

Cultural Practices for Water Conservation: Turfgrass

Part 4 of 5 in the series "Water Conservation in Connecticut Landscapes"

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Changing weather patterns and increasingly dry conditions have made water conservation in Connecticut landscapes a priority. The potential for a year of less than adequate rainfall compels the reconsideration of seasonal irrigation practices. Landscape professionals and home gardeners can adopt simple and smart water conservation strategies. **Proper cultural practices support the efficient use of water in the landscape, reducing waste and maximizing the health of turfgrass areas.**

A dense, healthy stand of turf is a net benefit to the environment if grown in a sustainable way. **Managing and watering lawns and other turf areas properly helps the environment, by conserving water and reducing chemical/nutrient runoff. It also creates a healthy, sustainable turf, while reducing expenses and labor in the long term.**

I. CONSIDER WATER USE AND CONSERVATION IN ALL ASPECTS OF LANDSCAPE DESIGN

- **Identify lawn areas that are the most important to maintain as mown turf for either use or aesthetics.** Areas that are of low priority, unused, or difficult to mow (e.g., steep banks) can be non-irrigated and, potentially, left unmown.
- **Avoid planting turfgrass in locations that are a challenge to irrigate and maintain properly** (e.g., isolated strips along sidewalks and driveways).
- **Repurpose challenged turf areas.** Alternative landscapes (e.g., meadows, expanses of drought tolerant groundcovers, or rain gardens), which do not require supplemental irrigation once established, are an option for areas that are too dry, wet, shady, or otherwise challenging to maintain as turf.
- **Utilize up-to-date irrigation technology**, such as smart sensors, which monitor soil moisture and evapotranspiration rates, to ensure irrigation is turned off during rain events and only applied when warranted by turfgrass needs.

II. SELECTING THE RIGHT TURFGRASS SPECIES

For seeding all new lawns or overseeding of established lawns, **select turfgrass species and cultivars that have improved drought tolerance.** Deep root systems and low rates of evapotranspiration (the sum total of water lost to the atmosphere from both evaporation from the soil surface and transpiration from leaf surfaces) are important factors that support turfgrass drought tolerance. For general health, once established, turf-type tall fescue and fine fescues require less water than perennial ryegrass and Kentucky bluegrass. They should be incorporated into most lawn mixtures whenever possible. **Always overseed newer turfgrass cultivars with improved tolerance for drought stress into existing lawns.** Contact Extension specialists for help identifying improved cultivars.

- Select turfgrass species best suited to existing growing conditions and the intended use of the turf area. Whenever possible, use certified seed, or seed with the highest germination and purity, to ensure a reduced percentage of weed seed in the seed mix.
- **Selecting the correct turfgrass species is dependent on:**
 - Irrigation Practices
 - Intended Use (i.e., amount of activity; traffic)
 - Intended Management Practices
 - Soil Type
 - Aesthetic Expectations
 - Micro-climates (e.g., sun/shade, topography, soil)



This low-maintenance, healthy lawn is planted with drought tolerant grass species and cultivars.

- **Select species and cultivars** that have been evaluated for drought survival here in the northeast. Variations in drought tolerance may occur with geographical and climactic differences in other regions.
- **Use new, improved turfgrass varieties with enhanced drought tolerance, pest tolerance, and improved turf quality.** Look for cultivars noted for strong drought tolerance here in the northeast, as part of the National Turfgrass Evaluation Program (www.ntep.org), Turfgrass Water Conservation Alliance (www.tgwca.org), or the Alliance for Low Input Sustainable Turf (a-listturf.org) approved cultivars.
- Some improved turfgrass cultivars of fine fescue, turf-type tall fescue, and perennial ryegrass are noted to be endophyte-enhanced. Endophytes are host-specific beneficial fungi that may deter surface-feeding insects, including chinch bugs, sod webworms, and billbugs. Turfgrass cultivars that contain high concentrations of endophytes are also noted to exhibit improved vigor and drought tolerance when climate conditions are harsh.

