

Struggle for the recovery of Mesopotamian marshes

Sentinel-1 CSAR IW acquired on 24 February 2019 at 02:53:54 UTC
Sentinel-1 CSAR IW acquired on 25 February 2019 from 02:46:29 to 02:46:54 UTC
Sentinel-2 MSI acquired on 25 February 2019 at 07:29:01 UTC
Sentinel-2 MSI acquired on 28 February 2019 at 07:38:41 UTC
Sentinel-1 CSAR IW acquired on 19 April 2019 at 02:55:08 UTC

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Keyword(s): Hydrology, wetland, UNESCO World Heritage, Ramsar site, river, agriculture, dam, biodiversity, Iraq, Iran

[2D Layerstack](#)

Fig. 1 - S2 (25 & 28.02.2019) - 12,11,2 colour composite - View of the Mesopotamian marshes in Iraq and Iran.

[2D view](#)

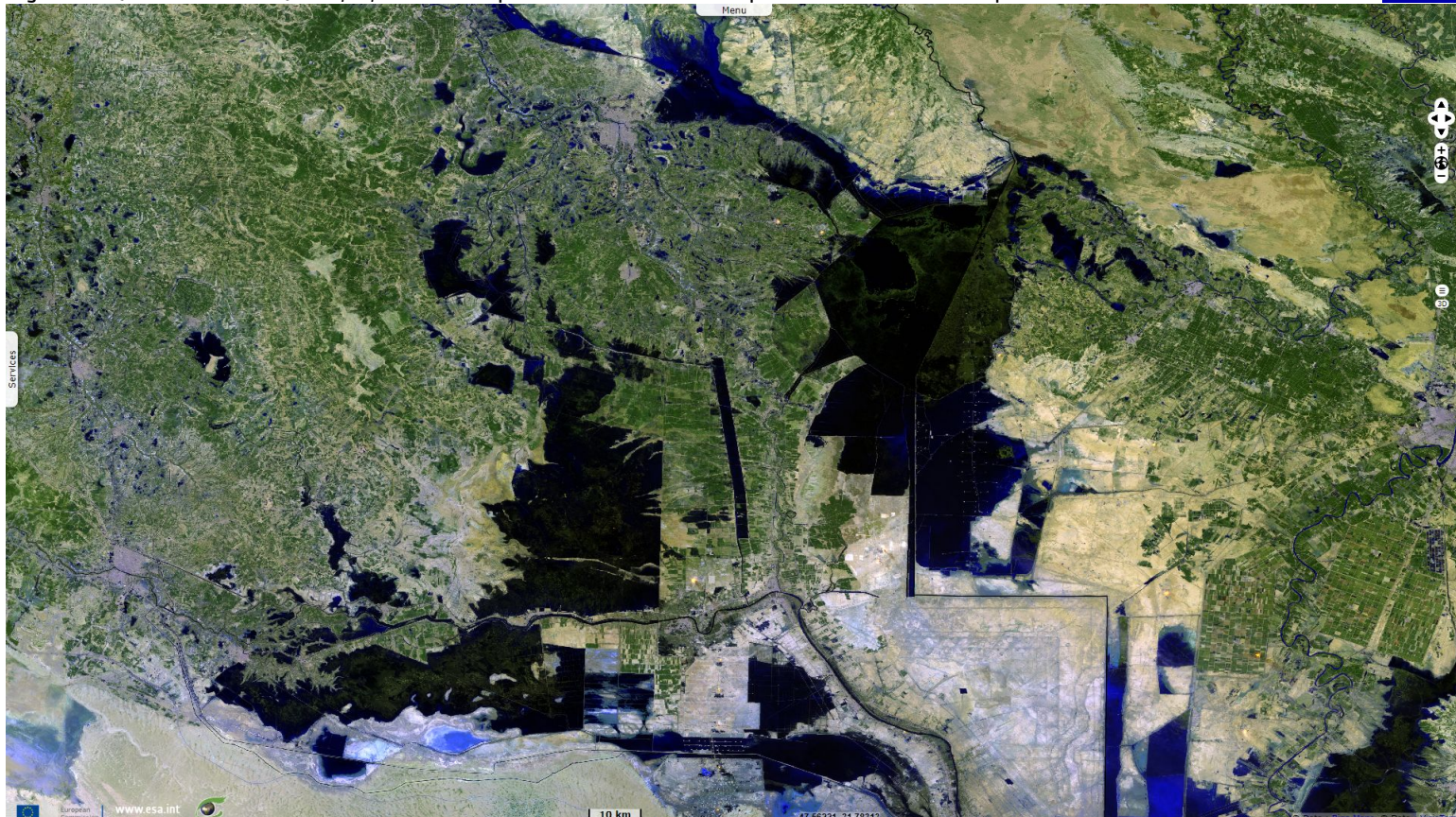
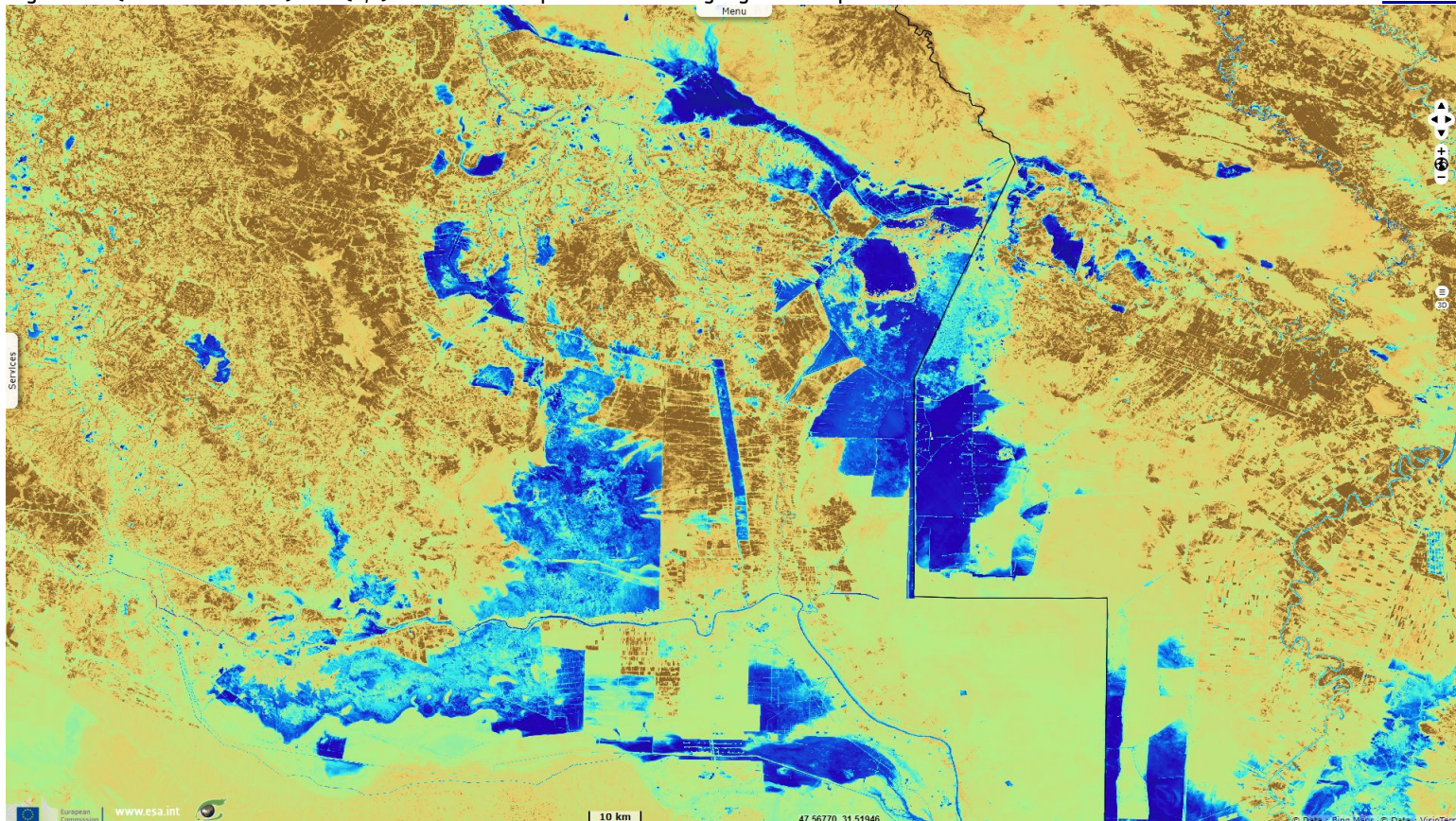


