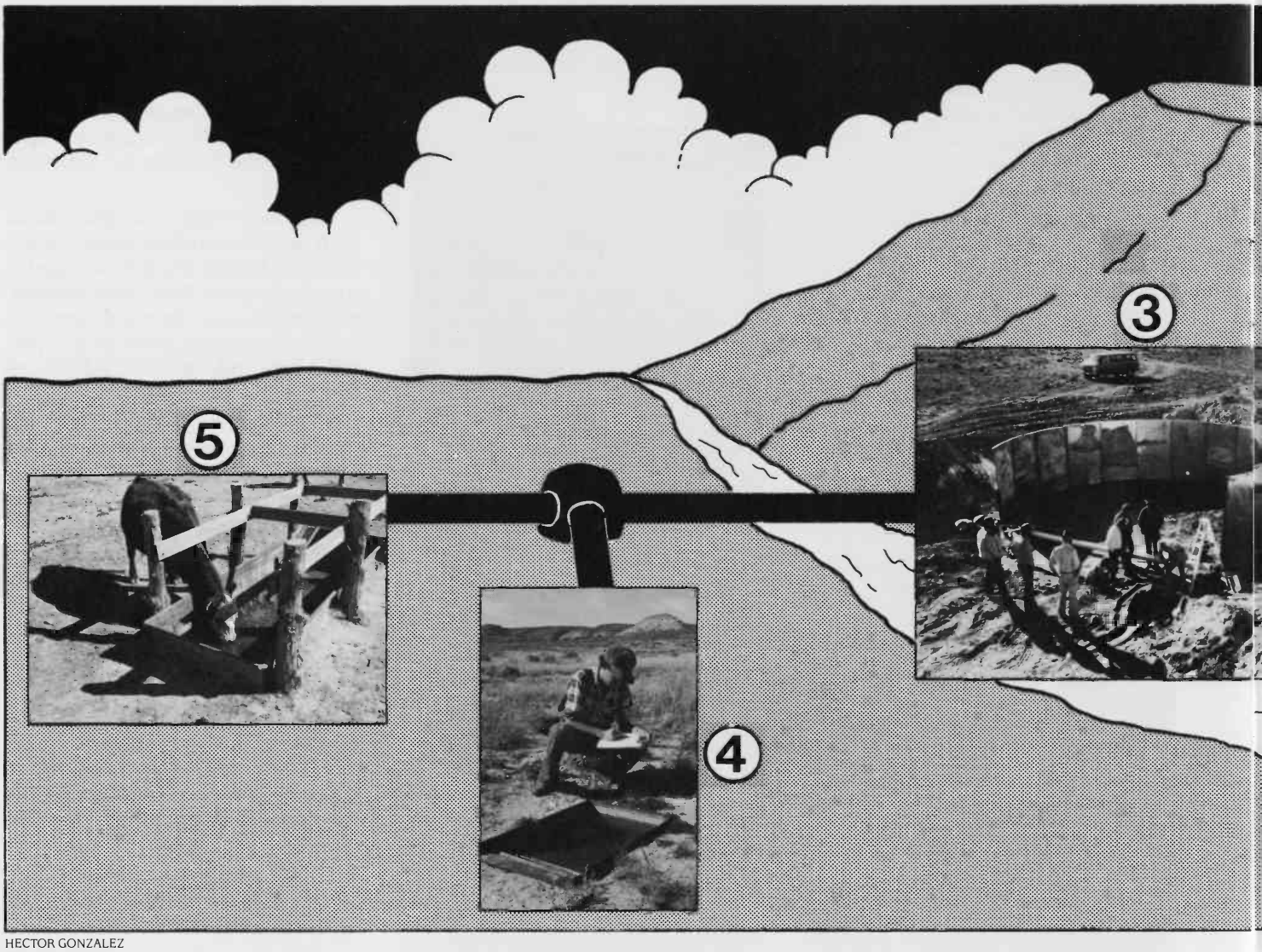
MAKING THE MOST OF



HECTOR GONZALEZ

Photos and Story By Larry Klaas

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