

# {NOTEBOOK}

SCIENCE NEWS IN CONTEXT

## FRONTIER

## THE VANISHING ACT

The world's habitable spaces are under pressure. For those evicted by environmental change or conflict, is there ever any going back?

In the arid land of southeastern Iraq, where the Tigris meets the Euphrates, marsh lands are reappearing. The new growth is a result of a concerted effort to reverse the damage caused by Saddam Hussein, who during his regime, drained the wetlands, with the deliberate intention of destroying a vibrant ecosystem and driving away its human inhabitants.

Restoring the region's native ecology has been an important part of rebuilding Iraq, and newly released satellite photos reveal that much of the environmental damage can be repaired. But can the recovery of the land spur the recovery of a people? At a time when more and more people are fleeing uninhabitable landscapes, what becomes of the Marsh Arabs will reveal how the health of an environment affects the success of the society that calls it home.

The marshes of Mesopotamia have been home to the Marsh Arabs, or Ma'dan, for at least five millennia. The wetlands—originally almost as large as the state of New Jersey—are legendary for their fertility and biodiversity and may, some scholars say, have been the inspiration for the Biblical Garden of Eden. The Ma'dan, once half a million strong, were well-adapted to the habitat. They built floating islands, houses, and boats with mud and reeds and survived by fishing, hunting, and herding water buffalo.

But for Saddam Hussein, the territory was troublesome. It was a haven for anti-Hussein

rebels and difficult for the Iraqi army to control, says Azzam Alwash, an Iraqi exile and civil engineer who grew up in the region. After a failed Shi'ite uprising against his regime in 1991, Hussein began systematically destroying the swampy wilderness, building dikes, dams, and drainage canals that diverted water away.

