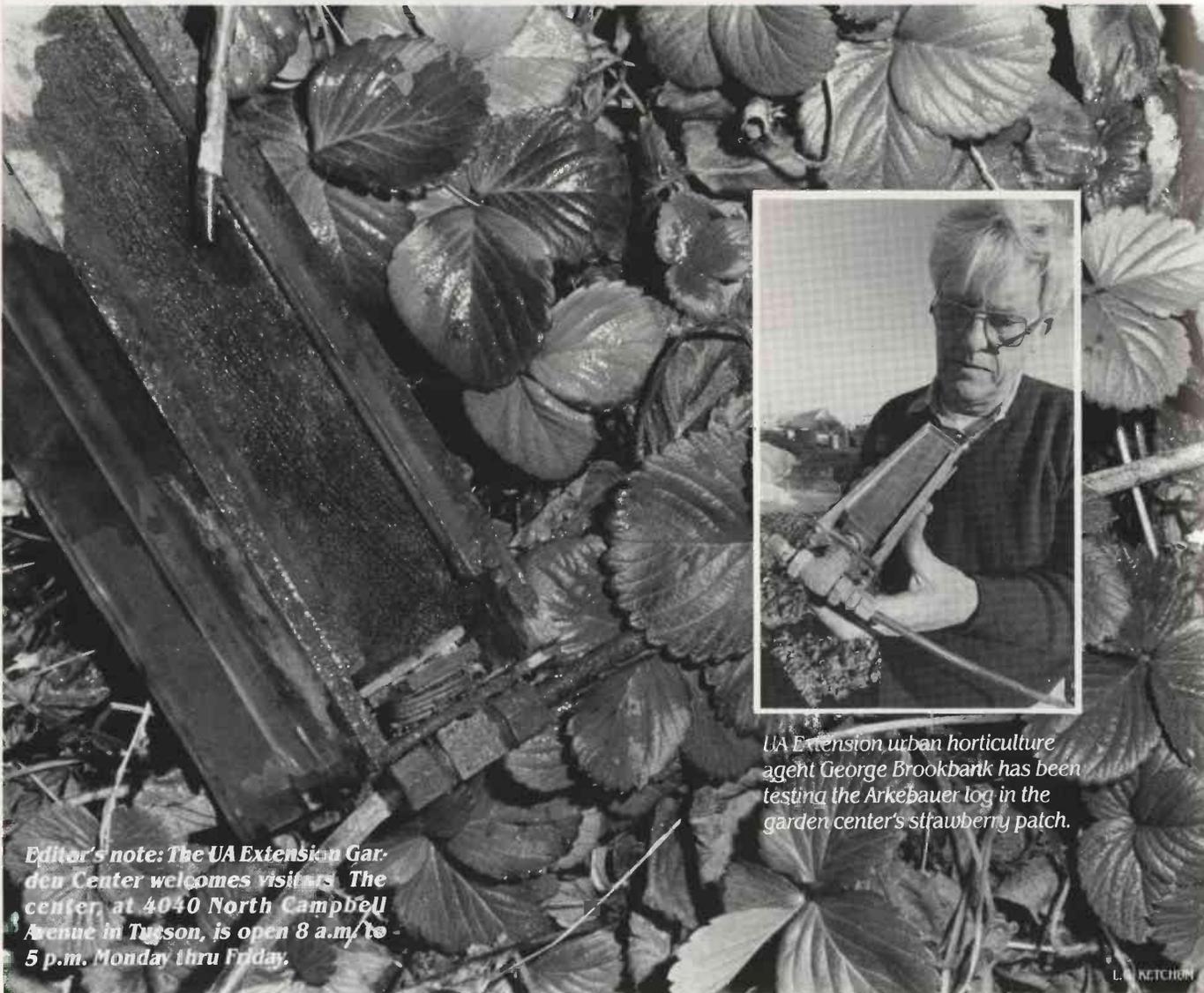


BACKYARD WATER MANAGEMENT

by Lynn Ketchum



Editor's note: The UA Extension Garden Center welcomes visitors. The center, at 4040 North Campbell Avenue in Tucson, is open 8 a.m. to 5 p.m. Monday thru Friday.

UA Extension urban horticulture agent George Brookbark has been testing the Arkebauer log in the garden center's strawberry patch.

L. KETCHUM

Harry Arkebauer wanted a simple way to monitor the moisture in his garden. But he also wanted a device that would respond automatically to conditions. When the garden was dry, the gadget would have to trip a valve for irrigation. And when the garden was too wet, the apparatus would have to sense that and turn the water off.

Timers were out. They don't take into account current weather conditions. When the scheduled time rolls around, the water goes on, even if it's raining. Sophisticated sensors and computers could do the job. But for a backyard gardener, that technology is just too expensive and too complicated. What to do? The answer, Harry believed, could be found in a block of "redwood".

Today, Harry Arkebauer's redwood technology is at the heart of an irrigation system used to water strawberries at the UA Extension Garden Center. It is just one water conservation approach the center is testing.

