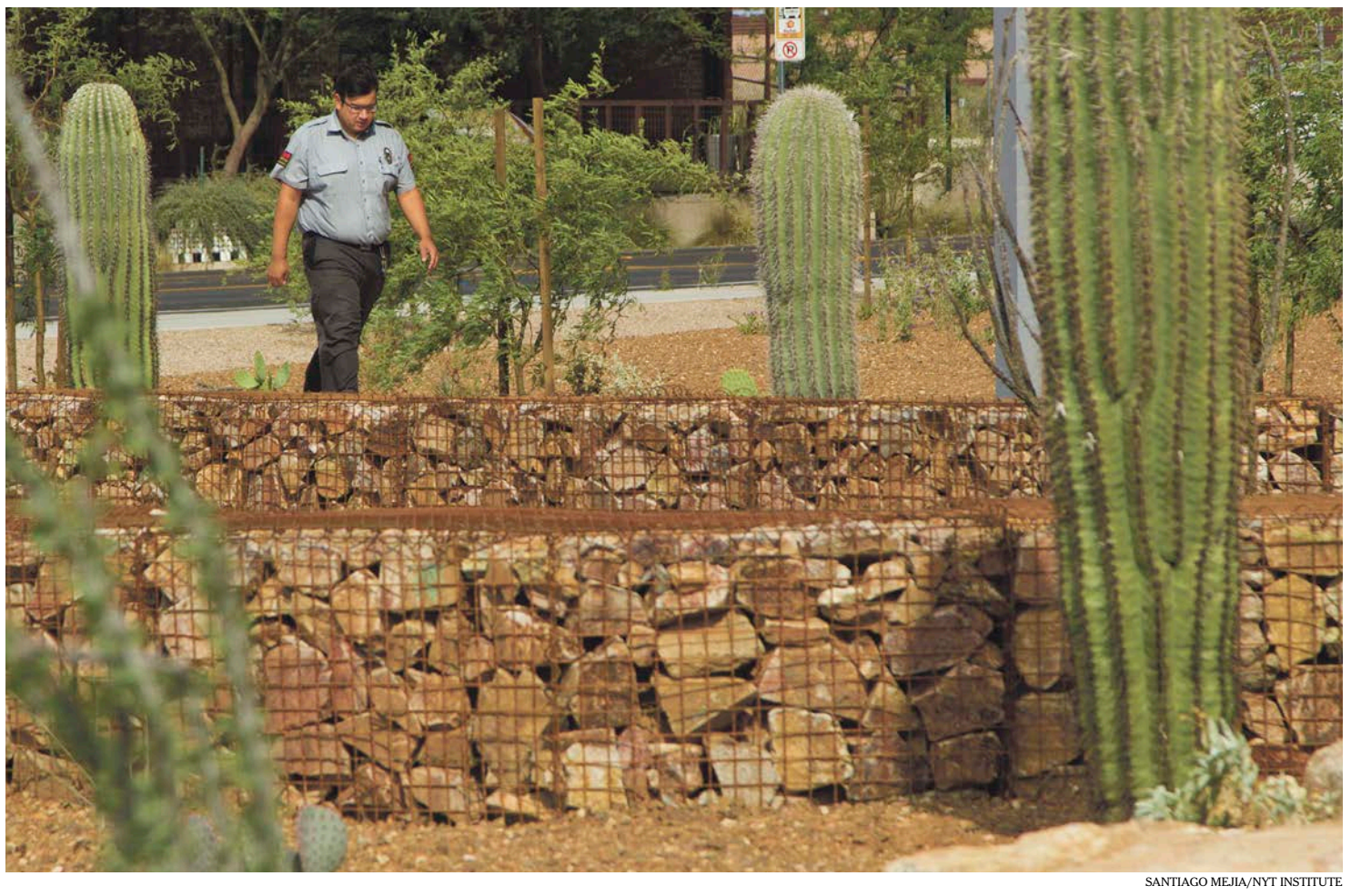
# *Water Conservation: Seeking Solutions That Will Last*



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An underground irrigation system, instead of sprinklers, hydrates a cactus garden at the County Public Service Center in Tucson.

