"Hayantar" State Non-Commercial Organization
of the Ministry of Agriculture
of the Republic of Armenia

Management Plan for the period of 2017-2021
Ijevan State Sanctuary of Ijevan Forest Enterprize of "Hayantar" State Non-Commercial Organization

Draft October 2016

Contents

Executive Summary

The basis for establishment of Ijevan State Sanctuary and development of its management plan was the State Program on Protection of Specially Protected Nature Areas of Armenia for 2014 – 2020 (approved by the RA Government on September 25, 2014) with the activity 3.3. "Establishment of Ijevan State Sanctuary to ensure the integrity of ecosystems". The proposed Ijevan Sanctuary includes the existing 3 forest state sanctuaries – Ijevan, Hazel-nut and Gandzaqar-Verin Aghdan as well as some other areas of Ijevan Forest Enterprise.

Management plan of Ijevan State Sanctuary was developed in the frames of the ENPI-FLEG II program within WWF-Armenia implemented activities through the service provided by the Young Foresters Union NGO.

According to the ToRs of the assignment the main goal was to carry out management planning of the sanctuary aimed at conservation of natural values and socio-economic development of the sanctuary adjacent communities. In particular the tasks included studies and inventories of forests, natural resrouces and biodiversity, studies on socio-economic situation and cultural values, tourism and recreation potential, consultations with engaged communities and development of draft management plan.

Ijevan State Sanctuary is located in Tavush Province of Armenia. The total forest cover of Tavush Province makes about 129500 ha, making 47,9 %, which by three times exceeds the average indicator for the country. The forests of Tavush Province is of mountainous nature, they have soil-prortection, water-protection and climate regulating functions. They are also characterized by diversity of flora and fauna species. The dominant tree species include beech, oak, hornbeam, pine, ash, juniper, maple and elm.

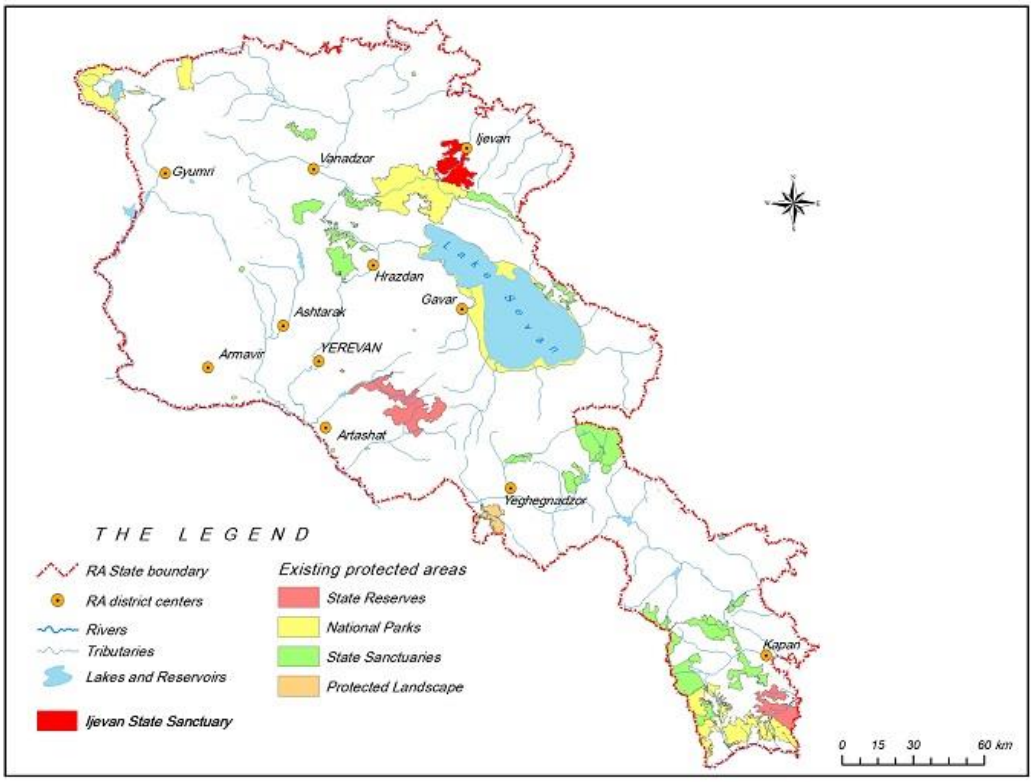
Since 199 the forests in Tavush Province have been under intensive exploitation due to economic blocade and energetic crisis, which has resulted in significant quantitative and qualitative changes. Due to non-regulated loggings the regeneration capacity of forests has been disturbed with resulting environmental problems. It should be mentioned that all 3 existing forest sanctuaries had not defined boundaries and management plans, which caused obstacles to sustainable forest management and fulfilment of the sanctuary regime on their territories.

1. General information on Ijevan State Sanctuary

1.1 Location of the Sanctuary

Ijevan State Sanctuary is in the structure of Ijevan Forest Enterprise of "Hayantar" State Non-Commercial Organization, it is located in Tavush Province of the Republic of Armenia (Map-scheme 1). The administrative office of Ijevan Forest Enterprise is located in Ijevan town at the distance of 140 km from Yerevan.

Map-scheme 1. Specially Protected Nature Areas of Armenia and Ijevan State Sanctuary



1.2 Establishment of the Sanctuary, its aim and vision

Ijevan State Sanctuary is established on the basis of 3 existing forest sanctuaries – Hazelnut State Sanctuary (40 ha, established 13.09.1958), Ijevan Sanctuary (5908 ha, established 19.04.1971) and Gandzaqar-Verin Aghdan Sanctuary (6813 ha, established 19.04.1971).

The **aim** of establishing Ijevan State Sanctuary is to ensure natural development of natural forest and meadow ecosystems in the basins of the River Aghstev and its tributaries the Urtijur and Sarnajur in Tavush Province of Armenia, and conservation, protection, rehabilitation, reproduction of landscape and biological diversity, natural and historical-cultural unique monuments as well as sustainble use of natural resources. The objects of special conservation in the Sanctuary include mountainous forest ecosystems with typical rare and valuable plant and animal species as well as the relict hazel-nut forest.

The **vision** of Ijevan State Sanctuary (long-term perspective till 2030) is as follows:

Ijevan State Sanctuary ensures natural development, restoration and conseration of mountainous forest ecosystems of the territory with typical rare and valuable flora and fauna populations, plant associations and other values and integrity and continuity with ajdacent specially protected nature areas, the use of natural resources is sustanable, ecotourism creates additional income for the sanctuary and adjacent communities.

1.3 Boundaires of the Sanctuary

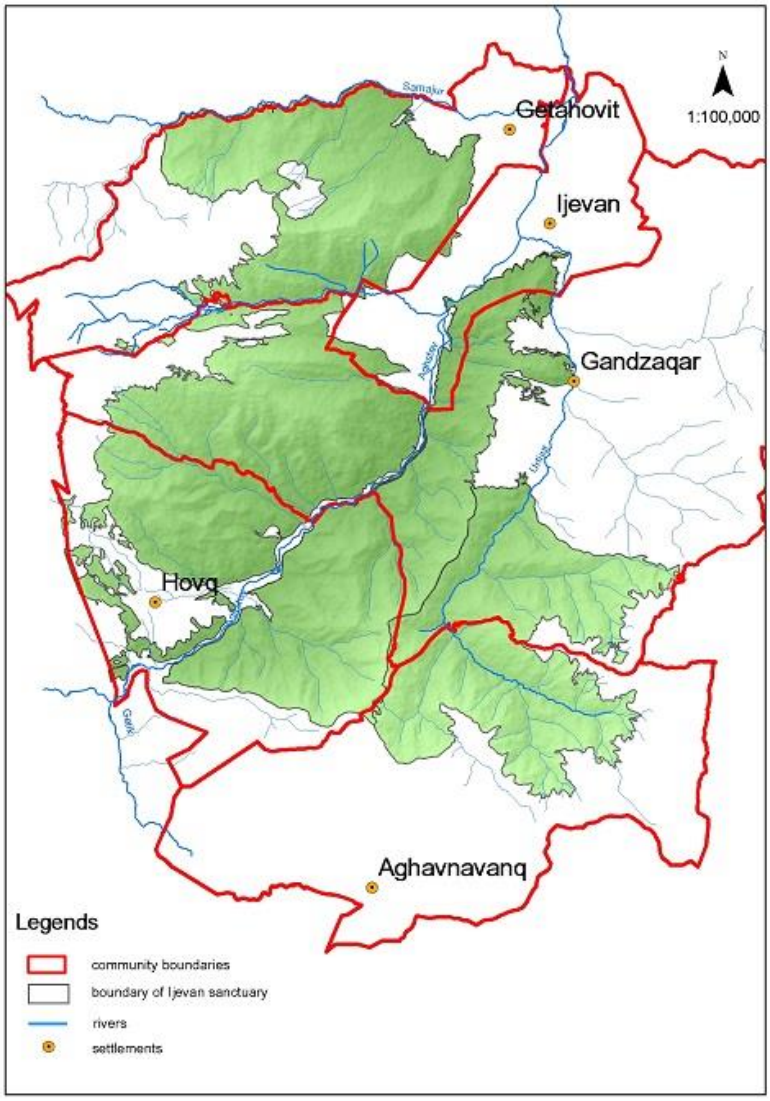
The boundaries of the Sanctuary were defined with consideration of pecularities of the relief (watersheds, gorges, rivers, mountainous ranges, etc.), which are distinctive in nature and can serve as relatively stable boundaries, as well as based on the analysis of satellite images with taking into account the actual boundaries of Ijevan Forest Enterprise.

The map of Ijevan State Sanctuary is presented in Annex 1.

1.4 Strucute of the Sanctuary

The total territory of the Sanctuary makes 13916 ha. The Sanctuary expands from north to south on 17 km and from east to west – on 15 km. It is located within administrative borders of Gandzaqar and Getahovit rural communities, Ijevan town as well as Hovq and Aghavnavanq rural settlements included in the structure of Dilijan urban community (Map-scheme 2).

Map-scheme 2. Ijevan State Sanctuary and administrative borders of communities

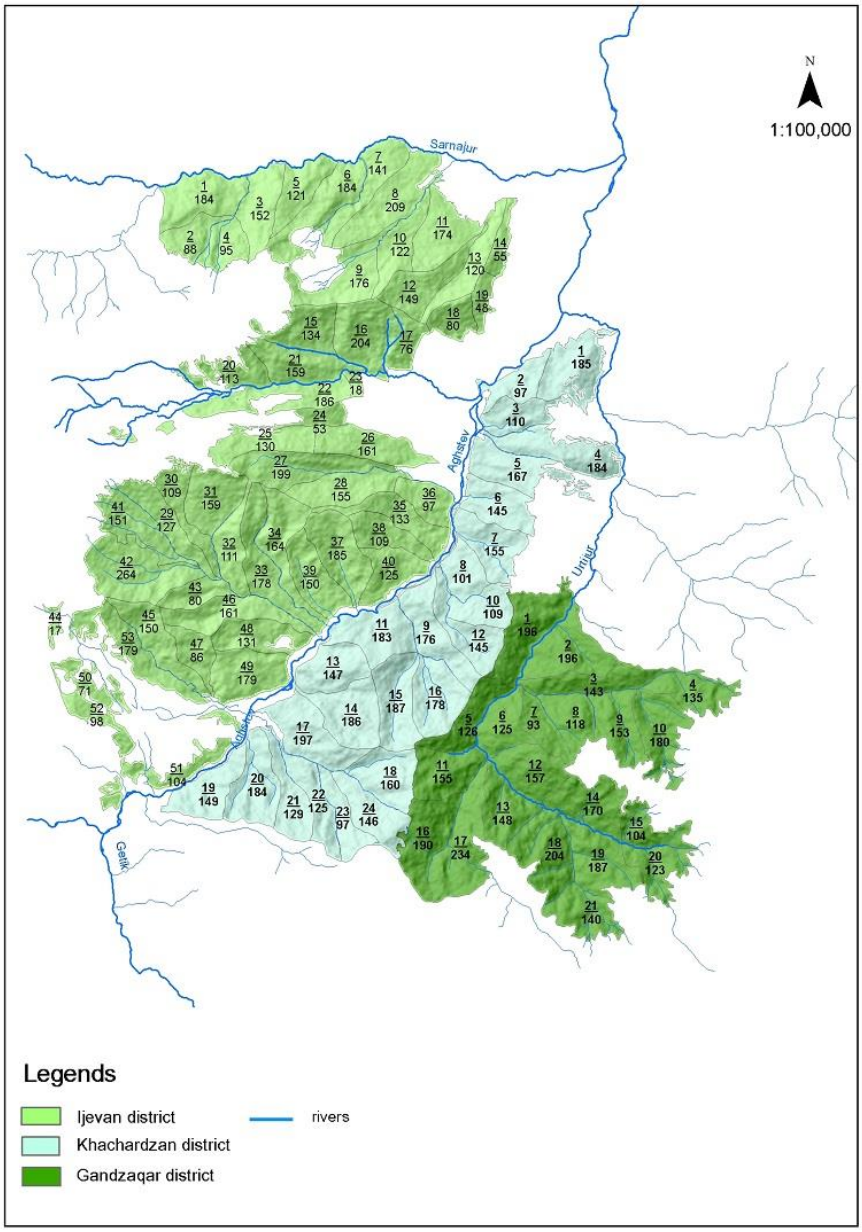


The Sanctuary consists of 3 districts: Ijevan - 6997 ha, Gandzaqar - 3277 ha and Khachardzan - 3642 ha. The territory of the Sanctuary was divided to the net of quarters. In total it includes 99 quarters. The largest quarter makes 264 ha and the smallest – 17 ha, the average is 142 ha. The number of forest compartments is 2512, their average area is 5.5 ha (Table 1, Map-scheme 3)

Table 1. Structure of Ijevan Sanctuary

Forest District	**Number of quarters**	**Area of quarter, ha**			**Compartments**	**Average area of compartment, ha**
		maximum	minimum	average		
Gandzaqar	21	234	93	156	455	7,2
Ijevan	53	264	17	132	1303	5,4
Khachardzan	24	197	97	152	754	4,8
Total	98	254	35	142	2512	5,5

Map-scheme 3. Ijevan Sanctuary districts and quarters



2. Methodology for developing sanctuary management plan and works

Development of management plan for Ijevan State Sanctuary was based on the following main legal documents: RA Law on Specially Protected Nature Areas (2006), Methodological instruction on development of management plans for specialy protected nature areas (2008), RA Forest Code (2005) and Instruction on development of forest management plans (2005).

Development of the sanctuary management plan included studies and inventories of forests, natural resrouces and biodiversity, studies on socio-economic situation and cultural values, tourism and recreation potential as well as consultations with engaged communities.

2.1 Inventory of forests and forest resources

General inventory of the forests in the sanctuary was carried out according to the Instruction on forest inventory and management planning in the forests of Armenia. It was based on the analysis of satellite images and studies in the field with combining selective eye measurement and calculatory evaluations.

All acquired data were registered in the taxation (evaluation) cards. These are the main field documents filled for each forest compartment. For mountainous conditions the additional indicators include the average altitude above sea level, steepness, location of the compartment on the range, soil protection and erosion (severe, average), valuable and relict species, etc.

The steepness of slopes was divided as follows: up to 10^0, $11\text{-}20^0$, $21\text{-}30^0$ and above 30^0.

The site class was defined by average age and average height for the main forest element.

The relative crown cover was defined by eye-measurement or by use of respective field instrument.

The timber stock per 1 ha was defined on the basis of respective volume tables for the region.

The hay-making areas and pastures were defined as good, average and low quality areas based on the nature of plant cover, its state and productivity.

The availability of roads is important for mountainous forests with complex relief, therefore the accessibility (roads) were mentioned for each compartment.

The compartment is considered accessible if it has road passing through it or the distance from the compartment boundary to the road is less than 200 m. The other compartments are considered inaccessible. When mentioning the planned activities in such compartments, the distance to the closest road is mentioned.

All roads passing through the quarters were described – their significance (for forest management or general use), type (with artificial cover or natural road), width, length and the state of the road.

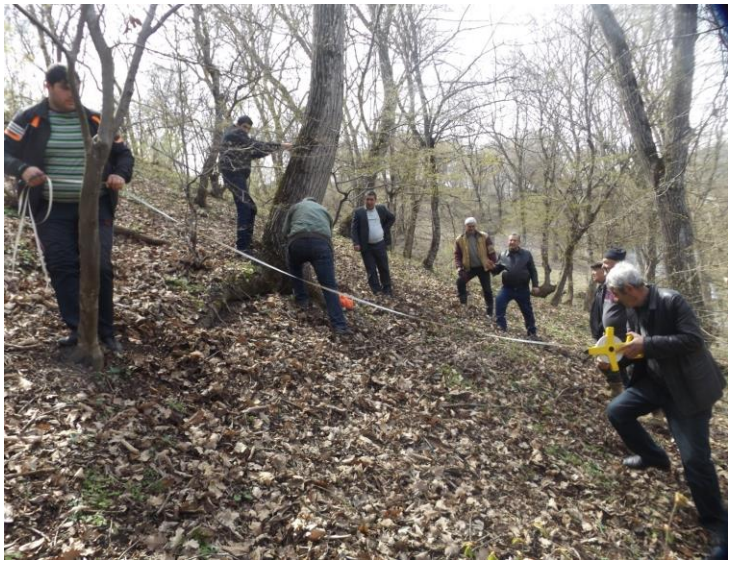
2.2 Classification of the sanctuary lands

The forest cover of the sanctuary territory makes more than 86%. Therefore, the lands of the sanctuary were classified based on the Instruction on forest inventory and forest management planning (its table 49).

2.3 Team (collective) training

The team training was conduced in the field in preliminarily selected stands prior to the field inventories. The main aim is to train inventory staff for the forest inventory (photos).

The team training included the following topics: measurements for forest inventory, use of measurement tools and instruments (excersises), use of measured data; respective legal documents; forest growing conditions and forest types, species composition of stands, site class and other indicators; forest pests and diseases (trees and stands), their signes in nature, alerting about the cases; satellite images and their analysis; field inventory templates and requirements on how to fill them in and others.



2.4 Mapping activities

The following main mapping materials were used for the mapping of Ijevan State Sanctuary of Ijevan Forest Enterprise:

- Mapping materials from the previous forest management planning of Ijevan Forest Enterprise (2005);
- The mapping materials on clarification of the boundaries and mapping of Ijevan State Sanctuary (2014-2015);
- Topographic maps, scale 1:25000;
- Satellite images of the area;
- Cadastral maps of the adjacent communities;

The above mentioned materials were transferred to GIS, the information was digitalized and data were registered in geographic coordinates system. The external and quarter boundaries of adjacent forest

districts were taken from the forest enterprise maps and the river and road nets, altitude isolines and others were taken from topographic maps. All was used to clarify the boundaries of the areas.

The Arc GIS 10-2 was used, the map database was complemented by respective information – thematic maps with characteristics of compartments.

2.5 Participatory approach

The management plan was developed by participatory approach. The main aim is to engage respective stakeholders in the management planning process. Engagement of stakeholders is important for consideration of different objectives by different stakeholders, which should be taken into account in the process of managment planning and decisión-making.

The representatives of Ijevan Forest Enterprise and all the adjacent communities (settlements) were involved in the team (collective) trainings and discussions/consultations.

In the process of management planning apar from numerous informal meetings and discussions, two formal consultative workshops were organized (13.05.2016, 21.10.2016) with participation of representatives of adjacent communities, Ijevan Forest Enterprise, others state bodies, local NGOs and other stakeholders. The topics presented and discussed during the workshops included: the results of field studies and findings on forests and biodiversity, conservation and restoration, engagement of adjacent communities, draft management plan with envisaged activities, mapping materials, analysis of aquired data, etc. The feedback and comments from the workshops were incorporated in the final draft management plan.

3. Natural characteristics of the sanctuary

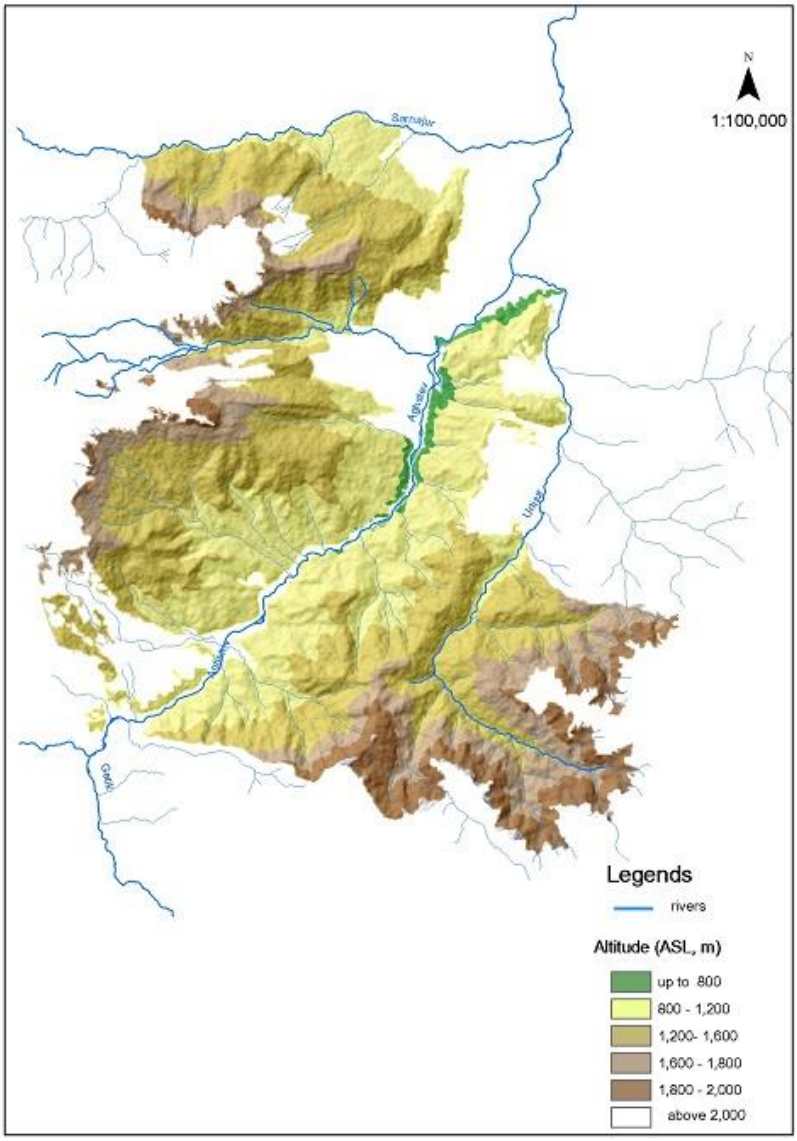
3.1 Geology, relief and soils

The forests of Ijevan State Sanctuary are located in the northern part of the Lesser Caucasus Mountains in the north-eastern regions of Armenia. The Sanctuary is located on Mtnasar, Ijevan and Hakhum mountainous ridges of the Lesser Cauasus Mountains. They expand on north-eastern direction with decrease of altitudes from south to north.

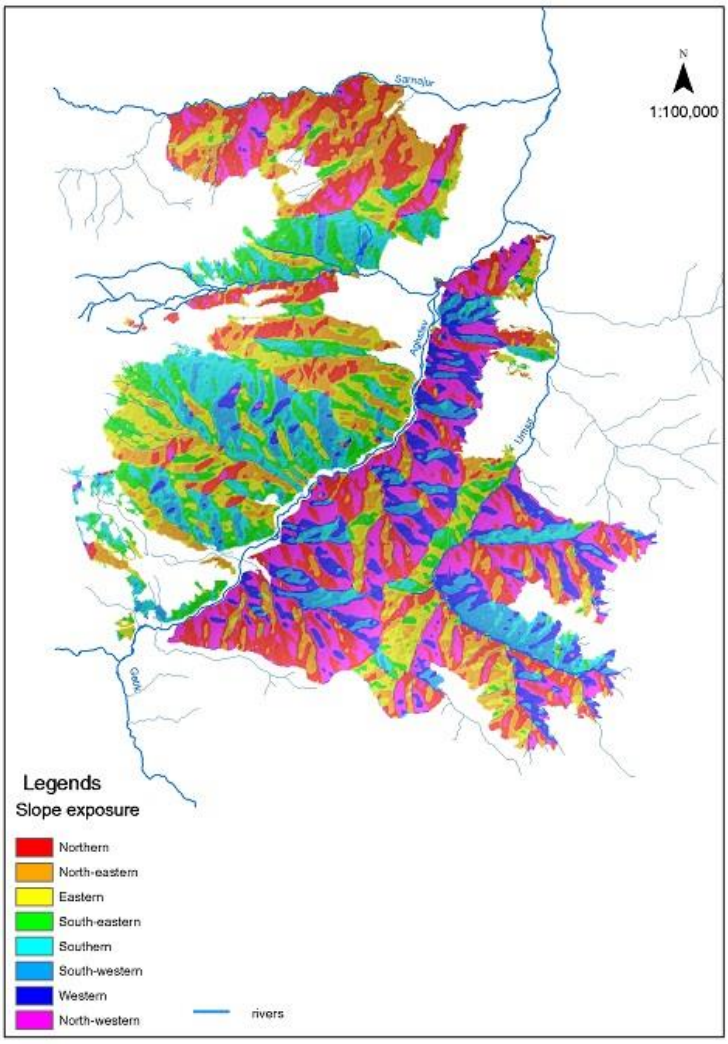
The forests of the sanctuary are located at the altitudes of 600-2000 m above sea level, with 40% of forest covered areas and 43% of biomass located at the altitudes of 1200-1600 մ above sea level.

The relief is rought and the slopes changes frequently, the slopes of northern disposition dominate along with domination of the slopes with steepness of 21-30° (Map-scheme 4, Map-scheme 5Map-scheme 5, Map-scheme 6).

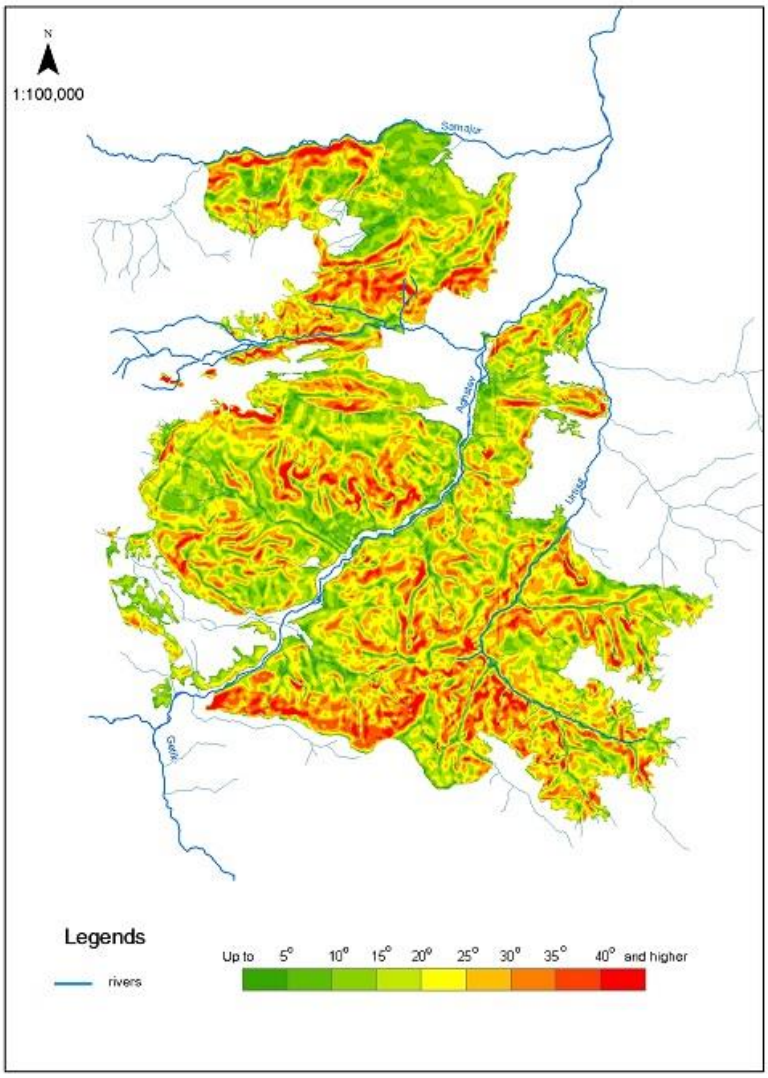
Map-scheme 4. Altitudes above sea level of Ijevan sanctuary areas



Map-scheme 5. The slopes of Ijevan Sanctuary areas



Map-scheme 6. Steepness of the slopes in Ijevan Sanctuary areas



Special soil studies were not carried out and for soil description the data from previous soil studies for Ijevan region as well as soil mapping information was used. The main soil types include mountainous brown forest soils, mountainous dark forest soils, mountainous turfcarbonate forest soils and limited areras of alluvial soils. Out of the mentioned types the mountainous brown forest soils dominate with its sub-types.

