

The water requirements of most plants in New Mexico's urban landscapes exceed rainfall amounts. Most landscapes must therefore be irrigated, and proper watering is important for maintaining an attractive and healthy lawn. Because water is a limited resource in New Mexico, you'll want to use efficient irrigation, which means using the minimum amount of water required to obtain acceptable grass appearance and quality.

In order to maintain and irrigate your lawn efficiently, you need to know about the type of grass and its water requirements, the type of soil in your lawn, and the irrigation system you're using. For a more detailed discussion of lawn irrigation, see Cooperative Extension Service Circular 660, *Turfgrass Irrigation*, available at http://aces.nmsu.edu/pubs/_circulars/CR660.pdf.

GRASS SELECTION

You should choose your grass based on its water use and your intended purpose for the lawn area (for example, a high-traffic lawn area versus a landscaped area that is only planted for aesthetic appearances; Figure 1). Turfgrasses can be generally divided into cool-season and warm-season grasses, and warm-season grasses are a better choice for water conservation purposes.

Cool-Season vs. Warm-Season Grasses

Cool-season grasses are more cold-tolerant and have a longer growing season in the Southwest than warm-season grasses, which means that they also use more water during the summer (between 15 and 20% more). You will generally find it easy to maintain cold-tolerant plants in the summer. Kentucky bluegrass, perennial ryegrass, and tall fescue are examples of cool-season grasses, and they combine traffic-tolerance with cold-tolerance to give you a dark green and uniform appearance during most of the year.

Warm-season grasses are more drought-tolerant and use water more efficiently, but they are sensitive to low temperatures in the winter, which can make them a poor choice for colder New Mexico climates.



Figure 1. Public park area with turf and trees.

Warm-season grasses have a shorter growing season than cool-season grasses, which means that they require less water during the year. Buffalograss and blue grama are warm-season grasses that you can use only in areas that receive little or no traffic and where your main purpose is to contribute to the appearance of your lawn. Bermudagrass and zoysiagrass are also warm-season grasses, but these are more traffic-tolerant and you can use them in areas that receive a significant amount of foot traffic.

WATER REQUIREMENT

The amount of water lost due to transpiration from the plant and evaporation from the soil is called evapotranspiration, or ET (evaporation + transpiration). Water lost to ET must be replaced, and ET is therefore a good measure of the amount of water that your lawn requires. Evapotranspiration depends on many factors, including climate and grass species, but you can use Tables 1 and 2 to estimate the water requirements of cool- and warm-season grasses in different areas of New Mexico. The ET rate of your grass species in your climate will help determine your irrigation schedule.

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Table 1. Estimates of Average Daily ET Rates (inches) of Cool-Season Turf During a Typical Year at Four New Mexico Sites

Time Period	Farmington	Tucumcari	Albuquerque‡	Las Cruces
1/1 – 1/15	0.00	0.00	0.01	0.01
1/16 – 1/31	0.00	0.00	0.01	0.02
2/1 – 2/15	0.00	0.03	0.02	0.03
2/16 – 2/28	0.00	0.04	0.03	0.05
3/1 – 3/15	0.02	0.07	0.05	0.07
3/16 – 3/31	0.04	0.09	0.08	0.12
4/1 – 4/15	0.07	0.13	0.12	0.16
4/16 – 4/30	0.11	0.18	0.16	0.20
5/1 – 5/15	0.14	0.20	0.19	0.23
5/16 – 5/31	0.19	0.24	0.22	0.24
6/1 – 6/15	0.23	0.29	0.25	0.27
6/16 – 6/30	0.26	0.27	0.26	0.26
7/1 – 7/15	0.25	0.26	0.25	0.25
7/16 – 7/31	0.24	0.30	0.24	0.24
8/1 – 8/15	0.21	0.28	0.22	0.22
8/16 – 8/31	0.19	0.25	0.20	0.20
9/1 – 9/15	0.16	0.23	0.17	0.17
9/16 – 9/30	0.14	0.21	0.16	0.17
10/1 – 10/15	0.11	0.16	0.13	0.14
10/16 – 10/31	0.09	0.15	0.11	0.12
11/1 – 11/15	0.07	0.14	0.09	0.11
11/16 – 11/30	0.00	0.10	0.05	0.09
12/1 – 12/15	0.00	0.00	0.02	0.04
12/16 – 12/31	0.00	0.00	0.01	0.01
Total	38.50	55.10	45.80	53.10

‡ Reliable multi-year weather data for Albuquerque were not available. Therefore, ET for Albuquerque is presented as an average between Las Cruces and Farmington.

