Reasons for Lawn Problems…

Although there are many specific reasons to which one could attribute lawn problems, the most common general reasons include:

- Poor management decisions (soil compaction, improper mowing, irrigation, fertilization, pest management)
- Using poorly adapted species or cultivars. Limitations in resources (water, time/labor, dollars)

Mowing

The two most important facets of mowing are mowing height and frequency. The preferred height for all species in a lawn is two and half to three inches. Mowing to less than two inches can result in decreased drought and heat tolerance (due to shallow rooting and reduced photosynthesis) and encouraged weed invasion. Higher encourages insects, diseases, and weeds. Mow the lawn at the same height all year. There is no reason to mow the turf shorter in late summer or in the fall.
Mow the turf often enough so no more than one-third of the grass height is removed at any single mowing. This may mean mowing a bluegrass or fescue lawn every three to four days during the active spring growth period, but only once every seven to 10 days at other times of the year when growth is slowed by heat, drought or cold. If weather or another factor prevents mowing at the proper time, raise the height of the mower temporarily to avoid cutting too much at one time. Cut the grass again a few days later at the normal mowing height. [Figure 1]

Figure 1. Mow often enough that no more than 1/3 of the grass height is removed in any single mowing.

Let grass clippings fall back onto the lawn while mowing, unless they are to be used for mulching elsewhere in the landscape. Grass clippings decompose quickly and provide a source of recycled nutrients (equivalent to 1 to 1½ fertilizations per year) and organic matter for the lawn. Although a mulching or recycling mower makes this easier to do, clippings can be recycled into the lawn using any mower (as long as the 1/3 rule of mowing frequency is used). Grass clippings do not contribute to thatch accumulation.

### Lawn Clippings and Surface Water Pollution

Lawn clippings and leaves mowed, swept, or blown onto the street are the major source of phosphorus pollution in urban lakes and streams. With side discharge lawnmowers, mow in a direction to prevent clippings from being blown onto the street, driveway, and other hard surfaces. Do not sweep or blow lawn clippings into the gutter and street. [Figures 2 and 3]

Figure 2. In a Minnesota study, 60 to 80% of the phosphate loading of surface water in an urban setting came from lawn clippings and leaves that were mowed or blown into the streets.

Figure 3. When mowing the lawn, mow in a direction to prevent clippings from being blown into the street.
Also, leave an unmowed grass buffer strip edging any lakes, streams, ponds, and wetlands. [Figure 4]

Figure 4. To reduce surface water pollution, leave an unmowed buffer strip around lakes, streams and ponds.

In a natural setting, rain and snowmelt absorbs mostly into the soil. Air-borne pollutants and pollen washed out of the air are broken down by soil microorganism activity. The nitrogen and phosphorus released from the decay of grass, leaves, and other organic matter recycle back into the soil.

However, in the landscape setting, the water cycle is greatly changed by large areas covered by hard surfaces (streets, driveways, walks, parking lots, compacted soils, and buildings). In a typical landscape setting 55% of a rainfall moves as surface runoff, compared to only 10% in a naturalized setting. Nutrients from grass and leaves (along with fertilizers, pesticides, and other water-soluble pollutants) readily wash off the hard surfaces into the storm sewer system. Here the pollutants end up in local streams, ponds, and lakes.

Fertilization

Selecting a Lawn Fertilizer

Nitrogen (N) is the most important nutrient for promoting good turf color and growth. However, do not over-stimulate the turf with excess nitrogen, especially during the spring and summer. Over-fertilization can contribute to thatch buildup with some species, as well as increased mowing and irrigation requirements. Under-fertilization of some species (bluegrass and ryegrass, for example) can result in poor turf color and turf thinning, which can encourage weed and disease problems. Turf species differ in both the amount of nitrogen required to keep them healthy, as well as the best time of the year to fertilize them.

Balanced or complete fertilizers contain various amounts of phosphorus, potassium, iron, and sulfur. They are a good safeguard against a potential nutrient deficiency and there is no harm in using a “complete” fertilizer. However, if you leave clippings on the lawn, these nutrients are recycled back into the lawn, so there is little likelihood of seeing these deficiencies. Besides nitrogen, the most commonly deficient nutrient in lawns is iron (Fe).

