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Watering Eden

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The Mesopotamian marshlands of Iraq, long a vital ecological oasis in a parched land, have shrunk to a tenth their expanse 10 years ago. Several international groups are weighing options to restore the wetlands once the war is over.

For millenniums, thousands of square miles of lush marshes have anchored the eastern end of the Fertile Crescent - the cradle of Western civilization that arced up along the eastern Mediterranean coast, across northern Syria, and down along the Tigris and Euphrates rivers to the Persian Gulf.

Until 1991, as many as half a million "Marsh Arabs" who trace their ancestry to the ancient Babylonians and Sumerians called these wetlands home.

The marshes, sustained by annual flooding of the Tigris and Euphrates rivers, nurtured young fish and shrimp that later would sustain fisheries in the Gulf. And they have cradled several species of plants, fish, and birds unique to the region, as well as waterfowl traveling along one of the world's major migratory flyways.

Now, several groups are looking beyond the US-led war in Iraq for ways to restore at least some portion of these marshes, weakened by decades of dam-building, then shriveled to a tenth of their original expanse after Saddam Hussein drained them following a 1991 campaign to quash a rebellion in the area.

According to the UN Environment Program (UNEP), the human-engineered collapse of the marshes and its effect on the region's inhabitants stand alongside deforestation in the Amazon and the drying of the Aral Sea in the former Soviet Union as "one of the Earth's major and most thoughtless environmental disasters."

Last Sunday, at the end of the third World Water Forum in Kyoto, the UN released a report showing that since 2001, the remaining marshlands have declined by an additional one-third,

heightening the sense of urgency. UNEP estimates that the remaining marshes could vanish in the next three to five years.

Indeed, Iraq's marshes have become the latest poster child for wetland destruction globally. In a statement issued at the forum's close, UNEP Executive Director Klaus Töpfer said, "The continued desiccation of the Mesopotamian marshlands confirms that more decisive and concrete action is needed" to save wetlands worldwide.

According to Mr. Töpfer, once the shooting stops, UNEP's post-conflict assessment team stands ready to help devise a restoration plan for the marshlands.

In addition, a small international team of scientists and engineers sponsored by the Washington-based Iraq Foundation is looking at the feasibility of marshland restoration in what has come to be called the Eden Again project.

And the University of Pennsylvania's Institute for Strategic Threat Analysis and Response (ISTAR) is expected to file a proposal with the US Defense Department within the next two weeks to send a team of ecologists, hydrologists, and engineers to look broadly at Iraq's water-management needs, including marsh restoration.

Limited fresh water

"The Tigris and Euphrates are Iraq's only sources of fresh water," says ISTAR director Harvey Rubin. "Management of that system will eventually determine the social, political, and economic stability of a post-Saddam Iraq."

The marshes - at least as they existed prior to 1991 - owed their existence to melting glaciers and rising sea levels following the end of the last ice age some 18,000 years ago. As the once-dry Persian Gulf filled in, the Tigris and Euphrates, as well as tributaries that tumbled out of the Zagros Mountains in western Iran and onto the flat Mesopota-mian plains 3,000 to 5,000 years ago, built an enormous river delta, pushing the Gulf's shoreline out to its current locations.

The freshwater marshlands - three large interconnected patches centered on the confluence of the Tigris and Euphrates - are thought to have emerged from salt-water predecessors some 3,000 years ago.

Yet what geophysical pro-cesses took thousands of years to build, humans have nearly destroyed in a decade. According to documents captured after the 1991 Gulf War, as early as 1989, following the Iran-Iraq war, Mr. Hussein's regime was worried about "subversive elements" in the marshland region. The government's blueprint for action included moving Marsh Arabs onto "dry land," where they would be easier to control.

When the Shiite Marsh Arabs, or Madan, rebelled against Baghdad after the Gulf War, the Republican Guard crushed the rebellion, and the government put the blueprint into action.

