UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION

Efficient Water Use in Landscapes & Nurseries

Water is an essential resource for the production, establishment and maintenance of landscape plants. Managing the resource wisely both conserves water and enhances plant health and survival. During times of drought, local water restrictions may be imposed which limit commercial and residential water use for irrigation. Plants that have been properly selected, installed and maintained prior to the drought will stand the greatest chance of survival during tough times.

I. In the Landscape

New plantings

Water is the key to plant survival. Do not plant during a drought period unless you have the capacity to water regularly for the rest of the growing season. Water thoroughly after planting, then water once or twice a week, applying enough water to wet the soil to a depth of 8-12 inches for trees and shrubs or six inches for annuals. The amount and frequency depends on soil characteristics and, of course, the weather. An inch of water is all a sandy soil can hold in a foot of soil, but it takes three inches of water to bring a foot of silt textured soil to field capacity. The sandy soil stores less water and therefore needs to be watered more frequently.

A rule of thumb sometimes used for newly-planted trees is to apply one gallon of water per day per inch of trunk diameter. It is probably easier for most people to water twice a week rather than daily. Applying ten gallons of water each time should be sufficient for a 20"-24" root ball. As the root system establishes, reduce the irrigation frequency and enlarge the area being watered. One gallon of water per square foot of soil surface area in the root zone is a general guide to provide sufficient water once roots have grown out of the original root ball.

Plants grown by nurseries in lightweight container mixes will dry out more quickly after transplanting than the surrounding soil. Therefore container-grown plants may require more frequent irrigation than balled and burlapped material.

Group plants together according to water needs. Those plants with the highest water needs are best situated near the house and water source. Perhaps an irrigation system can be installed to cover the “high water” area, while other areas of the landscape can rely on natural rainfall during most years. Drought-tolerant plants can be selected for landscaping these areas, but keep in mind that some drought-tolerant plants may not be suitable for areas which have alternating wet/dry periods.

Use smaller plants. Bigger is not always better. The water requirements for smaller plants are naturally less than for larger ones, so chances of survival during drought are greater. Smaller plants cared for properly will establish roots and recover from transplanting faster than larger plants. An established plant has adequate roots to support normal twig-growth rate for the species, and can generally go for 2-3 weeks without rain during the summer. For trees, the establishment period is one year per caliper inch. So while a two-inch caliper tree will be established and able to function after two years, a four inch caliper tree will continue to need supplemental irrigation for another two years. Meanwhile, it's very likely that the smaller tree will actually overtake the larger one in size.

Use soil amendments properly. If amending the soil, add large quantities (2" - 4") of organic matter such as compost to the entire planting area and till it into the top 6" - 8" of soil. This will increase the water holding capacity of sandy soils, and improve drainage and aeration in heavier soils. Amending individual planting holes is not as beneficial as amending the entire bed and may actually impede lateral water movement between the root ball and surrounding soil. Check the pH and soluble salts of compost before use, and check the soil in the bed after incorporating the amendments.

Use proper planting techniques. Remove all containers, even fiber pots. If roots are matted or circling the container, make three or four vertical slices an inch deep on the outside edges of the rootball. This will encourage the roots to grow out into the surrounding soil. If using balled and burlapped material, remove the top half of the wire basket, as much burlap as possible, and all of the twine or strapping material. Burlap left on the surface can wick water from the soil, and/or repel water applied from above.

Mulch liberally. Mulch can reduce evaporation from the soil surface by 70 % compared to bare soil. Mulch the root zone of trees and shrubs with 2"-4" of organic mulch such as shredded bark. Extend the mulch ring at least to the drip line on individual trees/shrubs. Annuals can be mulched with finer textured mulch to a depth of 1"-2". Always keep mulch a few inches away from trunks and stems.

Create water basins around plants by raising a ring of soil at the outer edge of the rootball. This will help contain hose-end irrigation or rainfall in the area where fine feeder roots are developing. Filling the basin with a hose allows the water to infiltrate the soil slowly and evenly. Break the dams in the fall to prevent saturated conditions and/or ice buildup around the plant.

