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ECOLOGICAL ROLE OF FORESTS IN NATURE PROTECTION AND ENVIRONMENTAL SUSTAINABILITY

***Abstract:** Forests are among the most important natural ecosystems that ensure ecological balance, biodiversity conservation, climate regulation, and environmental sustainability. The increasing anthropogenic pressure on forest ecosystems, including deforestation, overgrazing, agricultural expansion, and environmental pollution, has significantly affected forest structure, productivity, and ecological stability. The present study examines the ecological role of forests, their importance in nature protection, and the main factors contributing to forest degradation.*

The research demonstrates that forests perform multiple ecological, economic, and recreational functions. Forest vegetation regulates air temperature, humidity, wind intensity, soil moisture, and groundwater levels while also contributing to the prevention of soil erosion and the stabilization of mountain landscapes. The phytocenotic structure of forests, characterized by vertical stratification and species diversity, creates favorable ecological conditions for sustainable ecosystem functioning. Special attention is given to the forest ecosystems of the mountainous regions of Azerbaijan, particularly the Lankaran region, where multilayered forest phytocenoses are clearly expressed.

The study reveals that anthropogenic impacts negatively influence forest ecosystems by disrupting ecological balance, reducing biodiversity, accelerating soil erosion, and intensifying climate-related problems. Deforestation and irrational

utilization of forest resources lead to degradation of natural ecosystems, reduction of the biosphere significance of forests, and increased risks of floods, droughts, and hydrological disturbances. The results emphasize the necessity of sustainable forest management, conservation of forest biodiversity, restoration of degraded forest areas, and implementation of effective environmental protection measures.

The preservation and restoration of forest ecosystems are essential for maintaining ecological stability and ensuring sustainable development. Integrated approaches aimed at rational forest use, ecological monitoring, afforestation, and reduction of anthropogenic pressure are crucial for the long-term protection of forest resources.

Keywords: *forest ecosystems, biodiversity, phytocenosis, forest degradation, anthropogenic impacts, nature protection, ecological balance, afforestation.*

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ЭКОЛОГИЧЕСКАЯ РОЛЬ ЛЕСОВ В ОХРАНЕ ПРИРОДЫ И ОБЕСПЕЧЕНИИ ЭКОЛОГИЧЕСКОЙ УСТОЙЧИВОСТИ

Аннотация: *Леса относятся к числу важнейших природных экосистем, обеспечивающих экологическое равновесие, сохранение биоразнообразия, регулирование климата и экологическую устойчивость. Усиление антропогенного давления на лесные экосистемы, включая вырубку лесов, чрезмерный выпас скота, расширение сельскохозяйственных угодий и загрязнение окружающей среды, существенно повлияло на структуру, продуктивность и экологическую стабильность лесов. В данном исследовании*

рассматривается экологическая роль лесов, их значение в охране природы и основные факторы, способствующие деградации лесов.

Исследование показывает, что леса выполняют множество экологических, экономических и рекреационных функций. Лесная растительность регулирует температуру воздуха, влажность, интенсивность ветра, влажность почвы и уровень грунтовых вод, а также способствует предотвращению эрозии почвы и стабилизации горных ландшафтов. Фитоценотическая структура лесов, характеризующаяся вертикальной стратификацией и видовым разнообразием, создает благоприятные экологические условия для устойчивого функционирования экосистемы. Особое внимание уделяется лесным экосистемам горных районов Азербайджана, в частности, Ленкораньской области, где четко выражены многоярусные лесные фитоценозы.

Исследование показывает, что антропогенное воздействие негативно влияет на лесные экосистемы, нарушая экологическое равновесие, сокращая биоразнообразие, ускоряя эрозию почвы и усугубляя проблемы, связанные с изменением климата. Вырубка лесов и нерациональное использование лесных ресурсов приводят к деградации природных экосистем, снижению биосферной значимости лесов и увеличению рисков наводнений, засух и гидрологических нарушений. Результаты подчеркивают необходимость устойчивого лесопользования, сохранения лесного биоразнообразия, восстановления деградированных лесных массивов и внедрения эффективных мер по охране окружающей среды.

Сохранение и восстановление лесных экосистем имеют важное значение для поддержания экологической стабильности и обеспечения устойчивого развития. Комплексные подходы, направленные на рациональное использование лесов, экологический мониторинг, лесовосстановление и снижение антропогенного давления, имеют решающее значение для долгосрочной защиты лесных ресурсов.