**By KAYLA SAMOY**

The dire predictions grow worse each year: Arizona and the six other states that draw their drinking water from the Colorado River are facing an increasing demand and a dwindling supply.

In the Tucson area, a 15-year drought forced the city to use less and conserve more.

Mayor Jonathan Rothschild said Tucson is using less water than it did 20 years ago, even as its population has grown by 200,000 since then. It has focused on conservation efforts, such as persuading people to switch to more-efficient toilets, making landscaping choices that use less water and encouraging rainwater harvesting.

But house-to-house conservation is "a losing strategy," according to environmental officials and consultants, who say lasting solutions will come only from ambitious and far-ranging applications. Throughout Tucson, researchers and scientists are investigating some of these, as well as the impact they may have on the way residents live and eat and the environmental choices they make.

Among the more promising approaches are reclaimed wastewater, products to fight off the high evaporation rates in Arizona and research on propagating plants that use water more efficiently.

Each summer for the last five years, Shane Snyder, a professor of chemical and environmental engineering at the University of Arizona, has made the 20-hour trek to Singapore, a world leader in recycling wastewater.

Mr. Snyder, who is also a director of the new Water and Energy Sustainable Technology Center, has a particular interest in the innovations that Singapore has achieved with NEWater, the country's recycled wastewater that is bottled and safe to drink.

"Water reuse is so important," Mr. Snyder said. "We need to get as much mileage from the water we get as possible." He said this was important because water is scarce and it takes a lot of energy to transport it to users.

Technology available today is capable of taking water from any imaginable source and, with enough treatment, making it pure again, Mr. Snyder added.

One of the biggest challenges is public perception.

"We need to try and get people to not think about the water's history and where it comes from, but think of the water's quality," he said.

Though Singapore copied American water technologies, it was more open about its procedures, which helped the effort to gain public acceptance and turned NEWater's facilities into a tourist attraction: There are public tours, which explain the water recycling process.

Beyond convincing the public to move past the stigma of drinking reclaimed water, another challenge is the life cycle of the purification equipment. Mr. Snyder said that after a year or two, problems can develop because membranes involved in the filtration system have a short lifespan.

In Tucson, each lake and other large body of water is estimated to lose 100 inches of water annually to evaporation. From an uncovered swimming pool, that could mean up to six feet of water lost every year.

An associate professor at the University of Arizona, Moe Momayez, has been developing a product called Hexocover since 2008 to help fight the evaporation. Hexocover is a hexagonal-shaped floating cover made from recyclable plastic. It is used to reduce evaporation in mining plants so that more water is left to be pumped back through the plant, which cuts down on the water drawn from the Colorado River or aquifers.

Through testing, the Hexocover company discovered that covering a majority of the surface of a body of water can reduce evaporation up to 85 percent. The covers are also designed to double as solar panels, generating energy. The interlocking design enables users to take out individual panels for maintenance. Mr. Momayez said the panels can be left in bodies of water for long periods of time. The two-layer design allows for the panels to stay afloat more easily, with wind passing through the gap between the layers, which pushes the panels down instead of blowing them away.

The company's main clients so far have been large corporations as well as municipalities, some overseas in South Africa, China and Chile.

"We hope to market the product for any kind of open body of water — lakes, storage facilities and pools," Mr. Momayez said. The element of solar energy and the convenience of controlling the panels through a cellphone app make it more attractive than the typical swimming pool tarp, he added.

Agriculture is the biggest user of water in Arizona by far, consuming about 60 percent. Alfalfa is a particularly thirsty water guzzler. David Galbraith, a professor in plant sciences at the University of Arizona, said there are some places where alfalfa "is growing to the extent that you can feel the humidity in the air across the growing area." Pecans, a large crop in southern Arizona, are very inefficient water users, requiring large amounts for optimal growth and fruit production.

"It seems somewhat ironic that even if cities are using basically no water at all, we still have a water problem because of agriculture," Mr. Galbraith said.

One way to address the problem is to try to isolate the plant genes involved in responding to drought and salt conditions. An understanding of the genes and how they work together, Mr. Galbraith said, would possibly allow the engineering of more drought-tolerant plants. But creating more-efficient plants is much harder than many initially anticipated.

