

# Divining Jordan's desert waters



The Jordian badia basaltic desert. (Photo courtesy of Brenda Buck)

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*Stephen Dale*

To most people, a desert — by definition — is a place where water is practically nonexistent.

But a team of researchers studying Jordan's *badia* — a large desert in the country's northwest corner — has uncovered a secret moving slowly beneath the area's vast arid expanses. Using satellite photos, knowledge of the local geology, and a dash of intuition, the researchers have discovered a system of shallow aquifers that may provide a vital source of water to the semi-nomadic people who inhabit the area.

As in any delicate ecological setting, there are concerns that overuse of this precious resource could have a destructive environmental impact. But [Dr Nizar Abu-Jaber](#), a geologist at [Yarmouk University](#) in Irbid and leader of the research project supported by Canada's International Development Research Centre (IDRC), says his team will be able to determine the amount of water, define a sustainable rate of use, and put a system of safeguards in place to maintain the aquifer.

## Traditional conservation

According to Dr Abu-Jaber, local inhabitants have traditionally managed water carefully. He points out that people in the area have a long history of being water-conservers, and the idea of using the new resource sustainably would not be foreign to them.

"I think there is an awareness that if you use this at too rapid a pace," he says, "very quickly it will become depleted. So its not something people would be too tempted to overexploit."

## Accidental focus

Dr Abu-Jaber says the project was devised almost by accident. The geologist was interested in examining how water moves through various materials (such as sand, silt and rocks) and what impact these processes have on recharging the deep aquifers that lie hundreds of metres below the surface. When someone in the area remarked that there are locations in the *badia* where water can

be gathered from shallow sources, new possibilities occurred to him. If these sources of water could be demonstrated to be fairly widespread, it might be possible to tap them for use by local inhabitants.

So Dr Abu-Jabar and his team began scouting for locations where drilling was likely to uncover these shallow reserves. Since disused wells and cisterns indicated that local citizens had exploited these water reserves in the past, the researchers began with the knowledge of the local residents. They then studied satellite photographs to see where plant growth was thicker and where specific geological features were present. Ten promising sites were pinpointed; drilling revealed significant quantities of water in two of them and nominal amounts at two others. The success rate in this first try was high enough to convince researchers that these shallow aquifers may indeed provide water at many locations across the *badia*.

## **Defeating evaporation**

What accounts for the unlikely presence of water a short distance below the surface of the desert? Mostly a quirk of the local geology. The section of the *badia* that Dr Abu-Jabar examined is covered by an ancient, volcanic rock called basalt. This basalt has been broken down into chunks of rock whose round shape that allows water to roll off into the materials underlying the surface.

These rocks play a critical role in the collection of rain. When a desert cloudburst drops rain on the area, the raindrops quickly roll down into a cool layer of silt and sand, which is not only sheltered from the sun but protected from compaction by the rocks above. They eventually filter down towards the shallow aquifers below the desert floor. The result is a very high level of infiltration, with up to 80 percent of rainfall flowing through into the aquifers. In most deserts, by contrast, most of a rainfall could be expected to evaporate immediately: an infiltration rate of 20 percent would be considered high.

## **Helping people live better**

Finding local water sources could have a strong beneficial effect on the region's development.

"Most of the Middle-East is short of water, but Jordan is desperately so," explains IDRC water expert [David Brooks](#). The amount rain the country receives every year is well below what is needed to sustain agriculture.

In the inhospitable climate of the *badia*, the situation is even more critical: local residents eke out a living by keeping mixed flocks of sheep and goats. Increasingly, they have been giving up their nomadic lifestyle to settle in tiny villages, and travel from this base back into pasture land with their flocks. This means that they now require a ready source of water for domestic purposes as well as for animal and human consumption. "The original idea was to get a little more water for the flocks, and to irrigate some home gardens," says Dr Brooks.

Dr Abu-Jabar concurs that there were never any illusions the project would uncover vast amounts of water — just enough to bring about small, local improvements. "It's not that we have any dreams of building Las Vegas out there," he quips. "Its more a question of helping the local people live a better life."

## New insight into desert life

The remarkable discovery of an unexpected water source in the *badia*, believes Dr Abu-Jaber, will be of great value as researchers wrestle with other, somewhat theoretical questions about the geology of deserts, and more practical ones about how humans can survive there.

For one, knowledge of how the *badia*'s shallow aquifers work might help scientists broaden their geographic focus — allowing them to look for water in other areas where similar geological conditions exist, both within Jordan and in other desert lands. As well, the researchers new understanding of how surface geology alters the flow of water suggests that the terrain in some places could be altered to encourage the infiltration of water. "If you do really simple modifications," explains Dr Abu-Jaber, "like building small retention dams, you might be able to encourage much of this water that's lost to recharge into the subsurface."

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