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## Extreme Digging

By Melanie Lenart | August 13, 2012

I thought I was leaving the extremes of the southwestern desert behind as I traveled to the so-called temperate climate of the Midwest and the balmy tropics of Puerto Rico. But those areas, like much of the country these days, faced the kind of weather extremes that exemplify what's ahead as the world warms.

The hot droughts I saw in progress in Ohio and Indiana reminded me of a southwestern June. While attending a family reunion in Indiana in late June, I could almost hear the parched remnants of grass crackling as I walked across their yellow expanse. Grassy Creek, as named by my grandfather, had become Crunchy Ground.



Around Fort Wayne, Indiana, grass cover was disappearing in face of the ongoing hot drought. Photo by Melanie Lenart

I started to think that the Midwest, where I grew up, could use a lesson from Arizona when it comes to shaping the landscape to collect and store water. The

feeling that more places could benefit from southwestern approaches got stronger as my journey carried me on to Puerto Rico. Tucson, where I live now, averages only about 12 inches of rain a year – with half of it coming in flood-provoking rains during the summer monsoon.

In Tucson, we're happy to have even dry grass underfoot (as long as it's native). Much of Arizona's ground cover consists of bare dirt. This year, with triple-digit days starting in April, Tucson was [competing to beat its own annual record](#) of 99 days topping 100 degrees Fahrenheit. That's one of the reasons we have bare ground and cactus, and few farmers who would gamble on growing crops without irrigation.



Some Midwestern corn, such as this patch in Ohio, was recovering thanks to recent rains, but yields were expected to remain low. Photo by Melanie Lenart

The Midwest's plants and people aren't used to triple-digit heat, although some of them have certainly been learning to endure it. Around Fort Wayne in northern Indiana, my mom has struggled through [three solid weeks](#) of temperatures in the 90s or more, with humidity that wilts people but doesn't rescue plants. [Four days in a row](#) reached 100 degrees.

Many midwestern corn plants had lost their will to live, or at least produce. By late July, the U.S. Department of Agriculture was projecting [that yields from](#) the stunted plants in Indiana and Ohio would roughly a third below the previous year's bounty – and that was taking into account mid-month rains that had provided some relief.

Soon after my trip through the Midwest, I headed south to the humid tropics of Puerto Rico. A Caribbean island

about a thousand miles south of Florida, Puerto Rico was on the tail end of what the National Weather Service had declared its [hottest and driest](#) June on record. Like Indiana, the island had been facing a series of 90-plus days – and nights. You'd have to have warm nights, too, to get an average monthly temperature of 85.7 degrees. That's hot even for a tropical island in summer.

Puerto Rico's plants can handle the heat, but only because of high rainfall rates. Bamboo, vines and fast-growing trees abound in the El Yunque rainforest at the island's northeast corner. On Big Tree Trail, a rusting plaque announces that the average year brings 120 inches of rainfall. That's ten times Tucson's annual tally.

The trace amount Puerto Rico received in June – [a mere 0.16 inches](#) – is not enough to sustain the lush greenery found throughout the island, roughly equivalent to 35 by 100 miles in size. By late June, palm fronds and ginger leaves had browned with sunburn. The tire-sized leaves of an entire Cecropia tree had become dried-out husks that, even so, continued to shade the trees around it. They remained green, as did most of the vegetation I saw.

But with soil moisture evaporating by the hour and no clouds to temper the solar-powered blasts of heat, how much more could these tropical plants take before they started to drop out of the genetic race for a piece of the landscape?

Fortunately, I didn't need to find out on this trip. The day I arrived, June 26, we got a brief shower. After another



Leaves of some ginger plants in Puerto Rico turned brown during the hottest, driest June in the island's record. Photo by Melanie Lenart

week of sparse but occasional rainfall in our corner near the El Yunque rainforest, the clouds kicked into the type of action I remembered from my years in the 1990s of living on this



This river in Puerto Rico, the Rio Piedras, was calm in July of 2012. But it often floods nearby neighborhoods during heavy rains. Photo by Melanie Lenart

enchancing island. Thunderstorms drifted in and out, watering the plants and giving the sun's rays something to do with their energy besides heat the ground. Evaporating water takes a lot of power.