Organic fertilizers will work as effectively as synthetic types. However, it is important to understand the release characteristics of the different fertilizers so that they can be used at the correct times of the year. Organic fertilizers typically release nutrients more effectively when soils are warm and moist. Many synthetic
types work well when soils are cooler, but some synthetic types work like the natural organic sources.

Better lawn fertilizers include a quick release form of nitrogen for quick green-up, plus slow-release forms of nitrogen for sustained greening. Examples are listed in Table 1.

<table>
<thead>
<tr>
<th>Quick-Release Nitrogen</th>
<th>Slow-Release Nitrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>for fast green-up</td>
<td>for sustained green</td>
</tr>
<tr>
<td>Ammonium sulfate</td>
<td>Resin-coated urea</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
<td>Sulfur-coated urea</td>
</tr>
<tr>
<td>Potassium nitrate</td>
<td>Isobutylidene diurea (IBDU)</td>
</tr>
<tr>
<td>Urea</td>
<td>Methylene urea</td>
</tr>
<tr>
<td></td>
<td>Urea formaldehyde</td>
</tr>
<tr>
<td></td>
<td>Compost and manure</td>
</tr>
<tr>
<td></td>
<td>Poultry waste</td>
</tr>
<tr>
<td></td>
<td>Poultry feathers</td>
</tr>
</tbody>
</table>

When to Fertilize and How Much to Apply

The natural grass growth cycle influences proper fertilization time for lawns. Figure 5 illustrates typical root and shoot growth patterns of cool season turfgrass species. [Figure 5]

Figure 5. Growth cycle of roots and shoots for cool season turf.

Figure 6 on the right illustrates the influence on shoot growth when nitrogen fertilizer is applied. Heavy spring fertilization promotes shoot growth, reducing carbohydrate energy reserves and stress tolerance. [Figure 6]

Figure 6. Influence on shoot growth for nitrogen fertilization.

Benefits of Fall Fertilization on Cool Season Home Lawns

- Enhances storage of carbohydrate energy reserves
- Strengthens root system
- Increases shoot density
- Increases stress tolerance
- Better fall and winter color
- Earlier green-up in spring
Timing and Application Rate

Timing and application rates are given in Table 2. If lawn clippings are returned to the lawn, reduce application rate by ¼ to 1/3.

<table>
<thead>
<tr>
<th>Turfgrass species</th>
<th>Mid-March to April&lt;sup&gt;3&lt;/sup&gt;</th>
<th>May to mid-June</th>
<th>July to early August</th>
<th>Mid-August to mid-September</th>
<th>Early October to early November&lt;sup&gt;4&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool Season Species</td>
<td>High maintenance Bluegrass and Ryegrass</td>
<td>½ to 1</td>
<td>1</td>
<td>Not required</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Low Maintenance Bluegrass</td>
<td>½</td>
<td>½-1</td>
<td>Not required</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Turf-Type Tall Fescue</td>
<td>½</td>
<td>½-1</td>
<td>Not required</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Turf-Type Fine Fescue</td>
<td>½</td>
<td>½-1</td>
<td>Not required</td>
<td>½-1</td>
</tr>
<tr>
<td>Warm Season Species</td>
<td>Buffalograss, Blue Grams, and Bermudagrass</td>
<td>Apply no N</td>
<td>½-1</td>
<td>½-1</td>
<td>Apply no N</td>
</tr>
</tbody>
</table>

(Nitrogen application rates are in pounds of nitrogen per 1,000 square feet of lawn area.)

1 Nitrogen applications can often be reduced by 1/4/ to 1/3 when grass clipping are returned to the lawn during mowing. Nitrogen and other nutrients contained in the clippings are recycled to the lawn as they decompose. **Grass clippings do not contribute to thatch accumulations in lawns.**

2 On sandy soils, use slow-release nitrogen fertilizers (sulfur-coated ureas, IBDU, and natural organic-based fertilizers) throughout the year to reduce the potential for leaching loss. On very sandy soils, do not fertilizer turf after late September. Nitrogen can leach into ground water during the winter months.

3 The March-April nitrogen application may not be needed if fertilized in late fall (September to November) the previous years. If spring green-up and growth is satisfactory, delay fertilizing until May or June.