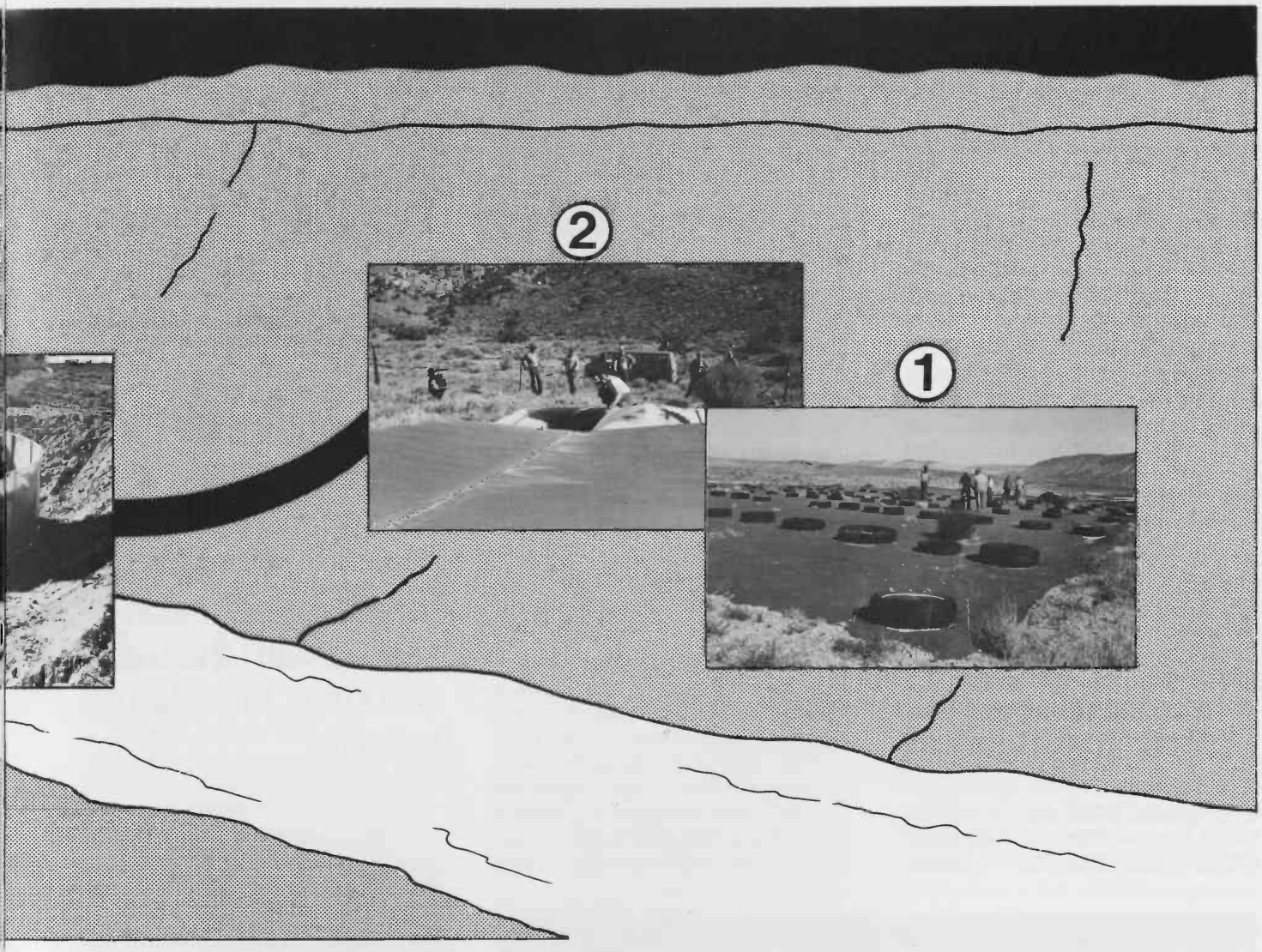
Her name was Aeiuthe, a 13-year old Paiute water gatherer. Beneath her gaze, a vast expanse of high desert spread uninterrupted to the far horizon.

