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Forest Erosion of the Hırkan Talish Mountains, Application of Flora and Erosion Resistant Varieties

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Abstract: In the article information is given about forest erosion in some parts of Hirkan mountainous areas and prevention measures of it. The purpose in investigation is studying the causes of erosion, bioecological characteristics of trees and bushes, effects of climate factors. During the study, the Hirkan plant reservoir, soil types were studied, the consequences of the global ecological erosion processes, the criteria for impact on the plant gene pool were studied, the forest cover was monitored by DJI Phantom 4 DRON from 30-400 m and GPS was used to determine the exact coordinates. There has been a partial thinning in the Talish-Hirkan National Park, and changes were observed in the areas compared to previous years. The reasons for the shrinkage of plant habitats have been identified, and research has been conducted on hazard criteria, biological characteristics, and causes of changes in natural resources in accordance with IUCN version 3.1. Land use in the Talish-Hirkan area has been studied over the years, as well as ways to prevent the growth of erosion. The results of anthropogenic impact, measures taken to maintain the balance, the work done at the state level are reflected in the article. The aim was to choose sustainable species during the ameliorative works in the process of erosion. The use of such species as *Quercus* L., *Fagus* L., *Pinus* L., *Fraxinus* L., *Robinia pseudoacacia*, *Popus* L. and its constituent species in forest regeneration has been considered expedient.

Keywords*:* Forest, Erosion, Lankaran, Talish, Mountains

Introduction

Compared to other regions of the world, our republic is less forested. Only 10% of the total area is covered with forest. Due to its physical and geographical conditions, Talish region differs significantly from other natural regions of Azerbaijan. This is the only humid subtropical region in the republic. Due to orographic and ecological conditions, the region is usually divided into 2 areas, separate sub-districts - mountain-forest and Lankaran plain. Due to climatic conditions, this region is again divided into two sub-districts: lowland and mountainous. Talish ecological-economic region includes 6 administrative districts: Astara, Lankaran, Masalli,

Lerik, Yardimli and Jalilabad districts. The total area of the region is 496.0 thousand hectares, including the area used in agriculture is 152.4 thousand hectares (1/3 of the land area) (Amirov, 2003).

A distinctive feature of this region is that from October to May, sufficient rainfall is provided, and in hot weather, drought and low humidity prevail (Amirov, 2003). Talish region has different soils and vegetation. Here the plants are selected in a unique way on the vertical belt.

Figure 1. Consequences of erosion

Its vegetation consists of plants of the third period, preserved in accordance with its past and to this day. From *Parrotia persica* (DC.) C.A.Mey to *Quercus castaneifolia* C.A.Mey. and *Carpinus* L. plain forests move to the lower mountain-forest belt due to the elevation of the land. *Zelkova* Spach., *Albizia julibrissin* Durazz. and *Diospyros kaki* are also mixed. While ascending the mountains, the forests are dominated by *Fagus* L., mostly *Quercus castaneifolia* and *Quercus macranthera* Fisch. Other species also mix with forests: *Acer* L., *Popus* L., *Crataegus* Tourn.ex L., *Mespilus* L. and others. The vegetation of Talish (including forest plants) is reminiscent of a huge natural museum of the republic, and is dominated by relict species. Green treasure of Azerbaijan presents ten classic relict trees that typify the Hyrcanian Forest. The fossil records attest to the fact that the Hircanian Forest is a descendant of forest communities that were widespread throughout the northern hemisphere during the Miocene, a geological era between 23 and 5.3 million years before present but whose range significantly retreated during the climate change that occurred during the Pleistocene (Mammadov, 2007). Despite fluctuations over the first millions of years and a gradual but constant cooling trend, the global climate during the Miocene was notably warmer than today. For this reason, North America and Eurasia were covered well into their northern regions by warm temperate vegetation. The Pleistocene finally brought on another but more distinctive cooling period leading to the ice ages of the final two million years, in which not only the cold but also increasing drought played a key role in forcing back the distribution of the Miocene forest vegetation.

The main characteristic of the world's use of land resources in the last millennium is the increase in arable land due to the growing demand for food. As can be seen from Table 1, the area of land in the world has changed very little within each major region, and the area of forests has decreased.

