

**The Groundwater Task Force of the International Water  
Resources Association**

# **Azraq Oasis Restoration**

**By Susan Fouad Kilani**

**30 June 2021**

# How Azraq Oasis used to be (picture from the 70s)



## **Leap of Faith**

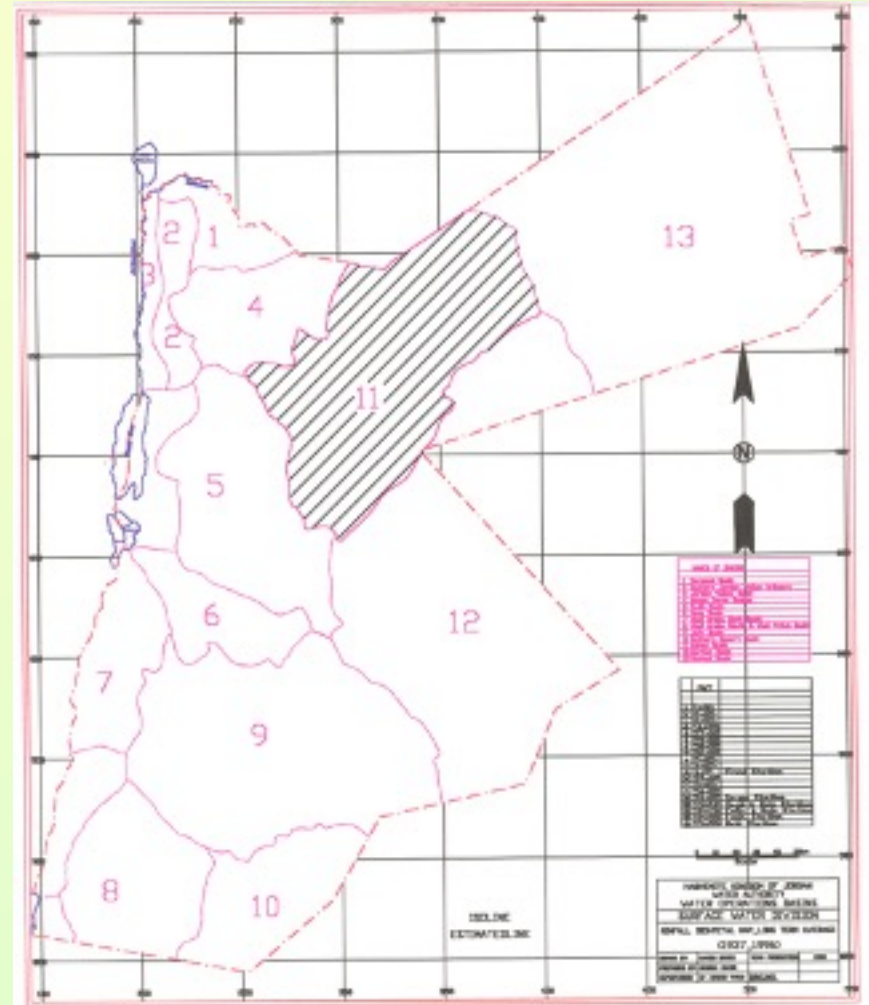
In page (5) of Her Majesty's Queen Noor Al Hussein book, “Leap of Faith: Memories of an Unexpected Life” I quote the following about Azraq Osais:

“ ...Lakes once covered the eastern desert, where fossilized lions’ teeth and elephant tusks can be found in the sand. On the road to Baghdad loom the 1300 year old Islamic Desert Castles.....with colorful frescos and mosaics of birds, animals and fruits and heated indoor baths.”



# Azraq basin -Jordan

- Azraq basin is located in the Northeastern part of the country and is of regional importance as it is shared between Jordan and Syria.
- The total area of Azraq basin is about 12710 km<sup>2</sup> where 94% belongs to Jordan and 6% to Syria.



# Azraq Oasis Characteristics

- The Azraq drainage basin (Qa'a Azraq) at an elevation of 505 masl, surrounded by mud flats and salt pans.
- The precipitation ranges from 50 mm/a in Azraq Oasis to >1000 mm/a in Jabal Arab (Jabal Drouz). The average precipitation for the entire basin is 87 mm/a, most of which occur as storms between January to March.
- The mean daily temperature in winter is less than 10C°. The summers are hot. The absolute maximum temperature is 45 C° .
- The area in general is lightly vegetated although in the farm areas a wide range of vegetables, fruits and olive trees are grown under irrigation.

