

# Missouri Environment & Garden

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## Strawberry: A Brief History

“Doubtless God could have made a better berry, but doubtless God never did.” Over 400 years later, this quote by 17th century English writer Dr. William Butler still reflects the high esteem most people hold for strawberry. Its fragrant aroma, delightful sweet flavor, and brilliant color make strawberry nearly irresistible. Whether eaten freshly sliced or prepared, the taste of strawberry makes it one of America’s most beloved fruits and May is an ideal month to sample this year’s harvest.

Throughout antiquity, strawberry has seen many different uses other than as a food source. For example, it was used as a symbol for Venus, the Goddess of Love, because of its heart shape and red color. The ancient Romans believed that strawberry had great medicinal value; they used it to alleviate the symptoms of a wide array of maladies ranging from melancholy to kidney stones. Medieval stone masons carved strawberry designs on altars and around the tops of pillars in churches and cathedrals to symbolize perfection and righteousness. In one of its most bizarre uses, Madame Tallien, a prominent figure at the court of the Emperor Napoleon, was famous for bathing in fresh strawberry juice. Reportedly, she used 22 pounds of strawberry fruit per bath.

Botanically, the “fruit” of the strawberry is not a fruit at all. The fleshy, edible part of the plant is the enlarged receptacle of the flower. The visible “seeds” that dot the surface of the strawberry actually are achenes. An achene is a type of dry fruit borne by some plants in nature where the ripened ovary contains but a single seed.

Many people assume the common name “strawberry” stems from the fact the plant is most often mulched with straw during the winter. Although the exact origin of its common name is uncertain, the name strawberry probably is a corruption of “strewn berry”. The latter was an early designation for the plant which made reference to the fact that, as a strawberry plant produced runners and spread,

its berries were strewn about the ground. Other sources suggest its name stems from the fact that English youth picked wild strawberries and sold them impaled on grass straws to the public.



Strawberry is a member of the Rosaceae (Rose) family and goes by the scientific name of *Fragaria x ananassa*. The letter “x” in its name indicates that strawberry is of hybrid origin and, in the case of strawberry, of two different species. The origin of that hybridization is very interesting and involves a Pan American union that occurred in Europe.

There are species of strawberry native to temperature regions all around the world. However, it was the union of two species native to the Americas that gave us our garden strawberry. *Fragaria virginiana* is a species of strawberry native to North America. It is characterized by its highly aromatic berries borne in great abundance but rather

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small in size. History records *Fragaria virginiana* was taken from the New World to France in 1624.

*Fragaria chiloensis* is a wild species of strawberry native to Chili. It bears berries the size of walnuts. It, too, was taken to France but in 1712. Both species were widely grown (presumably side-by-side) in European gardens. Chance seedlings representing crosses between the two species appeared. Some were vigorous, large-fruited and productive. These probably served as the ancestors of our modern garden strawberry, *Fragaria x ananassa*.

It was not until the late 1700's that garden strawberry made its way (back) to the Americas, and by 1825 strawberry production was well-established in the United States. One of the first popular cultivars was 'Hovey' introduced in 1838 by Charles Hovey, a fruit grower, plant breeder and writer from Massachusetts. Since that time, plant breeders made tremendous progress in improving the fruit quality and overall productivity of strawberries.

Modern strawberry cultivars can be classified into one of three different types: June-bearing, everbearing, or day-neutral. June-bearing cultivars respond to the short-days of spring by blooming and setting fruit. They bear their entire crop over a period of from two to three weeks. In contrast, everbearing cultivars produce two crops annually: one in the spring and a second, smaller crop in the fall. Day-neutral cultivars do not respond to the length of day versus length of night. They flower and set fruit whenever the temperature is between 35 and 85 degrees F. Unlike June-bearing types, day-neutral cultivars produce a crop the first year they are planted.