Table 1. Forest area change over the years

Year	1700	1850	1920	1950	1980	1985	2000
Forest	62	60	57	54	50		
Pasture	68	68	67	67	68		
Plantation	3	5	9	12	15	15	15,4
Total	133	133	133	133	133		

Distinguished by favorable subtropical climate and fertile soil conditions, Lankaran lowland has allowed dense population. Plowed lands make up 11.0% of the total area of the region, and the area under pastures is 15.7%. Irrigated lands cover 12% of agricultural lands. Deforestation has occurred in some areas of the lowland, which is used as a habitat. In these forests, especially in the lowlands, hirkan-relict tree species (chestnut-leaved oak,

ironwood, azat, silk acacia, etc.) have been developed. Deforestation has occurred in some areas of the lowland, which is used as a habitat (Kaper, 1985).

As a result of anthropogenic impacts on nature in the Talysh region, the following changes are not allowed in the ecosystem:
1. Soil erosion develops due to plowing and deforestation. About half of the region's territory is subject to water erosion. 64.4 thousand hectares of them are strongly eroded lands.
2. Contamination of soils with chlorinated pesticides and heavy metals, accumulation of lead, nickel, zinc, etc. is several times more than the world quark.
3. Use of construction industry products, soil pollution (Amirov, 2003).

In different elements and shapes of the relief, the thickness of the soils and their exposure to erosion vary. In the 100 m wide (from Jalilabad to Astara region) forest strip in the lowland, only chestnut-leaved oak, mainly evergreen (cypress) and deciduous (pecan, oak, catalpa, etc.) trees along the main road, village roads and field protection forest strips. was used. Water canals were built from the Khanbulanchay reservoir to irrigate citrus fields. Thus, the natural landscape of the Lankaran lowland has changed radically. Poor soil washing and irrigation erosion are widespread in the south of the country - in Lankaran, in the basin of the Araz River (lowland along the Araz). Due to the low slope of the surface, the erosion process is weak here. In the Arkhangelsk and coastal areas, the slope of the surface is 30 and sometimes 50, so the washing of the soil is severe, and as a result, the formation of ravines is observed. Heavy washing of the soil surface is observed in the upper mountainous part of Lankaran. Eroded soils are rare in the areas close to the Hirkan forests in Talysh province. The physical properties of the soils here are more or less good, there are few stones, so the conditions for afforestation are relatively favorable (Amirov, 2003).

Compared to all other types of soil degradation, the most harmful is soil erosion. It makes the soil inactive in the true sense: it deprives the soil of a fertile upper humus horizon. Sour soils can be neutralized, saline soils can be desalinated, saline soils can be desalinated, and hard soils can be softened. However, it is impossible to restore eroded soil and turn it into non-eroded soil. The main reason for the formation and development of soil erosion is agriculture. Due to human activities, the use of slopes under agricultural crops, intensive grazing of pastures and meadows, destruction of forests, plowing along the slopes intensifies the process of erosion. As a result of the development of the process of surface erosion on the slopes, soil fertility decreases, the productivity of agricultural crops decreases. During the erosion process, the topsoil is sometimes completely washed away. Soil erosion is a major disaster worldwide. Although various measures have been taken to prevent it, no results have been achieved. However, it is easier to prevent the erosion process than to fight it and eliminate its consequences (Zaitsev, 1981).

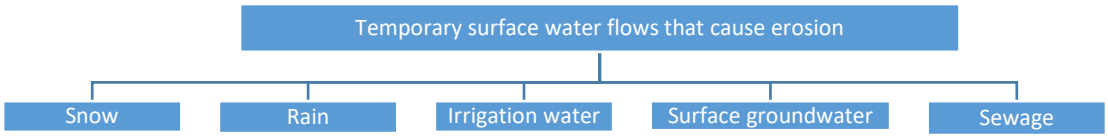

Figure 2. Causes of erosion

Method

Fertile soils from washing in the prevention, minimization of flood, wind and drought protection of arable lands is of exceptional importance to forests. High humidity in the forest is always noticeable. To form the umbrella, trees block the sun's rays and protect it from strong winds. As a result, a favorable living environment for the life of forest plants and animals are raised, under the umbrella of the tree seeds are rapidly developing. Thus, there is a forest ecosystem. Forest ecosystems are closely connected with each other all the components that are included (Beideman, 1960). Discovering fruits and seeds spread by consuming seeds long distances are involved. The development of wood fungi depends on trees. Dried trees, branches and stem decay fungi that affect mineral absorption into the soil helps. The interaction between the various components of the forest for many years formed. Came from a microclimate, there is dense vegetation. Infused with all natural processes of forest self-regulation. The arid climate plays a key role in the forest-meadow landscape structure of the plains.

