SUSTAINABLE LIVING IN DRYLANDS

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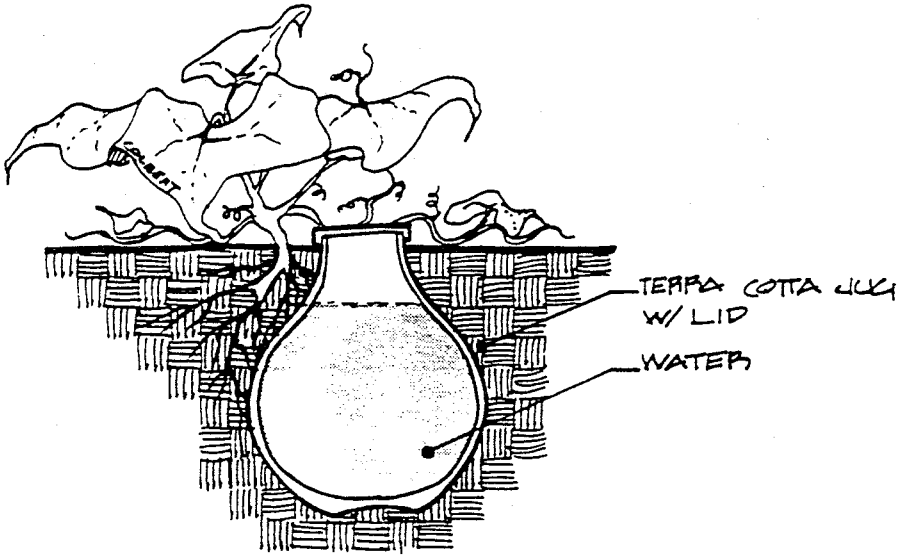
Planting in Extreme Climates

By Tim Murphy

Planting trees in the desert is easy; keeping them alive is the challenge. Problem soils and extreme microclimates require unconventional planting techniques and project design to ensure survival and growth.

Conventional tree planting technique--digging a large hole and surrounding plant roots with amended soil--may work well in areas with deep soils, such as flood plains or former farmland. However, many of us must deal with skeletal soils, heavy clay or caliche, as well as the extreme heat, reflected solar radiation, and heavy runoff found in urban microclimates. Our strategy for afforestation or reforestation projects must address these extreme circumstances.



Olla Irrigation

CHOOSING TRANSPLANTS

Many nurseries raise plants in ways that do not ensure their best chance for survival. "Liners" or seedlings are purchased from other growers and forced to size with copious amounts of water and chemical fertilizers. The resulting plant often has a much larger crown-to-root ratio than its wild sisters, a broader more tender leaf, and a correspondingly higher drought susceptibility. It is also an enticing salad for pests like aphids, harvester ants, and leaf-cutter bees. A tougher transplant can be produced by drought-conditioning seedlings - growing them in larger or deeper containers and gradually exposing them to more light. This preparation can be part of a home nursery program (which can also include growing species unavailable from commercial outlets.)

The alternative is to find a reliable commercial nursery--usually a locally-owned small enterprise that may serve as an information center as well. Look for nurseries that demonstrate an ethical orientation: those that stock organically grown seedlings, regionally adapted plants, integrated pest management supplies, appropriate literature, and quality tools. If your area is fortunate enough to have such a nursery, patronize them!

PLANTING TIME

Timing is another success factor. In drylands the ideal time to plant is the fall. The cooler months coincide with the time when the life juices are concentrated in the roots and most growth is centered

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there. Fall planting is especially advantageous in southeastern Arizona and southwestern New Mexico. There, moisture-charged soil from the summer monsoons and the light rains in fall sustain strong root development. In spring these plants have a distinct advantage over new transplants struggling to meet their transpiration and growth rates with underdeveloped or damaged root systems.

SUCCESSION: A NATURAL MODEL

In nature, seeds or stems are scattered or implanted throughout the landscape and take hold only under extremely favorable circumstances. These circumstances may only occur in a series of exceptionally mild or adequately moist years that see the young plant through its vulnerable establishment period. Often a surviving young plant will have the benefit of a nursemaid overstory to provide a favorable microclimate, a humus and micro-nutrient rich soil mound or *nebkah*, deep root channels and symbiont micro-organisms to aid its development. Eventually it may overshadow its benefactress and even cause her demise.

This process is common in nature. Called succession, it may repeat itself over and over until a stable or climax state is reached. Usually each stage of the process is begun by chance as fate intervenes to transport seed to an appropriately moist and sheltered microclimate where germination occurs.

