
Fiesta	8	6	7	8	7	7	6	7	2	6	2
Game	5	3	3	4	3	2	5	8	3	5	1
Gator	8	8	7	7	8	7	7	8	4	7	1
Linn	5	2	3	3	1	2	4	6	3	5	3**
Loretta	5	7	8	7	8	5	6	8	5	6	1
Manhattan	6	5	6	8	5	5	6	3	3	5	1
Manhattan II	8	8	8	6	8	7	7	7	8	6	2
NK 200	7	5	6	9	4	5	5	3	3	6	1
Omega	7	6	6	8	5	7	7	4	3	7	1
Omega II	7	7	7	7	7	7	7	7	8	7	5
Palmer	7	8	7	6	6	8	7	7	1	7	3
Pennant	7	6	6	8	5	7	6	7	3	7	8
Penn Fine	6	5	6	6	5	7	3	5	3	7	3
Prelude	8	8	6	6	6	7	7	8	2	7	5
Premier	7	7	7	6	6	7	6	7	2	7	5
Regal	8	6	6	8	7	7	7	4	1	7	8**
Repell	7	7	7	7	7	7	6	5	4	6	9
Tara	8	7	7	6	7	7	6	7	4	6	1
Yorktown II	7	7	8	7	7	7	7	5	2	5	1

*9 = Darkest color, most density, finest texture, most winter hardiness, best disease resistance, and highest endophyte level.

** Endophyte level may vary with different seed lots.

number of turf diseases. However, as a species, perennial ryegrass appear to be less subject to severe disease problems than bluegrass, fine fescue, and bentgrass.

The most serious summer disease problem is brownpatch incited by *Rhizoctonia solani*. Other warm weather disease problems include winter Pythium blight or damping off, dollarspot incited by *Sclerotinia homoeocarpa*, and stem rust *Puccinia graminis*.

Some of the more important cool-season diseases include winter brown blight (also called winter leaf spot) incited by *Drechslera* spp. (formerly *Helminthosporium* spp.), crown rust incited by *Puccinia coronata*, and Corticium red thread and pink patch.

Brownpatch is potentially a very

serious problem on ryegrass turf during periods of warm humid weather. It is favored by warm night temperatures, high nitrogen fertilization, and supplemental irrigation. Fortunately, great improvements in brownpatch resistance have been made by plant breeders, particularly Dr. Reed Funk at Rutgers University. Good genetic resistance to brownpatch has probably been the single most important factor in extending southward the usage of turf type perennial ryegrass. Some of the more brownpatch resistant cultivars include Blazer, Citation II, Prelude, Palmer, Pennant, and Premier.

Pythium blight or damping off is usually a disease of seedlings or young turf. There is little genetic resistance to Pythium so appropriate

fungicides should be used if it is a problem. Applying supplemental irrigation carefully often helps limit the occurrence of pythium. During warm weather it is very helpful to plant seed treated with fungicides, such as Koban or Apron. This practice is used extensively for winterseeding in the south.

Incidents of **dollarspot** damage on perennial ryegrass turf appear to be increasing. This disease is often seen in shady areas and is favored by low nitrogen levels, dry soil conditions, high humidity, and moderate temperatures.

Crown rust usually occurs in the fall and though unsightly is generally not a major problem. It is favored by the cooler temperatures of late summer and is usually seen on turf whose growth is slowed by a lack of adequate fertility or drought stress. It is seldom found on actively growing turf. Some of the more crown rust resistant cultivars include Elka, Loretta, Gator, Prelude, Premier, and Fiesta.

Brown blight, or winter leaf spot, is usually associated with cool temperatures and wet or water saturated turf. It is frequently seen in the cooler parts of the year and under short day lengths when turf is growing very slowly.

This disease is a serious problem on winter turf in the Pacific Northwest. Fortunately, many of the newer cultivars have good resistance to winter brown blight. Some of the most resistant cultivars include Prelude, Citation II, Blazer, and Manhattan II.

