



Departement of: Ecology and Environment

DISSERTATION

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Presented by

Lamri Sahraoui Salim
Laifa Ahmed Abdelbari

To obtain the diploma of

MASTER

Discipline: Ecology and Environment

Specialisation: Ecology

THEME

**Comparative analysis of two Atlas cedar forests in the
semi-arid zone using remote sensing and field surveys:**

Boutaleb and Ouled Tebben case study

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Before the jury

Beldjazia Amina

Pr. UFA Sétif 1

Chair

Khaznadar Mouna

MCA UFA Sétif 1

Supervisor

Moghli Aymen

MCB UFA Sétif 1

Examiner

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Dedication

*I dedicate this work to my beloved family and dear friends,
whose constant support, encouragement, and understanding
have been a source of strength throughout this journey.*

Salim Lamri Sahraoui

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Laifa Ahmed Abdelbari

Abstract

Cedrus atlantica forests in Algeria's semi-arid mountains face increasing threats from climate variability and ecological degradation. This study compares two climatically similar but ecologically contrasting sites: Boutaleb, with severe dieback, and Ouled Tebben, with active regeneration. We combined remote sensing analysis (Google Earth Engine) with field-based phytosanitary surveys. Data from CHIRPS, MODIS, and Sentinel-2 reveal persistent warming, negative water balances, and declining vegetation indices since 2015. Fire history diverges sharply: Boutaleb suffered multiple severe fires, while Ouled Tebben saw minor, non-forest events. Field surveys confirm pronounced stress and regeneration failure in Boutaleb, versus ongoing seedling recruitment in Ouled Tebben. These results highlight the role of fire and local factors in pushing Boutaleb beyond resilience thresholds, underscoring the need for targeted management: restoration and fire control in Boutaleb, and conservation-focused prevention in Ouled Tebben.

Résumé

Les forêts de *Cedrus atlantica* situées dans les montagnes des zones semi-arides d'Algérie sont de plus en plus menacées par le changement climatique et la dégradation écologique. Cette étude évalue et compare l'état des cédraies dans deux régions aux conditions climatiques similaires mais écologiquement contrastées: Boutaleb, caractérisée par un dépérissement sévère, et Ouled Tebben, où la régénération reste active. Une approche combinée a été adoptée, intégrant une analyse par télédétection à l'aide de Google Earth Engine (GEE) et une étude phytosanitaire sur le terrain. Ce double regard permet de mieux comprendre les dynamiques écologiques en cours et d'identifier les facteurs environnementaux les plus influents sur la santé des cédraies dans un contexte de changement climatique.

المخلص

تواجه غابات الأرز الأطلسي (*Cedrus atlantica*) في جبال الجزائر بالمناطق شبه الجافة تهديدات متزايدة نتيجة لتقلبات المناخ والتدهور البيئي. تهدف هذه الدراسة إلى تقييم ومقارنة حالة غابات الأرز في منطقتين متشابهتين من حيث الظروف المناخية ولكن تختلفان من الناحية البيئية: بوطالب، التي تشهد تدهورًا حادًا، وأولاد تبان، حيث لا تزال عملية التجدد النباتي نشطة. تم اعتماد مقارنة مزدوجة، تجمع بين التحليل بواسطة الاستشعار عن بُعد باستخدام منصة Google Earth Engine (GEE) وكذا دراسة الصحة النباتية في الميدان. تُمكن هذه الرؤية المتكاملة من فهم أفضل للديناميات البيئية الجارية وتحديد العوامل البيئية الأكثر تأثيرًا على صحة غابات الأرز في ظل التغيرات المناخية.