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FOREST DEGRADATION AND ITS EXPRESSION IN THE TERRITORY OF REPUBLIC OF ARMENIA

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The article refers to the issue of forest degradation, the analysis of the main factors causing degradation, the reasons for the degradation of the forests of Armenia, the current state and the restoration means of degraded forests in Armenia. At present the degradation of forests is one of the most important and urgent problems mankind faces, the main reason for which is human being's irrational and non-professional nature. The main reason for the degradation of forests in Armenia is the human factor, especially illegal logging of the 1990s. The restoration of degraded forests is based on the following methods: natural growth support by fencing, natural re-growth support through soil mineralization, coppicing, etc.

Forest fund – degradation – climatic factors – anthropogenic factor – biotic – recreational overload

Ներկայումս անտառների դեգրադացիան մարդկության առջև ծառացած կարևոր և հրատապ լուծում պահանջող հիմնախնդիրներից մեկն է, որի գլխավոր պատճառը մարդու ոչ ռացիոնալ և անհաշվենկատ բնօգտագործումն է: ՀՀ-ում անտառների դեգրադացման գլխավոր պատճառը նույնպես մարդկային գործոնն է, հատկապես 1990-ական թթ. ապօրինի անտառահատումները: Դեգրադացված անտառների վերականգնումը հիմանականում կատարվում է հետևյալ եղանակներով՝ բնական վերաճի օժանդակում ցանկապատման եղանակով, բնական վերաճի օժանդակում հողի հանքայնացման եղանակով, կոճղաշիվային վերաճի օժանդակում և այլն:

Անտառային ֆոնդ – դեգրադացիա – կլիմայական գործոններ – մարդածին գործոն – կենսածին – ռեկրեացիոն գերբեռնվածություն

Рассматривается проблема деградации лесов Республики Армения и анализируются главные факторы и ее причины, дается оценка сегодняшней ситуации. В настоящее время это одна из главных проблем, требующая немедленного решения. Основная причина деградации лесов человеческий фактор. Особую роль сыграли нерегулируемые и незаконные рубки лесов 1990-х и начала 2000-х г. Представлены разные апробированные подходы и методы для реконструкции и восстановления деградированных лесов РА.

Лесной фонд – деградация – климатические факторы – антропогенный фактор – биотический – рекреационная перенагрузка

The term "degradation" derives from the Latin "degradatio", which means gradual reduction, decrease or decline**.** Forest degradation means a gradual loss of forested areas, deterioration of the quality of forest (canopy closure, species composition, annual growth of timber, biomass, ecological functions, etc.) as a result of various negative factors.

Some authors describe "degradation" as degradation of biomass, productivity or biodiversity in forest degradation and changes in ecological functions [10]: There is another brief definition of degradation: loss of woodland or forest [7]: In terms of sense, these characteristics are almost no different.

According to the UN Food and Agriculture Organization (FAO), in the first decade of the 21st century, degradation of the world's forest areas reached 6 million hectares as a result of large-scale logging and other negative factors. That is to say about 30-35 million hectares of forest cover on the world has been subjected to degradation at that time. According to the World Bank, in 2000 to 2012, the forested areas in the Russian Federation (RF) were reduced by 32.6 million hectares as a result of negative factors, and the restoration was only 16.2 million hectares. That is to say 2.2% of the Russian forest surface degraded during the mentioned period. In the same period, Brazil lost 5.1% of the forest surface, US - 4.3% and Canada - 4.0%. Thus, one can conclude that forests of the world over the years are subjected to large-scale degradation as a result of the influence of various factors [7-11]:

Materials and methods. Different local and international literature sources have been used for this study, as well as government decisions (e.g. Government Decree No 684-N on June 27, 2013 on Conservation of state forests), FAO publications, etc. Comparative geographic, complex analytical, induction methods, as well as systemic, spatial-temporal and geo-ecological approaches were used during the study.

Results and Discussion. The major factors causing forest degradation are conditionally divided into the following key groups:

1.1 Climatic,
1.2 Biotic,
1.3 Anthropogenic.

1.1 Climatic factors include air temperature, relative air humidity, winds and lightnings, atmospheric precipitation (rain, snow and hail). As a result of the climate change forecast (increase of average air temperature, decrease of precipitation) in mountainous areas of Armenia, a gradual upward movement of vegetation landscapes is forecasted. The vegetation of the steppe and semi-desert zones will gradually remove the vegetation of the lower zone of the forest belt, occupying the forested areas. That is, global climate change will promote forest degradation phenomena. According to forecasts, the loss of forest territories in the North-Eastern region of Armenia will make about 9 thousand hectares [10]. In addition, as a result of climatic changes, there has been an increase in the frequency of droughty years, when under conditions of high air temperature, decreased amount of precipitation and relative humidity in some cases considerable drying of the forests, loss of trees vitality are observed. In the drought years, the frequency of emerging forest fires also significantly increases, which is explained by the duration of the dry period. In the droughty years, the frequency of emerging forest fires also significantly increases, which is explained by the extended duration of the dry period.

The erosion processes are activating as a result of heavy rains, mudflows and landslides in mountainous forested areas, resulting in decreasing the forest cover. The hail damages is considerable to young stands. As a result of abundant snow, a snow- break and windthrow causes damage to potential re-growth and canopy closure development [2].

Strong winds generate a windthrow, resulting in degradation of significant forested areas. Violent windthrow cases have been registered in almost all forest landscapes. In such areas, an unwanted transformation is taking place now- high-value beech and oak trees are replaced by hornbeam, poplar, ash and other relatively low-value trees and shrubs. This is a classic example of forest degradation.

Lightning often contribute to the occurrence of fires, at which non in-time extinguishing damage harmfully the forest ecosystems.

