

Mowing & Edging in Landscape Maintenance Zones



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What is mowing?

Mowing is the mechanical trimming of turf, weeds and other vegetation and is the most required roadside maintenance job. Mowing to the required standards contributes to a safe driving experience and results in efficient use of available resources. Mowing schedules that facilitate the application of consistent mowing standards also help limit erosion, control weed invasion and enhance the natural beauty of Hawaii.



How does grass respond to mowing?

Turfgrass can withstand constant, frequent mowing and will thrive because of it. Mowing turns grass into a lawn. When you mow, the ends of the grass stems are cut off and the plants branch out and form new runners, resulting in a denser, tightly woven lawn. Without mowing, the surface will eventually become very bumpy with the build-up of thatch composed of mounding or bunchy grasses. Weedy plants will invade the area and eventually become overgrown.



No-mowed slope (l) versus mowed slope (r). Weeds, trees and shrubs can rapidly overtake a no-mow area. No-mow should only be employed where the invasion of neighboring trees and shrubs is not an issue or in some cases desirable.

This no-mow situation is often acceptable for steep slopes to prevent erosion on rural roadsides, but will result in a potentially unsafe and unattractive situation in open level roadside conditions.



What are the mowing standards for Hawaii?



Cutting too close using a weed eater or mower can create brown patches on grass. This is called scalping.

All maintenance personnel are required to meet the mowing standards in this section and in other sections of this manual.

All turfgrasses grown in Hawaii are warm season grasses. They can tolerate high temperatures in the summer, but may stop growing and go dormant in the winter if temperatures are consistently below 50°F. In most areas of Hawaii the winter temperatures are not cold enough for complete dormancy. At cooler higher elevations the grass may not grow much in mid-winter.

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The height of the grass determines the depth of the roots: more leaves, deeper roots. If you cut too low for a particular type of grass the roots will be too shallow, leading to a lawn that dries out quickly and needs water more often. Shorter mowing heights can result in scalping of the grass, which produces unsightly brown patches of short grass stems. This will usually expose the soil surface and give weeds an opportunity to invade. In general, caring for short cut grass is difficult.

Remember

If you stop mowing, the grass thins out and you end up with weeds eventually taking over.

Also, if you mow warm season grasses too high, the lawn develops a thick layer of thatch which gives the lawn surface a thick spongy texture that interferes with watering, fertilizing and mowing.

It is best to mow on a regular schedule, often enough to maintain the one-third rule (see “How often do I mow?” in the next section) and at a mowing height that is near the middle of the recommended mowing height for the type of grass.

Each type of warm season grass has its own best mowing height range



Most roadside grasses are not a pure single type but rather a mix of Bermuda grass and several other weedy types, such as Hilo grass and crab grass. In these cases, mow at 2 inches, which is within the recommended standard heights “A”: 1½ to 3 inches (see table below). For high maintenance areas, height recommendations are:

- ▶ St. Augustine = 2-3 inches
- ▶ Centipede grass = 1½-2 inches
- ▶ Common Bermuda = 1½-2 inches
- ▶ El Toro zoysia = 1-1½ inches
- ▶ Seashore paspalum = 1/2-1 inch
- ▶ Emerald zoysia = 1/2-1 inch
- ▶ Hybrid Bermuda = 1/2-¾ inch
- ▶ Rural grass = no mow; 5-6 inches in seasonally fire-prone areas

Mowing heights less than one inch are best done with a reel mower. Heights will also be determined by the context or location of the road which determines the expected level of maintenance in any given Landscape Management Zone (LMZ).

