

Zoysiagrass for Florida Lawns¹

J. Bryan Unruh, L. E. Trenholm, and J. L. Cisar²

Zoysiagrasses (*Zoysia* spp.) were introduced into the United States from Asia and provide attractive turf throughout much of the United States. In recent years, dramatic improvements in zoysiagrass have been made by turfgrass breeders. These improvements include insect resistance, accelerated establishment, and overall performance. Zoysiagrasses are adapted to a variety of soil types and have good tolerance to shade, salt, and traffic. They provide an extremely dense sod that resists weed invasion, but certain pests can be problematic.

Zoysiagrass maintenance is different from that of other Florida lawn grasses. When improper maintenance practices are followed, undesirable results are likely to occur. Table 1 provides a quick comparison of zoysiagrass to other lawn grasses.

Species and Cultivars

Several species and varieties of zoysiagrass are used for residential and commercial landscapes, athletic fields, and golf course tees, fairways, and roughs. They vary widely in leaf color, texture, and establishment rate.

Proper lawn maintenance practices are the best means for avoiding pest problems and maintaining a healthy lawn. Zoysiagrass requires inputs of fertilizer to maintain good cover and healthy growth characteristics. During certain times of the year, it may require supplemental irrigation, especially during periods of extended drought, to remain

green. Pesticides may be needed periodically, but their use can be minimized if other cultural practices (mowing, irrigation, fertilization) are done correctly.

Zoysia japonica

This species was introduced into the United States in 1895 and is commonly called Japanese or Korean lawn grass. Cultivars from this species are generally coarse-textured grass with hairy, light green leaves. Of all the zoysiagrasses, this species has a faster growth rate and exhibits excellent cold tolerance. *Zoysia japonica* is the only zoysiagrass for which seed is commercially available; however, the seeded varieties generally do not produce as high-quality turf as do the vegetatively propagated (sodded or plugged) varieties. They can be used for lawns or general turf areas where convenience of establishment by seed is more important than quality.

Zoysia matrella

Also called Manilagrass, this species was introduced into the United States in 1912 from Manila. It produces a finer and denser turf than *Zoysia japonica*, but is less winter hardy and slower growing. Manilagrass resembles bermudagrass in texture, color, and quality and is recommended for a high-quality, high-maintenance turf where a slow rate of establishment is not a disadvantage.

1. This document is ENH11, one of a series of the Environmental Horticulture Department; UF/IFAS Extension. Original publication date May 1991. Revised October 2000, September 2006, June 2011, May 2013, and June 2016. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

2. J. Bryan Unruh, associate center director and professor, UF/IFAS West Florida Research and Education Center; L. E. Trenholm, professor, turfgrass specialist, Environmental Horticulture Department, and J. L. Cisar, professor, turfgrass specialist, UF/IFAS Ft. Lauderdale REC; UF/IFAS Extension, Gainesville, FL 32611.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information and other services only to individuals and institutions that function with non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office.

U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A & M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Nick T. Place, dean for UF/IFAS Extension.

Zoysia tenuifolia

Also called Mascarenegrass or Korean velvet grass, this species is the finest-textured and densest zoysiagrass available. It has good wear tolerance but poor cold tolerance and is only adapted to the central and southern areas of the state. It also produces an excessive thatch, giving it a puffy appearance. This species is often used for low-growing, ornamental specimen plants, especially in Asian-themed gardens.

Cultivars

Although information is available on the Internet about a number of zoysiagrass varieties, at the present time only a few are commercially available in Florida. Based on research information and anecdotal observations, following is a summary of what to expect.

DE ANZA

De Anza is a medium- to small-leaf zoysiagrass patented by the University of California in 1995. It has good shade and drought properties and retains color longer than most zoysiagrasses during the fall. ‘De Anza’ ranked favorably in the National Turfgrass Evaluation Program (NTEP) (Table 2).