Corticium red thread is becoming an increasingly important turf disease. It appears to be several diseases and plant pathologists now distinguish at least two closely related forms, red thread and pink patch. Red thread and pink patch can be serious problems on turf maintained at low to medium fertilizer levels. It is also favored by cool cloudy weather. Most presently available cultivars have varying degrees of susceptibility. There appears to be some genetic resistance to Corticium and resistant cultivars may be available in the coming years.

Insect resistance and Lolium endophyte

One of the most recent developments in ryegrass breeding has been the release of several cultivars resistant to damage incited by insects such as sod webworms and billbugs.

Just recently, it has been determined that the insect resistance is apparently related to the presence of a fungal endophyte living within the

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plant. This *Lolium* endophyte lives symbiotically within the host plant and causes no outward symptoms when present.

The mechanism of resistance is not clear, the best theory is that the fungus produces a chemical within the plant that is toxic to chewing insects. The endophyte is transmitted by seed or by vegetative propagation such as tillering. It does not spread from plant to plant in the field.

Under "average" storage conditions the fungus will remain viable in seed from 8 to 16 months after harvest. Under cool storage (40 degrees F.) the endophyte will remain viable for many years.

One of the most recent developments has been the release of several cultivars resistant to damage by insects.

Plants grown from seed possessing living *Lolium* endophyte will have the endophyte growing within the plant and concentrated mainly in the lower stem and crown. Ryegrass plants with the endophyte have demonstrated resistance to damage caused by chewing insects such as the sod webworm (*Crambus* spp.), billbug (*Sphenophorus parvulus*) and Argentine stem weevil (*Listronotus bonariensis*).

Endophyte enhanced performance

In addition to improved insect resistance, ryegrass plants possessing the *Lolium* endophyte often exhibit improved turf performance—particularly during periods of summer stress due to heat and drought.

For reasons that are not clear, endophyte infected turf appears to have improved persistence and vigor during periods of summer stress. It may also have increased vigor, a more attractive appearance, improved density and recover more rapidly from injury.

During most of the year good varieties not containing endophyte will be every bit as good as those that do. It is only during periods of chewing insect infestation or summer stress that an endophyte containing cultivar may

Perennial Ryegrass Varieties

All Star is a leafy, attractive, medium early, turf-type variety. It is marketed by J. and L. Adikes of Jamaica, NY. Most of the parental germplasm of All*Star originated from selections made from old turfs located in Baltimore and College Park, MD. All*Star has the ability to produce a fine, dense turf with a reduced rate of vertical leaf growth and an attractive bright, dark green color. The variety has shown good heat and drought tolerance and good cold hardiness. All*Star has demonstrated good resistance to *Rhizoctonia* brown patch disease and some species of sod webworm.

Barry is a leafy, attractive, late maturing turf-type variety, developed in Europe by Barenbrug Holland BV, and marketed in the U.S. by Turf Merchants Inc., Albany, OR. Its parental germplasm came from Manhattan and from selections made in Europe. Barry is capable of producing a fine textured, dense, medium-low growing turf with a dark green color. It has good resistance to brown blight and *Rhizoctonia* brown patch. Barry has good heat and cold tolerance and the ability to maintain good color into the cool temperatures of late fall. Mowing characteristics are above average.

Belle is a medium early maturing variety currently being produced by E. F. Burlingham and Sons of Forest Grove, OR. Belle is a leafy, persistent, turf-type variety capable of producing an attractive, dense, moderately low-growing, fine-textured turf of a moderately dark green color. Belle has shown moderately good resistance to some races of crown rust, *Rhizoctonia* brown patch and winter brown blight diseases. It has shown medium to good heat and cold tolerance, good wear and good mowing qualities.

Birdie is a medium early variety developed by Turf Seed, Inc. of Hubbard, OR. It has a moderately dark green color, medium-fine texture, medium-high density, and is a moderately low-growing, turf-type variety. Birdie has moderately good resistance to *Rhizoctonia* brown patch and some races of dollar spot. It is susceptible to the winter brown blight disease. Birdie has shown medium-good heat tolerance and medium cold hardiness. It has relatively good mowing qualities except during late spring when the turf becomes quite stemmy.

