

PART II

Irrigation: Maintaining Efficiency

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The Gist of Irrigation

Landscape irrigation is a luxury. Urban areas in Southern California can exist without it by using fewer plants and only varieties that could exist entirely on rainfall. But our quality of life would suffer as a result. A rich varied landscape enriches our urban experience in numerous ways.

Landscapes have a profound impact. They improve public health. Air quality, emotional wellbeing and longevity are all affected by landscapes. They provide many services, such as urban cooling, holding soils, and providing food. And their inherent beauty increases property values and helps spur community pride and engagement.

All these benefits are reasons why we irrigate. However, we can no longer continue to do it in the same unmindful way we have in the past. Water has become too precious for that. Modern realities mandate that we use every drop wisely.

Using water wisely, however, is not a straightforward task. The picture below illustrates the inherent problem. During the drought years, the sprinklers in this area were turned down. That worked for some areas, but obviously not for others. Increasing the irrigation frequency and duration would have greened up the brown areas, but doing so would have overwatered the areas that were already green. The problem illustrated here, unfortunately, applies to nearly all irrigation systems; one value will underwater some areas, overwater others, and be perfectly suited to still others.



Irrigation is inherently inefficient. One value will almost always underwater some areas, overwater others, and be perfectly suited to still others.

The goal of the Irrigation sections of this book is to reduce the scale and size of this problem. This first chapter provides an overview of irrigation. The second chapter explains how to program an irrigation controller/timer for maximum efficiency. The third irrigation chapter highlights maintenance practices, timing of tasks, and troubleshooting common problems. The fourth, and last chapter, explains how to get the most from irrigating with recycled water.

Types of Systems

For the purposes of this book there are only two types of irrigation systems: high-pressure and low-pressure. Each has advantages and disadvantages.

High-Pressure

Designed to distribute water over a large area in a short period of time, high-pressure systems use rotor heads, impact spray heads, regular spray heads and bubblers.

Advantages

- One sprinkler head can cover hundreds if not thousands of square feet and costs per sq. ft. of wetted surface are low.
- Because of the expansive coverage, maintenance costs are low.
- Installation and maintenance can be managed by a layperson, although efficiency usually suffers.

Disadvantages

- These systems are terribly water wasting—up to 50% of a sprinklers water can be lost to evaporation and wind drift.
- Water costs are higher than low-pressure systems.
- Improper use of system can lead to many kinds of infestations: fungus, insects, molds and weeds.
- Overspray from sprinklers contributes to dry-season runoff and the deterioration of our stream and ocean environments.

Low-Pressure

Designed to reduce inefficiencies and water loss, low-pressure irrigation delivers water directly to where the plant needs it, with little or no evaporation, overspray and runoff. There are three broad categories: drip (micro-sprayers, bubblers, emitters), inline emitter tubing, and soaker hose.

Advantages

- These systems can be precise and deliver water only where the plant needs it.
- The systems can be very water conserving.
- Water costs are lower than high-pressure.

Disadvantages

- Both the installation and maintenance costs are higher.
- Tubing breaks down in sun.
- Easily disrupted by people and pets.
- Prone to blockage with hard water.
- Can be chewed through by animals.
- If not used properly, it can cause salts to accumulate.
- While anyone can design, install and maintain a system, they generally work better when professionally done.

What is Good Irrigation?

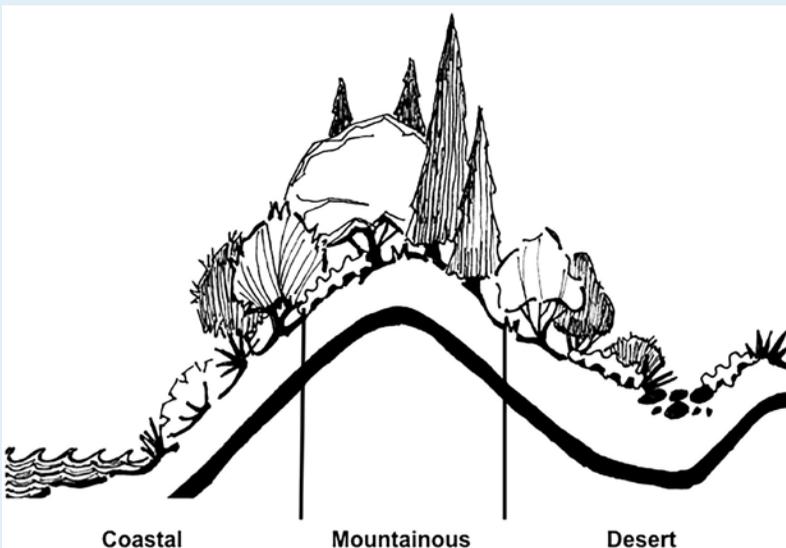
A well functioning irrigation system will go on when a soil dries to a predetermined depth and then replenish the moisture lost. It will neither irrigate before the plants need it, nor deliver water deeper than the plants need it. There is also no overspray or runoff.

The most important part of an efficient irrigation system is the observer. A careful irrigator must look at the system, the soil and the plants in order to identify irrigation and water problems. Below are the methods used to gauge soil moisture and the characteristics of landscapes that are either too wet or too dry.

Irrigation Communities

The plants listed in this book are drought-adapted and drought-tolerant, but that does not mean that they evolved without moisture. Nearly every plant has a period of growth and a natural period of dormancy. The challenge is to ensure proper moisture when they are growing (water need) and reducing moisture when they are not (water waste). The California Friendly plant palette has three broad types of irrigation communities:

- **Coastal Influenced:** Many of our coastal natives start growing with the start of the rainy season, in late October, early November. Success with these plants is achieved by ensuring proper levels of moisture November through March. As the seasons progress moisture levels should taper off encouraging natural dormancy by late summer.
- **Freeze Influenced:** Plants native to the colder regions start growing after the last frost, typically late February/early March. Success with this group is achieved by maintaining just enough moisture late February through June and then reducing levels of moisture as summer moves into fall.
- **Monsoon Influenced:** Many desert natives evolved to moisture twice a year: winter and summer. Success with this group comes from maintaining just enough moisture during these two primary growing seasons. Moisture levels can dramatically fall in spring and fall.