Use micro irrigation. Installing drip lines or soaker hoses under the mulch of planting beds is well worth the cost and effort. All the water applied goes into the root zone, with no loss to evaporation or wind drift, so it is very efficient, as well as easy to operate. In sandy soils, make sure there is an emitter adjacent to each plant because lateral water movement is limited in these soils. Drip emitters operate at low pressure (6-30 psi) and have application rates ranging from .5 - 2.0 gallons per hour. Run the system only for the amount of time needed to wet the root zone. The most common problem with drip systems is clogging, so filtration is recommended.

Micro sprinklers or micro sprayers are low-volume irrigation emitters either installed in line or connected via spaghetti tubing to a pipe, typically a ½" - ¾"- diameter flexible black poly pipe. Several laterals may feed into one main distribution pipe. The pipes can be buried, covered with mulch, or left exposed. Each sprayer can be individually placed as needed to cover 50% -75 % of the root zone of a tree or shrub, or one sprayer may cover several annuals or perennials. Large trees may require more than one emitter. Application rates range from 5-35 gallons per hour. When it doesn't rain, operate micro irrigation systems every 2-3 days.

Use other irrigation aids. If you are not able to use drip irrigation or micro sprayers, consider using one of the new tree rings or tree bags on newly planted trees. These devices are placed over the root ball and filled with water once a week or as needed. The perforated ring or bag then allows the water to drip slowly over an extended period of time, keeping the root zone moist. They can be easily moved, removed and/or reused.

Antitranspirants have limited use. The most common type of antitranspirants are films which coat the leaf blocking the stomata and therefore reducing transpiration. They may be helpful in transplanting plants in full leaf, but will only provide protection for a few days to two weeks.

Water-holding gels may not help. Hydrophilic gels or copolymers are most useful when incorporated into container media, where some studies have shown them to reduce plant water stress and extend the period between irrigation. There is little research to show benefits from application to plants going into the landscape, whether applied as a root dip, a backfill amendment, or by watering in. One reason is that salts (such as in the soil solution) reduce their water absorption capacity by up to 90%.

Trial other products, such as mycorrhizae and biostimulants. Controlled research has failed to result in consistent, repeatable results from use of these types of products at transplanting time, but there are plenty of testimonials out there supporting their use. A drought year would be the ideal time to trial these products, since they are supposed to stimulate root development and/or enhance water-absorbtion. Be sure to leave comparable plants untreated for comparison.

Established Plantings

Prioritize water use. Concentrate on watering those plants which are most valuable and visible and least drought-tolerant. Consider adding micro irrigation systems to those important areas. If you're allowing your lawn to go dormant during a drought, provide water for established trees which normally depend on turf irrigation. Water tree root zones deeply every two weeks.

Control weeds and replenish mulch. Weeds use valuable soil moisture. Remove weeds by hand or use an approved herbicide, then renew mulch to the recommended 2" to 4" depth. Don't disturb the old mulch or you will kill the feeder roots which have grown into the mulch layer. Consider enlarging mulched areas, particularly around trees.

Hold the fertilizer. Nitrogen fertilization increases the shoot-to-root ratio of woody plants, meaning that more top growth results with fewer roots to support the plants' water needs. In addition, fertilizer salts can cause root dehydration and result in leaf scorch if soil moisture is lacking. Wait until fall, or until normal rainfall patterns resume, to fertilize unless irrigation is provided. If you do fertilize, use an organic or synthetic slow-release fertilizer at a rate of 1 lb of nitrogen per 1000 square feet of fertilized area.

Delay pruning. Pruning to reduce leaf area is not a recommended strategy for coping with drought. Pruning during late spring or summer stimulates new growth, increasing the plant's water requirements. Prune deciduous plants during the dormant season instead. Remove only dead and dying plant parts during the summer.

Water wisely. If using sprinklers or hoses, water late at night or early in the morning when evaporation losses are minimal . Install a rain-shutoff device on automatic irrigation systems so that you don't waste water by irrigating when it does rain. Water when plants show signs of stress - usually wilting or a color change. Annuals may require water every 2-3 days, whereas established woody plants and perennials can usually go a week or even two without water. A plant such as *Viburnum plicatum tomentosum* (doublefile viburnum), which wilts

severely when soil moisture is low, can be used as an indicator plant to trigger the decision to irrigate. Water adequately when you do water, so that the entire root zone returns to field capacity.

