Missouri Environment & Garden

July 2012 Volume 18, Number 7

Rescue Irrigation for Trees

With nearly unprecedented drought conditions for May and June over most of Missouri, even well established trees and shrubs are in danger of permanent damage. Many trees are still recovering from similar conditions in July and August of 2011. In Columbia, I am beginning to see 20-year-old redbud trees browning in their tops. Given that trees are valuable assets to a landscape, doubling one's water bill to keep them alive is a good investment.

An established tree may have a root system that occupies thousands of square feet to a depth of 18 inches. When the soil in that volume nears permanent wilting point, the tree may exhibit drought survival strategies like leaf scorch, leaf drop or dieback. If drought persists, extreme dieback or death may ensue. Fortunately, wetting the soil in a tiny fraction of the total root volume of a tree can greatly reduce drought stress. The challenge is to apply enough water to do some good in a soil volume where tree roots can access it.

One approach to tree rescue irrigation is to lay "leaky hose" type soaker hoses within the drip line. Soaker hoses are notoriously uneven in their distribution. To improve uniformity, make a "gender bender" (figure 1), consisting of an 8" piece of hose with two female ends. This allows both ends of the soaker hose to be attached to a garden hose using a Y-adaptor. Lay the loop within the dripline of the tree to be rescued and irrigate long enough to apply at least 100 gallons of water. Although the wetting pattern varies greatly with soil type, two inches of irrigation will generally wet the soil to a depth of about one foot. This is generally deep enough to access many tree roots. Assuming that a 50'foot soaker hose will wet a band of soil about 18" wide, it will cover an area of about 75 square feet. Since it takes 0.62 gallons of water per square foot of surface, it would take about 50 gallons of water to apply one inch. Most domestic water supplies deliver about 5 gallons per minute from the hose bib, so it would take about 20 minutes to apply 2 inches. Check regularly for runoff. Under "normal" conditions, a typical landscape soil may only be able to absorb ¼ inch per hour. However, under present conditions, irrigation water will flow freely into cracks in the soil. Keep the hose running during the day, moving it around to the trees showing the most severe drought stress symptoms. Consider using a timer so you will not forget to turn the water off when you are not tending the hose.

Fig 1. Gender Bender and Y adaptor to improve uniformity of delivery of a soaker hose.

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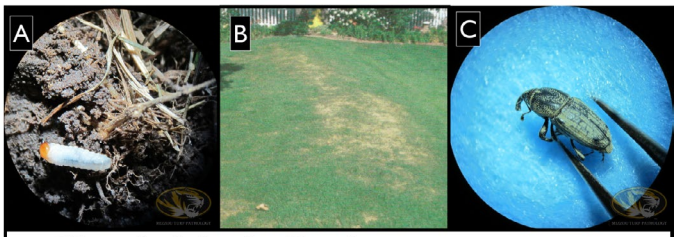
In This Issue

Missouri Environment & Garden newsletter is published by the MU IPM Program of the Division of Plant Sciences Extension. Current and back issues are available on the Web at **http://ppp.missouri.edu/newsletters/megindex.htm**. Mention of any trademark, proprietary product or vendor is not intended as an endorsement by University of Missouri Extension; other products or vendors may also be suitable. Editor: Kate Riley (rileyka@missouri.edu)

Hunting Billbugs – Emerging Problem for Zoysiagrass in Missouri



Billbug outbreaks throughout Missouri
A. Billbug larvae are small, with last instars only measuring 1/4 - 3/8" long.
B. Stand symptoms, like this affected zoysia lawn, appear as drought or disease symptoms and normally occur in areas with full sun.
C. Hunting billbugs have a pronounced curved proboscis (the "bill") and are ~ 1/2" long. They are reclusive, hide in the thatch layer, and are only active at night.

In the past, zoysiagrass was deemed a "no to low-maintenance" turf for lawn use, but an emerging insect pest may be changing that notion. Over the last two weeks, billbug grubs have been observed in declining zoysiagrass and bermudagrass samples of lawns and athletic fields. Infested areas are patchy and appear to be impacted by our current drought situation, yet supplemental irrigation is not keeping these areas healthy. Numerous small billbug grubs were observed throughout the thatch and soil profile of these samples, and the feeding of the grubs and adults is the true cause of turf decline. Sample locations include St. Louis, Rolla, and Columbia, so the problem appears to be widespread throughout the eastern and middle part of the state.