Mowing Standards for Hawaii

Vegetation management scenarios	Mowing Standards	Minimum (inches)	Maximum (inches)
High visibility areas where higher levels of maintenance will enhance the natural beauty of the location (scenic lookouts)	A	1.5 inches	3 inches
Medians, level road sides and interchanges (unless in urban areas)	B	2 inches	4 inches
Erosion control	C	2 inches	8 inches
Behind guard rails	D	2 inches	24 inches
Rural areas where the mature height of the existing vegetation can go up to 36 inches	E	No mow (May be mowed when directed by the Engineer)	No mow (May be mowed when directed by the Engineer)
Fire season : Rural areas prone to annual dry season fires	F	5-6 inches (mow 30 ft. width to edge of pavement)	Mow once in July/August as directed by the Engineer
Steep slopes	G	No mow (May be mowed when directed by the Engineer)	No mow (May be mowed when directed by the Engineer)

NOTE: Standards A & B may also depend on species of turf. You may use species-specific height recommendations mentioned in the text.

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You are required to mow only in the landscape maintenance zone. Minimum standards for mowing turf are listed in the Mowing Standards for Hawaii table.

Other tree and shrub vegetation heights and distances relative to road features are detailed in Chapter 4 "Landscape Maintenance Zone, Distances and Heights."

The instructions that follow can be used as guidelines to determine the mowing height of turf within the Landscape Maintenance Zone.

Any changes to these standards may be made with the permission of the Engineer.



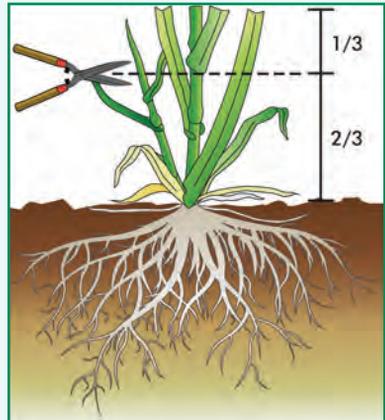
How often do I mow?

The best way to determine when to mow is to follow the one-third rule:

Tip

One-third rule of mowing:

Never cut more than one-third of the turfgrass blade during any one mowing. For example, if your mowing height is two inches, mow when the turfgrass blades have grown to a height of three inches.



The one-third rule of mowing may not always apply, especially when following a structured schedule for regular roadside maintenance. The normal mowing schedule you will be assigned is every two weeks. This schedule can be changed by the Engineer depending on the management zone designation and location of your contract/job. Rural areas will be mowed less often than urban areas.

How often you mow also depends on:

The type of grass

- ▶ Hybrid Bermuda grass and 'El Toro' zoysia may need more frequent mowing to maintain the required quality level.

The season of the year

- ▶ Rainy winter months may require more frequent mowing in areas with mixed weedy grasses.
- ▶ Hot dry summer months may require less mowing in areas without a working irrigation system.



What are some do's and don'ts for mowing?

Tips

- ▶ Do not mow when grass is wet. Trimming with weed eaters or 21-inch trim mowers may be done, but equipment that would result in wheel tracks and ruts should be avoided.
- ▶ Do not mow at all when it is raining.
- ▶ Remove all litter and debris before mowing.
- ▶ Rake or otherwise clear the area of excessive clippings after mowing; use bags or chutes to remove excess cuttings.
- ▶ Clean and remove all clippings from hard surfaces, roadways and drainage swales at the end of each workday.
- ▶ Always wash or blow down equipment before moving to a new area.
- ▶ Do not mow areas with heavy invasive weeds until weeds have been eradicated. (See Chapter 9, "Invasive Species Management.")





Turf damage by heavy equipment used in wet conditions.



Unsightly excessive grass clippings left on surface.

A payment deduction will be made if trimmings are not removed and will be determined as presented in the "Inspection" chapter.



What is thatch and how do I manage it?

Thatch is the brown stemmy layer that builds up between the soil surface and the green leafy part of the grass. The warm season grasses used in the high visibility, high maintenance Hawaii urban roadsides will occasionally build up a thick layer of thatch.

This gradual formation of the thatch layer is a normal process resulting from the accumulation of layers of runners as the grass grows. The three most common reasons for a more rapid thatch buildup are over fertilizing with a high nitrogen fertilizer, over watering, and cutting the grass at a higher mowing height than recommended.



