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Best Management Practices: Turfgrass Irrigation

Part 3 of 5 in the series "Water Conservation in Connecticut Landscapes"

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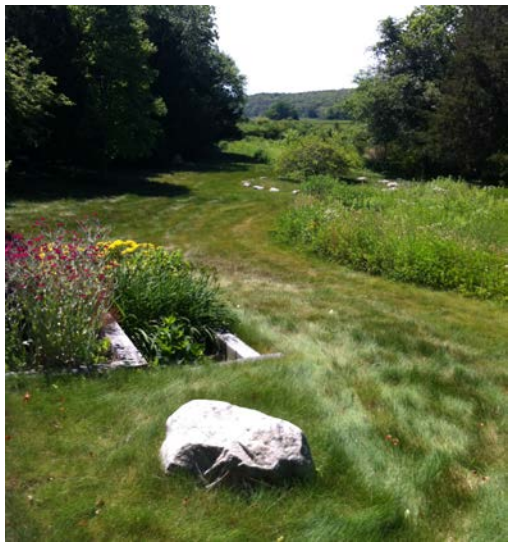
In the fall of 2016, Connecticut implemented statewide voluntary water restrictions. However, some towns have already moved to mandatory restrictions, and others may soon follow. Given the near certainty of future water regulation, it is important to adapt home lawn management strategies to conserve water and maintain turf health with less irrigation. **Using water more efficiently not only saves money, it promotes healthier turf and protects the quality of life of current and future Connecticut residents.** Each homeowner has a responsibility to take ownership of water conservation and the power to significantly impact the environment.

It is not uncommon for lawns to be overwatered, especially if lawns are irrigated with a programmed irrigation system that does not include sensors and other current water-conserving technology. Overwatering a lawn is not only a waste of water and negatively impacts the environment, it is detrimental to the health of the turfgrass and an expense that may be unnecessary. Frequent lawn watering promotes shallow rooting of turfgrasses, which makes turf more susceptible to other stresses, including drought, and increases disease vulnerability. Excessive irrigation encourages the production of weak, succulent tissues. It also can lead to the depletion of soil oxygen, which is important for root growth and health. Overly wet soils can also contribute to soil compaction.



A healthy, established lawn requires irrigation only once it exhibits observable symptoms of drought stress.

A dense, healthy stand of turf is a net benefit to the environment if grown in a sustainable way. Most established home lawns don't need to be watered frequently and can survive with natural rain events or with limited irrigation. Cool season turfgrass lawns that are not irrigated will naturally go dormant in the summer, and recover when adequate moisture returns in the fall. **Lawns that are irrigated should be watered deeply and infrequently throughout the summer, optimally when turfgrass begins to show signs of drought stress.** Turfgrasses that are irrigated based on their need for water, rather than on an arbitrary schedule, will develop stronger roots, in order to seek water located more deeply in the soil profile, creating a thicker, healthier lawn.

Key elements of a sound water management strategy:

- Supply the optimal amount of water to maintain plant health.
- Provide the proper amount of water to avoid leaching (deep percolation below the plant roots) and runoff (movement of water over the soil surface without penetration).

Typically, natural rainfall in Connecticut in March, April, and May provides sufficient moisture in the spring months to satisfy the needs of most residential lawns without supplemental irrigation. As rain events become less frequent, a watering regime based on weather and turfgrass health, rather than a set irrigation schedule, is optimal. **Delay watering until lawns begin to show evidence of leaf wilt and mild drought stress.**

I. WHEN IS IRRIGATION NECESSARY?

If turfgrass or soil water content becomes limited, drought stress or (eventually) plant death may occur. Water is lost from the turfgrass root zone by gravity, evaporation, and natural plant uptake.

Irrigation needs can be determined by:

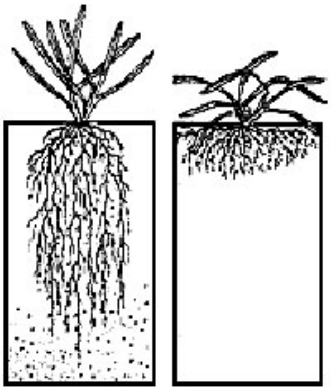
- Being aware of soil moisture levels.
- Assessing weather conditions.