4 Make the final fall nitrogen application (October-November) while the grass is still green and at least two to three weeks before the ground begins to freeze. Optional N applications shown in (). Use extra nitrogen applications where a higher quality turf is desired or on a heavily used turf.

**Fertilizers and Water Pollution**

Home lawn management techniques play a significant role in protecting or polluting surface water. Popular press has incorrectly labeled lawns as a major contributor to water pollution. It is not the lawn, but rather the management style of the gardener that become the problem.

Fertilizers and pesticides (herbicides, insecticides, and fungicides) spread onto hard surfaces (driveways, sidewalks, streets, and compacted soils) will move with surface water into neighboring lakes, streams, and ponds. (Surface water running down the street gutter is not treated before release into local lakes, streams, and ponds.)
However, phosphate fertilizer applied to a lawn or garden soil is bound to the soil and does NOT leach into ground water. The phosphate could move into surface water with soil erosion.

Organic fertilizers are not necessarily safer for the environment. The pollution potential is based on where the fertilizer is applied and application rates. Any fertilizer becomes a potential pollution problem when over-spread into hard surfaces. Over application of both manufacture and organic fertilizers have been linked to ground water contamination.

Potential pollution problems arise from the careless application rather than the type of fertilizer applied. In most Western soils, lawns do not need phosphate fertilizers.

Irrigation

Many factors influence lawn water requirements, and no two lawns will have exactly the same needs. Table 3 gives the typical water requirement (rain plus irrigation) per week. A healthy, high-quality bluegrass or ryegrass lawn may require up to 2 to 2.25 inches of water per week under hot, dry, windy summer conditions; but may require much less when the weather is cool or cloudy. Turf-type tall fescue may perform well with less irrigation than a bluegrass lawn, if it can grow a deep root system and the soil in which it is growing is holding usable water. In many cases, however, a tall fescue may require as much water as bluegrass to look good. [Table 1]

| Table 3. Typical Water Requirement (Rain Plus Irrigation) for Colorado Lawns |
|-----------------------------|-----------------|----------------|------------------|-----------------|
|                             | Late April 0.75"| May & June 1.0"| July & August 1.5"| September 1.0" |
| Inches of water per week    |                 |                |                  |                 |
| (irrigation plus rain)      |                 |                |                  |                 |

Buffalograss and blue grama lawns can remain green for weeks without watering, even during the hottest summer weather, with rainfall.

Shady lawns (not in the rooting zone of large trees) and areas protected from the wind require less water over the growing season than more exposed turf. However, the roots of mature trees and shrubs also need water. You may have to water more in mature landscapes where the roots of many plants compete for water. Healthy turf encouraged by proper mowing, fertilizing, and cultivation, uses water more efficiently.
How Much Water?

Each time you water the lawn, apply enough water to moisten as much of the root zone as possible. Use a soil probe or shovel to determine what the average rooting depth is in your lawn. If the roots grow down 6 inches deep, water so the soil is moistened to that depth. It is important to know not only how deep the turf roots grow, but also how deep your irrigation water penetrates. Watering too deeply, especially on sandy soils, wastes water and allows it to percolate past the root zone. [Figure 7]

Figure 7. Typical water (rain plus irrigation) is given in Table 5. However, actual water use jumps around from day to day based on temperature, wind, humidity, and solar radiation (sunny or cloudy).

How Often Should a Lawn be Watered?

Grass growing on a sandy soil must be watered more often than the same grass growing on clay or loam soils. Even after a thorough watering, sandy soils hold little plant-available moisture. They require more frequent irrigation with smaller amounts of water.

Conversely, turf growing on clayey soils can be irrigated less frequently, with larger quantities of water. Watering less often means more efficient water use because of less loss to evaporation. It can also reduce the number of weeds that appear in the lawn. With most soils, do not apply all of the water in a short period of time. If applied too quickly, water will run off of thatchy turf, from sloped areas, or from turf growing on heavy clay or compacted soils. In these cases, it is more effective to apply only a portion of the water and move the sprinkler or switch to another station to water another section of the lawn. Cycling through irrigation stations (“soak cycles”) will promote infiltration and reduce runoff and puddling in low spots. This allows water to soak into the soil rather than run off.