Birdie II is an early maturing variety developed by Pure-Seed Testing and marketed by Turf Seed Inc., Hubbard, OR. This variety was derived from Birdie perennial ryegrass and new sources of stem rust resistance. It produces a leafy, persistent turf with a medium dark blue-green color and good density. Birdie II has excellent seedling vigor, and improved resistance to winter brown blight, brown patch, stem rust, and heat tolerance, and a dwarf growth habit than its parent Birdie. This variety has moderately good resistance to insects such as bill bugs and sod webworm based on its high endophyte level (81 percent). It has performed very well for the overseeding of dormant bermudagrass in the southern U.S.

Blazer is a medium late maturing variety currently being produced by Pickseed West Inc., of Tangent, OR. Blazer is a leafy, persistent, moderately low-growing turf-type perennial ryegrass capable of producing an attractive, dense, fine-textured turf of a bright, moderately dark green color. Blazer has shown good resistance to *Rhizoctonia* brown patch and winter brown blight and moderate resistance to some races of crown rust. It has demonstrated good heat and cold tolerance and has good mowing qualities.

Caravelle is a medium maturing variety developed in the Netherlands by Mommersteegs International and distributed in the United States by O. M. Scott and Sons of Marysville, OH. Caravelle is a leafy, low-growing, turf-type variety with a very dark green color, medium fine texture and medium density. It has medium-poor cold hardiness and poor heat tolerance. Caravelle is susceptible to the *Rhizoctonia* brown patch disease. This variety is used primarily for winter overseeding in the South. It tends to mow poorly in hot, dry weather.

Citation is an early maturing variety with an attractive, bright, dark green color. It was developed, and is being produced and marketed by Turf Seed Inc. of Hubbard, OR. Citation produces a low-growing turf with medium fine texture and medium density. The variety has medium cold hardiness, good heat and wear tolerance and good resistance to *Rhizoctonia* brown patch and *Fusarium* blight. Citation has moderate resistance to red thread and many races of dollar spot. It is susceptible to the winter brown blight disease. Citation has good mowing qualities except during its reproductive phase in late spring.

Citation II is a medium-early maturing variety capable of producing a fine textured turf of medium high density. Citation II has the rich dark blue-green color and heat tolerance of its parent Citation. This variety, marketed by Turf Seed Inc. was developed cooperatively by Pure Seed Testing Inc. and the New Jersey Agriculture Experiment Station. It has shown very good resistance to brown patch, stem rust, winter brown blight, dollar spot and crown rust. Citation II has also shown improvements in its tolerance to red thread and *Fusarium nivale*. This variety has excellent seedling vigor, heat and cold tolerance, close mowing tolerance, improved mowing quality and a low growing, dwarf leaf orientation. The endophyte of this variety is very high at 94 percent, which should convey resistance to above ground feeding insects. It has performed very well in southern overseeding trials.

Cowboy is a new, very early maturing variety being marketed by Loft's Seed Co., Bound Brook, NJ. It was developed as a new stem rust resistant variety cooperatively by the New Jersey Agriculture Experiment Station and Pure Seed Testing Inc. This variety has a moderately dark green color, a medium fine texture and medium density. It has a low growth habit compared to other early maturing varieties. It has

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shown good resistance to winter brown blight, brown patch, crown rust, and dollar spot. It has good heat and cold tolerance and will be very good for the overseeding of dormant bermudagrass in the southern U.S. It has a moderately high endophyte content (57 percent) which should convey a moderately good level of insect resistance.

Dasher is a medium early variety developed by Pickseed West Inc. of Tangent, OR. It is a fine-textured turf-type variety capable of producing a leafy, dense, attractive moderately low-growing, persistent turf with a bright, medium dark green color. Dasher has shown good resistance to winter brown blight. It has medium good cold hardness and good heat tolerance. Dasher has relatively good mowing qualities except during the reproductive period in late spring.

Delray is an early maturing variety that was developed and is being produced by Northrup King. It has a medium dark green moderately low-growing, turf-type variety. Delray has moderate resistance to Rhizoctonia brown patch and some races of dollar spot. It appears to be highly susceptible to the winter brown blight disease. Delray was developed for improved winter hardness and improved performance at reduced fertility levels. It appears to have moderately good heat tolerance. It has moderately good mowing qualities except during its stemmy, reproductive period in late spring.