Fig. 2 - S2 (25 & 28.02.2019) - ndi(3,8) with colour map - The NDWI highlights the open water areas.

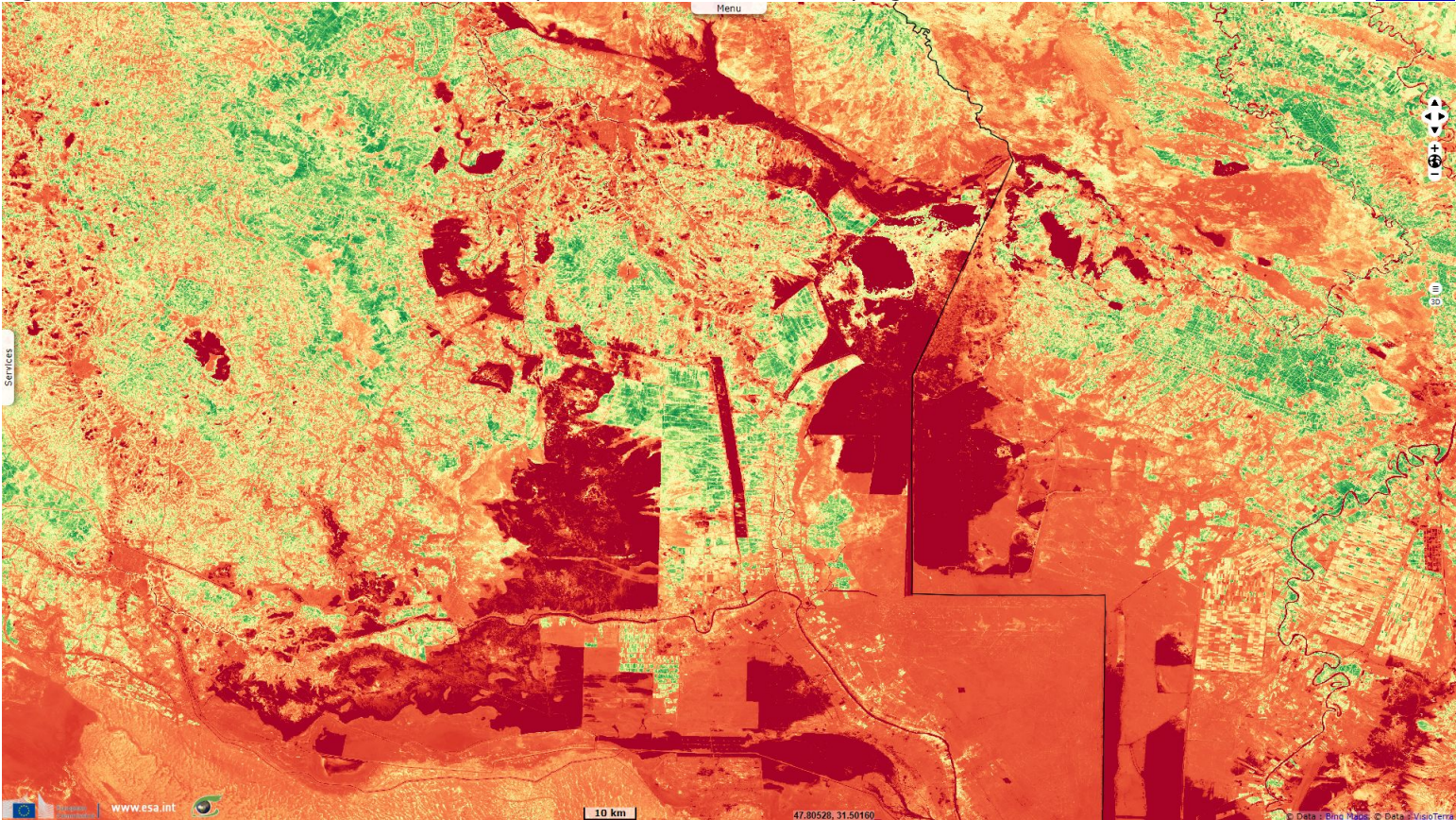
[2D view](#)