Figure 3. Erosion Ravines

Table 2. Determination of coefficients distributed in connection with soil erosion

Signs of the soil	Soil name and correction factors			
	Mountain-meadow	Mountain black	Wild mountain-brown	Mountain-gray-brown (chestnut)
Erosion	1	2	3	4
Damaged	1,00	1,00	1,00	1,00
Slightly damaged	0,84	0,82	0,82	0,81
Moderately damaged	0,71	0,68	0,69	0,75
Badly damaged	0,49	0,50	0,53	0,60

Lankaran lowland in the north-east slopes of the mountainous areas in order to prevent the collapse of lands from erosion and degradation processes, corrupt forest restoration and planting new forests urgent problems of the time. The time taken to curb the growth of forests, erosion, severe ecological disasters, erosion processes, expansion, growth of gray areas, mountainous areas, floods and landslides, avalanches, there will be the danger of drying up of springs and rivers. In these areas, particularly in low-lying areas of the few non-wooded forests, protective forests and forest several times the amount of restoration and large-scale studies are being carried out in order to reconstruct. That should be considered to be increasingly limited areas of forests and large-scale logging operations in these areas because decreasing erosion threatens the forest.

Results and Discussion

Deforestation, erosion and collapse of slopes, unsystematic cattle grazing, drought, the cultivation of agricultural crops and natural vegetation areas, and other factors resulted in damages to climate. The above-mentioned factors dramatically affect the vegetation of the area.Reforestation began after 1930 and they were important in increasing forest resources, *Quercus* L., *Fagus* L., *Pinus* L., *Fraxinus* L., *Robinia pseudoacacia*, *Popus* L. and others played an important role in the cultivation of productive tree species. Without detailing the results of the *Robinia pseudoacacia* growth study, it can be shown that white acacia is a fast-growing species that adapts quickly to the environment and grows well in rocky and dry soils and rocky river valleys that were eroded in the early years. Therefore, it is promising to cultivate plantations for short-term use of this species. *Pinus* L. is a genus that does not require soil fertility, it is drought tolerant. Therefore, it is of great importance in afforestation and landscaping of eroded soils. In Azerbaijan, this problem is very actual, so here the forest areas are so few, the reserve of the soil areas that will be given to the forest production is limited. In our forests, 150 species of feral fruit plants of 1536 species are available. There are thousand tons (walnuts, apples, pears, dogwoods, hawthorn, medlar, hazelnuts, pistachios, dates, blackberries etc.) of feral fruit products in these plants. 30 percent of these fruits have significance as consumption products.

Table 3. Degree of soil erosion in the Talish region

Administrative districts	Total area (hectares)	Not subject to erosion	Weakly eroded	Eroded soils	Strongly eroded soils
Jalilabad	144536	105836	15683	14405	8612
Astara	61643	52963	2850	2540	3290
Lankaran	153941	126721	9525	966	8031
Lerik	135172	67227	24123	14620	19202
Masalli	72097	55610	8340	5332	2815
Yardimli	70622	25385	9441	13290	25506
	638011	433742	69962	69851	64456
	100	67,98	10,92	10,94	10,10