There are four billbug species that affect turfgrasses: bluegrass, Denver, Phoenician, and hunting. The bluegrass billbug is well established in the Midwest and northern states, and is one of the top three pests of Kentucky bluegrass. Denver and the Phoenician billbug, as the names imply, are not located in this region and are limited to western states. This leaves the hunting billbug, a species thought to reside primarily in the Southeast. Because most of these finds have been in warm season turf species, I suspect most, if not all, of these recent samples have been larvae of hunting billbugs… and this is not great news. Additionally, we have had captures of hunting billbug adults from zoysia plots at the University of Missouri Research Farm, confirming the insect species. Evidently, we really are officially part of the SEC!

The hunting billbug (*Sphenophorus venatus vestitus*) is primarily a pest of zoysiagrass and bermudagrass, but may also feed on Kentucky bluegrass and field crops such as corn and wheat. Adults are ~ ½" long, black to dark reddish brown, have a pronounced curved snout (the bill), and reside in the thatch layer. Larvae (grubs) are very small, 1/8 –3/8" long, and unlike annual white grubs have no legs.

Research is still ongoing to determine the complete life cycle, but it's thought the hunting billbug survives as a dormant adult during the winter and emerges in early spring. It begins to feed and lay eggs in mid-late spring in the leaf sheath. Eggs hatch in 3-10 days and the small larvae start to feed inside the leaf stem and migrate down into stolons. The larvae soon outgrow the stems and fall out into the thatch layer where they continue to eat stolons and roots. After several weeks of feeding, the larvae dig 2-4" into the soil and pupate into new billbug adults. In our region, we can expect two generations of the hunting billbug, and judging from the size of recent finds the larvae are diving down in the soil to pupate. Since another generation is coming, control of active infestations now is crucial to limiting further damage later this summer and fall.

Hunting Billbug Damage @ Mizzou Turf Farm
A) Over the past week, hunting billbug damage has been observed at the Mizzou Turf Research Farm.
B) Nearly full size, but still really small, billbug larvae.
C) Plastic cup pitfall trap to attempt adult capture.

Hunting billbug damage may be the most often misdiagnosed problem in warm- season turfgrass, appearing similar to damage from diseases, drought, chinch bugs or delayed spring greening. The adults are reclusive, only come out at night, and are well camouflaged. Also, for a good portion of their larval stage, the billbug grub is inside the plant, making detection difficult. Oftentimes, the only diagnostic symptom of billbug damage is the hollowed out stolons and leaf stems apparent after the larvae emerge from their turfgrass hatchery and feeding chamber. Many declining zoysia lawns were reported in eastern MO this past spring, and residual or early spring hunting billbug activity may have been a factor in these cases. Current low soil moisture levels are making billbug damage more apparent than in previous seasons.

Now is the time for hunting billbug scouting as all life stages may be active, and larger grubs are emerging from the plant. In zoysia and bermudagrass turf areas that are not responding to irrigation, break out the shovel. Dig out a 3-4 inch square of turf and break it apart, sifting through the top 1-2 inches of soil and thatch. The small white grubs should be apparent in the next week or two,

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Hunting Billbugs – Emerging Problem for Zoysiagrass in Missouri

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but their time is fleeting. Another way of monitoring is to target the adults with pitfall traps. Using a small plastic cup or similar, dig out a few areas in the area and place the cup inside with the lip just even with the soil surface. As the adult billbugs crawl around at night, they will fall into the cup and can be observed. Another good use of the "red solo cup".

The species and cultivar of zoysia most often grown in Missouri (*Zoysia japonica* cv. 'Meyer') also happens to be the most susceptible to hunting billbug damage. Other cultivars of *Zoysia japonica* are also susceptible, so renovating to another cultivar within this species may not reduce damage. *Zoysia matrella* is a more resistant zoysia species to hunting billbug, but is not as cold tolerant as *Z. japonica* and not widely available in this region.