The World Wildlife Fund (WWF) [describes](#) the Tigris-Euphrates alluvial salt marsh as follows: "*The vast deltaic plain of the Euphrates, Tigris and Karun rivers is located at the northern end of the Persian Gulf, in extreme eastern Iraq and southwestern Iran. This alluvial basin drains a large area of Turkey, Syria, Iraq, and the western Zagros Mountains of Iran, and the basin is covered in recent (Pleistocene and Holocene) alluvial sediments.*"

Fig. 3 - S2 (25 & 28.02.2019) - ndi(8,4) with colour map - The NDVI shows little healthy vegetation has recolonised the marshes yet.

[2D view](#)

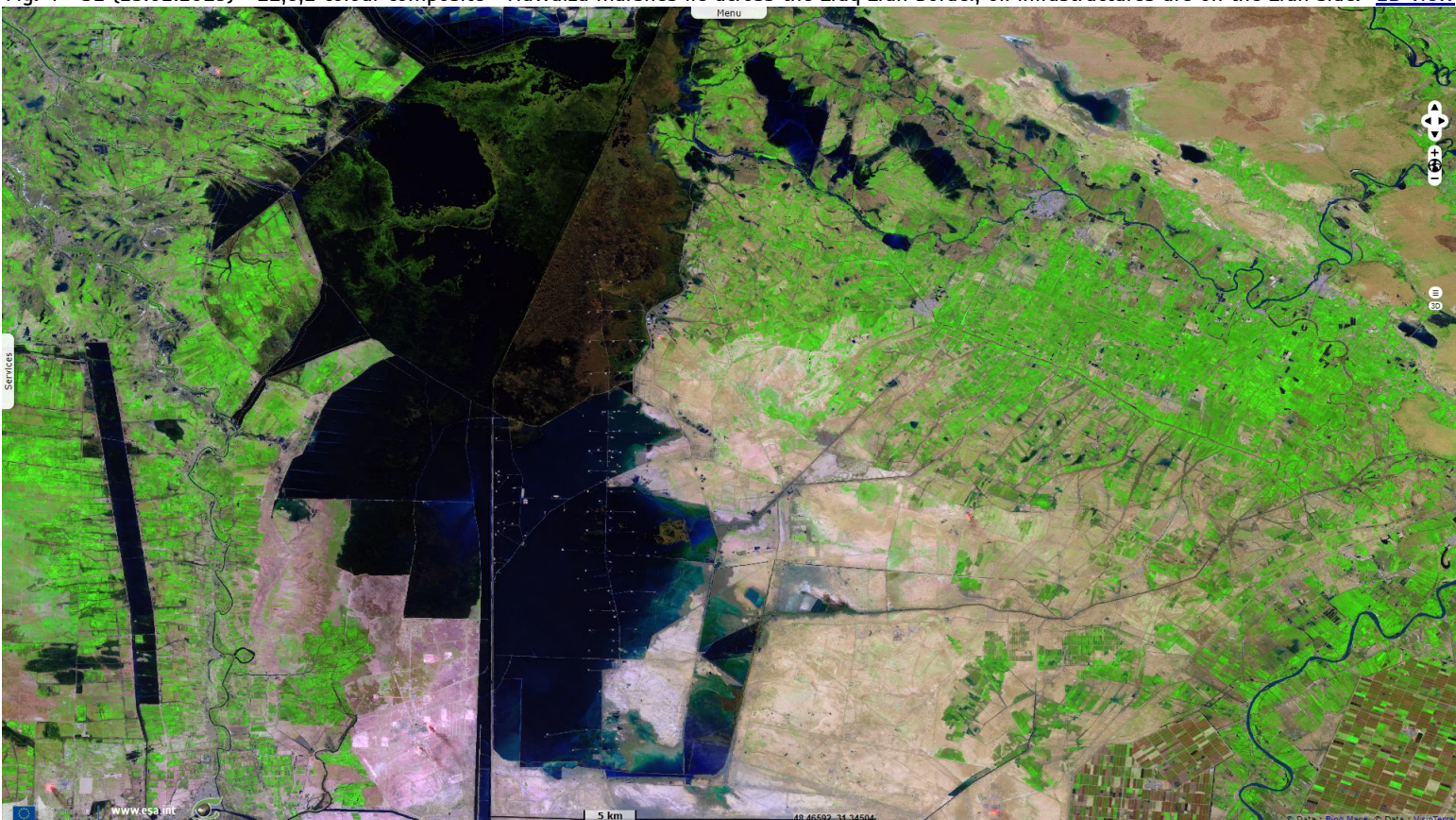


"The ecoregion is a complex of shallow freshwater lakes, swamps, marshes, and seasonally inundated plains between the Tigris and Euphrates rivers. It includes huge permanent lakes of Haur al Hammar, the Central Marshes, and Haur al Hawizeh as well as more seasonal 'ahrash' forest of *Populus* and *Tamarix* on islands and banks of the great rivers (Evans 1994). The vegetation of the ecoregion is dominated by aquatic plants – *Phragmites* (reeds), *Typha* (rushes), and *Cyperus* (papyrus) (Stattersfield et al. 1998).

The climate of the region is subtropical, hot and arid. The hydrology of these vast marshes is extremely important to the ecology the entire upper Persian Gulf (Ramsar Convention Bureau 2001)."

Fig. 4 - S2 (25.02.2019) - 11,8,2 colour composite - Huwaiza marshes lie across the Iraq-Iran border, oil infrastructures are on the Iran side.

[2D view](#)



In an article [released](#) in 2006 in BioScience, Curtis J. Richardson highlights the importance of the Mesopotamian marshes for mankind and wildlife: *"Many consider Iraq's Mesopotamian marshes —often referred to as the "Garden of Eden"— to have been the cradle of Western civilization (Thesiger 1964, Nicholson and Clark 2002). The word Mesopotamia means "between rivers," referring to the location between the Tigris and the Euphrates. These marshes were once the largest wetlands in southwest Asia and covered more than 15 000 square kilometers, an area nearly twice the size of the original Everglades."*

Fig. 5 - S1 (24 & 25.02.2019) - vv,vh,vv colour composite - Only its northern section is partially covered by marshy vegetation.