Derby is an early maturing variety de-

veloped by International Seeds Inc., of Halsey, OR. It has been a very popular variety for the last 10 years. It is a moderately fine-textured, turf-type variety capable of producing an attractive turf of medium density and a moderately dark green color. Derby has medium cold hardness, good heat tolerance and good wear tolerance. The variety is susceptible to the winter brown blight disease but shows moderately good resistance to Rhizoctonia brown patch and some races of dollar spot. Leaf appearance is moderately good after mowing except during late spring.

Diplomat is a medium late maturing variety developed by Lofts Seed of Bound Brook, NJ. It is an attractive, moderately dark green, turf-type cultivar that produces a leafy, persistent turf of greater density, finer texture, and a slower rate of vertical growth than most other perennial ryegrasses. It has moderately good resistance to Rhizoctonia brown patch and the winter brown blight disease. Diplomat has good heat and cold tolerance and relatively good mowing qualities.

Elka is a late maturing variety developed in the Netherlands by Cebeco-Hendelsraad. International Seeds is currently producing seed of this variety. Elka is a turf-type variety with a medium light green color. It has soft, fine leaves and the ability to produce a turf with greater density and a slower shoot growth rate than most varieties currently on the market. It has fair heat

tolerance and moderately good cold hardness and shade adaption. Elka has demonstrated good resistance to present races of crown rust but the variety appears moderately susceptible to Rhizoctonia brown patch, winter brown blight and dollar spot. Mid-spring performance ratings of Elka can be excellent but summer performance can be below average.

Fiesta is a medium early maturing variety currently being produced by Pickseed West Inc., of Tangent, OR. Since its release in 1977, Fiesta has been a popular and widely used variety. It has a moderately dark green color, medium fine texture, and medium high density. It has a reduced shoot growth rate and a turf-type growth habit. Fiesta has good cold hardness and good heat tolerance. The variety has good resistance to Rhizoctonia brown patch and moderate resistance to winter brown blight.

Game is an early maturing variety developed in the Netherlands. Game has a bright, medium green color, low density and produces a turf with an erect growth habit and a rapid shoot growth rate. Game has shown poor heat and cold tolerance and high susceptibility to Rhizoctonia brown patch. It has a very poor leaf appearance after mowing.

Gator was developed by International Seeds Inc., Halsey, OR, from germplasm obtained from the New Jersey Agricultural Experiment Station. It is a leafy, turf-type ryegrass

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medium maturity. Gator is a newer Variety and is capable of producing an attractive, persistent, low-growing, fine textured turf of medium high density and has a bright medium dark green color. It has shown good resistance to Rhizoctonia brown patch and winter brown blight. It has very good resistance to many races of crown rust. Gator has demonstrated good winter hardiness and improved summer performance. It has better mowing qualities than most other varieties now available and can tolerate low cutting heights well. Gator is very low in percent endophyte content.

Linn is an early maturing variety with a

bright, medium green color, low density, an erect growth habit and a very rapid vertical growth rate. It has poor heat and cold hardiness and poor wear tolerance. Linn is susceptible to the Rhizoctonia brown patch and winter brown blight diseases. It has very poor mowing qualities.

Loretta is a late maturing variety developed in Germany. It is distributed in the United States by O. M. Scott and Sons of Marysville, OH. Loretta is a leafy, moderately low-growing variety with soft leaves and a turf-type growth habit. It has a bright medium light green color, medium fine texture and medium high density. Loretta has medium heat and

cold hardiness. The variety has good resistance to present races of crown rust, moderate resistance to Rhizoctonia brown patch and winter blight and is quite susceptible to dollar spot. Loretta exhibits a good leaf appearance after mowing.

Manhattan is a late maturing variety developed by the New Jersey Agricultural Experiment Station. Manhattan is a leafy, moderately low-growing, turf-type variety with a bright, moderately dark green color, a medium fine texture and medium density. Manhattan has moderately good tolerance of heat and shade, improved cold hardiness and excellent wear tolerance when growing conditions are favorable. Manhattan has good resistance to the winter brown blight disease and moderate resistance to Rhizoctonia brown patch. It is moderately susceptible to crown rust, red thread and dollar spot. This variety shows relatively good mowing quality during heat stress.