Both Kentucky bluegrass and perennial ryegrass, two of the most popular turfgrass species in the northeast, enter dormancy quickly in summer months. Turf-type tall fescues and fine leaf fescues (creeping red, hard, or sheep fescue) will retain color and maintain turf quality for a longer period of time under drought conditions. As available water continues to be regulated, homeowners that cannot tolerate the aesthetic look of off-color and dormant turf during summer may want to consider **overseeding or renovating with newer, more drought tolerant cultivars.** Updating the species composition of the lawn to be a higher percentage of fine fescue or turf-type tall fescues will contribute to a reduction in irrigation needs.

There are four cool season turfgrass species that are consistent ingredients in home lawn seed mixtures: perennial ryegrass, Kentucky bluegrass, fine fescue, and turf-type tall fescue.

<u>Species</u>	<u>Drought Rating</u>	<u>Growing Information</u>
Perennial Ryegrass (<i>Lolium perenne</i>)	Fair	<ul style="list-style-type: none"> • Performs best in full sun. Good wear tolerance. Can tolerate a low height of cut. • Germinates and establishes quickly; reduces weed establishment and minimizes the potential for soil erosion. • Grows best with 3-4 pounds of N/1,000 ft²/year and with supplemental irrigation.
Kentucky Bluegrass (<i>Poa pratensis</i>)	Good	<ul style="list-style-type: none"> • Performs best in full sun. Best maintained for home lawns at an average height of 2-3 inches. Rhizomatous roots; excellent ability to fill in open spaces and recover from wear. • Slow to germinate; often paired with perennial ryegrass. Grows best with 3-4 pounds of N/1,000 ft²/year and with supplemental irrigation.
Fine Fescue (<i>Festuca</i> spp.)	Excellent	<ul style="list-style-type: none"> • Very fine-textured, needle-like leaves, with a delicate appearance. 3+ species of grasses are considered “fine fescues.” • Once established, all fine fescue species can tolerate and persist in dry, infertile soils. • Prefers the filtered light of shady environments but can tolerate full sun. Does not tolerate intense traffic. Best maintained at a 3 inch height of cut. • Mature stands tolerate minimal fertility (1-2 pounds of N/1,000 ft²/year). • Dense stands of fine fescues often have the ability to crowd out weeds. • Some species used as nurse grasses in roadsides, native gardens, and wildflower mixtures.
Turf-type Tall Fescue (<i>Festuca arundinacea</i>)	Excellent	<ul style="list-style-type: none"> • Does well in areas of full sun and partial shade where traffic may be an issue. Best maintained at a 3 inch height of cut. • As a species, tall fescue has more extensive roots and is more drought-tolerant than the other cool-season turfgrass species. Retains green color longer than other cool season turfgrass species into the summer before going dormant. • In early New England springs, may be challenged to establish when soil temperatures are cool. Best seeding times are in late summer and early fall. • New, improved varieties are more “turf-like,” finer-textured, and blend well with other cool season turfgrasses. • Prefers more fertility than fine fescues, and less than K. bluegrass and P. ryegrass.

III. ESTABLISHMENT OF A NEW LAWN

To improve drought tolerance of newly established lawns:

- **Select the appropriate species and improved cultivars with drought tolerance** (see above).
- **Improve and protect soil structure:** Improvement in soil structure is more easily accomplished prior to new lawn establishment and in new landscape construction, before plants are selected and placed. In established lawn areas, soil structure improvements can be made, but with greater challenges and expense.
 - Incorporate organic matter (such as dry, well-aged compost) into the topsoil to lower bulk density, which will reduce soil compaction. Enhancing organic matter content can improve water retention in sandy soils and improve porosity in clay soils. Any compost added to the soil should be applied to meet soil test recommendations and included as a component in an overall nutrient management program for the turfgrass area.
 - If the soil is compacted, aeration can help to improve soil structure and add oxygen to the soil.
- **Seed turfgrass areas in late summer/early fall** (mid-August through the end of September). Better success occurs with turf establishment at this time, when there is less competition from weeds, more available soil moisture, and cooler air and soil temperatures. Temperate weather provides favorable conditions for turfgrass root development.
 - Spring seedings often have limited success, as it is a challenge for turfgrass to establish before the onset of hot summer weather. Grassy weeds that compete with turf accelerate their growth as temperatures warm and can quickly outgrow and dominate in cool season turfgrass areas. Use of pre-emergent grassy weed control products, necessary with spring seedings, would not be required with fall overseeding.
- **Irrigate frequently and lightly** for at least 2-3 weeks, or until all seed germinates. Keep the soil surface moist to encourage establishment of all turfgrass species in the seed blend or mixture.
- **Mulch** with products that retain soil moisture, such as weed-free straw, salt marsh hay, or hydromulch (optional).
- **If an in-ground irrigation system is in place**, install and use the most up-to-date technology, such as soil moisture sensors, to help determine water needs and reduce water usage in turf areas.
- Coated seed is a new technology promoted to benefit turf establishment, especially where water may be limited. Coated seed is available to both homeowners and landscape professionals.



