Human Dimensions of Ecological Restoration

Integrating Science, Nature, and Culture

Edited by Dave Egan, Evan E. Hjerpe, and Jesse Abrams
Foreword by Eric Higgs

ISLANDPRESS
Washington | Covelo | London

Chapter 20

Eco-cultural Restoration of the Mesopotamian Marshes, Southern Iraq

MICHELLE STEVENS
WITH DR. HAMID K. AHMED

If there is hope for restoring the Mesopotamian marshes of southern Iraq and Iran, it lies with two key elements: the indigenous Marsh Arabs and the availability of water. The supply of consistent water is largely a political issue between the various countries within the Tigris-Euphrates watershed. For their part, the Marsh Arabs have a long and intimate connection between a functioning marsh ecosystem and their own cultural identity. This deep bond is expressed well by the Iraqi poet, Dr. Rasheed Bander al-Khayoun:

> The people of al Ahwar need water in the marshes. . . . Their spiritual need surpasses the material need, since draining the marshes means putting the boats out of service and an end to regional poetry specific to al-Ahwar, and to singing, which can only be performed in that theatre of water and reeds and rushes. Indeed, draining the marshes means the death of a way of life that people have practiced for tens of centuries. There is no doubt that the people desperately want their environment to return to its natural state. . . . All the people dream of is the marshes full with fishes, birds, cows, and buffalos with modernized passageways and islands, because it is this vision that is in harmony with their spiritual heritages as found in their songs, poems, and tales. (as recorded by Stevens 2009)

During ethnographic interviews I conducted in 2002–2003 with expatriate Iraqis in San Diego, California, I found that the marshes are considered a cultural icon, similar to the Statue of Liberty (Stevens 2004, 2009). Everyone I interviewed wants the marshes to continue to exist and thrive. Ninety percent of the people interviewed in San Diego would want to go back if they had autonomy and their own way of life. One Iraqi said, "We grow like a bird in the marsh. Everything is in front of us. We canoe inside the marshes for reeds for the animals and for fish." They expressed a great desire to have the marshes restored, saying "The marshes are like our body, our blood. You cannot miss one part. It all should stay as marsh." People also want clean water, health care, education, transportation, modern housing with electricity, cell phones,

computers, and televisions, and women want to have access to disposable diapers and other child care amenities.

History, Importance, and Current Condition of the Mesopotamian Marshes

The *al Ahwar*[1] marshes of southern Iraq and Iran encompass the largest wetland ecosystem in the Middle East and western Eurasia, historically covering 5,790–7,770 square miles (15,000–20,000 km^2) of interconnected lakes, mudflats, and wetlands within what is now Iraq and Iran. Often called the Mesopotamian marshes, the area is considered by Muslims, Christians, and Jews as the site of the legendary Garden of Eden. The marshes are a cultural heritage center of global importance, having supported the traditional lifestyles of approximately 500,000 indigenous people—the Marsh Arabs or Ma'dan—and the important agricultural production of rice, wheat, millet, and dates. A major haven of regional and global biodiversity, the marshes provide habitat for significant populations and species of wildlife (Iraq Foundation 2003). For instance, two-thirds of western Asia's wintering waterfowl, estimated from one million to ten million birds, are believed to winter in the marshes. The marsh ecosystem also sustains an economically important local and regional fishery, providing spawning habitat for migratory fin fish and penaid shrimp species that use the marshes for spawning migrations to and from the Persian Gulf.

Unfortunately recent history has not been kind to the marshes or the people that inhabit them, as the area has been the scene of three military conflicts—the Iran–Iraq War (1980–1988), the Gulf War (1990–1991), and the 2003 invasion of Iraq led by the United States and Great Britain. For thirty-five years the Iraqi people and marshes have been in the middle of a war zone. As Hassan Partow reported to the United Nations concerning the fate of the Marsh Arabs: "With the outbreak of the Iran–Iraq war in 1980, their homeland was transformed into a frontline combat zone. Subsequently, they were faced with cultural genocide and the drainage and destruction of their marsh home that ultimately shattered their society and way of life" (UNEP 2001). After the Gulf War ended in 1991, uprisings against the Iraqi regime of Saddam Hussein broke out. A period of genocide and ecocide began, during which the Hussein regime drained more than 90 percent of the marshes to obtain access to rebels taking refuge in the marshes (H. K. Ahmed from discussion with author, December 14, 2008).