The mountainous dark forest soils on northern slopes are rather developed and even on very steep slopes they sometimes reach 1 m and more. The soils on southern slopes are bright brown, they are typical for oak and oak-hornbeam formations. At the upper timberline the dark forest soils transfer to bright brown soils typical for oak formations.

In the lower forest zone (below 800 m) the soils are poor – skeletal soils. The forests there are mainly represented by secondary hornbeam (mixture of Carpinus orientalis and C. caucasica) formations with accompanying bush species, which are the result of elimination of oak. The process of erosion is rather severe here, non-regulated intensive loggings and high steepness of the slopes contribute to erosion.

3.2 Climate

The territory of Armenia is characterized by diversity of natural-climatic conditions. The Ijevan Forest Enterprise area is defined in the 6-7th agro-climatic zones. The 6th climatic zone includes the altitudes of 600-900 m above sea level and the 7th climatic zone – 900 m above sea level and more. In the upper forest zone (1700 m and above) the climatic conditions are rathe severe. The area is characterized by low alterations of temperature, temperate warm and relatively dry summer, rainy autumn and temperate cold winter.

The average precipication rate is 550-600 mm, the average annual temparature is 10°C, the absolute minus temperature is 20°C. The snow cover depents on the altitude, it differs from 8-10 cm to 50-60 cm.

In general the climatic conditions of the sanctuary area are relatively supportive for growth of numerous tree-bush species.

3.3 Hydrology

The territory of the sanctuary is covered by the net of small rivers. All the river are of mountainous nature, they get water from underground sources, snow melting and springs. They are typical mountainous rivers with fast flow with high content of stones and sand. The water in rivers is not abundant, though in spring they get more water.

The River Aghstev with its tributaries the Urtijur and Sarnajur (and their small tributaries) flow on the territory of the sanctuary (Table 2). There are no lakes and other reservoirs on the territory of the sanctuary.

Table 2.Rivers of Ijevan Sanctuary

River	Flows to	Length, km	Watershed area, km ^{2}	Average volume	Width, m	Depth, m	Barriers indicator		Usefulness for water transportation
							By normative	actuarl	
Aghstev	**Kura**	121	2500	5.4	18	0.46		0.3	not useful
Urtijur	**Aghstev**	20	73.5	0.71	4.6	0.27	-	-	not useful
Sarnajur	**Aghstev**	31	205	0.95	7.0	0.39	-	-	not useful

3.4 Lands of the sanctuary

In the total territory of the sanctuary – 13916 ha the forest covered áreas make 12042,9 ha (86,5%), including forest cultures only 96,9 ha. The sparse forests makes 307,5 ha, the glades - 501,9 ha. Non-forest lands cover 953,5 ha (6,85%), including pastures - 352,1 ha and hay-making áreas – only 7,5 ha (Table 3).

Table 3.Distribution of lands of Ijevan Sanctuary

N/N	Land type	Unit	Sanctuary district			Area	%
			Ijevan	Gandzaqar	Khachardzan		

1	Total area	ha	6997,0	3277,0	3638,0	13912,0	100
2	Covered by forest, total	ha	5854,9	2806,0	3382,0	12042,9	86,56
2.1.	Including forest cultures	ha	65,5	12,3	19,1	96,9	
3	Forest culture with low crown cover	ha	5,6	-	2,0	7,6	
4	Not covered by forest	ha	587,8	237,3	86,9	912,0	6,55
4.1	Burnt, logged and not restored	ha	59,0	43,6	-	102,6	
4.2	Sparse forest	ha	171,1	120,6	15,8	307,5	
4.3	Glades	ha	357,7	73,1	71,1	501,9	
7	No-forest land	ha	547,5	233,7	167,1	949,5	6.89
7.1	Orchard	ha	5,2	-	-	5,2	
7.2	Pasture	ha	126,4	194,7	31,0	352,1	
7.3	Hay-making area	ha	-	-	7,5	7,5	
7.4	Road	ha	38,6	13,6	19,4	71,6	
7.5	Water surface	ha	11,9	9,4	19,2	40,5	
7.6	Other lands	ha	365,4	15,6	85,7	466,7	

4. Forests and biodiversity of the sanctuary

4.1 Forests

The forests of Armenia have rich diversity of valuable tree and bush species – 323 species belonging to 118 genera and 54 families. These species are mainly representataives of xerophillous, boreal and caucasian flora.

Ijevan floristic región is one of the rich áreas of plant diversity in Armenia. In the forest biodiversity the role of tree and bush species is important for creation of the hábitat for numerous species of fauna.

The territory of Ijevan Forest Enterprise is characterized by vertical zonation and diverse relief with resulting rich plant diversity conditioned mainly by the georgraphic location and altitude above sea level. The forest flora of Northern Armenia is mainly represented by the elements of the caucasian and boreal floras. The territory of Ijevan Sanctuary is fully located in Ijevan floristic region, where forest is the main vegetation type; dry open woodlands and sub-alpine formations cover rather limited areas.

The tree-bush flora of Ijevan floristic region includes 160 species belonging to 45 families, out of them 77 are tree species, 51 – bush speciews and 32 – small bush and liana species. Out of them 80% are represented on the territory of the sanctuary and adjacent areas (Trees and bushes of Armenia in nature and culture, Zh. H. Vardanyan, 2003).

The main forest species of Ijevan floristic region are beech (Fagus orientalis), oak (Quercus macranthera, Q. iberica), caucasian hornbeam (Carpinus caucasica). The accompanying species are hornbeam (Carpinus orientalis), lime (Tilia cordata, T. caucasica), acer (Acer camrestre), poplar (Populus tremula) and others. They are represented in mixed or complex beech and oak stands and in some cases they form homogenous small stands.

At lower altitudes (up to 1000 m) the forest vegetation is represented by hornbeam coppice stands with significant representation of Q. iberica, lime (Tilia cordata, T. caucasica), acer and elm. Bush species are represented by the species of Cornus, Crateagus, Rosa, Mespilus and others. The hornbeam formations are of secondary origin, they have replaced the oak stands logged in the past.

On southern slopes there are open juniper woodlands with mixture of a number of xerophillous species. At the altitudes of 700 – 1400 m above sea level walnut makes small groups or is present in the form of separate trees.

In the middle mountainous zone (1000-1700 m) the northern slopes are mainly covered by beech stands and the southern slopes are covered by oak formations. In beech stands there is mixture of hornbeam, oak, lime and ash. On the glades and underforest there are species of Rosa, Cornus, Mespilus, etc.

The southern slopes up to 1200 m are covered by mixed oak stands (Q.iberica). At the altitudes of 1200-1400 m the species Q. iberica and Q. macranthera often grows together. The altitudes above 1400 m up to the upper timberline are covered by the stands of Q. macranthera. The oak stands are characterized by mixed composition with presence of hornbeam, ash, maple, lime, apple and pear.

In the total area of Ijevan state sanctuary making 13916 ha the área covered by forests makes 12042,9 ha (86,5%), including forest cultures only 96,9 ha: Sparse forests cover 307,5 ha, forest glades make 501,9 ha:

The role of forest is significant for soil-protection, water-protectio and regulation of climate especially in the conditions of mountainous relief of Armenia. About 47% of forests of the sanctuary is located on steep slopes of 30° and above. In such forests, especially on southern slopes, the erosion process is severe and natural regeneration is not sufficient. The water protection role of forests is very important, the forests along the rivers and streams protect from floods. In addition, these forests ensure maintenance of water regime for the forest adjacent communities.

4.1.1 Distribution of forest covered areas and stock in the sanctuary by altitude above sea level

The forests in the sanctuary are located at altitudes 600-2000 m above sea level with the following distrubution: up to 800 m - 308.2 ha (2.6% of total area and 1% of total stock), 801-1200 m - 4492,7 ha և 490890 m^3 (37,3% and 28,6%), 1201-1600 m in the middle forest zone 4669,1 ha և 738730 m^3 (40% and 43%), 1601-1800 m - 1809,9 ha and 339080 m^3 (13,8% և 19,8%), 1800 m and above - only 763 ha and 129980 m^3 (6,3% and 7,6%), above 2000 m - only 11,1 ha (

Table 4).

By main dominating tree species 73,5% of the beech stands are located at the altitudes of 1200-1800 m above sea level, 86,3% of the oak stands – at the altitude of 800-1800 m, 90,9 % of the caucasian hornbeam stands – at the altitude of 800-1600 m and 99,3% of the hornbeam stands – at the altitudes up to 1600 m (Table 5).

Only 15,3% of the total area and 9,7% of the total stock is located at the slopes of up to 20^0, respectively 37,7% and 37% - at the slopes of 21-30^0, and 47% and 53,3% - at the slopes above 30^0 (Table 6).

Table 4. Distribution of forest covered areas and stock in the sanctuary by altitude above sea level

Altitude, m above sea level	Area, ha	Stock, m^3
Up to 800	308,2	17540
801-1200	4492,7	490890
1201-1600	4669,1	738770
1601-1800	1809,9	339080
1801-2000	751,9	128710
2000 and above	11,1	1270
Total	**12042,9**	**1716260**

Table 5. Distribution of the main dominant tree species by altitude above sea level

Dominant species	Altitude above sea level, m						
	Area, ha						
	Up to 800	801-1200	1201-1600	1601-1800	1801-2000	2000 and above	Total
Oak	18,9	545,8	1037,3	477,4	209,4	4,5	2385,1

Caucasian hornbeam	96,1	2023,2	1254,2	123	60,4		3605,4
Beech		708	2065,4	1201,7	466,9	2,2	4444,2
Pine	4,9	14,3					19,2
Walnut	8,5	54	33,2				95,7
Hazel-nut (Corylus colurna)		31,8	55,7				87,5
Juniper	15,4	159,9					175,3
Hornbeam	155,9	869,6	164	7,8	1		1198,3

Table 6. Distribution of the areas and stock of the main dominant tree species by slope steepness

Dominant species	Slope steepness									
	0-10		10-20		21-30		30 and above		Total	
	ha	Stock, 10 m^3	ha	Stock, 10 m^3	ha	Stock, 10 m^3	ha	Stock, 10 m^3	ha	Stock, 10 m^3
Oak	17,70	270,0	348,10	3183,0	925,70	11513,0	1093,60	12993,0	2385,1	27959,0
Hornbeam	50,20	447,0	604,20	5693,0	1349,4	14507,0	1601,60	20617,0	3605,4	41264,0
Walnut	39,00	381,0	32,60	234,0	24,10	299,00			95,70	914,0
Beech	4,10	85,0	341,70	5220,0	1690,5	35032,0	2407,90	55039,0	4444,2	95376,0
Hazel-nut (Corylus colurna)	0,10		8,50	222,0	28,50	775,0	50,40	923,0	87,50	1920,0
Pine	5,50	41,0	1,90	21,0	-	-	11,80	244,0	19,20	306,0
Juniper	-	-	27,3	55,0	78,4	237,0	69,6	212,0	175,3	504,0
Hornbeam	43,40	96,0	319,20	671,0	434,70	1186,0	401,00	1215,0	1198,3	3168,0
Total	160,0	1320,0	1683,5	15299,0	4531,3	63549,0	5635,9	91243,0	12010,7	171411,0

4.1.2 Analysis of main indicators of forest inventory in the sanctuary

4.1.2.1 Distribution of areas and stock by dominant tree species

In the forest covered areas of the sanctuary the beech stands dominate, they cover 4444,2 ha with the stock of 953760 m^3 (36,9% of total forest covered area and 55,6% of the total stock). The oak stands cover 2385,1 ha (19,8%) and 279230 m^3 (16,3%), including Q.iberica stands located up to 1300 m above sea level, totally 680 ha and Q. macranthera stands located at 1300 m above, totally 1705,1 ha. Caucasian hornbeam stands cover 3604,4 ha (29,9%) with the stock of 412640 m^3 (24%) and hornbeam

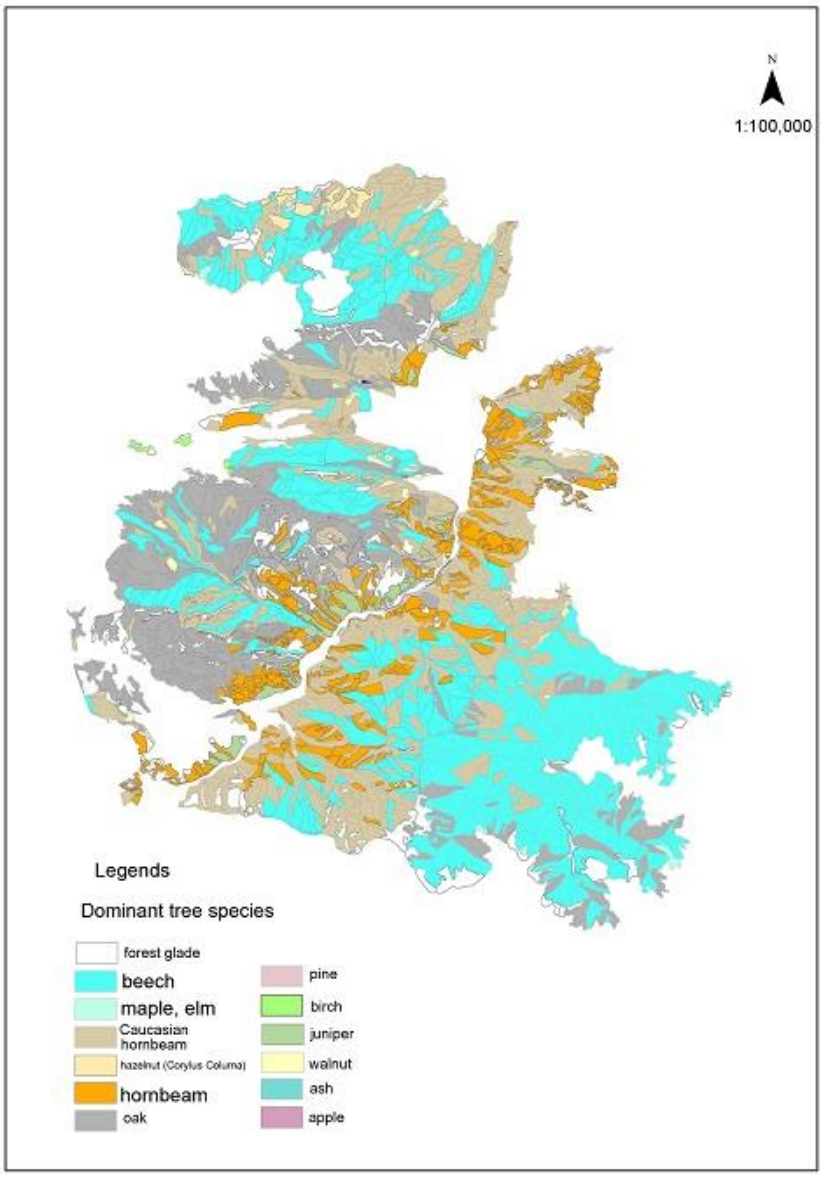
stands 1198,3 hա (9,9%) and 31680 m^3 (1,8%) respectively. Juniper open woodlands make 175,3 ha (1,5%), walnut stands - 95,7 ha (0,8%) and the stands with domination of Corylus colurna - 87,5 ha (0,7%) (Table 7, Map-scheme

Map-scheme 7).

Table 7. Distribution of areas and stock by dominant tree species

N/N	Tree species	Arera, ha	Stock, 10 m^3
1	Pine	19,20	306
2	Juniper	175,30	504
3	Oak	2293,30	27286
4	Oak (seed origin)	91,80	637
5	Caucasian hornbeam	3556,90	40953
6	Caucasian hornbeam (seed origin)	48,50	311
7	Ash	1,60	8
8	Birch	16,00	90
9	Willow	6,40	30
10	Beech	4444,20	95376
11	Maple	3,90	56
12	Hornbeam	1198,30	3168
13	Walnut	95,70	914
14	Hazel-nut (Corylus colurna)	87,50	1920
15	Chest-nut	1,30	16
16	Hazel nut (C.avellana)	1,40	5
17	Apple	1,60	10
Total		**12042,90**	**171590,00**

Map-scheme 7. Ijevan sanctuary areas by dominant tree species



4.1.2.2 Distribution of dominant tree species by site class

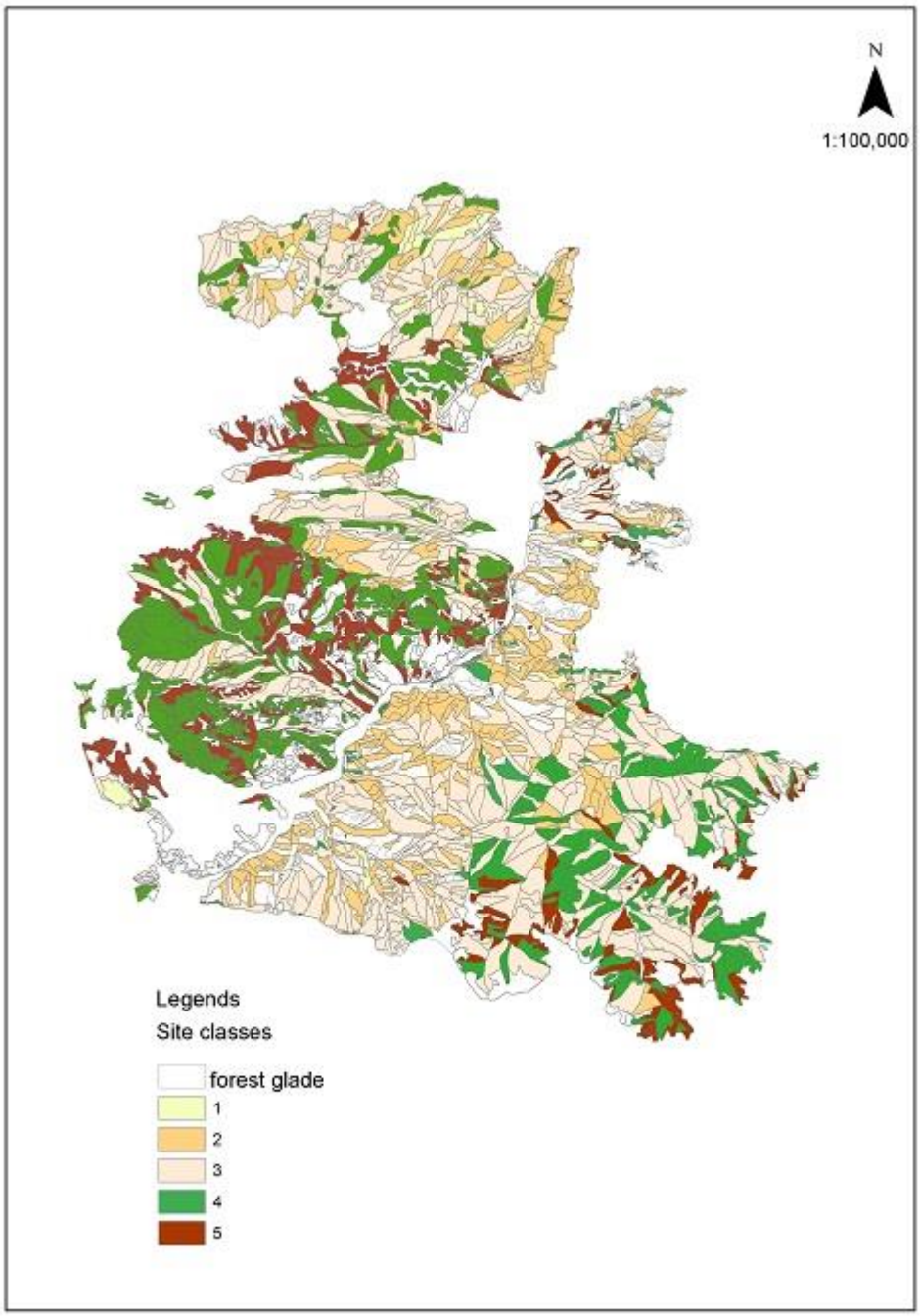
The average site class of the stands in the sanctuary is III. The site class of pine, ash and hazelnut (Corylus colurna) is relatively high (2,0-2,6); in the structure of main dominant species stands: beech stands - 3,2, caucasian hornbeam stands - 3,4, oak stands (mainly located on southern slopes) – 4,2 (relatively low). The forest growing conditions of juniper woodlands and hornbeam stands are por with respective average site class 5,7-5,8 (

Table 8, Map-schemeMap-scheme 8).

Table 8. Distribution of dominant tree species by site class, ha

Dominant species	Site class						Total
	I	II	III	IV	V	V a	
Pine	1,2	8,7	7,3		2		19,2
Juniper					31,1	144,2	175,3
Oak		27,5	134,8	1526,7	800,5	23,8	2293,3
Oak (seed origin)				5,4	57,7	28,7	91,8
Beech	22,9	311,6	3241,9	717,9	149,9		4444,2
Caucasian hornbeam	36,7	1020,4	1488,9	766,2	244,7		3556,9
Caucasian hornbeam (seed origin)				18,9	26,5	3,1	48,5
Ash		1,6					1,6
Maple			1,3	2,6			3,9
Walnut	23,4	24,1	28,7	19,5			95,7
Hazel-nut (Corylus colurna)		46,6	37,1	3,8			87,5
Chest-nut		1,3					1,3
Hornbeam				24,2	162,7	1011,4	1198,3
Birch				12	4		16
Willow		0,3	5,4	0,7			6,4
Apple			1,6				1,6
Hazel nut (C.avellana)					1,4		1,4
Total	84,2	1442,1	5127	3097,9	1480,5	1211,2	12042,9

Map-scheme 8. Ijevan Sanctuary areas by site class



4.1.2.3 Distribution of dominant tree species by age groups

In the forest cover of the sanctuary the middle age group forests absolutely prevail - 9506 ha with the total stock of 1493750 m^3 or 78,9% of the total forest covered area and 87% of the total stock. The maturing and mature (overmature) stands cover 909,3 ha (7,5%) with the stock of 151850 m^3 (8,8%) and 75,1 ha (0,6%) with the stock of 6210 m^3 (0,4%), which indicates that intensive irregular loggings have been done in the forests of the sanctuary (Map-schemeMap-scheme 9, TableTable 9).

The average crown cover of the sanctuary forests is 0.51. In the structure of main dominant species the average crown cover of oak stands is 0.50, beech stands - 0,51, Caucasian hornbeam stands - 0,55, which indicates non-desirable change of species.

The stands of low crown cover (0.3-0.4) cover 2606,3 ha with the total stock of 231480 m^3 or 21,6% of the total area and 13,5% of the total stock, the stands of high crown cover (0,7 and more) - only 1126,2 ha (9,4%) with the stock of 194030 m^3 (11,3%) and the stands with the middle crown cover absolultely prevail - 8310,4 ha (69%) and 1290750 m^3 (75,2%)(Table 10, Map-schemeMap-scheme 10).