Table 2. Estimates of Average Daily ET Rates (inches) of Warm-Season Turf During a Typical Year at Four New Mexico Sites

Time Period	Farmington	Tucumcari	Albuquerque‡	Las Cruces
3/16 – 3/31	0.00	0.00	0.00	0.00
4/1 – 4/15	0.00	0.00	0.06	0.11
4/16 – 4/30	0.00	0.12	0.07	0.14
5/1 – 5/15	0.08	0.15	0.13	0.18
5/16 – 5/31	0.12	0.19	0.16	0.20
6/1 – 6/15	0.17	0.24	0.20	0.22
6/16 – 6/30	0.21	0.22	0.21	0.21
7/1 – 7/15	0.21	0.21	0.22	0.22
7/16 – 7/31	0.19	0.21	0.20	0.20
8/1 – 8/15	0.16	0.20	0.17	0.17
8/16 – 8/31	0.15	0.17	0.15	0.15
9/1 – 9/15	0.12	0.15	0.13	0.13
9/16 – 9/30	0.10	0.14	0.11	0.12
10/1 – 10/15	0.08	0.10	0.09	0.10
10/16 – 10/31	0.00	0.10	0.05	0.09
11/1 – 11/15	0.00	0.14	0.06	0.11
11/16 – 11/30	0.00	0.10	0.05	0.09
12/1 – 12/15	0.00	0.00	0.00	0.00
Total	24.40	33.70	29.25	34.10

‡ Reliable multi-year weather data for Albuquerque were not available. Therefore, ET for Albuquerque is presented as an average between Las Cruces and Farmington.

All turfgrasses can survive with less than 100% ET replacement. How far below 100% ET you can water and still have your grass survive depends on the grass' drought-tolerance and ability to recuperate and on lawn traffic. Heavily trafficked turf areas may require more water than what is listed in Tables 1 and 2 in order to grow back in worn-out areas. Nearly all turfgrasses will survive short periods of drought if they are followed by periods of recovery, during which time you should sufficiently water your grass.

ROOT ZONE/SOIL

Soil Type and Soil Moisture Relationships

The properties of your soil, along with your grass' ET and your irrigation system's output rate (also called precipitation rate), will determine how long and how often you should water your turf area. The size of the particles that make up the soil determine water movement into the root zone (infiltration rate) and through the soil (percolation rate), and the amount of water that a soil can store (porosity).

Because fine-textured soils hold more water, you can generally wait longer between irrigations. However, because water infiltrates more slowly in fine-textured soils, you may have to irrigate multiple times with short waits between irrigations to allow water to fully infiltrate the root zone. Sandy, coarse-textured soils drain faster and hold less water than fine-textured clayey or silty soils, and may therefore require more frequent irrigation.

You can contact your local Cooperative Extension Service office for help with determining the type of soil in your turf area.

Management Allowable Depletion

Your grass can use water from the root zone as long as the soil moisture level doesn't drop below the permanent wilting point, or the point at which soil moisture levels are low enough to affect grass health. The amount of water held in the soil between field capacity (the water content after complete saturation and 24 hours of drainage) and the permanent wilting point is called plant available water. The maximum amount of plant available water that can be removed from the root zone before grass stress occurs or visual appearance declines significantly is called maximum (or management) allowable depletion (MAD). Warm-season grasses allow for slightly higher MAD than cool-season grasses.

Table 3. General Soil Water Properties and Management Allowed Depletion in Various Soil Textures

Soil Texture	Available Water (inches per foot)	Infiltration Rate (inches/hour)	Management Allowed Depletion (%)
Clay	1.5	0.12	30
Silty Clay	1.9	0.18	40
Clay Loam	2.4	0.25	40
Silty Clay Loam	2.4	0.25	50
Sandy Clay Loam	1.8	0.20	50
Sandy Clay	1.9	0.12	50
Silt	2.0	0.40	50
Silty Loam	2.4	0.43	50
Loam	2.0	0.54	50
Sandy Loam	1.4	0.75	50
Loamy Sand	0.8	0.88	50
Fine Sand	0.7	1.25	60

Table 3 gives the water holding capacity, infiltration rate, and MAD for different soil types. This information will be used to schedule irrigation times and amounts.

IRRIGATION SYSTEM

You can apply irrigation to your grass area in a variety of different ways, but pop-up sprinkler systems have become the most commonly used because they provide high-quality turf while helping to conserve water (if irrigation is applied uniformly). Whatever system you decide to use, be sure that it is designed, installed, and maintained properly. If you want uniform irrigation and water spray patterns that match the shape of an area, you'll have to consider hydraulics (water pressure and flow, pipe sizing), sprinkler head configuration, spacing between sprinkler heads, and nozzle selection.

Irrigation System Output

You will need to determine the precipitation rate (or output) of your irrigation system so that you can schedule efficient irrigation of your grass. A precipitation rate is usually expressed in inches per hour and can be calculated in two ways. The first is through a calculation using flow rates and the surface area of the lawn, and the second is by an irrigation audit (or catch can test). You can directly measure the flow rate of your irrigation system by using your home's water meter, a separate flow meter (if installed), or a bucket and stopwatch.

