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Guidelines for Professional Turf and Groundcover Management

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These guidelines for general landscape turfgrass and groundcover management are adapted from materials developed by the Landscape Industry Council of Hawaii for professional turfgrass and landscape managers. They are not designed to address the needs of specialized turf sites such as golf courses, athletic fields, or other high-use, high-maintenance situations.

Routine maintenance of landscape turf

Mowing

Mowing height affects turfgrass health. Each turfgrass species (and often cultivars within species) has a range of mowing heights within which it remains most competitive (see Table 1, p. 2). This competitiveness is due to the turf's ability to occupy available space, access water and nutrients, intercept light, resist disease and insects, and maintain vigor. Lower mowing heights within the tolerance range reduce apical dominance, so the plant increases its rate of basal tillering. Increased basal tillering results in increased turf density, which improves the turfgrass plant's ability to occupy space.

However, with lowered mowing height the amount of available leaf-blade surface for photosynthesis is less, and the root mass usually decreases. These negative responses can limit the plant's ability to tolerate mechanical and environmental stresses such as wear, heat, and drought. Reduced root mass also limits the volume of soil that the plant can explore for nutrients.

Because leaf area available for photosynthesis decreases with lower mowing height, the plant must rely on stored food reserves for some of its regrowth. As the plant depletes stored food reserves its growth, vigor, and competitiveness decrease. Consequently, turf managers must increase maintenance intensity to provide an "assist" to the plant with measures such as more frequent irrigation, additional foliar nutrition, and more emphasis on disease management. When mowing height becomes so low that the maintenance intensity no longer can sustain the resulting aesthetic value and improved playability, the only wise course of action is to raise the mowing height.

Even a small increase in mowing height can provide significant benefits. Considering the total number of leaf blades in a given area, even a millimeter more of length for each blade can significantly increase total leaf area and the photosynthetic capacity of the turf. By increasing photosynthesis, the plant can produce more carbohydrates, allowing it more effectively to accommodate growth needs without utilizing stored food reserves.

More leaf-blade tissue also results in denser shading of the soil, thus reducing heating of the root zone. Reduced soil heating reduces root sloughing as well as the severity of root diseases. Increasing the amount of leaf-blade tissue in the canopy also improves resistance to the mechanical stresses of mowing and traffic.

An example of the benefits of a higher mowing height can be seen on the perimeter of putting greens, where the closely mowed turf has a much more difficult time maintaining high quality in contrast to the adjacent higher-cut turf in the collar (which often consists of the same species or species mix). Such an example can be useful to turf managers when they are asked to explain the benefits of higher mowing height.

The specific mowing height depends on the mowing frequency, the type of grass, and its location, use, and maintenance level. Sports turf, for instance, should be mowed at 1 inch to reduce interference with the ball and play.

Site and seasonal differences

Raise the mowing height for shaded areas by 30–50 percent to compensate for more elongation of leaves under reduced light. Raise the mowing height for bermudagrass slightly during winter.

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Debris removal

Before mowing, remove from the site all debris, trash, and objects that can be thrown by mowing equipment.

Mower type

The two basic kinds of power mower in use by landscapers are the reel mower and the rotary mower. Reel mowers can result in better lawn appearance, particularly when the cut is under 1 inch.

A reel mower cuts like a pair of scissors, with a shearing action as the blades turn against a stationary "bed knife." If the blades are sharp, the cut is clean without fraying. Compared to rotary mowers, reel mowers are less dangerous, require less power, and, because the motor runs slower, may last longer.

Reel mowers have disadvantages in that they do not cut very close to objects and may jam on thick grass and twigs. They do not cut tall grass and weeds as well as a rotary mower. Because they are mounted on two wheels, they cut at a constant height, following dips and valleys in the landscape, accentuating uneven terrain.Also, they require periodic adjusting and sharpening, which adds to the cost of upkeep. The best use of a reel mower is on relatively open and level lawns. Reel mowers are not recommended for mowing heights above 1 inch.