Map-scheme 9. Ijevan sanctuary areas by age groups

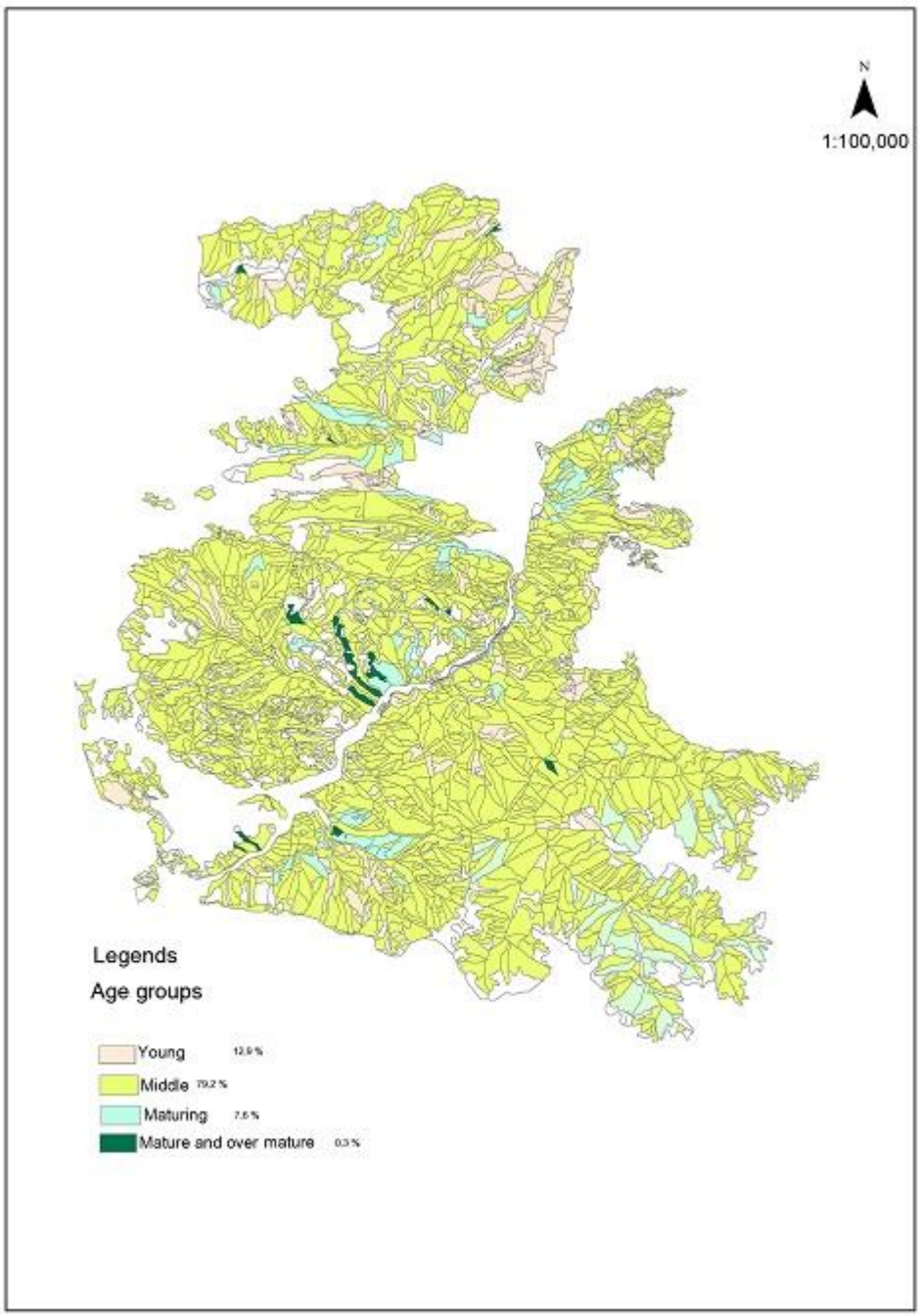


Table 9. Distribution of the area and stock of dominant tree species by age groups

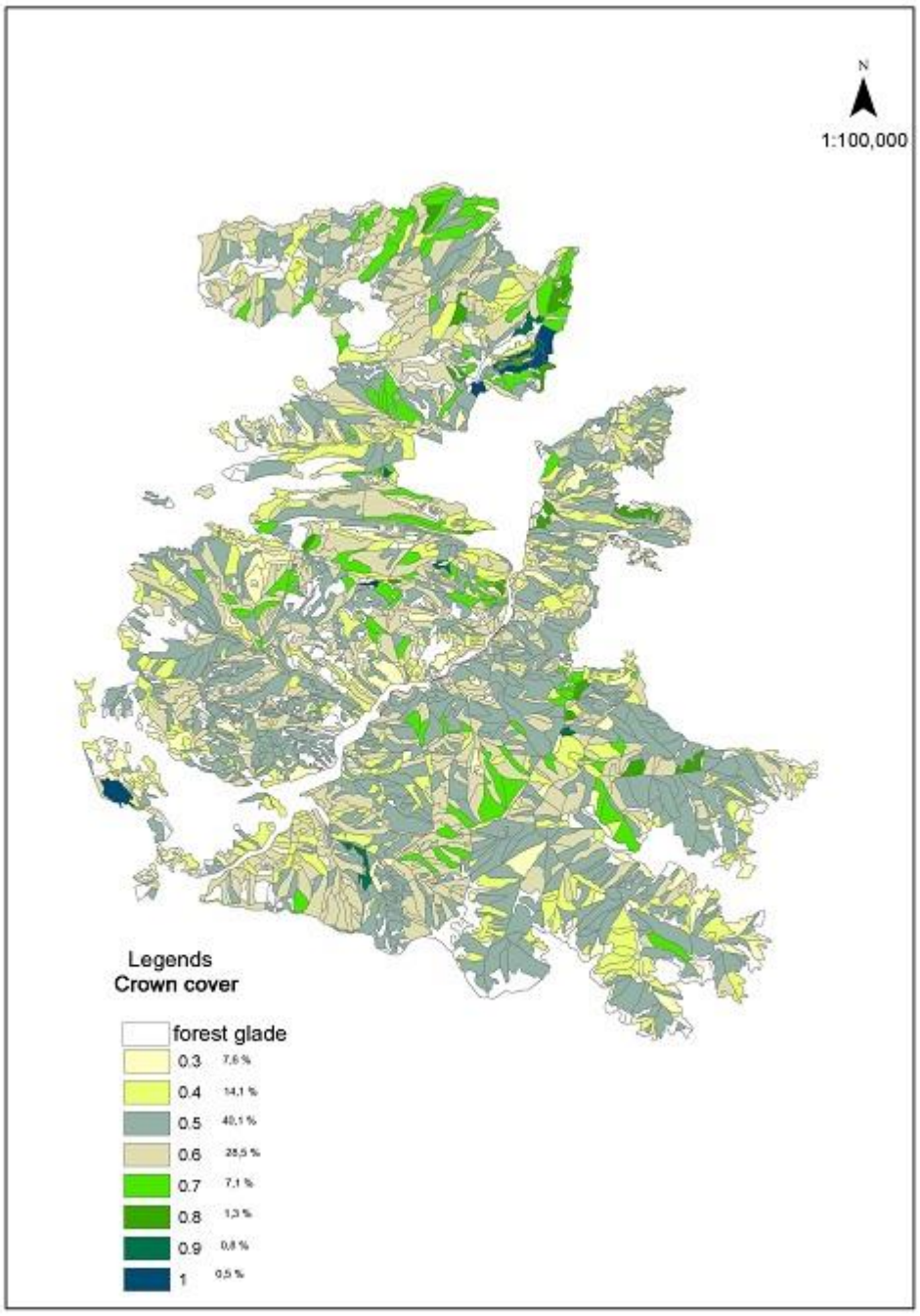
N/N	Dominant species	Forest covered area, ha						Total stock of stands, m^3 (10)						Average age	
		Total	young		Middle age	Maturing	Mature and overmature	Total	young		Middle age	Maturing	Mature and overmature		
			1	2					1	2					
1	Pine	19,2	7,4	5,9	5,9			306		52	130	124		91	
2	Juniper	175,3			143	32,3		504			380	124		83	
	Beech	4444,2		16,2	3983,1	444,9		95376		140	84262	10974		123	
3	Oak	2293,3		26,3	2261,2	3,1	2,7	27286		143	27085	33	25	114	
4	Oak (seed origin)	91,8			73,4		18,4	673			517		156	84	
5	Caucasian hornbeam	3556,9	434	810,9	2116,6	188,9	6,5	40953	1003	4854	31856	3091	149	57	
6	Caucasian hornbeam (seed origin)	48,5			48,5			311			311			48	
	Chest-nut	1,3			1,3			16			16			55	
	Hornbeam	1198,3	100	114,1	702,2	234,5	47,5	3168		12	2080	785	291	49	
	Maple	3,9			1,3	2,6		56			17	39		136	
7	Ash	1,6		1,6				8		8				25	
	Walnut	95,7	1,5	34,5	59,7			914	3	194	717			54	
	Hazel-nut (Corylus colurna)	87,5	0,1		87,4			1920			1920			137	
	Birch	16			16			90			16				
8	Willow	6,4			6,4			30			30			43	
9	Other species	1,6				1,6		10				10		130	

11	Bush species	1,4				1,4		5				5		25	
Total		12042,9	543	1009,5	9506	909,3	75,1	171590,0	1006	5403	149375	15185	621	93	

Table 10. Distribution of crown cover of stands by dominant tree species and stock

Dominant species	Crown cover																	
	0,3		0,4		0,5		0,6		0,7		0,8		0,9		1		Total	
	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³	ha	10, m³
Pine	5,4	36	3,3	31	1,2	13	9,3	226									19,2	306
Juniper	97,3	283	62	149	4,8	12	8,3	49	2,9	11							175,3	504
Oak	309,1	2178	408,3	4199	779,6	9326	575,6	7737	192,9	3453	24,6	336			3,2	57	2293,3	27286
Oak (seed origin)	4,5	18	11,9	67	49,6	384	25,8	204									91,8	673
Caucasian hornbeam	197,6	1372	374,3	3485	1297	15000	1255,1	17344	239,3	2270	93,8	848	23,2	184	76,6	450	3556,9	40953
Caucasian hornbeam (seed origin)			6,7	33	10,9	99	16,5	129	14,4	50							48,5	311
Ash							1,6	8									1,6	8
Maple			3,9	56													3,9	56
Birch					6,1	31	9,9	59									16	90
Walnut	18,7	78	19,6	157	23,8	209	31,2	439			2,4	31					95,7	914
Hazel-nut (Corylus colurna)					12,6	151	41,7	831	33,2	938							87,5	1920
Willow	6,4	30															6,4	30
Beech	131,4	1471	551,9	9032	2159	46856	1230,9	27516	335,1	9835	23,1	563	12,8	103			4444,2	95376
Apple	1,6	10															1,6	10
Hazel-nut (C.avelana)									1,4	5							1,4	5
Chest-nut					1,3	16											1,3	16
Hornbeam	138,4	105	254	358	540,6	1539	218	897	27,9	147	10,5	30	8,9	92			1198,3	3168
Total	**910,4**	**5581**	**1695,9**	**17567**	**4886,5**	**73636**	**3423,9**	**55439**	**847,1**	**16709**	**154,4**	**1808**	**44,9**	**379**	**79,8**	**507**	**12042,9**	**171626**

Map-scheme 10. Ijevan Sanctuary areas by crown cover



4.1.2.4 Forest types and the types of forest growing conditions

The typological schemes for the Caucasus and Armenia developed by L.B. Makhatadze, N.D. Popov and P.A. Khurshudyan were considerred for distinguishing forest types on the territory of the sanctuary. According to the schemes the forests of Ijevan Sanctuary are located in Ijevan floristic province, which is characterized by rich biological diversity with domination of the stands of beech (Fagus orientalis Lipsk.), oak (Quercus macranthera, Quercus iberica) and Caucasian hornbeam (Carpinus caucasica).

On the territory of the sanctuary the forest with Festuca undergrowth (24,3%) and motley grass undergrowth (56,3%) types prevail - 61.4% (6279,1 ha) and 34.1% (3490,8 ha) (TableTable 11).

The analysis of forest inventory data shows that the fresh forest growing conditions (C2) prevail with 7409,6 ha or 72,5% and the forest growing conditions in the sanctuary are favorable for the growth of forest species requiring average humidity (Table 12).

Table 11. Distribution of the sanctuary areas (ha) and proportions (%) by forest types, ha

N/N	Forest type	Dominant species									
		Pine	Juniper	Oak	Oak (seed origin)	Beech	Caucasian hornbeam	Caucasian hornbeam (seed origin)	Ash	Other species	Total
1	Blackberry undergrowth					13,4	93,3	3,3		12,6	**122,6**
2	Dead undergrowth	5,4	8,5	27,2		263,8	176,4	11,1		36,9	**529,3**
3	Festuca undergrowth	1,9	21,1	557,7	9,7	1456,3	593,8			335,1	**2975,6**
4	Sedge undergrowth		79,9	395,6	82,1		80,8	23,4		261,6	**923,4**
5	Fern undergrowth					27,5	4,8				**32,3**
6	Motley plant undergrowth	11,9	65,8	1089,5		2291,1	2596,6	10,7	1,6	718,8	**6786**
7	Sub-alpine undergrowth			218,1		279,2	4,7			47,1	**549,1**
8	Asperula undergrowth			5,2		112,9	6,5				**124,6**
Total		**19,2**	**175,3**	**2293,3**	**91,8**	**4444,2**	**3556,9**	**48,5**	**1,6**	**1412,1**	**12042,9**

Table 12. Distribution of forest covered áreas by forest growing conditions, ha

Forest type	Dominant species									
	Pine	Juniper	Oak	Oak (seed origin)	Caucasian hornbeam	Caucasian hornbeam (seed origin)	Ash	Elm	Other species	Total
A1	1,5		36,6	72,9						**111**
A2				84						**84**
A3				101,3						**101,3**
B1			24,5	550,9					281,1	**856,5**
B2	26,6		162,1	586,9					72,5	**848,1**
B3	3		12,9						13,1	**29**
C1	4	23,9	52,2	336	4,8	5,2			812,3	**1238,4**
C2	234,7		2434,9	3401	144,9	337,3	7,2	39,8	1809,8	**8409,6**
C3	10,3		121,2	158,8		6,1	4		64,6	**365**
Total	**280,1**	**23,9**	**2844,4**	**5291,8**	**149,7**	**348,6**	**11,2**	**39,8**	**3053,4**	**12042,9**

4.1.2.5 Average indicators of the main tree species

The average age of the forests in the sanctuary is 93, the average site class - 3,6, the average Crown cover – 0,51 and the average stock per 1 ha - 143 m^3, which is a rather low indicator for the north-eastern forest growing región. The average stand composition is as follows: 3,4 caucasian hornbeam, 3 – beech, 2 - oak, 0,9 - hornbeam, 0,2 – maple, 0,1 – ash, 0,1 – Hazel-nut (Corylus colurna), 0,1 – juniper. In the stands dominated by hornbeam (Carpinus orientalis, C. caucasicus) the average stand composition of 4,3 indicates about undesirable species change processes in the result of intensive irregular loggings (TableTable 13).

Table 13. Average indicators by the main tree species

N/N	Dominant species	Average age	Average site class	Average crown cover	Average stock per 1 ha
1	Pine	92	2,6	0,48	159
2	Juniper	83	5,7	0,36	29
3	Oak	115	4,3	0,50	93
4	Beech	123	3,2	0,51	215
5	Caucasian hornbeam	58	3,3	0,55	229
6	Ash	25	2	0,60	50
7	Maple	137	4,1	0,40	144
8	Hazel-nut (Corylus colurna)	137	2,5	0,62	219
9	Hornbeam	50	5,8	0,48	61
Average (sanctuary)		93	3,6	0,51	143

4.1.2.6 Fire risk of forests

Forest fires can affect the ground layer of forest (dead-wood, plant cover, bushes, regeneration, etc.) with little damage to trees and their crowns. Fires affecting crowns are more dangerous and they can cause severe damage to trees.

Based on weather conditions, by forest fire risk the following groups are distinguished:

- Extremely high risk of fire: long hot dry weather with the average air temperatura above 20^0 and humidity below 40%;
- High risk of fire: long dry weather, sometimes poor precipitation, humidity 40-60%;
- Low risk of fire: frequent rain and wet forest soil;
- No risk of fire: lenghty rains and humidity above 80%.

The risk of forest fire is characterized by the forest type and biological specifications of forest species, it was divided to 5 classes.

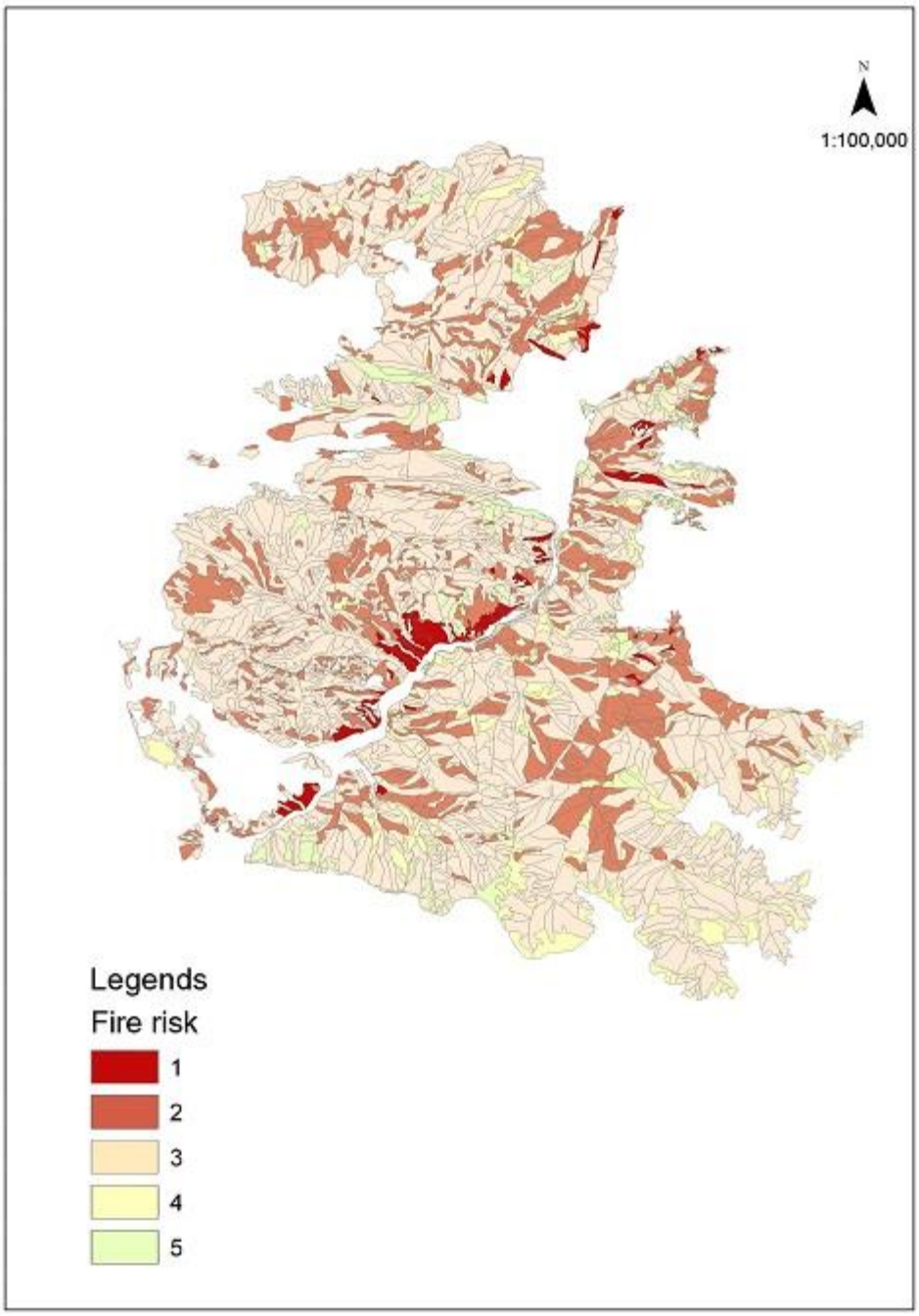
In the process of forest inventory the fire risk class was defined and the data were analyzed via computer software (Annex 2).

By risk of forest fire the sanctuary territories under class 1 cover only 121 ha, class 2 - 3186 ha, class 3 - 9194 ha, class 4 - 479 ha and class 5 - 936 ha. The average fire risk class in the sanctuary is 3, which indicates about the below middle risk of fires in the sanctuary (Table Table 14, Map-schemeMap-scheme 11).

Table 14. Fire risk classes in the sanctuary

	Fire risk class					**Average fire risk class**
	1	2	3	4	5	
	Area, ha	Area, ha	Area, ha	Area, ha	Area, ha	
	Ijevan district					
	220	1583	4481	166	547	3,0
	Khachardzan district					
	45	1135	2283	15	164	2,9
	Gandzaqar district					
	12	468	2274	298	225	3,2
Total	**277**	**3186**	**9038**	**479**	**936**	**3,0**

Map-scheme 11. Ijevan sanctuary areas by fire risk classes



4.1.2.7 Non-wood forest resources

Non-wood forest resources are of significant importance for the local population in the sanctuary adjacent communities. Over centuries the forest adjacent communities have met their social needs by use of natural wealth of forests – forest fruites, berries, nuts, mushroom, edible plants, etc. Many species have been used as medicinal, some species have been used as raw material for important production.

If properly managed, the use of hay-making areas and pastures can bring certain income (benefits). The inventory data showed that hay-making areas in the sanctuary make only 7,5 ha and pastures - 352,1 ha, including 160,8 ha located at average 20^0 steepness slopes and 191,3 ha -at more steep slopes. Therefore, intensive grazing on such slopes can result to intensified erosion.

Out of fruits and berries growing in the sanctuary the nearby population mainly collect walnut, cornel-cherry, pear, blackberry and dog-rose for domestic needs. In case of sustainable management (harvesting) the sanctuary forests can cover also other economic needs.

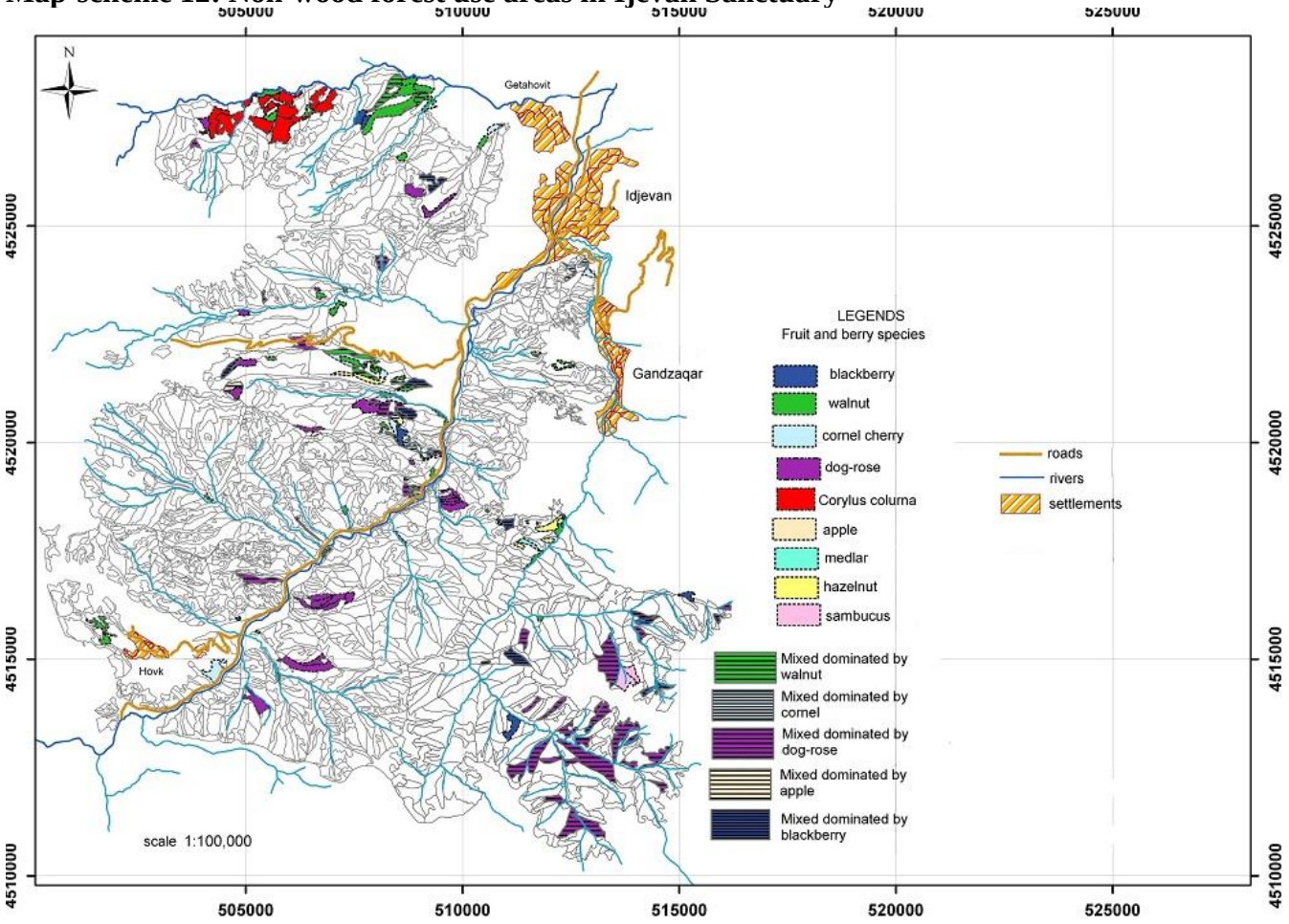
In the process of field inventory the non-wood forest resources were assessed and further analyzed. Distribution of forest fruit and berry species was assessed and mapped and the average expected yield was calculated through expert assessment, also based on discussions/consultations with forest enterprise staff including forest protection staff.

On the territory of the sanctuary the total area of stands dominated by fruit-berry species makes 969,4 ha, the expected yield was assessed approximately 96750 kg with domination of cornel-cherry - 37,7%, blackberry - 21,2% and walnut - 20,4%. Hazelnut (Corylus colurna) occurs on 127 ha with expected yield of about 3500 kg (Table 15, Map-scheme 12).

Table 15. Distribution of fruit-berry species áreas in the sanctuary by resource

	Fruit-berry species	District							
		Ijevan		Gandzaqar		Khachardzan		Total	
		ha	kg	ha	kg	ha	kg	ha	kg
1	Cornel-cherry	58,5	15000			137,7	21500	196,2	36500
2	Walnut	170,6	12000	9,3	4100	12,2	3600	192,1	19700
3	Hazelnut (Corylus colurna)	127	3500	-	-	-	-	127	3500
4	Apple	4,5	3000	1,5	500	-	-	6,0	3500
5	Pear	4,2	2200	2.5	1000			6,7	3200
6	Hazelnut (C.avelana)	13,3	2000	11,5	1600	--	-	24,8	3600
7	Medlar	3,9	400					3,9	400
8	Blackberry	55,2	9500	52,5	8000	10,1	3000	117,8	20500
9	Raspberry	8,9	1100					8,9	1100
10	Dog-rose	111	1800	115	2600	60	350	286	4750
	Total	557,1	50500	192,3	17800	220	28450	969,4	96750

Map-scheme 12. Non-wood forest use areas in Ijevan Sanctuary



Ijevan Sanctuary is also rich in useful plant species. In Ijevan region there is abundance of edible, honey-bearing, medicinal and spice plant species, which are the wild relatives of cultivated cultures. In the sanctuary there are mainly medicinal (207), edible (116), honey-bearing (41) and fodder (31) species.

The population widely use about 25 main plant species, many of them are sold in the local market as edible or medicinal plants.

The following species are used as edible plants: Astrodaucus orientalis, Chaerophyllum aureum, Falcaria vulgaris, Polygonatum glaberrimum, Polygonatum multiflorum, Polygonatum odoratum, Polygonatum orientale, Heracleum antasiaticum, Heracleum sosnowskyi, Rumex crispus, Urtica dioica.

The following species are both edible and medicinal: Origanum vulgare, Mentha longifolia, Thymus collinus, Thymus kotschyanus, Ziziphora clinopodioides.

The following species are used only as medicinal: Hypericum perforatum, Achillea filipendulina, Achillea millefolium, Melilotus officinalis, Teucrium polium, Plantago major.

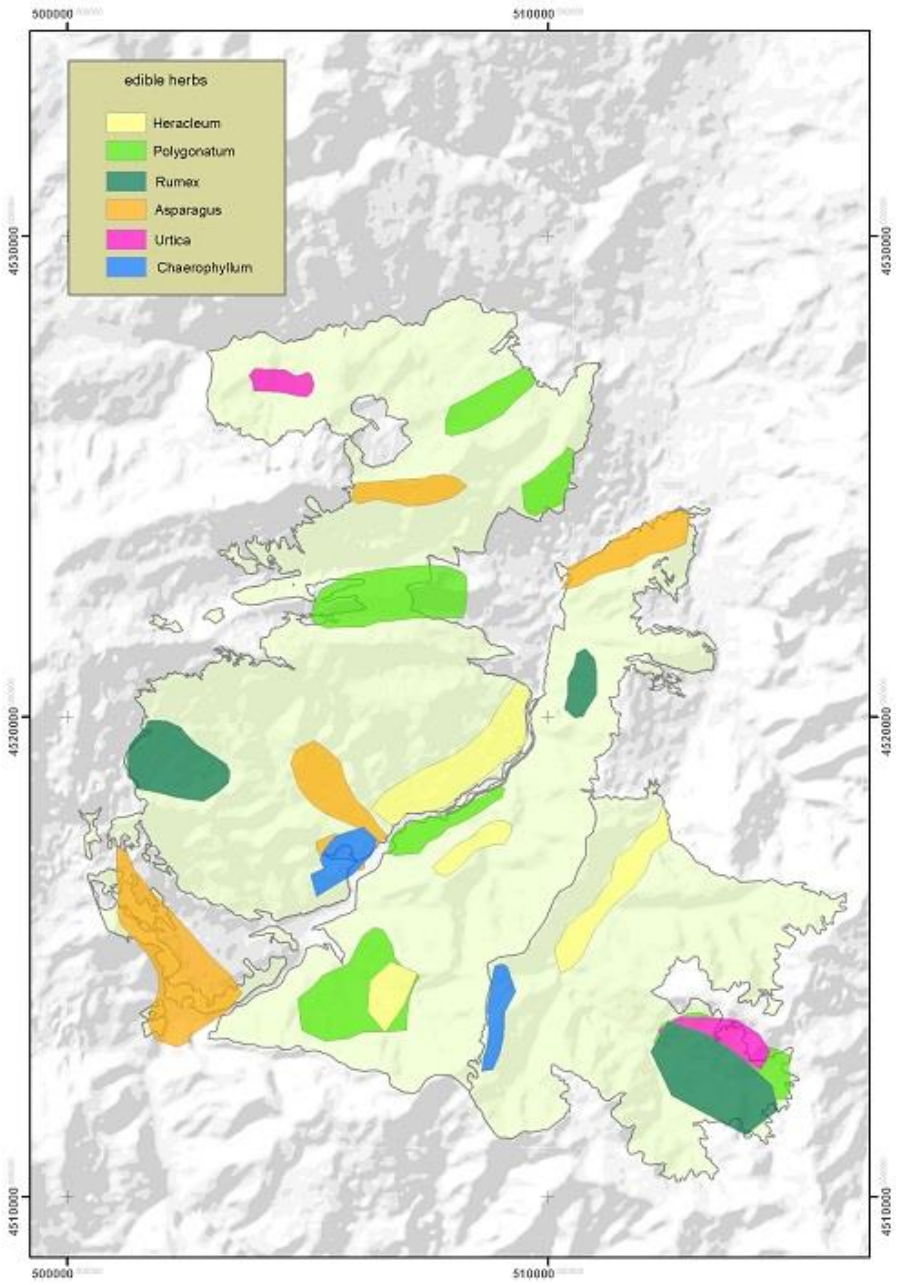
It should be stressed that to date the accurate resource assessment of the mentioned species has not been done and they are collected by population in non-organized manner. Assessment and calculation of the resources of edible plant species was done on the basis of field studies, expert assessments and discussions with collectors/sellers (Table 16,

Map-scheme 13).

