
Water Conservation

We need not sacrifice aesthetics to create an attractive, yet water wise garden. Rather, we should look around us and strive to recreate the beauty of our natural surroundings in our residential and commercial landscapes. Water deficits can impact plants in different ways dependent on the plant and several other factors.

It is easiest to create a drought-adapted landscape (xeriscape) from scratch. Native plants can be conserved and protected on the building site during construction by installing temporary fences that preclude access by contractors, delivery people, and others involved in construction. Although more difficult, existing landscapes can also be converted or modified to conserve water. For instance, large areas of turf can be removed or reduced, water greedy trees such as cottonwoods can be replaced with drought-tolerant species, and native grasses, cactus, succulents, and perennials can replace green leafy shrubs.

Soil amendment helps conserve irrigation water and facilitates the capture of precipitation. The addition of organic matter creates larger pore spaces that allow water to more freely infiltrate into clay soils while increasing the water holding capacity of sandy and loamy soils. Any way you cut it, adding organic matter to the soil of a planted bed is a winning proposition. On the other hand, you need not spend time and money adding large quantities of organic matter to tree and shrub planting holes. Research has proven that woody plants have better survival and growth when planted directly into loosened native soil.

Mulching the soil surface also conserves water in the landscape. Mulching materials come in a variety of forms: organic (shredded bark, leaves, etc.), inorganic (rock or gravel), and synthetic (not black plastic) that can be used with or without other mulch materials. Mulch works in two ways. First, by reducing the velocity of rain (or irrigation) droplets which allows them to soak in more freely, and second, by reducing evaporation from the soil surface.

Turf is appropriate in landscapes if used wisely. The evaporative effects of a small lawn can cool the environment and reduce indoor energy costs. In areas that simply require a ground cover, there are many grass species that use little water while maintaining soil cover and mitigating erosion. These grasses can be mowed or left unmowed for a meadow-like effect. Think of these water-conserving lawns as living mulch.

Drip irrigation systems are helpful when establishing a drought tolerant landscape, but after the plants are established, they can become harmful to the maturing landscape. For instance, the single drip emitter that was used to establish a tree will not be adequate to water that tree after it matures. Furthermore, the roots will tend to proliferate in that wet spot and not grow into unoccupied

soil beyond the wet zone. Improper use of drip systems can also apply too much water for an established plant causing it to grow more rapidly than is desirable. These fast growing plants are often pruned back in ways that are not healthy for the plant. Consider nature's pruning methods: growth in favorable times and stagnation or dieback when conditions are unfavorable. Drip systems should only be used to establish xeriscapes and either modified or abandoned after establishment.

Water Deficit - Impact on Plants

Water deficits occur when plant water loss exceeds supply or, as plant geeks say, transpiration losses are greater than water uptake. Drought tolerant plants can reduce their rate of growth to compensate for limited water supplies. Conversely, water loving plants may become diseased, colonized by pests, or simply die when water deficits occur. The key lies in knowing the moisture requirements of your landscape plants and anticipating their irrigation needs.

Water deficits may be acute or chronic. Acute deficits are short-lived and can range from hours to days. Chronic deficits range from a few days to several months and are often found in under-irrigated (or non-irrigated) landscapes during drought. Both can cause injury symptoms that range from mild to severe depending on the plant's innate ability to cope with the deficit.

The first symptom of acute water deficit is wilting leaves. If the deficit continues, plant tissues may dehydrate to the point that plant tissues die (necrosis). Rapid dehydration often causes the leaves to turn reddish-brown at the edges with a distinct delineation between live and dead tissue. If serious enough, leaf drop may occur or the whole plant may die.

Chronic water deficit can cause slow growth, reduced leaf size, pale leaf color, premature leaf drop, early fall coloring, a general loss of vigor or stopped growth altogether. The loss of effective leaf area results in reduced photosynthesis leading to decreased energy production. The combined decreases of vigor and energy production reduces root growth, which reduces the ability of the plant to take up soil moisture. As you can see, this is a vicious cycle and the plant can easily go into a tailspin.

Other stress factors can combine with water deficit to further reduce the vigor of landscape plants. Reflected light from sidewalks or brightly painted buildings and radiant energy coming from paving and motor vehicles all can increase moisture demand. Impervious paving and parking lots reduce soil permeability so less water enters the root zone. Soil compaction from pedestrian or auto traffic also reduce soil water infiltration. Construction damage reduces the root system and hence the plant's ability to take up water. String trimmers and mower damage can increase stress of plants. Poor planting and staking reduces a plant's ability to develop a healthy, functional root system that takes up water from a large volume of soil and solidly anchors the plant.

Plant Selection Based on Site Conditions

Plant selection is the process of matching a plant species to local site conditions. We can avoid many problems by selecting landscape plant species that are appropriate for the water availability and growing conditions of the site. Our harsh site conditions and arid environment are a certainty and any plant that we plant here should be well adapted.

- Determine how much growing space is available: both above and below ground. Height restrictions, width restrictions, and available root space should all be considered. Do not plant trees and shrubs closer to a building than one half the mature plant width. Powerlines and roof overhangs should also be considered. The Sunset Western Garden Book lists the mature size of plants suitable to our area. Roots of trees and shrubs extend 1.5 to four times the width of the canopy. Roots of a 20 foot wide tree could spread from 30 to 80 feet from the trunk. This rule can be forgiving. However, it is best to provide adequate root space and avoid underground features such as septic systems and underground utilities.
- Climate zones and cold hardiness maps are available through the Cooperative Extension office. These should be considered a starting point, but localized microclimates may further determine the success or failure of outplantings. Consider how hot it is when you walk across a parking lot in July. The heat is being reradiated from the asphalt. Along streams and rivers it is much cooler.
- The plant should be well adapted to the local environment. If you live in an upland pinyon/juniper forest you should avoid planting riparian species such as alder, cottonwood, or sycamore. Upland sites favor xeriscape species. After selecting appropriate plants, you must water them until established. Once established, they may live well on infrequent irrigation during times of drought.
- An abundance of water creates an oasis which can support a different array of species. Also, cold air drains from high to low elevation so these low lying areas will be cooler in winter. North and east exposures are cooler than south and west exposures. These guidelines will help you determine whether your planting site is especially hot or cold for your general climate zone.
- A soil depth of 18 to 24 inches is sufficient for most trees and shrubs. Consider adding soil if you have less than six to eight inches. Urban soils can be compacted due to construction, vehicle or foot traffic. This limits water penetration, air exchange, and root growth. Flood irrigation can also compact fine textured soils. Plants adapted to desert conditions usually do poorly in compacted soils. The relative amounts of sand, silt and clay (soil texture) on the site will determine how much water and air a soil can provide to plant roots. Sandy soils are well drained, well aerated, and resist compaction. Clay soils do not drain well, are poorly aerated, and easily compacted. Knowing your soil texture is useful when selecting plants and can usually be determined by a Cooperative Extension Master Gardener. Soil drainage can also be reduced by shallow bedrock, caliche, or clay layers.

Other factors that can influence plant selection are water quality, insects, diseases, birds and mammals. Salinity of irrigation water can be a serious problem in some areas of the Verde Valley. Large amounts of dissolved salts decrease the plant's ability to absorb water through the roots thereby stressing the plant. Known plant pests and diseases should also be considered when selecting plant species.

You local Cooperative Extension office can provide information on plants that are suited to your climate and growing conditions.

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