

Tucson's rain-catching revolution

In the Sonoran Desert, rainwater harvesting is finally going mainstream.

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By Tony Davis

In the mid-1980s, Brent Cluff lived in a low-slung four-bedroom house on a quiet street in Oro Valley, an upscale suburb northwest of Tucson. Saguaro and prickly pear, mesquite trees and shrubs filled his front yard and most of the others on the street.

His backyard, however, stood out, with peach, plum and apricot trees, and a vegetable garden overflowing with cucumbers, tomatoes, carrots and okra. It was completely irrigated by stormwater, captured from the street by an eight-inch pipe and used to fill a figure 8-shaped 100,000-gallon concrete pond. The pond was stocked with trout from northern Arizona; periodically, Cluff let Cub Scouts fish there.

In his late 40s, Cluff was by turns a genial, brusque and combative visionary, sporting a crop of gray hair. A University of Arizona water researcher, he published more than a dozen papers on water harvesting, including one on his pond. It was more than an amenity, he said; it was an essential survival tool for his desert city and the apocalyptic droughts he believed were inevitable.

Cluff told anyone who would listen — and many city leaders who preferred not to — that harvesting rainwater could ease the region's reliance on its rapidly declining aquifer. It made no sense, he argued, to irrigate lawns, gardens and trees with potable water when more rain fell on Tucson annually than its residents consumed, racing down streets into washes and streams, or simply evaporating. The initial investment for equipment could be steep, but after that, harvesting

required little energy and would neither increase water bills nor imperil aquifers or rivers.

Cluff, however, was no environmentalist. He believed that water harvesting could support unlimited growth, comparing his crusade to the building of the atomic bomb: “If I didn’t do this,” he said, “somebody else would.”

But most city and state officials dismissed rainwater harvesting as futuristic at best. For years, the idea received little notice. “There was a climate of denial about the implications of water scarcity in Tucson,” recalls William Lord, former director of the University of Arizona’s Water Resources Research Center. “A lot of people didn’t want to hear the kind of things (Cluff) was saying.”

Today, however, Cluff’s vision has become as trendy in Tucson as grass-fed beef burgers. Dealers sell cisterns as fast as they arrive. City rebates of up to \$2,000 to purchase rain tanks have gone to more than 600 homeowners in three years, and every new university building harvests rain. How did this happen? And could it help Tucson survive the dry future that Cluff so accurately foresaw?

Rainwater harvesting is an ancient technology; it made human settlement possible in southern Arizona 3,500 years ago. The Hohokam Indians captured rainwater with rock dams and built sizable storage tanks. The neighboring Tohono O’Odham built earthen dams and brush weirs to divert water from washes for crops and personal use, and even today they store rainwater in earthen tanks for cattle.

But the practice fell out of use as European-style wells proliferated at the end of the 19th century. They tapped a seemingly inexhaustible underground water supply, which lubricated Tucson’s growth for decades. When Cluff began his crusade, Tucson was the nation’s largest city totally dependent on groundwater. Its leaders knew the aquifers wouldn’t last forever, but they believed they could support

future growth by pumping Colorado River water uphill for more than 300 miles and using treated effluent to irrigate golf courses and parks.

Back in the mid-'80s, just a handful of Tucson residents had rainwater cisterns. A decade later, when water-harvesting advocates decided to start teaching the practice, they had to pay people to sign up for their classes.

Two relentless and persuasive proponents led the turnaround: Brad Lancaster, a tall, reddish-haired writer, activist and lecturer, and Katie Bolger, a feisty city council aide.

These days, Lancaster, 46, is something of a guru. He has published two books on rainwater harvesting and earns up to \$1,000 a day teaching the practice across the Middle East, including a U.S. State Department-funded tour. But he started out as an outlaw.

In 1998, using a handsaw, Lancaster illegally carved six cuts into his curb to divert rainwater into the vacant space between the curb and sidewalk. He and his brother had already transformed their barren front yard near downtown Tucson into a lush oasis by “planting the rain” — building earthen berms to capture rain in hand-dug basins. The curb cuts would help nourish mesquite and palo verde trees in the remaining empty space.

Lancaster has calculated that the average one-mile stretch of residential street in Tucson drains enough water annually to irrigate 400 drought-tolerant food-bearing trees: ironwood, mesquite, palo verde and hackberry. As his trees grew, his neighbors got interested, so Lancaster launched his own crusade to legalize the practice.

At first, city engineers balked, fearing that the tree roots would damage the public rights of way, and that saturated soils would cause sinkholes. “They thought the streets were designed to drain water,”

Lancaster says. “They put the water down the storm drain, or it evaporates.”

It took Lancaster three years to get the curb cuts legalized, and he had to engage in fancy bureaucratic footwork to do so, finding a sympathetic city hydrologist who convinced authorities that the existing cuts hadn’t caused problems. Lancaster argued that the shade from more trees would stretch the life of the asphalt. He got the backing of neighborhood groups and environmentalists, and found an important ally in Val Little, who runs the Water Conservation Alliance of Southern Arizona. Back in the early 2000s, Little persuaded the state to legalize the use of gray water from sinks, showers and washing machines — another lost water source — on outdoor plants. (Gray water accounts for 30 percent of what comes out of a homeowner’s tap, enough to irrigate 50,000 Tucson yards.)

Today, Lancaster stores about 100,000 gallons of rainwater a year. He uses city water for his washing machine and to shower, gray water on fruit trees, and rainwater for drinking. He says the system moderates summer heat, reduces street flooding and generates mulch. It also improves his neighborhood’s look and feel: “This is not just about conserving water,” he says.