Table 16. Distribution of áreas and resources of edible plant resources in the sanctuary

NN	Edible plant species	District							
		Ijevan		Gandzaqar		Ijevan		Total	
		ha	kg	ha	kg	ha	kg	ha	kg
1	Polygonatum	1000	1500	500	800	530	800	2030	3100
2	Chaerophyllum	250	1000	400	1100	-		650	2100
3	Heracleum	550	2200	280	600	300	700	1130	3500
4	Asparagus	1100	700	-		500	400	1600	1100
5	Urtica	250	900	250	900	-		500	1800
6	Rumex	250	400	300	600	60	100	610	1100
	Total	3400	6700	1730	4000	1390	2000	6520	12700

Map-scheme 13. Distribution of edible plants in Ijevan Sanctuary



4.1.2. 8 Wastewood

In the result of inventory the total reserve of wastewood was assessed 26000 solid m^3, out of which 8000 solid m^3 is in not-accessible areas.

The rest of 18000 solid m^3 of dead-wood is classified as follows:

- 4000 solid m^3 (22,2%) is in the stage of decay, it has mainly lost required qualitative characteristics and cannot be used/sold.

- 4000 solid m^3 (22,2%) is located at long distance from roads and spread in the forest, about 5-15 solid m^3 per 1 ha, in non-accessible and difficult to access areas, significant technical and material investments would be needed for its use.
- 10000 solid m^3 (55,6%) is wood with maintained technical characteristics, it includes wood of small diameter as remnant of the planned and irregular loggings, it is located in accessible areas, thought mainly at long distances from settlements.

Annually about 6000 solid m^3 of natural wastewood (about 30% of the annual growth) is originated in the sanctuary forests (without calculating wind-fallen and snow-fallen wood), out of which about 40% can be subject to use.

4.2 Biodiversity

The sanctuary territory is characterized by rich biodiversity. The flora of the sanctuary includes 562 species of high vascular plants, out of them 25 registered in the Red Book of Armenia. The fauna of the sanctuary is represented by 1155 species of invertebrates, out of them 20 registered in the Red Book of Armenia and 7 – in the IUCN Red List. There are 237 species of vertebrates, out of them 41 registered in the Red Book of Armenia.

4.2.1 Flora

4.2.1.1 High vascular plants

Description

The high vascular plants flora of Ijevan Sanctuary includes 562 species belonging to 98 families and 329 genera.

There are the following groups of flora:

- Trees - 50 species (8,9 % of flora)
- Bush sepcies - 35 (6,3 %)
- Semi-bush species - 8 (1,4 %)
- Perennial plants - 331 species (59,3 %)
- Bi-annual and annual species - 129 (22,9 %)

In the sanctuary there are also lians (4 species, 1,2% of flora) as well as 7 species of parasite and semi-parasites.

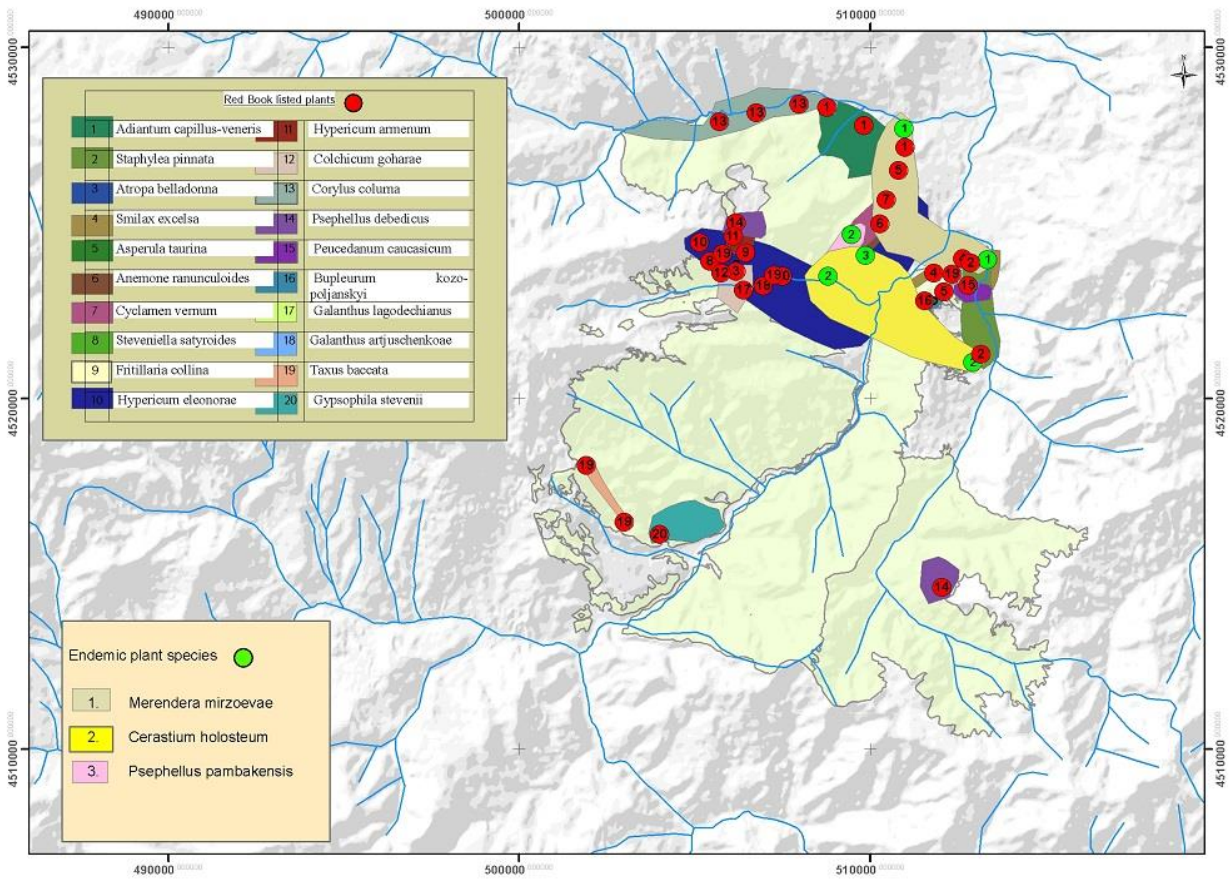
Forest formations dominate in the sanctuary, however, tree and bush species makes 8,9 and 6,3 % respectively. Perennial plant species dominate in the flora - 331 species (59,3%).

In total 25 species occurring in Ijevan Sanctuary are registered in the Red Book of Armenia: Gypsophila stevenii (CR), Hypericum armenum (CR), Hypericum eleonorae (CR), Listera ovata (CR), Galanthus lagodechianus (EN), Sternbergia colchicifolia (EN), Echinops tournefortii (EN), Psephellus debedicus (EN), Corylus colurna (EN), Colchicum goharae (EN), Castanea sativa (EN), Muscari pallens (EN), Fritillaria collina (EN), Steveniella satyroides (EN), Anemone ranunculoides (EN), Smilax excelsa (EN), Asperula taurina (EN), Taxus baccata (VU), Galanthus artjuschenkoae (VU), Bupleurum kozo-poljanskyi (VU), Peucedanum caucasicum (VU), Atropa belladonna (VU), Adiantum capillus-veneris (VU), Cyclamen vernum (VU), Staphylea pinnata (VU).

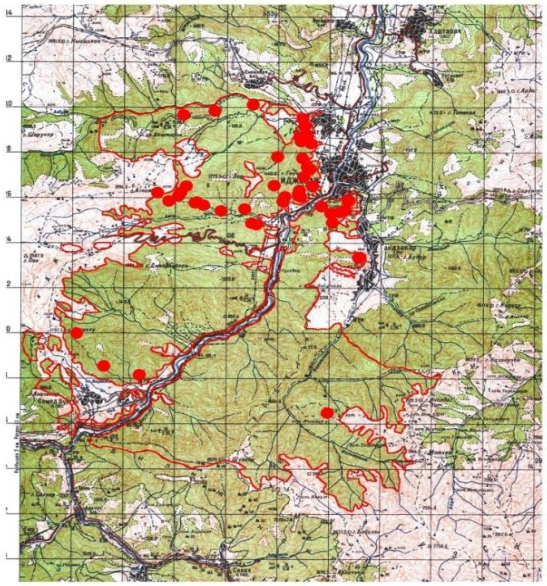
Out of them 4 are in the category critically endangered (CR), 13 - endangered (EN) and 8 - vulnerable (VU).

There are 8 endemic species on the territory of Ijevan Sanctuary, out of them 2 are endemics f Armenia and 2 – endemics of Transcacuasus: Bupleurum kozo-poljanskyi (Armenia), Psephellus debedicus (Armenia), Psephellus pambakensis (Armenia), Cerastium holosteum (Armenia), Colchicum goharae (Armenia), Merendera mirzoevae (Armenia), Galanthus lagodechianus (Transcacuasus), Galanthus artjuschenkoae (Transcacuasus) (Map-schemeMap-scheme 14, Map-schemeMap-scheme 15, Map-schemeMap-scheme 16).

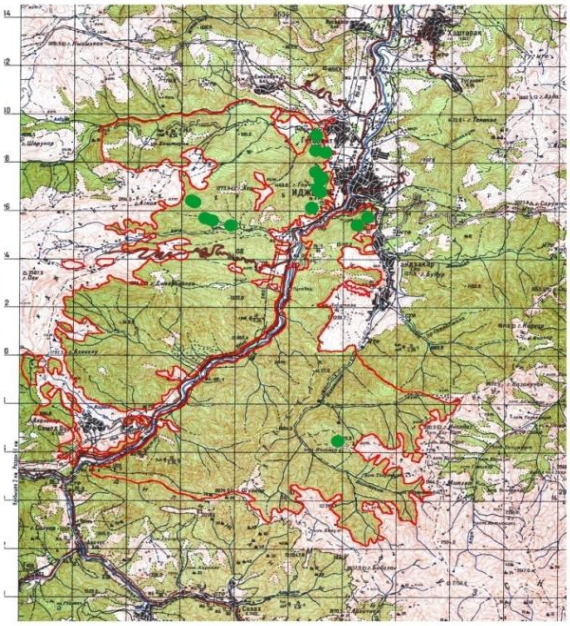
Map-scheme 14. Red Book listed and endemic plant species in Ijevan Sanctuary



Map-scheme 15. General distribution of Red Listed species in Ijevan Sanctuary



Map-scheme 16. General distribution of endemic species in Ijevan Sanctuary



Ijevan Sanctuary is rich in numerous plant species with useful properties, many of them have been widely used since long time ago. According to preliminary data there are abundant edible and spice spcies (118 species), honey-bearing (41), medicinal (207), fodder (41), technical (53) and decorative (163) species, many of them are wild relatives of cultivated varieties.

Edible and spice species include Rumex, Urtica, Allium, Heracleum, Poligonatum, Mentha and other species. They are used in fresh and processed forms for salads, seasonings, bakery, production of beverages, tea, juice and others.

There are numerous decorative species (Allium, Campanula, Silene, etc.), fodder (Trifolium, etc) and technical species (Juniperus, Quercus, etc.).

There are quite many valuable honey-bearing species (Thymus, Ziziphora, Salvia, etc.). Their abundance can support development of bee-keeping in the region. The medicinal plants (Taraxacum, Tanacetum, etc.) are not well known to local population.

There is not clear boundary between the above mentioned groups, some species have multiple useful properties (edible, spice, honey-bearing, medicinal, technical and decorative), which make them even more valuable.

The resources of many useful species have not been sufficiently studied and their quanitities are defined just quanlitatively as “abundant” or “frequently occurring”.

The territory of Ijevan Sanctuary is rich also in valuable fossil plant and animal localities, their detailed inventory is important for their protection. Some archeopaleontological data have been overviewed. In 1998 in the vicinities of Hovq community fossil plants (aged about 100 mln years) were collected. Such localities of fossil plants can be interesting for ecotourists in the area.

Main threats

The main threats are illegal loggings and grazing in the forest, especially free entrance of livestock to community adjacent forests, as well as collection of wild plants and inappropriate management of pastures.

Climate change (increase of temperature and decrease of humidity) can affect forest ecosdystems and forest biodiversity.

Dissemination of invasive and expansive species (such as Ailant, Acacia) can also be a threat to plant ecosystems.

Development of ecotourism in the area can increase the risk of trampling and elimination of plants due to increased visits and uncontrolled collection of wild decorative plant species.

Protection

The species registered in the Red Book of Armenia should be subject to protection on the territory of the sanctuary. The hazelnut grove (Corylus colurna) in Ijevan district should be under special attention.

It is necessary to carry out studies of invasive and expansive plant species as well as develop and implement measures to reduce their impact on natural ecosystems.

It is necessary to carry out studies on increased resilience of forest ecosystems against climate change and implement respective measures.

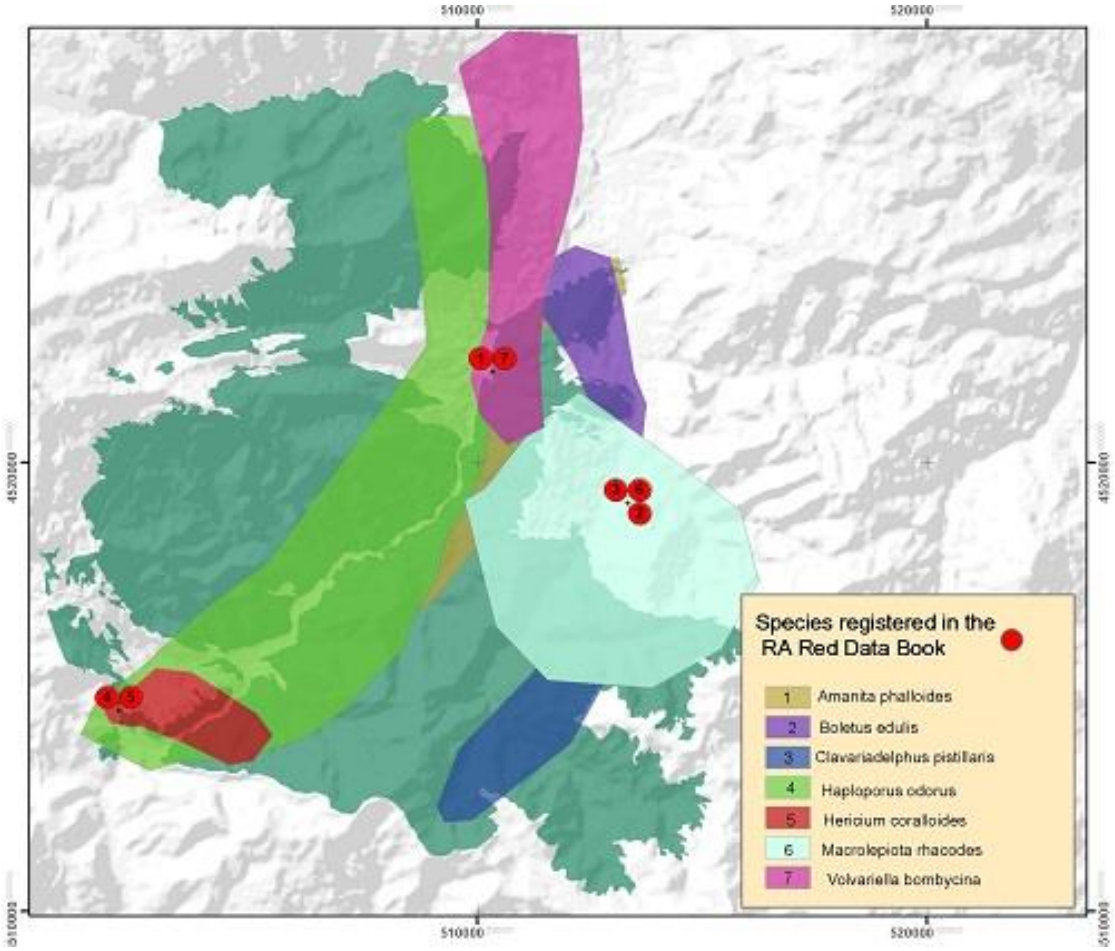
4.2.1.2 Fungi

Description

Fungi has a special role in the organic world as they can be found almost everywhere on the planet. In nature macroscopic fungi (macromicetes) are rather common, traditionally they are called mushroom (blewits). Ijevan region has favorable conditions for growth of mushroom. The most common and typical species include representatives of the genera Russula, Lactarius, Cortinarius, Inocybe and Amanita, as well as բնափայտ քայքայողներ Armillaria mellea and species of the generus Pleurotus and the family Polyporaceaem, which cause decay of wood. All the mentioned species are somehow linked to tree species, mainly in the forests.

The studies on the territory of Ijevan Sanctuary have revealed about 50 species of macromicetes. Out of them 23 are registered in the Red Book of Armenia *Amanita muscaria, A. phalloides, Asterophora lycoperdoides, Boletopsis leucomelas, Boletus edulis, B. satanas, Clavariadelphus pistillaris, Cystoderma amianthina, Dictyophora duplicata, Hapalopilus croceus, Haploporus odorus, Helvella atra, Hericium coralloides, H. erinaceum, Macrolepiota rhacodes, Meripilus giganteus, Mutinus caninus, Phallus impudicus, Phyllotopsis nidulans, Rhodotus palmatus, Strobilomyces strobilaceus, Tuber aestivum, Volvariella bombycina* (Map-schemeMap-scheme 17).

Map-scheme 17. Distribution of mushroom species on the territory of Ijevan Sanctuary



Macromicetes are divided into the groups of species of edible, poisonous and medicinal significance. In Ijevan floristic region there are about 200 sepcies of edible mushroom. Out of them the species Pleurotus ostreatus and Agaricus campestris are very common. They are sold in local market and along the roads. During spring the main marketed species are Lepista personata and Calocybe gambosa.

In the list of the mentioned species Pleurotus ostreatus is the most perspecive in terms of resources, possibility to collect as well as cultivation.

On the territory of the sanctuary there are 45 species of poisonous mushroom. They include Amanita muscaria, Amanita pantherina, Amanita phalloides, Boletus satanas, Coprinopiss picacea, Hypholoma fasciculare, Paxillus involutus and some species in the genera Cortinarius, Inocybe, Tricholoma, etc. The local inhabitants recognize them in the field and do not collect.

On the territory of the sanctuary there are about 60 species of macroscopic fungi with medicinal features. The population does not use them as they do not know about their medicinal significance. Among them there are rather common edible mushroom (f.e. Pleurotus ostreatus, Agaricus campestris) as well as poisonous species (Amanita, Hypholoma fasciculare).

Main threats

The main threats to growth of mushroom is ecosystem degradation, reduction of forest areas due to uncontrolled loggings as well as human economic activities, which reduce or eliminate the areas suitable for mushroom growth.

Protection

The mushroom species registed in the Red Book of Armenia need protection on the territory of the reserve. Restoration of degraded forest ecosystems is precondition for improvement of the status of mushroom species. It is necessary to carry out awareness raising in adjacent communities to reduce collection of endangered species of mushroom.

4.2.2 Fauna

4.2.2.1 Invertebrates

Description

The invertebrate fauna of the sanctuary is rich and diverse. According to studies during the recent years there are about 600 species of beetles (in Armenia there are about 4000 species) and about 90 species of butterflies (in Armenia there are about 250 species) on the territory of the sanctuary. Among them there are numerous rare species registered in the Red Book of Armenia (2010), Appendix 2 of Bern Convention as well as IUCN Red List under different categories (VU, NT, DD). In the invertebrate fauna there are species and sub-species, which are endemics to Armenia, Transcauasus and the Caucasus ecoregion.

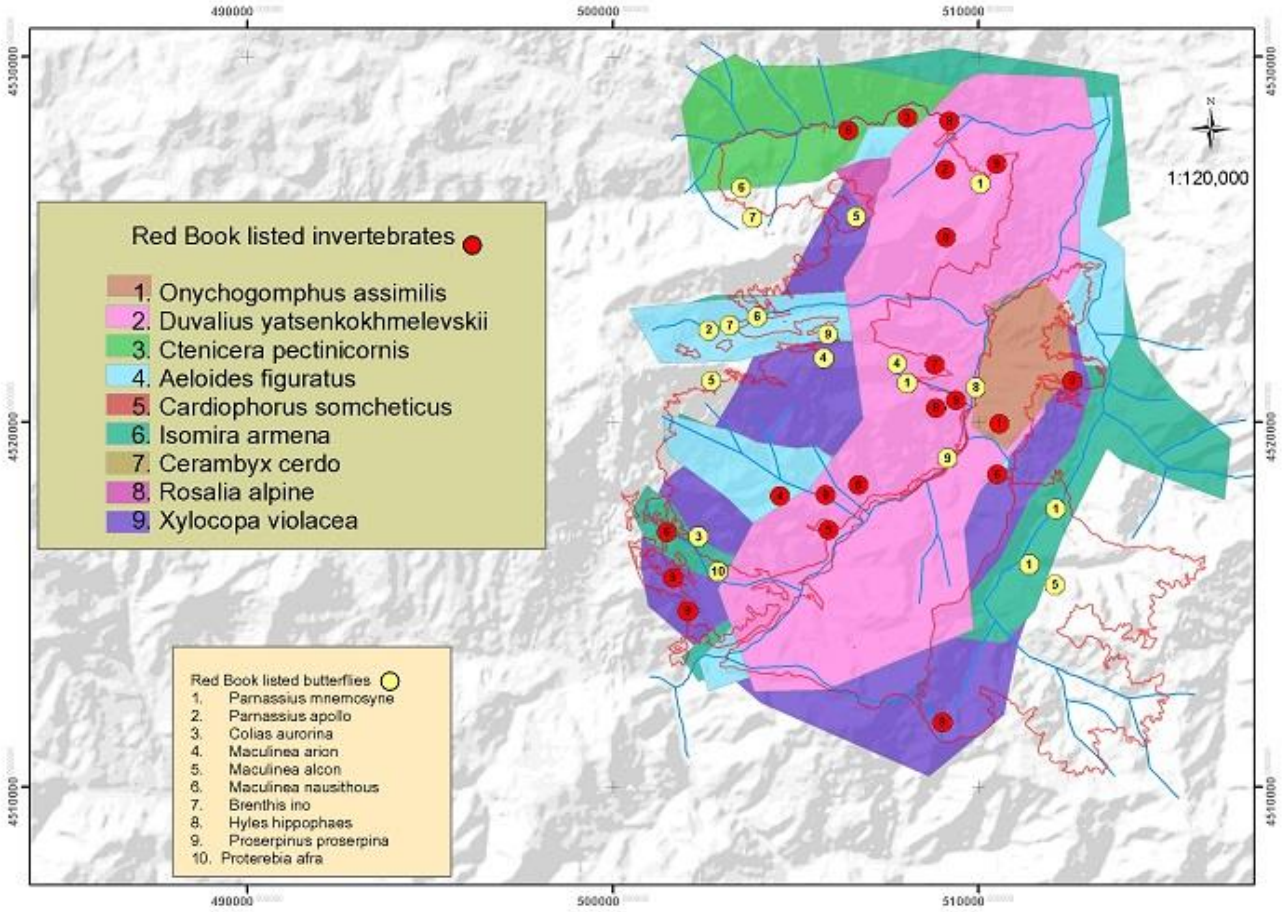
In total on the territory of the sanctuary there are 71 such species, including 20 species registered in the Red Book of Armenia, out of which 6 species are included in Appendix 2 of Bern Convention and 7 species are in the IUCN Red List. There are also 6 endemics of Armenia (beetles), 20 endemics of Transcaucasus (15 species and 5 sub-species) and 28 endemic species of the Caucasus.

For assessing invertebrate diversity field studies have been implemented with use of traditional methods and approaches.

Beetles were studies with use of traps installed in different districts of the sanctuary. The following species are easy to recognize and can be subject to assessment: b*Carabus pumilio, Carabus cribratus, Carabus puschkini, Carabus septemcarinatus, Carabus calleyi, Carabus clypeatus, Carabus varians, Prystonichus gratus, Prystonichus mannerheimi*.

Butterflies were studied with use of standard transect method. On the trail of 400-700 m the following easily identified species of butterflies are assessed: *Parnassius mnemosine, Anthocharis cardamines, Gonepteryx rhamni, Pararge aegeria, Limenitis reducta, Argynnis pandora* (Map-schemeMap-scheme 18).

Map-scheme 18. Distribution of endangered invertebrate species on the territory of Ijevan Sanctuary



Main threats

The main threat is illegal loggings, which result in fragmentation and degradation of forest areas.

Protection

During sanitary/maintenance cuttings it is necessary to keep separate dry trees with holes, which serve as habitats for invertabrates species.

During outbreakes of pests/diseases it is necessary to avoid use of aviation treatment and apply biological methods of pest control. If it is not possible avoid use of aviation, then the area of treatment should be maximally reduced to exclude areas outside of the boundaries of the outbreakes.

4.2.2.2 Vertebrates

Fish species

Description

The following fish species occur in the main River Aghstev (and its tributaries) flowing through the sanctuary territory:

- *Salmo trutta fario* L., rare species, the population is declining.
- *Alburnoides eichwaldii Filippi,* local species, which is not fished.
- *apoeta sevangi*) (VU), endemic species registered in the Red Book of Armenia.
- *Capoeta capoeta capoeta* Gueldenstaedt, local species, a fishing object.
- *Barbus cyri Filippi),* local species, a fishing object.
- *Luciobarbus mursa Guldenstadt,* local rare species (=Barbus mursa), a fishing object.
- *Squalius orientalis,* local species, a fishing object.
- *Carassius gibelio* (*Bloch*), a fishing object.

Main threats

The main threats to fish species on the territory of the sanctuary include uncontrolled fishing as well as pollution of rivers by domestic wastewater. Construction of hydropower plants on the territory of the sanctuary and nearby can be a potential threat to fish fauna of the sanctuary.

Protection

The species registered in the Red Book of Armenia and endemic species need protection.