Abdul Imam Hatab and Abu Kusai al Helfy, Ma'dan leaders from the Salien Marshes south of the Al Hammar Marshes, used to have very fertile land and were well off (H. K. Ahmed from discussion with author, December 14, 2008). Following the 1991 uprising, the Republican National Guard committed genocide and ecocide in the marshes, and initiated engineering work that desiccated the marshes. The men described it as a "tsunami hurricane" passing through their villages, and none survived apart from those who managed to escape the country. They felt jubilant and happy to see the toppling of Saddam for what he had done to the Iraqi people. Hatab and al Helfy said, "What has happened so far is only personal initiatives such as breaking dams by local Marsh Arabs, amending the irrigation networks around the marshes,

limited electricity services, limited fishing, harvesting reeds, raising buffalos, and boat manufacturing. We hope that the . . . government will start strategic development projects for the marshes as promised. We urge the government to help the marshes and the Marsh Arab, not only because it would bring sustainable development, unique ecosystems and potential eco-tourism to the Marshes, but also to acknowledge the sacrifices and suffering of the people under the previous regime" (H. K. Ahmed from discussion with author, December 14, 2008).

With the demise of Saddam Hussein and the Baathist regime in 2003, and with good water years from 2003 to 2005, water returned to about 60 percent of the former marshland area (Richardson et al. 2005). Some areas rejuvenated beautifully, with lush growth of reeds and rebounding fish populations. The Ma'dan people who lived as environmental refugees throughout the 1990s were returning to the marshes with their water buffalo. However, despite the rehydration of such a large area of the marshes, much of the marsh ecosystem is in poor condition. According to a paper in *Science* (Richardson et al. 2005), less than 10 percent of the original marshes in Iraq remain fully functioning wetlands (also Reiss et al. 2003; Stevens 2006).

Water, air, and land pollution is still extremely severe in many parts of Iraq, including the Mesopotamian marshes (Bowman 2005; Nature Iraq 2009). Iraq's environmental problems include (1) water resource pollution (including groundwater); (2) ecosystem and biodiversity degradation; (3) waste and sanitation disposal; (4) oil and other cement, fertilizer, and pesticide industry pollutants; and (5) the direct impacts of military conflicts (Bowman 2005). Reduced flows have exacerbated water quality problems. While in Basra, I was left with the impression that this area has highly polluted air, land, and water. With low flows, salinity in the Shat al Arab River (the river formed by the confluence of the Tigris and Euphrates Rivers) had increased from one part per thousand to four to five parts per thousand (Marine Science Center, Basra University, unpublished data, 2009). Flows are significantly reduced. In 1977–1978, flows in the Shat al Arab ranged from 990 to 1,277 cubic meters per second; in 1993–1994, flows ranged from 550 to 1,100 cubic meters per second; in 2005–2006, flows were as low as 204 cubic meters per second; and in 2008–2009, flows reached a low of less than 100 cubic meters per second. Shad (*Alose hilsa*) populations have declined 75 percent. Many other invertebrates are also declining, and the salty turbid water with warmer temperatures is adversely affecting fish production and biodiversity in the Persian Gulf. In Basra I saw shattered buildings and rivers so polluted with algae (*Dunaliella* spp.) that the water turned bright pink. Garbage was everywhere and stray dogs snuffled through it, well fed but in ill health. Heavy particulates from dust caused the air to appear sepia toned, with a visibility similar to dense fog.

Cultural Heritage: Basis for Eco-cultural Restoration

The *al Ahwar* marshes are the homeland of a distinct cultural group—the mostly Shi'ite Muslim Marsh Arabs. They consider their ancestral territory and cultural identity to straddle the present Iraq–Iran border, and there are strong kinship ties between marsh dwellers in both countries. According to Partow, "The marshlands have been

home to ancient human communities for more than five millennia. The area's inhabitants are known as the Ma'dan, Marsh Arabs or Marsh Dwellers, whose population is estimated to range from 350,000 to 500,000. . . . The Marsh Arabs have evolved a unique subsistence lifestyle that is firmly rooted in their aquatic environment. Most of the Ma'dan are seminomadic, but some of them are settled in villages. . . . Water buffalos play a pivotal role in Marsh Arab existence" (UNEP 2001, 15–16).