Katie Bolger is a salty-tongued, politically savvy 45-year-old native Tucsonan. As an aide and chief of staff to two city councilmen, she helped change the law in other ways to help bring water harvesting into the mainstream.

In 2007, Bolger introduced Lancaster to Rodney Glassman, whose campaign for city council she was managing. The two quickly bonded. Glassman was already aware of the bureaucratic barriers to harvesting. A few years earlier, working for the developer KB Homes, he discovered that since rainwater harvesting wasn’t covered in the land use code, builders had to get an exception to implement it.

After meeting Lancaster, and at Bolger's urging, Glassman pledged to require harvesting in new developments — "To make water conservation the rule, not the exception." Once elected, he pushed through new regulations, requiring new businesses to use rainwater for 50 percent of their landscape irrigation and new homes to have gray-water hookups. "There was shitloads of pushback from homebuilders," Bolger recalls. "The enviros started at 100 percent, the builders started at zero. Now, we have an ordinance that was truly a compromise."

Later, when Bolger was working for a second councilman, Paul Cunningham, she fought to create a fee on water bills for investment in low-flow toilets, harvesting and other conservation programs. Tucson Water fought back. Officials at the cautiously run utility were reluctant to support anything that would cost ratepayers, and they doubted the cost-effectiveness of the harvesting rebates. Bolger, however, suspected that the utility had darker motives: If people used less water, it would make less money. Tucson Water officials deny this.

Bolger ultimately decided to bypass the utility: She orchestrated a public hearing packed with residents who told the council they would pay higher rates for conservation. This was astonishing for Tucson, where a 1976 recall of four council members who raised water rates withered government-sponsored conservation efforts for years. The council eventually agreed on an average monthly fee of 25 cents and approved rebates up to \$2,000.

Bolger has three cisterns in her backyard that support grapevines, fruit trees, spinach and tomatoes. "If I can do it in my yard — and I have to hire someone to screw a fucking screw in my wall — it's ridiculous not to do it," Bolger says. "The last rain we had was 1.9 inches. I had 2,300 gallons of water of better quality than what comes from my tap delivered to my door. It blows my mind we're not doing it more."

Lancaster agrees, saying that even during droughts, Tucson still gets more rain than its homes and businesses use in a year. He suggests redesigning “every government building, every park, every school, every library, every parking lot” to harvest rainwater: “What if the entire population in the Colorado River watershed harvested 20,000 gallons of rainwater per year, per family?”

What if, indeed? Some critics argue harvesting can “steal” storm runoff from people with rights to river water. However, a 2007 study in suburban Denver found that only 3 percent of rain runoff ever reached streams, with the rest evaporating or being used by plants. Still, two years ago in Arizona, the concern scuttled a proposed state study of large-scale rain capture.

Nobody knows exactly how many Tucsonans have cisterns or earthworks, where the ground is sloped to direct runoff into basins with trees and shrubs. But the numbers appear to be growing rapidly. A local Ace Hardware has sold \$40,000 worth of rain tanks every two weeks for the past three years. Regionally, demand is strong enough that rain-tank manufacturer Bushman USA says its 24-hour-a-day California factory has a six-week backlog.

A few states besides Arizona have also liberalized their rules. Colorado once outlawed the harvesting of rainwater, reasoning that it belonged to people with water rights to rivers and streams. In 2009, it relaxed the law to allow homeowners who lack access to public water to catch rain, and permitted developers to install collection systems in 10 pilot projects. -California legalized rooftop rainwater capture in 2012.

In Los Angeles, the River Project is now working with San Fernando Valley homeowners to use gray water on outdoor plants and to install earthworks and “permeable pavement,” which allows rainwater to percolate into the aquifer. A pilot program at 22 homes saved and

reused 1.2 million gallons annually, captured 505,000 gallons in the aquifer, and cut water bills.

The potential for water harvesting is significant, especially for arid states facing an even drier future. Outdoor landscaping accounts for 27 percent of residential water use among Tucson Water customers. If all of them got all of their outdoor water from gray water and the sky, the city could slash water use by 25 percent. The savings could be greater in cities like Phoenix and Los Angeles, where lawns are more common.

Yet achieving this may prove difficult. Last fall, Tucson Water warned that the rebates weren't working. Their research found that recipients were not conserving any more water than a control group of homeowners who didn't get rebates. Officials were concerned that rebate recipients were simply adding new landscaping to be watered with harvested rainfall. Some programs, though, have saved water. One allows participants who reduce city water use to direct the savings into environmental restoration projects. In two years, 60 participants saved 855,000 gallons. On Tucson's south side, a 6-acre rainwater basin irrigates a baseball stadium's turf and landscaping at public buildings. Since 2001, it's cut irrigation bills enough that the county's \$6 million share of the project's cost should be repaid by 2018.

Drought is a big obstacle, however: "If it doesn't rain for four months, six months or a year, those cisterns are not going to be full," says Kathy Jacobs, who runs the University of Arizona Center for Climate Adaptation Science and Solutions. The up-front cost is also a problem. At \$2,000, a cistern could take decades to pay for itself with savings on water bills. Earthworks, on the other hand, cost as little as a few hundred dollars. And even a cistern pencils out if you consider the community benefits of the landscaping: higher property values,

reduced street flooding, food production and shade cover, which helps lower air-conditioning costs and reduce the urban heat island effect.

Today, Brent Cluff, who got the ball rolling 30 years ago, lives in assisted living in Rexburg, Idaho. The 79-year-old is battling illness and has difficulty speaking. I told his wife, Raydene, that rainwater harvesting is taking off in Tucson at last. When she told Brent, she said, he broke into tears.

Cluff's Tucson pond, however, has not survived: It dried up three years after he sold the home in 1999. The new owner filled it in with dirt.