"There is water here," she thought to herself. Aeiuthe was certain of that. She knew about water. She knew it sometimes came from the sky, or from the cold mountain springs, or it lay hidden beneath the dry, sandy arroyos that notched their way down to the valleys from imposing, flat mesas. Wherever it was, wherever it could be found, Aeiuthe would find it and return

PRECIOUS LITTLE
... Along the Arizona Strip



to her people with the water skins filled. Generations of Paiute before her had felt the same certainty; a knowledge built upon survival. Over the centuries, the Paiute had learned the secrets of finding water in this desolate place. Forage was scarce but it was water that was most difficult to find and it was water that was essential for survival.

Dr. W. Gerald Matlock considered that secret as he surveyed the same barren expanse Aeiuthe's people wandered some two centuries before. An agricultural engineer with the UA College of Agriculture, Matlock and a small team of scientists, conservationists and Cooperative Extension agents visited the Arizona Strip country recently. The team's objective was to find ways of improving those same basic water gathering techniques used by the Paiute and other aboriginal inhabitants of this arid land.

"You know, there really is nothing new under the sun," Matlock muses as his eyes scan the natural grandeur spread before him. "All we're doing here is taking the same methods used by the Indians and researching how

Fig. 1—The above illustration shows a typical water harvesting system used on the barren Arizona Strip. Rainwater is collected from a watertight, sloped surface,(corrugated steel, bitum or hot wax) then piped to a steel storage tank downslope and finally distributed to both livestock and wildlife troughs.

1. *Bitum surface runoff collector (old tires help secure the bitum).*
2. *Corrugated steel makes for another kind of surface runoff collector.*
3. *Easily assembled water storage tanks.*
4. *Wildlife troughs.*
5. *Livestock troughs.*

they can be improved with modern materials and technology." Words like "awesome" and "marvelous" pepper Matlock's speech as he stands in concentration over the landscape, trying to absorb the spirit of what the Paiute understood about water.

From the Nevada line on the west to Lake Powell on the east, from the Colorado River on the south to the Utah line on the north, the Strip is a remote notch of land in the extreme northwestern part of Arizona. Covering some three and one-half million acres, it contains what many consider to be the most inhospitable, barren, wild, and beautiful geography in North America. For the cattle growers who lease public lands on the Strip, finding adequate water for livestock is no less a challenge to survival than it was for the Paiute. Ranchers run an estimated 30,000 head of cattle here. Although forage is adequate for that number, the limiting element is still water.

For wildlife too, water is a constant challenge. Once great herds moved across the Strip to feed on waist high grasses and satisfy their thirsts in flowing streams. Now, even jackrabbits scratch and sniff to find enough water.

Recognizing the need, the Bureau of Land Management began practical experiments with a variety of water collection designs in 1971. L. D. Walker of the BLM hosted the University team's tour, arranged in conjunction with Robin Grumbles, Mohave County Extension agent, Stephan Campbell, Washington County, Utah Extension agent and Dr. Niel Biggs, a UA Extension irrigation specialist. Other team members included Dr. Roy S. Rauschkolb, director of the Arizona Extension Service, Larry White, Coconino County Extension director, and Peter Rude, a graduate research assistant in Agricultural Engineering.

From St. George, Utah, where the team began its tour, it took more than two hours by four-wheel drive vehicle to reach the site of the initial water gathering tests. Jolting along unpaved, ranch roads cut into the rocky terrain was a lesson in itself. The scientists came to understand why it costs some ranchers several thousand dollars each year to truck water to their stock and why those ranchers are so anxious to find alternatives. And the alternatives are there. Most of the BLM water gathering systems are spread in a great swath south and east of St. George in the Shivwits Resource Area. They abut canyon arroyos and nestle against mesa slopes in an expanse of hills and valleys to the west of Hurricane Cliffs.