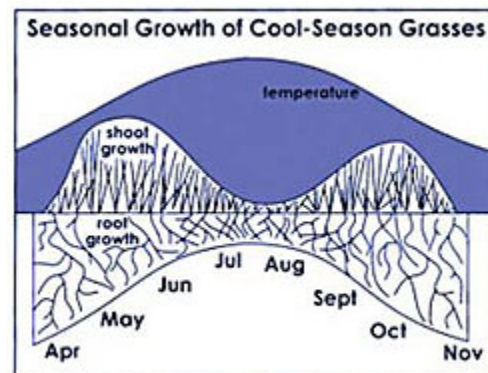
Perennial ryegrass seed is poured into a seed spreader for establishment of a new lawn area.

IV. CULTURAL AND MANAGEMENT PRACTICES ON ESTABLISHED LAWNS

The drought tolerance of cool season turfgrasses can be improved through proper management. The ability to produce an extensive root system is important to the survival of all turfgrass plants. Proper cultural practices can enhance turfgrass health and mitigate factors that limit root growth. Factors that may inhibit root growth include soil compaction, over-watering, scalping (excessively close mowing), excess nitrogen, excess thatch (>0.3"), soils with a low pH (<5.5), and the improper application and timing of weed control products. More than one of these factors in any combination can significantly reduce the health of turfgrass roots (density and depth).

A. MOWING MAINTENANCE

Maintain a consistent high height of cut for maximum turfgrass health and optimal root growth. For most lawn areas, a 3-4" height of cut is preferred. Longer leaf blades generate a greater capacity for photosynthetic activity and translocate more energy into root production, which produces healthier roots. This is critical during the spring, when 60% of the total annual root mass is produced. Root growth begins and peaks before optimal shoot growth in the spring, and declines with the warmer soil temperature of summer (Figure 1). Turfgrasses with extensive root systems are more drought tolerant and better able to access available water that is lower in the soil profile.



*Figure 1. Most root and shoot growth occurs in spring and fall, and slows in summer.
Image courtesy of www.maine.gov*

- **Scalping, or mowing grasses too short, reduces the amount of leaf surface area available for photosynthesis. This directly reduces the plants' ability to grow vigorously.** As the mowing height is reduced, lawns become less tolerant of environmental stress and are more prone to invasion by pests (including weeds) than lawns consistently maintained at a higher height of cut.
- Mow regularly all season at a consistent height of cut, particularly in spring and fall, when turfgrass growth is most active. **Remove no more than 1/3 of the leaf surface at one time.** To maximize the health of a turfgrass lawn and maintain the turf at a height of 3", mow when the height of cut reaches a length of about 4.5". Mower blades should be sharpened repeatedly to provide a clean cut during each mowing event.



Mow regularly all season at a consistent height of cut.

B. FERTILIZATION

Cool season turfgrasses should be fertilized in the spring or fall, when they are actively growing. Improper timing or over-application of fertilizer may result in excess nutrients not used by turfgrass plants being released into the soil, creating the potential for them to leach into groundwater.

Best practices for fertilization of turfgrasses include:

