



Bermudagrass

J. T. Brosnan and J. Deputy
Department of Tropical Plant and Soil Sciences

Bermudagrass (*Cynodon* species) is one of the most widely used turfgrasses in tropical and subtropical regions. This species, which is native to Africa, produces a vigorous, low-growing turfgrass stand with high density and tolerances to both traffic and drought stress. Bermudagrasses establish rapidly and spread by vegetative propagules, both aboveground (stolons) and belowground (rhizomes). Bermudagrasses grow best in full-sun conditions, as most are intolerant of shade.

Hybrid bermudagrasses

Hybrid bermudagrasses are the product of interspecific crosses of *Cynodon dactylon* and *Cynodon transvaalensis*. These hybrids do not produce viable seed and must be propagated by sprigs, stolons, or sodding. Advantages of the hybrid bermudagrasses over common bermudagrass are numerous; hybrid bermudagrasses offer improved levels of quality, density, and color, as well as improved tolerances to the stresses of traffic, heat, and drought. In addition, hybrid bermudagrasses can tolerate mowing heights less than 1 inch, and they produce very few unsightly seed heads. Disadvantages include an increased cost of establishment and higher maintenance requirements.

The first hybrid bermudagrass used in Hawai'i was 'Sunturf', introduced in 1962. It gained wide acceptance and quickly replaced common bermudagrass as the turf of choice in many situations (see CTAHR publication TM-2, '*Sunturf*' Bermudagrass). Since 1962, other new hybrid bermudagrass cultivars have been introduced and are replacing 'Sunturf'.

As of January 2008, not all hybrid bermudagrass cultivars listed below are available in Hawai'i due to

quarantine restrictions. Within the coming years, all of these varieties should become available.

'**Celebration**' is a dark green, fine textured, aggressive, traffic-tolerant cultivar with high recuperative potential and drought tolerance. Research has found 'Celebration' to be more shade-tolerant than other hybrid bermudagrasses.

'**GN-1**', marketed as CT-2 in Australia, is a dark green, medium textured, traffic-tolerant cultivar with high recuperative potential and improved nematode resistance. Its leaf blades are wider (coarser) than those of 'Tifway.' It is used in lawns and athletic fields, as well as golf course fairways and tees.

'**Tifway**' (also referred to as '**419**') is the foundation of the "Tif" series of bermudagrass hybrids developed at the USDA research station in Tifton, Georgia. It is an extremely traffic-tolerant, fine textured, dark green cultivar. 'Tifway' sheds no pollen and sets no seed. 'Tifway' is best utilized on golf course fairways and tees and on well maintained athletic fields and lawns (Photo 1). This cultivar spreads faster and is more resistant to sod webworms than 'Tifgreen' (also referred to as '328'). A more recent selection, '**Tifway II**', has the same desirable characteristics as 'Tifway', with an improved resistance to sting and root-knot nematodes.

'**Tifgreen**' (also referred to as '**328**') is a medium green, fine textured bermudagrass with a high shoot density and a low growth habit. Although 'Tifgreen' may produce a few yellowish-green seed heads, no viable seeds are produced. While 'Tifgreen' is often used on golf courses and athletic fields, it usually requires more intensive management than 'Tifway' and is susceptible to sting nematodes.

*This publication revises one of the same title by J. Deputy, D. Hensley, and J. Tavares.

‘**Tifdwarf**’ is similar to ‘Tifgreen’ except that it is darker in color and has shorter leaves and internodes. This cultivar is used regularly on golf course putting greens due to its dark green color, high shoot density, and tolerance to low mowing heights ($< \frac{1}{8}$ inch). ‘Tifdwarf’ is susceptible to caterpillar and mole cricket damage.

‘**Tifsport**’ (also referred to as ‘**Tift 94**’) is similar to ‘Tifgreen’ and ‘Tifway II’ in overall turfgrass quality. ‘Tifsport’ tolerates close mowing, resists southern mole crickets, and is moderately cold-tolerant compared to other hybrid bermudagrasses; however, breeding efforts in recent years have produced hybrid bermudagrasses with better cold tolerance than ‘Tifsport.’