Excess thatch layer in emerald zoysia; notice the spongy and clumpy appearance of the surface. When mowing, these clumps will be scalped down into the thatch, leaving the brown patches in the lawn.

When thatch is more than 1-inch thick, it begins to make the lawn feel soft and spongy and often results in scalping damage during mowing.

Excessive thatch also:

- ▶ Interferes with movement of water and fertilizer into the soil.
- ▶ Provides a good hiding place for harmful lawn pests.
- ▶ Is an unfavorable growing environment for grass.



The brown patches are caused by scalping during mowing due to a thick buildup of thatch. The mower sinks into the soft lawn and cuts down into the brown thatch layer.



When and how do I remove thatch?

The most noticeable signs that indicate it is time to remove the thatch is the development of the soft spongy feel to the lawn and the resulting scalping with each mowing.

- ▶ The best time to remove thatch is when the grass is healthy and actively growing; in Hawaii this is from April through September.
- ▶ To remove thatch use a rotary mower and scalp down. Thin out and rake up all the underlying brown stemmy growth to allow new grass to grow back from the remaining runners on the surface (called stolons) and underground runners (called rhizomes).
- ▶ The rotary mower will scalp the grass down to around 1 inch but will not remove the lowest layers of thatch. Continue cutting the lower layer with a weed eater if it is still very dense. This may not be necessary.
- ▶ Scalping the lawn down as low as possible with a rotary mower (and weed eater if necessary) should be followed immediately with a final mowing using a verticutter. This entire process can be done on the same day.
- ▶ The verticutter is a specialized piece of equipment that has evenly spaced, knife-like blades that swing perpendicularly to the soil surface. The blades slice into the thatch and remove many pieces of runners growing near the soil line. This process is usually needed once a year in heavy thatching grasses, such as seashore paspalum and emerald zoysia.



After scalping down the grass with a rotary mower and weed eater, remove most of the remaining runners by making several passes with a verticutter. Rake up and remove all the debris.



After verticutting, most of the runners have been cut away, exposing much of the soil surface. New growth will come from these remaining runners and any underground runners. The grass shown here is St. Augustine grass. It is very important to leave at least this amount of surface runners since St. Augustine does not form underground runners and the surface runners are the only source of new growth. Most or all of the surface runners for Bermuda, seashore paspalum and zoysia grasses can be completely cut away since these grasses have underground runners that will produce the new growth.

It is very important to use the correct blade spacing and cutting depth when verticutting different turfgrasses.



- ▶ **For Bermuda, zoysia and seashore paspalum grasses**
Use a blade spacing of 1 to 2 inches and a cutting depth set to just reach the soil surface. These grasses all have underground runners called rhizomes and can survive if most of the above ground stolons are removed. Most of the new growth will come from the rhizomes.
- ▶ **For centipede and St. Augustine grasses**
These grasses have thicker stolons and do not form rhizomes. Use blade spacing of 2 to 3 inches and cutting depth should be set so that the blades do not reach the soil surface, leaving a thin layer of stolons behind. All new growth will come from the stolons left on the soil surface.



What do I do after dethatching?

- ▶ After dethatching, rake up all of the loose debris, consisting mainly of pieces of cut stolons removed from the lawn.
- ▶ Following cleanup, mow the lawn to remove any remaining debris, then thoroughly water to prevent drying of exposed roots and rhizomes.
- ▶ If the soil is heavily compacted, core aerate and follow up with a thin layer of compost topdressing to fill the core holes.
- ▶ Core aeration is done with another specialized machine that cuts and pulls small plugs of sod out of the soil surface (see Chapter 11, "Fertilizers").
- ▶ Apply five pounds of a balanced fertilizer, such as 16-16-16, for every 1,000 square ft. of lawn to encourage new top growth.
- ▶ Irrigate well until the new growth is well established. This should take only a few weeks if done during the summer months.



What mowing equipment do I use?

Do not use equipment that damages turf by sliding, scalping, forming bare ground or rutting.



