# Assessing the Condition of Frankincense Trees at Wadi Dowkah Natural Reserve

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## ABSTRACT

This study assessed the current condition and population dynamics of *Boswellia sacra* at Wadi Dowkah Natural Reserve to: (1) quantify the impact of intensive grazing pressure, (2) investigate pest effects on tree populations, (3) identify multiple environmental threats, (4) evaluate current management strategies, and (5) propose evidence-based conservation interventions. A total of 37 *Boswellia sacra* trees were documented across the four transects, with maximum recorded height of 4.5 m, trunk diameter of 70 cm, and crown width of 7.5 m. Critical findings revealed: (1) evidence of severe population decline with nearly one-third of trees lost over the past two decades, (2) complete absence of natural regeneration in unfenced areas, (3) distinctive "umbrella" growth form indicating chronic camel browsing with foliage removal up to 3 m height, (4) widespread pest infestation affecting majority of trees with branch injuries exceeding 1 m, and (5) compromised tree architecture and physiological stress indicators throughout the population. Unfenced areas demonstrated severe ecological degradation with no seedlings or juvenile trees, extensive browse lines, and many mature trees approaching mortality. In contrast, fenced sections showed healthy protected trees with successfully planted specimens and evidence of recovery potential. The study identified camel grazing as the primary threat, exacerbated by insect infestations that target stressed individuals, creating a synergistic decline mechanism. The research documents an extinction trajectory for *Boswellia sacra* at this UNESCO site without immediate intervention. Despite 20 years of continuous grazing pressure, surviving trees demonstrate remarkable resilience, indicating significant recovery potential if protective measures are implemented. This study provides critical baseline data demonstrating that *Boswellia sacra* populations at Wadi Dowkah Natural Reserve face imminent conservation crisis. However, the documented resilience of surviving trees and success of existing fenced areas indicate that targeted management interventions can effectively reverse population decline and ensure the long-term conservation of this culturally and economically vital species. Immediate action is required to preserve this UNESCO World Heritage site's botanical integrity for future generations. Priority actions include: (1) immediate comprehensive condition evaluation across the entire UNESCO site, (2) implementation of strategic grazing management through stakeholder engagement and rotational exclusion zones, (3) expansion of protective fencing around critical regeneration areas, (4) capacity building for local conservation personnel, and (5) government intervention to prevent species extinction at this globally significant site.



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