“**Ultradwarf**” hybrid bermudagrasses

Newer “ultradwarf” hybrid bermudagrass cultivars have begun to replace some of the older bermudagrass hybrids used on golf course putting greens, such as ‘Tifgreen’ and ‘Tifdwarf’. The ultradwarf bermudagrasses, which are the product of hybrid bermudagrass mutations, generally have improved turf quality compared to older selections. Compared to hybrid bermudagrasses, the ultradwarf bermudagrasses have shorter internode length, higher shoot density, and an improved tolerance to low mowing heights ($< \frac{1}{8}$ inch). Ultradwarf bermudagrasses quickly produce excessive thatch and thus require regular vertical mowing, grooming, and topdressing. The extremely high shoot densities of ultradwarf bermudagrasses can make topdressing challenging.

As of January 2008, not all ultradwarf bermudagrass cultivars listed below are available in Hawai‘i due to quarantine restrictions. Within the coming years, all of these varieties should become available.

‘**FloraDwarf**’, selected from a previously planted ‘Tifgreen’ bermudagrass putting green in Hawai‘i, was released by the University of Florida in 1995. ‘FloraDwarf’ is similar to ‘Tifdwarf’ except for its much finer leaf blade, increased shoot density, shorter internode spacing, and extremely low growth habit. It is tolerant of very low mowing heights ($< \frac{1}{8}$ inch).

‘**MiniVerde**’ is a mutant from ‘Tifdwarf’ that has much finer leaves, a rapid lateral growth rate, and improved shoot density. It is tolerant of very low mowing heights ($< \frac{1}{8}$ inch).

‘**TifEagle**’ (also referred to as ‘**TW-72**’) is a dark green bermudagrass with a fine leaf texture and extremely high shoot density. ‘TifEagle’ is a mutant induced by cobalt radiation of ‘Tifway II.’ It is similar in overall quality to



1. ‘Tifway’ is commonly selected for use on football fields due to its good traffic tolerance.

‘Tifway II’ except that ‘TifEagle’ can tolerate extremely close mowing ($< \frac{1}{8}$ inch). The most traffic-tolerant of the ultradwarfs, ‘TifEagle’ is commonly used on golf course putting greens (Photo 2). ‘TifEagle’ does not tolerate shade. Reports of fairy ring development on ‘TifEagle’ putting greens in Hawai‘i are common.

Common bermudagrasses

Common bermudagrasses are often used to establish home lawns, athletic fields, golf course roughs, and other utility turf areas. These varieties, which are propagated by seed, possess an upright growth habit, medium to coarse leaf texture, and are not tolerant of mowing heights below 1 inch. However, breeding efforts in recent years have led to the development of improved common bermudagrass cultivars. Most selections now offer improved cold tolerance along with medium green color, medium texture, improved density, and tolerance to mowing heights below 1 inch. Recommended seeding rates range from 1 to 2 pounds per 1000 square feet, and germination begins 5–14 days after seeding, depending on climatic conditions.

As of January 2008, not all cultivars listed below are available in Hawai‘i due to quarantine restrictions. Within the coming years, all of these varieties should become available.

‘**Princess-77**’ is a dark green, medium-fine textured, high quality seeded cultivar that produces a dense turfgrass canopy tolerant of mowing heights as low as $\frac{1}{2}$ inch. ‘Princess-77’ has less traffic tolerance than cultivars such as ‘Riveria’ and ‘Tifway’.



2. ‘TifEagle’ golf green on Maui

‘**Riveria**’ is a medium-dark green, medium textured, aggressive, traffic-tolerant cultivar with a high recuperative potential. ‘Riveria’ provides a traffic-tolerant turf similar to ‘Tifway.’

‘**Savannah**’ is a medium-dark green, medium textured, low growing cultivar with improved shoot density compared to older selections.

‘**Southern Star**’ is a medium green, medium textured cultivar with medium density and improved turf quality. Research has found that it offers improved tolerance to shade, dollar spot, and bermudagrass mites compared to other seeded bermudagrasses.