Traditionally, Marsh Arabs lived in a flat watery landscape, sleeping in reed homes that are built on humanmade islands in the marsh, traveling in their boats or *mashoofs*, and welcoming travelers in their *mudhifs*, which are large structures woven of reeds in a style that dates back to the Sumerian culture, roughly the third to fourth century BC. Water buffalo (*Bubalus bubalis*) have played a role in their culture similar to that of the camel in Bedouin Arab culture (Maxwell 1957; Thesiger 1964). Life in the marshes centered around gathering reeds in the marshes, caring for water buffalo, fishing, hunting for birds, and seasonal work in date palm plantations and rice fields.

The marshes were sustainably managed by Marsh Arab tribes for thousands of years. Traditional management of the marshes included selective harvesting and burning of reeds on a seasonal and phenological basis, multiple-species management (reeds, fish, waterfowl, bird eggs, rice), burning senescent vegetation to stimulate new growth, spatial and temporal restriction of fish harvest during spawning, and landscape patch management. These management practices were beneficial for reed growth and biomass production, to maintain diverse patch dynamics, and to increase microhabitat diversity. The only anthropological study specifically devoted to a part of the Mesopotamian marshes was published in Shakir Salim's *Marsh Dwellers of the Euphrates Delta*. After spending two years (1954–1955) living with the Ma'dan, Salim classified the inhabitants occupationally into cultivators, reed-gatherers, and buffalo breeders (Salim 1962). According to Salim, 82 percent of households fished, 49 percent hunted, 66 percent farmed, 58 percent cultivated crops for food, 75 percent used reeds, 78 percent kept animals or birds, and 2 percent worked for a wage. Salim observed that traditional Marsh Arab society burned and cut reeds and bulrushes periodically to obtain fodder for the water buffalo. The Marsh People burned the old reeds every year, around January, to stimulate the growth of young reeds. Reeds were used for animal fodder; building boats and rafts, houses, and mosques/public places; and weaving mats and baskets for sale. The most important use for reeds was mat weaving. Salim (1962) estimated that about forty thousand mats were used for huts, twelve thousand for guest houses, and ten thousand for annual export. These qualitative data are indicative of the extensive ecological impact of reed harvesting and traditional management on marsh culture and ecology.

As a result of this long history of human management, the marshes are a culturalized landscape, formed over thousands of years by agricultural and traditional management practices such as the selective harvesting of more than eight different sizes and textures of reeds, the use of fire, and hunting and fishing. These intermediate-scale disturbances have long been the key to ecosystem structure and function. These traditional activities are important to the local economy and have brought in more than $7.3 million per annum (Maltby 1994; Nicholson and Clark 2002).

One cannot discuss the Ma'dan without talking about their use of water buffalo. Water buffalo are both an umbrella species and a cultural icon, and they represent the well-being of indigenous Ma'dan people. They are also a keystone species in the marsh ecosystem. "Water buffalo are widespread throughout the marshes in the south of Iraq" (Stevens 2009). "There are no houses in the marshes without a water buffalo. They are the main source of livelihood of people in the marshes. In fact, water buffalo are considered indicators of the quality of marsh life and restoration of the Iraqi marshes. The Ma'dan depend on their herds of water buffalo; they are valued for their dairy products, and are part of the family. I expect that the absence of water buffaloes will lead to the disappearance of people in the marshes."