Strawberries are ideal for the home garden in that they do not require much space and (normally) produce good yields. They prefer a full-sun setting in a garden loam amended with organic matter. June bearing types should be spaced between about 18 inches apart in rows 24 inches

wide. Allow about four feet between rows. Planting depth is very critical for success; cover the roots and only half of the crown of the transplant with soil.

For a complete discussion of strawberry culture including recommended cultivars, fertilizing, weed control, and insect and disease management, please refer to MU Extension Publication G6135 (Home Fruit Production: Strawberry Cultivars and Their Culture). The latter can be found at <http://extension.missouri.edu/p/G6135>

### Interesting Strawberry Facts:

- According to the United States Department of Agriculture, the annual per capita consumption of fresh and frozen strawberries is 4.85 pounds.
- Over 53 percent of seven to nine year olds picked strawberries as their favorite fruit.
- Strawberries are low in fat but high in vitamin C, fiber, folic acid and potassium. One cup of strawberries contains only 55 calories.
- Strawberries are grown in every state in the United States and every province of Canada.
- California produces an amazing one billion pounds of strawberries each year. If all the strawberries produced in California in one year were laid berry to berry, they would circle the Earth 15 times.
- According to the Guinness Book of Records, the world's largest strawberry shortcake was 827 square feet in size and weighed 6,000 pounds. It was made in 1999 in Plant City, Florida.

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## Home Lawn Watering Needs

Eighty percent of the water used around a home during the summer is for outside uses. Watering the lawn is the main outside water use. Water conservation is becoming more and more prevalent across the country and local water authorities may cut off water for outside usage. Measures of this kind are necessary and effective means to reduce water consumption and relieve the strain on city water supplies in many locations.

To avoid severe loss of turf and conserve water, homeowners should manage their lawns each year with water conservation in mind.

This guide offers cultural practices that will reduce the need for irrigation while improving the competitiveness and appearance of your lawn.

### Know when to water – look for the signs

Purple-blue wilting leaves, footprints that stay, and folded or rolled leaves are signs that lawns should be thoroughly watered if grasses are to remain green and actively growing. Turfgrass water use rates are high during sunny and windy days with low relative humidity. Evapotranspiration rates for turfgrasses in July and August, for central Missouri, is around 4-inches each month. In situations where lawns are not replenished with this amount of water by irrigation or rainfall, grasses first show symptoms of wilt and later turn completely brown (dormancy).

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## Home Lawn Watering Needs

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When soil lacks moisture, leaves will be folded or rolled lengthwise along the blade, indicating a lack of plant water presenting a bluish-purple color. Another early sign of insufficient water in the plant occurs when footprints or wheel marks remain in the lawn for several hours. Leaves with plenty of water quickly return to their rigid upright position, while leaves lacking water (turgor) will remain trampled for a period of time.

If high temperatures and dry conditions continue without rain or irrigation, the above-ground portion of grasses will turn entirely brown and senesce. Grasses are said to be dormant during this browned-out stage. Since the lower portion (crown) of the plant usually remains alive but not growing, the plant conserves moisture. Thorough watering, by irrigation or rainfall, will bring lawns out of dormancy and new leaf tissue will resume.

Even though grasses are dormant, watering restrictions that result in extended dry periods can cause large ground cracks, severe soil drying, and excessive loss of turf cover even when watering is resumed later in the summer or early fall. Summer dormancy of grasses is a mechanism that helps a lawn to survive, but it does not guarantee that a lawn will fully recover from the browned-out stage.

Dormant lawns should receive at least 1 inch of water every two or three weeks during summer to prevent complete turf loss. Grasses may not show a noticeable greening, but that amount of irrigation should be sufficient to hydrate the lower plant portions and increase the recovery once adequate moisture is available.

Wet wilt is another type of wilt to look for. Wet wilt occurs when the soil is obviously wet, but the root system is not able to keep pace with the water demands from the atmosphere. The curling of leaves from wet wilt looks very similar to wilt caused by lack of soil moisture. Waterlogged lawns that have a shallow root system (from spring rains) are susceptible to wet wilt. Do not add more water when lawns are wilting and soil moisture appears to be adequate; it will only aggravate the problem by starving the root zone of oxygen.