- Leave grass clippings on lawn areas after each mowing event to return nutrients to the soil. If necessary, disperse clippings to avoid clumping on the turfgrass surface.
- Up to ¼ inch of dry, aged compost can be top-dressed annually to improve organic matter content in the soil. Calculate the quantity of compost needed according to results of a soil test.
- Complete a soil test every 2 to 3 years to monitor changes in the percentage of organic matter and soil nutrient levels. Applications for soil tests and protocol for sampling can be obtained through UConn Extension. For instructions, visit <http://www.soiltest.uconn.edu/sampling.php> or call the UConn Soil testing lab at (860) 486-4274 or the UConn Home and Garden Education Center toll-free at (877) 486-6271.
- **Fall fertilizer applications should be completed by mid-late October** to coincide with the slowing of turfgrass growth. Fall feedings should conclude before turfgrass growth ceases, so that all nutrients are used by the turfgrass plant and do not contribute to surface groundwater contamination.
- **Applications of nitrogen (N) products** (either synthetic or organic) should be used to sustain turf function, particularly when turfgrass is not under drought stress. Avoid excess applications of N, which encourages rapid shoot (leaf) growth, promotes development of succulent leaf and root tissues that are more sensitive to heat and drought, and reduces both root production and rooting depth.
 - Fertilizer products that slowly release nutrients (synthetic or organic) and extend the duration of nutrient release are recommended. Spring applications of N should be light (1/2 lb.) and should promote healthy root and shoot (leaf) growth, without overstimulating shoot growth.
 - The bulk of annual N needs should be applied in the fall before turfgrass growth slows (by mid-October), to stimulate turfgrass recovery after the dry and stressful summer season and to increase chlorophyll/carbohydrate production, in order to promote root development necessary for winter survival.
 - Use of organic products are recommended in late spring, summer, or early fall, when soil temperatures are warm and soil microbes are actively using and converting N. Microbial activity declines when soil temperatures are cool in early spring and late fall.



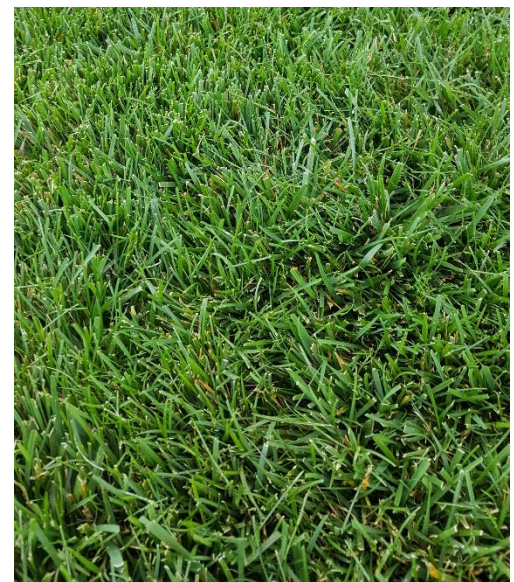
Leave grass clippings on the lawn after mowing for a natural boost of nutrients to the soil. Disperse clippings to avoid clumping on turfgrass surface.

- **Apply potassium (K) in balance with nitrogen** to help turfgrasses survive stress. If potassium levels are inadequate, as indicated by soil tests, K should then be applied at about half the level of N.
- **Phosphorus is an important nutrient in turf establishment, especially for germinating turfgrass seed.**
 - For mature turf, a phosphorus application is rarely needed on most soils unless a deficiency is indicated by a soil test. A soil test can help determine whether the use of starter fertilizer (including phosphorus) is warranted during establishment of new turfgrass. Applications of P are not permitted unless soil test (within 2 years) indicates such a need for P.¹
 - **CT Law stipulates that no phosphorus (P) fertilizer applications can be made between Dec. 1 and March 15** to protect against P leaching into surface groundwater.

C. MANAGING THATCH

Thatch is the natural organic layer in a lawn of dead and living shoots, stems, and roots that develops over time at the soil surface. Thatch builds up when turf produces organic waste more quickly than it can be broken down by microbial populations. While leaf clippings break down quickly, stems, rhizomes, and stolons take longer to degrade and contribute to the thatch layer. Certain turfgrass species that have rhizomes or stolons, such as Kentucky bluegrass and creeping red fescue are more prone to develop thatch.

A small amount of thatch in lawns (up to ¾ inch) is beneficial. A healthy thatch layer provides insulation against temperature extremes and protects the turfgrass plant from fluctuations in soil moisture. It can provide resiliency in an athletic turf, soften impact on the playing surface, and improve footing. However, **a thatch layer greater than an inch thick can be detrimental.** Turf roots may grow within a thick thatch layer and not actually reach the soil, making the plant more vulnerable to dehydration. As the thatch layer heats, it dries out more quickly than soil layers below it and can begin to repel water. Conversely, under circumstances where a thatch layer is constantly wet, it will remain wet for a longer duration during and after rain events, thus reducing the gas exchange of carbon dioxide and oxygen required for good soil health.



