

# SAVING IRAN'S GREAT SALT LAKE

Stopping Lake Urmia from turning into salt desert is the country's top environmental priority

By Richard Stone, at Lake Urmia, Iran



Lake Urmia's retreat has imperiled ecosystems and agriculture, and dislocated whole communities, in northwestern Iran.



PHOTOS: (LEFT TO RIGHT) ALESSANDRO MARONGIU/DENOTX; US DEPARTMENT OF THE INTERIOR/USSGS (2)

In a wetland dying of thirst, Hossein Akhani, a botanist at the University of Tehran, mourns a verdant past. “Fifteen years ago, the lake was here,” he says. “Every time I come back, the water is farther away.”

Lake Urmia, in Iran’s northwestern corner, was once the planet’s sixth largest salt lake, covering about 5200 square kilometers—a bit larger than the Great Salt Lake in Utah. Flamingos, egrets, and other waterfowl feasted on brine shrimp, and resorts catered to tourists who believed that bathing in the saline waters improves health. But after gradually receding for years, the water body that the local Azeri people once revered as their “turquoise solitaire” shriveled last year to a mere 10% of its maximum. Salt lakes pulse like lungs, swelling during wet periods and contracting during the dry season. But Urmia’s contraction at the end of 2014 was more like a death rattle.

“The crisis in Lake Urmia is clearly a disaster of hemispheric proportions,” says Brad Marden, an ecologist at Great Salt Lake Artemia in Ogden, Utah. He is one of several U.S. experts who traveled to Tehran in March 2014 for a brainstorming session, sponsored by Iran’s Environment Department and the United Nations Development Programme (UNDP), on how to rescue the lake. Like the Aral Sea, a better known vanishing salt lake in Central Asia, Lake Urmia is exposing a salt desert that generates noxious dust, threatening crops and people. Wildlife is vanishing, all the way down to its endemic brine shrimp, and recreation is also on the extinction list.

Some Iranian officials have tended to blame the weather—droughts and rising temperatures. But others concede that policy has had a major impact. Water management in the basin “has played the central role in the lake’s demise,” says Soroosh Sorooshian, director of the Center for Hydrometeorology and Remote Sensing at the University of California, Irvine. The three rivers that supply nearly 90% of the water flowing into Urmia have all been dammed for irrigation and hydropower. And groundwater recharge to those rivers has tapered thanks to an estimated 40,000

illegal wells that have lowered the water table, Iranian experts say.

A cure will be neither cheap nor easy. President Hassan Rouhani’s government plans to spend about \$6 billion over the next decade on Urmia’s revival—the largest environmental project in the country. In 2015, his cabinet approved \$660 million for 88 projects, most targeting better irrigation systems and other infrastructure. Other measures will follow, including water conservation, walling off and protecting arms of the lake to provide havens for wildlife, and steps to combat desertification. Still, more needs to be done, Akhani says. “Almost nothing is being spent on research and ecological restoration,” he says, or on paying villagers to quit destructive practices like grazing and mining near the lake. And whether Urmia can still be saved remains “the million-dollar question,” Sorooshian says.



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By 2014, Urmia had shriveled to a mere 10% of its maximum.

NEAR THE LAKE’S eastern edge, birds steer clear of a former wetland, now a blinding expanse of salt. Crunching across salt-crusted soil, Akhani heads to a still-moist area where clumps of sedges are making their last stand. He crouches and points out a few kinds of halophytes, or salt-loving plants. Then his eyes light up. “There it is!” he exclaims. “This plant changed my life.” As a student in 1986, he found this rare halophyte, *Microcneumum coralloides*, in a salt marsh near his hometown of Arak—a discovery that set him on a lifelong pursuit of halophytes. The marsh in Arak dried up, taking *M. coralloides* with it, but

8 years ago, Akhani happened on this population. Now, he says, “this plant has no future here.” He presses a sprig between sheets of paper, preserving it for study in Tehran.

Just to the west of Rahmanlu, a former port and resort on the former eastern shore, is one culprit in the lake’s decline: breathtaking fields of sunflowers. Before the 1979 revolution, the region grew grapes and made wine. After Iran became an Islamic republic, wine was forbidden. Farmers turned to thirstier crops, including sunflowers, wheat, apples, and sugar beets; to slake that thirst, authorities dammed local rivers for irrigation. Water-intensive crops

just 6% of the country. Chief culprits are forest conversion to cropland, logging, urbanization, and holiday villas. Wildfires have taken a heavy toll in recent years, especially in the Zagros Mountains and in Golestan National Park, Iran's first biosphere reserve and home to almost 20% of Iran's plant species. And a few years ago, Zagros oaks—which account for almost half of Iran's remaining forest cover—began succumbing to a fatal fungal pathogen, *Biscogniauxia mediterranea*, which causes a malady called charcoal disease. Meanwhile, Iran's Environment Department is attempting to block construction of two dams: Shafarud Dam in Gilan province, which would flood vast swathes of Hyrcanian relict forest, assemblages of tree species such as the Persian ironwood near the Caspian Sea; and Khersan-3 Dam in Chaharmahal and Bakhtiari province, which would submerge 2400 hectares of Zagros oaks.