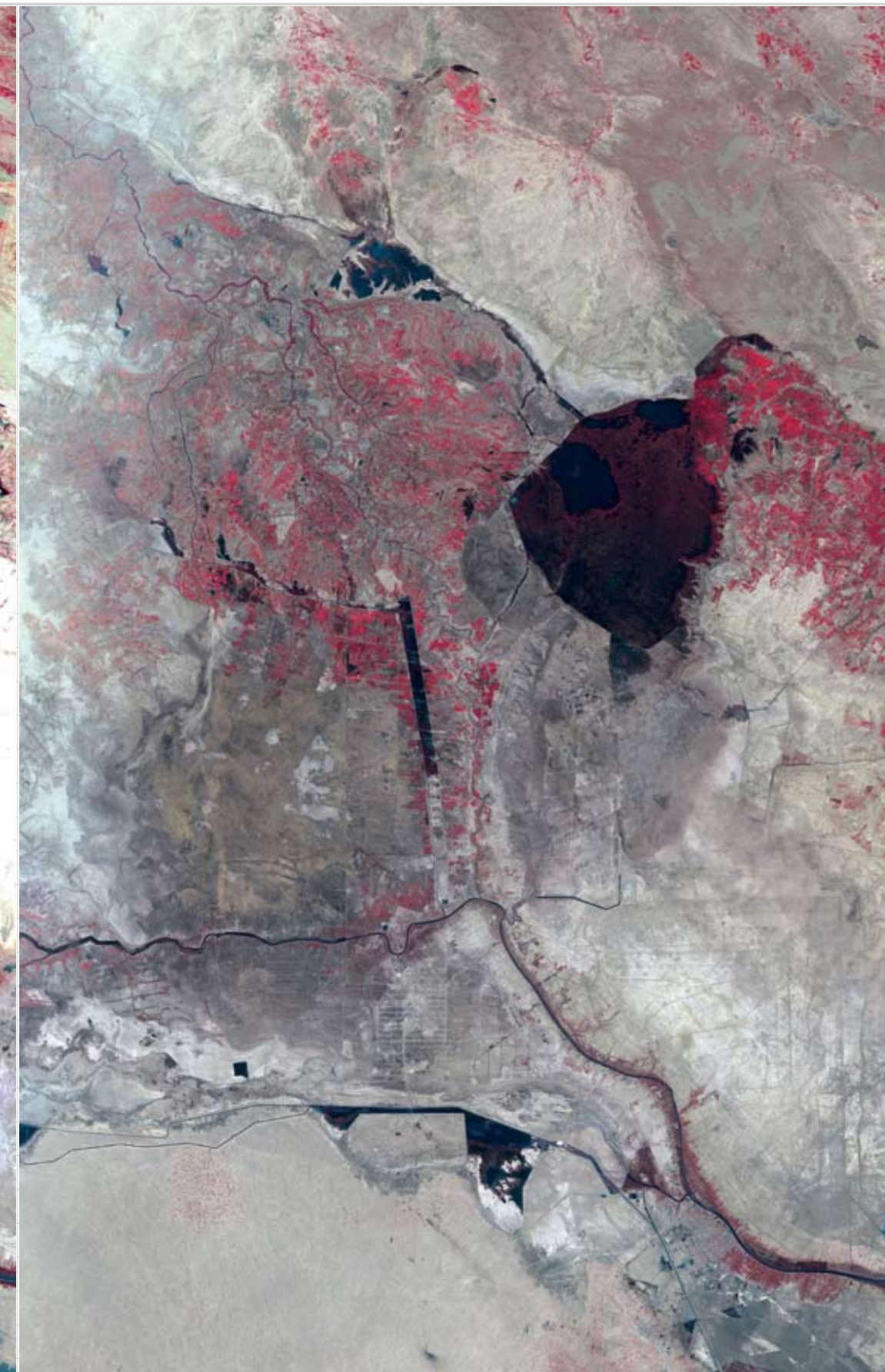
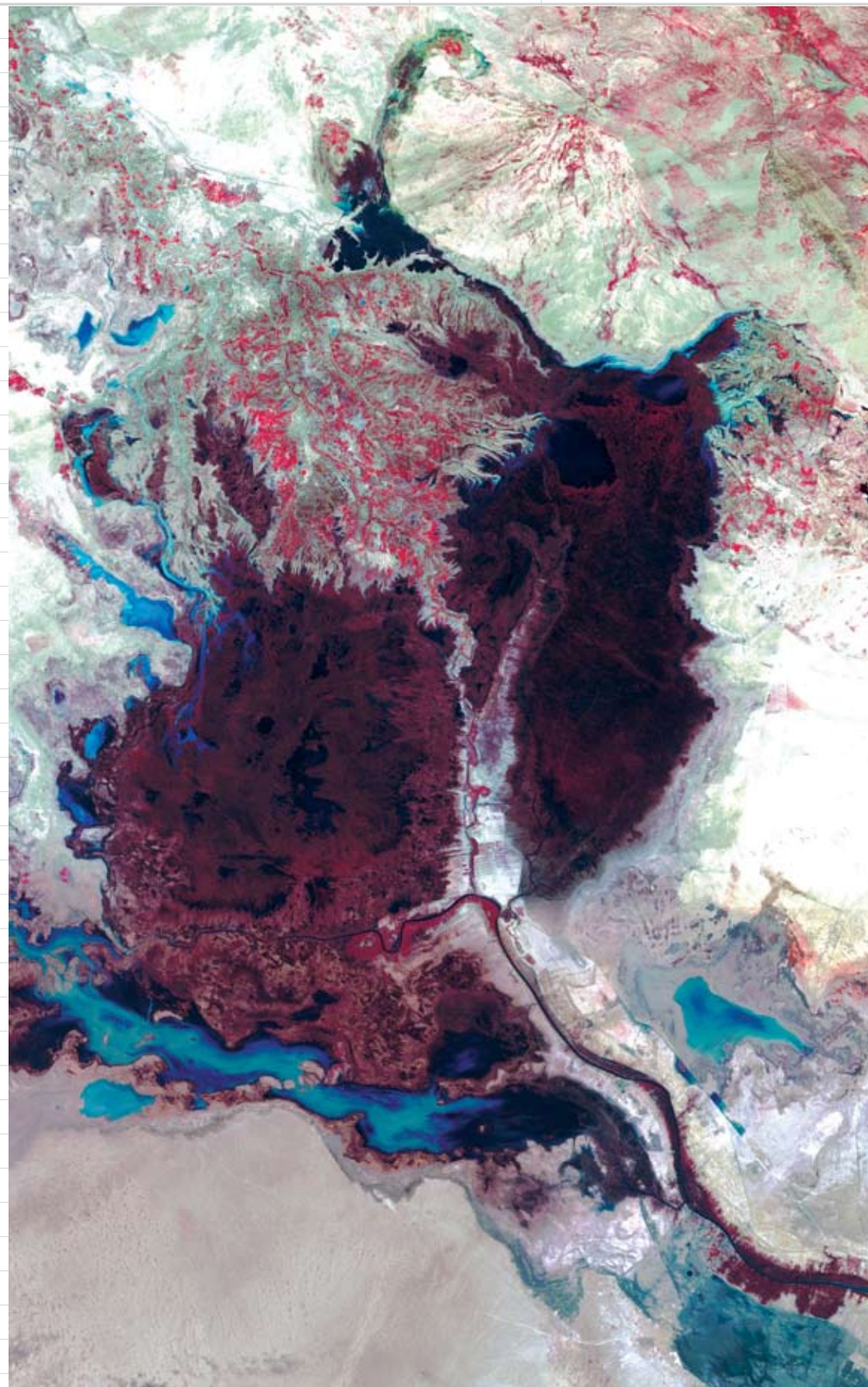
"Once you cut off the water from the marshes, they die a slow death," Alwash said. "Saddam could not wait for the marshes to die