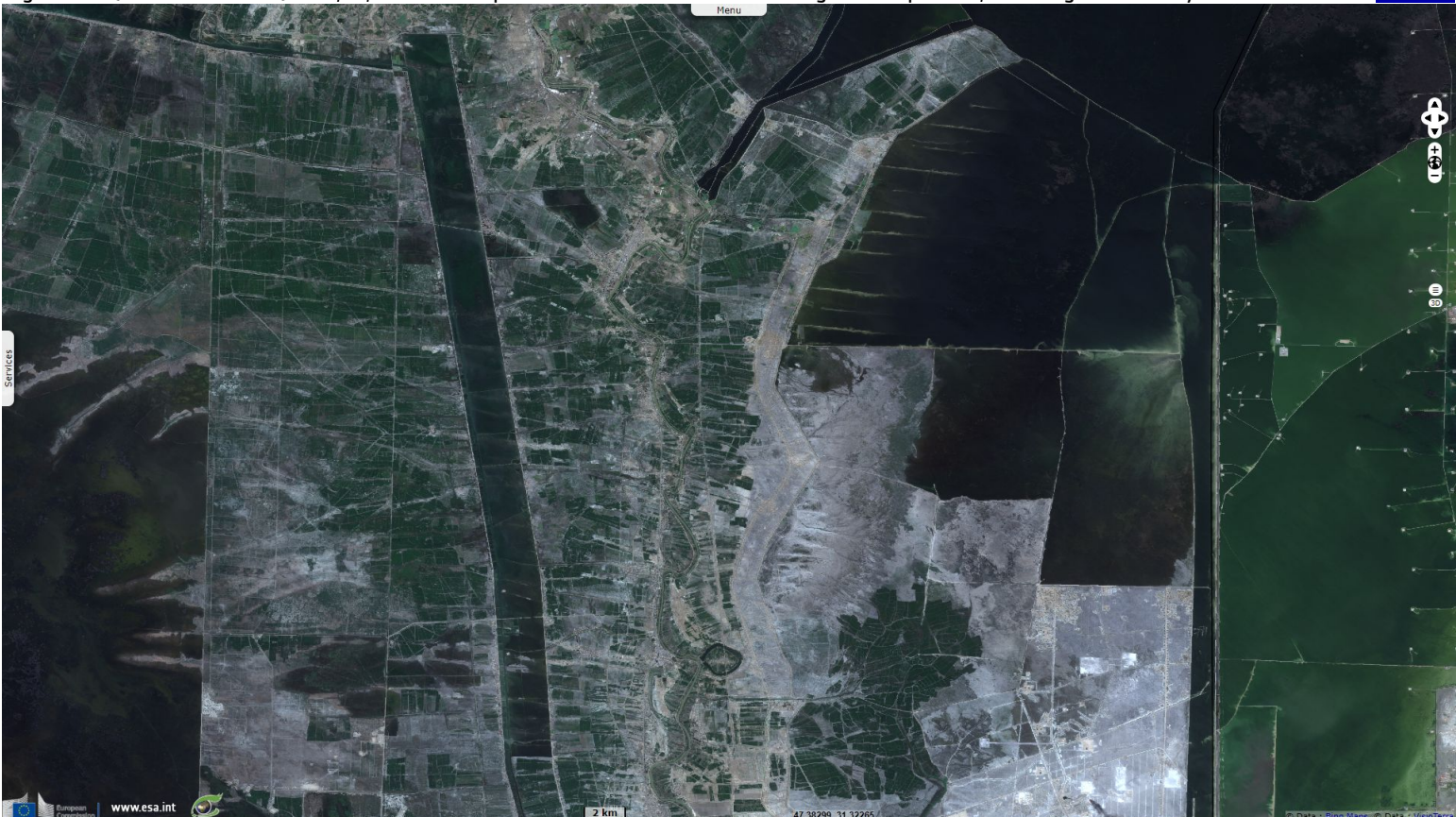
[2D view](#)



"The marshes were also once famous for their biodiversity and cultural richness. They were the permanent habitat for millions of birds and a flyway for millions more migrating between Siberia and Africa (Maltby 1994, Evans 2002). More than 80 bird species were found in the marshes in the last complete census in the 1970s (Evans 2002)."

Fig. 6 - S2 (25 & 28.02.2019) - 12,11,2 colour composite - Gharraf Canal links the Tigris to Euphrates, diverting water away from marshes.

[2D view](#)



Then he reminds the impact of Saddam Hussein's rule on the marshes: *"However, as a result of a systematic plan by Saddam Hussein's regime to ditch, dike, and drain the marshes of southern Iraq, less than 10% of the area remained as functioning marshland by the year 2000 (Partow 2001, Brasington 2002)."*

Fig. 7 - S2 (25 & 28.02.2019) - 12,11,2 colour composite - Central Marshes are located between the Tigris and the Euphrates.