Biocontrol products containing the entomopathogenic nematodes *Steinernema* and *Heterorhabiditis* have been found effective in controlling larvae and adults. Spraying 1 billion infective juveniles/acre is necessary for control and should be applied at the first sign of billbug presence or damage. If these biocontrols are attempted, it is crucial to pay attention to the expiration date, application, and storage instructions to maintain viability of the living organisms within the jug and spray tank.

If hunting billbug larvae or adults are found and associated with declining turf, an insecticide treatment is often necessary. For adult control in early spring, bifenthrin (Talstar), deltamethrin (Deltagard), imidacloprid (Merit), or lambda-cyhalothrin (Scimitar or Battle) are recommended. Adult control is often a preventive measure in areas that have a perennial hunting billbug problem. For larvae control, clothianidin (Arena) or thiamethoxam (Meridian) is suggested. If both larvae and adult control are necessary however, (like NOW) applications of chlorantraniliprole (Acelepryn), or the combination products clothianidin + bifenthrin (Aloft), or imidacloprid + bifenthrin (Allectus) are needed. To target hunting billbug larvae, it is crucial to water in the insecticide with ⅛ - ¼ inch of irrigation.

The Entomology team at North Carolina State University led by Dr. Rick Brandenburg is currently conducting research on hunting billbug biology and control. Other online resources for hunting billbug biology and control information are listed below:

http://www.turffiles.ncsu.edu/insects/Hunting_Billbug.aspx
http://entnemdept.ufl.edu/creatures/orn/turf/hunting_billbug.htm
http://ohioline.osu.edu/hyg-fact/2000/pdf/2502.pdf

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Water Management in the Garden

For the past several summers, an article detailing the need to conserve water when gardening might have been considered unwarranted because of the abundance of rainfall we received. The hot, dry weather this summer is a vivid reminder of the importance of water to the livelihood of plants. Additionally, its shortage reminds us that water is our most precious natural resource and should be conserved.

It has been estimated many gardeners use about twice the amount of water in their landscapes than is necessary. Gardening using techniques that carefully manage water input often is referred to as "water-wise" gardening. The latter not only conserves the supply of this valuable natural resource, it also reduces the amount of money gardeners spend on water.

Water-wise gardening is a step-wise process, the first of which is proper planning. The latter includes the establishment landscape areas or zones according to the amount of supplemental water garden plants need. For example, the "high-use" zone is occupied by plants that are supplied with water whenever they need it. Annual

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beds and borders as well as patio plantings fit into this zone. Plants selected for is zone are for other virtues they possess and not for drought tolerance. Therefore, plants in this zone might suffer under even slight drought stress.

The "medium-use" zone contains plants that receive water during their establishment and at times of water stress such as during dry periods. Plants used in this zone should have good drought tolerance. Many perennial borders as well as woody ornamentals plantings around the home are typical of this zone.

Plants in the "low-use" zone do not receive additional water except during the period of their establishment. Once these plants are well-rooted, natural rainfall is their only water source, even during periods of drought. As a result, plants selected for this zone must be very drought tolerant. Areas in the landscape distant from the home often fit into this zone.

Shade is important when planning a water-wise garden in that it reduces water consumption by keeping surfaces cooler, thus reducing transpiration and evaporation. Shade especially is useful in places where it keeps surfaces of buildings, etc. from heating which, in turn, keeps plants near them cooler. Shade combined with proper use of mulch is a very effective way to conserve water in the garden.

The second step in water-wise gardening involves plant selection. Selecting plants for the high and medium water use areas is relatively easy. Practically anything that will survive the temperatures typical of a Missouri summer can be used in the high-use zone. Selecting species known for their ability to withstand water stress (e.g. marigold and zinnia) will help to conserve water even in the "consumptive" zone.

Most plants that can adapt to Missouri's temperatures while forming deep root systems are suitable for planting the medium-use zone. Many perennial plants along with a select few annuals are good candidates for this zone. Additionally, the majority of ornamental woody plants fall into this category.

The selection of plants used in the low-use zone presents quite a challenge in that drought tolerance is of utmost importance. Native species of plants, or imported species of plants native to hot, dry areas, are good candidates for the low-use zone. Please refer to MU Guides G6629, Flowering Annuals: Characteristics and Culture; G6650, Flowering Perennials: Characteristics and Culture; and G6660, Wildflowers in the Home Landscape for additional information that will make plant selection easier.

