

## ECOLOGICAL RESTORATION ACTIVITIES FOR LONG-TERM PRESERVATION OF THE COMMON HABITATS IN THE RETEZAT NATIONAL PARK

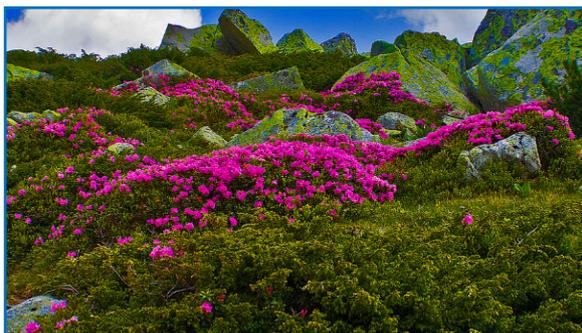
<sup>1,2</sup>. University Politehnica Timisoara, Faculty of Engineering Hunedoara, ROMANIA

**Abstract:** Between the natural and artificial regeneration methods applicable to restore the degraded mountain pines populations, the regeneration by plantation seems to be the only reasonable method, having in view that the natural regeneration is difficult and require long period of time. The renaturation with mountain pines seedlings, within the case study regarding an ecological restoration in Retezat National Park, methods, remarks and predictable results are presented. Focusing on the mountain pines (*Pinus mugo*), the (*Juniperus communis*) and the rhododendron (*Rhododendron kotschyi*) common habitats, the establishing the methods of maintaining or protecting of non-degraded populations, and the restoration methods of degraded populations, within the alpine habitats conservative management belonging to the Retezat National Park, are the aims of the present study.

**Keywords:** Retezat Mountains, alpine habitats, mountain pines (*Pinus mugo*), habitat restoration, artificial regeneration, afforestation

### 1. INTRODUCTION

The Retezat Mountains is one of the most species-rich areas dedicated to nature protection in Romania and has great significance for the conservation of Europe's natural heritage. The Retezat National Park has a great diversity of forms, which makes the landscape peculiarly spectacular. The protected area occupies the center of the mountain. The first area with full protection has a scientific character (11466 ha), being prohibited any exploitation (mining, grazing, hunting, fishing, gathering fruit, hiking, and camping). In this area, the access is allowed only with authorization from the Natural Monuments Preservation Commission, on certain routes and territories. The second area has a less rigorous protection, grazing being allowed two months per year. With a wide variety of endangered and endemic plants and spectacular wildlife, the Retezat National Park is included in the UNESCO network of biosphere reserves.



**Figure 1.** The mountain pines (*Pinus mugo*) scrubs with rhododendron (*Rhododendron kotschyi*) associations in the Retezat Mountains



**Figure 2.** The juniper (*Juniperus sibirica*) scrubs with rhododendron (*Rhododendron kotschyi*) associations in the Retezat Mountains

Since the 90s, the grazing activity has increased considerably, and damages brought to nature in Retezat National Park have increased worryingly. Every summer, sheep were climbing to alpine meadows, endangering the flora and fauna of the area (as a result, the chamois number is decreasing every year). Because of this, in the last decade of the past century, the pasture area in Retezat decreased considerably, and for years, at the end of each summer remained eroded lands and much stevia (*Rumex*), as a result of sheep grazing. Due to overgrazing, the characteristic species of natural grasslands have been completely degraded or gradually replaced by species that eliminate the other cohabiting plants [6; 15; 13]. Retezat National Park is the only national park in Romania that has a management plan, which is fully approved by the central public authority for environment [8; 9; 15; 16]. However, information is lacking on the distribution of habitats and species in the park and management is not always adequate – some habitats are



**Figure 3.** The Retezat Mountains view on the Drăgșanu Ridge

The preservation of the unique natural landscape, undisturbed, is a priority activity which brings benefits both in terms of biodiversity and tourism attractiveness. During 2008, it has been developed a monitoring protocol for the priority habitat of the creeping mountain pine and junipers shrubs in Retezat Mountains, aimed at the maintenance of natural processes deployment and elimination, or at least reduction of the factors hindering the deployment of these processes [11-16]. So, certain direct actions have been supported for stopping the destructive processes, within a conservative management of the alpine habitats belonging to Retezat National Park [6; 11-16]. The main objective was to improve the conservation management of the alpine habitats in the Retezat Mountains. On site activities to halt habitat destruction would be implemented along with a campaign promoting conservation, especially the long-term preservation of the alpine habitats.