With redwood, Harry Arkebauer made an effective water management system. His invention operates on the simple principle of expansion and contraction. When wood is wet it expands and when it's dry it contracts. Coupled with a hydraulic valve, you can begin to see how Arkebauer's system works. Placed in the middle of the garden in contact with the garden soil, the redwood block quickly responds to the garden's condition. When it's dry, the shrinking wood activates the valve and the irrigation system. But when the wood block is saturated—the expansion turns the valve off. The system can be adjusted by increasing or decreasing tension on the redwood block. Arkebauer's gadget can control ditch, sprinkler, drip and flood irrigation.

According to Extension urban horticulture agent George Brookbank, the Arkebauer system works in water-shy Arizona just as well as it does back in Arkebauer's hometown of Ferguson, Missouri. The "low tech" gadget responds to all soils, Brookbank says, and with a variety of crops. During two and a half years of testing, Brookbank

has successfully used Arkebauer's redwood log to grow not only strawberries but corn.

THE BACKYARD PROBE . . .

As simple as it sounds, Arkebauer's redwood log is really quite sophisticated compared to another one of Brookbank's water management tools. During the last ten years, it's the soil probe that has helped many desert gardeners control their water use.

In the desert, Brookbank says, there's a tendency to overwater. "I'm in the desert so, I better water." That's the typical approach of gardeners, particularly newcomers, the agent says. "But the trick is to keep the soil around the roots moist."

One of the easiest ways to monitor soil moisture is with, what Brookbank calls, "the simplest tool in the world."

The pointed steel rod, with one end bent to form a handle, works on the basic principle that a steel rod can be pushed into moist soil easier than dry soil. The probe management technique works this way. Using a set of established guidelines, a gardener can determine when to water particular types of vegetation by how far the probe penetrates the soil. In the case of trees there's enough water in the soil when the probe can be pushed in three feet . . . two feet for bushes and 18 inches for a lawn.

The probe, Brookbank says, "is a way to see where the water goes." And that's important information for water-conscious desert gardeners. "Once they use them they have a much greater understanding of water management."

PATIO HYDROPONICS . . .

Brookbank calls it the "model of the future," the garden center's hydroponic garden. Hydroponics not only conserve water, but soil and space. How does this garden grow? Unlike conventional gardening, a hydroponic garden is soilless. Plants grow in water containing dissolved nutrients.

There are many variations of hydroponic farming, but the novel setup at the UA Extension Garden Center was designed for a minimal space, an important consideration for the urban gardener. On only ten square feet, this vegetable garden accommodates some 60 plants.

Rather than planting in conventional horizontal rows, Brookbank's garden is stacked, vertically, in six, four inch PVC drainage pipes rising some five feet off the ground. The design easily fits on an apartment balcony or a townhouse patio.

Assorted plant leaves poke through holes cut along the pipe sides. Inside the standing pipes, the roots are constantly washed with nutrients mixed with water that's fed at the top. The water and nutrients (perlite, vermiculite, house plant food) flow down the pipe to a collection bucket. A submersible pump at the base of the "green" columns recycles the water from the collection bucket back to a spider spreader at the top. Unlike conventional gardening where much of the water disappears into the soil, the only water lost in hydroponics is the water used by the plants.

It's obvious the system is technology dependent. That fact may be one of its drawbacks for the weekend gardener. To garden hydroponically means to constantly monitor the equipment. Failure can cost the gardener a crop of strawberries, lettuce, tomatoes, to name just a few hydroponic possibilities.

Brookbank has found that practically any combination of traditional vegetable will grow in the hydroponic garden. And although the exact yields have not been recorded, Brookbank is confident his "standing" hydroponic garden will produce enough for two people.

As any visitor to the UA Extension Garden Center will quickly learn, productive backyard farming in southern Arizona depends on water management. Hydroponics, Arkebauer's redwood log and the soil probe, are a few ways that Brookbank hopes will help area gardeners be better water managers and in turn successful "desert" gardeners.



Continued from page 11.

50,000 to 60,000 acre feet per year down the Santa Cruz River," Wilson notes, and he is developing some ideas for conservation and cost savings. For the money being paid to buy up farmland for water rights, for example, Tucson could trade secondary treated sewage water with Marana farmers for high-quality ground water they currently use on crops.

Another leak in the canteen is the traditional landscaping trees, like mulberries, which are so popular in Arizona cities. The common sense of using drought-tolerant species becomes easier to accept when the plants are also beautiful.

"In the last few decades the low-water

use plants have increased dramatically, mostly through education," says Dr. Carol Crosswhite, curator and nursery manager at the UA Boyce Thompson Arboretum at Superior. She calls the demonstration of these alternative landscaping plants and public education about them the essential duty of the arboretum, which was established in 1924.

"It has been a source of a lot of the drought-tolerant plants," she says, and landscapers can actually obtain seeds of species from around the world at the arboretum. "The gardens themselves are the testing grounds."