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slowly. He started burning the reeds to flush out the resistance and kill all the wildlife so people would not have an ability to survive."

By 2000, about 85 percent of the marshes had been destroyed, replaced by barren land or expanses of salt crust, according to the United Nations Environment Program. And the Ma'dan had made their exodus. It is difficult to determine an exact number, but tens of thou-

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Satellite images show the Mesopotamian marshes in the 1970s (left) and again in 2000 (right), with densest marsh in dark red.

IMAGES COURTESY HASSAN PARTOW, UNEP

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sands of Ma'dan left Iraq for Iran, and hundreds of thousands were internally displaced. According to some estimates, as few as 20,000 may have remained in the marshlands.

The precise mechanisms by which environmental destruction becomes societal destruction are nuanced and varied. At the simplest level, deterioration of the land can ruin the natural resources that people require for day-to-day survival. But environmental ruin can also affect a society or culture in more complex ways. "There are some societies that are very, very tied to places, whose worldview, whose religions, whose social structures are

environmental damage and an easily observable example of the ties between ecological and societal survival. Not only did the Ma'dan use the land for subsistence farming and hunting, but also as the basis of their participation in the national economy (they wove reed mats for export to Iraqi markets) and their community structures (their villages were defined by close groupings of islands). The Ma'dan were therefore particularly susceptible to damage to their habitat.

"Saddam Hussein understood the value of the marshes and how integral and important they were to the people—so he destroyed them," said Michelle Stevens, an environmen-

tion. This attempt has been more successful than anticipated; in December 2006, satellite photos revealed that nearly 50 percent of the marshes had been restored.

But the survival of the wetlands is by no means guaranteed. The fires changed the soil chemistry, and, in some places, the now clay-like earth is unsuitable for supporting plant life. The restored land is patchy and unconnected, making the survival of native plants and animals more difficult. Some species have returned to the wetlands, but the biodiversity remains reduced.