DIAMOND

Diamond is an improved *Zoysia matrella* that is vegetatively propagated. It was released from Texas A&M University in 1996. ‘Diamond’ is distinguished from other zoysiagrasses by its fine texture and excellent salt and shade tolerance. It performs best when mowed at a height of ½ inch or less. In fact, ‘Diamond’ has been planted on several experimental golf greens mowed at ¼ inch or lower. Like other zoysiagrasses, it has poor cold tolerance, which may limit its use in northern parts of the state, and it is highly susceptible to tropical sod webworms.

EL TORO

El Toro is an improved *Zoysia japonica* released in 1986 from California. It has a faster establishment rate, improved cool-season color, better cold tolerance, and less thatch buildup than ‘Meyer’ zoysiagrass. ‘El Toro’ is also reported to have early spring green-up, more shade tolerance, and improved resistance to rust disease. ‘El Toro’ performed well in the NTEP trials conducted in Gainesville, Florida, and the greater Pensacola, Florida, area from 1997–2000 (Table 2).

EMERALD

Emerald zoysiagrass is a selected hybrid between *Zoysia japonica* and *Zoysia tenuifolia* developed in Tifton, Georgia, and released in 1955. This hybrid combines the winter hardiness, color, and faster growth rate of one parent with the fine texture and density of the other parent. ‘Emerald’ resembles Manilagrass in color, texture, and density, but is faster spreading and has a wider adaptation. ‘Emerald’ zoysiagrass is highly recommended for top-quality lawns where time and money allow for adequate maintenance. ‘Emerald’ produces an excessive thatch layer and is susceptible to dollar and leaf spot. Large (brown) patch disease also can occur.

EMPIRE ZOYSIA®

Empire Zoysia® brand zoysiagrass cultivar ‘SS-500’ is gaining popularity in Florida. It is similar in texture to ‘El Toro’ and has a very dense growth habit. It maintains a nice green color and, compared to other new zoysiagrass cultivars, it has a moderate rate of establishment. Empire Zoysia® has performed well in sandy and clay soil types with aggressive growth from its stolons and rhizomes, but it can be mowed with a standard rotary mower due to its broader leaf and open growth habit. It does not do as well in shade as other zoysiagrass cultivars. Empire Zoysia® is being planted in numerous communities in Florida and seems to do well in many areas throughout the state; however, it is susceptible to large (brown) patch disease.

JAMUR

JaMur is a medium coarse-textured cultivar that has performed well in many areas and is now produced in limited quantities in Florida. It has a very attractive color and does well in moderate shade. ‘JaMur’ has an excellent rate of establishment, performs well at normal home lawn mowing heights, and can easily be mown with a rotary mower. It is susceptible to large (brown) patch disease.

MEYER

Meyer (Z-52, Amazoy®) has been in use since the 1950s and is often seen in ads as the “miracle grass.” It is very slow to establish, and Hunting billbugs and nematodes pose serious problems with ‘Meyer’, limiting its use in Florida. ‘Meyer’ zoysiagrass performed very poorly at the Florida locations of the NTEP trial conducted from 1997–2000 (Table 2), and its use in Florida is discouraged.

TOCCOA GREEN™

Toccoa Green™ brand *Zoysia matrella* cultivar ‘BA-305’ was released by the University of Florida. (‘BA-305’ was formerly marketed under the brand **PristineFlora™**). It

is recommended for use in high-maintenance situations, including high-end home lawns. This variety is fine textured, extremely dense, and has a dark green color. Toccoa Green does not produce seed heads as prolifically as other fine-textured cultivars, such as ‘Emerald’ or ‘Diamond’. Toccoa Green™ is similar in appearance and maintenance to ‘Diamond’; however, it has a much faster rate of growth and recovers more quickly from scalp damage.

‘BA-189’

‘BA-189’ is a *Zoysia japonica* cultivar developed by the University of Florida (‘BA-189’ was formerly marketed under the brand **UltimateFlora™**). It has a similar leaf texture and upright growth habit to ‘Meyer’, but it has a faster rate of spread and better adaptability for use in Florida. This cultivar is used for home lawns and was selected for the lawn at the Birmingham Home & Garden Inspiration Home in Vestavia Hills, Alabama, and at the 2006 New Southern Home in St. Cloud, Florida.