Amphibians and reptiles

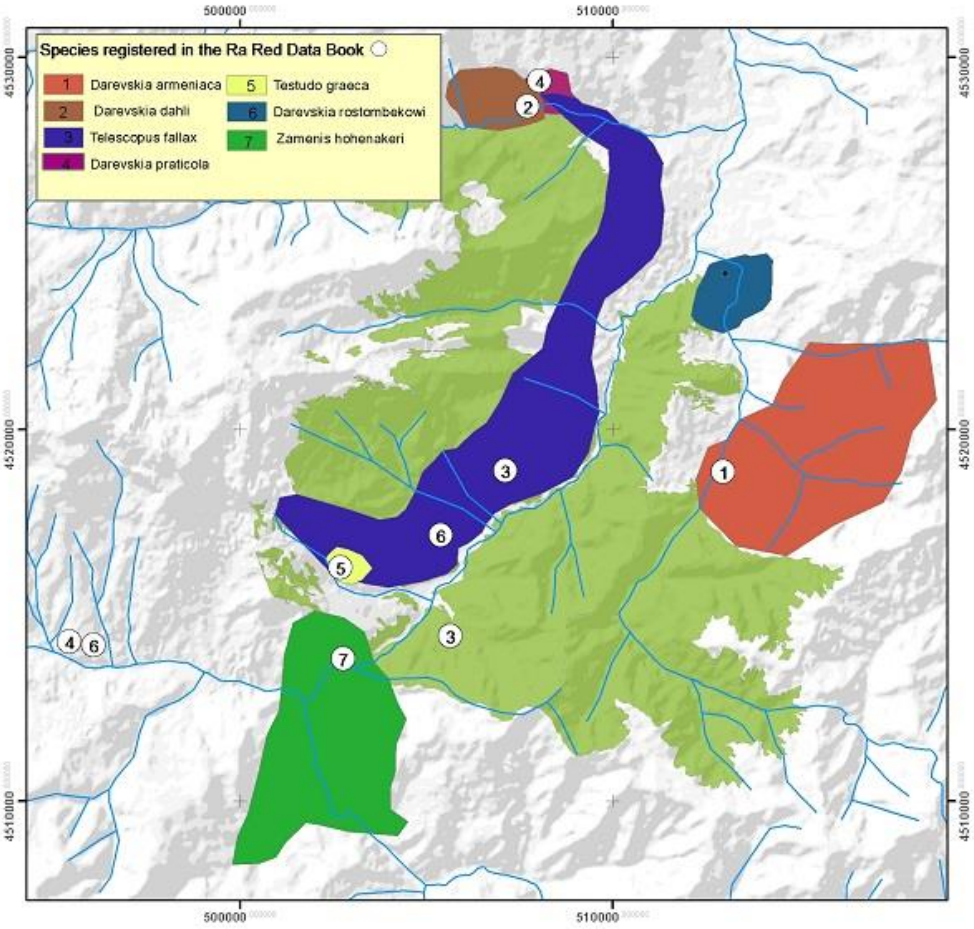
The studies on the territory of Ijevan Sanctuary revealed 4 speices of amphibians and 18 species of reptiles, including 1 species of turtle, 12 species of lizards and 5 species of snakes. However, given the specifics of the area it is supposed to have at least 22 speices of reptiles, for which additional studies are needed.

Among identified amphibians noone is registered in the Red Book of Armenia, they all are in the IUCN Red List under the category LC. There are no threats to those species on the territory of the sanctuary.

In the list of reptiles 7 species are registered in the Red Book of Armenia and 14 speices in the IUCN Red List. The following endangered species need protection: *Testudo graeca*, *Darevskia praticola, Darevskia rostombekowi*, *Zamenis hohenakeri*, *Telescopus fallax.*

The habitats of many of the above-mentioned species are located in more or less urbanized areas. In forest areas reptiles are not common, they often occur in dry areas and rocky sites (Map-schemeMap-scheme 19).

Map-scheme 19. Distribution of reptiles and amphibians on the territory of Ijevan Sanctuary



Main threats

The main threats to reptiles include:

- Modification and elimination of natural habitats due to human activity (loggings);
- Pollution of habitats with organic and inorganic waste;
- Direct elimination of animals, for example, illegal uncontrolled hunting of Mediterranean turtle (*Testudo graeca*) registered in the IUCN Red List to use as food or as pet.

The following factors have negative impact on *Darevskia rostombekowi* species:

- Road construction works: on the road Ijevan – Dilijan due to its widening the nearby rocks have been destroyed along with the cracks, which are needed for the species as shelter during winter.
- Urbanization: expansion of Ijevan town results in destruction of natural habitats, the populations of synanthropic species are growing (dog, cat, rat, crow, etc), which feed on the species *D. rostombekowi*.

Protection

The following endangered species need protection: *Testudo graeca, Darevskia praticola, Darevskia rostombekowi*, Zamenis hohenakeri, *Telescopus fallax*.

It is necessary to raise awareness, publish and disseminate materials in the communities to present the importance of those species and their role in ecotourism activities, etc.

Birds

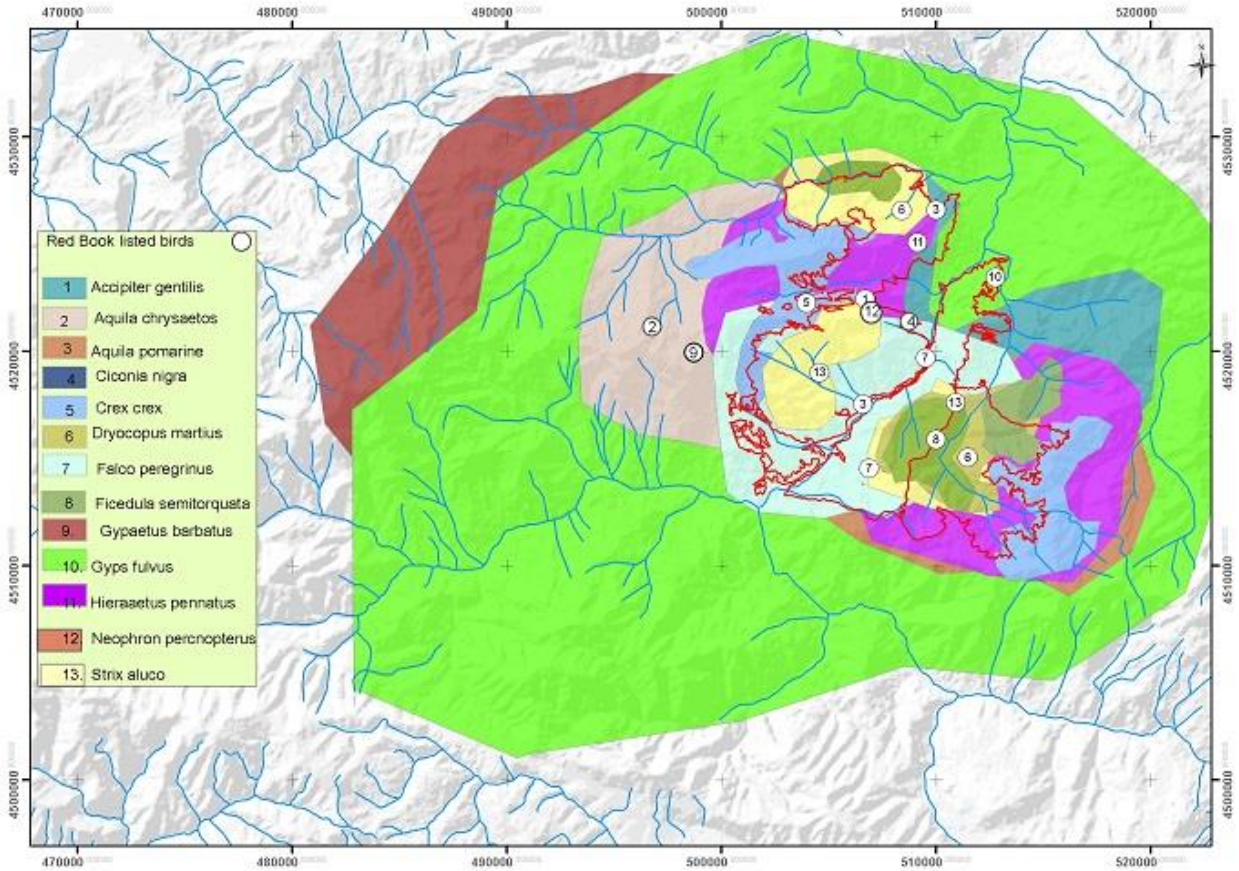
Broadleave forests, mountainous meadows as well as rought relief and abundant rock formation of the sanctuary create favorable conditions for bird habitats and diversity on the territory of the sanctuary.

In Ijevan region there are about 150 species of birds, of them 75% are breeding in the area and the rest occur only during migration and spend winter in the area. About 27 species are registered in the Red List of Armenia, of them 6 in the IUCN Red List.

The bird studies on the territory of the sanctuary have been carried out in 9 sites through transect and point assessment methods. Based on the studies the bird fauna of the sanctuary is represented by 103 species, of them the majority is forest species (thrush, woodpecker, etc.). However, on rock and stone formations some rock bird species also occur (such as Neophron percnopterus and Falco peregrinus). Open areas are habitats for meadow and steppe species.

In the bird fauna of the sanctuary 13 species are registered in the Red Book of Armenia under different categories (Map-schemeMap-scheme 20).

Map-scheme 20. Distribution of endangered bird species on the territory of Ijevan Sanctuary



The high mountainous areas of the sanctuary can be habitats of two other endangered species *Tetrao mlokosiewiczi* and *Tetraogallus caspius*. Additional field studies are necessary to clarify if the mentioned species occur on the territory of the sanctuary.

Main threats

The main threat to bird habitat destruction is intensive loggings. Logging of mature trees has negative impact on breeding of big raptors. Likewise, logging of dry dead trees with holes has negative impact on forest owl and other rare forest species breeding in tree holes. Loggings in spring and summer have negative impact on breeding of raptors and other large species, which are rather sensitive to disturbance.

Poaching is also a threat along with direct hunting of certain species (for example, quail) and large raptors (in particular vultures).

Protection

The species registered in the Red Book of Armenia need protection. Restoration of degraded forest areas is an important precondition for improvement of populations of bird fauna.

Mammals

The mammals in Ijevan region are typical for dry broadleave forests of Armenia. Apart from that some species are linked to mountainous meadows above forest and rocky sites at various altitudes.

Based on the literature data, information received from local population and forest enterprise staff as well as field studies more than 50 species of mammals have been identified on the territory of the sanctuary.

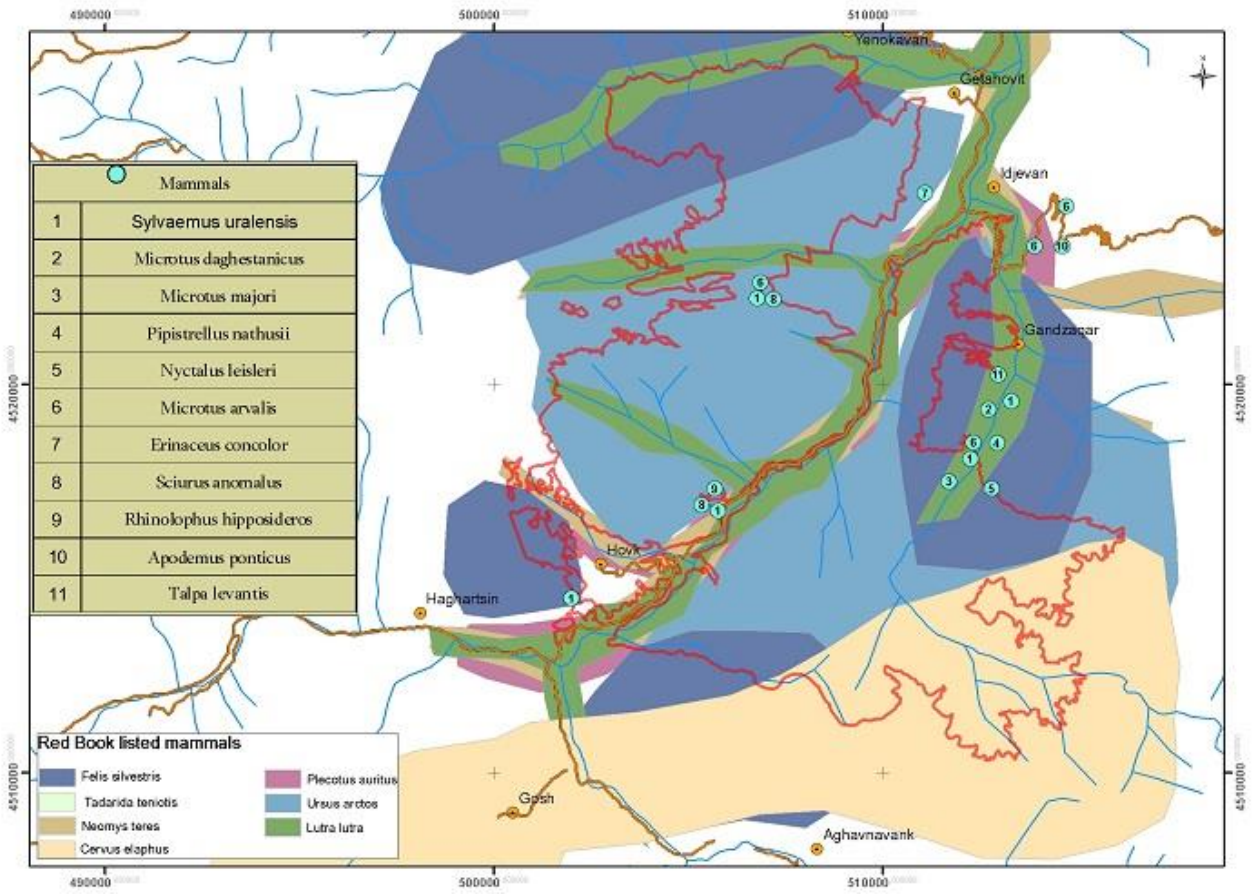
In the list of the common species are fox, golden jackal, roe-deer, badger, weasel and others. The presence of wild cat (*Felis sylvestris*) was not confirmed by our studies, the information on its presence comes from local people of Yenoqavan community.

Out of 30 species of Cherioptera of Armenia only 6 species have been revealed in the studied area. However, based on literature data as well as biotopes of the sanctuary, it is supposed to be 8 species.

In the fauna to rodents two species of forest mice prevail (often *Apodemus ponticus (flavicollis).* The latter is mentioned for both open areas and forest sites. In the list of Insectivores the species *Neomys schelkovnikovi* should be mentioned, it occurs on river banks.

In the list of mammals of the sanctuary 7 species are registered in the Red Book of Armenia under different categories (Map-scheme Map-scheme 21). For Red Deer (*Cervus elaphus maral*) a potential habitat is mentioned on the map, as its presence has not been confirmed so far. Additional field studies are needed for that.

Map-scheme 21. Distribution of endangered mammals on the territory of Ijevan Sanctuary



Main threats

Intensive uncontrolled loggings continue to be the factor for degradation of habitats and decrease of their populations. Hunting is also a treath.

Protection

The species registered in the Red Book of Armenia need protection.

In the list of endangered species otter (*Lutra lutra*) should be under special protection, for which field studies of its habitats and monitoring should be carried out.

Additional field studies are required in the potential habitats of Red Deer. It is nesessary to develop and impelement measures to ensure continuity of ecosystems between Ijevan Sanctuary and Dilijan National Park to ensure conditions for the species migration from the territory of the national park (at present WWF-Armenia implements a project on reintroduction of the species in Dilijan National Park).

Restoration of degraded forest ecosystems is an important measure to improve the status of populations.

4.3 Main threats to forests and biodiversity in the sanctuary

The main threats to forests and biodiversity of Ijevan Sanctuary are as follows:

- Illegal loggings, which result in degradation of natural ecosystems and reduction/elimination of species habitats;
- Grazing of livestock in forest areas, which has negative impact on forest regeneration, in particular livestock grazing in community adjacent forests is a serious obstacle to natural forest regeneration;
- Uncontrolled collection of wild plant species and hunting, which reduce their populations;
- Soil erosion in the forests located on steep slopes (especially southern slopes). About 47% of forests of the sanctuary are located on slopes of 30°and more, where erosion is severe and natural regeneration is not satisfactory;
- Improper management of pastures and hay-making areas, their overuse can result in their reduced regeneration (in forest glades) as well as bring to erosion especially at steep slopes;
- The risk of forest fire is not high in the forests of the sanctuary. However, forest fire is a threat, which can have negative impact on forests and biodiversity;
- Alien invasive and expansive plant species can have unpredictable impacts on natural ecosystems;
- Climate change (increase of temperature and decrease of humidity) can have negative impact on forest ecosystems and biodiversity.

5. Socio-economic characteristics of the sanctuary adjacent communities

5.1 General information

The communities adjacent to the sanctuary include Ijevan town, Hovq and Aghavnavanq settlements within Dilijan town administrative boundaries as well as Getahovit and Gandzaqar rural communities (Table 17).

Table 17. General information about the communities adjacent to the sanctuary

	Hovq	Gandzaqar	Getahovit	Aghavnavanq	Ijevan
Distance from administrative center, km	18	5	3	20	0
Distance from Yerevan, km	120	138	138	130	140
Altitude above sea level, m	920-1250	850	700	1500	730
Permanent population	397	3531	2024	410	20800
Permanent households	160	1142	528	150	5800
Administrative area of the community, ha	5406,3	12906	5558	6888	596

Ijevan, Gandzaqar and Getahovit communities are located at almost the same altitude of 700-850 m, which is favorable for production of fruits, whereas about 30% of Aghavnavanq community areas is under pastures (altitude 1500 m), which is favorable especially for livestock breeding.

Rural communities differ by the number of households and size of the administrative area. Gandzaqar community has the biggest population and the number of houseulds is 9 times more than that of Hovq community, which is the smallest in terms of population. In spite of such differences all 4 rural communities are at the same level of development with low living standard, lack of employment opportunities, poor condition of agricultural infrastructures. The main source of income in the communities is forest, including wood and non-wood forest resources.

The community budgets are the main source to cover running costs, meanwhile in the community budgets the highest is the budget line on grants. They include dotations from the state, which make about 70% of the planned budget and about 80% of the actual budget. It means that the communities can cover only a small proportion of their running costs and greatly depend on the state. The second largest budget line is tax incomes, which makes 12-24% of the budget. All the other budget lines are rather low.

5.2 Gender and age composition of population

The gender composition of the actual population in all communities is almost the same. About 48% of the actual population are men and 52% are women, which is conditioned by relatively high emigration of male population.

The share of temporary population in the communities is 4-10%, except Hovq community, where this indocator makes 22%.

76% of the employed population in the communities are in the agricultural sector and the other 24% have also other occupation in addition to agriculture. However, the employment opportunities are rather limited. Engagement of all members of a family in agricultural works on their own lands is considered employment for all members, however it cannot ensure adequate income for the whole family.

5.3 Migration for employment

In the communities the migration for employment is high. Continuous growth of the workforce outflow has been registered during the recent years. It makes about 12% of the active population with the majority of young males. This has its social impact as the burden of domestic tasks and upbringing of children lays on the shoulders of women.

Out of 4 rural communities the natural growth is relatively high in Gandzaqar and Getahovit communities, which can be conditioned by its close distance to the administrative center and easy access to Ijevan town.

5.4 Education

The level of education differs in the communities. It is relatively high in Gandzaqar and Getahovit communities which are close to Ijevan town. In the mentioned communities about 30% of adult population have higher education, which can be conditioned by the nearby Ijevan town, where Ijevan branch of Yerevan State University functions.

5.5 Social services and infrastructures

The social infrastructures in the communities are not well developed. The solvency of population is low, they cannot use services. Therefore, development of social infrastrucures almost fully depents of the state and donors.

There are schools in communities, but the number of pupils is reducing (due to low birth rate and migration to towns). It is a serious problem for the communities, which can result in reduced school budgets and loss of employment by shool teachers.

All 3 rural communities have ambulant clinics, which ensure first aid through specially retrained medical personal. Only Gandzaqar community has an ambulance and a drugstore. The rest of population uses respective services in Ijevan town.

The cultural events are rather rare in the communities. Such event are important for the communities in term of social and economic significance. They can increase the number of visitors/tourists and ensure additional income.

5.6 Transport and roads

The transport and roads are key issues in the sanctuary adjacent communities. The roads to the administrative center (Ijevan) are in sufficient state. During winter it is problematic only for Hovq community, when the road to Ijevan becomes difficult to pass.

5.7 Income

The data on income are based on subjective assessments resulting from interviews with the community representatives. In general 58% of rural households have income below 100000 AMD or 28000 AMD per capita. According to the RA National Statistics Service the consumer basket (2016, second quarater)

makes 55 703.2 AMD/month (annually 668 438 AMD). The food basket makes 31 470.7 AMD/month (annually 377 648.6 AMD). It means that 58% of households are extremely poor.

About 18% of households in the communities have monthly income of 120,000-150,000 AMD, which means 42000 AMD per capita. This figure is above the food basket, but much less than the consumer basket. This share of population can ensure adequate food for the households, but cannot cover other expenses (cloths, utilities, etc.).

Only 25% of the households have more or less adequate income. Of them 19% have monthly income of 125,000-250,000 AMD and 6% - more than 250,000 AMD.

Such low level of incomes is primarily conditioned by poor agricultural practices, which do not bring adequate income. The migration to foreign countries is common. About 32% of population get support from diaspora countries.

There is gas supply in Ijevan town and Gandzaqar and Getahovit communities. However, due to the high prices and low solvency, fuel-wood is the main source of heating and cooking for many families.

5.8 Agriculture

The agriculture in the communities is in poor condition due to the insufficient irrigation, outdated agricultural machinery, difficult access to quality seed material, expensive fuel, lack of the initial capital for investment in agriculture, lack of storage facilities for agricultural products, etc.

The majority of cultivated lands are under cereals. The majority of potato cultivation is in Gandzaqar community. Agricultural production is mainly aimed at covering household needs in the backyard plots.

There is high livestock breeding potential in the communities, conditioned by the presence of pastures. However, the problems include unstable market of livestock products, bad roads to summer pastures, lack of watering facilities for animals, overgrazing in closely located pastures, periodical epidemic deseases, etc.

The most developed branch is cattle breeding, in average each household has 2 animals, which is a very low indicator for the communities with such high potential. The highest indicator per capita is in Hovq community – 1,5, this indicator in the other communities is 0.3-0.8. About 50% of produced milk is marketed and the rest is used for household needs.

Poultry (chicken) is used for household needs as it is difficult to compete with poultry farms and imported meet. The half of the produced eggs is marketed and the half is used for household needs.

5.9 Fuel-wood demand of the sanctuary adjacent communities

Five communities are located adjacent to the forest areas of the sanctuary and within 5 km zone – Ijevan town, Hovq and Aghavnavanq communities within the administrative boundaries of Dilijan town, Getahovit and Gandzaqar rural communities. In total, they have 27162 permanent population, 7780 households. In the mentioned settlements the minimal total annual demand for fuel-wood makes 31000 m^3 – in rural communities about 7 m^3 and in Ijevan town about 3 m^3.

The annual cut by plans in Ijevan forest enterprise in 2015 made 6410 m^3 and as of 01.10.2016 - 1126 m^3. Dead wastewood allocated to population in 2015 made 5250 m^3 and as of 01.10.2016 – 1270 m^3.

The fuel-wood coming from the planned cuts is not purchased by the communities due to high prices and low solvency. Almost all it is marketed outside of the region.

6. Cultural values and touristic potential of the sanctuary

Ecotourism is a travel for studying and getting familiar with nature, flora and fauna and historical-cultural monuments. Ecotourism contributes to familiarization with natural and cultural heritage and brings income to local population so that people value and maintain the environment as the source of income.

Ecotourism can provide additional income to specially protected nature areas to be used for other management purposes such as protection of biodiversity, landscape and genetic resources, monitoring, ecoeducation, scientific research and other tasks envisaged by respective charter.

The key pillars of ecotourism include protection of natural and cultural heritage, ecological education and improved livelihood of local population.

The objectives of ecotourism in the sanctuary include: environmental protection (biodiversity, soil, air as well as watershed management), cultural development (increased knowledge and awareness of local population and visitors about environment, valuation of local natural and cultural heritage) and social development (local population livelihood improvement, advertising sustinable tourism versus mass tourism, safeguarding growing income for protection).

Ijevan region of Tavush province is one of the picturesque areas of Armenia. Rich nature, clean air and w ater, presence of numerous historical-cultural strucures, organic food are good prerequisites for tourism development in the region.

There are ancient castles, medeival cave dwellings, church complexes and small chappels – all supporting tourism development in the region.

The table below presents the most interesting historical-cultural monuments on the territory of the sanctuary and nearby areas within administrative boundaries of the communities (Table 18).

Table 18. Historical-cultural monuments

NN	Community	Name of the monument	Year of establishment
1.	Ijevan	«Mantash» or «Ashot Yerkat» castle	10-13 centuries
2.	Ijevan	Graveyard	2-1 centuries B.C.
3.	Gandzaqar	«Aghjka berd» fortress	13-17 centuries
4.	Gandzaqar	«Budur stone» castle	4-3 centuries B.C.
5.	Gandzaqar	«Hakob Bek Cross» castle	Medieval ages
6.	Gandzaqar	Graveyard	1 century B.C.
7.	Gandzaqar	Rock dwellings	12-19- centuries
8.	Hovq	Church complex	10-12 centuries
9.	Hovq	Castle	Medieval ages
10.	Hovq	Chappel	13-14 centuries
11.	Aghavnavanq	«Berdategh» fortress	2-1 centuries B.C.
12.	Aghavnavanq	«Tpi ghash» castle	2-1 centuries B.C.
13.	Aghavnavanq	Bridge	12-13 centuries
14.	Getahovit	medeival settlement	12-13 centuries
15.	Getahovit	Graveyard	12-13 centuries

Development of touristic service (trails, horse-riding trips, walking trips, hotel and B&Bs, etc.) can be additional input in community development. At present such services are mainly missing in the sanctuary adjacent communities. Nearby the sanctuary within the administrative boundaries of Yenoqavan community on the territory of Sevqar forest enterprise there is Lastiver-Anapat Resort, which has visitors not only from Armenia, but also other countries. In the area there are also several natural monuments, which can also be interesting for the visitors.

It is possible to develop birdwatching on the territory of the sanctuary. The presence of large raptors and rich diversity of Caucasian species as well as accessibility of bird sites, beautiful highlands and rocky areas can be used to develop this type of ecotourism. In two eco-trails proposed for the sanctuary there are birdwatching sites.

In Tavush province of Armenia tourism development is considered a priority branch, which needs to be developed.

7. Management programs of Ijevan State Sanctuary

The following management programs have been developed for Ijevan State Sanctuary:

1. Administrative program
2. Forest and biodiversity conservation program
3. Forest rehabilitation program
4. Monitoring and scientific research program
5. Forest protection program
6. Natural resource use program
7. Education and awareness raising program
8. Ecotourism development program

Annex 3 presents Action Plan for Ijevan State Sanctuary for the period 2017-2021.