The third step in water-wise gardening involves soil improvement. Since many landscapes in Missouri have poor, shallow soils, the additional of organic matter is very important to water-wise gardening. Amending soil with organic matter helps to increase its water-holding capacity and the likelihood that plants will survive during droughts. The thorough incorporation of about four inches of well-decomposed organic matter on an annual basis is considered to be a "best management practice" for all types of gardening and in all of the afore-mentioned gardening zones.

Proper plant establishment is necessary if plants are to survive in the medium and low-use garden zones and is the fourth step in water-wise gardening. Even though the goal for these two zones is to encourage plants to be able to survive with little or no additional water, newly planted plants with limited root systems need water to become established. In the case of perennials, adequate water is most important the first year after planting, but may be important during the several years, depending upon species. During hot, dry weather, about one to two inches of water per week should be supplied if not received as rainfall. Slow, thorough soaking of the soil will make optimum use of water resources during the period of plant establishment.

Mulching is the fifth step in water-wise gardening because it helps to conservative water while at the same time acting as a deterrent to "water robbing" weeds. Mulches serve to block evaporation from the soil as well as to reduce soil temperature. While many materials are available for use as mulches, organic mulches usually are preferred. They should be fairly fine in texture and non-matting. Shredded bark, pine needles, sawdust, (dried) grass clippings and straw are examples of organic mulches. Landscape fabric or black plastic can be used below organic mulches to improve weed retardation and aid in evaporation control.

It is well documented that healthy plants are more drought-tolerant than are weak (or damaged plants) plants. Therefore proper plant maintenance is the sixth step in water-wise gardening. Well-fertilized plants will have healthier, deeper root systems capable of absorbing more water. Keep in mind, however, fertilization is not important during periods of drought when plants are not actively growing. Instead, delay fertilizer application until fall or spring when weather conditions are more ideal for plant growth. Pruning excess foliage can help reduce water usage by reducing the surface area carrying on transpiration. However, avoid severe pruning which tends to open the plant to more sunlight and water loss.

The final step in water-wise gardening is to practice proper irrigation techniques. When irrigation is necessary,

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Water Management in the Garden

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efficient water use is very important. Irrigation systems that optimize water usage such as drip systems or soaker hoses are (relatively) inexpensive and readily available. They apply water only in the immediate vicinity of their placement (usually close to the root system of a plant) and do not expose water to the air, which tends to promote evaporative loss. In contrast, overhead sprinkling is less efficient both from the standpoint of water placement and evaporative loss. If an overhead system is the only means of irrigation available, then watering early in the morning will help to conserve water.

The amount of water that should be applied when irrigation is necessary is an important consideration in water-wise gardening. The old adage "to water thoroughly but infrequently" applies well to water-wise gardening. When irrigating, sufficient water should be applied to have the top six inches of soil moist (but not soggy) for a few hours after the irrigation system has been shut off. Soil type along with delivery rate will dictate the amount of time an irrigation system must be operated to accomplish this goal. With all irrigation systems, runoff reduces water-use efficiency. Since water runoff is greatly influenced by the physical property of the soil, the need for proper soil improvement before planting becomes of even greater importance.

In conclusion, water is the natural resource that ultimately will dictate Earth's population. The summer of 2012 appears destined to be one of the driest in recent memory and is a good object lesson that water-wise gardening should be a way-of-life for all gardeners. By following the practices outlined above, gardeners can produce attractive, colorful landscapes while at the same time conserving our most valuable natural resource.

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Don't Give Up on the Trees

As the drought of 2012 drags on, with no end in sight, it may be tempting to resign oneself to the idea that landscape plants are doomed. Certainly, it has been challenging to devise irrigation strategies that provide enough soil moisture to keep ornamentals alive, let alone attractive- looking. Although it seems likely that there will be considerable mortality of trees and shrubs before the current drought ends, it is still worth the effort to attempt to keep the most valuable specimens alive. As terrible as trees and shrubs may look, many people will be surprised at the recovery that woody plants will make if kept alive until the drought finally breaks.

