

Revegetating Kuwait's Damaged Natural Ecosystem with Native Plants

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Abstract

The natural habitats in desert areas, like Kuwait, host many wildlife species and a diversity of drought resistant plants that flourish and reproduce annually depending on amount of seasonal precipitation. However, due to urbanization and massive use of rangelands for grazing, camping and wildlife hunting as well as military activities and the spread of oil pollution in large areas, the land became severely damaged and a restoration program deemed necessary to alleviate and mitigate biodiversity losses. Specific restoration measures are required to promote vegetation regeneration. The Kuwait Environmental Remediation Program supported the largest remediation and revegetation program to remediate/rehabilitate and restore the damaged terrestrial environment of Kuwait. Native plants are an important source of genetic material that can withstand harsh climatic conditions and are well adapted to arid environments. Ecological restoration of damaged terrestrial environment required mass production of native plants, use of native plants in landscaping projects, protection of existing desert ecosystems as well as in situ and ex situ conservation of native plants. Effective measures to improve the ecosystem regeneration and the massive production of native plants to restore damaged areas seems to be one of the most effective revegetation methods to address the matter.

Keywords: Ecological restoration; Remediation; Deserts; Arid lands; Vegetation; Bioremediation; Landscaping; Regeneration

Introduction

Restoring and revegetating native plant habitat is vital to preserving Kuwait's biodiversity [1]. By creating a native plant garden, each patch of habitat becomes part of a collective effort to nurture and sustain the living landscape for birds, lizards, rodents, and other animals. Native plants are those that occur naturally in a region in which they evolved. They are the ecological basis upon which life depends, including animals, birds, and people. Without them and the insects that co-evolved with them, local species cannot survive [2]. Over the past 60 years in Kuwait, urbanization has taken intact, ecologically productive land has transformed into unfertile lands and idle place for native inhabitants. Additionally, the rangelands of Kuwait have suffered from massive degradation caused by several factors, most notably overgrazing, military activities associated with the Iraqi invasion of Kuwait in 1990 along with the detonation of more than 700 oil wells that caused massive soil contamination led to a marked deterioration in their condition. The damage to the rangelands is so severe that in the short to long-term, specific restoration measures are required to promote vegetation regeneration. Thanks to the KERP projects (Kuwait Environmental Remediation Program), by the State of Kuwait, one of the world's largest remediation and revegetation programs, which started its activity to address the severe environmental issue in a massive scale.

Problems of Biodiversity Loss in Kuwait

Following points and photos describes the factual reasons of ecosystem damage [3-6]

A. Grazing animals depend largely on native grasses/plants that affect ecosystem

balance. Overgrazing by too many animals for a long period can adversely impact plant growth and survival (Figure 1).

B. Urbanization and anthropogenic activities without considering nature's existence (Figures 2 & 3).

C. Gulf war and the Iraqi invasion that caused massive oil spills in large areas (114Km²) due to detonation of more than 700 oil wells in the oil production fields (Figure 4).

D. Off-road driving, waste dumping into the desert, and desert camping.

E. Poor law enforcement for the effective use of open deserts.

F. Climate change phenomena [7].



Figure 1: Overgrazing of desert rangelands.



Figure 2: Wastes materials in deserts.



Figure 3: Dumping of waste and construction material.



Figure 4: Oil pollution due to detonation of oil wells during the invasion of Kuwait in 1990-91.

Solutions

Several solutions have been considered to alleviate and mitigate biodiversity losses. Some solutions are listed as follows:

- Remediation of contaminated soil.
- Mass production of native plants for re-vegetation and restoration projects.
- Mandatory use of native plants in landscaping projects.
- Protection of existing desert ecosystems by fencing and patrolling.
- In situ and ex situ conservation of native plants.

Remediation of Contaminated soil

The Iraqi invasion to Kuwait in 1990 resulted in a great damage to the oil sector and environmental catastrophe that, to this day, continues to have far reaching effects on native plants, wildlife, soil, and groundwater, and is the focus of environmental restoration and remediation efforts. The destruction of oil wells in the north and south oil fields caused massive soil pollution with crude oil flooded the desert landscape and gathered in lower lands and depressions forming what is called (oil-lakes). Although crude oil is a natural organic product, it has xenobiotic and toxic burning effects on plant tissues and wildlife skins. The government of Kuwait, institutions, various private companies, and Kuwait Oil Company (KOC) have taken initiatives in collaboration with the Kuwait National Focal Point (KNFP) for Environmental Remediation Program using several methods such as bioremediation and made endeavors to remediate and restore the environment to its former state prior to the Iraqi invasion [8]. The remediation and restoration programs developed by KOC are unique and exceptional in that they convert damaged lands into productive lands for natural recovery and in pursuance to the United Nations Compensation Commission (UNCC) Decision 258. Damaged areas are remediated and restored by treating the remaining crude oil contamination in soil from the oil well demolition and explosions in addition to controlling access and land-use to areas that have special ecological importance. These areas are set up as oases and protected areas for the conservation of natural resources and biodiversity [9].

Mass Production of Native Plants

The large-scale production of native perennial plant species has been shown to be technically feasible with relatively little investment required for infrastructure. The plants produced can be used for ecosystem restoration projects, which could be of great relevance if the large-scale remediation and revegetation projects are implemented in Kuwait (Figure 5). Large quantities of seeds are produced by these plants within a year. This shows that a seed production unit is technically possible, which will be of great relevance to those big projects. Apart from restoration purposes, the native perennial grasses can be used as an excellent source of fodder for domestic livestock, especially as they require relatively little irrigation when compared to conventional forage grasses.