II. In Nurseries

Install irrigation. If you don't have permanent irrigation systems in place, this may be the year to justify their installation, whether you operate a garden center, a greenhouse, or a production nursery. A properly planned, installed, and managed irrigation system applies water more efficiently than even the best employee with a hose. Do careful research to get the right system for your operation, and have an irrigation professional design the system. The payback period for installing irrigation is less than a growing season (according to one irrigation supplier), considering only labor costs for hand watering. With proper management, you should expect improvements in plant quality and faster production cycles. Irrigation decisions, however, should be up to the grower and not an automated timer.

Convert existing systems to micro-irrigation. Overhead sprinkler irrigation systems are an inefficient way to deliver water. In a field nursery, only about 75% of the water applied becomes available to the plant, due to wind, evaporation, and spraying water on areas not intercepted by roots. For container nurseries the average efficiency is only 25% because so much water falls between pots or is intercepted by the foliage. Micro-irrigation delivers water directly to the root zone and can be 90% to 95% efficient. Although expensive to install, micro irrigation is considered economically justifiable on 7-gallon and larger containers, as well as field-grown trees and shrubs. Cost sharing may be available for converting to more efficient systems - call your local Farm Services Agency for details and qualifications.

Perform irrigation system maintenance regularly. Check overhead systems annually for leaks, clogged or worn nozzles, and measure operating pressure. Do not mix irrigation nozzles with different application rates or spray diameters within an irrigation zone. Do a simple can test to measure application rate and calculate distribution uniformity (for directions or help doing this, contact your county Extension Educator).

Micro irrigation systems need frequent checking to make sure all emitters are working properly. Flush the lines periodically and clean the filters. Check pressure and uniformity, especially if pressure-compensating emitters are not used.

Group plants according to water needs. Irrigation should be zoned so that blocks/beds can be irrigated independently depending on need. For example, the water requirements of evergreens are usually less than those of deciduous shrubs or trees during the summer, and they should not be placed in the same irrigation zone. Conifers have lower water requirements than broadleaf evergreens and should be grouped separately. Plant size makes a big difference as well; obviously a five-gallon plant requires much more water than recently potted liners and should not be on the same irrigation zone. Container material will need more water than balled and burlapped material in the wholesale yard or garden center. Container plants brought in from other nurseries may be in different mixes and require different watering schedules.

Use cyclic irrigation. Cyclic irrigation refers to applying water in several short cycles rather than one long irrigation application per zone. Irrigation zones are scheduled with an automated irrigation controller to run for approximately 15 minutes and then rotate to the next irrigation block. After all blocks are irrigated the rotation begins again. Usually three cycles, approximately one to two hours apart, are required before irrigation

requirements are complete. The quantity of irrigation water may be reduced by as much as 25 %, representing a savings in both water and energy consumption.

Install tensiometers in field or container blocks. Tensiometers or other reliable moisture sensors are used as decision-making aids. Over time, you will develop a feel for when irrigation needs to be applied according to the soil moisture tension. Special tensiometers have recently been developed for use in container media.

Don't modify your potting medium. It may be tempting to increase water holding capacity by adding more peat or compost to the mix, but don't do it unless you are highly confident that drought conditions will persist throughout the growing season. Should heavy rains occur, the mix will retain too much water and cause impairment of root growth and function.

Adjust cultural practices during a drought. Be conservative with fertilizer (see landscape section above). Use the lowest effective rate for your crop. If using a slow-release formulation, choose a product with a 3-4 month release period or less to avoid potential salt problems during overwintering. Monitor soluble salts every two weeks during the growing season, especially if reducing irrigation. Avoid heavy pruning during late spring and summer which stimulates vigorous new growth. Rows of field-grown material can be mulched to conserve moisture and suppress weeds.

Recycle water. Look at your options for capturing run-off and recycling irrigation water through irrigation ponds (or holding tanks for greenhouses). This is an expensive proposition and should be considered when planning initial nursery construction or expansion.

by Catherine Neal, UNH Extension Ornamental Horticulture Specialist, 5/02