Drought causes many different symptoms on plants. As soil moisture is depleted the first response may be wilting of leaves, indicating that there is insufficient moisture to supply the transpirational needs of the foliage. Leaves need a constant supply of water to remain turgid and to cool their surfaces through evaporation. Wilted leaves close their stomata (leaf pores) to conserve water and, therefore, can no longer cool themselves. As the leaf temperature rises, the tips and edges often turn brown (scorch) and dry up. If the drought continues, many plants drop some of their leaves to further conserve water. All of these changes are drought survival mechanisms which help plants conserve whatever water they may retain in their leaves, stems and roots.

Although a drought stressed plant may look terrible, it may be far from dead and will usually benefit greatly from irrigation. If left un-irrigated during hot, dry conditions, the soil in the root zone may become so dry that it actually pulls water from root tissue, which may cause mortality. Even wetting the soil in a small percentage of the root zone of a tree or shrub can lead to remarkable recovery. It is quite common to see trees completely defoliated by drought producing new shoots within days after irrigation (figure 2). Although the prognosis is somewhat murky this year because the drought began so early in the season, I am optimistic that most trees can be saved if irrigated before it is too late. Check the branches to see if they are still pliable before giving up. Even trees showing branch dieback may recover fully if kept alive. Nick the bark farther back on the branch so see if it is still moist and green underneath.

In general, evergreen trees and shrubs are fairly drought tolerant. However, once they begin to show severe drought symptoms, such as needle browning, it is sometimes too late to rescue them by irrigation. There was considerable mortality of arborvitaes last summer, during

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the flash drought and many arborvitaes, pines and spruces appear to have passed the critical point in Columbia within the past week of triple digit temperatures.

Given the extreme climatic conditions that we are experiencing, it is important to wet the soil to a depth of 8-12 inches in an area covering at least 20% of the area within the drip line (the shadow with sun directly overhead) about once per week. For a tree with a 20 foot diameter drip line, this will usually require about 75 gallons of water applied over a 60 square foot area (2x30 feet). Plants can redistribute water once it is taken up. Any method that gets this amount of water into the soil without runoff on a weekly basis will greatly increase the chances that a tree will survive the current drought and live to recover when conditions improve.

One approach to tree rescue irrigation is to lay "leaky hose" type soaker hoses within the drip line. Soaker hoses are notoriously uneven in their distribution. To improve uniformity, make a "gender bender" (figure 1), consisting of an 8" piece of hose with two female ends. This allows both ends of the soaker hose to be attached to a garden hose using a Y-adaptor. Lay the loop within the dripline of the tree to be rescued and irrigate long enough to apply at least 100 gallons of water. Although the wetting pattern varies greatly with soil type, two inches of irrigation will generally wet the soil to a depth of about one foot. This is generally deep enough to access many tree roots. Assuming that a 50'foot soaker hose will wet a band of soil about 18" wide, it will cover an area of about 75 square feet. Since it takes 0.62 gallons of water per square foot of surface, it would take about 50 gallons of water to apply one inch. Most domestic water supplies deliver about 5 gallons per minute from the hose bib, so it would take about 20 minutes to apply 2 inches. Inserting a 25 psi pressure regulator (available from garden stores) upstream from the Y-adaptor will make the hose more efficient (fewer geysers), but will lengthen the time required to thoroughly wet the soil. Check regularly for runoff. Under "normal" conditions, a typical landscape soil may only be able to absorb ¼ inch per hour. However, under present conditions, irrigation water will flow freely into cracks in the soil. Keep the hose running during the day, moving it around to the trees showing the most severe drought stress symptoms. Consider using a timer so you will not forget to turn the water off when you are not tending the hose. A simple way to tell if you have put enough water into the ground is the "screwdriver test". If you stick an 8" screwdriver in the ground and it hits hard soil at 2 inches, keep watering.

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July-August is the Best Time for Evaluating the Nutritional Status of Grapes, Apples, Peaches & Nectarines

Plant analysis has proved to be a very effective means of predicting fertilizer needs for perennial fruit crops. It has been used as a diagnostic tool for many years. To determine nutrient deficiencies, most growers rely primarily on visual symptoms, plant tissue analysis and soil analysis. Plant analysis and soil testing go hand in hand. A soil test provides an index of the nutrient that is potentially available for the crop. Plant analysis tells how much of that potentially available nutrient is actually taken up by the plant.