1.2 Biotic or biogenic factors are the living organisms capable of causing considerable damage to the forest masses or individual trees and shrubs. The oak stands are heavily damaged by oak fungi, which, during the massive breeding period, dry oak leaves and significantly reduce the annual growth of trees and, in some cases causes to their dry-out [2].

Leafy pest insects cause increasing significant damage to RA forests. Defoliation significantly reduces the annual growth of trees causing drying of large forest massive after two or three years continuous impact. The most of damage are caused by brown-tailed moth (Euproctis chrysorrhoea L.), lackey moth (Malacosoma neustria L.), Gypsy moth (Ocneria dispar L.), which are capable of massive reproduction and can destroy large masses of forest [3].

1.3. Anthropogenic factors are considered to be the most negative factors for degradation of forests, especially in relation to illegal logging. In the 90s of the last century as a result of the energy crisis, large-scale illegal logging was carried out in Armenia, resulting in degradation of huge forest areas. According to various expert data, the area of illegal felling in the north-eastern region of Armenia varies from 20 to 30 thousand ha [2]. Some of the high-value seed origin oak stands were replaced by low-grade coppice forests. An unpleasant transformation of high-value beech forests stands were re-placed by low-grade hornbeam forests.

Fires caused by human negligence have a huge negative impact on the degradation of forested areas. The forests of the Republic of Armenia also are not free from forest fires. In 1998 -2010 there were 198 fires and about 1700 hectares of forest covered was burned. In recent years due to preventive measures in Armenia the damage caused by anthropogenic forest fires has decreased. The loss of forested areas for 2011-2015 made about 500 hectares [1].

Grazing of large and small cattle in forests also contributes to degradation phenomena. Destroying the natural regrowth of the forests, the forest is deprived of the young tree and in case of continuous grazing, degradation occurs.

Forest degradation also contributed by the technogenic factors, particularly by the open mining industry, with a striking example of the exploitation of the Teghut mine in Armenia. In addition, harmful emissions of industrial enterprises and environmental pollution by hazardous substances are very dangerous. The most sensitive plants and trees gradually stop growing and eventually dry. All this also has a negative impact on the biodiversity patterns that fall dramatically [7, 8, 9].

Poorly organized people's recreation in forest landscapes may also have a negative impact on the state of the forests. The natural re-growth and the younger trees are damaged, the soil becomes too solid and the conditions of growth are aggravated. In order to avoid these negative phenomena, access to some forest areas is restricted to people and may be also prohibited in a fire-dangerous period [1].

According to the official data, the RA forest fund is 459900 hectares, of which 334100 hectares are forested or 11.2% of the total area. The forests of Armenia have uneven distribution and are traditionally grouped to the north-east (62% of the country's forests), south-east (36%) and central (2%) forest massifs.

Forest geosystems within the borders of Republic of Armenia in 4000-1000 years B.C. made up around 35% of the total area, in 18-19 centuries- around 18%, in the early 20th century- 10%, in the 1950s- 8.1%, at the beginning of 1990-s 11.2% (according to the official data) and about 8% at the beginning of the 21st century (according to satellite imagery results and studies by international reputable organizations). Over the past two decades, the restoration and re-growth of a considerable part of the forests has taken place within its former borders. The restored forest is qualitatively degraded [5].

The Armenian forests were particularly damaged by unregulated and illegal logging after independence: At the beginning it was docked with a blockade and an energy crisis, and from 1996/97 it turned into an organized business, including the entire logical chain of woodworking, including timber exports. The majority of large-scale permissible and unauthorized illegal logging took place in the vicinity of major cities (e.g. Vanadzor, Ijevan, Alaverdi) as well as in forest-rural communities [4].

A striking example of deforestation and forest degradation can be seen in Lake Sevan basin, where a quarter of the artificial planted forests have been logged out [4]:

Cuttings have significantly accelerated erosion processes, which, in turn, contributed to the emergence of powerful mud flows. These unregulated cuttings have a great impact on the forest self-rehabilitation capacities and contribute to the reduction of forested surfaces.

Forests next to local communities are frequently damaged by large and small cattle. Particularly it is damaged the natural re-growth and seedlings. In order to avoid such a negative phenomena, endangered areas are needed to prevent the cattle from entering the forest. For the mentioned reasons, there are also large forests massifs in the North-Eastern region of Armenia without natural re-growth. There where large-scale fencing activities carried couple of decades ago. Currently, there are many areas that need protection through fence.

In the forested areas that have no natural re-growth as a result of cattle grazing or other reasons, it is necessary to carry out mineralization activities around the seedling trees. The litter is removed and the soil is mineralized at a depth of at least 8 cm. As a result of this work, the fertility of the seeds grows noticeably and the natural re-growth is activated. These works can be combined with fencing if necessary [6]: The soil mineralization works should be carried, beside grazed and un-satisfactory re-growth areas, also along the radius of burned forest patches which will promote gradual natural growth and will gradually fill the burnt forest area.

In the earlier logged high-stand oak forests currently it is noticed the intensive growth of coppices and the trees got the form of shrubs and the areas are degraded and almost become impassable. In these areas it is necessary to carry out the so-called "coppicing" assistance. The essence of these works is the intersection and removal of numerous shoots that originates from the single stump. Only 2-3 well developed shoots are left on stump, which subsequently thicken, bring trees to a previous appearance, causing foliage. The forest gradually accepts the former appearance.

The forest landscapes of Armenia, despite their scarcity and high environmental value, are subjected to continuous degradation due to natural and biological factors, especially anthropogenic factors. A strong and urgent demand is the prevention of continuous degradation of forests and the restoration of such areas, especially in the context of global climate change.

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