Manhattan II is a leafy, attractive, persistent, turf-type variety of medium maturity. It was developed cooperatively by Pure Seed Testing Inc., the Manhattan Ryegrass Growers Association, and the New Jersey Agricultural Experiment Station. It is capable of producing a dense, fine textured, medium low growing turf with a bright, dark green color. Compared to Manhattan, Manhattan II shows improvements in resistance to stem rust, brown blight, Rhizoctonia brown patch and red thread. It also shows improvements in heat tolerance, summer performance and mowing qualities.

NK200 was developed by the Northrup King Company. It is a late maturing variety with a bright, medium dark green color, medium texture and a turf-type growth habit. NK200 has improved cold hardiness but below average heat tolerance. It is susceptible to crown rust and Rhizoctonia brown patch. NK200 has good mowing qualities except during heat stress.

Omega is a medium maturing variety developed by Turf Seed Inc. of Hubbard, OR. It has a bright, type habit, a medium high density and a reduced rate of vertical shoot elongation. It has good heat, cold and wear tolerance. Omega has good resistance to the Rhizoctonia brown patch and the winter brown blight diseases. The variety shows relative good leaf appearance after mowing.

Omega II is a medium early variety being marketed by Turf Seed Inc. It was developed by Pure Seed Testing Inc. with the cooperation of the New Jersey Agricultural Experiment Station. This variety has excellent rust resistance. It has a dark green color and produces a dense, leafy, attractive turf. It has a dwarfier leaf orientation than most other varieties. Omega II has shown excellent brown blight resistance and improvements in heat tolerance, mowing qualities, brown patch, red thread, dollar spot and crown rust resistance compared to its parent, Omega. It possesses comparable seedling vigor and cold tolerance to Omega. This variety contains an endophyte level of 55 percent, to convey a moderately good level of resistance to above ground feeding insects. It has shown good performance in southern overseeding trials.

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SCAG — a good name to remember

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Palmer is a leafy, turf-type ryegrass of medium maturity. It is capable of producing a persistent, dense, attractive, medium low growing, fine textured turf with a bright, dark green color. Palmer has shown good resistance to many races of crown rust, very good resistance to Rhizoctonia brown patch, and moderately good resistance to winter brown blight. This variety has shown moderate resistance to some species of sod webworm and has shown good winter hardiness. Palmer has exhibited improved mowing qualities, heat tolerance, and summer performance characteristics. The variety has excellent seedling vigor and good wear tolerance. Palmer originated from germplasm collected from old turfs in Maryland, New Jersey, New York, Pennsylvania and Greece.

Pennant is an early maturing variety currently being produced by E. F. Burlingham and Sons, Forest Grove, OR. This variety has relatively good mowing qualities and an attractive bright, moderately dark green color. It produces a medium-fine textured turf with medium-high density and a reduced rate of vertical leaf growth. Pennant has good heat and shade tolerance and moderately good cold hardiness. It appears to require somewhat less nitrogen fertilizer for good performance than most other ryegrass varieties. Pennant has good resistance to Rhizoctonia brown patch, and moderately good resistance to winter brown blight, dollar spot and some races of crown rust. This

variety also has good resistance to billbug and some species of webworm. Pennant was selected from an old lawn in College Park, MD.

Pennfine is an early maturing variety developed by the Pennsylvania Agricultural Experiment Station. It has been a very popular variety and since its release in 1972 has been the most widely used cultivar. It is a moderately low-growing turf-type variety with a moderately dark green color, medium fine texture and a medium density. The variety has moderately good resistance to Rhizoctonia brown patch, Typhula blight and some races of dollar spot. It is susceptible to the winter brown blight disease. Pennfine has shown good heat tolerance and medium cold hardiness. It has relatively good mowing qualities except during late spring when the turf becomes stemmy.