Rotary mowers are not recommended for mowing heights below 1 inch. A well designed rotary mower lifts the grass by suction and gives a uniform, crew-cut type cut. The cutting action is one of impact, like that of a sickle. As the rotary mower blade becomes dull it tends to produce a frayed leaf edge that dries out, giving a brown or yellow cast to the lawn. Rotary mowers are far more versatile than reel mowers. They not only handle weeds and thick grass with ease, but they also are more maneuverable and can cut closer to objects. Because they ride on four wheels, they tend to maintain a more even lawn appearance by cutting higher in the dips. Compared to reel mowers, rotary mowers may be noisier and may wear out sooner because they run faster.

Most riding mowers are rotary types. They may not do as good a job of mowing as walking mowers because of the larger cutting blades. Riding mowers are justified for large, open lawns.

Mulching rotary mowers are a specialized type of rotary mower that retains clippings longer, chops them finer, and drops them below the mower rather than to the side, thus avoiding the need to bag clippings.

Blades

Mower blades should be kept sharp to prevent damage to the grass leaves.

Mowing pattern

In landscape turf the mowing direction and pattern should be alternated at each mowing to minimize formation of a grain and avoid a "washboard look." On

Table 1. Recommended mowing heights for common Hawaii turfgrasses.

Species		Recommended mowing height (inches)	Preferred mower type
Bermudagrass (common)	*Cynodon dactylon*	½ – 1½	reel or rotary
Improved bermudagrass	*C. dactylon* 'Tifgreen', 328, 'Tifway', 419, 'Tif dwarf', and other cultivars	½ – ¾	reel
Buffalograss	*Buchloe dactyloides*	1½ – 3	rotary
Carpetgrass	*Axonopus affinis, A. compressus*	1 – 2	rotary
Centipedegrass	*Eremochloa ophiuroides*	¾ – 1½	rotary
St. Augstinegrass	*Stenotaphrum secundatum*	1½ – 3½	rotary
Seashore paspalum	*Paspalum vaginatum*	½ – 1	reel or rotary
Manilagrass	*Zoysia matrella*	¾ – 1	reel
Japanese Lawngrass	*Zoysia japonica* 'Meyer', 'El Toro', 'Z-3', 'Emerald', and other cultivars	¾ – 1	reel
Templegrass	*Zoysia tenuifolia*	½ – ¾	reel
Mixed species	Hilograss, crabgrass, and mixtures	1 – 3	rotary

terraces and slopes, mowing up and down instead of across the slope will generally result in less scalping.

Frequency

Ideally, mowing frequency will be determined by the growth of the grass. Mowing should be scheduled so that no more than one-third of the leaf is removed in any mowing. In scheduled maintenance operations, however, mowing must be conducted at specific intervals. The mowing intervals in Table 2 are recommended based on desired mowing heights. For grassed areas mowed infrequently but where appearance is important, mow at a height between 3 and 4 inches.

Clippings

Short clippings produced by frequent mowing or use of a mulching rotary mower generally sift down into the turf and create no problem. Clippings also return nutrients and organic matter to the soil. Continued removal of clippings can reduce the amount of available N by as much as 50 percent. Returning clippings to the site using mulching or conventional mowers does not increase disease, insect pests, or thatch build-up. Use of mulching mowers requires greater attention to frequency. Large amounts or long clippings should be removed to reduce or prevent shading of the turf. Clippings should be directed away from streets and walks and should be removed from walks, streets, parking lots, and curbs after mowing by sweeping or blowing.

Edging and trimming

Edging of hard surfaces (walks, solid bed-headers, and curbs) and soft surfaces (plastic, soil, lumber, or other soft material) is typically done at every mowing for high-maintenance areas. Sites receiving low or medium levels of maintenance are mowed less frequently, and where appearance is less critical and budgets are restricted, edging may not be done at each mowing.

Trimming around trees, signs, and other objects in the landscape should be done at every mowing for best appearance. String trimmers should be used to edge beds and mechanical blade edgers should be used to edge walks and curbs. Trees and plants are best edged with a reciprocating trimmer rather than a string trimmer to avoid damaging them.

Debris from edging operations should be removed and the areas swept clean. Caution must be used to avoid flying debris. The operator must wear safety glasses during edging and trimming operations.

