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# Watering Home Lawns: How Much and How Often

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Grass plants in healthy lawns contain nearly 90 percent water. Most homeowners realize the consequences of not applying enough water to their lawn: the grass will become sparse and may eventually die. But many people may not be aware that applying too much water can also be detrimental. Water-logged soils will cause depletion of oxygen in the root zone, and can lead to root death. Also, excessive water will leach nitrogen out of the plant root zone and potentially pollute groundwater. Finally, applying too much water will waste a valuable resource and add cost to caring for a lawn. This bulletin gives step by step instructions on how to correctly determine both how much water to apply to a lawn and how often to water.

## Irrigation Basics

Before deciding how much and how often to water your lawn, consider the following factors.

Soil Texture—There are three basic sizes of soil particles: sand, silt, and clay. Sand particles are the largest and clay particles are the smallest. The relative amount of each of these three soil particles determines the soil texture, which affects the amount of water a soil can hold. Soils containing large amounts of sand particles hold the least amount of water, while soils with predominately clay and silt hold more. Soils that have approximately equal amounts of sand, silt and clay are termed loam soils. Only a certain amount of water can be held by soil, and this is termed the "water holding capacity." Applying more water than the soil will hold will result in wasted water.

Environmental Conditions—Water applied to lawns is used by plants, runs off if application rate is excessive, or evaporates from the grass and soil. Higher air temperature, increased wind, and sunlight will all cause more water consumption. Grass planted adjacent to streets or parking lots will also use more water, particularly if the paved surface is dark colored. Areas of a lawn that are shaded by buildings or trees will use less water than areas exposed mostly to full sun. Sloped areas are prone to becoming dry because water runs off instead of soaking into the soil. This is especially true for sloped areas with heavier, clay soils.

Lawn Management Factors—Grass that is allowed to grow taller—up to four inches for some grass species—will have deeper roots, giving it access to more water. Heavy thatch or compacted soils will prevent water from penetrating uniformly into the root zone. Proper fertilization and aerification will help prevent thatch buildup and alleviate soil compaction.

Amount of Water Needed—When a lawn is irrigated, just enough water should be applied to wet the soil to the depth of the root zone without moving water below that zone. A properly cared for lawn will have a rooting depth of approximately one foot.

The following steps will help you determine how much water to apply and how often to irrigate your lawn. Complete the information in those areas where the text is blue.

## Step 1. Determine Soil Texture

To calculate how much and how often to water your lawn, you must first know the quantity of water your particular soil can hold based on soil texture (table 1). Coarse-textured soils (for example, sand and loamy sand) hold less water than the other two broad soil textures, but the latter two soak up water much more slowly. In table 1, the column labeled "average water" is the total amount of water that can be held by each of the three broad soil textures. The "usable water" column is the amount of water that can be used by a lawn to maintain plant health before it needs to be irrigated. For example, soil with a "smooth" texture can hold an average of 2 inches of water, but only 1 inch is usable water.

Determine your general soil texture by feeling the soil in your hand when it is saturated with water. Coarse-textured soils will feel *gritty or coarse* when rubbed between your thumb and index finger. Soils such as silt and clay loam will feel *smooth or sticky*, while a silt loam soil will feel *soft or silky*. The latter two soil types in table 1 are commonly referred to as "fine-textured" soils. When squeezed in your hand, fine-textured soils will form a very firm ball that readily holds its shape, whereas a ball of coarse-textured soil will readily break apart. If in doubt as to the soil texture, use the "smooth" category for your calculations. More complete explanations of soil textures can be found in CIS 1098, *Watering Home Lawns and Landscapes*, http://info.ag.uidaho.edu/pdf/CIS/CIS1098.pdf.

Use the Step 1 worksheet to record your soil texture and usable water-holding capacity.

## Step 2. Determine Effective Water-Application Rate

Many sprinkler types are available to irrigate home lawns. The amount of water delivered by each sprinkler varies due to nozzle type and size, and water pressure. Because of this, you must measure the amount of water delivered to your lawn by all the different types of sprinkler systems you use.

Home lawns with underground sprinkler systems are divided into zones. Ideally, all the sprinklers in each zone are of the same type to assure good water application uniformity. Spray heads apply between 1.5 to 2 inches per hour, and impact or gear-drive rotating sprinklers apply about 0.25 to 0.5 inches per hour. Even zones with the same type of sprinkler heads may apply different rates because of the number of heads per zone or size of the sprinkler orifice. Because of this, it is necessary to calculate an application rate for each zone.