Figure 5: Native Plants Revegetation in Kuwait-before (left photo) and after (right photo).

Mandatory use of Native Plants in Landscaping Projects

Since native plants are accustomed to their habitat, they can hold water better than non-native plants, which will save significant amounts of water. Native plants can adapt to the typical amount of precipitation an area receives. Native plants also tend to withstand the environment better than non-native plants [10]. This allows them to withstand harsh weather and grow back the following year. Native plants are typically more resistant to disease, drought and other environmental risks than other plants. They can spread quickly to crowd out any weeds, which means less maintenance. Many native plants grow in such a fashion that protects the soil from being flooded with water. Landscaping with native plants contributes to a natural habitat for the animals that reside in the area. Native plants typically produce fruit, nectar, nuts, and seeds, which provide a natural source of food for many birds and animals within the area. In some areas, large amounts of wildlife depend on these plants and other natural sources to survive and they have a natural built-in defense system to protect themselves.

Protection of Existing Desert Ecosystems by Fencing and Patrolling

Grazing, which has been widely considered as the main anthropogenic driver of vegetation degradation and environment ecosystem deterioration. The climate in these areas is generally characterized by strong sunlight, high temperature, high evapotranspiration, and little precipitation, inducing a fragile ecological ecosystem that is sensitive to human activities and

climate change [11]. Overgrazing leads to the excess output of energy and nutrient from plant–soil ecosystems to herbivores which results in degradation of grasslands. Overgrazing pattern aimed to get higher economic income may not only reduce vegetation cover, aboveground productivity, species diversity, and change the distribution of community spaces, but also exacerbate soil erosion and induce soil degradation, or even enhance desertification. Thus, it is mandatory to protect the available deserts or desert patches by fencing and patrolling (Figure 6).



Figure 6: Fencing enhances natural vegetation regeneration (Wafra, Kuwait 2023).

In Situ and Ex Situ Conservation

In situ conservation: on-site conservation or the conservation of genetic resources in natural populations of plant or animal species, such as desert genetic resources in an arid ecosystem E.g., Sabah Al Ahmad Nature Reserve [4], KISR research station, Sulaiibiya Ex situ conservation: off-site conservation is the process of protecting an endangered species of plant or animal outside of its natural habitat, however, long term management of range lands even in protected areas is important to understand how native plants function as community and respond to climatic changes and conditions [12].

Conclusion

The Kuwait Desert ecosystem is threatened by a wide range of anthropogenic disturbances. The present review describes the most common factors affecting the nature and its belongings. Those issues are not recently started, they are there since the oil discovered. Effective methods to control those activities and suggestions to improve ecosystem regeneration are also explained in this article. Mass production of native plants and their extensive use in various projects seems to be one of the most effective revegetation methods to address the matter.

References

1. Omar SA (2022) Foreword Article. Restoration ecology of arid lands (RE-AL) thematic series. Journal of the Society for Ecological Restoration 31(2).
2. Hallett JG, Omar SAS (2020) Restoration ecology of arid lands (RE-AL) restoration ecology. Washington, DC 20005, USA, 28: A3-A4.
3. Omar SAS, Bhat NR (2008) Alteration of the Rhanterium epapposum

- plant community in kuwait and restoration measures. *International Journal of Environmental Studies* 65(1): 139-155.
4. Omar S, Bhat NR, Shahid SA, Assem A (2005) Land and vegetation degradation in war-affected areas in the sabah al-ahmad nature reserve of kuwait: A case study of umm Ar Rimam. *Journal of Arid Environments*. 62(3): 475-490.
 5. Misak R, Omar SA (2004) Military operations as a major cause of soil degradation and sand encroachment in arid regions (the case of Kuwait). *Journal of Arid Land Studies* 14S: 25-28.
 6. Al-AJM, Misak RF, Omar SA (2003) Causes and consequences of desertification in Kuwait: A case study of land degradation. *Bull Eng Env* 62: 107-115.
 7. Asem SO, Roy WY (2010) Biodiversity and climate change in kuwait. *International Journal of Climate Change Strategies and Management*, Emerald Group Publishing Limited, UK, 29(1): 68-83.
 8. Omar S, Grealish G, Roy W (2006) Types and extent of soil contamination at greater a-burgan oil field in Kuwait. *Kuwait Journal of Science and Engineering, Kuwait University* 33(2): 89-90.
 9. Omar S, Literathy P, Quinn M, Taha F, Bhat N et al. (2014) Management and technical Supervision of Kuwait Environmental Remediation Program for Kuwait National Focal Point. SP006C. I: Overview. KISR 12518.
 10. Omar SAS, Al MY, Zaman S (2007) *Vegetation of Kuwait: A comprehensive illustrative guide to the flora and ecology of the desert of Kuwait*. (Second edn), (Arabic). Depository Number 2007/175, Al Asriyah Press, Kuwait, p. 163.
 11. Bhat NR, Al-NA, Omar SAS (2009) Desertification in arid lands causes consequences and mitigation. *Proceedings of the International Conference on Desertification Control in the Arid Region*, Depository, p. 286.
 12. Omar SAS (1991) Dynamics of range plants following 10years of protection in arid rangelands of Kuwait. *Journal of Arid Environments* 21(1): 99-111.