ZEON

Zeon is a fine-textured *Zoysia matrella* that has performed well in Florida, though its availability is limited in the state.

ZENITH

Zenith zoysiagrass is one of the few commercially available seeded varieties. Generally, the seeded cultivars do not perform as well as the vegetative cultivars (Table 2). ‘Zenith’ zoysiagrass is dark green and medium textured.

ZORRO

Zorro is a fine-textured *Zoysia matrella* released by Texas A&M University. ‘Zorro’ establishes well, has good shade tolerance, and is easier to mow than some fine-textured cultivars. This turf performed moderately well in Florida in the 1997–2000 NTEP trial (Table 2).

Establishment of Zoysiagrass

With one exception, zoysiagrasses must be planted vegetatively by sod, plugs, or sprigs. *Zoysia japonica* is the only species for which seed is commercially available. Proper site preparation before planting is critical to ensure successful establishment. Refer to ENH02, *Preparing to Plant a Florida Lawn* (<http://edis.ifas.ufl.edu/lh012>), for complete information.

Seeding

Establishing zoysiagrass from seed is increasing in popularity. The seed, however, requires light for germination and cannot be covered with soil, as is normally recommended.

Consequently, areas to be established by seed need to be covered with some type of erosion cloth to reduce any surface disruption caused by rain or irrigation. The best time to seed is during the period from April to July, since this permits a full growing season before winter weather. Fall seeding is undesirable because the young seedlings may not become sufficiently established to withstand cold injury during the winter. It may take up to 2–3 weeks to germinate and an additional 6–8 weeks to establish. During this time, irrigation management is extremely important. After seeding, frequent, light irrigations are necessary to keep the soil moist and encourage germination. Maintain this moisture regime until the planted area is completely covered.

Plugging

Because of the slow establishment rate of zoysiagrass (compared to St. Augustinegrass), plugs are usually planted on 8- to 12-inch centers. This means that plugs are planted every 8–12 inches in a row and rows are spaced 8–12 inches apart. The closer spacing provides full coverage more quickly. Depending on the level of maintenance given, at least one full season (and longer for some varieties) is required for complete coverage and a uniform height. Plugs should be tamped firmly into the soil and watered in. During grow-in, the soil should be kept moist until the grass is well rooted. Weeds will dominate the bare areas between the plugs, and they should be scouted on a regular basis and weeds removed before they have a chance to gain hold.

Sprigging

Planting zoysiagrasses by sprigs is a laborious but effective method of establishment. Fresh sprigs with at least 2 or 4 nodes should be planted in rows that are 6 inches apart. Plant the sprigs end-to-end or no more than 6 inches apart in the row, and cover them with soil about 1–2 inches deep, leaving part of each sprig exposed to light. A roller can be used to press sprigs into the soil. Soil must be kept moist until plants initiate new growth and the area is completely covered.

Sodding

Sodding produces an instant turf as the entire area to be planted with grass material is covered. Sodding can also reduce potential weed competition that can occur when using other planting methods that leave bare ground. However, it is important to remember that the grass is still vulnerable at this stage and it is not yet safe for play, traffic, or other activities. It is quite dependent until the roots have developed and extended down into the soil. Sod should only be laid over bare, moist soil, with pieces laid

in a staggered brick-like pattern and the edges fitted tightly together to avoid any open cracks (Figure 1). Rolling and watering thoroughly ensures good contact with the soil for fast rooting. Sodded areas should be watered at least twice per day with ¼ inch of water until the sod is held fast to the soil by new roots (usually 2–3 weeks), after which watering should be reduced to an as-needed basis.



Figure 1. Sodding produces an instant lawn.