- Monitoring rates of evaporation and transpiration (the process by which plants absorb water through their roots and then release water vapor through pores in their leaves.)
- Understanding micro-climates and their effect on turf areas. Some factors that commonly vary within a property include: the amount of shade/sun (due to neighboring tree canopy or nearby buildings; humidity; topography; and composition of the soil.
- Identifying the turfgrass species composition of the lawn. Once established, turf-type tall fescue and fine fescues require less water than perennial ryegrass and Kentucky bluegrass.

Variables influencing the amount of water used by plants:

High water loss:	**Low (slow) water loss:**
Sandy, coarse soil structure	Clay, fine soil structure
High temperature	Low temperature
High wind	Low wind
High solar radiation	Low solar radiation
Prolonged sun exposure (full sun)	Short sun exposure (shade)
Low relative humidity	High relative humidity
Fast rate of growth	Slow rate of growth
Shallow rooting depth	Deep rooting depth
Summer	Early spring, late fall
Area with a steep slope	Flat area, no slope
Plant species with high water uptake	Plant species with low water uptake

Established and deeply-rooted plants can extract water from a greater volume of soil, making them more drought tolerant than shallow-rooted species or juvenile plants. When compared to coarse (e.g., sandy) soils, finer textured (e.g., loam, clay) soils hold more water and require less frequent irrigation.



Turf with deep roots (left) are healthier and more drought tolerant than turf with shallow roots (right). Image courtesy of University of Minnesota Extension

If irrigation is limited or unavailable, and aesthetics of a dormant turf can be tolerated, plants will gradually enter natural dormancy in summer, once triggered by drought stress. However, if planned irrigation is part of a lawn maintenance program, begin irrigation of turf before plants succumb to dormancy. **Once a regular watering program is initiated, it must be continued throughout the dry summer months to prevent dormancy.**

To determine when to irrigate:

1. **Observe plant symptoms; look for signs of drought stress:**
   - **The first sign of drought stress is wilting.** Wilting occurs when a turfgrass plant's internal water content drops below the point necessary for the plant leaves to remain turgid (stiff), and plant cells begin to collapse. In turfgrasses, **wilt causes visible change**: **leaf folding, foot printing, and uneven dew formation.** When footprints or equipment tracks remain visible on the lawn for several minutes, it is a good visual indicator that turf is not very turgid and wilting is imminent. **Initial signs of wilting is not indicative of permanent injury. Water as signs of wilting begin to appear to avoid severe wilt or permanent injury.**
   - **Signs of turfgrass progression to severe wilt:** increasing discoloration from bluish-green to straw/brown and leaf roll. Permanent injury and poor recovery may occur in heavily trafficked sites under severe drought stress.

Footprints in turfgrass are a common symptom of drought stress.

If water is provided at the first indication of wilt, no loss in turfgrass quality will result. However, **if an irrigation program is suspended or interrupted**, and the turf has not already naturally gone dormant, a prolonged period of drought stress may result in leaf/shoot death.

2. **Examine the soil:**
   - Use a soil probe or a garden spade to examine the soil to a depth of up to six inches. Water when the soil appears dry.

3. **Measure soil moisture (recommended):**
    - Include water sensors as part of an irrigation system. Sensors recognize when adequate soil moisture is present, automatically shut off the irrigation system, and adjust or delay the system to regularly save water and money.
    - Encourage the use of soil moisture detection meters that are used by professional turf managers to maximize irrigation efficiency. As part of the "irrigation needs" equation, many landscape professionals use these tools to help determine the need for irrigation as it relates to plant function and health. These meters can detect variations in moisture stress within sections of a lawn.

Water turfgrass when both the soil and the environmental conditions merit the need, rather than irrigating on a schedule. This practice helps to avoid overwatering, conserves water, and protects turfgrass from extended drought stress. The irrigation program must be evaluated over the course of the season, as seasonal needs change. Up-to-date technology, such as smart sensors, make this easier and more convenient for homeowners.