Prelude is an early maturing, leafy, turf-type ryegrass capable of producing an attractive, persistent, low growing, fine textured turf of medium high density and a bright dark green color. It has shown very good resistance to Rhizoctonia brown patch and many races of crown rust, good resistance to winter brown blight, and moderate resistance to red thread and pink patch. It has shown good winter hardiness and improved summer performance. Mowing qualities of Prelude are better than most varieties currently available. It has good tolerance to close mowing, shade and heat. Prelude has shown medium good resistance to some species of

sod webworm in New Jersey.

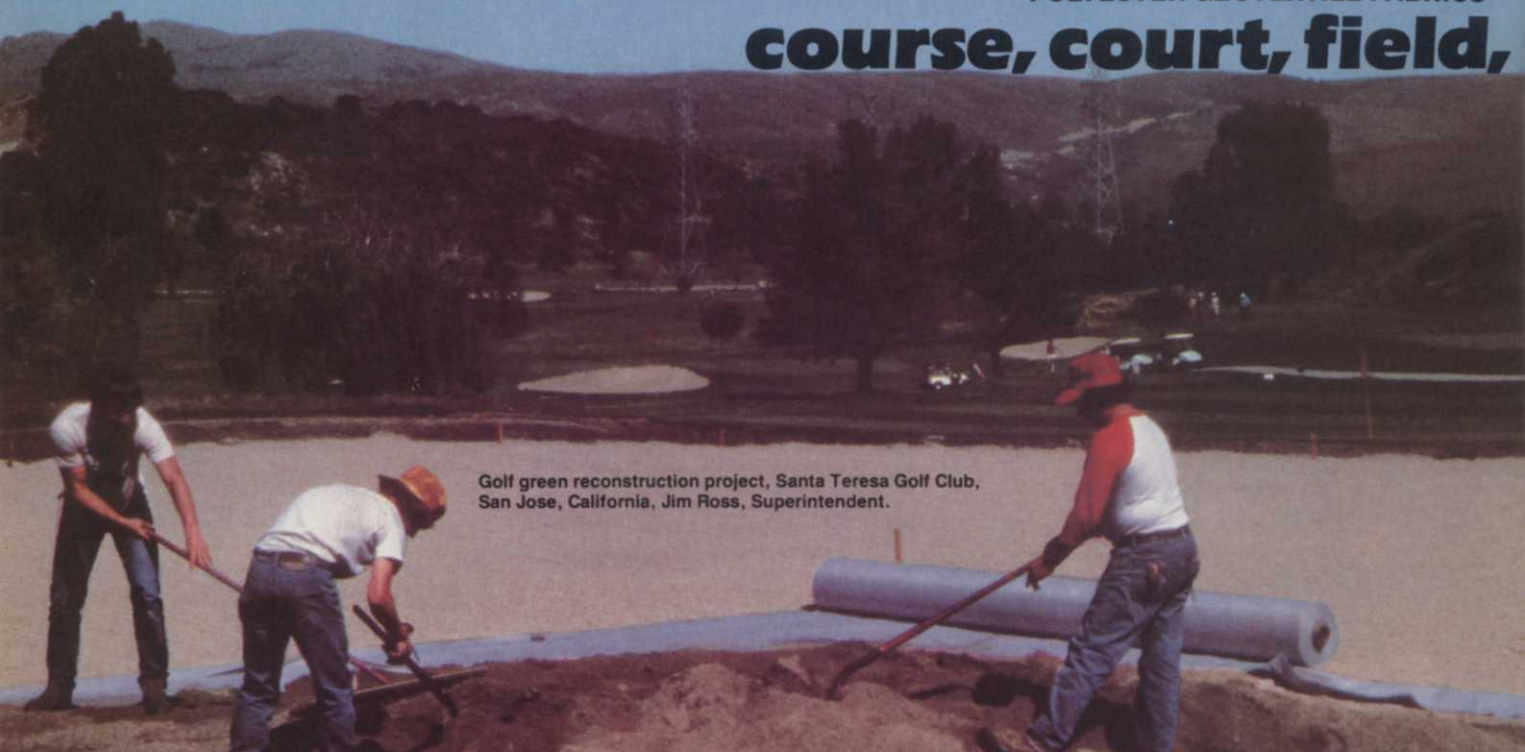
Premier is an early maturing, persistent, low-growing, turf-type ryegrass with an attractive bright dark green color, medium fine texture, and improved mowing qualities. It has the excellent seedling vigor, wear tolerance, and wide range of soil adaptation characteristic of the best turf-type perennial ryegrasses. This variety has good cold hardiness and improved heat tolerance. It has shown good resistance to the Rhizoctonia brown patch disease and improved resistance to winter brown blight, dollar spot, and crown rust.