Maintenance of Zoysiagrass

Nutrient Management

Proper fertilization is very important for sustaining a healthy lawn. Fertilization and other cultural practices influence the overall health and quality of the lawn and reduce its vulnerability to numerous stresses, including weeds, insects, and disease. It is very important that anyone fertilizing their lawn be familiar with and follow the Florida-Friendly Landscaping™ Best Management Practices (BMPs). These practices are designed to maintain healthy lawns and reduce any potential nonpoint source pollution of water resources that might result from lawn and landscape fertilization and other cultural practices. There are now state and local regulations that cover lawn fertilization, so be aware of city and county guidelines and always follow the directions on the fertilizer bag. For more information on BMPs, please refer to ENH979, *Homeowner Best Management Practices for the Home Lawn* (<http://edis.ifas.ufl.edu/ep236>).

A soil test should be done to determine soil pH and what nutrients are available to the lawn. The local Extension office has instructions and supplies for taking soil samples and submitting them to the UF/IFAS Extension Soil Testing Laboratory for analysis. Refer to SL281, *Soil Sampling and Testing for the Home Landscape or Vegetable Garden* (<http://edis.ifas.ufl.edu/ss494>), for more information. In particular, phosphorus levels are best determined by soil testing. Since many Florida soils are high in phosphorus, it

is often not necessary to add phosphorus to a lawn once it is established.

Florida Rule (5E-1.003) mandates that the fertilizer application rates cannot exceed 1 lb of nitrogen per 1000 square feet for any application. Based on the percentage of nitrogen that is in a slowly available or slow-release form in a fertilizer, UF/IFAS recommendations call for applying a ½ pound (water-soluble nitrogen source) to 1 lb (slow-release nitrogen source) of nitrogen per 1000 square feet of turfgrass. For information on determining how much fertilizer this equals, please refer to ENH962, *Figuring out Fertilizer for the Home Lawn* (<http://edis.ifas.ufl.edu/ep221>).

As a general rule, the first fertilizer application of the year should be early April in Central Florida and mid-April in North Florida. In South Florida, fertilizer applications may be made throughout the year since growth is year-round. UF/IFAS guidelines for lawn grass fertilization offer a range of fertilizer rates over which a particular species may be successfully maintained in the various regions of the state. These ranges account for individual homeowner preferences for low-, medium-, or higher-input grass. Additionally, localized microclimatic effects can have a tremendous impact on turfgrass growth. A range of rates allows for these environmental variations. An example of this would be a typical home lawn that is partially shaded and partially sunny. The grass growing in the shade needs less fertilizer than that growing in full sun. Fertilization is also affected by soil type, organic matter in soils, and practices such as clipping management. Recycled clippings provide some nutrients back to the turfgrass and may reduce the need for fertilizer inputs. Additionally, a newly sodded lawn on a sand soil with no organic matter requires more fertilizer than a lawn that has been fertilized for years. In Florida, new homes and new developments may be next to much older developed landscapes, and a one-size-fits-all approach to fertilization is not reasonable. Thus, the guidelines provide a base range from which the end user can begin a fertilization program. The homeowner is encouraged to initiate a program based on these guidelines and to adjust it over time based on how the turfgrass responds.

Zoysiagrass responds better to a “spoon-feeding” fertilizer regimen (smaller quantities applied more frequently) rather than supplying larger quantities infrequently. Current UF/IFAS recommendations state that zoysiagrass should receive 3 (North Florida) to 6 (South Florida) applications per year in most situations (Table 3). Research suggests that new cultivars of zoysiagrass can persist on less nitrogen, and the UF/IFAS recommendations for zoysiagrass are under review. Avoid applying nitrogen fertilizer simply to promote

green color. Instead, monitor growth and apply only when the growth rate has dramatically declined. Potassium nutrition also is important and should be applied at rates equal to nitrogen. During excessively rainy periods, potassium may need to be applied more frequently due to its leaching ability.

Since zoysiagrass is very slow to green-up in the spring, avoid applying fertilizer until after the turf has become fully green to avoid premature green-up, which is prone to frost injury. This is especially important in North Florida, where late spring frosts may damage the grass. Delaying spring fertilization until the turf is actively growing and can use the fertilizer also reduces the potential for nitrogen leaching from fertilizer. Likewise, do not fertilize too late in the year, as this can slow regrowth the following spring. An application of iron can enhance spring green-up. Applying nitrogen on zoysiagrass in early spring and late fall significantly increases the risk of large (brown) patch disease.