Through extensive interviews, I discovered that the Iraqis who lived in the marshes had a great wealth of biological knowledge about culturally significant resources, such as reeds, water buffalo, and fish. This traditional ecological knowledge is an important source of information for emerging models of ecological restoration and ecosystem management of the marshes. Because the marsh ecosystem is adapted to human management, any effort to restore the ecosystem must also be an effort to reestablish Marsh Arab culture and make use of their traditional management practices. Thus maintaining the integrity, identity, and culture of the Marsh Arab society must be preeminent in restoration planning, and this must include encouraging the sustainable livelihoods of Marsh Arabs who have returned to the area. "The future of the 5,000-year-old Marsh Arab culture and the economic stability of a large portion of southern Iraq are dependent on the success of this restoration effort" (Richardson et al. 2005), however, the converse is equally true, the success of the restoration effort depends on the actions of the Marsh Arab culture and the economic stability of a large portion of southern Iraq.

Iraqi Perspective on Healing the Marshes and Helping the Ma'dan People

In 2008, I attended the International Congress on Biodiversity in the Middle East in Jordan. The following year, I was the invited keynote speaker at the Third Scientific Conference on the Rehabilitation of the Southern Iraq Marshes in Basra, Iraq. Being invited to visit the marshes was a dream come true. After six years of studying the marshes and traveling internationally, I was very excited (and scared) about visiting Iraqi scientists and the Ma'dan people, and about visiting the Mesopotamian marshes themselves.

I conducted more than twenty hours of interviews with Nature Iraq (www.natureiraq.org) biologists while attending the biodiversity conference (Stevens 2009). According to Dr. Azzam Alwash, director of Nature Iraq, an Iraq nongovernmental organization accredited by the United Nations Environmental Program and affiliated with Birdlife International, "The security situation is making it harder to do the work (in the marshes), but our teams of young scientists are determined to keep the work going despite the rough conditions and continuing violence. . . . Teams are still taking monthly trips to the marshes to collect scientific data to . . . understand the state of the restored marshes" (Stevens 2009).

Nature Iraq is sponsoring the prioritization, identification, and monitoring of Key Biodiversity Areas (KBAs), as defined by the International Union for Conservation of

Nature (IUCN). These are sites of global significance for biodiversity conservation (Nature Iraq 2009). The Nature Iraq KBA Project is the largest and most comprehensive study in this highly volatile region in more than twenty-five years. Biological indicators were sampled at more than one hundred sites with birds as the primary focus of survey work, especially those species of "conservation concern."

Korsh Ararat is a field biologist specializing in ornithology. He told me, "It was my dream to work in the marshes. I collected everything we could find on the marshes" (Stevens 2009). He worked as a translator for the British, then for Nature Iraq. "I love the marshes," Ararat said. "Nature compensated me and gave me things. I love it. I consider it my mother. I want to give back." When he first began studying birds in the marshes, he had to make his own binoculars and collected all the books and magazines he could find about natural history. Ararat said, "I found no one in Iraq who could write about birds, so I started to write a book." Since then, he has helped complete both the *Field Guide to the Birds of Iraq* and a *Children's Guide to the Birds of Iraq* (Ararat and Porter 2008; Fadhel, Salim, and Ararat 2008).

Botanist Muzhir Shibil said, "Each time I go to the marshes, I learn more. And the life in the marshes is amazing. The marshes are a very natural location to the world. Part of it could be used for ecotourism, and to help the locals. This would help conserve the marshes, to save them. Ecotourism would be friendly for the environment and can provide benefits for people and the marshes. I think it can help people to be in contact with the people from other countries and see the other traditions. But without change, these traditions need to be maintained. We want to keep this special" (Stevens 2009).

Nature Iraq also conducted socioeconomic surveys of older people, or *Sherch*, as they called them, people who lived in the marshes and have many experiences and stories to tell. Botanist Muzhir Shibil said, "We talked with them about their lives and what their lives are like now, compared with before the marshes were drained. They said that before the marshes were drained their life was easier and generated more income, because fishing was always good in the area" (Stevens 2009). According to Ibrahem Abed, Nature Iraq fisheries biologist, economically important fish are almost completely absent from the marshes, particularly the species that require good water quality. These fish have only been recorded at a few sites and in small numbers, despite the fact that Iraq's southern marshes have always been considered an important spawning and nursery ground for them.