Bunch-type grasses, such as turf-type tall fescue, do not develop significant levels of thatch.

Monitoring thatch levels is an important cultural practice. To prevent excessive buildup of thatch in the lawn:

- **Select and incorporate turfgrass species or cultivars that produce less thatch:** Bunch-type grasses, such as perennial ryegrass and turf-type tall fescue, do not develop significant levels of thatch.
- **Manage fertility:** Nitrogen increases production of root and stem tissues, which promotes thatch development.
- **Dethatch:** Dethatching (mechanical removal of thatch with vertical mowers or power rakes) should be undertaken when turf is actively growing, so that the turf can recover from the activity. Spring, late summer or early fall is the preferred time to dethatch here in southern New England.
- **Manage pH:** Turfgrass grows best when the soil pH is between 6.0 and 7.2. This neutral pH range supports turf growth and microbial populations that degrade and break down thatch.

D. CULTIVATION/AERATION

Drainage can be improved and compaction can be alleviated through cultivation. Cultivation/aeration physically creates spaces in the soil to allow for an exchange of CO₂ and O₂. This practice helps to maintain a healthy balance of oxygen (O₂) and carbon dioxide (CO₂) in the soil to support healthy root development needed for drought tolerance during dry summer months. Compacted soils and overly wet soils have a high concentration of CO₂ that is detrimental to healthy turfgrass growth. Soil microbes, including bacteria, fungi, and insects, all consume oxygen (O₂) and release

¹ Henderson, J., V. Wallace, and J. Campbell. 2013. *Best Management Practices for Pesticide-Free, Cool-Season Athletic Fields*. Storrs, CT: University of Connecticut Extension.

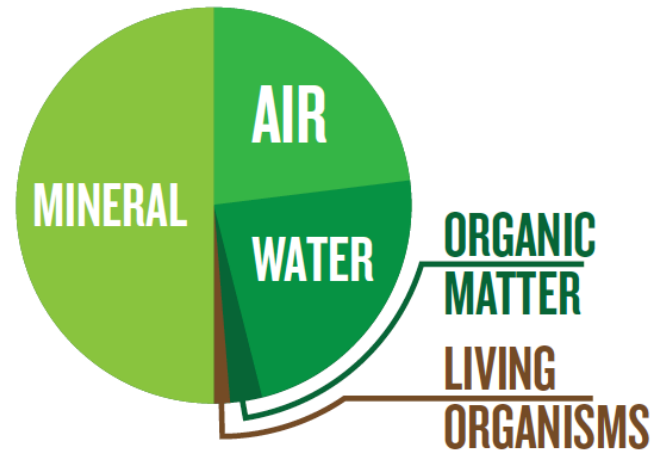
carbon dioxide (CO₂). Soil cultivation should be considered in landscapes where large trees dominate the landscape and root systems and have encroached into lawn areas.

For new sites/landscapes:

- If soil is compacted, till soil to a depth immediately below the compaction layer to improve water penetration.
- Limit soil compaction and disturbance by designating paths for machine and foot traffic.
- Do not till, dig, or move soil when it is wet or extremely dry.

For established sites/landscapes:

- Aerate established lawns at least once a year to promote deeper root growth, improve water infiltration rates, and enhance nutrient movement in the soil. Cultivate during the time of year when grass is actively growing.
- Areas (e.g., athletic fields, backyards, dog parks) that are prone to compaction may require multiple cultivation events each year.
- Limit compaction by not using mowers and other equipment in the same pattern repeatedly. Do not mow when the soil is wet.



Composition of ideal soils.
Image courtesy of University of Georgia Extension

E. Wetting Agents

Wetting agents can be used to increase the amount of water that penetrates into the thatch and soil to make water more available to grass roots. A wetting agent is a surfactant that can be added to irrigation water to reduce its surface tension, allowing for a better distribution and penetration of water through the soil. They can be applied in a liquid or granular form, and can be watered in or applied through the irrigation system. Wetting agents are commonly used by turfgrass professionals, such as golf course superintendents and sports turf managers as a regular component of their turfgrass maintenance programs.

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- <http://extension.uga.edu/publications/detail.cfm?number=C1058-1>

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