Starting in 1975, Walker says, the BLM tried its first hot wax collector. It consisted of a wedge-shaped, three-quarter acre slice of slope scraped clear of brush, rocks and grass. At the downhill apex, a funnel-type catchment directed water into a pipe that led to a steel holding tank farther downslope. From the tank, a float valve fed water to stock tanks below (see Fig. 1). The secret to the system was the hot wax spread atop the cleared earth making it impervious so that rain falling on the treated ground flowed down into the catchment rather than soaking into the soil.

According to Walker, this first hot wax collector performed at around 85 percent efficiency for several years, gradually declining to around 60 percent efficiency as the wax coating deteriorated. Recently wax was reapplied and the system's efficiency has returned to the 85 percent level.

"Everyone knows we're in the business of helping cattle growers," he adds, "but we shouldn't forget that our concern is with the total resource, including wildlife."

"This is the simplest and cheapest collection system we've got," says Walker," and it's also one of the most efficient. Not far from the hot wax collector, Walker showed the UA team a bitum collection system. Installed in 1976, the bitum system uses a fiberglass-based cloth coated with an asphalt-type material in the catchment area. More durable than wax, the bitum is also more expensive. This collector cost slightly more than $25,000 to install. The steel tank and its installation were the most expensive components. The bitum collection apron cost about $6,000.

Though more expensive, the bitum collector is more efficient than the hot wax collector. Walker calculates bitum efficiency at between 90-and-95 percent. Over the years since its installation, efficiency with this system

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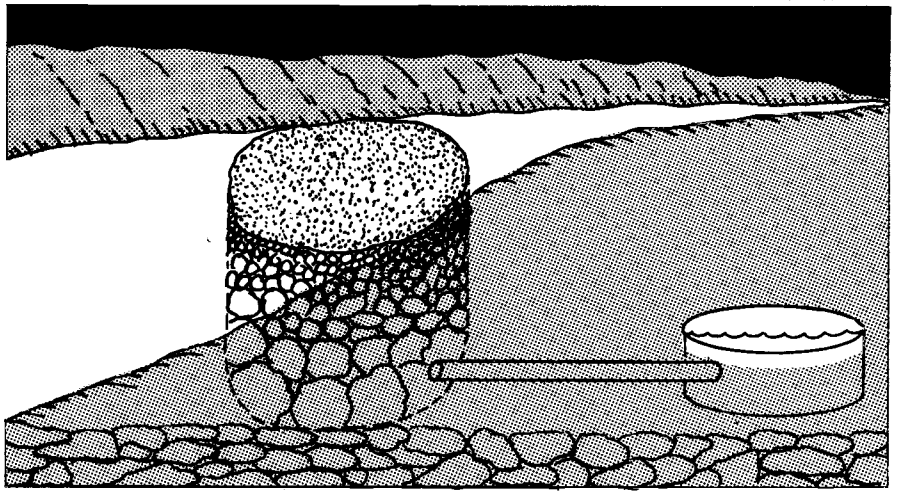


Fig. 2—Illustration of a sand spring subsurface catchment.

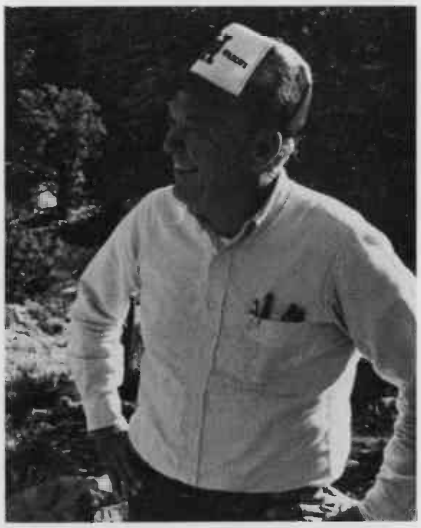
has declined only slightly to about 80 percent where BLM specialists expect it to remain, so long as the collection apron remains intact. Four years after initial installation, the bitum collection apron was expanded by 25 percent to cover three-quarters of an acre total.