[3D view](#)

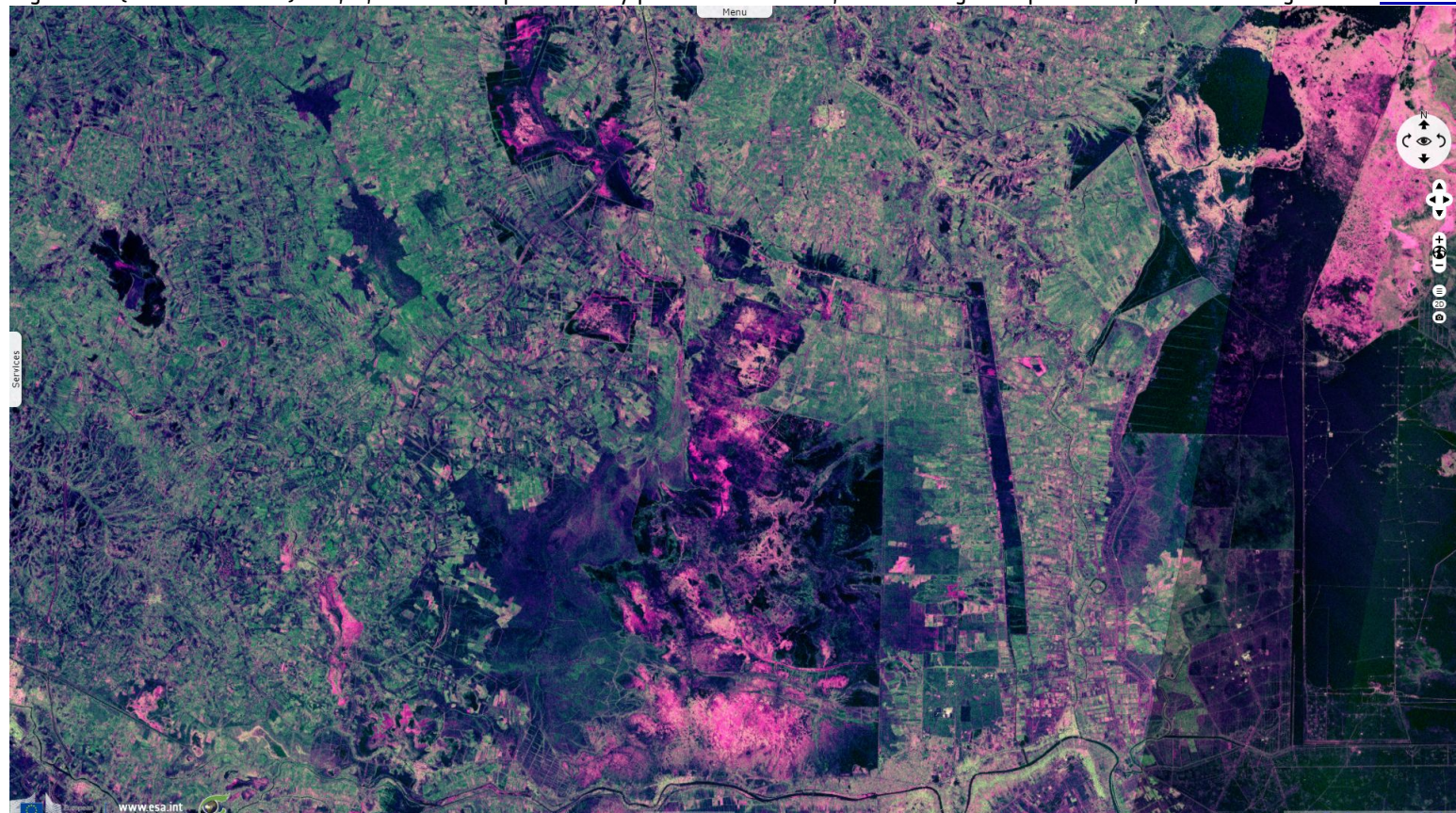


A report [written](#) in 2003 by Human Rights Watch reminds how the destruction of the marshes was a part of persecutions against the Ma'dan minority, detailing the : *"campaign by the Ba'athist government of Iraq against the Ma'dan or so-called Marsh Arabs—the mostly Shi'a Muslim population that inhabits the marshlands (al-ahwar) in southern Iraq around the confluence of the Tigris and Euphrates rivers. Numbering some 250 000 people as recently as 1991, the Marsh Arabs today are believed to number fewer than 40 000 in their ancestral homeland. Many have been arrested, 'disappeared', or executed; most have become refugees abroad or are internally displaced in Iraq as a result of Iraqi oppression. The population and culture of the Marsh Arabs, who have resided continuously in the marshlands for more than 5 000 years, are being eradicated.*

Starting shortly after the end of the Gulf war in 1991, Marsh Arabs have been singled out for even more direct assault: mass arrests, enforced 'disappearances', torture, and execution of political opponents have been accompanied by ecologically catastrophic drainage of the marshlands and the large-scale and systematic forcible transfer of part of the local population."

