Restoration and Rehabilitation of the Biological Reserve (Djebel El Ouahch, Constantine)

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Abstract
Biological Reserve Djebel El Ouahch is considered a unique environment known for its rich biodiversity. Thus, the study of the environment allows us to estimate that the site has undergone a sharp deterioration, mainly due to human action (illegal logging, overgrazing, fires), and socioeconomic factors. In this study, we propose a project for rehabilitation and restoration of this reserve who registers within a framework of protection of fauna and flora of this ecosystem, and that'll participate in the same time developing a green tourism.

Key words: Biological Reserve (Djebel El Ouahch), degradation, restoration, rehabilitation.

Introduction
The Biological Reserve is one of the most important elements of the Djebel El Ouahch forest; it is characterized by a rich flora (Djouadi and Khoreif-Nasreddine, 2000) and remarkable fauna. Covers 27 hectares around four artificial lakes, the reserve contains a collection of 43 forest species, ornamental and nobles from Algeria and another continent (Europe, America). Despite these advantages, this gorgeous set is subjected to critical important cause degradation to human action: overgrazing, fires (Mebarki and Meziane, 2008), more physiological and parasitic diseases due to factors in the physical environment (Laestadius, 2011). In this study, we will try to propose a rehabilitation plan and development of biological reserve to be useful to the forestry and scientifically plan, a hand and secondly, make the welcoming and efficient site for environmental education to a wide audience (public and school).

Material and methods
Presentation of the study area
The study area of Biological Reserve (Djebel El Ouahch’s forest) belongs administratively to the province of Constantine (Map 1). It is located between longitude (6° 39′ 30″ E and 6° 40′ 10″ E) and latitude (36° 24′ 10″ N and 36° 23′ 50″ N). The estimate terrain elevation above sea level between 886m and 1119m. The relief is characterized by a low slope (3-12%). The drainage system consists of a few ravines and collected by temporary flow regime. Its bioclimatic is subhumid. Soil type of forest station is Numidian sandstones.

Results and discussion
Development proposals biological reserve
The preservation of this natural forest ecosystem is the major function of our study. The development plan we propose will be presented after cutting into homogeneous area, cutting goal is to obtain operational areas for the study and implementation of a

Map 1. Location of study area.
development program, which is an important tool for managing the territory of the air study (Dinger, 1995; Heynink, 2009). The following figure shows the proposed new division:

The first zone presents the current biological reserve (Map 2) already protected through quality plantations and the rich fauna includes. To protect this area must be:

- Installed as network surveillance: Construction lookouts stations; Installation of surveillance cameras to control all activities
- Sewerage work and cleaning by Cutting sick species, dead wood, wooden effigies and the wrong subjects and from very old trees that may interfere with the youngest.

Map 2. Proposed division of biological reserve

- Lakes Rehabilitation

The proposed solution to this problem is the construction of a reservoir in the lowest part in the reserve (Map 3). It will be fed by pumping and all water catchment lakes.

Map 3. Proposal for rehabilitation of lakes in Biological Reserve
The second zone is the extension of biological reserve; it surrounds the first zone (Map 4). It already includes ecological resources of flora and fauna that deserves special attention. In this area we propose to do quality reforestation of rare and unique species eg: Redwood, Maclura, Atlas cedar, Black pine.

Map4. The second zone

The third zone is the extension area, located outside of biological reserve (Map 5). In this study, we propose a pilot project to realize an eco-recreational and entertainment center in an area of 100ha.

Map5. The third zone

This center brings together several units: Laboratory of natural sciences, multifunctional complex, luxury cottage, massive wooded preserve, family areas, forest attraction, complex bio-craft, recovery station and storm water treatment, consumption units, water basin, amusement park, sports complex, Air Theater, outdoor ecological circulation, cafeteria and fast-food (Map 6).
It is estimated that the leisure center will absorb a large percentage of the unemployment rate of the population. The figure below shows the development plan for the rehabilitation of the area of Djebel El Ouahch.

**Map 6. Development plan of biological reserve**

**Conclusion**

Biological Reserve of Djebel El Ouahch is very rich, it contains trees and shrubs varied including some rare and noble (nearly 43 local and introduced forest species), with a special wildlife interest which is important biologically, in a simple and genuine natural environment. Unfortunately, this natural area has suffered and continues to suffer attacks that are liable to lose all this sensitive. The results of observations made on land, the state of the forest environment is degraded by several adverse factors;
mainly due to human action, manifested by illegal logging, overgrazing, fires and pollution by the presence of waste and garbage in the open air.

The study area with its high biodiversity is poorly maintained; it appears necessary to resume maintenance and followed to protect this reserve. Several urgent actions are suggested:

- We offer an extended area to make a development plan for biodiversity as protected targets. Carry out a study on the status of places of the reserve.
- Perform remediation is to take down the old trees that are in a state of decay and repopulate the vacuum existing species that has good characteristics.
- Rehabilitation of lakes and hill reservoir.
- Perform garbage removal and existing waste and prohibit the passage of the car inside the reserve to mitigate pollution.
- Develop a green tourism, structuring and developing the home and outdoor activities.

REFERENCES