Still another collection system uses nothing more than a basketball court-size catchment made of corrugated steel. At its lower end, a steel trough collects rainwater and serves as a "header," feeding the collected water into a large pipe which carries it into a storage tank down slope. The water is then fed through float-type valves to watering tubs for the stock and wildlife (see Fig. 1). Regardless of which material is used, these surface collection systems all work on the same principle and they all suffer the same shortcoming. The collection material is either too delicate (as is the case with wax), or too expensive (as with bitum collectors).

"That's one of the things we're working on....or will be working on," says Dr. Niel Biggs, UA Extension irrigation specialist. "We need to develop some collection material that's easy to transport, easy to install, safe for the environment, efficient and inexpensive." Biggs is working with Matlock on applications of small scale water management in Arizona agriculture. Their three year study began in July, 1986 with funding from the Experiment Station at the UA College of Agriculture.

Some miles to the southwest of St. George, the team was shown a "sand spring" type of water collection system that doesn't depend on surface catchment at all. Slice them in cross section and many stream beds in the Strip country present the same profile. Usually the stream bed is composed of course sand. At varying depths beneath the sand is bedrock. "These streams may flow only 10 percent of the time or less on the surface," Matlock explains, "but dig down to bedrock and you often find water flowing 30 percent of the time or more." The Paiute understood this and took advantage of it.

At Cedar Wash, the BLM recently installed a test sand spring system that taps this residual underground flow.



Dr. W. Gerald Matlock, UA agricultural engineer.

After selecting a suitable location, BLM engineers dug a large pit through the surface sand down to bedrock. In the bottom of the pit they laid one end of a PVC pipe, covering it with large rocks. Then, layer upon layer, the larger rocks were covered with successively smaller rocks until the pit was filled at the top with a layer of sand (see Fig. 2).

The PVC pipe was led from the pit downslope and into a catchment tank built off to one side of the wash. These tanks are made of galvanized steel from sections that are small enough to be easily handled. The sections are bolted together with a pliable sealant at the joints to prevent leakage and mounted on a base of compacted soil. The Cedar Wash sand spring was built for a cost of about $4,000 with the bulk of that going for the tank.

"When you think about it, that's not a high price to pay at all," observes Robin Grumbles, Mohave County Extension agent. "The rancher here used to spend $3,000 a year on gasoline alone hauling water to his stock, so to him, in fact, this will represent quite a savings over time."

Grumbles and other Cooperative Extension Service agents in the West are working with university researchers toward perfecting practical applications of such small scale water collection systems.

In Coconino County, Larry White, county Extension director, is doing applied research on reducing competition for water among plants so as to make more forage and browse available to livestock and wildlife. "By utilizing these two methods together," says White, "I think we can make this kind of country a lot more productive for livestock and a lot more hospitable for wildlife."

The water collection systems designed and installed by the BLM make special provisions for wildlife. In addition to water troughs for livestock, specially designed, ground-level basins allow wildlife to drink at a comfortable distance from the livestock tanks.

"That's something we don't want to loose sight of in researching these systems," says Dr. Roy Rauschkolb, director of the Cooperative Extension Service in Arizona. "Everyone knows we're in the business of helping cattle growers," he adds, "but we shouldn't forget that our concern is with the total resource, including wildlife."

"One problem we've got with all these collection systems is evaporation," says Stephan Campbell, Washington County, Utah Extension agent, as he walks up to a holding tank near the hot wax collector. "We've experimented around with various kinds of covers for these tanks....but none of them seems to last."

Tearing into a sun-decayed fragment of synthetic found floating atop a holding tank, Matlock ponders the problem. "You know it's just criminal to put so much effort into collecting water and then let it slip out of your hands this way." Matlock says anywhere from three to five feet of water is lost in a tank each year from evaporation. Slowing that loss, or bringing it to a halt, will be part of the team's research goal. For the Cooperative Extension people, the goal will be to convince ranchers water collection systems can be beneficial to their livestock and to the wildlife resource. "It's clear that no single agency has the human and capital resources to be able to work with such a massive expanse of land, animal and vegetative resources," says Rauschkolb," and so we have to share our expertise and work together to protect these resources and to preserve them for future generations."