II. TURFGRASS DORMANCY

Drought-induced dormancy is a defensive mechanism of turfgrasses that allows them to survive periods of limited rainfall and drought. Typically, growth of turfgrass roots and shoots slows dramatically in warmer summer months. Turfgrasses that do not receive enough moisture to remain actively growing in the summer, whether through adequate rainfall or scheduled irrigation, will naturally go dormant. In dormancy, turfgrasses stop growing, lose their green color (limited photosynthetic activity/chlorophyll production), and turn brown/straw-colored, although the roots and the crown (location where shoots emerge) of the plant are alive. Timely watering is required to prevent this natural drought-induced dormancy if, aesthetically, such dormancy cannot be tolerated. Once rain or irrigation is applied, active growth will resume and color will return in 10-14 days.

Turfgrasses can remain dormant for up to six weeks with minimal or no loss of overall quality. Extended periods of dormancy (45 to 60 days) with little or no rainfall may impact recovery. **Minimize activity on drought stressed or dormant turf** to reduce damage and prevent turf cover losses. Dormant turf that is subject to excessive wear can suffer irreparable damage. Since grasses are not actively growing when they are dormant, they are **not able to compete with pests and become more susceptible to weed invasion**. Also, damage from insect and disease injury may not be easily detected because the turf is already off-color (brown). The areas of turfgrass loss would be detected once rain, and thus growth, resumes.

A healthy, but dormant, lawn.

Strategies to maintain or manage dormant turfgrass include:

- **Stop or minimize mowing of turf areas during periods of drought**, unless absolutely necessary, to reduce stress or damage.
- **A targeted fertilizer program in the early fall will enhance turfgrass recovery**. A low nitrogen, high potassium application (e.g., 15-0-30 or similar analysis) can encourage the root and shoot development that is critical for turfgrass restoration.
- **Regular inspection of turf areas for weeds, diseases, and insects**. Scouting may be more of a challenge while the turf is dormant. Pay attention to areas known to have prior history of pest problems. Avoid herbicide usage during the warm summer months; delay weed control until early fall, if possible.
- **Overseeding or renovations to turf stands in the fall may be necessary** if drought recovery is poor or thatch levels are excessive (> 1.0 inch).

III. WATER PROPERLY FOR OPTIMAL TURFGRASS HEALTH AND MAXIMUM IRRIGATION EFFICIENCY

When irrigation of turf is necessary, water deeply and infrequently. Research shows that **irrigation frequency affects turfgrass rooting and drought resistance**. Typically, a well-watered lawn with a moist root zone can thrive with irrigation once a week, depending on weather patterns, soil conditions, and health of the turfgrass.

- **Irrigation applied deeply and infrequently (before and during the time that wilting symptoms are evident),** encourages deeper roots, a reduced thatch layer, improved health, and better overall quality during drought.

- Deep, infrequent irrigation thoroughly penetrates the soil. Turfgrass roots extend more deeply into the soil when water is available at deeper levels. Conversely, roots remain closer to the surface when turf is watered more frequently for shorter periods of time.
- During the heat of summer root growth of turfgrasses slows, and some roots die off. Turfgrasses with a more extensive root system at the start of summer will be better able to withstand drought conditions in the summer season.

- **A less frequent irrigation schedule as the summer begins will condition turfgrasses to be more resilient in summer drought conditions.** Grasses that are "pre-conditioned," by acclimating them to low water availability, have been found to better withstand water stress and recover more quickly than grasses that are abruptly cut off from irrigation and suddenly forced into dormancy. Grasses that are pre-conditioned may still enter dormancy, but will be healthier at the dormancy onset.
- Apply enough water so that the soil is wetted to a depth of four to six inches (approximately one inch of water; but the amount varies with soil texture). Watering to this depth could take 2-3 hours to apply.
- **Most home lawns require about 1 inch of rainwater or irrigation per week to prevent dormancy.** A compacted soil often is unable to absorb an inch of water at one time. To irrigate compacted soil, **water can be cycled through the irrigation system twice with a rest period in between cycles to prevent runoff and loss of the water**. Runoff and leaching is impacted by:
  - Duration of application
  - Precipitation rate
  - Soil type (i.e., clay, silt, sand)
  - Soil compaction
  - Slope
- To ensure that water has been evenly distributed across the lawn, and to determine when an appropriate amount of water has been applied, place several empty cans (e.g., tuna or cat food cans) in the sprinkler area.
- New seedings require more frequent irrigation, of shorter duration, than established plantings.

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.

An example of a wetting agent available for purchase. (Not an endorsement of this particular product.)

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