### Select a sprinkler that best fits your needs

Automatic irrigation systems with pop-up sprinklers are often associated with excessive irrigation. This is not necessarily true, since properly designed and operated systems supply water uniformly over an entire area without wasted runoff. Missouri soils generally have low water infiltration rates. Automatic controllers can be set to supply several short cycles so that the total amount of water desired is supplied without runoff.

The most common type of watering occurs with hose-end sprinklers. Some studies have shown that the average homeowner applies 2.5 times the amount of water that is required for turf growth when using hose-end sprinklers.

There are several types of hose-end sprinklers. Select one that best fits your size and shape of lawn and then operate it efficiently. All hose-end sprinklers can be attached to inexpensive timers that can be used to shut off unattended sprinklers and avoid over-irrigation.

### How much water to apply

Once you have decided on the best sprinkler for your size and shape of lawn, you must decide how long to operate a sprinkler in a certain location. This is best achieved by knowing how many inches of water your method of irrigation puts out in a certain amount of time. To do this, place shallow, straight-sided containers (tuna cans work well) or rain gauges in a grid pattern around the sprinkler. Operate the sprinklers (use overlapping patterns where needed) for a given amount of time and measure the amount of water captured. Then use the following example to determine your water application rate in inches per hour. For example, a sprinkler operated for 30 minutes that delivers a quarter-inch of water has a delivery rate of one-half inch per hour.

Alternative methods would be to measure the area that your sprinkler pattern covers and the length of time it takes to fill a one-gallon container directly from the sprinkler. For example, a sprinkler that covers 235 square feet and takes 1 minute and 15 seconds to discharge one gallon of water has a delivery rate of one-third of an inch per hour.

In the above examples, sprinklers should be operated approximately three hours in each location throughout the week to supply one inch of irrigation water per week.

Most soils in Missouri will infiltrate only about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch of water per hour. If your sprinkler system delivers more than that amount, move it to a different location more frequently, after each  $\frac{1}{4}$  to  $\frac{1}{2}$  inch of water has been applied. Repeat the process until the total amount of desired water has been applied.

Rotary sprinklers that are set to deliver a quarter or half sprinkler pattern will discharge four or two times the amount of water on a given area. Operate rotary sprinklers with half patterns for half the amount of time and sprinklers with quarter patterns for one-quarter the amount of time.

The utility water meter connected to your home can also be used to check how effectively water is being applied. It accurately measures water in cubic feet. When no other water is being used in the home, water a known area for a set amount of time and use the following conversion factors to determine your water application rate.

- 624 gallons (83.3 cubic feet) of water are required to apply 1 inch of water on 1,000 square feet of lawn.

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# Home Lawn Watering Needs

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- 7.48 gallons = one cubic foot of water.

Once the decision has been made that a lawn has sufficiently wilted and irrigation is needed, supply enough water to last a week. Depending on the type of sprinkler and soil water infiltration rate, several sprinkler changes may be required over a two- or three-day period to supply the amount of water desired.

If no rainfall occurs, continue to irrigate on a weekly schedule. If rainfall occurs, delay the next irrigation until symptoms of wilt is present. Even though water application is discussed on a weekly basis, it is not crucial that water be applied every seven days. Keep the application schedule flexible and irrigate based on the determination of lawn wilting and soil moisture.

Use Table 1 to determine the amount of irrigation that will be needed for your lawn situation.

Once the decision has been made to irrigate, use the above recommendations to guide irrigation scheduling and how much water to supply. Should puddles or runoff occur before the total amount of water is applied, stop irrigating and resume only after the ground has absorbed the free moisture. Lawn areas that are moist, firm and have no visible water are ready for a repeat irrigation cycle. Areas that are soft and produce squasy footprints when walked on are not ready to receive additional irrigation.