For perennial fruit crops (blueberries, strawberries, apples, grapes, peach, nectarine, etc.), plant analysis is the best way by which to monitor the plant's nutrient needs. Fertilization practices can be monitored by sampling leaves (apples, peaches and nectarines) or petioles (grapes and blueberries) during mid season and making adjustments for the following year.

Foliar samples for perennial fruit crops are typically taken once the plants start bearing regular crops. Plant tissue sample is taken from plants when the nutrient levels in the leaves are relatively stable. The analysis and interpretations are of little value without the use of standard and consistent sampling procedures. In general, plant

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July-August is the Best Time for Evaluating the Nutritional Status of Grapes, Apples, Peaches and Nectarines

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Table 1: How and When to Sample Perennial Fruit Crops?

Crop	Stage of Growth	Plant Part/Location on Plant	Number of samples
Apples	July 15 – Aug. 20	Fully-expanded leaf from middle of current terminal shoot	30 leaves and petioles
Blueberries	First week of harvest	Young mature leaf from current season's growth	30 leaves detach petioles
Brambles	Aug 1 –Aug 21	Select the most recent fully expanded leaf blade of each primocane	30 leaves detach petioles
Fruit Trees (Peach, nectarine, plums, etc.)	July 15- Sept 1	Select shots at eye level from around the outside of the tree. Select shoots that make a vertical angle of 45-60 degrees to the ground. Remove 1 or 2 leaves from the mid portion of current season's growth.	30 leaves and petioles
Grapes	Veraison*	Petiole from most recently matured leaf on shoot (1 petiole per shoot). * Veraison stage refers is the time when grape berries begin to soften and change color from green to red, blue, or yellow.	30 petioles
Raspberries	First week in Aug.	Leaf 18 inches from tip	30 leaves
Strawberries	Mid Aug.	Mature leaves from new growth at flowering	20 leaves

samples for perennial fruit crops are taken at midseason. Usually the leaf plus petioles or just the petiole alone is sampled for plant nutrient analysis. If the level of the nutrients falls outside the optimum range, the corrective measures should be taken. Optimum nutrient ranges are based on samples collected at a particular growth stage. Since the results of the plant analysis will be compared to known standards, it is important that parts of plants are sampled at a certain stage of development.

The leaf nutrient concentrations vary throughout the growing season. The general nutrient status of grape vines and orchards should be evaluated annually. This will help in evaluating the response for applied fertilizer. July to August is the best time to monitor the nutritional status of grapes, apples, pears and nectarines to make adjustments in the fertilizer program to avoid nutrient deficiency and to improving the fruit quality and yield for the following season. For plant nutrient analysis for orchards, the leaf sample should be collected preferably between July 15th and August 15th. Table 1 lists the proper time and plant parts to sample for perennial fruit crops.

Submitting Plant Samples for Analysis

Do not include plants affected by insects, disease or pesticide damage. Where a deficiency is suspected, take samples from normal plants in an adjacent area as well as from the affected area. It is important to take a soil sample from each area. Comparing soil and plant analysis results can greatly assist in the interpretations. Collected plant tissue is very perishable and requires special handling to avoid decomposition. Therefore, fresh plant tissue should be placed in clean paper bags left open; partially air dried if possible or kept in a cool environment during shipment to the laboratory. Wash dusty plants before air-drying. Fresh plant samples should not be placed in closed plastic bags unless the tissue is either air-dried or bag and contents are kept cool. Air-drying of fresh plant tissue can be done by placing the plant tissue in an open, dry environment for 12 to 24 hours. Air dried samples can be placed in a clean brown bag or envelope and mailed to the lab. Request a complete analysis of each plant sample including nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo), sulfur (S), zinc (Zn), and boron. The University of Missouri soil and plant testing lab offers this service for $30 per sample. You can also request for regular analysis (N, P, K, Ca, mg for $17 per sample) or regular plus micro nutrients analysis (N, P, K, Ca, Mg, Cu, Fe, Mn and Zn for $23 per sample). Information on submitting samples to the lab and sample information forms can be obtained from the lab's website at: http://soilplantlab.missouri.edu/soil/