The socio-economic changes in Romania apply an increasing pressure over the natural habitats, and urgent measures for the long-term preservation of these values are needed. [8; 9; 11-16] The complexity of the issues concerning the protected areas and the diversity of approaching the priority habitats subject, are essential factors that emphasize the need of implementing restoration activities, in the years to come.

## 2. ECOLOGICAL RESTORATION ACTIONS IN THE RETEZAT MOUNTAINS

Accelerated degradation of natural capital in Romania under the pressure economic development, in particular under the conditions present crisis economic-financial creates countless environmental problems in most protected areas. National and natural parks, nature and scientific reserves and other categories of protected natural areas – and by default protected species and their habitats – are subject to pressures of all kinds, which result in the reduction and fragmentation of habitats, invasive species, and the threat of species with extinction. [8; 9; 11-16]

Degraded land imposes such execution of any specific actions for upgrading, consolidation and preparation of the land with a view to planting, as well as the use of certain special procedures for afforestation of hills and going downhill's. Thus, the terraces may be planting seedlings of forest species specific conditions appropriate to the environment of habitat. Forest types of crops which have submitted a good production and have a high efficiency in stopping the excessive erosion of surfaces are the priority habitats of the creeping mountain pine and junipers shrubs.

Research within the research institutes highlights the particularly important role exerted by the forest crops installed on damaged land in the environment protection. As a result of the exercise of the protection of the soil (anti-erosional), these crops constitute a real shield to protect against erosion and substantially reduce the land movements. [2; 3; 11]

Stabilization processes of degradation of lands, the progressive restorations, in the meantime, of the land that may have been damaged and the restoring (renaturation) of the forest vegetation effects can be considered to be more important functional exercised forest protection actions. All of these have a resulting that improve and protect the natural environment, and, gradually, under direct effect of forest crop protection, it is the gradual restoration of the ecological balance of areas. Forest vegetation installed on the degraded lands has, therefore, an important role in silencing variations in flow and, by default, to provide for permanent leaks and balanced by increasing the amount of precipitation in the form of snow and the delay in its melting. [7-9]

Research made for the study of the leakage area and soil erosion, in experimental boundaries located in different slope conditions, vegetation and degree of erosion, have implemented submits that, to the excessively eroded afforested land, after the age of 15-20 years of crops, it is carried out a reduction in leakage surface of more than 4 times, as compared with the land erosion active,

threatened by overgrowth following abandonment of traditional pastoral activities and by the invasion of alien species. At the same time, tourism in the area leads to deliberate destruction of valuable mountain pine (*Pinus mugo*) habitats and the scattering of waste throughout the area.

Following a study on grasslands in Retezat Mountains, the Retezat National Park Administration concluded that their area has decreased drastically due to overgrazing [15, 16]. The alpine habitats in Retezat National Park area used by overgrazing, an example in this respect being Drăgșanu Ridge, where the biodiversity is very low, being correlated with the abandonment of former grazing areas, which requires careful management measures.



**Figure 3.** Degraded land by overgrazing in Retezat Mountains (Drăgșanu Valley)

practically free of vegetation. Forest vegetation makes soil erosion to be much reduced as compared with those of the plots of land which are discovered, in particular in the case of torrential floods. Thus, the forest forms a crucial importance, especially in the case of the downpour floods accompanied by high winds, specific in the alpine areas. Also, the water retained on the hills and stored in the soil ensures adequate supplies of crops, especially during the drought periods. [17, 18]

The socio-economic changes in Romania apply an increasing pressure over the natural habitats, and urgent measures for the long-term preservation of these values are needed. [14] The complexity of the issues concerning the protected areas and the diversity of approaching the priority habitats subject, are essential factors that emphasize the need of implementing restoration activities, in the years to come. Forest landscape restoration provides a complementary framework to sustainable forest management and the ecosystem approach in landscapes where forest loss has caused a decline in the quality of ecosystem services. It doesn't aim to re-establish pristine forest, even if this were possible; rather, it aims to strengthen the resilience of landscapes and thereby keep future management options open.