Regal is an early maturing ryegrass developed by International Seeds Inc. of Halsey, OR. Regal is a turf-type variety with a dark green color, medium fine texture and medium density. It has medium cold hardiness and good heat tolerance. Regal has shown good resistance to dollar spot, Rhizoctonia brown patch and billbugs. It is susceptible to brown blight and crown rust. Regal mows well except during its stemmy reproductive period in late spring.

Repell is a leafy, turf-type perennial ryegrass capable of producing a persistent, dense, attractive, low-growing turf of a bright, dark green color. This cultivar has shown good resistance to large brown patch disease incited by *Rhizoctonia solani* Kuhn, winter leaf spot disease caused by *Drechslera* spp., and many races of crown rust. Repell shows promise of excellent performance in both full sun and in light to

A Warren's Turf Pro Report...

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Golf green reconstruction project, Santa Teresa Golf Club,
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moderate shade. Repell is also useful for the winter overseeding of dormant warm season turfs. Seed of Repell containing high levels of viable endophyte has demonstrated good resistance to damage caused by chewing insects such as sod webworm and billbug.

Tara is a leafy, turf-type perennial ryegrass of medium maturity marketed by Hubbard Seed and Supply, Hubbard, OR. It is capable of producing a persistent, moderately dense, very attractive, medium low-growing, fine-textured turf with a bright, medium dark green color. Tara has improved mowing qualities, good heat tolerance, and above average summer performance and winter hardiness ratings in New Jersey trials. It has shown good resistance to many races of crown rust incited by *Puccinia coronata* and good resistance to the large brown patch disease caused by *Rhizoctonia solani*. Tara has also shown good resistance to the winter netblotch disease caused by *Drechslera dictyoides*. Tara was the highest rated cultivar for 1983 in the national ryegrass tests seeded in 1982.

Yorktown II is a medium late variety developed by Lofts Seed Inc. of Bound Brook, NJ. It has an attractive, dark green color, a fine texture, high density and a leafy, low-growing, turf-type growth habit. It has shown good heat and cold tolerance. Yorktown-II has good resistance to brown patch and moderately good resistance to Fusarium patch and some races of crown rust. It mows well. □

exhibit enhanced turf performance.

A poor variety with endophyte is still a poor variety. However, a good cultivar containing endophyte may at times be superior to an equally good

In the next 20 years, turf breeders hope to develop ryegrasses that creep, grow lower and slower, resist insect damage, and tolerate herbicides better.

cultivar that does not contain endophyte.

The "Endophyte Enhanced Performance" program has been proposed by Dr. Rich Hurley of Lofts Seed and Dr. Reed Funk of Rutgers. The intent of this program is to make clear to consumers the benefits of endophyte containing seed. This program is available to all companies wishing to

participate. A special tag will be attached to seed bags of all cultivars of participating companies containing at least 80 percent live endophyte at harvest. This special tag would explain what the endophyte is and what benefits the consumer might expect if the seed is used properly. It is not yet clear how extensively this proposed program will be used.

Future

The past 20 years have been very exciting and productive for turf breeders working with ryegrass. The improvements in all aspects of ryegrass turf utilization have been great. Fortunately, ryegrass is a very genetically diverse species and continued improvement, though at a slower rate, can be expected.

Some of the more promising areas of potential improvements are insect and disease resistance, increased tolerance to herbicides, the development of lower and slower growing types, and the development of creeping varieties.

Ryegrass breeders have successfully met the challenges of the last 20 years and there is every indication they will be equally successful in the future. **WT&T**

can help improve your pond or landscape.

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