Core cultivation (aeration) can resolve some infiltration problems by reducing thatch and compaction. Wetting agents may enhance water movement into the soil, but they should not be considered a cure-all, especially when compaction and thatch are problems.

What are Some Signs that Turf Needs to be Watered?

A sure sign that turf requires irrigation is a wilted appearance. One symptom is “footprinting,” where footprints on the lawn that do not disappear within an hour or so following traffic. This symptom is soon followed by actual wilting, where
the turf takes on a grayish or purple-to-blue cast. If only a few such spots regularly appear in the same general location, spot water them to delay watering the entire lawn for another day or so. These indicator spots help predict that the entire lawn will soon need watering.

A hardened or toughened lawn, attained through less frequent, deep irrigation, often withstands minor drought and generally has fewer disease problems. It is important, however, that the turf not be allowed to become overly drought-stressed between waterings. This weakens the turf and makes it more susceptible to insect and disease damage and to weed invasion.

During extended dry periods from late fall to spring, it may be necessary to "winter water" every four to six weeks if the ground is thawed and will accept water. Pay particular attention to exposed slopes, sites with shallow soil, and south- or west-facing exposures, where winter mites may infest and kill drought-stressed turf during the winter and early spring.

The most efficient time of day to water is late evening and early morning (between 9 p.m. and 9 a.m.). It generally is less windy, cooler, and more humid at this time, resulting in less evaporation and more efficient use of water. Water pressure is generally better, optimizing sprinkler distribution patterns. Contrary to popular belief, watering at night (after 9 p.m.) does not encourage disease development in turf.

**Thatch**

Thatch is a tight, brown, spongy, organic layer of both living and dead grass roots and stems that accumulates above the soil surface. Factors that lead to thatch problems include the following: [Figure 8]

- **Sod over compacted soil** – When sod is laid over compacted soils, a thatch problem will develop in a couple of years.
- **Soil compaction** is a common contributor to thatch build-up as it slows the activity of soil microorganisms.
- **Over fertilization** is a common contributor to thatch build-up as the lawn may be growing faster than the microorganism can break it down.
- **Grass species** – Thatch tends to be a problem on Kentucky bluegrass, bentgrass, and fine fescue lawns. It is rarely a problem with tall fescue or buffalo grass.
- **Frequent heavy irrigation** may contribute to thatch as lower soil oxygen levels slow the activity of soil microorganisms.
- **Pesticides** – Excessive use of some pesticides may also slow soil organism activity.

Figure 8. Thatch is a tight, brown, spongy, organic layer of both living and dead grass roots and stems that accumulates above the soil surface.
Grass clippings do not contribute to thatch accumulation and should be returned to the lawn during mowing to recycle the nutrients they contain.

Measure thatch depth by removing a small piece of turf, including the underlying soil. Up to ½ or ¾ inch of thatch is acceptable and will enhance traffic tolerance. The thatch depth can increase quickly beyond this point, making it difficult to control later. As the thatch layer thickens, it becomes the main rooting medium for the grass. This predisposes the turf to drought stress or winterkill and increases the possibility for insect, disease and weed problems. In addition, fertilizers and pesticides applied to a thatchy lawn work less effectively.

**Power Raking for Thatch Management**

This method of thatch removal has been used for years. Light (shallow) power raking may be beneficial if done often. Deep power raking of a thatch lawn can be damaging, and often removes a substantial portion of the living turf. Used properly, power raking of wet, matted turf can speed spring green up by letting air move into the root zone and warm the turf. Compost all removed thatch and organic material to kill any living grass before it is used as a mulch or soil amendment.

**Core Cultivation or Aerating.**

This can be more beneficial than power raking. It helps improve root zone conditions by relieving soil compaction, while controlling thatch accumulation. Soil compaction, in fact, is one factor that contributes to thatch buildup. Aeration removes plugs of thatch and soil two to three inches long (the longer, the better) and deposits them on the lawn. Enough passes should be made to achieve two-inch spacing between holes.

What is done with the cores is a matter of personal choice. From a cultural perspective, there may be an advantage to allowing the cores to disintegrate and filter back down into the lawn. Mingling soil and thatch may hasten the natural decomposition of the thatch. The little fluffs of thatch and turf that remain behind can be collected and composted. Depending on soil type, core disintegration may take a few days to several weeks. Irrigation helps wash the soil from the cores. Running over dried cores with a rotary mower can be effective but will dull the blade. If the cores are removed from the lawn, compost before using as a mulch or soil amendment.

