

# ***In situ* and *ex situ* conservation of genetic diversity of desert plants in Kuwait**

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## **Introduction**

The need for conserving biodiversity in the Gulf region has become increasingly apparent. Accelerated development of the desert has subjected the fragile and vulnerable ecosystems to almost non-restorable condition. The value of biological resources, as an integral part of the natural heritage which can yield sustainable benefits, should not be underestimated. Not only can the establishment of protected areas potentially preserve the natural ecological systems of the national area, but it can also contribute positively to the region's ecological balance, scientific research and education, natural history preservation, recreational opportunities, and tourism.

In response to this situation and to give future generations the opportunity to enjoy nature, the Arabian Gulf countries safeguarded their natural environment by dedicating areas for the conservation and preservation of biological diversity. By setting aside areas of significant natural ecosystems or important ecological characteristics (in situ conservation), steps are being taken to conserve and preserve the natural history of the terrestrial and marine ecosystems. Examples of this in Kuwait are presented as follows:

## ***In situ* conservation**

Five protected areas have been established: Sabah Al Ahmad Natural Reserve, Jahra Pond reserve, Doha reserve, KISR Sulaybia Field Research Station and Al Leyah Protected area, which is recently established. Some other areas have been proposed for protection in the future (Figure 1). The following is general description of each area:

### **The Sabah Al Ahmad Natural Reserve**

The Sabah Al Ahmad Natural Reserve is located in the northwest of Kuwait Bay. It is characterized by different ecosystems such as: salt marshes, ridges, gullies, depressions, wadis, and desert plain ecosystems. It is possibly the largest terrestrial ecosystem designated as a protected area in Kuwait. The park extends from Umm Al-Aysh in the north, to Al Bahrah in the east into Kuwait Bay in the south, and Hoban in the west. The area is generally flat with minor undulations. The significant physical feature in the area is the jal Az-Zor escarpment, which rises to about 135 m and runs parallel to the seashore. The escarpment forms a natural watershed. The deepest depression is Wadi Unim Ar-Rimam located in the north-western corner of the park.

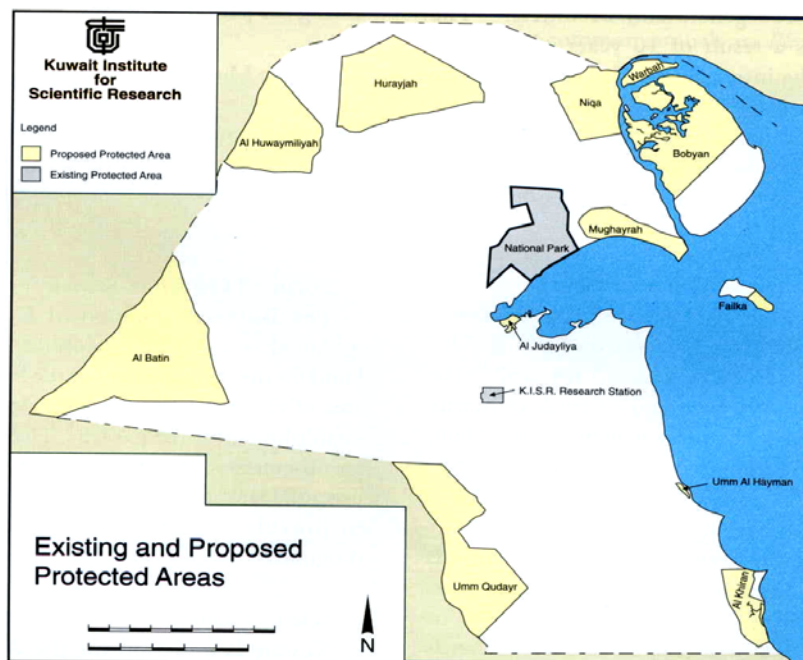


Figure 1. Existing and proposed protected areas in Kuwait.

Reptiles, birds, and mammals comprise the vertebrates of the park. The dhub is the most visible reptile. The agamids (lizards) and snakes are also important reptiles. The rodents generally prefer the sandy desert region with shrub cover, where they usually burrow. The jerboas are found on the more open flat areas of stony desert. Foxes have been observed in Umm Ar-Rimarn and Jal Az-Zor. Feral dog packs wander along the coastal stretches and are becoming common.