But these approaches will take time, Mr. Galbraith said, because genetically engineered crops take many breeding generations to develop.

"The bottom line in all of this is that life is turning out to be more complicated than we ever dreamed," Mr. Galbraith said.

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Elbit Systems of America has a $145 million contract to build surveillance towers like this one it built near Nogales, Ariz.

# *U.S. Expanding High-Tech Monitoring at Border*

**By ALEXANDER COREY**

Drones and other border-surveillance technologies used to detect migrants have repeatedly been found ineffective in United States government audits, but Customs and Border Protection, with congressional support, is working to expand the use of those technologies.

Over the past 18 years, two programs that used surveillance towers and ground sensors have been scrapped. Last year, another program, the Arizona Border Surveillance Technology Plan, was criticized by the Government Accountability Office.

And in December, the Department of Homeland Security found that Border Patrol's drone program was ineffective and recommended that no more drones be purchased until a review was completed.

But new towers are being built, and Congress is considering a measure to mandate more drone surveillance flights along the Southwest border.

The issue of border security in Arizona has a long and fraught history. Border Patrol spent $3.6 billion last year and intercepted about 479,000 migrants along the southwest border, according to Homeland Security. Border Patrol said it cannot estimate how many undocumented migrants are not caught.

Border Patrol uses a number of technologies, old and new, for monitoring. Horses and tracking dogs have been joined by drones and surveillance towers over the past two decades. These technologies pair with vibration sensors and trucks with mounted sensors, which have been in use since the Vietnam era.

But given their expense, these surveillance programs have been criticized as ineffective. In fact, some yield too much unnecessary information — animals and certain weather conditions set off false alarms, according to a Homeland Security Inspector General's audit.

In that audit, which examined the drone program over eight years, Border Patrol's parent agency, the Department of Homeland Security, said that Border Patrol should abandon expansion plans and put future funds to better use.

In place of a proposed $443 million program expansion, the audit urged further study of the drones' cost effectiveness versus alternatives like additional manned aircraft and more officers patrolling on the ground.

Yet Congress is considering the Secure Our Borders First bill (H.R. 399), which would mandate more flight time for the drones. Representative Martha McSally, an Arizona Republican who is a co-sponsor of the bill, said that the drone program could work but that the department needed to "adjust their strategy as opposed to just throwing more hours at the current way they're doing business."

A combination of technology and other resources such as foot patrols, vehicle patrols and manned aircraft would lead to a better outcome, Rep. McSally said in an interview on Monday.

"It's not a one-size-fits-all," she said. "It depends on what the terrain is like."

Border Patrol officials echoed Rep. McSally's assessment of surveillance practices. "They all have their uses, and so to compare them wouldn't be fair regardless," said a spokesman for the Tucson Sector Border Patrol, Mark Landess.

The drone program was begun in 2005 with the intent of cutting border-security costs in the long term. Border Patrol sent camera-equipped drones to check out vibration sensors ahead of agents on the ground, but the recent audit found the results unimpressive.

The audit also said drones accounted for less than 2 percent of apprehensions in 2013 in the Tucson sector.

Responding to the Homeland Security audit, a spokesman for Border Protection, Carlos Lazo, said on Monday that the apprehension data was flawed because drones receive credit only if they remain at the scene, and most are constantly soaring and scouting.

Mr. Lazo said that Border Protection had no plans to expand the program beyond replacing a drone lost last year when it crashed in the ocean near San Diego, Calif., after a malfunction. In April 2006, another was lost when it crashed into a hillside near Nogales, Ariz.

From 2005 to 2013, Border Protection spent $360 million for the purchase, support and maintenance of the drones, the Inspector General report said.

The other key technology used along the border involves surveillance towers. Since 1998, two large-scale surveillance programs costing more than $1 billion have been canceled. Their successor, the Arizona Border Surveillance Technology Plan, started in 2011, adds more surveillance towers, remote video surveillance and mobile surveillance.