**Soil Compaction**

Soil compaction is the most common problem in lawn quality. With reduced soil oxygen levels, rooting systems will be more shallow. With compaction, the grass roots have reduced access to water and nutrients. Irrigation and fertilization will need to be light and more frequent.

Aerating (removing plugs) once or twice a year will help reduce soil compaction in an established lawn area if enough passes are made to yield plugholes at two-inch intervals. The best time of year to aerate a lawn is late August to late September,
as fewer weed seeds germinate this time of year. Aerating the lawn area around a tree is also the best method to promote tree vigor. [Figure 9]

![Core aeration in lawn](image)

**Figure 9.** Core aeration helps reduce soil compaction when enough passes are made over the lawn to yield plugholes at two-inch intervals.

---

## Weed Management

Lawn weed killers provide only temporary control if management factors that favor weeds are not addressed. In a thin turf with heavy traffic, weed problems may intensify following the use of weed killers. When the weeds (which help absorb the wear and tear of foot traffic) are removed with weed killers, the lawn may thin. The thin lawn opens the soil to increased weed problems.

Soil compaction is the primary cause of weed problems. Weed management factors include the following.

- **Core aeration** – Soil compaction favors weeds and discourages lawn growth. Common lawn weeds including annual bluegrass, black medic, chickweed, clover, crabgrass, knotweed, prostrate spurge, and plantain thrive in compacted soils. Clover may be a good companion crop for lawns in compacted soils, filling in between the thin grass.

- **Mowing** – High mowing height (shading) and frequent cutting discourages weeds.

- **Watering** – Deep, infrequent watering will drought out many common shallow rooted lawn weeds. [Figure 10]

![Deep watering in lawn](image)

**Figure 10.** Deep infrequent watering will drought out many common shallow root lawn weeds.

- **Limited fertilizer** – A thick, actively growing turf chokes out most weeds. However, fertilizer will not thicken up a turf when soil compaction is the growth-limiting factor.

For additional information on turf weed management, refer to these CSU Extension Publications available online at [www.cmg.colostate.edu](http://www.cmg.colostate.edu).

- *Annual Grassy Weed Control in Lawns*, Extension Fact Sheet #3.101
Insect and Disease Management

In semi-arid climates like Colorado, turf insect and disease problems are minimal, compared to other areas of the nation.

Frequent use of lawn insecticides may increase the occurrence of lawn insect problems. Some garden insecticides have a potential to kill birds feeding in the treated areas (refer to the insecticide label). Thus, avoid unwarranted treatments of lawn areas.

When controlling soil insects, the insecticide must be watered into the root zone to be effective. Some insecticides get held up in the thatch and do not water in effectively.

In semi-arid climates like Colorado, lawn diseases are minimal, compared to other areas of the nation. With Colorado’s dry climate, fungicides do little to nothing for home lawn disease management. Cultural practices (fertilizer, watering, and soil compaction) are the keys to disease management. [Table 3]

<table>
<thead>
<tr>
<th>Soil Compaction</th>
<th>High N</th>
<th>Low N</th>
<th>Thatch</th>
<th>Irrigation</th>
<th>Mowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asochyta Leaf Blight</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>timing</td>
<td>yes</td>
</tr>
<tr>
<td>Necrotic Ring Spot</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>drought with heat</td>
<td>yes</td>
</tr>
<tr>
<td>Leafspot and Melting Out</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>timing (wet/dry cycle)</td>
<td>yes</td>
</tr>
<tr>
<td>Gray Snow Mold</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dollarspot</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>drought</td>
<td>low</td>
</tr>
<tr>
<td>Stripped Smut</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairy Ring</td>
<td>yes</td>
<td></td>
<td>yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Influence of Cultural Practices on Kentucky Bluegrass Diseases

Authors: Tony Koski, PhD, Extension Turf Specialist, and David Whiting, Extension Consumer Horticulture Specialist (retired); Department of Horticulture & LA; Colorado State University. Artwork by David Whiting and Tony Koski; used by permission.

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