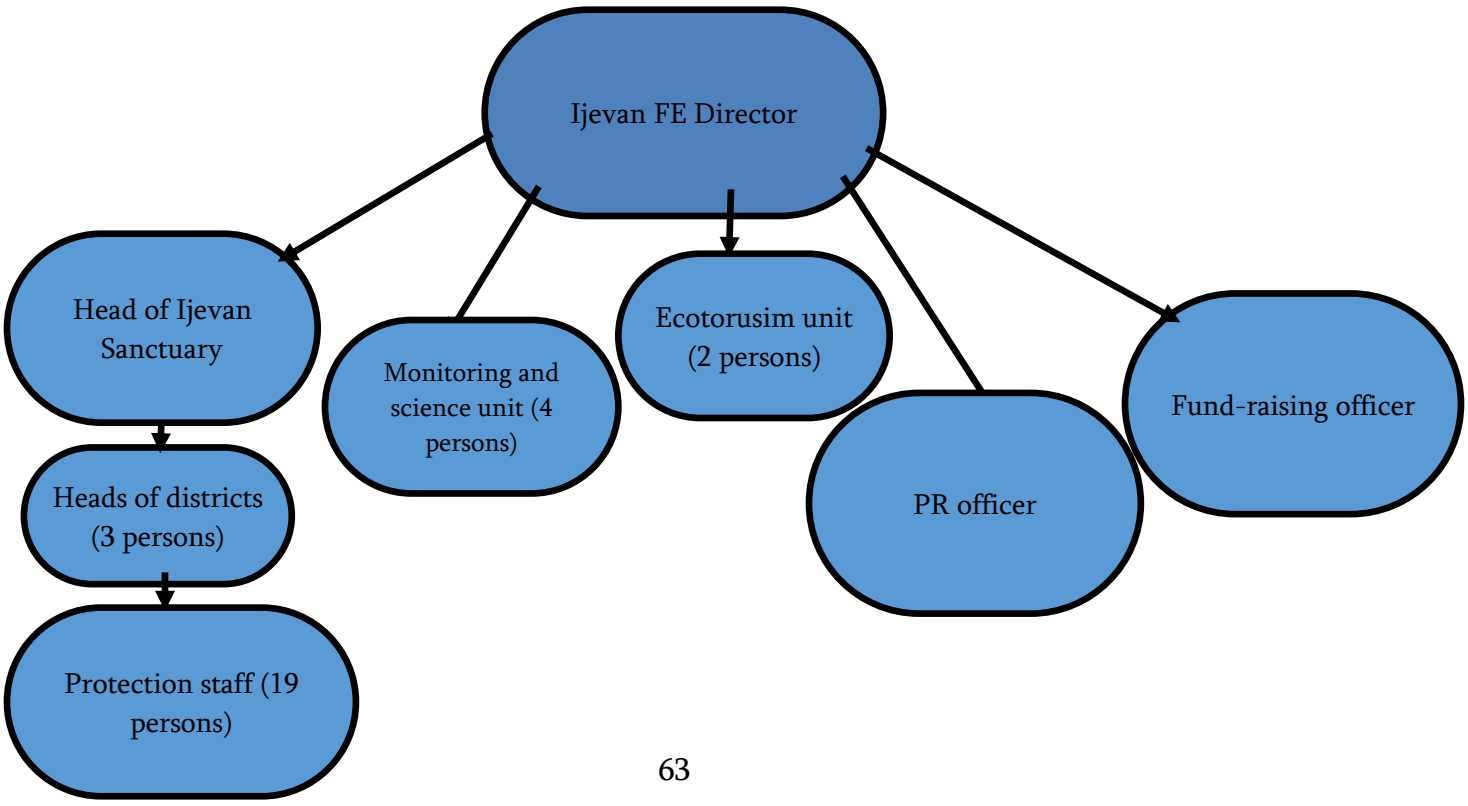
7.1 Adminsitrative program of the sanctuary

The aim of the adminsitrativ program of Ijevan State Sanctuary is to ensure respective human and technical capacities for the sanctuary management as well as to seek new sources of financing for the sanctuary in order to get additional financing for fulfilling the tasks envisaged by the sanctuary charter.

Management of the sanctuary

Ijevan State Sanctuary is in the structure of Ijevan Forest Enterprise of "Hayantar" SNCO. It was established on the basis of 3 existing forest sanctuaries. The mentioned sanctuaries have not had specially assigned staff and technical capacities for managmenet.

The following organizational structure is proposed for the units to deal with management of Ijevan Sanctuary in the structure of Ijevan forest enterprise.



The sanctuary management unit should be established subordinate to Director of Ijevan FE. The Head of Ijevan Sanctuary should be responsible for organizing the sanctuary management issues. Heads of 3 districts in the sanctuary should report to the Head of the sanctuary. The field staff of the sanctuary should include 19 field rangers (protection service).

The units on monitoring and science (4 persons) and ecotourism development (2 persons) should be established. They should have specially trained staff to fulfil respective functions for the sanctuary and the whole FE assisted by the field protection staff (rangers).

The PR officer should be responsible for communications, public awareness and ecoeducation activities in the sanctuary and FE. The fund-raising officer should be responsible for seeking additional financial resources for the sanctuary management, work with donors and international organizations, etc.

Director of FE and all sanctuary related responsible staff (especially the heads and officers) should closely cooperate with the Department on Forest Protected Areas in "Hayantar" SNCO as well as other respective departments for support.

The other administrative issues (accounting, HR, office management, etc) should be done by respective staff of Ijevan FE within their functions. The detailed list of positions, responsibilities and others will be presented in a consolidated format in Ijevan FE management plan.

Human and technical capacity building for the sanctuary

Respective human and technical capacities are needed for proper implementation of the functions linked to the sanctuary management. In particular it is necessary to have and implement a staff training program (short-term and long-term acivities) in the fields of forest and biodiversity conservation, forest protection, ecotourism development, fund-raising and others.

For proper conservation and monitoring activities in the sanctuary the following minimal technical capacities are needed (TableTable 19):

Table 19. Technical capacities needed for conservation and management activities in the sanctuary

No	Equipment, tools	Number
1	Off-road vehicle	1
2	Horses and accessories (3 per district)	9
3	Permanent road-blocks	8
4	Portable road- blocks	6
5	GPS	5
6	Drone	1
7	Photo/video camera	5
8	Camera-traps	10
9	Binocular (19 field staff and others)	22
10	Night vision binocular	5
11	Video-control equipment (cameras)	14
12	Summer uniform	25
13	Winter uniform	25
14	Field tools for protection staff (knife, torch, back-pack, first aid kit,	19

No	Equipment, tools	Number
	etc)	
15	Office space in Hovq community for Ijevan district staff	1
16	Office furniture	4
17	Office equipment (computer, printer, scanner, etc)	4

7.2 Forest and biodiversity conservation program

7.2.1 Legal basis for conservation in the sanctuary

Conservation in the sanctuary should be aimed at ensuring natural development of landscape and biological diversity, conservation and rehabilitation of mountainous forest ecosystems with typical rare and valuable flora and fauna species.

According to the draft Charter of Ijevan Sanctuary the following activities should be prohibited on the territory of the sanctuary:

1) any activity, which disturbes natural development of natural complexes of the sanctuary as well as threatens safety of natural habitats;

2) any activity, which disturbes hydrological regime of the territory except the cases when water resources are needed as drinking water resources for population of the settlements in the region;

3) disturbance of natural conditions of the habitats of flora and fauna representatives;

4) works on introduction and adaptation of new species of flora and fauna as well as genetically modified organizms (species) originated through biotechnologies;

5) use of chemicals and mineral fertilizers for plant protection;

6) use of ecologically harmful technologies, which cause emissions and waste waters in the amounts exceeding the norms established by legislation of the Republic of Armenia;

7) production, use and storage of radioactive substances and waste as well as of other substances, which are harmful or toxic for human health and environment;

8) works on geological studies (with disturbance of soil cover), mining operations and ore processing activities;

9) loggings (except sanitary and maintenance cuttings);

10) movement of motor and caterpillar means of transportation outside of the roads and water courses of general use and their parking outside of the road network or the sites not envisaged for parking;

11) construction and exploitation of economic and residential facilities, construction of roads, pipe-lines, electricity lines and other communications (except the objects needed for the sanctuary functioning, such as office, ranger station and others);

12) any other activity, which disturbes the stability of the sanctuary ecosystems or threatens conservation of the ecosystems requiring special protection, representatives of flora and fauna and objects of scientific or historical-cultural value.

7.2.2 Forest and biodiversity conservation

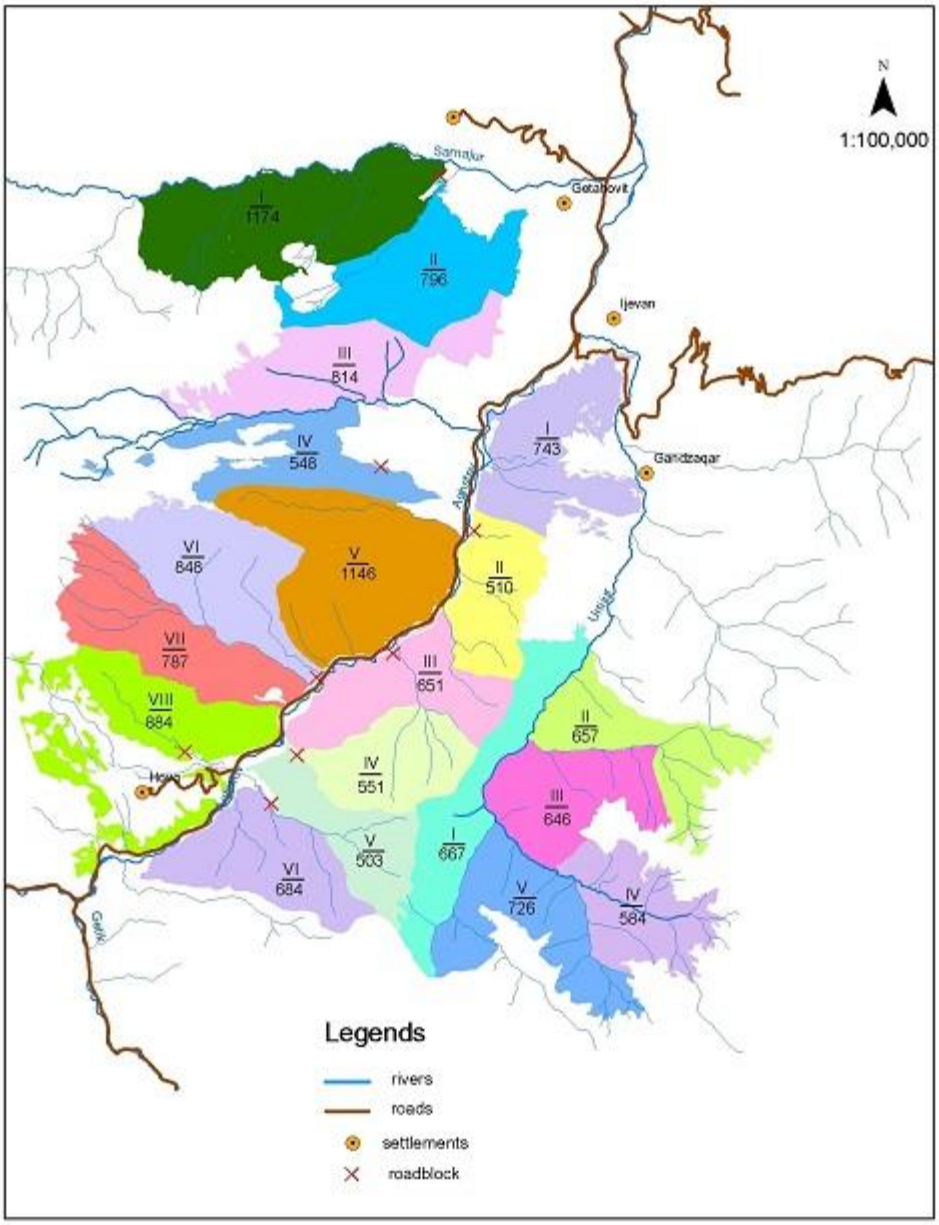
The main goal of conservation program is to reduce to the minimum uncontrolled use of forests, ecosystems and other resources, restore degraded forest areas, decrease the fire risks as well as create conditions for free movement of animals between the sanctuary and Dilijan National Park.

The activities on conservation of plants and animals (registered in the Red Book of Armenia) include:

- Restoration of degraded (previously logged) forest ecosystems. This is necessary for improving populations of endangered species and ensuring integrity of ecosystems and reduce fragmentation to support migration of species. This implies forest rehabilitation activities especially in the habitats of endangered species. The forest rehabilitation program is presented in section 7.3.
- Cooperation with respective staff of Dilijan National Park to ensure integrity of ecosystems and species migration between two protected areas.
- Development and implementation of biotechnical measures on species conservation based on field studies and upon necessity (for example, feeding animals in winters with very deep snow cover, installement of nests, etc)
- Identification and respective management of high conservation value forests (HCVF). The management of HCVFs should be aimed at their conservation and rehabilitation.
- Studies on pastures and hay-making areas used by the communities and development of their sustainable management plans together with the communities to reduce livestock grazing in forest areas. It is necessary to ensure no entrance of livestock to forest rehabilitation areas. The pastures should be outside those areas and use of hay-making areas (forest glades) should not have negative impact on natural (seed) regeneration of forests. The pastures are often located on steep slopes, therefore their use should not contribute to erosion. In some areas (for example, Hovq community) fencing of community adjacent forest areas is necessary to prevent the entrance of livestock to forests.
- Reducation of uncontrolled loggings through development and implementation of a complex program. The program should be aimed at provision of additional fuel-wood to communities trough the management of the sanctuary and FE, development of alternative energy, increase of energy efficiency, socio-economic development of communities and other measures.

The territory of the sanctuary was divided into 19 protection units: the largest is 1162 ha and the smallest is 498 ha, the average size is 732 ha. Natural conditions, distance from settlements and proper implementation of protection service was considered. Permanent and portable road-blocks should be installed on the most used roads in the sanctuary (Map-scheme 22). In the same sites it is proposed to use video-control tools (videocameras).

Map-scheme 22. Protection units of Ijevan sanctuary



7.2.3 Protection from forest fire

The Action Plan for 2017-2021 envisages installment of fire-prevention signs, having special locations for rest and smoking, construction of a water reservoir, purchase of fire-extinguishers, rehabilitation of anti-fire roads, awareness-raising meetings with the communities and others (Table

Table 20). It is necessary to develop forest fire alert systems.

Table 20. Anti-fire measrues (2017-2021)

Measures	Unit	Unit cost, thousand AMD	Years					Budget, thousand AMD
	Number of units		2017	2018	2019	2020	2021	
Installment of fire-prevention signs	item 40	10	20	10	10			400,0
Construction of water reservoirs in the most risky areas	item 3	800	1	1	1			2400,0
Fire extinguishers	huun 8	20	4	4				160,0
Awareness-raising meetings with the communities	meeting 25		5	5	5	5	5	
Rehabilitation of anti-fire roads	km 15	120	3	3	3	3	3	720,0

7.3 Forest rehabilitation program

Based on forest invetory data the forest rehabilitation during 2017-2021 is planned totally for 198,9 ha: Ijevan district - 87,4 ha, Gandzaqar district - 53,1 ha and Khachardzan district - 58,4 ha. Forest rehabilitation is planned for the previously logged áreas (sparse forests of anthropogenic nature) - 96,2 ha and in forest áreas with low crown cover (03-04)- 93,8 ha. It is planned to establish a forest nursery on the territory of 2,5 ha in Ijevan district as well as to restore an old orchard located nearby (Map-scheme 23, Table 21):

Forest rehabilitation will be mainly done trough support to natural regenation via fencing to prevent livestock grazing, preparation of sites for seeding 1m x 1m and seeding as well as softening of soil.

The measures to support natural natural regeneration are planned on 10 ha in Ijevan district in the Hazel-nut grove area (Corylus colurna) to increase the crown cover of the stands.

The seed material needed for forest rehabilitation measrues should be collected on the territory of the sanctuary from selected seed trees.

It is necessary to consider climate change issues and increase resilience of forest ecosystmes. It is necessary to use seedlings/samplings grown in the region, which are resistent to dry conditions and consider diversification of forest species (mixed species composition to reduce pest/diseases, fire-risk).

Map-scheme 23. Forest rehabilitation measures on the territory of Ijevan sanctuary

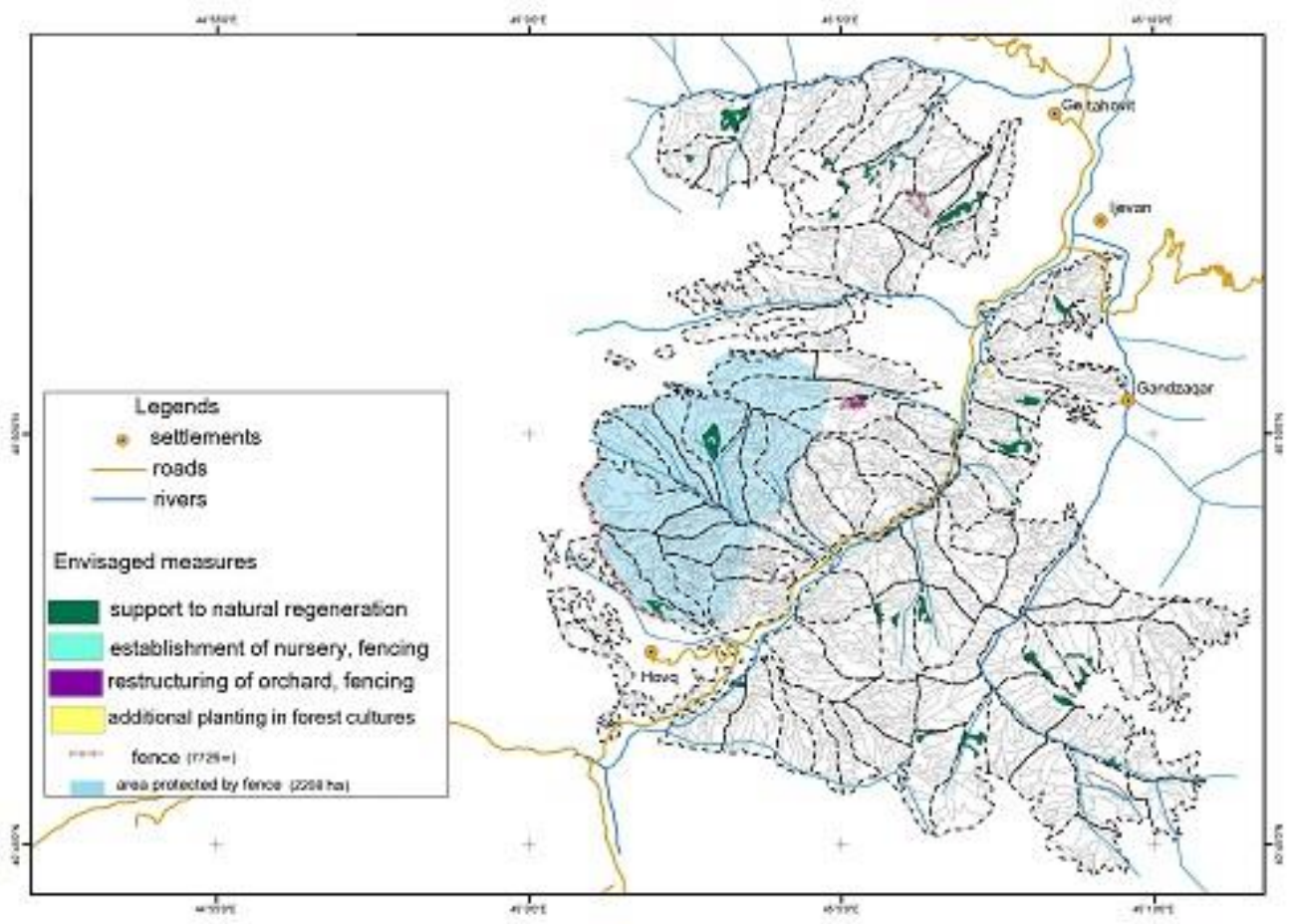


Table 21. Summary of forest rehabilitation measures (2017-2021)

N	Quarter N	Compartment N	Total area/rehabilitation area, ha	Slope, steepness	Altitude, m above sea level	Site class	Land type and crown cover	Soil preparation method	Rehabilitation measure	Species to be restored	Seeds, kg	Number of seedlings and samplings, item	Work method	
					Ijevan district									
1	1	13	21,2/10,0	N-E 15	1470	2	Forest, 0.5	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Hazelnut	50	-	Manual	
2	2	11	2,5	N - 25	1715	2	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech	7		Manual	
3	7	22	3,3	N-W-20	1465	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech	9	-	Manual	
9	9	5	3,7	N - E -25	1390	2	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech	9	-	Manual	
5	9	8	3,2	N - E -25	1450	3	Sparse forest of anthropogenic nature	Terrac Sites for seeding es /1mx1m/, 700 per ha	Support to natural regeneration	Beech	9		Manual	
6	9	9	1,5	N - E -15	1380	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech	5		Manual	
7	9	18	2,7	N - W -10	1550	3	Sparse forest of	Sites for seeding	Support to natural	Beech	9		Manual	

							anthropogenic nature	/1mx1m/, 700 per ha	regeneration					
	10	7	5,2	N -15	1225	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech Oak	10 40		Manual	
	13	13	19,7	N - W-25	1300	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech Oak	30 20		Manual	
	13	17	1,8	N -25	1395	3	Forest, 0.4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	35		Manual	
	27	15	3,0	S - E 10	1200	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Oak	55		Manual	
	28	6	2,5	N - E 5	1220	3	Glade		Nursery, fencing					
	28	7	4,4	N -15	1170	3	Orchard, apple 50 years old		Reconsruction, fencing	Apple, Pear, Chest-nut (seeds)				
	31	16	19,8	S -30	1350	4	Forest, 0.3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	300		Manual	
	53	29	8,1	N - W-25	1175	4	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Oak Beech	125 5		Manual	
8	Sub-total		91,4								718			
							Gandzaqar district							
9	7	6	3,6	N - E -25	1525	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Բնական վերականգնման օժանդակում	Oak Beech	50 5		Manual	
10	7	7	8	S - E -25	1615	4	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Oak	140		Manual	
8	8	10	5,2	N - W-20	1650	4	Sparse forest of	Sites for seeding	Support to natural	Beech	9		Manual	

							anthropogenic nature	/1mx1m/, 700 per ha	regeneration					
8	8	16	6,0	N -30	1700	4	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech Oak	5 40		Manual	
13	12	10	6,7	S - W-30	1780	4	Forest, 0,3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	100		Manual	
	14	30	5,2	S - W-25	1650	4	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Beech	9		Manual	
	16	3	4,9	S - W-25	1750	4	Forest, 0,3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	75		Manual	
	17	3	13,5	N - W-20	1625	3	Sparse forest of anthropogenic nature	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Oak Beech	200 10		Manual	
14	Sub-total		53,1								643			
Khachardzan district														
	1	53	8,0	N - W-25	980	2	Forest, 0,4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	30		Manual	
15	5	3	2,0	N - W-10	740	3	Forest culture with low crown cover, walnut	Digging holes	Additional planting	Walnut	150		Manual	
5	5	21	7,7	N - W-20	1100	4	Forest, 0,3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak Beech	30 3		Manual	
17	6	11	10,4	N - W-20	1000	3	Forest, 0,4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak Beech	40 5		Manual	
	6	26	3,9	N - W-30	1150	2	Forest, 0,3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak Beech	20 2		Manual	

	6	23	4,5	N - W-25	1100	2	Forest, 0,4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	15		Manual	
	15	9	5,5	N - E -15	1250	3	Forest, 0,4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	17		Manual	
	15	13	3,5	N - W-25	1110	3	Forest, 0,3	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak Beech	15 2		Manual	
	16	4	8,7	N - W-25	900	3	Forest, 0,4	Sites for seeding /1mx1m/, 500 per ha	Support to natural regeneration	Oak	35		Manual	
	19	3	4,2	N - W-30	1100	3	Forest, 0,3	Sites for seeding /1mx1m/, 700 per ha	Support to natural regeneration	Oak	35		Manual	
18	Sub-total		58,4								**399**			
19	**Total**		202,9								**1760**			

7.4 Monitoring and scientific research program

For monitoring and scientific research in the sanctuary the Monitoring and Scientific Research unit to be established in the structure of Ijevan FE together with respective staff of "Hayantar" SNCO headquarters should closely cooperate with scientific and academic institutions (RA National Academy of Sciences, universities) and NGOs. It is necessary to search and engage the institutions/scientists/researchers interested in targeted scientific research on the sanctuary territory and about certain species/ecosystems. In the field monitoring activities it is necessary to engage volunteers – NGOs, schools, university students, etc.

The sanctuary staff should support scientists, researchers, volunteers in field works on scientific research and monitoring.

7.4.1 Monitoring program

The main goal of the biodiversity monitoring program in the sanctuary is to prevent the processes due to anthropogenic and natural factors and make predictions regarding their development. The monitoring data should be used for adjustments of management actions aimed at protection and natural development of habitats and species.

The objectives of biodiversity monitoring include:

- Identify the state and trends of biodiversity species composition, distribution, qualitative indicator, habitats, migration routs, etc;
- Identify anthropogenic impact on ecosystems and their components;
- Assess and predict trends of qualitataive and quantitative changes of ecosystems and their components (biodiversity and natural resources);
- Support to establishment of an information data-base and its functioning.

It is necessary to develop a detailed monitoring program for the sanctuary. It should include selection of indicator species to identify the trends of ecosystem changes, development of monitoring protocols, define observation points and testing areas and others. It is necessary to have a monitoring data-base with respective computer software.

The large mammals subject to monitoring in the sanctuary include brown bear (*Ursus arctos*), lynx (*Lynx lynx*), wolf (*Canis lupus*), roe-deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). The raptors and other bird species should be monitored.

Ecotourism monitoring should include assessment of environmental and social impact of visitations in the area (to be used for their proper management) as well as assessment of the quality of provided services. In particular, the monitoring should cover the measrues in the frames osf the ecotourism development program, which potentially can have negative impact on ecosystems and their integrity. It is necessary to have an ecotourism data-base with GIS system.

It is necessary to have respective human and technical capacities for monitoring activities. It is necessary to organize trainings for respective staff and field protection service of the sanctuary and Ijevan FE.

7.4.2 Scientific research program

Scientific research should be aimed at effective implementation of the main tasks of the sanctuary, namely conservation of biological and landscape diversity and historical-cultural and natural heritage. Data received through scientific work should be used for the planning of measures, including conseration and restoration of ecosystems and their components and assessing their effectiveness, for assessment and prediction of the state of protected complexes and objects, monitoring, awareness-raising, tourism and recreation as well as assessment of the impact of implemented economic activities.

Scientific research in the sanctuary should be carried out by respective staff. They should cooperate with scientists and researchers to support them and provide necessary technical assistance in field work. For scientific works the most important topics for the sanctuary management should be identified and priorities defined in cooperation with respective staff.

The scientific research program for 2017-2021 includes:

- Field studies of the flora and fauna species registered in the Red Book of Armenia (inventories, stock-taking and assessment of populations) with special focus on red deer, Caucasian black grouse, otter and other most endangered species;
- Environmental scientific-experimental and scientific-practical experimental works on protection and restoration of genetic resources;
- Establishment and maintenance of biodiversity database and creation of collection of valuable and rare species;
- Studies of ecosystems (stands) including rare and endanagered species and how to increase their regeneration capacities to plan additional measrues on improving their status (f.e., Corylus colurna, natural pine stands, etc.)
- Sudies of forest vulnerability to climate change and increasing resilience of forest ecosystems to plan respective measrues;
- Studies of invasive and expansive flora species to plan measrues aimed at reduction of their impact on natural ecosystems;
- Studies of ecosystem services provided by forest ecosystems, including useful plant resources, carbon sequestration and others.

7.5 Forest protection program

The RA Forest Code and the instruction on forest management planning define legal aspects of forest protection from pest/diseases. According to the mentioned documents forest protection inlcudes forest-pathology studies, prevention of outbreakes and sanitary cuttings.

Forest-pathology studies assess the sanitary condition of forests, define the number of damaged, drying and dry trees, the need for sanitary cuttings and volumes. Sanitary cuttings should be done to improve the sanitary status of forests as well as to remove dry trees and those with lost vitality due to the negative impact of pest/disease. Forest-pathology studies should serve as the basis for development and implementation of biological methods of pest/disease control.

Selective sanitary cuttings are aimed at removal of the trees with lost vitality due to the above mentioned reasons. They should not affect the stand viatlity, structure, productivity, functions and after the cuttings the crown cover should not be less tan 0.5.

It is important that overmature and dry standing trees are hábitat for fauna representatives and during any type of cuttings overmature and dry standing trees should be left in stands (2-5 m^3 per ha) for biodiversity conservation and reproduction purpose.

Selection and stamping of trees for sanitary cutting should be based on the special scale, which characterises general status of a tree.