In the summer of 2007, it was started the destruction of stevia (*Rumex*), and in the subsequent have been started the ecological restoration projects [8, 9, 11-16]. In the years that followed, direct actions have been taken to restore the valuable alpine habitats belonging to the Park, resulting in the development of pilot projects for ecological restoration of some mountain pine tree habitats. In this regard, for the rehabilitation of some degraded areas in the mountain habitat, a series of actions have been conducted to review the perimeter planted, in soil beds, with 2–3 years old seedlings of creeping mountain pines hrbubs originated from natural populations [8, 9, 11-16].

### 3. PREDICTABLE RESULTS

This paper proposes to establish a synthesis of research, protection measures and regeneration initiatives for mountain pine (a priority EU habitat type, Bushes with *Pinus mugo* and *Rhododendron myrtifolium*) from inside the Retezat National Park, and also to depict the distribution of this vegetation in the area. Underlining previous contributions related to structure, functions and regeneration possibilities we would like to argue the necessity to continue them and develop new ones from the perspective of principles and methods of monitoring and ecological management. [8, 9] The current economic conditions and as a result of the actions to promote tourism it is very likely that the pressures due to tourism activity to increase, endangering one of the basic features of Retezat National Park, natural look that wild, as well as specific diversity. [8, 9, 11-16]

The long-term predictable results of the ecological restoration with creeping mountain pine, performed for supporting some actions aiming the stoppage of the destructive processes, are: [8, 9, 11-16]

- » prevention of avalanches, floods and soil erosion as a result of solid and liquid precipitation retention by the woody vegetation;
- » creating the required conditions for natural regeneration and /or restoration of the creeping mountain pine population;
- » provision of food, by means of mountain pine seeds, of some mammals (bear and certain species of small rodents), as well as some birds living in the mountain area;
- » organising a campaign to promote the green conservative concepts, with a special focus on long-term preservation.

In the medium term, the expected outcomes are to create better conditions for the development of woody and herbaceous plants, along with the wild animals, followed by a normal development in the future. This goal is achieved by establishing a control over the factors that previously contributed to the degradation of the ecosystems consisting of plants and wild animals.

In the short term, the predictable results of this ecological restoration are:

- » protection and preservation of flora and fauna;
- » ecological restoration of creeping mountain pine and juniper habitats by planting in affected and degraded areas;
- » creating normal conditions for natural regeneration of the mountain pine, which is going to spread bit by bit in the surrounding areas, so that the creeping mountain pine population will recover.

The research and studies carried out in this area are numerous; they have continuity and tradition, and concern fundamental aspects regarding the biodiversity. For this reason, the maintenance and proper management of this unique national park is a priority. The main objective was to improve the conservation management activities to halt the alpine habitats destruction in the Retezat Mountains would be implemented along with a campaign promoting conservation, especially the long-term preservation of the alpine habitats. [8, 9, 11-16]

### 4. CONCLUDING REMARKS

In order to reconstruct and maintain a favorable conservation status of *Pinus mugo*, *Juniperus* and *Rhododendron* mountain habitats and in full compliance with the European legislation and existing national, with the results obtained in other projects which have as their object of study this type of habitats but also with environmental requirements, we proposed the ecological reconstruction by planting in ground beds with young trees, coming from natural populations (nursery).

By ecological restoration of these mountain habitats, it is expected that the surface erosion of the degraded woodlands, previously used for grazing, to be fully stopped in 5–15 years after the execution of afforestation works, in accordance with the afforestation species and the nature and intensity of degradation. Through the direct effect of the protective afforestations with creeping mountain pines, applied for the ecological reconstruction of these mountain habitats, it is expected a regeneration in 5–10 years' time of the moderately/highly eroded slopes, and in 8–15 years' time of the very strong/excessively eroded slopes.

Given the scale of action, it is therefore necessary to draw up programs for afforestation by stages and geographical areas, with the needs of seedlings, of labor, effort and financial resources, on the basis of an assessment of the forest surface necessary and the urgency of intervention. The future restoration actions shall consist of re-entry into the soil of specimens affected by winter phenomena, supplemented by compost of previous years' planting areas and planting in addition to young trees and seedlings. The action will be completed at the beginning of the summer months, when will it be maintained either vegetation around young trees planted and will be determined degree of success of planting.

In conclusion, the afforestation of land that may have been damaged, associated with installation of forest curtains, represents one of the most effective measures to protect the environment and ambient to mitigate climate change, through vital functions which the crops forestry exercising them, while at the same time providing resources of renewable materials. The anti-erozional measures, with renaturation character, must be based on wide studies to determine the damaged fields characteristics and to establish the proper species and appropriate technologies for the further afforestation actions.