Main Water Meter

Use the following steps to measure your irrigation system's flow rate using your house's main water meter.

- 1) Close all faucets, valves, or leaks downstream of the meter and keep them closed until you're finished. (Potential openings include sinks, showers, toilets, swamp cooler valves, and other outdoor faucets.)

- 2) Check the water meter for a few minutes to ensure that no water is running (as indicated by a rotating red triangle on most meters) before you begin to measure.
- 3) Record the meter reading and open the valve to the irrigation system.
- 4) Run the system for a measured time period (e.g., 15 minutes), then take another reading.
- 5) Divide the number of gallons used by the number of minutes that you ran the system to determine the flow rate in gallons per minute (gpm).

Flow Meter

You can also determine the flow rate by using a separate totalizing flow meter installed just downstream of your irrigation system's valve, pump, outlet, etc. The flow meter method works well for all types of irrigation systems, including sprinklers attached to a single hose, sub-surface drip systems, or pop-up sprinkler systems. Be sure to record the flow rate in gpm.

Bucket and Stopwatch

A third method to determine flow rate is to use a bucket and stopwatch.

- 1) Place the end of your hose or sprinkler in a 5-gallon bucket and record the time it takes to fill the bucket (in seconds).
- 2) Divide 5 by the number of seconds it took to fill the bucket, then multiply the result by 60 to calculate the flow rate in gpm.

Average Precipitation Rate

Once you know the precipitation rate of your irrigation system (in gallons per minute), you can calculate the precipitation rate over the area of your lawn. The precipitation rate is used to schedule irrigation times and amounts. Use the following equation.

$$PR = (FR \times 96.3)/A$$

Where:

- PR = precipitation rate in inches per hour
- FR = total flow rate in gpm
- A = area being watered in square feet

Catch Can Test to Measure Irrigation System Uniformity

You can also use a catch can test (also called an irrigation audit) to measure the precipitation rate as well as to evaluate the distribution uniformity of an irrigation system. You will need a number of short, straight-sided, flat-bottomed cans (e.g., coffee cans) or containers similar to calibrated rain gauges.

- 1) Place these cans in a grid-like pattern within the irrigated area and turn on the irrigation system for a recorded length of time.
- 2) Measure and record the amount of water caught in each can.
- 3) Divide the sum of all can measurements by the number of measurements (cans) in order to calculate the average precipitation amount.
- 4) Divide the average precipitation amount by the number of minutes you ran the system, then multiply by 60 to determine the average precipitation rate in inches per hour. This figure will be used to schedule irrigation.

Your irrigated area will most likely not be 100% uniform, so some sections will receive more water and others less. You may want to adjust your irrigation for the drier parts of your lawn, but keep in mind that this will result in somewhat overwatering the wetter parts.

HOW TO SCHEDULE IRRIGATION TIMES AND AMOUNTS

The following is an example of how to use information about your grass type and water requirements, soil, and irrigation system precipitation rate to schedule irrigation times and amounts.

In Albuquerque, a Kentucky bluegrass/tall fescue mix (cool-season grasses) with a rooting depth of 18 inches (1.5 feet) is grown on a sandy loam soil that holds 1.4 inches of water per foot at field capacity (Table 3). If your soil is holding the maximum amount of water possible (field capacity), then there are 2.1 inches of water available over the root zone depth (1.5 foot rooting depth x 1.4 inches per foot).

Sandy loam soils have a MAD of 50%, so approximately 1.05 inches (50% MAD x 2.1 inches) of water can be lost from the turf area before irrigation must be applied. Cool-season grasses have an ET rate of 0.25 inch of water per day in Albuquerque during the summer (Table 1). If 1.05 inches of water are available in the root zone after 50% MAD is reached, irrigation would need to be applied every 4 days (1.05 inches / 0.25 inch = 4.2 days) and the amount of water to apply

would be 1.0 inch (0.25 inch x 4 days). Use your irrigation system's average precipitation rate (in inches per hour) to determine how long to run the system to apply 1.0 inch of water to your turf area.

Keep in mind that your soil texture will affect the infiltration rate. If you find that water is pooling on the soil surface during irrigation, you may need to split up your irrigation into shorter time lengths in order for the water to fully infiltrate the soil.

SUMMARY

- Efficient irrigation means using the minimum amount of water required in order to obtain acceptable grass appearance and quality.
- In order to irrigate efficiently, you need to know the type of grass in your lawn and its water requirements, the type of soil in your lawn, and your irrigation system's precipitation rate.
- You should choose your grass based on perceived water use, your intended purpose for the area, drought-tolerance, lawn traffic, and recuperative ability.
- Improving your irrigation system's uniformity and efficiency can help you conserve water by reducing run times without affecting grass quality, and by avoiding unnecessary losses due to wind, surface runoff, deep percolation, and evaporation from standing water when application rates do not match infiltration rates or the soil's water-holding capacity.



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