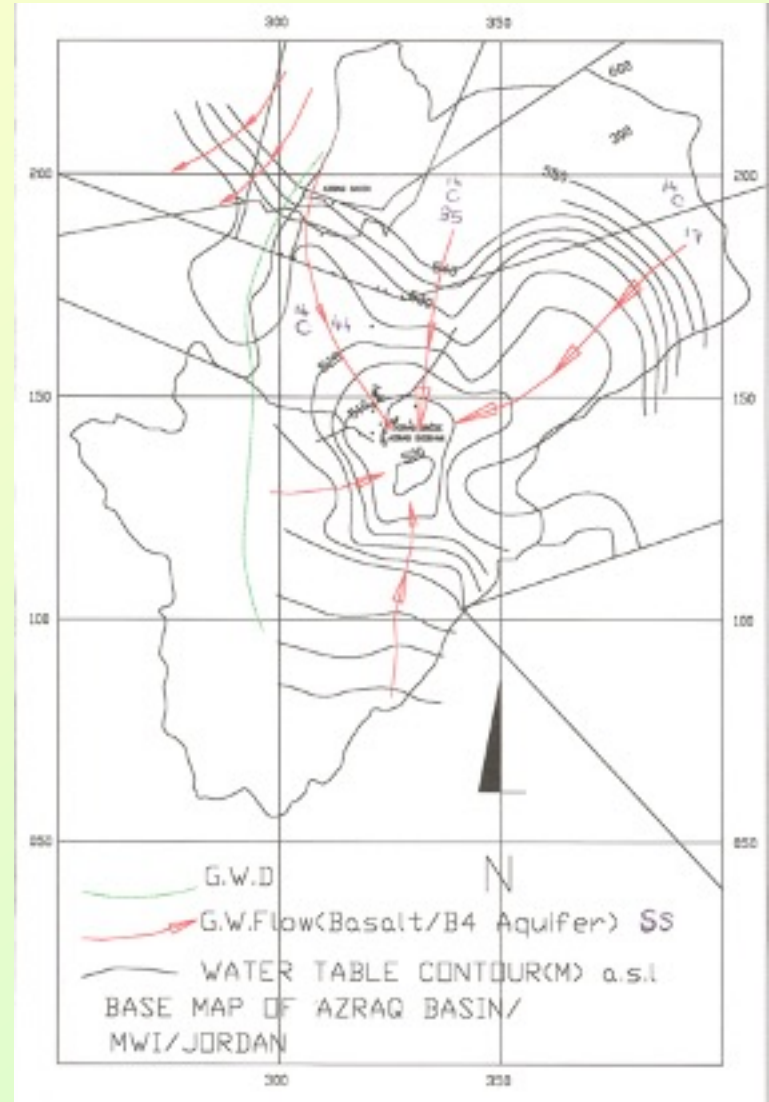
# Hydrogeology

Three main aquifers form the Azraq basin hydrogeological units:

- The Upper (unconfined) Basalt/ B4 aquifer forms the main aquifer in the Azraq area. The depth to the ground water table is from few meters in the center of the oasis to 400 m in the northern catchment area.
- The Middle confined Aquifer (almost saline) (B2/A7) composed of Karstic Limestone and Chert formations overlain by the B3 aquitard (confining) formation.
- The deeper aquifer unit known as the Kurnub Sandstone Aquifer. Investigation results indicate low yields and a poor quality resource

# Recharge Pattern

- The main recharge of the upper Basalt aquifer is from the high rainfall areas at Jabal Arab in southern Syria
- Local recharge is negligible
- The estimated total recharge is about 34 MCM/a
- The residence time of the groundwater to discharge area is ranging between 4000 to 20000 years.