Commonly used equipment:

- ▶ Riding rotary mowers
- ▶ Riding flail mowers
- ▶ Riding boom type mowers
- ▶ 21 inches walk-behind rotary mowers (for smaller areas)
- ▶ String trimmers (weed eaters)
- ▶ Edgers
- ▶ Power blowers

Eco

Ensure that all portable gasoline cans comply with OSHA/HIOSH regulations, properly stored, container intact, and not in the path of downstream drain inlet. Always refuel away from waterways and off grass or vegetation areas. Keep spill kits/materials handy for oil or fuel leaks in the field.



How do I mow safely?

Mowing is a moving operation that takes place off the roadway. The most important thing to remember is to make the mower unit highly visible to oncoming traffic. If you do, drivers will be alert to the mower unit and will be able to avoid any potential collisions.

Safety!

Traffic Control for Mowing Operations

- ▶ Mow facing the direction of oncoming traffic with the discharge shoot pointed in, away from the road. This results in less chance of impact by a missile thrown out and also provides better visibility.
- ▶ Operate **rotating yellow lights** on mower tractors.
- ▶ Install “**Slow-Moving-Vehicle**” signs on all mower tractors.
- ▶ Install **yellow flasher lights** on roll bars on the top of tractor cabs and operate these **at all times**.
- ▶ Install an **orange flag** or pennant on a whip to show the location of the tractor in high grass or over the edge of slopes.
- ▶ Operate the tractor with **headlights on at all times**.
- ▶ **Warning signs**, such as “Mowing Ahead” or “Road Work Ahead” (preferred), may be placed along the road. Place the sign in advance of mowing operations in the right-of-way. Place it on the shoulder so that the approaching drivers can read the sign easily (2 ft. off of the travelway).
- ▶ **As work progresses**, remember to **move the signs** so there are one to two miles between signs and the actual mowing work.
- ▶ **Mount signs** on a breakaway portable support that will not be knocked over or blow down easily.
- ▶ **Cover or remove signs** when work is not in progress; however, do not remove cover or remove signs when you have stopped to repair or adjust equipment because the warning to drivers is important to safety operations.



Types of mowing

Road and street maintenance workers do several general types of mowing. In order of importance, these are:

- ▶ **Aesthetic Mowing**
Primarily done in high visibility areas, such as urban main streets for beautification; generally, the entire right-of-way.
- ▶ **Safety Mowing**
Ensures signs and other traffic control devices, guard rails and other safety features can be seen. Provides good sight distance for drivers approaching intersections and driving around curves.
- ▶ **Transition Mowing**
Makes a smooth change from a narrow mowed width to a wide mowed width when different widths of right-of-way are mowed using different mowing equipment. There should be no visible difference in grass mowed with riding mower versus weed eater.
- ▶ **Contour or Selective Mowing**
Naturally blends the grass with other vegetation planted in the Landscape Maintenance Zone. Shows off special architecturally designed landscaping areas or dresses up an interchange entrance or median in an urban area.
- ▶ **Fire Season Mowing**
Rural areas prone to summer fires require occasional mowing from the roadside edge to inside of 30 ft.

Mowing on Slopes Steeper than 1:3 (Vertical:Horizontal) *USE:*

- ▶ A side-mounted mower on a boom if the tractor can remain on flatter surfaces. Ballast or weight the tractor properly.
- ▶ Operate side-mounted or boom mower units on the uphill side of the tractor to limit the possibility of overturning the tractor.
- ▶ Be sure the mower has a roll-over protection structure (ROPS).
Use the seat belt at all times.

- ▶ If specially equipped boom mowers are not available use hand-held equipment designed for the task, such as weed eaters.

Edging and trimming of turf and ground covers

Edging and trimming is more important in urban areas where appearances matter most. This work contributes to safety by maintaining sight distances and infrastructure, such as signs and guard rails.