Of the 350 bird species recorded in Kuwait, crested larks, shrikes, bee eaters, wagtails, little owls, kestrels, and steppe eagles are among the most common seen in the reserve. Arm Flamingos, herons, cormorants, shelducks, and crab plovers are mostly found in the coastal region. Houbara. had not been recorded in the area until 1995. Invertebrates, especially insects, are an ephemeral component of the community; the majority only appears for a restricted period of each year.

In the reserve, significant habitats are dominated by the following genera: *Haloxylon*, *Halocnemum*, *Seidlitzia*, *Nitraria*, and *Zygophyllum*. Endangered species in the reserve include *Rhanterium epapposum*, *Calligonum polygonoides*, *Gynandris sisyrinchium*, *Ochradenus baccatus*, *Halothamnus* and *Convolvulus oxyphyllus*.

### Jahra Pond/Reserve

Located at the narrow edge of Kuwait Bay and covering an area of 2.5 km<sup>2</sup> of salt marshes, the reserve consists of a man-made pond covered by secondary treated sewage effluent flowing across sandy sabkha into the sea. It also has a coastal zone with a tidal area, mudflats, shoreline, and reed beds. Jahra pond is a resting site for migratory birds. The reserve serves as a shelter for both indigenous birds and those displaced from Iraqi marshlands. The site has a good potential to be used for field studies at all academic levels.

It was an unfortunate day on October 30, 1997, when the Jahra pond was set on fire due to sabotage. Luckily, the fire department was able to extinguish the fire. Yet, most of the area covered by the reed *Phragmites australis* was destroyed and many birds were killed. Fortunately, one year later, the grass recovered and the pond was restored by providing an underground water supply.

### Doha Reserve

Located on the coastal belt at 29° 22' N 47° 49' E, this salt marsh of a reserve covers 4.5 km<sup>2</sup>. The sandy sabkha has halophyte vegetation associated with mudflats and coastal plains, and an important reed stand of *Phragmites australis*. The area is regionally significant, as it is used by numerous bird species for breeding and resting.

### KISR's Sulaibiya Field Research Station (SFS)

In Kabd, which is located to the southwest of Kuwait City, a green desert plain covers an area of 20 km<sup>2</sup>. In 1975, this area was set aside to establish a satellite field station to conduct range management research and to conserve the renewable natural resources of the associated *Rhanterium Cyperus* community type. A 2 m high chain fence surrounds it and it has a one million gallon capacity reservoir supplied with brackish water of 3,500-4,000 ppm.

The vegetation in the area is dominated by *Rhanterium epapposum* in association with *Cyperus conglomeratus*. Due to its long-term protection, the area has a thick stand of vegetation and litter. Annuals grow vigorously during each rainy season. Among the common annuals are *Plantago boissieri*, *Schimpera arabica*, *Cutandia memphitica*, *Lotus halophilus*, and *Horwoodia dicksoniae*, a plant named after Dame Violet Dickson. Common perennial species are *Farsetia aegyptia*, *Stipagrostis plumosa* and *Panicum turgidum*. The dhub is the most common large lizard, foxes and owls are occasionally observed, and bee-eaters and crested larks are common visitors. Permission to enter the site is required by KISR. A site layout is shown in Figure 1.

### Al Leyah Protected Area

The former gravel quarry site at Al-Liyah was severely affected by industrial activities, resulting in the widespread destruction of the natural vegetation cover. After a nation-wide ban was imposed on quarrying in 2001, KISR has been undertaking work to restore the desert ecosystems in Al-Liyah at the request of the Kuwait Government.

As a very broad generalization, the Liyah quarry site can be divided into two separate areas:

- The northern area much of which was heavily impacted by excavation work. After the cessation of quarrying, large tracts were filled with poor quality debris / quarry spoil and subsequently heavily compacted.
- The southern area where the impact from excavation work, although severe, was generally less intense than in the northern part. In places, an impressive natural regeneration of the vegetation has taken place.

In the southern part of Liyah, extensive stands dominated by the perennial grass *Stipagrostis plumosa* have gained a foothold, presumably where the substrate is more favourable, accompanied locally by *Centropodia forsskaolii*. Furthermore, a few small patches of *Rhanterium epapposum* have been found in some eastern sections of the southern part, and this community probably dominated parts of the area up until a few decades ago. Several small groups of the rare perennial *Astragalus sieberi* were discovered in several locations in Liyah. The species was otherwise only known from Salmi and a single plant in the Sabriya oil field, and it is therefore of high conservation value.