Forest inventory in the sanctuary has not revealed massive spots of damaged forests due to pest/disease, the sanitary status was assessed as sufficient. Selective sanitary cuttings are planned only in 2 compartments totally on 22,4 ha. The total stock in those compartments is 7290 m^3 , the stock of trees subject to sanitary cuttings is 420 m^3, including timber 20 m^3 and fuel-wood 290 m^3 (TableTable 22, Map-scheme Map-scheme 24, Map-schemeMap-scheme 26):

Table 22. Sanitary cuttings, 2017-2021

District	Quarter №/ Compartment N	Area, ha	Altitude, m above sea level/ slope steepness	Stand composition	Average age, site class		Average crown cover	Total stock, m^3	To be removed, m^3	Including		
										Timber	Fuel-wood	Residual waste-wood
Ijevan	37	3,2	1470	8 oak 2 hornbeam	170	2	03	510	90	5	30	55
	1		N-E 5		20		07	60				
Gandzaqar	19	19,2	1750	5 oak	130		07	6720	330	15	260	55
	6		S-W 30	4 beech 1 elm		3						
Total		22,4							420	20	290	110

7.6 Natural resource use program

7.6.1 Specifics of natural resource use in the sanctuary

According to the FA Forest Code (Article 35) the following types of forest use are allowed:

- wood harvesting;
- harvesting of secondary wood products;
- use of non-wood forest products;
- forest use for the purpose of organization of fauna reproduction and use;
- forest use for scientific-research purposes;
- forest use for cultural, health, sport, recreation and tourism purposes.

At the same time according to the Law on Specially Protected Nature Areas (Article 18) any activity disturbing the ecosystem sustainability or threatening ecosystems, flora and fauna, scientifically or historically valuable objects which demand for special protection measures is prohibited in the state sanctuaries. The objectives and specifics of conservation regime are regulated by the charter of a given state sanctuary.

According to the Charter of Ijevan State Sanctuary the following activities are allowed to implement:

- reproduction of wild rare and valuable species of flora and fauna typical to the sanctuary ecosystems;
- measures on prevention of the phenomena and processes, which disturb the balance of ecosystems as well as on restoration of disturbed ecosystems;
- cognitive tourism as prescribed by regulations;
- tourism including organization of services related to ecotourism with consideration of locations of historical and cultural monuments on the sanctuary territory and with safeguard of undisturbed historic environment;
- use of organic fertilizers and biological means to control pests and diseases of flora and fauna species;
- organization of educational, up-bringing and practical trainings for educational institutions;
- scientific-research studies;
- recreational and sport fishing in specially envisaged locations;
- leasing lands for recreational purposes according to the order established by the law;
- production, processing and marketing of agricultural products by ecologically friendly methods.

7.6.2 Use of non-wood forest resources

At present the sanctuary adjacent communities collect and use plants, fruits, berries, etc. from the sanctuary territory for the household needs. The main fruit-berry species are walnut, cornel cherry, pear, blackberry and dog-rose.

It is necessary to develop and implement programs on sustainable use of non-wood forest products. They can ensure additional income and improve socio-economic condition of communities, meanwhile reducing uncontrolled use of forest resources including fuel-wood and contribute to forest and biodiversity conservation.

7.6.3 Use of wood resources

Maintenance cuttings have been planned on the basis of forest inventory and general studies of the state of forest stands. The selection of the sites for maintenance cuttings and volumes were caltulated based on the Regulation of maintenance and sanitary cuttings (approved by the RA Government 22.06.2006). According to that regulation maintenance cuttings should be aimed at impoving the composition of forest stands, increase the growth and wood resrouces for use and their quality as well as to improve sanitary condition of forests. By the stand age the following types of maintenance cuttings are distinguished: lightening, cleaning, thinning and transition.

Sufficient crown cover (density) of stands is precondition for decision about maintenance cuttings. According to the regulation in homogenous stands maintenance cuttings can be done if the crown cover is 0.8 and more and in mixed stands – also 0.7. Maintenance cuttings can reduce the fire risk and increase the resilience of stands towards climate change.

Based on forest inventory and assessment maintenance cuttings were planned totally for 357,7 ha, where the total stock makes 56510 m^3. Out of that the stock to be removed makes 5715 m^3 (10,1%) and the amount to be marketed makes 2641 m^3, including timber 144 խմ and fuel-wood 2497 m^3 (Table 24).

Maintenance cuttings by districts

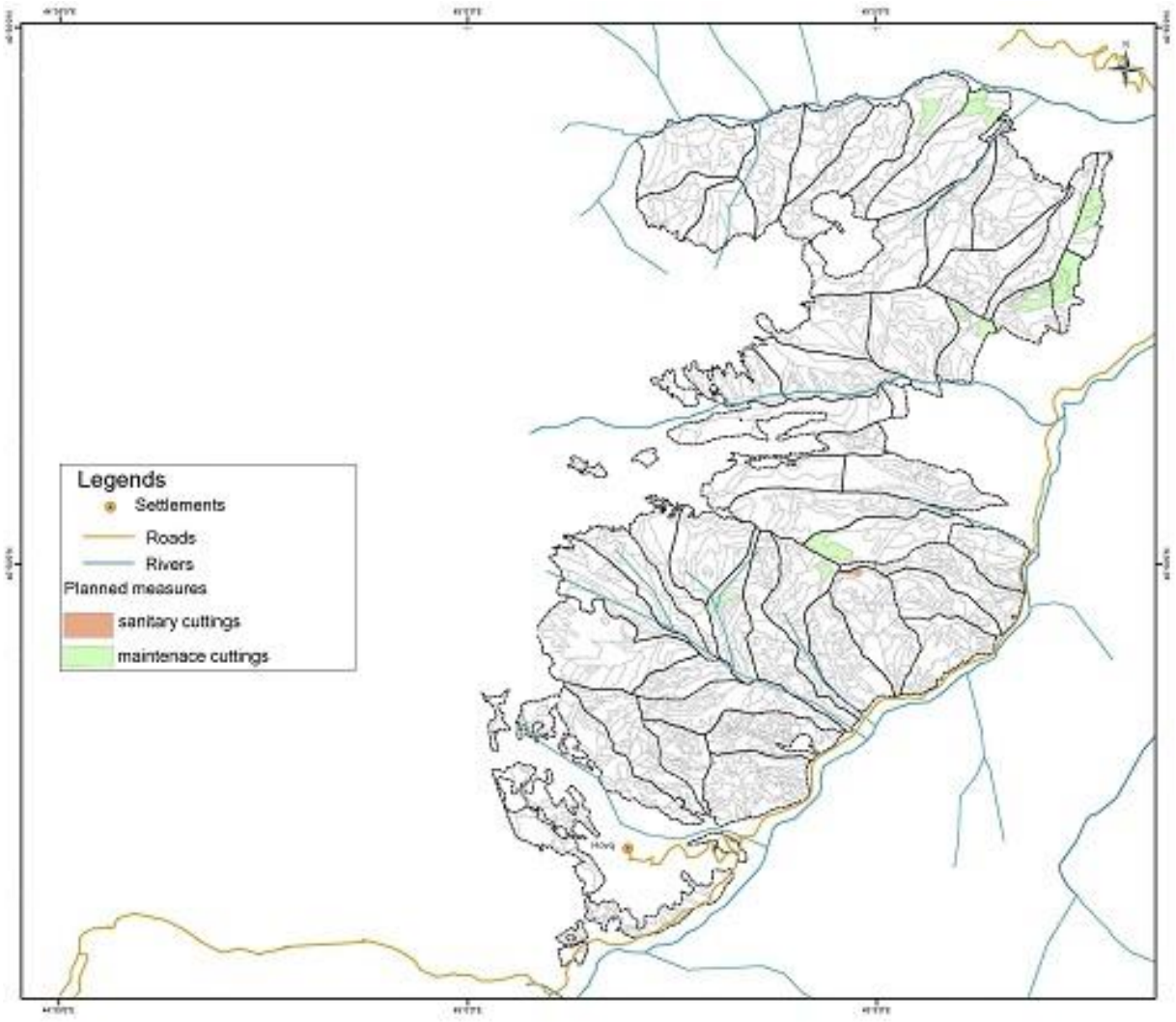
Ijevan district

Transition cuttings were planned for 151,7 ha, where the total stock is 15900 m^3, the amount to be removed makes 1983 m^3 (12,5%) and to be marketed 672 m^3, including timber 30 m^3 and fuel-wood 642 m^3.

Thinnings were planned for 34 ha, հեկտարի վրա, where the total stock is 2540 m^3, the amount to be removed makes 351 m^3 (13,8%) and to be marketed 120 m^3, նույն թվում շինափայտը՝ 0 m^3, and fuel-wood 120 m^3.

Lightening and cleaning cuttings were planned for the stands of the 1st age class with crown cover 0.8 and more totally on 63,9 ha and transition cuttings - 53,8 ha (Map-scheme 24).

Map-scheme 24. Maintenance and sanitary cuttings in Ijevan district



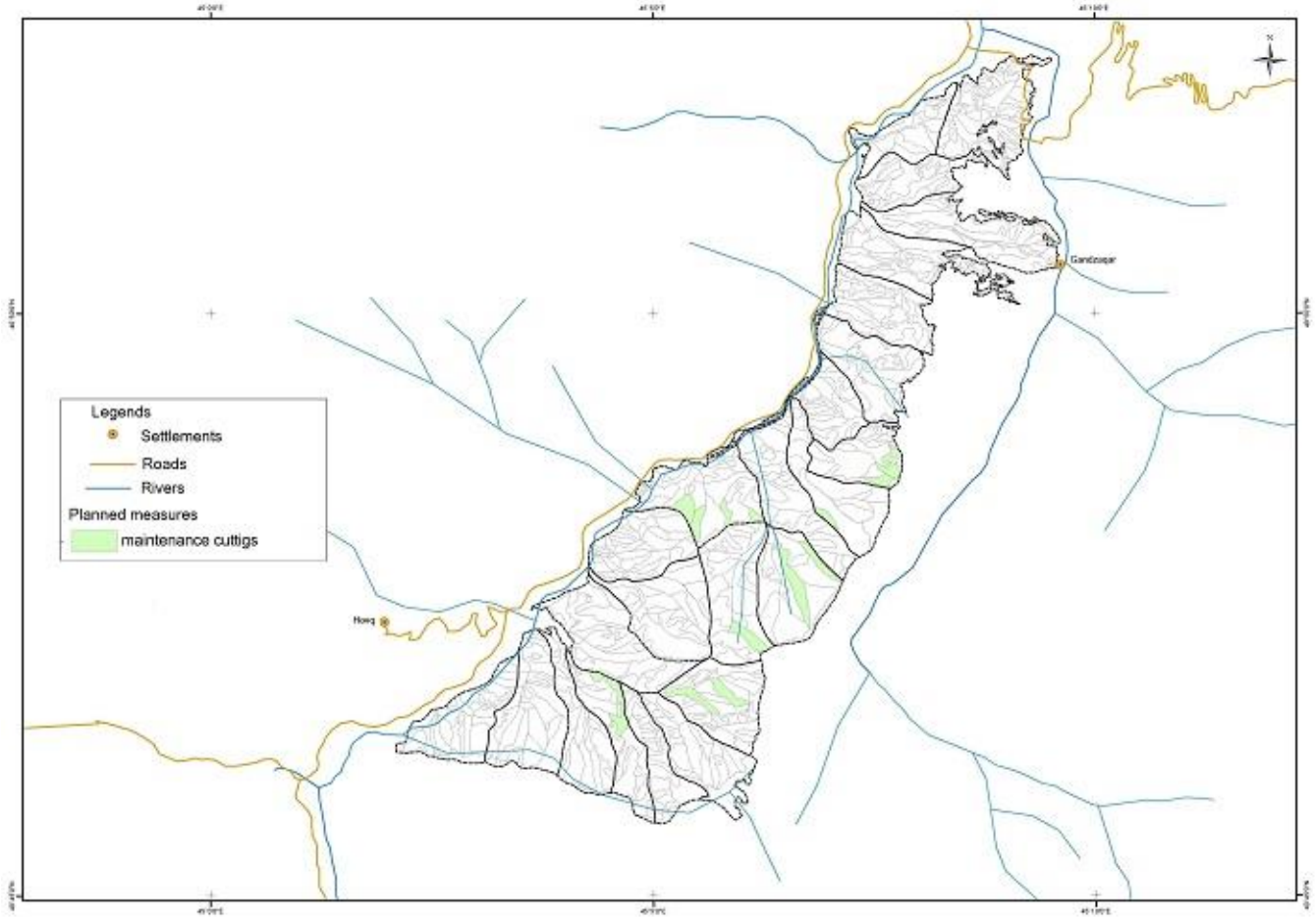
<u>Khachardzan district</u>

Transition cuttings were planned for 94,3 ha, where the total stock is 28390 m^3, the amount to be removed makes 2028 m^3 (7,1%) and to be marketed 1550 m^3, including timber 127 m^3 and fuel-wood 1423 m^3.

Thinnings were planned for 9,7 ha, where the total stock is 1260 m^3, the amount to be removed makes 126 m^3 (10%), and to be marketed 80 m^3, including timber 0 m^3, and fuel-wood 80 m^3.

Cleaining was planned for 16 ha (Map-scheme 25).

Map-scheme 25. Maintenance and sanitary cuttings in Khachardzan district



Gandzaqar district

Transition cuttings were planned for 43,7 ha, where the total stock is 7730 m^3, the amount to be removed makes 760 m^3 (9,8%), and to be marketed 570 m^3, including timber 30 m^3, and fuel-wood 540 m^3.

Thinning was planned for 23,1 ha, where the total stock is 2090 m^3, the amount to be removed makes 318 m^3 (16,3%), and to be marketed 169 m^3, including timber 5 m^3, and fuel-wood 164 m^3 (Map-scheme 26).

Map-scheme 26. Maintenance and sanitary cuttings in Gandzaqar district

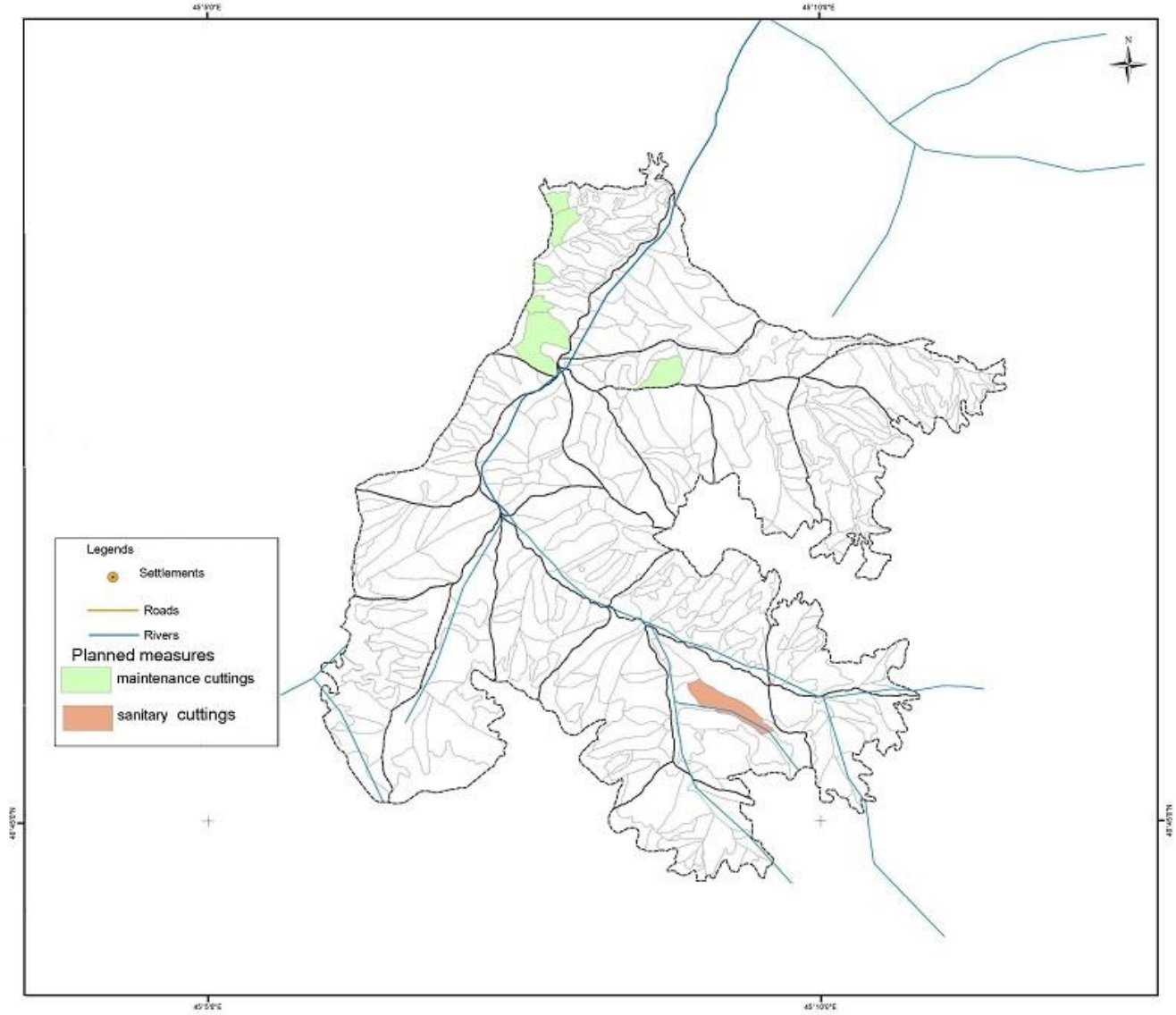


Table 23. Maintenance cuttings, 2017-2021

District	Quarter N	Compartment N	Type of maintenance cutting	Area, ha	Altitude, m	Sloope, steepness	Average age	Crown cover	Site class	Total stock, m^3	To be removed, m^3	To be marketed		
												Total	Including	
													Timber	Fuel-wood
Ijevan	7	7	Transition	11,2	980	N-E 20	70 30	04 04	3	1230 670	280	205	10	195
	8	4	Thinning	4,7	825	N -25	25 70	07	4	160	20	5	-	5
	8	7	Thinning	9,5	840	N -20	50 25	04 03	3	1050	105	35	-	35
	8	8	Cleaning	6,6	950	N -E 20	20 110	07	3	300	30	10	-	10
	13	8	Cleaning	4	1170	N - W 20	20	08	3	80	8	-	-	-
	14	5	Cleaning	8,4	1050	N - E 25	20	08	2	290	29	10	-	10
	14	8	Cleaning	10,5	1180	N -30	20 50	0,8	2	370	40	5	-	5
	19	1	Cleaning	17,2	1240	S-30	20	1,0	3	770	154	30	-	30
	19	4	Cleaning	10,3	1200	S -30	20	1,0	3	460	92	20	-	20
	19	2	Cleaning	3,2	1350	N - E 25	20	1,0	3	240	48	--	-	-
	17	2	Transition	5,9	1550	N - W 25	90 25	04 04	4	570	85	40	-	40
	17	5	Thinning	7,5	1250	S -25	25	1,0	3	530	106	30		30
	18	1	Cleaning	3,7	1435	E -25	25	1,0	3	170	34	-	-	-
	18	2	Thinning	2,3	1400	S -25	25 50	08	3	80 20	15	10		10
	28	12	Transition	20,7	1550	N - W 25	110 50	04 03	2	4140 1860	600	110	10	100
	32	8	Transition	8,5	1310	S - W 25	130 35	04 03	4	1020 300	130	45	**5**	40
	34	10	Transition	5,4	1460	S - W 20	130 35	04 03	4	540 240	80	60	5	55
	35	17	Transition	2,1	1415	N - E 10	110	08	2	110	22	17		17
	18	10	Thinning	10	1200	S -30	25 70	1,0	3	700	105	40		40
			Sub-total	**151,7**						**15900**	**1983**	**672**	**30**	**642**

District	Quarter N	Compartment N	Type of maintenance cutting	Area, ha	Altitude, m	Sloope, steepness	Average age	Crown cover	Site class	Total stock, m^3	To be removed, m^3	To be marketed		
												Total	Including	
													Timber	Fuel-wood
Gandzaqar	1	12	Thinning	5,4	1300	N - W 25	35	07	3	380	38	19	-	19
	1	18	Thinning	8,7	1380	N - E 25	35	08	3	520	78	39		39
	1	31	Transition	4,4	1415	S -25	50 25	04 04	2	530 150	100	70	5	65
	3	10	Transition	12,2	1430	S -25	130 35	05 03	4	1710 730	360	147	7	140
	1	35	Thinning	4,6	1400	S -25	30 110	09	3	510	102	51		51
	1	31	Thinning	4,4	1415	S -25	45 25	04 04	3	530 150	100	60	5	55
	1	37	Transition	27,1	1410	S - E 30	110 20	04 06	3	4610	300	105	5	100
	Sub-total			**86**						**9820**	**1478**	**491**	**22**	**469**
Khachardzan	10	12	Thinning	9,7	1260	N - W -20	40	07	2	1260	126	80		80
	10	19	Transition	5,6	1350	N - W -30	120	07	3	1850	185	130	7	123
	11	32	Transition	9,6	1175	N-35	90	07	3	3070	307	255	15	240
	11	33	Transition	7,3	1080	N -35	90	07	3	2120	212	155	10	145
	11	35	Transition	8,6	1100	N - E 35	50	07	3	1380	138	90	5	85
	12	12	Transition	4,4	1270	N - E 30	90	07	3	1320	132	90	5	85

District	Quarter N	Compartment N	Type of maintenance cutting	Area, ha	Altitude, m	Sloope, steepness	Average age	Crown cover	Site class	Total stock, m^3	To be removed, m^3	**To be marketed**		
												Total	**Including**	
													Timber	Fuel-wood
	15	20	Transition	11	1450	N - W 30	100	07	3	3740	374	130	10	120
	16	7	Transition	9,4	1275	N - E 35 envisage 40%	110	07	3	3200	130	120	10	110
	16	8	Transition	19,2	1250	N - E 35 envisage 40%	125	07	3	6140	240	190	15	175
	18	10	Transition	9,5	1330	N -E- 30	90	07	3	2760	200	160	10	150
	18	14	Transition	9,7	1670	N - W 35 envisage 40%	110	07	3	2810	110	90	5	85
	22	8	Cleaning	16	1100	N -W- 15	20 60	07 02	2	690 450	100	20		20
			Sub-total	**120**						**30790**	**2254**	**1510**	**92**	**1418**
Total				**357,7**						**56510**	**5715**	**2641**	**144**	**2497**

Residual wastewood (fuel-wood)

Field inventory and sociological surveys in the communities revealed that the sanctuary adjacent communities remove almost all residual wastewood from the distance up to 10 km zone (1st zone) and from the closer located areas in the distance of 15-25 km zone (2nd zone). Residual wastewood from more distant areas is partly used by temporary population during the summer pasture period.

The maintenance and sanitary cuttings planned for 5 years for the sanctuary make totally 6135 solid m^3, out of which the amount of fuel-wood to be marketed makes 2897 solid m^3, annually 579,4 solid m^3, and residual wastewood makes totally 110 solid m^3.

In the sanctuary the amount of residual wastewood with respective qualitative characteristics and subject to marketing (accessible) makes about 10000 m^3.

7.7 Education and awareness-raising program

The goal of education and awareness-raising program is to raise the awareness of the sanctuary adjacent communities and provide information on biological, socio-economic and cultural values of the sanctuary and their importance, as well as about community engagement and expected benefits and to establish cooperation with adjacent communities and their representatives.

Education and awareness-raising are important functions of the sanctuary. Information and knowledge on conservation of biological and landscape diversity, the role of the sanctuary in socio-economic development of the region can bring to better understanding of the role of the sanctuary as a national value.

The main activities of education and awareness-raising program include:

- Cooperation with the sanctuary adjacent communities aimed at awareness-raising of target groups (schools, universities, NGOs, general public, etc.) about the sanctuary values, threats, their engagement in the management and others. The activities include provision of information on threatened species and the need for their conservation, field visits for target groups, school forestry activities, events, campaigns, etc.
- Engagement of communities and local and other NGOs in management planning and its implementation (monitoring, blazing of ecotrails, cleaning and forest rehabilitation measures, etc.)
- Publications (brochures, calendars, information and map materials, field guides on plants and animals, video materials, etc.)
- Work with mass media - TV, radio, trainings for journalists, discussions.
- Creation and maintenance of a sanctuary web-page and information in related web-sources.

7.8 Ecotourism development program

The goal of ecotourism development program is to increase visits to the sanctuary territory and resulting income through developing conditions for ecotourism in the sanctuary and making it more attractive for visitors, building respective human and technical capacities and engaging communities in provision of ecotourism related services.

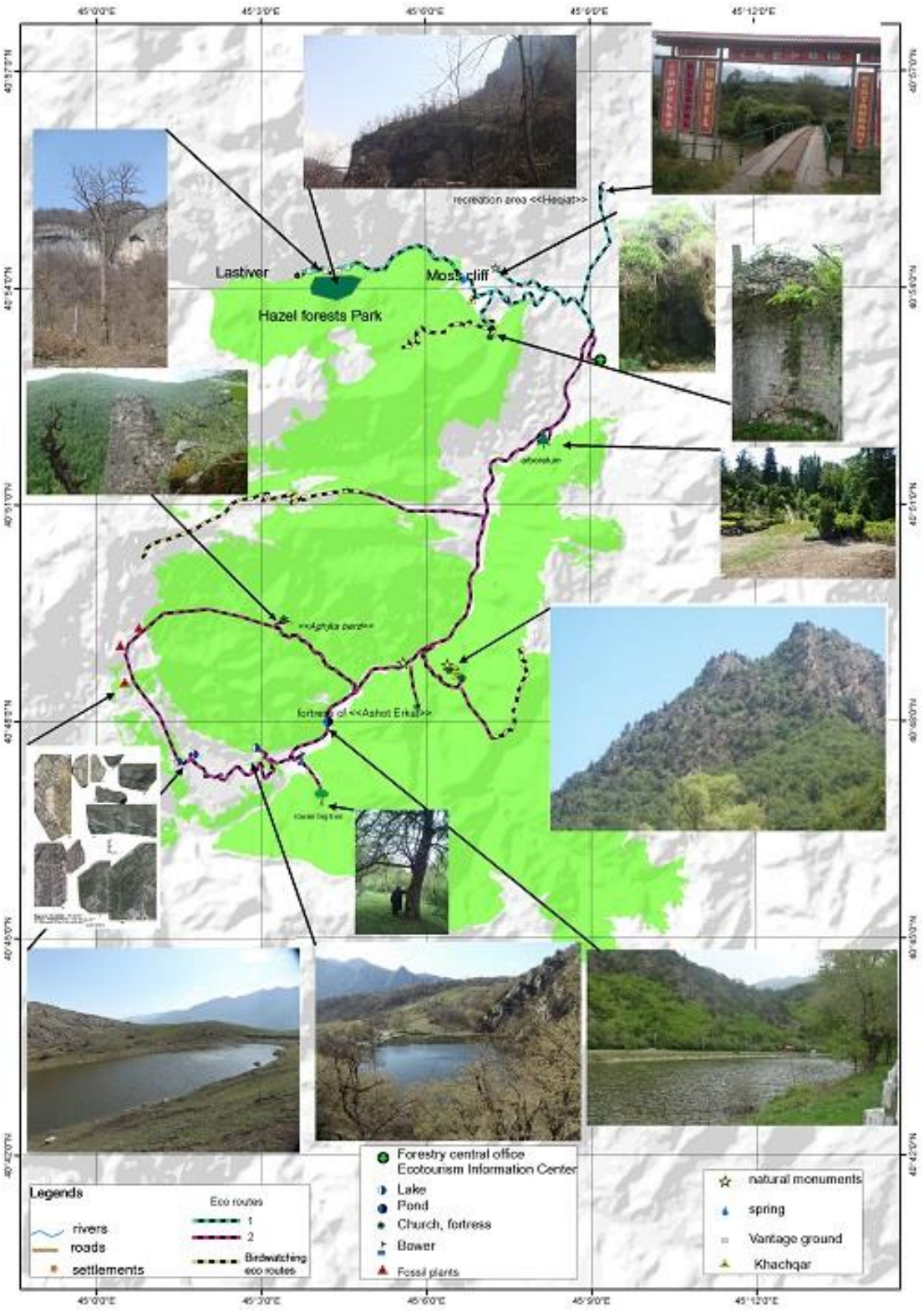
It is important that ecotourism is managed to prevent possible negative impacts of visits on natural ecosystems and species (see also the monitoring program). Ecotourism can be a good chance for adjacent communities to ge additional income. It can reduce uncontrolled use of sanctuary resources.