#### **Acknowledgment**

We would like to express our great appreciation to the staff of the Retezat National Park's Administration and the Forestry Directorate in Deva, a branch of the National Forest Administration for the valuable and constructive suggestions and proposals during the planning and development of this research work and during the degraded grasslands protective restoration.

#### **Literature / References**

- [1.] CANDREA BOZGA, Ș.B., LAZĂR, G., TUDORAN, G.M., STĂNCIOIU P.T. (2009), Priority forest, sub-alpine and alpine habitats in Romania – Monitoring the conservation status (in Romanian), Press of Universității Transilvania, Brașov
- [2.] COMIN, F.A. (2010), Ecological Restoration: A Global Challenge, Cambridge University Press, Cambridge, UK
- [3.] CONSTANDACHE, C., BLUJDEA, V., NISTOR S. (2010), Achievements and perspectives on the improvement by afforestation of degraded lands in Romania, Land Degradation and Desertification: Assessment, Mitigation and Remediation, Springer, 547–560
- [4.] DONIȚĂ, N., POPESCU, A., PAUCĂ-COMĂNESCU, M., MIHĂILESCU, S., BIRIȘ, I.A. (2005), Habitats in Romania (in Romanian), Editura Tehnică Silvică, București
- [5.] GREENPEACE (2012), Intact Forest Landscapes, [www.intactforests.org](http://www.intactforests.org)
- [6.] HODOR, C. (2008), Priority alpine habitats in Romania – Monitoring plans (in Romanian), Brasov
- [7.] JORDAN, W.R., GILPIN, M.E., ABER, J.D. (2003), Restoration ecology: A synthetic approach to ecological research, Cambridge University Press, Cambridge, UK
- [8.] KISS, I., ALEXA, V. (2014), Ecological restoration of mountain habitats by artificial regeneration – Environmental management protective plans for the protected areas in Romania, *Tajokologiai Lapok (Journal of Landscape Ecology)*, 2, 401–409
- [9.] KISS, I., ALEXA, V. (2014), Renaturation activities of mountain habitats with creeping mountain pine seedlings in Retezat National Park, *Annals of F.E.H. – International Journal of Engineering*, 4, 353–358
- [10.] RADU, S. (2004), The Retezat, yesterday and today (in Romanian), Monography Parcului Național Retezat, Retezat National Park's Administration, <http://retezat.ro>
- [11.] REPORT (1995), Technical guidelines for mapping and afforestation of land that may have been damaged (in Romanian), Ministerul of Waters, Forests and Environment
- [12.] REPORT (2008), Management Plan of Retezat National Park – Biosphere Reserve, 2009–2013, Retezat National Park's Administration, <http://retezat.ro>
- [13.] REPORT (2009), Conservative management of alpine habitats as a Natura 2000 Site in Retezat National Park (in Romanian), Proiect NATURA 2000, <http://www.natura2000.ro>
- [14.] REPORT (2010), National strategy to reduce the effects of drought, preventing and combating land degradation and desertification, short-medium- and long-term (in Romanian)
- [15.] REPORT (2012), Ensure favorable conservation status for priority habitats in Romania (in Romanian), Romanian Ministry of Environment, National Agency for Environment Protection (ANPM), <http://www.lifenatura2000.ro>
- [16.] REPORT (2013), Management Plan of Retezat National Park – Biosphere Reserve, 2014–2020, Retezat National Park's Administration, <http://retezat.ro>
- [17.] UNTARU, E., CONSTANDACHE, C., ROSU, C. (2008), Forest crop effects installed on eroded and sliding land in relation to their trends over time (in Romanian), *Silvologie*, vol. VI, Editura Academiei Române, București, 137–168
- [18.] UNTARU, E., CONSTANDACHE, C., NISTOR, S. (2012), Current status and projections for the future in respect environmental reconstruction by afforestation of degraded land in Romania (in Romanian), *Revista pădurilor*, 128(1), 16–26

copyright © UNIVERSITY POLITEHNICA TIMISOARA, FACULTY OF ENGINEERING HUNEDOARA,

5, REVOLUTIEI, 331128, HUNEDOARA, ROMANIA

<http://annals.fih.upt.ro>