Table 4. The Hirkan plant reservoir taxa

Species:	
Latin	Latin
Malus baccata (L.) Borkh.	*Pyrus hyrcana* Fed.
Malus orientalis Uglifzk.	*Prunus divaricata* ledeb.
Malus sylvestris Mill.	*Prunus spinosa* L.
Malus micromalus Mak.	*Ulmus parvifolia Jacq.*Schneid.
Mespilus germanica L.	*Capparis spinosa* L.
Rosa iberica Sieb.	*Ligustrum vulgare* L.
Rosa canina L.	*Fraxinus excelsior* L.
Rosa multiflora Thunb.	*Fraxinus lanceolata* Borkh.
Rosa banksiae R. Br.	*Fraxinus ornus* L.
Rosa karcagi Sosn.	*Fraxinus oxycarpa* Willd.
Rosa kazarcanii Sosn.	*Syringa vulgaris* L.
Rosa spinosissima L.	*Rhamnus alaternus* L.
Rosa tschatyrdagi Chrshan.	*Paliurus spina-christii* Mill.
Rosa hracziana S.Tamamsch	*Salix caprea* L.
Rubus idaeus L.	*Salix babylonica* L.
Rubus buschii (Rozan.) Chrshan.	*Salix acutifolia* Willd.
Rubus caesicus L.	*Smilax excelsa*
Rubus caucasicus Fojke.	*Populus hubrida* M. B.
Rubus hyrcanus Juss.	*Danae racemosa* (L.) Moench.
Rubus odoratus L.	*Ruscus hyrcanus* G.Woron
Rubus sanguineus Friv.	*Sambucus nigra*
Sorbus discolor (Maxim.) Hedl.	*Acacia dealbata* Link.
Pyracantha coccinea M. Roem.	*Acacia melanoxylon* R. Br.
Pyracantha angustifolia Franch.	*Amorpha fruticosa* L.
Pyracantha fortuneana (Maxim.) L.	*Colutea arborescens* L.
Crataegus monogyna Jacq.	*Colutea caucasica* Boiss. et Huet.
Crataegus nigra Waldst. et Kit.	*Colutea orientalis* Mill.
Crataegus caucasica C.Koch.	*Berberis vulgaris* L.
Crataegus kyrtostyla Fingerh.	*Catalpa bignonioides* Walt.
Crataegus lagenaria Fisch. et Mey.	*Pinus kochiana* Klotzsch ex C. Koch.
Crataegus orientalis Ball.	*Juniperus communis* L.
Cydonia oblonga Mill.	*Euonymus latifolia* (L) Mill.
Armeniaca vulgaris Lam.	*Quercus castaneifolia* C.A.Mey.
Cerasus avium (L.) Moench.	*Cotinus coggygria* Scop.
Cerasus mahaleb (L.) Mill.	*Ficus carica* L.
Cerasus austera (L.) Roem.	*Ficus hyrcana A.* Grossh
Cerasus incana (Pall.) Spach.	*Acca sellowiana* Berg.
Cerasus vulgaris Mill.	*Ephedra equisetina* Bunge.
Cerasus microcarpa (C.A.Mey) Boiss.	*Acer campestre* L.
Cotoneaster melanocarpus Load.	*Acer laetum* C.A.Mey
Cotoneaster nitens Rehd. et Wils.	*Alnus subcordata* C.A.Mey.
Cotoneaster adpressus Boiss.	*Alnus barbata* C.A.Mey.
Cotoneaster divaricatus Rehd. et Wils.	*Betula papyrifera* Marsh.

Caprinus betulus L.	*Ricinus communis* L.
Carpinus macrocarpa (C.maxima Mill.) H. Winkl.	*Philadelphus caucasicus* Koehne.
Buxus microphylla Sieb. et Zucc.	*Parrotia persica* (DC.) C.A. Mey.
Buxus colchica Pojark	*Aesculus hippocastanum* L.
Buxus sempervirens L.	*Platanus orientalis* L.
Buxus hyrcana Pojark	*Punica granatum* L.
Gleditsia caspia Desf.	*Solanum aviculare* Forst.
Lonicera iberica Bieb.	*Lycium chinense* Mill.
Lonicera caucasica Pall.	*Lycium horridum* Thumb.
Celtis caucasica Willd.	*Tilia cordata* Mill.
Swida sanguinea (Opiz) L.	*Tilia caucasica* Rupr.
Cornus mas L.	*Peganum harmala*
Corylus avellana L.	*Hydrangea macrophylla* DC.
Artemisia abrotanum Bess.	*Jasminum revolutum* Lindl.
Artemisia arenaria D.C.	*Ligustrum japonicum* Thunb.
Artemisia dracunculus L.	*Ligustrum chinensis* Lour.
Artemisia baldhanorum Krasch.	*Ligustrum ibota* Sieb. et Zucc.
Artemisia vulgaris L.	*Ligustrum lucidum* Ait.
Santolina chamaecyparissus L.	*Ligustrum vulgare* L.
Santolina virens Mill.	*Pinus pitsunda* Steve.
Diospyros lotus L.	*Pinus hamata* D.Sosn.
Elaeagnus pungens Thunb.	*Carya illinoinensis* L.
Elaeagnus argentea Pursh.	*Fagus orientalis* Lipsky
Hippophae rhamnoides L.	*Juglans* nigra L.

Conclusion

Poor soil washing and irrigation erosion are widespread in the south of the country in Lankaran, in the massif. Due to the low slope of the surface of the Lankaran lowland, the erosion process is weak here. In the Caspian Sea and coastal areas, the slope of the surface is 30 and sometimes 50, so the washing of the soil is severe, resulting in the formation of ravines.

Each year more than one million seedlings of various species in these areas are grown. These species of deciduous and coniferous forests in Lankaran grown in areas facing severe ecological disasters. In order to combat soil erosion, a cultivation system is used without turning them, and deep plowing, intermittent plowing, plowing, splitting, etc. are carried out to prevent leaching, which can be used to keep and hold the falling precipitation.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPHELS journal belongs to the authors.

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