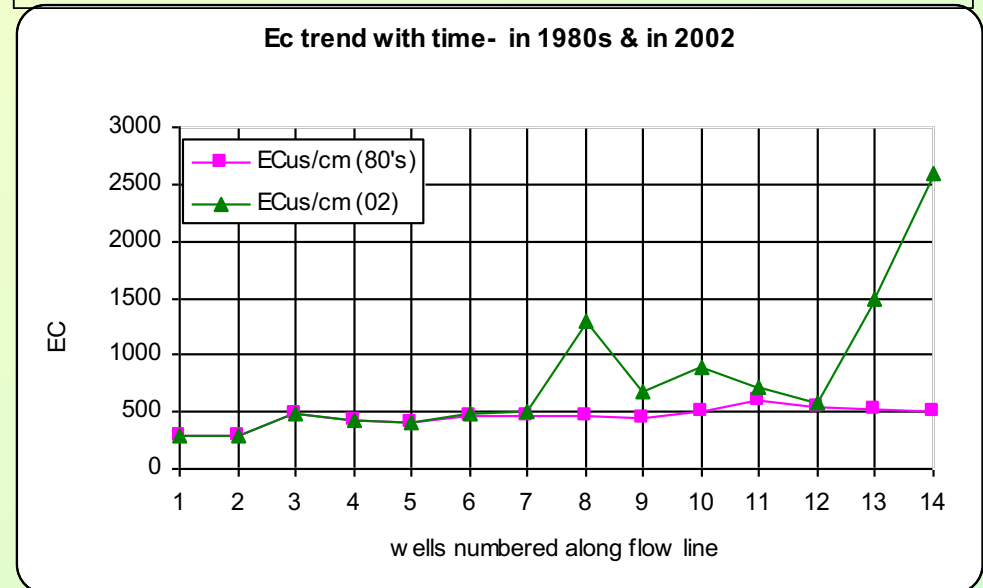
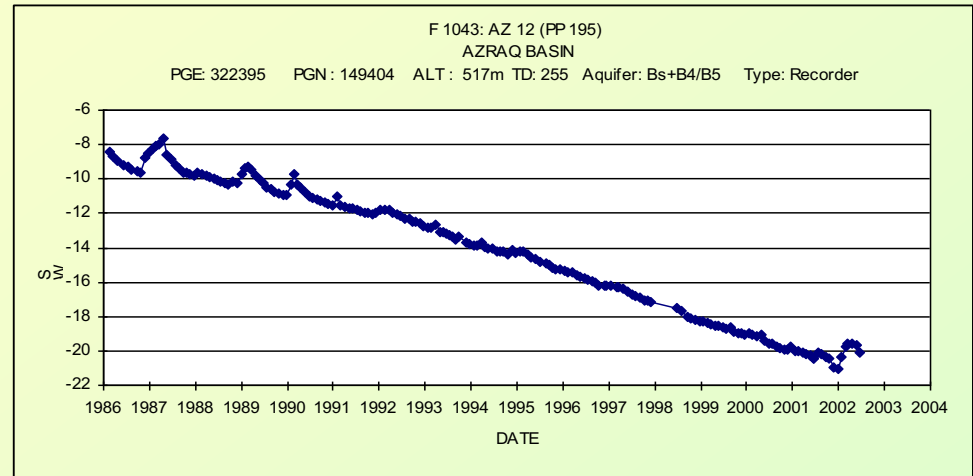
# Importance of Azraq Basin

- Azraq basin is an important aquifer in the water policy of Jordan. A well field “Amman Water and Sewage Authority (AWSA)” was established North of Azraq Druze Springs (northern springs) where about 15-20 (MCM/a) of water is pumped to the capital Amman for drinking purposes since 1982.
- Farmers in the area are using around 45 MCM/a many of which are illegal wells. Therefore total abstraction from the basin is about 65 MCM/a.
- The Azraq Oasis is designated a RAMSAR Wetland of international importance and an Important Birds Area (IBA) by Bird Life International. Azraq Oasis, an outstanding example of an oasis wetland in an arid region comprised a large complex of spring-fed marshes and seasonally flooded mudflats [1].

# Consequences of groundwater over pumping

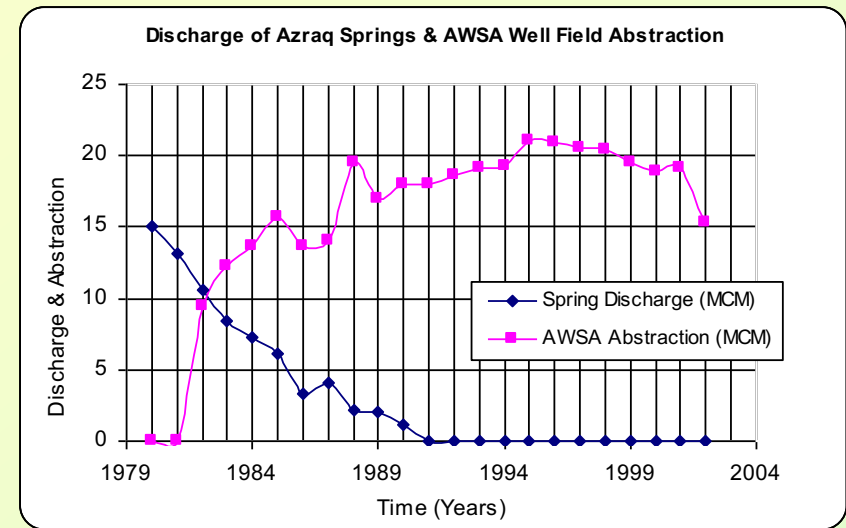
The intensive exploitation of water resulted in:

- A dramatic draw down of the local water table with consequent risk of future availability of water.
- Degradation of water quality and salinization of a number of wells in the AWSA well field which would seriously affect the water supply for the future.