On the evening of July 20, a day of luxuriant rainfall in lengthy downpours, I found about an inch and a quarter of water in the empty dish of the cat who had taken breakfast on the roof. That's an informal measurement to be sure, but the National Weather Service noted nearby San Juan had [broken a rainfall record](#) for that day, with 1.14 inches measured.

Now we had to start worrying about the other extreme.

I was reminded of this while attending a ceremony celebrating the re-opening of the International Institute of Tropical Forestry building, located within the University of Puerto Rico Botanical Gardens. As IITF Director Ariel Lugo reminded, too much rain was a more typical problem for this site, which drains into the flowing Rio Piedras and a barrio known as Puerto Nuevo.

"Every time it rains a lot in San Juan, we all know that Puerto Nuevo floods," Lugo told the hundred-plus people attending the ceremony. "And there's a lot of loss of property and people's time and suffering bound in the floods to the coastal zone of Puerto Nuevo."

I knew this firsthand from my years of working in a nearby building, then occupied by San Juan Star reporters and staff. An inch or so of rain soon collected into knee-high water in the streets, making driving down the highway an adventure in navigation.



This detention pond on the grounds of the International Institute for Tropical Forestry in Puerto Rico will help reduce flooding of nearby neighborhoods. Photo by Melanie Lenart

People and politicians regularly push to reduce the risk of flooding by channelizing the river's banks and, in fact, had begun to take this artificial approach further upstream. But Lugo and others involved in the building reconstruction project decided to take a more natural approach on their piece of the landscape.

“We have been conspiring with the university to try to figure out more ecological ways of resolving that problem,” he said. Preparing people for their coming tour of the site, he added, “So when you walk through, you will see these ponds that we’ve created around the building. And you will not see the construction that is going on behind, which is a green parking lot.”

The parking lot will look like a lawn from the distance, he explained later, with foot-long concrete squares practically invisible between the grasses growing around them. The building will be topped off with a green roof, too. With all the greenery to soak up rains and the ponds capturing most overflow, the site was designed to withstand up to three inches of rain in a day without contributing floodwaters.

The natural beauty of this approach becomes even more stunning in the context of the extremes facing much of the world in these days of changing climate. It’s a form of flood control that doubles as protection from damaging drought.

During heavy rains, the greenery and contours in the landscape slow runoff, reducing the risk of floods. During dry times, the contours can help store any incoming water on the landscape, giving greenery a better chance of staying alive until the rains return.

In Tucson, pioneering landscapers have been advancing a low-tech but highly successful approach toward [rainwater harvesting](#), using gullies and gutters to channel water from nearby land and roofs toward plants. Mesquite trees can thrive, and sometimes even water-hogging citrus. People also have been cutting their curbs to bring in some of the bounty flowing through the streets during the rare but often spectacular desert rains.

The water-harvesting approach often boils down to creating contours to guide the movement of water, then planting in the low-lying portions of the landscape. And, just as Puerto Rico’s flood control approach can help during drought, Arizona’s water-harvesting techniques can help during heavy rains, such as the intense storms of the summer monsoon.



Brad Lancaster, author of a series of books on rainwater harvesting, shows a curb cut that allows water to flow from the street into the walkway of his Tucson home. Photo by Melanie Lenart

More of the world is facing the kind of hot droughts and intense rains once relegated mainly to desert lands or tropical realms. Because of this, more of the world's people need to adopt some of the techniques desert dwellers and tropical islanders use for surviving extreme weather. One of them is creating holes to collect and store water: digging by design.



**About the Author:** Melanie Lenart is an environmental scientist and writer who lives in Tucson, Arizona. She initially came to Tucson to continue her studies in forests and climate, and in 2003 received a Ph.D. in Natural Resources with an emphasis in Global Change from the University of Arizona, where she now works on a variety of climate-based projects and teaches environmental writing. Her 2010 book *Life in the Hothouse: How a Living Planet Survives Climate Change* takes a Gaian view that the Earth is a living system to explore the interactions between plants, climate and the landscape. For more on her, see [www.melanielenart.com](http://www.melanielenart.com). Follow on Twitter [@MelanieLenart](https://twitter.com/MelanieLenart). Follow on Twitter [@MelanieLenart](https://twitter.com/MelanieLenart).

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