‘**Transcontinental**’ is a medium green, medium textured, aggressive, low growing cultivar with improved heat and drought tolerance.

‘**Yukon**’ is a dark green cultivar with high shoot density and improved drought tolerance. ‘Yukon’ ranked as the top seeded cultivar for overall turf quality in the 2006 National Turfgrass Evaluation Program bermudagrass trial (NTEP 2007)

Establishment

Vegetative propagation

Hybrid bermudagrasses are usually established by sprigging or stolonizing. Sprigging utilizes both rhizomes and stolons as vegetative sources of plant material, while stolonizing uses only aboveground vegetative propagules.



3. Vertical mower (photo: J.A. Borger)

Sprigs are obtained by shredding harvested sod or with a sprig harvester. Stolons are generally harvested with a vertical mower (Photo 3). Sprigs should be 6–8 inches long and have at least two vegetative nodes.

Establishment with freshly harvested sprigs or stolons will enhance survival. Ideally, sprigs and stolons should be planted within 48 hours of being harvested. Before planting, it is important to promote airflow through the harvested material to prevent heat buildup. It is recommended that stockpiles be regularly turned (rotated) to promote airflow and that they be stored in shady, moist conditions.

Table 1. Vegetative planting rates for different turfgrass areas.^a

Type of area		Planting rate ^b
<i>Golf courses:</i>	Putting greens	15–30 bushels per 1000 sq ft
	Tees	10–20 bushels per 1000 sq ft
	Fairways	400–800 bushels per acre (9–18 bushels per 1000 sq ft)
	Roughs	200–400 bushels per acre (4.5–9 bushels per 1000 sq ft)
<i>Athletic fields:</i>		400–800 bushels per acre (9–18 bushels per 1000 sq ft)

^a From *Managing Bermudagrass Turf* by L.B. McCarty and G. Miller (2002).

^b 1 bushel is defined for this purpose as the volume of propagules obtained from 1 sq yd of sod.

Sprigs or stolons should be planted at a rate of 5–30 bushels per 1000 sq ft, depending on the rate of cover required. A bushel is defined as the amount of material harvested from 1 sq yd of sod (McCarty and Miller 2002). Recommended sprigging/stolonizing rates for different turfgrass area are listed in Table 1.

Plant material should be evenly broadcast across an area and pressed (“cut”) into moist soil with a roller. After rolling, apply a light (< ¼ inch) layer of topdressing to the area (e.g., soil, mulch, compost, or hydromulch) (Photo 4).

Water immediately after topdressing. Sprigs and stolons are subject to drying out, as they are planted at shallow depth. Light, frequent irrigation (four to six times daily) is recommended until roots become established. This process takes between 2 and 4 weeks depending on environmental conditions. Complete turfgrass cover is normally reached in 6–8 weeks.

During vegetative establishment there may be a need to control both broadleaf and grassy weeds, as well as sedges. Consult the CTAHR publication *Chemical Weed Control Recommendations for Turfgrasses in Hawaii* for more information.

Seeded establishment

Common bermudagrasses can be established from seed. While this may be cheaper than vegetative propagation, many seeded bermudagrasses do not provide the same level of quality as hybrid bermudagrass cultivars.

Bermudagrass seeding rates range from 1 to 2 pounds of hulled seed per 1000 sq ft. Seed is often applied with a rotary spreader. To promote uniform coverage, divide seed into two equal portions and apply it in two direc-



4. Application of hydromulch following stolonizing

tions across the area.

After seeding, lightly roll the area to promote seed-to-soil contact, and apply a light (< ¼ inch) layer of topdressing (e.g., soil, mulch, compost, or hydromulch).

During seeded establishment, frequent, light irrigation (4–6 times daily) is recommended for at least 2–3 weeks.

Germination may begin in 5–14 days, but allow 14–28 days for complete germination. Complete turf cover can be obtained in 4–6 weeks under optimum growing conditions.

When establishing from seed there may be a need to control both broadleaf and grassy weeds, as well as sedges. Consult the CTAHR publication, *Chemical Weed Control Recommendations for Turfgrasses in Hawaii* for more information.