On high-pH (> 7.0) soils or where high-pH water is applied, yellow leaf blades may be an indication of iron or manganese deficiency. Application of soluble or chelated sources of these micronutrients can provide a green-up due to elevated pH.

For iron deficiency, spray ferrous sulfate (2 ounces in 3–5 gallons of water per 1000 square feet) or a chelated iron source (refer to the label for rates) to temporarily enhance color. Iron applications every 6 weeks help maintain green color and, unlike nitrogen, do not promote excessive top growth.

Note that iron is not a substitute for nitrogen, which provides the building blocks for turfgrass growth and is required for turf health. While both iron and nitrogen deficiencies result in yellowing of turfgrass, they are distinctly different deficiencies in plants. Applying iron does not cure yellowing due to nitrogen deficiency, and iron fertilizer is not a substitute for nitrogen fertilizer. Foliar iron fertilizers, such as iron sulfate or chelated iron solutions, help cure iron deficiencies, and nitrogen fertilizers applied according to BMPs cure nitrogen deficiencies.

Mowing

If fertilized as recommended, zoysiagrasses require frequent mowing during the summer to look their best. Medium- to coarse-textured zoysiagrasses should be mowed weekly, or when they reach a height of 3–4 inches. They should be mowed at a height of 2–2.5 inches with a rotary mower. Fine-textured zoysiagrasses maintained at heights below 1

inch require more frequent mowing. Because zoysiagrass leaves are very coarse, they can be quite difficult to mow. Clippings should be left on the ground after mowing. They do not contribute to thatch buildup, as is often assumed, but are actually readily degraded by microorganisms. A sharp, well-adjusted rotary or reel mower should be used.

Watering

Zoysiagrass responds to drought by turning brown and going dormant in a short period of time (within a week under typical drought conditions). In the absence of rain or irrigation, zoysiagrass stays dormant for extended periods of time. Once irrigation or rainfall resumes, zoysiagrass will regain its green color.

Irrigating on an “as-needed” basis is the best way to water any established, mature grass as long as the proper amount of water is applied when needed. Irrigation is needed when leaf blades begin to fold up, wilt, or turn a blue-gray color, or when footprints remain visible after walking on the grass. Apply $\frac{1}{2}$ – $\frac{3}{4}$ inch of water per application. This applies water to roughly the top 8 inches of soil, where the majority of the roots are. Be sure to follow any local watering restrictions. Refer to the EDIS publication LH025, *Watering Your Florida Lawn* (<http://edis.ifas.ufl.edu/lh025>), for additional information on proper watering techniques.

To determine application rates of a sprinkler system, place several straight-sided cans (e.g., tuna fish or cat food) throughout each irrigation zone. Run each zone to determine how long it takes to fill the cans to the $\frac{3}{4}$ - or 1-inch level, then record the time. Each zone will likely take different amounts of time to give the same quantity of water. The recorded run times for each zone should then be programmed into the irrigation clock for automated systems. If the variation in the catch cans is great, a more thorough audit of the irrigation system is needed. Refer to ENH61, *How to Calibrate Your Sprinkler System* (<http://edis.ifas.ufl.edu/lh026>). Irrigation frequency should change seasonally, with less water needed in the fall and winter. Do not adjust the amount applied, just the frequency.

Thatch Management

Zoysiagrasses typically develop a thick thatch layer in the years after establishment—especially when overfertilized with nitrogen. This thatch must be controlled or removed mechanically to maintain a uniform grass appearance. This is most often done using a vertical mower or core aerator every year or two. Some have noted that scalping, during or shortly after spring green-up, helps reduce thatch buildup. One of the most important methods of reducing thatch

buildup is to keep nitrogen fertility at the recommended levels. Proper mowing heights also help prevent thatch buildup.