# Consequences of groundwater over pumping

- Discharge from the four main springs that fed the reserve fell from 10.5 MCM/year in 1981 to less than 1 million MCM in 1991 [1].
- In 1987, the two northern springs dried up completely. The southern springs ceased flowing in August 1992.
- By December 1992, the wetlands were completely dry.



Marsh vegetation died off, and slow-burning fires began moving through the ground in areas that were formerly deep swamps. Many of the rare birds and plants disappeared totally [1].

# The Success Story

## Azraq Oasis Restoration Project

- In order to save this natural jewel, RSCN managed in 1994, with international support, to restore a significant part of the wetland.
- In September 2020, the habitat restoration efforts continued in the Azraq Wetland Reserve and with support from the French Global Environment Facility (FFEM) and French Development Agency (AFD).
- By mid-December 2020, ca. 650 killifish individuals were collected from other pools in the reserve and reintroduced to this restored environment. The Common kingfisher has also become a regular visitor to the recently restored pools.

# Project Goals

- Halt further degradation of the aquatic ecosystems in the oasis and to restore as much of the wetlands as possible to a natural or near-natural condition with a view to maintaining the biological diversity of this unique wetland ecosystem.
- Establish a sustainable basis for the utilization of the water resources of the Azraq Basin.

# Project Activities

- 1) Rehabilitation and management of Azraq Wetland Reserve.
- 2) Establish an EIA unit within the Department of Environment and improved implementation of the Ramsar Convention in Jordan.
- 3) Establish guidelines for agricultural development in the Azraq Basin.
- 4) Develop water management plan for the basin.
- 5) Support long-term research on the conservation and management of water resources in arid and semi-arid regions.

# Achieving the Goals

- 1) large amounts of rubbish were cleaned and properly managed.
- 2) In June 1994, water was pumped back to the wetlands from the Basalt aquifer at a rate of 1.5 MCM/yr or approximately 10% of the original input.
- 3) At the same time extensive rehabilitation and clean-up effort to enhance the potential for recovery. Spring pools were dredged and enlarged, and many of the wadis leading to the reserve were also cleaned and deepened to enable channeling of as much surface runoff as possible during the rainy season.
- 4) A new perimeter fence was erected to exclude the site from exploitative activities, and grazing animals.
- 5) Construction of a new visitors' center in 1997 as an educational, recreational and scientific center.

# Achieved Ecological Outcomes

- Towards the end of October 1994, the water table in the lakes began rising, and parts of the oasis started to come back to life.
- Beginning in November, the rainy season of 1994-95 yielded above-average precipitation, and over ten million cubic meters of water reached the wetlands.
- During the following drought seasons the wetlands remained in an environmentally and ecologically healthy state due to the rehabilitation efforts.



# Notable project achievements

- An adequate amount of water was secured to revive and rehabilitate Azraq wetland ecosystem and its biodiversity.
- The water quality of the Azraq Basin was enhanced, and the danger of the complete salinization of the Azraq Basin has been lowered.
- An incremental minimization of pumping was attained. The ideal solution of bringing pumping down to the system's natural safe yields was not attained, but it is a move in the right direction.

- Evident positive socioeconomic trends among the local community noticed. The local people, after a lengthy period of frustration, were empowered and began to participate in the overall socioeconomic development of the area with the support of the Azraq Oasis Conservation Project.
- The Azraq Reserve is now a source of income for around 60 families from the local community
- Increasing numbers of tourists visiting the area, and numerous companies have expressed interest in investing in eco-tourism.
- A grassroots movement known as the Friends of Azraq Society was established to foster environmental preservation and the achievement of local socioeconomic stability.

# Future Improvement Opportunities

- Improved tourism industry that is main income to the Azraq community.
- Improved agricultural productivity and use of technology (water efficiency vs productivity).
- Improved sanitation services and utilization of reclaimed water in agriculture instead of the fresh aquifer water.
- Better management of the water resources in an integrated manner to overcome impacts of exploitation.
- Reinforce local industries like the salt industry that once have been main income for the Azraq community.
- Enhance and finance local projects that engage the youth for a better livelihood of their communities.



Thank you



## Further information @

<https://medwetmanagers.net/a-success-story-restoration-of-the-azraq-wetland-jordan/>

[1] Summary of the restoration project by Hazem Al Hreisha, Azraq Wetland Manager at RSCN