Vegetation in the northern part is extremely sparse (< 0.2 % cover). *Fagonia bruguieri* is probably the most widespread species, occasionally accompanied by *Erodium glaucophyllum* and *Astragalus spinosus*. However, their presence is patchy, and is usually associated with slight depressions.

Some depressions, presumably where water accumulates for extended periods after rainfall, are quite green. Apart from *Astragalus* and *Erodium*, the perennial herb *Haplophyllum tuberculatum* is often present.

Otherwise, a number of ubiquitous species of desert annuals emerge in these depressions. In wet winters, large populations of the annuals *Malcolmia grandiflora* and *Diploaxis harra* appear in parts of the northern area, but in dry seasons, they can be virtually absent. Of particular interest is the discovery of a large native iris field in a large depression in the northern part of Liyah with thousands of irises (*Gynandriris sisyrrinchium*). Other plants here include *Chrozophora* cf. *tinctoria*, *Citrullus colocynthis* and *Astragalus spinosus*.

## **Ex situ conservation**

### **The Kuwait Zoo**

The objective of establishing the Kuwait Zoo is two-fold: to breed wildlife in captivity for educational purposes and to preserve indigenous resident or migratory wildlife species to reintroduce them to the wild. The Zoo also conducts baseline studies on mammals.

### **Kuwait University Insect Collection**

The Zoology Department at Kuwait University maintains the insect collection of Kuwait. Before the invasion, the collection comprised 591 species belonging to 414 genera and 21 orders. The collection was a result of decades of intensive surveying of the insect fauna of all biotopes. The collection was looted during the Iraqi occupation, and after liberation, a new attempt was made to reestablish the collection. By the end of 1995, 280 species belonging to 223 genera and 14 orders had been recollected.

### **Kuwait University Herbarium**

The number of native and naturalized vascular plant species in Kuwait as reported in the checklist developed by Boulos and Al-Dosari (1994) is 374. The number of plant specimens in the Kuwait University Herbarium during the pre-war period was 22,000. Some 4225 species have been recollected since 1991.

### **KISR Herbarium**

The KISR herbarium contains 1980 plant specimens collected from about 55 families since 1961.

### **KISR Seed Bank**

KISR established a seed bank for native species and is planning to initiate large-scale seed production activities on its KISR Sulaibiya Field Station. For this purpose, FRSMD procured seed harvesting, processing and storing equipments that can handle varying quantities of native seeds. This will ensure the availability of seeds and planting materials at all times. Currently, the seed bank contains seed stock of 66 species of native plants

### **Science Museum**

The Science Museum contains the following numbers of specimens from Kuwait's desert and marine ecosystem: 130 plants, 10 reptiles, 200 insects, 110 fish and marine specimens, 2 birds, and 4 mammals.

### **Botanical Garden of Kuwait**

It has been proposed that The Botanical Garden of Kuwait be established at Al Doha. An area of about 176 ha has been designated for the establishment of the garden. The main objectives are to conserve the local flora, demonstrate their potential landscaping use and economic value, and to provide educational and public awareness programs. The area is under the jurisdiction of the Public Authority for Agriculture and Fish Resources.

### **Science Center**

Kuwait Foundation for the Advancement of Sciences established the Science Center for educational purpose. The Center consists of the aquarium, terrestrial ecosystem, and the explorer facility. Many living animals in the aquarium and the desert ecosystem were collected from local habitats.

### **Domestication of Native Plants**

Recently, the scientific community is stressing the importance of native plant preservation and the utilization of them in desert restoration and rehabilitation programs. In Kuwait several native perennial plant species are threatened due to various environmental factors. In order to preserve and propagate certain species of native plants, different regeneration methods have been developed. These plant species were selected because of their importance for desert rehabilitation and possible use in urban landscaping. Seeds and vegetative propagation.

### **Conclusion**

*In situ* and *ex-situ* conservation of biodiversity provided means for conserving fauna and flora of the country. While some areas have been already established as reserves more efforts are needed to manage resources and conserve species in their natural habitats. Rehabilitation efforts by utilizing native plants are essential for enhancing recovery of many depleted ecosystems.

### **References**

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