Pest Management

Like other lawn grasses grown in Florida, zoysiagrass lawns encounter pest problems. Periodic control of one or more of these problems is necessary to grow a healthy turf. The local county Extension office can help identify pest problems and provide current control recommendations (<https://sfyl.ifas.ufl.edu/find-your-local-office/>).

WEEDS

One of the best attributes of zoysiagrass is its ability to resist weed invasion due to its thick, dense growth habit. Insect and disease problems can damage zoysiagrass, creating voids in this dense mat where weeds can invade. Fortunately, unlike St. Augustinegrass and centipedegrass, zoysiagrass is very tolerant to many effective pre- and postemergence herbicides, giving a wide range of options to the turf manager (Table 1). Refer to ENH884, *Weed Management in Home Lawns* (<http://edis.ifas.ufl.edu/ep141>), for more information.

INSECTS

The most serious insect on zoysiagrass is the Hunting billbug. Billbugs feed on roots, causing the turf to die in irregular-shaped patches. The damage most often occurs in the fall and spring when populations are high and when damage may be misdiagnosed as dormancy. Stems and rhizomes break easily, have irregular feeding marks, and the turf will not hold together if cut. Most damage occurs on infertile or dry soil. If 10–12 billbugs are seen per square foot, control may be necessary.

Mole crickets and white grubs can also negatively impact zoysiagrass. Mole crickets feed on grass roots and leaf blades, and their tunneling activity dislodges plants from the soil, causing them to dry out. White grubs, like billbugs, feed on roots, causing the turf to turn yellow, wilt, and eventually die. Both of these insect pests often attract raccoons, skunks, armadillos, and birds, which may actually cause more damage than the insect itself.

Sod webworms can cause periodic cosmetic injury but are not believed to severely damage the turf. These insects mine the green tissue from the leaf tips, but they do not “notch” the leaf blades (Figure 2).

For more information, refer to *Insect Management in Your Florida Lawn* (<http://edis.ifas.ufl.edu/lh034>).



Figure 2. Sod webworm damage on zoysiagrass
Credits: J. Bryan Unruh, UF/IFAS

NEMATODES

Many turf managers state that nematodes are serious pests on zoysiagrasses; however, this is not well documented in scientific literature. UF/IFAS researchers and turfgrass breeders are aggressively working to identify the extent of zoysiagrass susceptibility, and they are identifying superior cultivars that can withstand nematodes. The UF/IFAS Extension Service Florida Nematode Assay Laboratory in Gainesville can diagnose whether nematodes are a problem by looking at a soil sample taken from the margin of the affected area. Proper cultural factors to encourage zoysiagrass root growth lessen nematode stress. These include applying less nitrogen, providing less frequent (but deep) watering, and ensuring adequate soil potassium and phosphorus.

DISEASES

Without a doubt, the most troubling disease for zoysiagrass is large (brown) patch (Figure 3). This disease becomes active when soil temperatures (4-inch depth) are between 65°F and 75°F each fall and can be a problem through the following spring. Although zoysiagrass is probably not more susceptible to this disease than St. Augustinegrass, recovery can be slow due to zoysiagrass's prolonged dormant to semidormant condition. Zoysiagrass is the first turf species to go off-color in the fall and the last to green-up in the spring. Therefore, if a large (brown) patch disease outbreak occurs, damage will be visible well into the next summer. With this in mind, it is important to treat preventively to ward off any likelihood of this disease. Refer to PP-233, *Homeowner's Guide to Fungicides for Lawn and Landscape Disease Management* (<http://edis.ifas.ufl.edu/pp154>), for more information on fungicides. Additionally, avoid excessive applications of soluble nitrogen, keep thatch levels to a minimum, and avoid irrigating at a time that will not allow the turf to dry prior to nightfall. Refer to <http://>

edis.ifas.ufl.edu/topic_turf_diseases for additional information on turfgrass diseases.



