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Arid ecosystem resiliency to total petroleum Hydrocarbons disturbance: A Case study from the State of Kuwait associated with the second gulf war

Meshal M Abdullah[1], Amjad T Assi[2,] Mansour T Abdullah[3] and **Rusty A Feagin[4]**

[1] Department of Ecosystem Science and Management, Texas A&M University, USA
[2] Biological and Agricultural Engineering Department, Texas A&M University, USA
[3] The Public Authority for Applied Education and Training, Kuwait
[4] Department of Ocean Engineering, Texas A&M University, USA

The world's largest Hydrocarbon disturbance occurred in the deserts and offshore waters of Kuwait during the Second Gulf War in 1990-91. In this research, RS and GIS techniques were utilized to explore how native desert vegetation was recovered from hydrocarbon contamination after the Second Gulf War. By using RS techniques, change detection analysis was conducted to understand the changes about the coverage and extent of the TPH contamination and vegetation recovery. These changes were traced from 1991 until the hydrocarbon was no longer visible on the ground surface in 1998. GIS spatial analysis was conducted to determine the major ecosystem factors that influenced the vegetation recovery along with the removal of hydrocarbon disturbance. According to the results, autogenic recovery occurred at both sites within a few years and that desert native vegetation was found to have the ability to adapt and recover from hydrocarbon pollution. Native vegetation recovered across 31% of the TPH contaminated areas at Umm Gudair, and 34% at Wadi Al Batin. The changes in TPH contamination were significantly correlated with the soil type, vegetation type, geological substrates, geomorphological features, and annual precipitation. The vegetation recovery of dominant desert communities in the study area was influenced by soil type, geomorphological feature, and TPH contaminated areas. Interestingly, the results showed that these desert communities can recover in areas contaminated by TPH at a higher rate than non-contaminated sites in the study area. Such a study can provide important inputs to the restoration and revegetation programs in arid landscapes.

e: mmabdullah@tamu.edu

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