Tough, environmentally-adapted weeds, trees, and shrubs, called pioneers are generally the leaders in the succession process. They build ideal soil and microclimate conditions for the next wave of less tolerant seedlings: plants which establish themselves during the next favorable growth period when adequate moisture is present. But even "pioneer" plants, known to get by without supplemental watering when they are mature, in nature require a period of favorable conditions to survive. This can be simulated with temporary drip irrigation.

SUPPLEMENTAL WATER

The first thing to consider in any tree-planting project is how to provide water, both in the establishment phase and later. Before tree planting is begun, earthworks for water harvesting should be in place. (Swales, microcatchments, etc. are examples.) Water-harvesting structures ensure long-term health and rapid growth, but supplemental water from other sources will probably be necessary during the establishment phase (unless it's one of those unusually wet years).

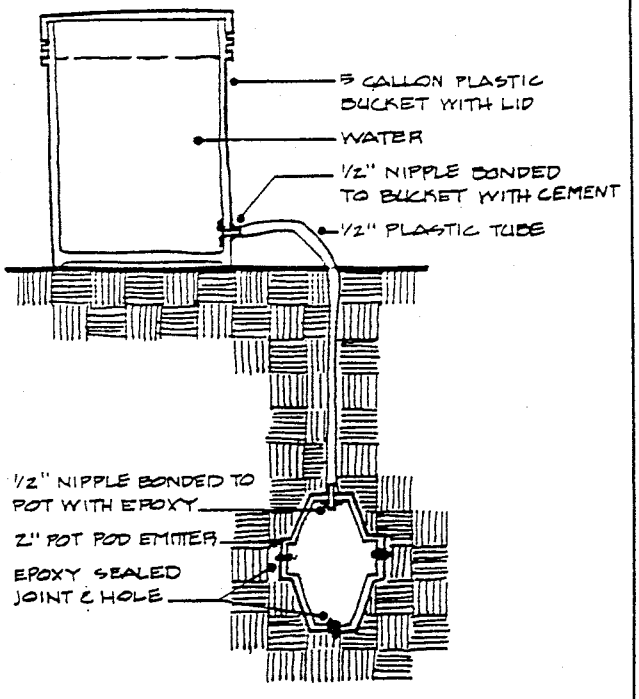
For trees and shrubs beyond the reach of existing plumbing, other watering methods are available that are self-contained and need a minimum of attention. David Bainbridge has developed or used the following systems in various reforestation efforts in Southern California.

The Buried Olla (pictured on front page)

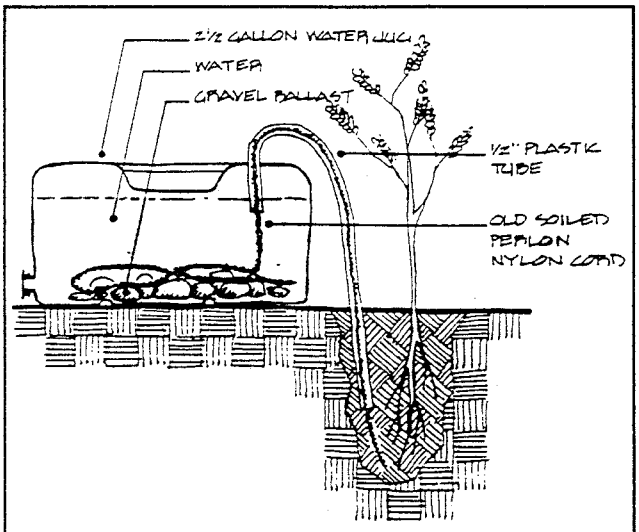
This method has been used historically throughout the world where water is at a premium and needs to be carried to the growing site. It consists of a covered earthenware pot buried to its rim in the center of a growing hole and then filled with water and covered. The water seeps slowly through the pores of the pot and sustains a ring of plants around it. Ollas are common in developing countries largely because they are cost effective. An easy replication here would be to bury a large clay pot after sealing the drain hole, then covering it with a weighted pie tin. Ollas need to be refilled every few days, but are very effective and produce lush growth.

California Hybrid - Drip Pod

This system was developed in California for revegetating areas with less than 5" average annual precipitation. The components are all readily available and can be of recycled materials. The above-ground reservoir is a covered 5 gal. plastic bucket. A nipple is cemented through the wall at the container bottom and inserted into a flexible plastic tube of an appropriate length. The far end of that tube slips over another nipple epoxied to an earthenware pod. The pod is created by joining two 2" terra-cotta pots at their rims with epoxy cement, after sealing the drain hole of one and attaching a nipple to the other. One filling of the 5 gal. bucket will operate the pod for up to 2 months.