Crosswhite credited retired UA landscape architect Warren Jones with being

a leading figure in the development of new landscaping plants that conserve water. Among newcomers she thinks could become popular additions to Arizona gardens are members of the genus *Salvia*, the sages and mints, and an Australian shrub of the genus *Eremophila* that holds its leaves year-round.

"It's growing very well in Mesa and Tucson," Crosswhite says of the Australian shrub. Dr. Charles Sacamano is continuing the tradition of collecting appealing plants, maintaining them at the Campbell Avenue Agricultural Center. One of the university's popular releases is the trailing indigo bush, now playing to rave reviews in Tucson.

photos by L.G. Ketchum

(opposite) An infrared thermometer helps improve irrigation efficiency by telling researchers when a plant, in this case turf grass, needs watering.

(left) Dr. Paul Brown, who's managing the UA's AZMET statewide weather station network, works with Extension turf and irrigated pasture specialist Dr. Dave Kopec (below) to bring up-to-the-minute weather data into the irrigation scheduling picture.



Kopec is also using mathematical models based on grass stress to schedule irrigations more effectively, calculating actual water requirements of various grass species and varieties.

Architect Brittain has pointed out, at Casa del Agua, how effective placement of landscaping trees can help shade and reduce energy requirements of a desert house. By contouring the grounds to direct rainwater to plants and using drip irrigation to supplement water needs, he can create a landscape with "no need for irrigation with municipal ground water."

This is important in the Tucson area where the ground water overdraft was 265,000 acre feet in 1980 and is projected to still be 99,000 acre feet in 2,000, even with ground water regulations in effect. The Central Arizona Project can't provide the balance by itself.

Okay, the visitor to Tucson or Phoenix

might say, what about these golf courses Arizona developers build? Don't they use a lot of water?

"The golf course industry is looked on out-of-focus by the public," acknowledges Dr. Dave Kopec, and Extension specialist for turf and irrigated pasture. He says the perception of golf courses as water wasters can be attributed partly to the fact that they do use lots of water—allocations go as high as 5 acre feet per year in Tucson and Phoenix.

"We're trying to promote conservation through education," Kopec says. He is also using mathematical models based on grass stress to schedule irrigations more effectively, calculating actual water requirements of various grass



Satellite and aircraft pictures can provide researchers with an aerial overview of faulty irrigation and turf disease. "Remote sensing" can also detect soil types . . . information that's critical to irrigation efficiency.

species and varieties, and introducing new management methods to golf course operators. New types of Bermuda, for example, use less water and can be used in roughs where precise cutting is not necessary.

Another way of conserving fresh water is to irrigate with effluent. More and more, it is used to water established golf courses. Effluent, Kopec says, is ideal for golf courses because turf serves as a natural filter.

Kopec works with Dr. Paul Brown, who is managing the UAs AZMET statewide weather station network, to bring up-to-the-minute weather data into the irrigation scheduling picture. Two of the 13 weather stations are on golf courses in the Phoenix area.

"All the measurements go into determining a water demand for that day," Kopec says. "It's a team approach."

The OALS remote sensing people are hoping to get involved by using multi-spectral scanning equipment from aircraft or satellite to detect faulty irrigation and turf disease. Soil type can also be determined by these methods.

"We can help them determine what irrigation rates would be optimal for that

type of soil," says Dr. Chuck Hutchinson, director of the Arizona Remote Sensing Center.

Home lawns also benefit from Kopec's Extension efforts. He devised a Summer Lawn Watering Guide for the Municipal Water Users Association, which paid for its publication. By making three easy calculations and setting a scheduling wheel in the Guide accordingly, a homeowner can make his sprinkling schedule more efficient.

Indeed, public education is being pursued from many angles to curb urban water waste. On a professional level, the *Arroyo*, a quarterly newsletter of the Water Resources Research Center, is published to make the public aware of research, legislation, conferences and other information about water in the Southwest.

And finally, you can't get any closer to public education than George Brookbank is, and the Extension agent for urban horticulture in Tucson is full of little innovation for small-scale gardening in a water-poor city.

"Over there is a horizontal system for growing plants in old roof guttering," Brookbank says as he shows a visitor

around the UA Garden Center on Campbell Avenue. The peas and beans seemed to have made it through the withering summer fine, as did the flowers in an upright section of PVC pipe and the sweet potatoes growing profusely inside a pile of old tires.

"This is something anyone can do, even if they don't have any space, even if they live 15 stories up," says Brookbank in the informative chatter so familiar to Arizonans who listen in to his weekly television show, one of his two radio shows, one of his two call-in programs, his newspaper column or a demonstration at the garden center or one of the city's library branches. His message is simple: you can garden in Arizona and conserve water at the same time.

There is a lot of interest. An average of 60 people attend Wednesday garden demonstrations at the center, and some 23,000 gardening leaflets were handed out there last year.

"I think we're getting the message across," Brookbank says. And the more the message gets across, the less the canteens leak. 