**Table 1. How much water does my soil hold?**
Average water-holding capacity and usable water of three broad soil textures.

| When wet soil is rubbed between your thumb and finger, it feels: | Examples of soil texture types: | Average water | Usable water |
|---|---|---|---|
| | | -----------inches per foot----------- | |
| Coarse or gritty (coarse) | Sand and loamy sand (coarse) | 1.0 | 0.5 |
| Smooth or sticky (smooth) | Loam, silt, clay loam, silty clay loam (fine) | 2.0 | 1.0 |
| Soft or silky (soft) | silt loam (fine) | 2.4 | 1.2 |

Adapted From: Ashley, R.O., W.H. Neibling, and B.A. King. 1996. Irrigation Scheduling Using Water-Use Tables. CIS 1039. Moscow, ID: University of Idaho Cooperative Extension System and Agricultural Experiment Station.

### Step 1 worksheet

Your soil texture:_______________________________________________

Usable water-holding capacity (column 4 in table 1):_________________inches/foot

To check sprinkler application rate:

a. Place a minimum of four straight-sided containers, such as soup cans or rain gauges, at regular intervals between every pair of overlapping sprinkler heads. This is referred to as "head-to-head coverage," when the water stream from one sprinkler reaches the next closest sprinkler.

   If you are using a single hose-end sprinkler, place the containers within the wetting pattern. Then, move the sprinkler to the opposite side of the wetting pattern and re-irrigate the area just watered. This technique mimics the head-to-head coverage of a built-in sprinkler system, and is the best way to irrigate using a single hose-end sprinkler. Measure the water in the can only after irrigating the area twice using this head-to-head technique.

   Because water tends to splash out of shallow containers such as tuna cans, these should not be used. Assure that the cans sit nearly flat to achieve the proper catch. Using more containers will allow you to calculate the water-application rate more accurately.

b. Operate the sprinkler(s) for a known time (such as 20 minutes), preferably at the same time you would normally operate the sprinkler system, and when there is very little wind. If two zones irrigate the same area, make sure to run both overlapping zones so the correct amount of water is collected before measuring.

c. Measure the depth of water collected in each can and add the amounts. If all the cans are exactly the same size, it is easier to pour all the water into one can and take only one measurement. However, take note to see if there are somewhat equal amounts of water in each container. If you are evaluating an underground sprinkler system and notice large differences in the amount of water collected in each container, check the sprinkler heads to make sure they are functioning properly. If not, you may need to contact your local lawn irrigation company for information on adjusting or replacing heads.

d. Using the Step 2 worksheet, calculate your water-application rate in inches per hour. Remember, if you have different types of sprinklers, such as pop-ups and rotors, or sprinklers with nozzles of different sizes, you will need to calculate an application rate for each zone separately because the different sprinkler types will not apply the same amounts of water.

**Step 2 worksheet**

$$\left(\frac{\text{Inches water collected}}{\text{Number of cans}}\right) \times \left(\frac{60}{\text{Sprinkler run time in minutes}}\right) = \text{inches per hour}$$

Example:

$$\left(\frac{\text{1.2 inches water collected}}{\text{6 cans}}\right) \times \left(\frac{60}{\text{20 minutes}}\right) = \text{.6 inches per hour}$$

Your Lawn:

$$\left(\frac{\text{Inches water collected}}{\text{\_\_\_\_\_\_\_cans}}\right) \times \left(\frac{60}{\text{\_\_\_\_\_\_\_minutes}}\right) = \text{\_\_\_\_\_\_\_inches per hour}$$

### Table 2. How long should I run my sprinkler?

Instructions: Find the application rate determined in Step 2d (column 1), read across the table to the column for the soil texture of your lawn, then in the adjacent column to the right, find how long you need to operate the sprinkler system to re-fill the root zone.[1]