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August Gardening Calendar

Ornamentals

- **Weeks 1-4:** Continue spraying roses that are susceptible to black spot and other fungus diseases.
- **Weeks 1-4:** Annuals may appear leggy and worn now. These can be cut back hard and fertilized to produce a new flush of bloom.
- **Weeks 1-4:** Deadhead annuals and perennials as needed.
- **Weeks 1-2:** Divide oriental poppies now.
- **Weeks 1-2:** Feed mums, asters and other fall-blooming perennials for the last time.
- **Weeks 1-2:** Roses should receive no further nitrogen fertilizer after August 15th.
- **Weeks 1-2:** Powdery mildew on lilacs is unsightly, but causes no harm and rarely warrants control, though common rose fungicides will prove effective.
- **Weeks 1-2:** Madonna lilies, bleeding heart (Dicentra) and bloodroot (Sanguinaria) can be divided and replanted.
- **Weeks 1-2:** Divide bearded iris now. Discard old center sections and borer damaged parts. Replant so tops of rhizomes are just above ground level.
- **Weeks 1-2:** Prune to shape hedges for the last time this season.
- **Weeks 2-4:** Order bulbs now for fall planting.
- **Weeks 2-4:** Evergreens can be planted or transplanted now to ensure good rooting before winter arrives. Water both the plant and the planting site several days before moving.
- **Weeks 2-4:** If you want to grow big dahlia flowers, keep side shoots pinched off and plants watered and fertilized regularly.

Lawns

- **Weeks 1-2:** Zoysia lawns can receive their final fertilizer application now.
- **Weeks 1-2:** Apply insecticides now for grub control on lawns being damaged by their activity.
- **Weeks 3-4:** Lawns scheduled for renovation this fall should be killed with Roundup now. Have soil tested to determine fertility needs.
- **Week 4:** Dormant lawns should be soaked now to encourage strong fall growth.
- **Week 4:** Verify control of lawn white grubs from earlier insecticide applications.
- **Weeks 1-4:** Compost or till under residues from harvested crops.
- **Weeks 1-3:** Sow seeds of beans, beets, spinach and turnips now for the fall garden. Spinach may germinate better if seeds are refrigerated for one week before planting.
- **Weeks 1-3:** Cure onions in a warm, dry place for 2 weeks before storing.
- **Week 1:** Broccoli, cabbage and cauliflower transplants should be set out now for the fall garden.
- **Weeks 2-4:** Begin planting lettuce and radishes for fall now.
- **Weeks 3-4:** Pinch the growing tips of gourds once adequate fruit set is achieved. This directs energy into ripening fruits, rather than vine production.

Fruits

- **Weeks 1-4:** Prop up branches of fruit trees that are threatening to break under the weight of a heavy crop.
- **Weeks 1-3:** Protect ripening fruits from birds by covering plants with a netting.
- **Weeks 1-3:** Continue to spray ripening fruits to prevent brown rot fungus.
- **Week 1:** Thornless blackberries are ripening now.
- **Weeks 2-4:** Watch for fall webworm activity now.
- **Weeks 2-4:** Cultivate strawberries. Weed preventers can be applied immediately after fertilizing.
- **Weeks 2-3:** Spray peach and other stone fruits now to protect against peach tree borers.
- **Weeks 2-3:** Fall-bearing red raspberries are ripening now.
- **Weeks 2-3:** Sprays will be necessary to protect late peaches from oriental fruit moth damage.

Miscellaneous

- **Weeks 1-4:** Soak shrubs periodically during dry spells with enough water to moisten the soil to a depth of 8-10 inches.
- **Weeks 1-4:** Once bagworms reach full size, insecticides are ineffective. Pruning off and burning large bags provides better control.
- **Weeks 1-2:** Spray black locust trees now to protect against damage by the locust borer.
- **Weeks 2-4:** Hummingbirds are migrating through gardens now.
- **Weeks 2-3:** Watch Scotch and Austrian pines now for Zimmerman pine moth damage. Yellowing or browning of branch tips and presence of pitch tubes near leaf whorls are indicative. Prune and destroy infected parts.
- **Weeks 3-4:** Clean out cold frames to prepare for fall use.
- **Weeks 3-4:** Monitor plants for spider mite activity. Hose these pests off with a forceful spray of water.
- **Weeks 3-4:** 2nd generation pine needle scale crawlers may be present on mugo pine now.

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)