5. Dormant bermudagrass baseball field (photo: A.S. McNitt)



6. Effects of wind distortion on irrigation coverage

Soil and environmental requirements

All bermudagrasses tolerate a wide range of soil types, but they do best in well drained soils with pH between 6 and 7. Soil pH above 7.5 can lead to nutrient deficiencies. Composite soil samples should be collected once a year and sent to an accredited laboratory for nutrient analysis. Contact your local CTAHR Cooperative Extension Service office for information about soil analysis.

Bermudagrass requires full sun for best growth. A minimum of 6 hours of full sunlight is required daily. Shaded conditions restrict photosynthesis, thus reducing growth. Excessively shaded bermudagrass develops thin, etiolated leaves and increased internode length in addition to reduced tiller density and rooting.

Bermudagrass grows best when air temperature is 85–100°F and soil temperature is 75–95°F. The minimum air temperature required for growth is 55°F. In climates where temperatures fall below 55°F, such as those found at higher elevations in Hawai‘i, bermudagrass may undergo dormancy (Photo 5).

Nutrient management

Nitrogen is the nutrient that has the greatest affect on bermudagrass quality. In Hawai‘i, mature bermudagrass stands require 9–24 lb of N, 1–4 lb of phosphorus as phosphate (P_2O_5), and 4½–12 lb of potassium as potash (K_2O) per 1000 sq ft per year.

Nitrogen should be applied monthly at rates of ¾–2 lb per 1000 sq ft. Sites with excessive foot traffic (e.g.,

heavily used athletic fields) and increased quality demands should use the higher end of that range. Note that regular vertical mowing will be required in these areas to manage thatch buildup. Residential landscapes and home lawns should use the lower end of the range. Do not apply more than 1 lb of soluble nitrogen per 1000 sq ft in any application. Slow-release fertilizers can be applied less frequently and at higher rates than soluble (quick-release) fertilizers; however, do not apply more than 2 lb of N per 1000 sq ft in any single application. A program incorporating both soluble and slow-release nitrogen sources is recommended.

Phosphorus and potassium can be applied in three or four equal applications during the year. Phosphorus applications may not be needed if soil test results do not detect a deficiency. To design a proper fertilizer program, it is critical to conduct regular soil tests. For more information on fertilizers, see CTAHR publication TM-13, *Turf Fertilizers for Hawaii’s Landscapes*.

Irrigation

Actively growing bermudagrasses require (on average) approximately 1–2 inches of water per week, as mean evapotranspiration rates during summer months in Hawai‘i have been reported to range from 0.15 to 0.28 inches per day. Requirements will vary not only with climatic conditions but soil type as well.

Irrigate early in the morning to minimize wind distortion (Photo 6). Deep, infrequent irrigation (no more than



7. A reel mower



8. A rotary mower

twice a week) is recommended for mature bermudagrass stands to promote root development. Try to moisten the soil to a 6-inch depth with each irrigation event. Watering during the early morning hours will also limit the amount of time leaf tissue remains moist, reducing the likelihood of disease development.

Mowing

Mowing requirements depend on a number of factors including use, cultivar, level of maintenance, and growth rate. Hybrid bermudagrasses produce high quality turf when mowed at heights between $\frac{1}{4}$ and 1 inch. Hybrid bermudagrass putting greens are often maintained at mowing heights less than $\frac{1}{8}$ inch. Older common bermudagrasses should be mowed at heights greater than 1 inch. Improved common bermudagrass cultivars can be maintained at mowing heights below this 1-inch threshold. It is essential that no more than one-third of the leaf blade be removed during a single mowing.

A reel mower (Photo 7) is required to maintain bermudagrasses at mowing heights of 1 inch or less. Rotary mowers (Photo 8) can be used to maintain bermudagrasses at mowing heights above 1 inch. Blades of both reel and rotary mowers should be sharpened regularly. Mowing with dull blades causes tearing and bruising of leaf tissues, conditions associated with increased disease incidence.

References

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Acknowledgment

The authors thank J.A. Borger and A.S. McNitt of Penn State University for allowing use of their photos. All other photos by J.T. Brosnan.

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