Currently, some people have a generator and electricity, which were not available before, and almost everyone has a cell phone. Even in urban areas, electricity is intermittent and undependable; people who can afford generators turn them on when the electricity cuts out. Most people in the marshes have low incomes, and jobs are few and far between. Educational and training opportunities for people in the marshes are in high demand and short supply. People want better education for their children and more schools; like people everywhere, they want their children to have a better life than they have had. In Basra, I saw young boys on busy and dangerous street corners running into the street to sell trinkets to people in idling cars. Education used to be mandatory, and exploitation of children would have been forbidden. There are also many widows after so many years of war; they stand on street corners wearing black

abayas and *niqab* (black traditional Arabic dress with a face veil covering all but the eyes). They raise their outstretched hands to people in idling cars, begging, sometimes with small, often dirty children beside them. The water, air, and environment are highly polluted. However, conditions are more stable and less dangerous; people are out at night, shopping and visiting. Parks are beginning to be replanted, and public art of dolphins and water vessels has replaced statues of soldiers pointing guns across the Shat al Arab at Iran.

Nature Iraq has been helping people through construction of aquaculture. The first hatchery in the al Chibayish District hatched two and a half million fingerlings to reintroduce native fish into the marshland and provide income and food. The Marine Science Center at Basra University is also working on restoring fish to the marshes. According to Nature Iraq surveys, even if the fish come back in the same amount, people in the marshes are now more dependent on the government for jobs (Nature Iraq 2009). Many don't want fishing jobs because there are not enough fish for a decent income. Both Nature Iraq and the AMAR Appeal (www.amarappeal.com) have provided reverse osmosis units to supply fresh water to people in the south. Nature Iraq has adopted a new project that reduces technical water quality information down to a simple description of a specific site's water quality. Development of a simple description of a specific site's water quality, called a Water Quality Index, will help simplify water quality information. This will help prioritize and formulate remedies for water quality problems (Nature Iraq 2009).

Korsh Ararat said, "I'm so happy to work with Nature Iraq. I can help my country, help my people, and develop knowledge" (Stevens 2009). Mohammed al Saffar told me, "We are fighting for Nature Iraq to accomplish something. We work on our reports. Nature Iraq is developing the Twin Rivers Institute at the American University in Sulaimaniya, Iraq, to educate Iraqi scientists and government officials."

Ibrahem Abed, fisheries biologist, said, "Nature Iraq has increased my experience and knowledge, and helped me achieve my dreams. Now I can help to make something good for Iraq" (Stevens 2009). When asked if he would like to add anything else, Abed said, "I would like to thank the American people and Nature Iraq for all they have given me, given the Iraqi people, and given the marshes" (Steven 2009).

The Dwindling Supply of Water and the Eco-cultural Restoration of the Mesopotamian Marshes

The story of how the Mesopotamian marshes have become desiccated is a story of nation-states operating without respect to the needs or rights of their neighbors, the well-intentioned use of American and British engineering technology to build dams, and the use of dictatorial powers to crush an indigenous people.

The Tigris and Euphrates Rivers, which supply much of the water for the Mesopotamian marshes, have their headwaters in Turkey, Syria, and Iran. Unfortunately, the proliferation of dams and irrigation schemes along these rivers has disrupted natural flows and choked off much of the water supply to the marshes. Moreover, while Iraq has water-sharing agreements with Syria, Turkey, and Iran, the treaties are not effective, and there is a continuous loss of water quality, water supply, and marshland

ecosystem functions and cultural services. Iran's damming of the Karkheh River, which feeds directly into the marshes, and its construction of a barricade along the border running through the Hawr al Hawizeh Marsh, is resulting in the desiccation and destruction of Iraq's most pristine remaining marsh—a wetland that in 2008 at the Ninth Meeting of the Ramsar Convention Conference of the Parties (Ramsar COP9) was designated a Wetland of International Significance and Iraq's first Ramsar site (Ramsar Convention on Wetlands 1982).

When the marshes were rehydrated in 2003, aquatic vegetation rapidly colonized much of its former area. For example, reeds were growing at sufficient height, density, and areal coverage to meet the needs of the Marsh People within a fairly short time frame. Unfortunately, reeds became stunted or killed by current drought conditions, which produced higher salinities, increased temperatures, increased eutrophication, anoxic conditions, and lower pH.