Check a few locations in the yard the day after watering to determine how well your irrigation program is distributing water. With a shovel, cut a slender 2-inch wedge 6 to 8 inches deep. This wedge of soil, roots and turf can be replaced easily without damage to the lawn after inspection.

Estimate the moisture content at different depths in the soil profile by pressing together a golf-ball-sized amount of soil. If drops of water can be squeezed from the soil ball, you may be irrigating too much or too often. Soils that hold together without crumbling and appear moist have been irrigated properly. Soils that appear dry, dusty and do not form a ball when squeezed have not received

enough irrigation or the water is running off the surface of the lawn and not into the root zone.

Adequate soil moisture at 6 to 8 inches deep is sufficient to maintain grasses during the summer. A foot-long slender screwdriver pushed into the ground in several locations can also give a quick assessment of the moisture condition of the soil. The screwdriver will easily penetrate a soil, which has received sufficient water. The screwdriver test can also be used to determine where and when there is a need for irrigation.

### Conserve water with these practices

- The best time to water a lawn is from 6 to 8 a.m. During this time the water pressure is highest, disruption of the water pattern from wind is low, and water lost to the atmosphere by evaporation is negligible. Watering early in the morning also has the advantage of reducing the chance of turfgrass diseases that require extended periods of leaf moisture. Avoid irrigation during mid-day and windy conditions.
- Move sprinklers frequently to avoid puddles and runoff.
- Water only when the plant tells you to. Become familiar with areas of the lawn that wilt first (blue/purple leaves, rolled leaves, foot printing). Water within a day of observing these symptoms.
- Water problem areas by hand to postpone the need for irrigation of the entire lawn. Some areas of a lawn usually wilt before others. These areas, or "hot spots," may be caused by hard soils that take up water slowly, slopes, southern exposures and warmer areas next to driveways and walks. Lawns that have unusual shapes also may require some hand watering to avoid unnecessary watering of paved surfaces, mulched beds and buildings. Soaker hoses that have a narrow pattern and supply water at a slow rate may be useful in these areas.

### Summary

Good lawn care practices save water and harden turfgrasses in preparation for dry periods or local watering restrictions. Taller mowing and fall nitrogen fertilization develop a hardy and efficient root system that reduces the need for supplemental irrigation.

Irrigation schedules should be kept flexible and associated with identification of lawn wilting. Choose a sprinkler that best fits your lawn size and shape. The amount of water a sprinkler applies should be determined to accurately water lawns.

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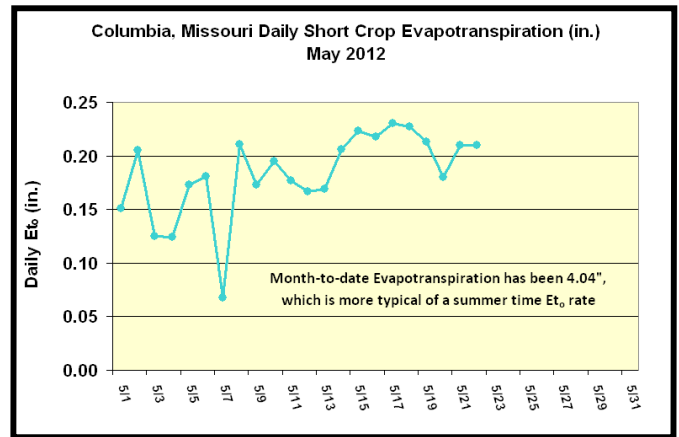
**Table 1. Approximate water requirements for various lawns.**

Lawn type	Green Turf <sup>1</sup> inches of water per week	Dormant Turf <sup>2</sup> inches of water per week
Perennial ryegrass	1.5	1.0
Kentucky bluegrass	1.2	0.7
Tall fescue	0.8	0.5
Zoysia or bermuda	0.5	0.2
Buffalograss	0.3	0.2