Drip Pod Irrigation



Wick Drip Irrigation

Wick-drip System

This system, also developed in California, uses a 2.5 gallon purified water jug or similar container. A hole in the top allows a flexible tube to be inserted into the jug on one end and placed below the surface of the soil on the other. A length of soiled, abused perlon nylon cord (the kind found new in mountaineering shops or surplus stores) is coiled in the bottom of the jug, and threaded through the tubing, allowing some to protrude on the far end. It is important that the cord is used, dirty, and distressed so that it will effectively wick moisture. Each end is knotted to keep the cord in place. The cord wicks the water from the jug to the root zone while the tubing prevents evaporation enroute. This irrigation system will operate continuously for up to 2 weeks on one filling.

Simple Plastic Jug - David's Planting System

In this system (pictured at right) a plastic jug is fitted with a drip emitter near its base. When this emitter is placed over a perforated plastic pipe extending to the bottom of the root zone it makes an effective way to establish trees with deep tap roots. Many of these, like mesquites, oaks, carob, nut trees, and some conifers, are effective pioneers. (These trees can be started in narrow deep containers like plastic drain pipes, "poly" sleeves, or adjoined milk cartons. The planting holes are augured to a depth of three feet with an additional hole of a smaller diameter drilled beyond that to facilitate rapid taproot penetration and ensure high survival rates.)

MULCHING

Organic sheet mulches will also dramatically improve any tree's chance of survival. (See *SLD* Issue #3 or *SLD: Year One* [a collection], or *Permaculture: A Designer's Manual* for sheet-mulching technique.) This is especially true for trees planted in extreme microclimates or skeletal soils. Sheet mulching simulates an advanced succession process by providing more litter around young trees to conserve soil moisture, moderate temperatures, and improve soil structure. Straw is commonly used, but almost any organic material will do. (One person's yard waste is another's mulch.) One caution: keep organic material away from the tree's trunk. This can be accomplished by placing a stack of rocks around the base of the trunk.

When organic material is unavailable, rocks make a great mulch in themselves. Take care to shade rock mulches with dead branches, cleared weed stalks, or something similar during the hot months to avoid reflection and excessive heat retention. During the cooler months these can be beneficial characteristics that help create a favorable microclimate.

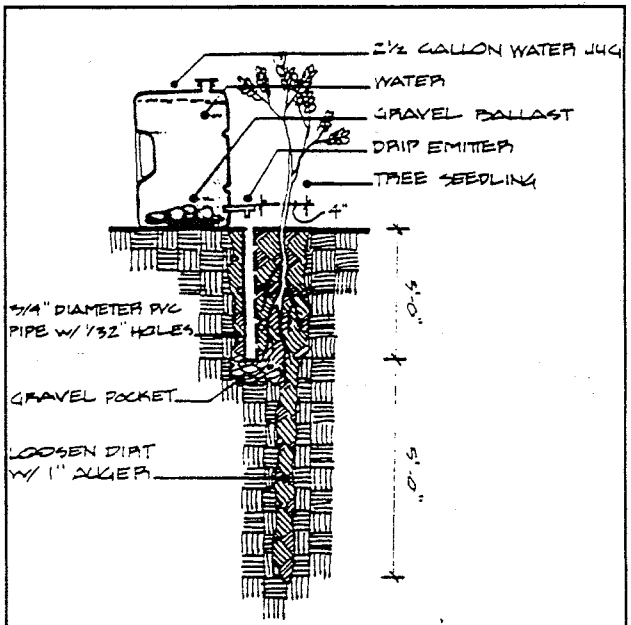
THE BIG PICTURE

Techniques and strategies like these are dynamic components of an overall design. The important considerations of a practical design are:

- to begin planting where water is most effectively concentrated and stored in the landscape.
- to choose healthy, stress-tolerant transplants.
- to time plantings carefully to reduce stresses.
- to develop and follow a succession strategy in extreme environments and marginal soils.
- to create moist microclimates with drip systems, and conserve that moisture by using mulch appropriately.

By following these guidelines, we can assure establishment and accelerate a process that occurs over decades in nature. In a relatively short period of time we can turn barren, desertified sites into productive, diverse and stable systems.

Tim Murphy is a permaculture consultant in Tucson and founder of Sonoran Permaculture Association.



David's Planting System

Illustrations by Michael Colbert.