| **Water applied per hour with sprinkler in step 2-d** (inches) | **Usable soil water-holding capacity for *coarse* soil from step 1** (inches) | **Time to run sprinkler to re-fill root zone** (hours and minutes) | **Usable soil water-holding capacity for *smooth* soil from step 1** (inches) | **Time to run sprinkler to re-fill root zone** (hours and minutes) | **Usable soil water-holding capacity for *soft* soil from step 1** (inches) | **Time to run sprinkler to re-fill root zone** (hours and minutes) |
|---|---|---|---|---|---|---|
| .10 | 0.50 | 5:00 | 1.0 | 10:00 | 1.2 | 12:00 |
| .15 | 0.50 | 3:20 | 1.0 | 6:40 | 1.2 | 8:00 |
| .20 | 0.50 | 2:30 | 1.0 | 5:00 | 1.2 | 6:00 |
| .25 | 0.50 | 2:00 | 1.0 | 4:00 | 1.2 | 4:48 |
| .30 | 0.50 | 1:40 | 1.0 | 3:20 | 1.2 | 4:00 |
| .35 | 0.50 | 1:25 | 1.0 | 2:51 | 1.2 | 3:26 |
| .40 | 0.50 | 1:15 | 1.0 | 2:30 | 1.2 | 3:00 |
| .45 | 0.50 | 1:07 | 1.0 | 2:13 | 1.2 | 2:40 |
| .50 | 0.50 | 1:00 | 1.0 | 2:00 | 1.2 | 2:24 |
| .55 | 0.50 | 0:55 | 1.0 | 1:49 | 1.2 | 2:11 |
| .60 | 0.50 | 0:50 | 1.0 | 1:40 | 1.2 | 2:00 |
| .65 | 0.50 | 0:46 | 1.0 | 1:32 | 1.2 | 1:51 |
| .70 | 0.50 | 0:43 | 1.0 | 1:26 | 1.2 | 1:43 |
| .75 | 0.50 | 0:40 | 1.0 | 1:20 | 1.2 | 1:36 |
| .80 | 0.50 | 0:38 | 1.0 | 1:15 | 1.2 | 1:30 |
| .85 | 0.50 | 0:35 | 1.0 | 1:11 | 1.2 | 1:25 |
| .90 | 0.50 | 0:33 | 1.0 | 1:07 | 1.2 | 1:20 |
| .95 | 0.50 | 0:32 | 1.0 | 1:03 | 1.2 | 1:16 |
| 1.00 | 0.50 | 0:30 | 1.0 | 1:00 | 1.2 | 1:12 |
| 1.05 | 0.50 | 0:29 | 1.0 | 0:57 | 1.2 | 1:09 |
| 1.10 | 0.50 | 0:27 | 1.0 | 0:55 | 1.2 | 1:05 |
| 1.15 | 0.50 | 0:26 | 1.0 | 0:52 | 1.2 | 1:03 |
| 1.20 | 0.50 | 0:25 | 1.0 | 0:50 | 1.2 | 1:00 |
| 1.25 | 0.50 | 0:24 | 1.0 | 0:48 | 1.2 | 0:58 |

[1] Divide minutes by 60 to change minutes to hours. For example, for 1 hr, 25 min, 25 ÷ 60 = 0.4 hours. Therefore, 1:25 (hrs:min) is 1.4 hours.

## Step 3. Calculate Sprinkler Run-Time

Each irrigation session should re-fill the root zone of a lawn with as much water as it can hold. Use the Step 3 worksheet to determine how long to operate a sprinkler: divide the usable soil water-holding capacity (from step 1) by the sprinkler application rate (from step 2d). If you would prefer to change the run-time to minutes, multiply the answer by 60.

Alternatively, if you'd prefer not to bother with calculations, you can use table 2 to determine how long to run your sprinkler each time you irrigate.

## Step 4. Set Days Between Irrigations

It's important to realize that no matter what soil texture you have, you must adjust the *time between irrigations*, and not the length of time the sprinkler is operated. Once the root zone is filled to capacity, additional water will only be wasted. You cannot water your lawn "extra" on one day in the hope that it will not dry out as fast. Even during the hot, dry times of summer you will still apply the same amount of water each time you irrigate. To compensate for the fact that plants need more water during this time, you must water more frequently.

### Step 3 worksheet

Example:

Usable water-holding capacity (from step 1): 1.0 inches/foot ÷ sprinkler application rate (from step 2d): 0.6 inches per hour = 1.7 hours per irrigation

To change this to minutes: 1.7 hours X 60 minutes per hour = 102 minutes per irrigation

Your lawn:

Usable water-holding capacity (from step 1):______(inches per foot) ÷ sprinkler application rate

(from step 2d):______(inches per hour) =______hours per irrigation

(Optional):______hours per irrigation X 60 minutes per hour =______minutes per irrigation