<sup>1</sup>Lawn remains green and growing  
<sup>2</sup>Lawn may turn brown, but will not die

# Water those Trees and Shrubs

The past few weeks have been especially stressful for newly planted trees and shrubs. Lack of rainfall in combination with abundant sunshine, wind and low humidity have created unusually high evapotranspiration rates for May. Since air temperatures have not yet been extremely high, most people are not fully aware of the amount of water our landscape plants are losing to the atmosphere. It is important to water regularly during conditions like this, particularly for trees and shrubs planted within the past year. For pointers on approaches to helping our woody landscape friends survive these unseasonable conditions, read the MU guide on irrigating trees and shrubs during summer drought. <http://extension.missouri.edu/p/G6879>



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## Hickory Galls Induced by Phylloxera



Bright red galls, as large as one inch in diameter, are prevalent this season on hickory (*Carya*) trees. An easy way to spot the galls is to find dead terminal branches. At the base of these branches, there will be one or many clustered galls. One of the largest galls is the hickory pouch gall, which is induced by *Phylloxera caryaecaulis*. Galls first appear pale yellowish green and then turn red before opening (in early May this year). At maturity, galls become leathery and black. Not only does *Phylloxera caryaecaulis* affect many native hickory species, but also pecan. This insect produces smooth galls on some hickories, including shagbark (*C. ovata*), shellbark (*C. laciniosa*), pignut (*C. glabra*), bitternut (*C. cordiformis*), and pecan (*C. illinoensis*). However, it has also been reported that *P. caryaecaulis* induces spiny galls on mockernut (*C. tomentosa*) and bitternut (*C. cordiformis*). More recently, at least twenty-nine species of *Phylloxera* have been identified that cause galls on *Carya* species. When infestations of *Phylloxera* are severe for multiple years, the defoliation occurs on affected limbs and entire branches may die.

In early spring, the *Phylloxera* fundatrix (wingless female) emerges from an overwintering egg and feeds

on new leaves and petioles, which induces gall formation. As feeding continues, the gall encloses the fundatrix. Eggs deposited inside the gall



hatch in six days and become the alate (winged) form. Nymphs of the alate form have three instar stages in fifteen days while feeding on the inner gall tissue. The bottom portion of the gall splits open and alates leave the leathery galls and deposit amber-colored eggs on the underside of nearby leaflets adjacent to the veins. Male and female sexuales hatch from these eggs and mate. Each female deposits one overwintering egg in an old gall or in a bark crevice from which a fundatrix develops in the spring and the life cycle continues. Affected wood with new galls can be pruned from the tree for suppression of this insect.

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# June Gardening Calendar

## Ornamentals

- **Week 1:** Deadhead bulbs and spring flowering perennials as blossoms fade.
- **Week 1:** Watch for bagworms feeding on many garden plants, but especially juniper and arborvitae.
- **Week 1:** Thin seedlings to proper spacings before plants crowd each other.
- **Weeks 2-4:** Plant tropical water lilies when water temperatures rise above 70 degrees.
- **Weeks 2-3:** When night temperatures stay above 50 degrees, bring houseplants outdoors for the summer.
- **Weeks 2-3:** Apply a balanced rose fertilizer after the first show of blooms is past.
- **Weeks 2-3:** Rhizomatous begonias are not just for shade. Many varieties, especially those with bronze foliage do well in full sun if given plenty of water and a well-drained site.
- **Weeks 2-3:** Most houseplants brought outside prefer a bright spot shaded from afternoon sun. Check soil moisture daily during hot weather.
- **Weeks 2-3:** Apply organic mulches as the soil warms. These will conserve moisture, discourage weeds, and enrich the soil as they decay.
- **Weeks 2-3:** Apply a second spray for borer control on hardwood trees.
- **Weeks 3-4:** Softwood cuttings can be taken from trees and shrubs as the spring flush of growth is beginning to mature.
- **Weeks 3-4:** Continue spraying roses with a fungicide to prevent black spot disease.
- **Weeks 3-4:** Tired of the same old foundation plantings? Find fresh ideas among the evergreens planted in the Dwarf Conifer collection.
- **Weeks 3-4:** Trees and shrubs may still be fertilized before July 4th.
- **Weeks 3-4:** Pruning of spring flowering trees and shrubs should be completed before the month's end.