Today, besides the urgent need for water in the marshes, the main challenges for resource management issues include the following: (1) reduced flood pulses, (2) formation of salt crusts, (3) uncontrolled burning of marsh vegetation, (4) overharvesting of reeds, (5) overfishing through nonsustainable fishing methods (electrocution, dynamite, and chlordane), (6) invasion of exotic species, and (7) overgrazing by water buffalo on submerged plants and by camels on grassland and patchy shrubs.

Water Rights and a Call for Social Justice

With good water years since 2003, water returned to approximately 58 percent of the marshland area. Unfortunately, there was a severe drought in 2007 and 2008 (UNEP 2009). Now the Mesopotamian marshes are once again drying up, and the Iraqi people who depend on them are desperate to maintain their marshes and traditional lifestyle. The picture is grim: less than 30 percent of the marshes remained hydrated in February 2009; the water levels of the Tigris and Euphrates Rivers continue to drop; marshes recede; and the fish, reeds, and water buffalo that embody the marshes die (Muir 2009; Nature Iraq 2009). After persecution and genocide under Saddam Hussein, the Ma'dan came home to the marshes hoping to regain their traditional lifestyle. With their marsh homeland disappearing into a salt-encrusted wasteland, they are once again a people dispossessed. The Ma'dan are now becoming urban refugees, squatting on lands they do not have ownership or rights to, attempting to eke out an existence with their water buffalo. The fragility and vulnerability of the vast marsh ecosystem is also jeopardized by a weak Iraqi government, without the political will or influence to demand riparian water rights from upstream users in the Tigris–Euphrates watershed.

Despite all these socioecological tragedies, the Mesopotamian marshes are loved by the Iraqi people, especially the people of the south. They are anxious to see the marshes restored, even though the restoration could be difficult given the extent and magnitude of the degradation. What seems apparent is that without intervention from powerful outside countries to broker water rights in the Tigris–Euphrates watershed, the marshes will die and the people will be dispossessed of their lifestyle, their cultural heritage, and their beloved marshes.

Jassim al-Asadi, Nature Iraq, put it this way: "There is drought, the water levels are getting lower, and water quality has worsened; the marshes are continuously shrinking. This leads to great suffering, especially for the water buffalo breeders and fishermen. We must put pressure on decision makers to implement temporary solutions to provide marshes with water from the rivers. Please help us in writing and demanding water from Turkey and Iran, providing us with our fair share of water required to revive the marshes" (Stevens 2009). To this end, more than five hundred Iraqi scientists and researchers have appealed to the Iraqi government, other governments in the Tigris–Euphrates watershed, and scientific organizations for help to ensure maintained flows of water for the Iraqi Mesopotamian marshes. Their signed petition, which was approved at the Third Scientific Conference on the Rehabilitation of Southern Iraqi Marshes in 2009 in Basra, states the following: "For over 5,000 years the cultures and ecosystem of the *al Ahwar* marshes have flourished and been sustained through life-giving waters; we request enough water to restore and preserve the biodiversity and long-lasting cultural heritage of this region." The Iraqi scientists have asked for help to make the world aware of the tragedy of the losses in the marshes and to help apply pressure on adjacent countries in the Tigris–Euphrates watershed (i.e., Syria, Turkey, Iran) to allow bypass flows into the system. This is a regional issue affecting all of the Middle Eastern countries in one way or another. There needs to be a just and equitable distribution of the water resources and improved efficiency of usage. Additionally, there needs to be some sort of basinwide planning or third-party negotiation for this to occur.

Conclusion

The Mesopotamian marshes are an acknowledged, internationally significant wetland, have outstanding cultural antiquity and heritage value, and provide an ecological and cultural experiment at a scale never before considered in eco-cultural restoration. *Incha Allah* (as God wills it), international negotiation will result in ensuring flows of water to the marshes to sustain the ecosystem and human lives. Narmeen Othman, Iraqi minister of environment, says, "There are two places in Iraq—the high places in the north's mountains and the southern marshland—where you are speaking with God. When I was alone in the mountains, I took my strength from nature, from the grasses and flowers and trees, from the waterfalls and rivers. The same pieces of water that come from our mountains, they end up in the marshes, and they are a gift to Iraq" (Stevens 2009).