#### A CHEETAH RACES EXTINCTION

Asiatic cheetahs once ranged from the Arabian Peninsula to India. Today, the critically endangered subspecies is making its last stand on the arid plains of central Iran. Fewer than 100 are left, Lewis says. Over the past decade, Iran's Environment Department, UNDP, and others have been working together to try to save the predator through the Conservation of Asiatic Cheetah Project. The project aims to crack down on poaching while curbing livestock grazing to restore cheetah habitat and boost the numbers of its prey, including the Jebeer gazelle and wild sheep. Project leaders say they want to balance habitat preservation with the needs of local villagers.

The hope is that the cheetah won't go the way of another big cat, the Persian tiger. This close cousin of the Siberian tiger went extinct in Iran 40 years ago. "The decline in the number of these beautiful animals may have stopped," Lewis says. Camera traps show an increase of cubs, and a survey is underway to get a better handle on numbers. Although the animal's fate still hangs in the balance, Lewis says, "I strongly believe that it is not too late to save the Asiatic cheetah." ■



At the northern end of Lake Urmia, Soroush Ebrahimi and his team are watering sand dunes with a bacterial medium that is meant to both stimulate plant growth and form a crust that stabilizes the dunes.

"quadrupled, if not more, water consumption in the region," Sorooshian says.

As the lake receded, winds blew salt onto the surrounding agricultural lands, poisoning the soil. "With agriculture under threat, livelihoods come under threat," says Gary Lewis, who represents UNDP in Iran and is the top U.N. official in the country. "As the sea has dried out, people moved away in the hundreds of thousands." (The same scenario played out at the dying Aral Sea in nearby Central Asia.)

To avoid a human and ecological crisis, Iranians "have to go after low-hanging fruits," such as stemming the diversion of water flowing naturally to the lake, Sorooshian says. Improved irrigation practices could reduce water use by 45% nationwide, easing demands on the lake's tributaries, says Masoud Tajirishy, vice president of research at the Sharif University of Technology in Tehran, which is implementing some of the restoration effort. A tougher task, he says, will be weaning farmers off water-intensive crops.

Equally tough will be deciding what to do about a 15-kilometer-long causeway built 20 years ago across a narrowing in the middle of Lake Urmia. Today, the causeway separates mostly dry lakebed to the south from a relict lake that resembles the Arctic Ocean—cerulean water dotted with what look like ice floes but are in fact islands of salt. "Interrupting the natural circulation had to have an impact" on the lake's resilience, Sorooshian says.

Yet to prevent desertification from taking over the entire lake, engineers are contemplating further barriers to seal off its salvageable arms. Brine shrimp could be revived

inside the embayments, possibly attracting back waterfowl. The strategy has been in use for a century at the Great Salt Lake in Utah. Akhani and other ecologists vehemently oppose partitioning, however. "We have experienced the impact of the causeway," he says. "We have a saying in Farsi: 'A wise man does not fall in a well twice.'"

At the northern end of Lake Urmia, a man in a straw hat is trying a smaller scale remedy. He is watering a sand dune with a garden hose. Soroush Ebrahimi, an environmental biotechnologist at the Sahand University of Technology in Tabriz, takes a break from this seemingly Sisyphean task to explain. He's spraying a bacterial medium that is meant to stimulate plant growth; it also forms a crust that stabilizes the dune.

Ebrahimi's effort is one of five pilot projects on dune stabilization that are vying for a sizable share of the Urmia restoration funds. Kiumars Pourjebeli, a horticulturist in Jebel village, plucks small purple berries from a bushy plant, *Nitraria schoberi*, clinging to a dune. He is planting the seeds near other, naked dunes. "I'm trying to accelerate the natural process," he says. He offers a berry: "Taste it." It's very salty.

In June, Sorooshian brought over a group of 10 Iranian scientists and water managers for a whirlwind tour of three saline California lakes—the Salton Sea, Mono Lake, and Owens Lake—and the Great Salt Lake. The purpose was to show them "what experiences we have gone through in the western United States. ... Not to say, 'Hey, this is what you have to do,'" says Sorooshian, who is an Iranian-American. He, for one, is not ready to write Urmia's epitaph. "I'm optimistic," he says. "But we don't have much time." ■