Mowing strips around trees and hedges (mulching)

Damage from mowers can kill shrubs and trees. To prevent damage to shrubs and trees form a protective mulched area around the base of the tree, use Roundup® to kill grass in a circle 1 to 3 ft. from the trunk depending on the size of the tree.

Once the grass is dead, fill the circular area with a course mulching material to a depth of three inches. Wood chips work well. Keep the mulch 6 inches away from the base of the tree trunk. Maintain the edges of the mulched circle free of invading grass with an edger or weed eater. Spot spray with Roundup® for any weeds that grow inside the mulched area. Remove small low tree branches that can hit an eye or throw the operator off balance or interfere with mowing close to the tree.



Protective mulched area around base of tree should be well edged and free of weeds.



How do I edge and trim?

JARGON

What are edging and trimming?

Edging involves making an even, thin vertical cut between the grass (or some other ground cover) and hard surfaces such as pavement, sidewalks or curbing so that the vegetation does not overgrow these features. This is best accomplished using a gas-powered edger and not a string trimmer (weed eater). The edger is designed specifically for this purpose and is much faster and easier to use. The edging cut should be no more than 1/4 inch wide, which is about the width of the cutting blade.



Use of an edger is recommended because it is quick and safe. It also produces a uniform edge.



Grass edger close-up



Example of a well-edged turf

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Both edging and trimming are done for either safety or ornamental reasons. Edging and trimming of vegetation are important in urban landscapes where both safety and appearance are important.

Edging and trimming are labor intensive and should not be done in areas with natural vegetation and in areas where there is less demand for aesthetic appeal.



Trimming is a horizontal cut of the grass in places where the edger or mower cannot reach. These places are usually along the bottom of walls, fences and other higher surfaces. Trimming should be done using a string trimmer (weed eater).

Trimming with a weed eater can also involve cutting the grass in smaller open spaces and on steep slopes that are hard to get to with a lawn mower.



A weed eater is designed to cut in the horizontal position.



A weed eater is not recommended for edging as it removes grass unevenly and scatters debris.

Tools for edging and trimming

For roadside vegetation maintenance work gaspowered weed eaters and edgers are the best choice as they are light, highly mobile and powerful. Weed eaters with two-cycle engines require mixing of engine oil and gasoline.

However, four-cycle weed eaters do not require mixing of engine oil and gasoline and offer 30% more fuel efficiency than the two-cycle weed eaters.

Optional attachments, such as the pole saw and hedge trimmer, are available with several models.



Operator is cutting grass in horizontal position with leading cutting edge throwing debris to left, away from sidewalk.

Models of weed eaters: Straight shaft and curved shaft

These two models rotate the line in different directions. This is important to know because the direction of rotation determines the way the debris is thrown out and also the preferred side of the cutting path to use.

The straight shaft model (pictured at right) is the most common commercial type. The line rotates counterclockwise, throwing the debris to the left of the operator.

When using the straight shaft weed eater to cut grass, use the left side of the cutting path as the leading edge. This gives a smoother cut and is less likely to dig into the grass surface and cause scalping.



Gas-powered straight shaft weed eater

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Keep the left side of the cutting edge pointed away from the roadside so that the debris and other small rocks will not be thrown toward on-coming traffic.

Curved shafted models (pictured at right) are operated in the opposite direction because they rotate clockwise and throw to the right.

When cutting grass both models of the weed eater should be held so that the cutting line is horizontal to the grass surface.

Do not tilt the head to the left or right, this leads to cutting too low and scalping the grass.



Gas-powered curved shaft weed eater

Remember

The cutting height maintained with the weed eater should be the same as the mowing height used on the mowers.

There should be no visible difference in the appearance of grass trimmed with a weed eater or cut with a mower. Do not cut lower and scalp the grass.

Weed eaters are not substitutes for mowers.

Guidelines for edging and trimming

- ▶ As highway maintenance personnel and contractors, you should employ edging and trimming of vines and ground vegetation only in the Landscape Maintenance Zones of the rights-of-way. The recommended width of the LMZ varies and, for any particular stretch of the road, it depends on the posted speed described in Chapter 3, "Landscape Maintenance Zone, Distances and Heights."
- ▶ Trim grass around sprinkler heads, valve boxes and quick couplers as needed to maintain a clean appearance and good irrigation coverage.