### Table 3. How often should I run my sprinkler?

Instructions: Find the soil texture of your lawn in column 3, 5 or 7 for the corresponding month. Then, in the column to the right (column 4, 6, or 8), find the number of days between irrigations.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| **Month** | **Average daily water use**[1] (inches) | **Usable soil water-holding capacity for *coarse* soil from step 1** (inches) | **Days between irrigations** | **Usable soil water-holding capacity for *smooth* soil from step 1** (inches) | **Days between irrigations** | **Usable soil water-holding capacity for *soft* soil from step 1** (inches) | **Days between irrigations** |
| April | .12 | .5 | 4-5 | 1.0 | 8-9 | 1.2 | 9-10 |
| May | .18 | .5 | 2-3 | 1.0 | 5-6 | 1.2 | 6-7 |
| June | .23 | .5 | 2-3 | 1.0 | 4-5 | 1.2 | 5-6 |
| July | .26 | .5 | 2-3 | 1.0 | 3-4 | 1.2 | 4-5 |
| August | .23 | .5 | 2-3 | 1.0 | 4-5 | 1.2 | 5-6 |
| September | .15 | .5 | 3-4 | 1.0 | 6-7 | 1.2 | 8-9 |

[1] Average daily water use is based on 1998-2007 crop water use averages from U.S. Dept. of Interior Reclamation for locations at Rexburg, Fort Hall, Twin Falls, and Boise. Agrimet, http://www.usbr.gov/pn/agrimet/id_charts.html.

After completing steps 1 through 3, refer to table 3 to determine how often to irrigate. Note that more water is used during the warmer summer months than earlier and later in the growing season, and coarse-textured soils (column 4) need to be irrigated more frequently than fine-textured soils (columns 6 and 8).

For example, a lawn should be irrigated every 4 to 5 days in April for a sandy soil (coarse texture), but every 8 to 9 days for a smooth soil (fine texture). In July a lawn growing in a sandy soil should be irrigated every 2 to 3 days and every 3 to 4 days for a smooth soil.

As discussed above, many variables need to be considered in determining irrigation frequency. Therefore, we give you a range of days in table 3 to account for these variables. See step 5 for help in deciding more exactly your irrigation frequency.

## Step 5. Check Your Results

The above calculations will help you determine how much water to apply to your lawn and how frequently to irrigate. However, this is not a foolproof method. It is important that you take time to check soil moisture and set the irrigation schedule to match the water use of your lawn. Consequently, at least once a month you should check your lawn to determine if too little or too much water is being applied. Remember, too, that during rainy, cloudy, or cool weather, lawns will use less water than the long-term averages used in this bulletin, so make adjustments as needed.

A good way to determine if the soil in your lawn has enough moisture is to push a small rod of about ¼ inch in diameter or something similar, such as a large screwdriver, into the soil in several places the day after you water. The rod should easily move through the soil to a depth of at least 10 to 12 inches. If the soil is too dry, you will not be able to push the rod into the soil. However, in very sandy soil it may still be possible to push the rod into dry soil. Check for moisture on the rod when it is removed from the soil. Then again on the day before irrigating check the soil moisture. If the soil is still wet/moist, wait one or two days before irrigating. If the soil is too dry, you may need to shorten your irrigation frequency.

During one of your checks, dig up a handful of soil to feel the moisture content. When squeezed in your hand, coarse-textured (sandy) soils that are fully saturated with water will leave a wet outline on your palm. Finer textured soils will form a sticky, dough-like ball when squeezed in your hand. Checking your lawn soil moisture this way will give you a better idea if you are irrigating properly. The blemish you put in your lawn by doing this will quickly disappear, so you should not be concerned about using this method to check soil moisture.

Dry spots on the lawn can be caused by varying soil textures, compaction, buried rocks or construction debris, insect damage such as billbugs, poor sprinkler design, or poor water pressure. If you run the entire sprinkler system in an attempt to fully wet the dry areas, you will end up over-watering the rest of the lawn. Instead, correct the problem if possible, or use a hose-end sprinkler to provide extra water to the dry areas. If the dry spot is due to soil compaction, aerate the area with a hollow-tine aerator. These aerators remove small soil cores and improve water infiltration and air movement to the roots. It also is possible that construction debris has been buried and may need to be removed.

Lawns that don't receive enough water will turn a gray-green color, and eventually turn brown. A lawn needs water when the grass does not spring back from foot traffic or wheel tracks.

In the interest of conserving water, some homeowners want to know if they can withhold irrigation and still keep their lawn alive. Some cool-season grasses, such as Kentucky bluegrass, will naturally go dormant from lack of water. The grass is still alive and will resume growth upon receiving sufficient moisture. If you need to conserve water, withholding irrigation is a viable option, but it is important to resume watering in late summer or early fall to allow the grass to green up and produce energy reserves for winter survival. Other cool-season grasses such as perennial ryegrass or tall fescue are bunch-type grasses. These do not survive extended drought periods as well, so determine the type of grass you have before withholding irrigation.

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