Iraqi officials have maintained that the government drained the wetlands to allow its oil industry to exploit oil deposits beneath the marshes. Indeed, at least one large canal had been on the drawing boards since the 1950s.

Policy to destroy Marsh Arabs

Yet the documents uncovered after Iraq lost the 1991 conflict combined with the speed with which the eight canals, "rivers," and levees were built leads many outside analysts to conclude that the regime was engaging in the wholesale destruction of the marshes to exact retribution for the failed rebellion.

"The evidence is pretty clear that Saddam drained the marshes solely for the purpose of destroying the Marsh Arabs," says Joseph Dellapenna, a Villanova University law professor who specializes in international water issues.

The Marsh Arabs, he says, were the targets of genocide, thus adding strong legal and moral imperatives to efforts to aid them - including restoring the marshlands to the extent possible.

Some advocates of marshland restoration pin their hopes on the lessons gleaned from projects such as CALFED, which seeks to restore the ecology of the Sacramento-San Joaquin River Delta in California, while ensuring adequate supplies of fresh water for irrigation and drinking in parched regions of the state.

One of those lessons is the importance of working with the local people, who may have different agendas for the same gallon of water, says Michelle Stevens, project manager for Eden Again. She notes that her group has been working with the Iraq Foundation and with expatriate Marsh Arabs who have settled in the US. ISTAR also has embraced the idea, collaborating with AMAR International Charitable Foundation, based in London, which has been aiding the Marsh Arab refugees in Iran since 1991.

One of the first steps in any restoration effort will be to update information on conditions in the region - ranging from the levels of poisons and pollutants in the water to the composition of the saline soils that have replaced much of the area that marshes covered.

Information on plants and wildlife also is woefully out of date. "We have no data from 1980 on" detailing bird populations, Dr. Stevens says. The group has had to rely on research-expedition reports from as far back as 1915 to piece together a picture of the marshes' "original" look.

Once that information is updated, researchers say they then can use computer simulations to test various approaches to restoration and, if necessary, perform ecological triage if it looks as if some former marshlands are beyond restoration.

Others control the source

In the long run, however, any attempt to restore the marshes will require international cooperation over water allocations in a region where water is more critical to long-term development than oil.

The vast majority of water flowing through Iraq's two major rivers comes from somewhere else, explains Thomas Naff, a professor emeritus of Middle Eastern History at the University of Pennsylvania and a member of ISTAR's group. He notes that 84 percent of the water flowing through the Euphrates comes from Turkey, while 13 percent comes from Syria. The Tigris is fed by tributaries flowing from Turkey, Iran, and Iraq.

Thus, dam projects in Turkey and, to a lesser extent, in Syria play a crucial role in what Iraq ultimately receives. The 800-pound gorilla in the hydrological arena is Turkey's Southeast Anatolia Project. Among its elements: 15 huge dams, 14 hydroelectric stations, and 19 irrigation projects - all feeding off the Tigris and Euphrates. In 1990, Turkey filled its Ataturk Dam, the largest of the project's dams, stopping its overwhelming share of the Euphrates's flow for 29 days.

And while Turkey and Syria have worked out an uneasy pact over water allocations, "Turkey has not had any real negotiations with Iraq for more than a decade," Dr. Dellapenna says. In effect, the countries will have to start from scratch to negotiate basin-wide allocation rights, he adds.

Last chance to save marshes

"Given the present condition of the marshes, the one marsh that is capable of resuscitation is Al Hawizeh Marsh," which straddles the Iran-Iraq border, Dr. Naff says. If time weren't so pressing, it might be possible to revive others, he continues, but to do so would require dismantling dams and other engineered structures, substantially increasing the cost of recovery at a time when the country has more pressing needs.

In the end, the best the Marsh Arabs can hope for, some experts say, may be to preserve as much of Al Hawizeh as possible, allowing them to establish an international wildlife reserve and encourage ecotourism.