A 2005 Inspector General report described the 1998 Integrated Surveillance Intelligence System as hindered by delays and cost overruns. The Secure Border Initiative, which took its place, was intended to cover the entire Southwest border with surveillance towers. It was canceled after "repeated technical problems, cost overruns and schedule delays," according to a 2011 statement from the Department of Homeland Security.

And recently, the Government Accountability Office criticized the latest program for failing to prove whether new surveillance technologies helped in apprehensions or drug seizures.

But last year, Elbit Systems of America, a subsidiary of an Israeli-based defense company, was awarded a $145 million contract for surveillance towers.

Joshua Garcia, a member of the Tohono O'odham Nation who lives in Tucson, said that over the past 10 years he had noticed more surveillance near the Coronado Forest, where generations of his family have picked acorns.

"Honestly, it feels like kind of like a violation of privacy," said Mr. Garcia, who said he is often stopped near the forest by Border Patrol. "If you're camping out, it always feels like you're being watched."

# *After Perilous Journey, Woman Gains Asylum*

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She keeps a natural look — hardly any makeup, simple clothes, the occasional ponytail. She tells a harrowing story, punctuated with a knowing smile.

The story starts in Guatemala City, in a poor family that could not accept that their son was transgender, a term that was unheard of in a macho culture.

She said she was sexually abused. Her mother, the only person who did not shun her, died when Ms. Bexton was 16. With nothing left in Guatemala, she walked for 15 days until she arrived in Chiapas, Mexico, 330 miles away. That is 22 miles a day, through trails hidden in the jungle.

In Chiapas, she climbed onto the roof of La Bestia, a train infamously known as the Beast or the Death Train. As many as half a million migrants from Central America ride La Bestia annually, according to the Migration Policy Institute, a Washington-based think tank. Many lose limbs or die from falling off — or are pushed off by gang members who try to extort migrants. Rape, kidnapping and gang recruitment are common.

La Bestia took her from Chiapas to San Luis Potosí, in central Mexico, after other stops along the way.

"We looked like flies on a chunk of meat on that train," she said. "But I learned how to be a humanitarian because of La Bestia."

She said she often helped people who had been injured on the train and took time between stops to volunteer at shelters that provided health care and food for passengers.

But San Luis Potosí was her last stop. Ms. Bexton, who was 21 at the time, could not bring herself to jump back on the train after what happened next.

In San Luis Potosí, she was captured by the police. She said the officers tied her up and raped her repeatedly for four days.

"It was in a cemetery," she said.

She chewed through the ropes they had tied around her wrists. Naked, she ran away to a nearby house, where a woman gave her clothes. Then she took to the road again, this time by bus. She arrived in Sinaloa in northern Mexico, where she was arrested by Mexican immigration officials and was deported back to Guatemala.

"It was like I kept waking up in the same nightmare over and over," she said. "After everything, I couldn't believe I was back in the hell I started in."

Immediately, she started walking to the United States again. This time after she arrived in Chiapas, she did not board La Bestia, instead she took a bus to La Paz, in northern Mexico. From there she walked for several days into Texas, crossing at Laredo, where she was picked up by United States Border Patrol agents and sent back to Guatemala again.

Again she started walking. In Chiapas, she took a bus and crossed the border by the Colorado River in western Arizona. There, she approached Border Patrol agents and asked for asylum, aware that people who could prove persecution could qualify for that protection.

The agents questioned her for several hours and later sent her to the Florence Detention Center, a men-only federal facility in Florence, Ariz., between Phoenix and Tucson. She was held there for six months, where she said she was often groped by security officials and was sexually abused by another detainee.

Yasmeen Pitts O'Keefe, a spokeswoman for Immigration and Customs Enforcement, said in a statement that all sexual abuse allegations are investigated and that action is taken if the allegations are substantiated.

On April 22 at 6:45 p.m., Ms. Bexton's new life began. Two lawyers working pro bono on behalf of transgender immigrants argued successfully that she dealt with persecution in Guatemala and Mexico, and an immigration judge in Tucson granted her asylum.

"I'll always remember the exact day and time," she said.

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Ashlé Nicoll Bexton, who is transgender, came from Guatemala.