Notes

1. The term *al ahwar* is derived from Aramaic and means "whiteness" or "the illumination of sun on water."

References

Ararat, K., and R. Porter. 2008. *Field Guide to the Birds of Iraq*. Cambridge, UK: Birdlife International and Sulaymaniyah, Iraq: Nature Iraq.

Bowman, R. E. 2005. "Global Cornerstones for Environmental Recovery in Iraq: A Comparative Law and Policy Analysis of Lessons in Environmental Response and Remediation." *N.Y.U. Environmental Law Journal* 13: 501–60.

Fadhel, O., M. Salim, and K. Ararat. 2008. *Bird Life for Iraqi Children*. Cambridge, UK: Birdlife International and Sulaymaniyah, Iraq: Nature Iraq.

Iraq Foundation. 2003. *Building a Scientific Basis for Restoration of the Mesopotamian Marshlands*. Findings of the international technical advisory panel restoration planning workshop February 2003 convened by Eden Again Project The Iraq Foundation. Washington, DC: Iraq Foundation. http://www.iraqfoundation.org/edenagain/publications/pdfs/bldgscientificbasis.pdf.

Maltby, E., ed. 1994. *An Environmental and Ecological Study of the Marshlands of Mesopotamia*. Draft Consultative Bulletin. Wetland Ecosystems Research Group, University of Exeter. London: AMAR Appeal Trust.

Maxwell, G. 1957. *A Reed Shaken by the Wind: A Journey through the Unexplored Marshlands of Iraq*. Harmondsworth, England: Penguin.

Muir, J. 2009. "Iraq Marshes Face Grave New Threat." BBC News, Middle East, Iraq, February 24, 2009. http://news.bbc.co.uk.

Nature Iraq. 2009. http://www.natureiraq.org/Eng/home.html.

Nicholson, E., and P. Clark. 2002. *The Iraqi Marshlands: A Human and Environmental Study*. London: The AMAR Appeal International Charitable Foundation.

Ramsar Convention on Wetlands. 1982. Convention on Wetlands of International Importance Especially as Waterfowl Habitat. http://www.ramsar.org/key_conv_e.htm.

Reiss, P., C. Richardson, A. Alwash, and D. Pool. 2003. *Strategies for Assisting the Marsh Dwellers and Restoring the Marshlands in Southern Iraq: Interim Status Report*. FORWARD Task Order, Bureau for Asia and the Near East, Integrated Water and Coastal Resources Management IQC, U.S. Agency for International Development.

Richardson, C. J., P. Reiss, N. A. Hussain, A. Alwash, and D. J. Pool. 2005. "The Restoration Potential of the Mesopotamian Marshes of Iraq." *Science* 25: 1307–11.

Salim, S. M. 1962. *Marsh Dwellers of the Euphrates Delta*. London: Athlone Press.

Stevens, M. L. 2004. "Restoration of the Mesopotamian Marshes of Southern Iraq: Synthesis of Current Restoration Activities." *Canadian Reclamation* Summer/Fall, 7–11.

———. 2006. "Healing the People and the Land: Restoring the Mesopotamian Marshes and Rejuvenating Culture in Southern Iraq." In *Healing a Hurting World: The Role of NGOs*, edited by F. Z. Swartz, 149–64. St. Paul, MN: Paragon House.

———. 2009. "Unpublished Field Notes, 2002–2003 and 2008–2009, from San Diego, CA; Aqaba, Jordan; and Basra, Iraq."

Thesiger, W. 1964. *The Marsh Arabs*. Harmondsworth, England: Penguin.

United Nations Environment Programme (UNEP). 2001. *The Mesopotamian Marshlands: Demise of an Ecosystem*. Early Warning and Technical Assessment Report. UNEP/DEWA/TR.01-3 Rev.1, Division of Early Warning and Assessment. Nairobi, Kenya: United Nations Environment Programme. http://www.grid.unep.ch/activities/sustainable/tigris/marshlands/.

———. 2009. "Support for Environmental Management of the Iraqi Marshlands." http://marshlands.unep.or.jp/.