What's more, dam-building and hydroengineering upstream from the region has disrupted the annual spring flooding—caused by snow melt in nearby highlands—that replenished soil and nutrients and washed salty water from the wetlands. "It's absolutely imperative in the marshes to have something like the floods, otherwise you concentrate your salt and pollutants," Stevens said. Researchers at Eden Again are designing a model of a mechanical flooding mechanism that would simulate seasonal floods, but even this would not make all the marshes recoverable, said Alwash, who directs the project.

Regrettably, restoration of an environment is, according to Diamond, "not always" enough to bring a society back from the brink of collapse. Demographic studies have shown that many of the Ma'dan, particularly the young, do not want to return to the abject poverty of their homeland and see better opportunities in the resettlement camps, farms, or cities to which they fled. Though many refugees have returned—some 90,000 Ma'dan are now living in the marshes, Alwash said—the population remains at less than half its former size.

Given the circumstances, however, maintaining a smaller population could be the Ma'dan's best chance of success. Some intertribal conflict has already been reported as refugees return, and the decreased wetland area could spur fights for space in, and access to, the marshes. "We cannot afford to have more than 90,000 people depending on the marshes as their main source of livelihood," Alwash says. "It's not the marshes of the 1970s."

In some ways, such damage is never entirely reversible, and the Ma'dan may have to settle for what's salvageable. Many environmental refugees will never be able to restore the damage that drove them away—how do you *un*-submerge a Pacific island?—and those whose environments can be restored, will, like the Ma'dan, return to landscapes profoundly changed by historic and social circumstances. In the next decades, other environmental refugees may not be that lucky. —Emily Anthes

## Overpopulation, is precipitating problems like desertification, which is driving many people in Africa and China out of their homes, and climate change is poised to further swell the ranks of environmental refugees.

articulated through a relationship with the environment," said Tony Oliver-Smith, an anthropologist at the University of Florida who studies displaced peoples and the impact of natural disasters.

For these societies, an ailing environment can unravel the social fabric. In his book *Collapse*, an account of societies that have self-destructed after abusing their natural resources, UCLA geographer Jared Diamond illustrates how. Diamond, for instance, argues that environmental degradation contributed to the devastating ethnic warfare between Rwanda's Hutus and Tutsis. Overfarming and overpopulation degraded the country's farmland; the growing economic disparities and agricultural property disputes that resulted divided families, neighborhoods, and communities and fed the incredible violence that tore the country apart.

Though *Collapse* focuses on societies that destroyed their own environments—rather than those that, like the Ma'dan, have their land sabotaged by outsiders—the processes of societal collapse are tragically similar. In fact, their case presents an accelerated instance of

tal scientist and the former manager of Eden Again, a marsh restoration project run by the US-based Iraq Foundation. "Hussein knew how connected people are to their environments, better than a lot of our leaders in the West know it."

This connection, however, is becoming increasingly apparent. Overpopulation, generally, is precipitating problems like desertification, which is driving many people in Africa and China out of their homes, while climate change is poised to further swell the ranks of environmental refugees. The residents of the island of Tuvalu are already fleeing their nation as sea rise gradually engulfs their South Pacific island. "More people are being displaced by environmental causes than by wars today," Oliver-Smith said. "It's a problem we're just starting to see the beginnings of."

Now, the case of the Ma'dan may demonstrate whether undoing the environmental ruin can pave the way for repairing the human damage. Reflooding of some Iraqi wetlands began immediately after Hussein was ousted in April 2003, and local and international scientists started planning the reconstruc-



### 09.1 SONG AND THE CITY

Urban life is faster paced than country life—true for people, but until recently, no one knew it's also true for birds.

Recording the songs of the great tit bird in 10 European cities, researchers found that their tunes were shorter, faster, and at a higher frequency than those of their forest-dwelling counterparts. The adaptation is likely a response to increased low-frequency noise from traffic and could explain why, when cities expand, some birds thrive while others perish.