Figure 3. Large (brown) patch disease caused by *Rhizoctonia solani*
Credits: J. Bryan Unruh, UF/IFAS

Other diseases that impact zoysiagrass include dollar spot and rust. Dollar spot typically occurs when nitrogen is below optimal levels. This can easily be corrected with a light application of nitrogen. Rusts occur during mild, humid weather and appear as small yellow to orange to reddish-brown pustules on the leaves. Fungicides are effective, but most often, frequent mowing with clipping removal will keep this under control.

Other Problems

Other factors can also decrease the quality of a lawn. Excessive shade, compacted soils, over- or underwatering, improper mowing, traffic, and high or low pH can all cause a lawn to perform poorly. It is important to recognize what the source of the problem is and to correct it if possible. For more information on these types of stresses, refer to ENH153, *Environmental Stresses and Your Florida Lawn* (<http://edis.ifas.ufl.edu/ep070>).

Table 1. A generalized comparison of zoysiagrass to common lawn grasses grown in Florida

	Centipedegrass	St. Augustinegrass	Zoysiagrass
Mowing height	1.5"–2.5"	Cultivar dependent (2"–4")	Cultivar dependent (0.25"–2.5")
Mower type	Rotary	Rotary	Reel-type or rotary
Annual fertility requirement	1–2 lbs N/1000 ft ²	2–6 lbs N/1000 ft ²	2.0–4.5 lbs N/1000 ft ²
Grassy-weed herbicides	Preemergence—many Postemergence—few	Preemergence—many Postemergence—none	Preemergence—many Postemergence—many
Broadleaf weed herbicide tolerance	Many are damaging.	Many are damaging.	Most are safe.
Insects	Spittlebugs Ground Pearls	Chinch Bugs Sod Webworm White Grubs	Hunting Billbugs Mole Crickets White Grubs
Diseases	Centipedegrass Decline	Take-all Root Rot Large Patch Gray Leaf Spot	Large Patch Dollar Spot Rust
Comparative Water Use	Persists on less water but can wilt quickly in the absence of water.	Moderate—wilts, but some leaves remain green for longer periods of time.	Moderate, but can wilt quickly in the absence of water. Within 1–2 weeks, the leaves will be brown and the turf will go dormant.

Table 2. Ranking of average turfgrass quality ratings of commercially available zoysiagrass cultivars grown at two Florida locations from 1997–2000 as part of the National Turfgrass Evaluation Program (NTEP)†

Cultivar‡	Establishment method§	Texture¶	Turfgrass quality ranking (1 = best)	
			Gainesville	Pensacola
'El Toro'	Vegetative	Coarse	1	1
'De Anza'	Vegetative	Medium	2	4
'Jamur'	Vegetative	Coarse	3	2
'Zeon'	Vegetative	Fine	4	5
'Emerald'	Vegetative	Fine	5	3
'Zorro'	Vegetative	Fine	6	6
'Meyer'	Vegetative	Coarse	7	8
'Zenith'	Seeded	Coarse	8	7

†Rankings of mean turfgrass quality are achieved by assigning "1" to the highest mean, "2" to the second-highest mean, etc. for each location. Rankings should only be used to determine the general performance of a cultivar at a given location.

‡Only named, commercially available varieties are included in the table. Not all varieties are available in Florida.

§Seeded varieties are direct seeded. Vegetatively established varieties can be established by sod, sprigs, or plugs.

¶Textural classes were determined from data taken at the Gainesville location as published by www.ntep.org.

Table 3. Annual fertilization recommendations for zoysiagrass in three regions of Florida.

Location ¹	Nitrogen fertility guideline ² (lbs N/1000 sq ft/year)
North Florida	2–3
Central Florida	2–4
South Florida	2.5–4.5

¹North Florida in this example is considered to be anything north of Ocala. Central Florida is defined as anything south of Ocala to a line extending from Vero Beach to Tampa. South Florida includes the remaining southern portion of the state.

²Preferences for lawn quality and maintenance level vary; therefore, a range of fertility rates is recommended. Additionally, effects within a localized region (i.e., microenvironmental influences such as shade, drought, soil conditions, and irrigation) necessitate a range of fertility rates