Gauging Soil Moisture

Soil testing is essential to irrigation efficiency. Below are the most common methods of physically testing soil moisture.

- **Coring:** Whether using a soil sampling device or simply a metal pipe and hammer, this method pulls up a ½" sample at depths of up to 2 feet. This is the most accurate method of measurement because it engages sight, smell and touch.
- **Dig:** A quick method when dry-to depth is between 2" and 5"; after that, it is not so quick. It is also the most intrusive and damaging method.
- **Dowel:** Pushing or driving a dowel into the soil and letting it remain for a minute or so provides an accurate picture of moisture levels. Dowels readily absorb available water. They will also pick up a soil's scent.
- **Electronics:** Soil probes typically measure electrical conductivity and not actual water volume. This makes these devices good for dense soils, but not light, sandy soils.
- **Long, Strong Screwdriver:** A long screwdriver can be pushed to depths over one foot. They are great for an overall impression, but lack the specifics because it is difficult to tell the depth of the soil it brings up.
- **Tensiometers:** These devices measure how strongly water is held in soil. They are most commonly used in agriculture and in landscapes where evenly moist soils are desired; they tend to fail in dry, coarse soils.



All these instruments can be used to gauge soil moisture: a long screwdriver, wooden dowel, knife, hand trowel, moisture meter, and a thin-walled pipe, hammer and rebar.

How To Identify a Water Problem

Whether home enthusiast or professional landscaper, every gardener needs to know the signs of water problems. Below are the most common characteristics of too much water and too little.

Too Wet: Compacted, Overwatered, Low Oxygen Environments

Saturated soils breed a slew of problems. They cause oxygen levels to fall, acidity to increase, and plant health to plummet. As plant health falls, so does its resistance to funguses, insects and weeds. In addition, too much summer irrigation shortens the life of many California Friendly plants. Many of these plants evolved to summer dormancy and overwatering encourages them to keep growing rather than rest.

Signs

- Wilting and drooping flowers, leaves and stems.
- Limp (not brittle) leaves.
- Edema (a blister-like symptom on the fleshy parts).
- Translucent or grey-hued leaves.
- Irregular and rangy growth.
- Limp, stunted growth.
- Persistent infestations of fungus.
- Lots of vegetative growth, but little flower or fruit.
- A sour (not sweet) smell to the soil.
- Algae, mold or moss.

Remedies

- Shut off irrigation.
- Plant water loving plants in perpetually moist areas.
- Mix organic matter into soil.
- Direct sheeting or running water away from area.



Swollen leaves and lanky growth indicates this *Euphorbia tirucalli* is getting too much water.

Weeds that Indicate Too Much Moisture

Chickweed, clover, dandelion, dichondra, dock, English daisy, nutgrass, oxalis, pennywort and plantain.



Nutgrass (*Cyperus* spp.) is not compatible to the conditions that favor rosemary and yucca. Its presence indicates this landscape is being over-irrigated.

Too Dry

Every plant needs water at some point, and without it the plant will show visible signs of distress. A lack of water not only shuts down a plant's essential functions, like photosynthesis, gas exchange and rigidity, but also shuts down the biological activity in the soil, decreasing levels of nutrients, increasing levels of salts, and reducing the soils ability to physically hold the moisture it does get.

Signs

- Wilting and drooping flowers, leaves and stems.
- Brittle (not limp) leaves.
- Dull, bluish leaves.
- Shedding of older leaves.
- Burns around the leaf edges.
- Extensive leaf drop.
- Stunted new growth.



This patch of *Aloe striata* is showing the signs of under-watering with shriveled leaves, dying older leaves, and stunted new growth.

Remedies

- Recharge the soil with irrigation.
- Recalibrate irrigation schedule to avoid stressing the landscape.
- Apply humus to reduce salt’s affects and wood chips to reduce soil temperatures and evaporation.
- If heavy with salts, leach soil with deep, deep watering.

Weeds that Indicate Dry Conditions

Cheeseweed (mallow), crabgrass, horseweed, lamb’s quarters, prickly lettuce, purslane, spotted spurge, sweet fennel, thistles and tumbleweed.



Soil can be read by its weeds. The horehound and tumbleweed pictured above not only indicate dry soil but also the presence of organic matter and salt.

Repellency Layer

Organic oils, resins, and waxes—residues from plants—accumulate in soils. These hydrocarbons begin evaporating as the soil becomes parched. Some of these gases will eventually condense, coating soil particles with a waxy layer, creating an impermeable barrier. When irrigation hits soils with this hydrophobic layer it beads up and runs off, never infiltrating. Repellency layers not only make irrigation difficult, but will also increase chances of runoff and topsoil loss.

A hydrophobic layer is common after wildfires and in times of intense heat. Sandy soils are more prone to repellency than clay because sand has less surface area than clay.

The remedies for breaking repellency include turning over the top 2" of soil with a shovel, scratching the soil with a stiff rake, mixing clay into the soil, applying pulse irrigation (brief irrigation many times a day), and mulching the soil to cool it and provide a water holding layer.



The small puddle of water pictured has been sitting on this sandy soil for over five minutes. A repellency layer has stopped it from infiltrating. Water repulsion is more common in sandy soils that grow resinous plants.