## Lawns

- **Weeks 1-4:** Water turf as needed to prevent drought stress.
- **Weeks 1-4:** Mow lawns frequently enough to remove no more than one-third the total height per mowing. There is no need to remove clippings unless excessive.
- **Weeks 1-4:** Gradually increase the mowing height of zoysia lawns throughout the summer. By September, the mowing height should be 2 to 2.5 inches.
- **Weeks 1-4:** Mow bluegrass at 2 to 3.5 inch height. Turfgrasses growing in shaded conditions should be mowed at the higher recommendations.
- **Weeks 1-2:** Zoysia can be fertilized now while actively growing. Do not exceed 2-3 pounds of actual nitrogen fertilizer per 1000 sq. ft. per year.

## Vegetables

- **Weeks 1-2:** Repeat plantings of corn and beans to extend the harvest season.
- **Weeks 1-2:** Plant pumpkins now to have Jack-o-lanterns for Halloween.
- **Weeks 1-2:** As soon as cucumber and squash vines start to 'run,' begin spray treatments to control cucumber beetles and squash vine borers.
- **Weeks 2-4:** Set out transplants of Brussels sprouts started last month. These will mature for a fall harvest.
- **Weeks 2-4:** Soaker hoses and drip irrigation systems make the most efficient use of water during dry times.
- **Weeks 2-4:** To minimize diseases, water with overhead irrigation early enough in the day to allow the foliage to dry before nightfall.
- **Weeks 2-3:** Start seedlings of broccoli, cabbage and cauliflower. These will provide transplants for the fall garden.
- **Week 2:** Stop harvesting asparagus when the spears become thin.
- **Weeks 3-4:** Control corn earworms. Apply several drops of mineral oil every 3 to 7 days once silks appear. Sprays of B.T. are also effective.
- **Week 3:** To maximize top growth on asparagus, apply 2 pounds of 12-12-12 fertilizer per 100 sq. ft., water well and renew mulches to conserve moisture.

## Fruits

- **Week 1:** Oriental fruit moths emerge. Most serious on peaches where first generation attacks growing tips. Shoots will wilt. These should be pruned out.
- **Week 1:** Thinning overloaded fruit trees will result in larger and healthier fruits at harvest time. Thinned fruits should be a hands-width apart.
- **Week 1:** Enjoy the strawberry harvest
- **Week 2-3:** Renovate strawberries after harvest. Mow the rows; thin out excess plants; remove weeds; fertilize and apply a mulch for weed control.
- **Week 2-3:** Summer fruiting raspberries are ripening now.
- **Week 2-3:** Begin control for apple maggot flies. Red painted balls that have been coated with tanglefoot may be hung in apple trees to trap egg-laying females.
- **Week 2-3:** Spray trunks of peach trees and other stone fruits for peach tree borers.
- **Week 3-4:** Prune and train young fruit trees to eliminate poorly positioned branches and to establish proper crotch angles.

## Miscellaneous

- **Weeks 3-4:** When using any gas powered equipment, be sure to allow the engine a few minutes to cool before refilling empty fuel tanks.
- **Weeks 3-4:** A mailbox mounted on a nearby post makes a handy place to store and keep dry any small tools, seeds, labels, etc. frequently used in the garden.

*Gardening Calendar supplied by the staff of the William T. Kemper Center for Home Gardening located at the Missouri Botanical Garden in St. Louis, Missouri. ([www.GardeningHelp.org](http://www.GardeningHelp.org))*