Table 2. Mowing intervals under managed situations.

Cutting height, inches	Mowing frequency, days
¼	daily
½	2 – 3
1	4 – 7
2	7 – 14
4	14 – 21

Mowing strips

"Mowing strips" around plants and objects in the landscape are mulched or kept clean with herbicides to reduce trimming time and protect plants from being damaged by mowers and string trimmers.

Fertilizer applications

Nitrogen fertilizer rates

The nitrogen rates in Table 3 are recommended as monthly nitrogen requirements for different turfgrasses in Hawaii. The higher ends of the ranges are suggested for sites that are irrigated frequently or in high-rainfall areas, have sandy soil, or have clippings regularly removed. The lower nitrogen rates are recommended for sites that are not irrigated or infrequently irrigated, have heavy soil, or have low maintenance levels and budgets.

The desired level of nitrogen can be applied monthly in either a soluble or slow-release formulation. The nitrogen can also be applied in slow-release form every other month, depending on maintenance level, quality desired, fertilizer release characteristics, and budget. During winter, reduce or omit nitrogen applications for bermudagrass in cooler and windward areas.

Other elements

Other nutrients should be applied as recommended after a soil analysis. Table 4 shows general nutrient level guidelines for Hawaii's soils.

Dethatching by verticutting

Zoysiagrasses including 'Emerald' and other named cultivars, seashore paspalum, hybrid bermudagrass cultivars, and some other turfgrasses under high levels of management build thatch and benefit from periodic dethatching with a power rake or by verticutting. Dethatching by verticutting should be done in the spring and followed by application of a preemergence herbicide. Seashore paspalum may require verticutting twice a year. All turfgrasses should be mechanically dethatched when the thatch layer is greater than ½ inch. Verticutting can be done as an annual maintenance event.

Aeration

Consider mechanical aeration using a core or spoon aerator for turfgrasses in heavy soils, those receiving significant traffic, or those undergoing intense use. Depending upon these factors, aeration may be required once or twice annually.

Top-dressing following core or spoon aeration will benefit soils with poor structure. Top-dressing following core aeration is optional in high-maintenance situations. Top-dress material should be a finely screened (less than ½–⅜ inch mesh) humus or composted organic material. Top-dressing normal sites with these materials or top-dressing without core aeration may show less benefit.

Irrigation

Ideally, turfgrasses are irrigated to reflect evapotranspiration losses at the site. Warm-season turfgrasses should receive 60 percent of the water lost through normal pan evaporation. This water should be applied in two to four irrigation events per week, depending on the site and its exposure. Irrigations should be timed to eliminate runoff from the site, and short, infvÂquent, shallow irrigations should be avoided.

Where evapotranspiration rates are not monitored, irrigation must be applied as a timed, scheduled event. Warm-season turfgrasses should receive 1–2 inches of water per week, depending upon species, either as precipitation or irrigation. Schedule irrigations to allow maximum percolation into the soil, wetting the entire rooting zone, and yet avoid runoff from the site. Short, daily irrigations limit water penetration and encourage shallow rooting. Shallow-rooted turf is more sensitive to water stress than deep-rooted turf and cannot use soil water reserves adequately.

Table 3. Recommended nitrogen fertilization rates for common landscape turfgrasses in Hawaii.

Turf species		Turf maintenance level		
		High	Medium	Low
		(pounds of nitrogen per month per 1000 sq ft)		
Bermudagrass (common)	*Cynodon dactylon*	1–1½	½–7/10	3/10–⅖
Improved bermudagrass	*C. dactylon* 'Tifgreen', 328, 'Tifway', 419, 'Tif Dwarf', and other cultivars	1–1½	½–7/10	3/10–⅖
Buffalograss	*Buchloe dactyloides*	not used	⅕–⅖	0–1/10
Carpetgrass	*Axonopus affinis, A. compressus*	not used	⅖–⅗	⅕–3/10
Centipedegrass	*Eremochloa ophiuroides*	⅖–½	⅕–⅖	0–1/10
St. Augstinegrass	*Stenotaphrum secundatum*	⅘–1	½–7/10	3/10–⅖
Seashore paspalum	*Paspalum vaginatum*	½–7/10	½	not used
Manilagrass	*Zoysia matrella*	½	½	¼
Japanese Lawngrass	*Zoysia japonica* 'Meyer', 'El Toro', 'Z-3', 'Emerald', and other cultivars	½	½	¼
Templegrass	*Zoysia tenuifolia*	½	½	¼
Mixed species	Hilograss, crabgrass, and mixtures	not used	½	¼