Two eco-trails were developed for the sanctuary territory, which include also the possibilities for bird-watching (Map-scheme 27). They both start in the administrative building of Ijevan FE located in Ijevan town.

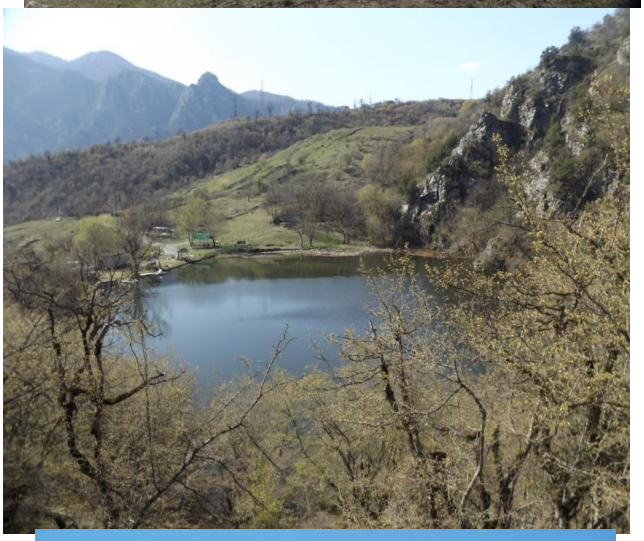
It is suggested to have a tourism/information center established in the administrative building of Ijevan FE in Ijevan town with respective information and visual materials. It is needed to have respective tools/equipment for provision of ecotourism services by the sanctuary (at least 5 horses with accessories, 10 tents, 5 mountain bikes, etc.), blaze the ecotrails and install signs, train the sanctuary staff on ecotourism and field guiding activities, cooperate with tour-operators to increase the number of visitor to the area (including training sessions, familiarization trips, etc.), etc.

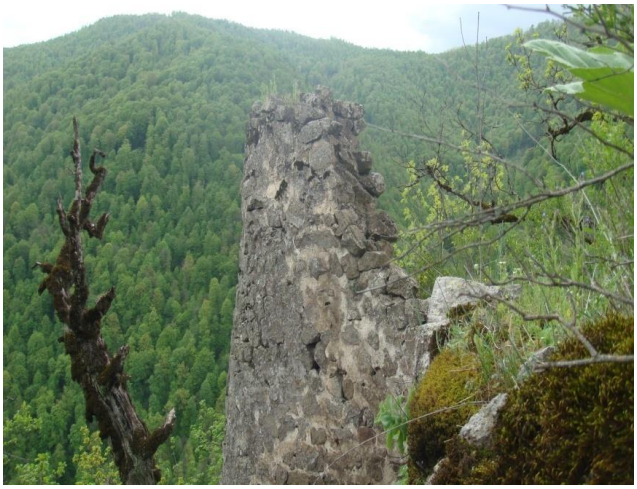
The sanctuary adjacent communities should be engaged in provision of services for eco-tourism, agro-toursim and historical-cultural tourism. The communities can be involved as field guides, offer B&B, local food, transportation, etc. It is necessary to support establishment of B&Bs and marketing of local products (processed fruit-berry, mushroom and other non-timber forest products). Trainings are needed for the communities to provide ecotourism services of respective quality.

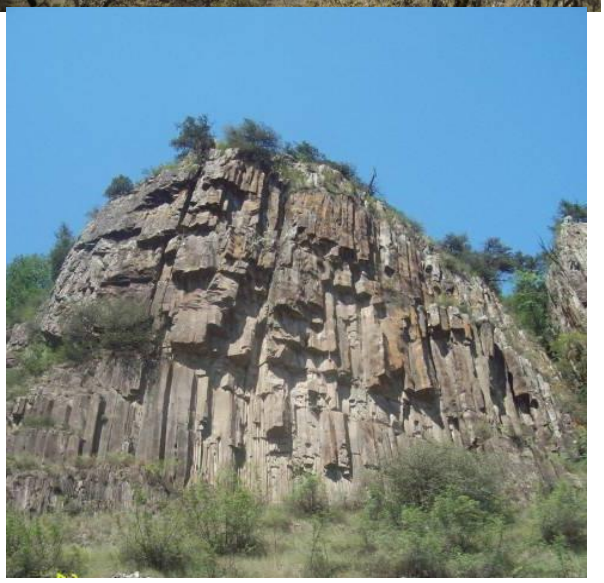
Map-scheme 27. Ecotrails in Ijevan sanctuary



Ecotrail N 1 (total lenght 45 km)

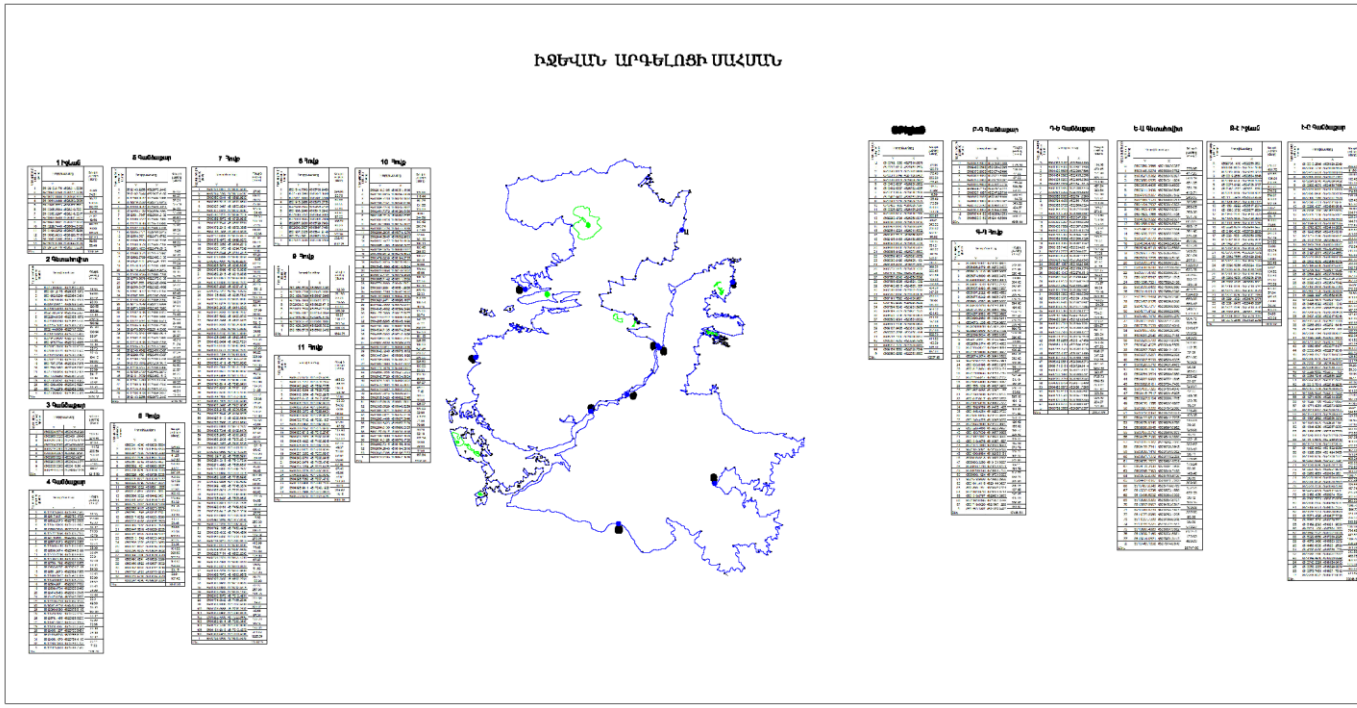






Eco-trail N 2 (total lenght 18 km)

Annex 1. Map of Ijevan Sanctuary



Annex 2. Fire risk classes on the territory of Ijevan sanctuary

Quarter N	Fire risk class									
	1		2		3		4		5	
	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha
Ijevan district										
1			14, 15, 17	28	1, 2, 4-13, 18	143			3,16,19,20	13
2			3, 8, 11, 13	21	4-6, 10, 12, 15,	41	2, 7, 9	12	1,14,16	14
3			3, 14, 16, 18, 22, 24	21	1, 2, 3, 4, 5, 7-9, 12, 13, 15, 19-21, 25, 27, 28	108			6,10,11,17 ,23,26,29	23
4			3-5	25	2, 6-10	60			1,11	10
5			9, 13, 14, 18, 20, 22	16	1, 3, 5, 7, 10-12, 15-17, 19, 21, 23	94			2,4,6,8,24, 25	11
6			4, 8, 12, 15, 21	23	1-3, 5, 7, 9-11, 13, 14, 16, 17, 19, 20, 23, 24	141	6	16	18,22,25,2 6	4
7			3, 9, 13	8	1, 2, 4-8, 10-12, 14-17,19-23	129			18,24,25	4
8			4, 5, 8, 9	46	1-3, 6, 7, 10-21	162			22,23	1
9			3-5, 11, 13, 19, 20	23	1, 2, 6-10, 12, 14-16, 18, 22	140			17,21,23-25	13
10			4-7, 10, 12, 15	36	1-3, 8, 9, 11, 13, 14, 16	85			17,18	1
11			6-8, 10, 11, 13, 16, 19	98	1, 3-5, 9, 12, 14, 15, 17, 18, 20-22, 24	63	2, 23	12	25,26	1
12			2, 6, 9, 12, 20, 22	29	1, 3-5, 7, 8, 10, 11, 13-18, 21	106			19,23	14
13			1-4, 8, 9, 11, 12	41	5, 7, 10, 13-15, 17, 18	68	16	2	6,19,20-22	9
14			1, 3, 5, 8-13	47	4, 7	6			2,6,14,15	2
15			13	6	1, 6, 8 -12, 14	110			2-5,7,15,16	18
16			1, 12, 13, 17-19	45	2, 3, 6-9, 11 15, 16	120	10, 20	11	4,5,14,21	28
17			1, 5, 7, 8, 10-12	52	2, 4, 6	17			3,9,13	7
18	18	8	1, 2, 4, 7, 10, 14, 15, 20, 21	51	3, 16, 17, 19	11	9	4	5,6,8,11-13,22	6

19			1-4, 6	43					5,7-9	5
20			2	8	1, 3-11, 13-15, 17, 18	87	19, 20	10	12,16,21,22	8
21			22	3	1-4, 6-14, 17-21, 23-27, 30	145	5, 29	8	15,16,28,31,32	3
22			7, 11-13, 15, 16	64	2, 3, 5, 8, 10	60	1, 4, 18, 19, 21	38	6, 9,14,17,20,2-24	24
23					1, 2	17			3	1
24			1-9, 11, 13	41	10, 14, 15	11			12,16	1
25			1, 10	7	2-8, 11	118	9	4	12	1
26			6, 16, 21-24	13	1-5, 7-15, 17-20	147			25	1
27			5, 7, 15	35	2-4, 6, 8, 9, 11, 12, 14, 16, 17, 19-25	139			1,10,13,18,26,27	25
28			6, 17	3	1-3, 5, 8, 10, 12-16, 18	131	4, 7, 9, 11	20	19,2	1
29			8, 9, 11, 14, 19	38	1-7, 10, 12, 13, 15-18	88			20,21	1
30					1-16	108			17	1
31			4, 17	3	1-3, 5-16, 18, 20	156			21	0
32			1, 12, 20, 22-24, 26	25	2-9, 11, 13-19, 25, 27, 30-32	79			10,21,28,29,33-35	7
33	33	8	1, 9, 15, 19, 21-23, 25, 26, 28, 29	61	2-4, 6-8, 11-13, 17, 18, 24, 30-32	75			5,10,14,16,20,27,34,35	34
34	34	5	5, 16, 20, 22, 24-26, 30, 31, 33	39	1-4, 6-10, 13-15, 17, 19, 27, 32	85			11,12,18,21,23,28,29,35,36	35
35			1, 3, 5, 10, 12, 13, 17, 19, 20, 22, 29, 31, 34, 35, 39-42, 44-47	64	2, 6-9, 11, 15, 16, 18, 21, 23-28, 30, 32, 33, 36-38, 43	64	14	2	4,48,49	3
36	17, 23	9	10, 11, 13, 16, 21, 22, 27	12	1, 4-9, 12, 14, 15, 18-20, 24-26	62	2, 3	12	28,29,30	2
37	33-36	3	5, 7, 8, 10, 12, 15, 27, 29, 37, 39, 40	40	1-4, 6, 9, 11, 14, 18, 19, 21, 23, 24, 26, 30, 31, 34, 35, 38	114			13,16,17,20,22,25,28,32,41,42	28
38			5, 17, 19, 20	9	1, 2, 4, 6, 8-12, 14, 15, 18, 21	76			3,7,13,16	17
39	31	10	4, 9, 17, 23, 26, 27, 32	36	1, 3, 5, 6, 8, 11, 13-15, 18, 20-22, 28	72	19, 29, 30	15	2,7,10,12,16,24,25,33	17

40	22, 25, 26, 29	11	4, 7-10, 13, 15, 16, 18-20, 23, 24, 27	51	1, 2, 6, 11, 14, 21	26			3,5,12,17, 28,30-32	37
41			5, 6, 12, 13	10	1-4, 7-11, 14-19	140			20,21	1
42			1, 6, 25	92	2-5, 7-24	170			26,27	2
43			4, 6, 13, 17	5	1-3, 5, 7-11, 14-16, 18, 19	72			12,20,21	3
44					1-5	16			6	1
45			2, 14, 25, 32	7	1, 4-6, 8-13, 15-18, 20, 22-24, 26-31, 33-37	130			3,7,19,21, 38,39	13
46			2, 11, 19, 21	3	1, 3-10, 12, 13, 15-18, 20, 22-25, 27	146			14,26,28,, 29	12
47			1, 12, 17, 18, 22	8	2-4, 6, 8, 9, 11, 13-16, 20, 21, 23, 24	69			5,7,10,19, 25-27	9
48			2, 5, 7, 8, 10, 12-14, 16, 18, 21, 23, 25, 28-30, 34, 35, 38, 44	57	1, 3, 4, 6, 9, 11, 15, 17, 19, 20, 22, 24, 26, 27, 32, 33, 36, 37, 39-41, 43	67			31,42,45,4 6	7
49	25	12	16, 18-22, 24, 26-28, 30, 32, 33	65	1, 2, 6-8, 10, 12, 14, 15, 17, 23, 29, 31	87			3-5,9,11,13, 34,35	15
50					1-13	70			14,15	1
51	5	14	3, 9, 10, 12-14, 18, 22-24, 26, 27	48	1, 2, 7, 8, 28	18			4,6, 11, 15-17, 19, 20,21, 25,29	24
52			5, 8, 10, 13, 16, 18, 20-24	62	2-4, 6, 7, 9, 11, 12, 17, 19	26			1, 14,15,25	10
53			14, 29, 33, 41	15	1, 3, 5, 7-9, 12, 13, 15-19, 21-28, 30-32, 34-40	146			2,4, 6, 10, 11, 20,42-44	18

Quarter N	Fire risk class									
	1		2		3		4		5	
	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha	Compartment N	Area, ha
Khachardzan distric										
1	2, 5, 8	5	1, 7, 9, 11, 12, 17-22, 24-26, 28-30, 33, 37-39, 44-46, 48, 49, 53-57, 61, 62, 64, 65, 67-70, 73-75	103	3, 6, 10, 13, 15, 16, 23, 27, 31, 32, 34-36, 40-43, 47, 50-52, 58-60, 63, 66, 71	71	4, 14, 72, 76	4	77,78	2
2			3. 5. 6. 9. 17. 19. 20	27	1, 2, 7, 10-15	62			4,8,16, 18,21	8
3			1, 2, 4, 6, 8, 11, 16-18, 20, 22, 25, 27	72	3, 5, 7, 9, 10, 13, 14, 19, 21, 23, 24, 26, 28	35	29	1	12,15, 30	2
4	22, 25	24	2-5, 7, 8, 13-18, 20, 27, 31-35, 37	72	1, 6, 9-12, 19, 21, 23,, 24, 26, 28-30	84			36,38	4
5			2, 3, 5, 6, 8, 9, 12, 13, 15, 19-23, 26-42	94	4, 7, 10, 11, 14, 16-18, 24, 25	66			1,43,44	7
6			2, 3, 5, 7-9, 14 , 18, 20, 22, 26, 28	55	1, 4, 6, 10-13, 15-17, 19, 21, 23-25, 27	89			29, 30	1
7			3-14, 19, 22, 25, 26	86	2, 15-18, 20, 21, 23, 24	67	1	1	27,28	1
8			2, 3, 5, 9, 17, 19, 20, 22, 27, 28	35	4, 6, 11-16, 18, 21, 23-26	63	1, 7, 10	2	8,29	1
9			2, 4, 7, 10-12, 14, 15, 19-22, 24, 27, 29	78	5, 6, 8, 17, 23, 25, 26, 28, 30-35	89	3	1	1,9,13, 16,18, 36,37	8
10			3, 4, 6, 11-14	18	1, 2, 5, 7-10, 15-21	90			22,23	1
11			1, 5-9, 15, 16, 20, 21, 24, 29, 31	27	10-12, 14, 17, 18, 22, 23, 25-28, 30, 32-38	151	2, 4	1	3,13,19,39	4
12			1, 4, 5, 8-10, 14	59	2, 3, 6, 7, 11-13, 15, 16	85			17,18	1
13			1-3, 6, 16, 17, 20-24, 28-31, 33-38	68	4, 5, 7-15, 18, 19, 25-27, 32	78			39	1
14			1, 4, 6, 9, 14, 15, 18	41	2, 3, 5, 7, 8, 10-13, 16, 17, 19-23	144			24,25	1

15			3, 5, 6, 9, 10	37	1, 2, 4, 7, 8, 11-26	149			27,28	1
16			4, 5, 9	14	1-3, 6-8, 10-15	163			16,17	1
17			1, 3, 9, 11, 14-16, 20, 21, 24, 25, 27, 29, 31,	82	2, 4-8, 10,, 13, 17-19, 22, 26, 28, 30, 32	109	23	4	12,33, 34	2
18			3, 6, 23-25, 30	18	2, 4, 8-21, 26-29	134			1,5,7,22,31-33	8
19			5, 14, 17	10	2-4, 6-10, 12, 13, 16, 18, 20, 21, 23-26, 29, 30	99	1	1	11,15, 19,22, 27,28, 31,32	39
20			1, 3, 4, 8, 9, 12, 13, 16, 17, 30	43	2, 5-7, 10, 11, 14, 15, 18-21, 23, 24, 26, 29	128			22,25, 27,28, 31,32	13
21			3-5, 7, 9, 10, 16, 21, 24, 25	40	1, 2, 6, 8, 11-15, 17-20, 22, 23	88			26,27	1
22			3, 5, 7, 8, 19	32	1, 2, 4, 6, 9-11, 13-15, 17, 20	77			12,16, 18,21-24	16
23			2, 3, 5, 10	14	1, 4, 6, 8, 9, 11-18, 20, 21, 23	73			7,19,22,24-26	10
24			3, 6, 14	10	1, 2, 4, 5, 7-13, 15-19	105			20-22	31

Quarter N	**Fire risk class**									
	1		**2**		**3**		**4**		**5**	
	Compartment N	**Area, ha**	**Compartment N**	**Area, ha**	**Compartment N**	**Area, ha**	**Compartment N**	**Area, ha**	**Compartment N**	**Area, ha**
Gandzaqar district										
1	8, 13, 16, 21, 22, 29	12	12, 14, 15, 18, 35	19	1, 4-7, 9, 11, 19, 20, 23-28, 30-34, 36-40	161	10	1	2,3,17, 41,42	3
2			1-13, 15-19	189	14	6			20,21	1
3			16-19, 25	7	1-15, 20-24, 26	134			27,28	2
4			2, 8	6	1, 3-7, 9-14, 16, 17, 20-22	117			15, 18, 19,23, 24	12
5			3	2	1, 2, 4-17	123			18,19	1
6			8-10	27	1-7, 11-14	96			15,16	2

7			6, 7	12	1-3, 5, 8, 9	63	4	17	10,11	1
8			2, 10, 11, 16	14	1, 3-9, 12-15	103			17,18	1
9			6	1	1-5, 8-17	116	7	35	18,19	1
10			9, 15, 22, 29	13	1-8, 11-14, 16, 17, 20, 21, 23-28, 30, 31	126	10	25	18, 19,32, 33	16
11			12	6	1, 2, 5, 6, 8-11, 13	110	3, 4, 7	38	14,15	1
12			3, 4, 17	12	1, 2, 5-8, 10-16, 18	135	9	9	19, 20	1
13			11, 17,	16	1-4, 6, 9, 10, 12-16	114	5, 7, 8	17	18,19	1
14			12, 15	1	1-4, 6-8, 11, 13, 16-31	143	5, 9, 10, 14	25	32,33	1
15			5, 6	3	1-4, 7-10, 12-16	95	11	5	17,18	1
16			13	3	1, 3-12, 15, 17-19	140			2,14,16,20-22	47
17			1, 3, 6,	24	2, 4, 5, 7-13	169			14-16	41
18			2, 4-7, 9, 12, 15, 17, 19-23	113	1, 3, 10, 11, 13, 16	67			8,14,18,24,25	24
19					3-7, 9, 10, 12-15	97	2	39	1,8,11, 16,17	51
20					1, 2, 5-14	103	3, 4,	19	15,16	1
21					1, 5, 9, 11, 13-21	56	2-4, 10, 12	68	6-8,22,3	16

Annex 3. Action Plan of Ijevan State Sanctuary for 2017-2021

N	Activity	Time Frame	Implementer	Source of Funding
	1. Administrative program			
1.	Establishment of respective units and recruitment of staff for management of Ijevan Sanctuary in Ijevan FE of "Hayantar" SNCO	2017-2018	"Hayantar" SNCO, Ijevan FE of "Hayantar" SNCO	State budget
2.	Search for new sources of funding and fund-raising for the state sanctuary management	2017-2021	"Hayantar" SNCO, Ijevan FE of "Hayantar" SNCO	State budget, International funding
3.	Development and implementation of short-term and long-term training programs for the staff of the sanctuary including the fields of forest and biodiversity conservation and monitoring, forest protection, ecotourism development, etc.	2017-2021	"Hayantar" SNCO, Ijevan FE of "Hayantar" SNCO	State budget, International financing
4.	Organisation of study tours for the staff of the sanctuary	2017-2021	"Hayantar" SNCO, Ijevan FE of "Hayantar" SNCO	State budget, International financing
5.	Technical capacity building for the sanctuary (for details, see Table 24)	2017-2021	"Hayantar" SNCO, Ijevan FE of "Hayantar" SNCO	State budget, International financing

	2. Forest and biodiversity conservation and forest rehabilitation program			
1.	Installation of permanent and portable roadblocks (8-10) on the most used forest roads and installation of security cameras	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
2.	Implementation of fire prevention activities (installation of warning signs, procurement of fire extinguishers, restoration of fire prevention roads, etc.) (for details, see Table 22)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
3.	Restoration of degraded (previously logged) forest ecosystems (for details, see Table 23)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
4.	Planning and implementation of biotechnological measrues on species conservation based on the field surveys and when neccessary (for instance, feeding animals during snowy winters, installing nests, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
5.	Identification of high conservation value forests and implementation of activities aimed at maintenance and restoration of their values	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
6.	Study on use of community pastures and development of pasture sustainable management schemes together with the communities in order to prevent grazing of domestic animals in forests. Boundary fencing of some forest areas close to the settlements (for example, Hovq) to prevent the entrance of domestic animals into forest.	2017-2021	MoA, communities	State budget, International financing
7.	Cooperation with respective staff of Dilijan National Park to ensure the connectivity of ecosystems as well as migration and dissemination of species between the sanctuary and national park.	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
8.	Development and implementation of a comprehensive plan to decrease non-regulated loggings and to provide fuel to the adjacent communities	2017-2021	Ijevan FE of "Hayantar" SNCO, communities	State budget, International financing

N	Activity	Time Frame	Implementer	Source of Funding
	3.Monitoring and scientific research program			
1.	Development and implementation of a biodiversity monitoring plan, including monitoring of forest ecosystems and evaluation of endangered species (indicator species, monitoring protocols, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities, NGOs	State budget, International financing
2.	Cooperation with scientific institutions, universities, NGOs and volunteers and their involvement in monitoring activities	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities, NGOs	State budget, International financing
3.	Development and implementation of ecotourism monitoring plan	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities, NGOs	State budget, International financing
4.	Creation and maintenance of monitoring database with use of computer software	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
5.	Field surveys of the animals and plants registered in the Red Book of Armenia (inventory, stock-taking, evaluating populations), with special focus on the most endangered species	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities	State budget, International financing

N	Activity	Time Frame	Implementer	Source of Funding
6.	Establishment and management of biodiversity database	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
7.	Field studies of ecosystems of endangered and unique species (Corylus colurna, natural pine, etc.) and planning additional measures to improve their status	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities	State budget, International financing
8.	Studies on vulnerability and resilience of forest ecosystems to climate change and their adaptataion with development of relevant measures	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities	State budget, International financing
9.	Studies of invasive and expansive species and development of measrues aimed at reduction of their impac on natural ecosystems	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities	State budget, International financing
10..	Studies of ecosystem services provided by forest ecosystems	2017-2021	Ijevan FE of "Hayantar" SNCO, National Academy of Science of RA, Universities	State budget, International financing

N	Activity	Time Frame	Implementer	Source of Funding
	4. Forest protection and natural resource use program			
1.	Conducting forest pathological studies (developing biological control methods, if neccessery)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget
2.	Sanitary cuttings (for more detailes, see Table 20)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget
3.	Maintenance cuttings (for more detailes, see Table 18)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget
4.	Providing adjacent communities with residual wastewood (firewood)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget
5.	Additional evaluation of the resources of the most used fruits and berries, eatable, medicinal and other species with useful qualities as well as development and implementation of their sustainable use plans	2017-2021	Ijevan FE of "Hayantar" SNCO, Communities	State budget, International financing

	5. Awareness raising program			
1.	Development and implementation of the plan intended to increase the awareness of adjacent communities (including information about endangered species and the necessity of their protection, field trips with the participation of target groups, publications, work with mass media, nature protection events and campaigns, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
2.	Involvement of representatives of adjacent communities and NGOs in the management operations (monitoring, field forest activities, ecotourism, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
3.	Launching the sanctuary web-page (or having a secion on the sanctuary in any existing web-page)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
	6. Ecotourism development program			
1.	Establishment of a visitor center in Ijevan FE of "Hayantar" SNCO with respective information materials	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
2.	Purchase tools/instruments for provision of ecotourism services (horses, tents, mountain bicycles, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing
3.	Installation of information signs along ecotrails (15), blazing of ecotrails, etc.	2017-2021	Ijevan FE of "Hayantar" SNCO	State Budget, International financing
4.	Cooperation with tour operators in order to increase the number of visitors (including training sessions, familizarization trips, etc.)	2017-2021	Ijevan FE of "Hayantar" SNCO	State budget, International financing

5.	Development of ecotourism services in local communities, including ecotourism infrastructures, B&B, field guiding, marketing of local production, etc.	2017-2021	Communities, Ijevan FE of “Hayantar” SNCO	State budget, International financing