Ключевые слова: лесные экосистемы, биоразнообразие, фитоценоз, деградация лесов, антропогенное воздействие, охрана природы, экологическое равновесие, лесовосстановление.

Forest ecosystems are complex natural formations that play a fundamental role in maintaining environmental stability and ensuring sustainable development. Forests provide society with essential ecological, economic, and social benefits while simultaneously regulating climatic conditions and preserving biodiversity. In recent decades, however, increasing consumption of forest resources has exceeded their natural regeneration capacity, creating serious ecological concerns worldwide [1,14,17,22].

The problem is particularly important in the Republic of Azerbaijan, where substantial changes in forest structure, productivity, and management have occurred over the last fifty years due to increasing anthropogenic pressure [18,24,15,25]. Therefore, studying the current condition of forest ecosystems and identifying effective approaches for their conservation and restoration remain highly relevant scientific tasks.

Forests are integral components of the biosphere and function as complex phytocenoses composed of various plant species arranged in vertical tiers. Such stratification ensures efficient utilization of environmental resources, including light, moisture, nutrients, and space, thereby enhancing ecosystem productivity and ecological stability.

Forests perform numerous ecological functions that are vital for environmental protection and ecosystem sustainability. Forest vegetation regulates air temperature, humidity, wind speed, and soil moisture while contributing significantly to groundwater regulation and erosion prevention [4-9,12,20]. The forest canopy reduces evaporation and creates favorable microclimatic conditions within forest ecosystems.

The tiered structure of forest phytocenoses allows different plant species to occupy ecological niches according to their biological characteristics and environmental requirements. In the mountainous forests of the Lankaran region, three distinct vegetation tiers are clearly visible, reflecting the vertical heterogeneity of phytomass distribution and ecological conditions [6-10,14,22,25].

Forests also possess important sanitary and climate-regulating functions. They absorb carbon dioxide, release oxygen, reduce atmospheric pollution, and mitigate climate change effects. Furthermore, forests contribute to the conservation of biodiversity by providing habitats for numerous plant and animal species.

Anthropogenic activities are among the major factors causing forest degradation. Human impacts on forest ecosystems include illegal logging, agricultural expansion, overgrazing, mining activities, infrastructure development, and chemical pollution. These activities disrupt natural ecological balance and negatively affect forest productivity and biodiversity.

Deforestation remains one of the most serious environmental problems worldwide. Forest destruction leads to increased soil erosion, greenhouse gas accumulation, hydrological disturbances, droughts, and dust storms. In mountainous regions, deforestation often results in catastrophic floods and severe degradation of natural landscapes.

The reduction of forest areas also decreases the biosphere significance of forests and contributes to the degradation of natural ecosystems and genetic diversity [24,25]. When anthropogenic pressure exceeds the ecological tolerance limits of forest ecosystems, their natural resilience and stability are severely weakened.

Effective forest conservation requires integrated ecological and management approaches aimed at reducing anthropogenic pressure and restoring degraded ecosystems. Sustainable forest management should include strict protection of forest territories, prevention of illegal logging, rational utilization of forest resources, ecological monitoring, and implementation of afforestation programs.

Restoration of degraded forest ecosystems should focus on preserving biodiversity, improving soil stability, and enhancing forest productivity [26]. Afforestation activities using ecologically adapted tree species contribute to erosion control and ecological recovery of degraded landscapes.

Environmental education and public awareness are also important components of forest protection strategies. Increasing public understanding of the ecological importance of forests can contribute to more sustainable attitudes toward natural resource utilization.

Forests are essential natural ecosystems that ensure ecological balance, biodiversity conservation, and environmental sustainability. However, increasing anthropogenic impacts have caused significant degradation of forest ecosystems, particularly in mountainous regions. Deforestation, overgrazing, and irrational land use negatively affect forest structure, productivity, and ecological stability.

The study demonstrates that sustainable forest management, ecological restoration, and rational utilization of forest resources are necessary for protecting forest ecosystems and maintaining environmental balance. Integrated conservation measures, including afforestation, biodiversity protection, and reduction of anthropogenic pressure, are essential for ensuring the long-term sustainability and productivity of forests.

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