Routine maintenance of groundcovers

Encourage groundcover plantings to grow and cover the ground in a full and solid mat kept neat in appearance. Edge groundcovers with a string-trimmer or power-edger to control encroachment into lawns and other plantings, curbs and walks, and to define borders. Some groundcovers require little trimming to maintain a desirable height, while others require significant work.

Fertilize established groundcover plantings to maintain color and appearance but not to encourage growth. This will usually require application of a 2:1:1 ratio (N:P:K) fertilizer at the rate of ½ pound of nitrogen every three months, depending on species, site, and management. Fifty percent of the nitrogen in the fertilizer should be a controlled-release (slow-release) form.

Compost and organic fertilizers are useful in fertilizing some groundcovers (mondograss, wedelia, and others). Compost does not contain large amounts of nutrients (usually compost has an N-P-K rating of 1-1-1), and its nitrogen becomes available to plants very slowly. These nutritional characteristics are not desirable for fertilizing turf, trees, shrubs, and many other landscape plants; however, they may be desirable for groundcovers. Compost and organic fertilizers can provide low levels of nitrogen over a long period of time to the groundcover without an excessive flush of growth. Consider the cost of the nutrients and their application carefully.

Groundcovers should be thinned or renovated as necessary to ensure a healthy stand. Weed control in groundcovers should be done by hand-pulling or application of a selective postemergence herbicide labeled for the use. Preemergence herbicides may be used during establishment and after renovation or thinning.

Table 4. Generally acceptable soil-test levels for turfgrasses in Hawaii.

Soil property	
Reaction (pH)	5.8–6.5
Salinity (EC)	< 3.0 mmhos/cm
Soil nutrient	(pounds per acre)
Phosphorus (P)	100–150
Potassium (K)	400–600
Calcium (Ca)	3000–5000
Magnesium (Mg)	500–800

Wedelia

Wedelia will flower at almost any height at which it is maintained, but below 4 inches its flowering may be reduced. It can be managed by periodic string-trimming or mowing with a rotary mower. Wedelia's rate of growth is a direct result of fertilizer and water inputs. Budget water and nitrogen so as to achieve a medium-green to dark-green color but to avoid excessive growth. Consider slow-release, organic, or compost sources of nitrogen.

Several chemical growth regulators have shown promise for controlling wedelia. Separate wedelia from trees and shrubs in a bed with a ring of mulch. Maintain this mulch ring to protect the shrubs and reduce trimming.

Lauae fern

Renovate lauae fern periodically (every one to three years) by removing most or all or the top growth. Mulch with 1–2 inches of compost or organic mulch to protect the rhizomes and control weeds after renovation. Periodically prune dying and damaged leaves to keep the planting fresh. Remove pruned leaves from the bed.

Lauae fern grows better in partial to full shade and will often be lighter in color or yellow in full sun. This is usually an environmental problem and cannot be corrected by fertilizer application. Conduct a soil test of problem beds to determine if soil nutrient levels may be contributing to the yellowing.

Ice plant

Ice plant grows well in full sun and drier locations and does not typically flower in Hawaii. The intensity of color of the ice plant will respond to adequate nitrogen

and water; however, excessive application of either results in rank growth, increased need for trimming, and increased incidence of disease and "melting out."

Mondo grass

Mondo grass responds well to mulching with compost or organic mulch. Apply only slow-release fertilizers, "organic" fertilizers, or compost, because the crowns of the plants can be injured by soluble fertilizers. Hand-rake periodically with a stiff rake to remove dead leaves. Nutsedge, kyllinga, and McCoy grass can be selectively removed from mondograss with a herbicide such as Image® or Manage®.

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