- ▶ Do not employ chemical edging unless as determined by the Engineer or within 2 ft. of guard rails (see Chapter 3, “Landscape Maintenance Zone, Distances and Heights”).
- ▶ Always wear personal protective clothing and ensure safe worksite as specified in FHWA’s Manual on Uniform Traffic Control Devices (MUTDC) and Chapter 4, “Safety & Temporary Traffic Control in the Landscape Maintenance Zone.”

Recap on edging and trimming

- ▶ Edge and/or trim turf, ground covers, and vines by the recommended practices described above to maintain a neat appearance and safe travelway.
- ▶ Use edgers in high visibility urban areas to maintain neat turf appearance. Weed eaters may be used for edging in other areas.
- ▶ Keep all curbing clear of overgrowth above curb and along gutters.
- ▶ Do not allow vines or ground cover to overgrow shrubbery, signs, street lights, fences, valve boxes, guard rails or other structures.
- ▶ Maintain height for ground covers (excluding grasses) between 6 and 36 inches throughout the LMZ in accordance with the vegetation maintenance distance and height guidelines provided in Chapter 3.
- ▶ Edge or trim each time you mow. This includes walks, drives, curbs, planting bed perimeters and tree wells.
- ▶ Do not use weed eaters around the base of trees or shrubs. Install tree protection guards or a mulched tree well.
- ▶ Use a weed eater to eliminate uneven edges of grass, ground covers, vines and shrub at the base of buildings, light poles, signage, guard rails, benches, etc., which cannot be cut by normal mowing procedures.

Other edging and trimming protocols

Unless otherwise specified by the Engineer, follow these additional edging and trimming protocols.

- ▶ Follow all equipment and vehicle cleaning protocols in Chapter 9, “Invasive Species Management.”
- ▶ Maintain a clean worksite in accordance with Chapter 7, “Rubbish & Debris in Gutters, Ditches and Swales.”
- ▶ Keep gutters ditches and swales clear of rubbish and debris. See Chapter 7, “Rubbish & Debris in Gutters, Ditches and Swales.”
- ▶ Ensure that you follow all safety standards for lane control in accordance with Chapter 4, “Safety & Temporary Traffic Control in the Landscape Maintenance Zone.”



Safety!

Always wear high visibility apparel when edging and trimming in the ROW. See Chapter 4 for details. Edging and trimming can sometimes create projectiles and dust conditions. Warning signs, such as “Road Work Ahead,” may be placed on the shoulder 2 ft. off the travelway so that approaching drivers can read the sign.

Training

All maintenance personnel, including HDOT staff and contractors and their maintenance staff, are required to take the training course based on this manual and the invasive species training required under new Section 665, Invasive Species Management in Hawaii Standard Specifications for Road and Bridge Construction.

Other sections that apply

You are required to document the movement of all earth, fill or debris removed from site as specified in the new Section 665 Invasive Species Management (F. Record Origin and Destination of Materials Removed from Site) in Hawaii Standard Specifications for Road and Bridge Construction.

Reporting & Inspection

You are required to report the time and effort spent mowing, edging and trimming. The inspector will check your compliance with mowing, edging and trimming in terms of appearance, heights and distances every month. See Chapters 14 and 15.



In a Nutshell

1. Rural is “NO MOW” except for the edge of roads and a 30-ft. swath from the edge of asphalt for seasonally fire-prone areas.
2. In high visibility urban areas, follow species-specific mowing standards.
3. Use proper tools: mowing should be done by rotary mowers, except for slopes and detail areas; edging should be done by edgers.
4. Your use of consistent mowing standards will contribute to a safe driving experience.
5. Efficient use of available resources helps limit erosion, control weed invasion and enhance the natural beauty of Hawaii.