Fig. 8 - S1 (24 & 25.02.2019) - vv,vh,vv colour composite - They provide flood control, water storage and purification, and climate regulation.

[3D view](#)



Curtis J. Richardson then [recalls](#) the evolution of the marshes between 2000 and 2006: *"The Mesopotamian marshes of southern Iraq had been all but destroyed by Saddam Hussein's regime by the year 2000. Earlier assessments suggested that poor water quality, the presence of toxic*

materials, and high saline soil conditions in the drained marshes would prevent their ecological restoration and doom the reestablishment of the Marsh Arab culture of fishing and agriculture.

However, the high volume of good-quality water entering the marshes from the Tigris and Euphrates Rivers, a result of two record years of snowpack melt in Turkey and Iran, allowed 39% of the former marshes to be reflooded by September 2005. Although reflooding does not guarantee restoration success, our recent field surveys have found a remarkable rate of reestablishment of native macroinvertebrates, macrophytes, fish, and birds in reflooded marshes. However, the future availability of water for restoration is in question, which suggests that only a portion of the former marshes may be restored. Also, landscape connectivity between marshes is greatly reduced, causing concern about local species extinctions and lower diversity in isolated wetlands."

Fig. 9 - S2 (25 & 28.02.2019) - 11,8,2 colour composite - West Hammar marshes lie just south of the Central marshes, across the Euphrates. [2D view](#)



In an article [written](#) for National Geographic in 2015, Peter Schwartzstein brings strong reservation on the ability of the marshes to recover fully: "The partial restoration of the Mesopotamian marshes has been heralded as one of the few success stories to emerge from Iraq's chaos. Nowadays, however, the greatly reduced water flow of the two rivers that feed the marshes—the Tigris and the Euphrates—once more threatens the livelihoods of some of the area's inhabitants.

From a high of around 75 percent restored in 2008, the wetlands are now at 58 percent of their average pre-drained level and look set to shrink below 50 percent this summer. Dam construction in Turkey and Iran has reduced the combined volume of the rivers by up to 60 percent, according to the United Nations. Given the impact of low rainfall and wasteful irrigation practices in Iraq, environmentalists predict the marshes will remain at a fraction of their typical size."



"(a) Marsh Arab fishermen collecting reeds (*Phragmites australis*) in the natural Al-Hawizeh marsh (N 31°38.583, E 47°35.203) near the Iranian border in June 2003 - Source: [Curtis J. Richardson](#)."

"(b) The totally drained Central marsh near Chibayish (N 30°58.102, E 47°09.033) in June 2003. An Iraqi engineer from the Ministry of Water Resources is viewing the cracked and desiccated marsh soil adjacent to a dried-out streambed" - Source: [Curtis J. Richardson](#).

Fig. 10 - S2 [25 & 28.02.2019] - 4,3,2 colour composite - East Hammar marshes are located near Basra beyond the confluence. [2D view](#)















The effect of men decision on biodiversity is also reminded: "Some of the most prized species, such as gatans, which can weigh up to 22 pounds (ten kilograms), have already vanished from the marshes, while the elevated saltiness has attracted fish that were previously found only out at sea.

The marsh dwellers haven't always helped themselves, conservationists hasten to add. Many have traded their nets for high-voltage transmitters, which stun the fish but also kill bottom-feeders and thereby stunt the food chain.

But the water level has fallen and salinity has rocketed—to 15 000 parts per million (ppm) in some areas, up from 300 to 500 ppm in the 1980s."

The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.
Contains modified Copernicus Sentinel data 2019, processed by VisioTerra.

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