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## FOREST BIODIVERSITY OF BASITCHAY STATE NATURE RESERVE

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## БИОРАЗНООБРАЗИЕ ЛЕСНЫХ ЭКОСИСТЕМ БАСИТЧАЙСКОГО ГОСУДАРСТВЕННОГО ПРИРОДНОГО ЗАПОВЕДНИКА

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*Abstract.* The study analyzed the natural plant species of the Basitchay State Nature Reserve, located in the south of the Lesser Caucasus (Zangelan District), the population status of plants in the areas, the taxonomic composition of trees, shrubs and grasses. To this end, the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan and the Institute of Dendrology of Azerbaijan NAS got acquainted with the current situation in the district. During the monitoring, satellite images, GPS coordinates, etc. were used. Soil samples brought from the site were examined for 14 indicators of the mineral composition using Palintest equipment, soil sets 400. *Quercus iberica* grows in the forest cover of the mountainous part of the region and *Carpinus caucasica*, 2 types of junipers: *Juniperus foetidissima*, *J. depressa* Stev. and hybrid, there are *Pistacia mutica*, sorbus, mulberry, willow, poplar, hawthorn, foxglove, mountain xerophilous plants, shrubs, blackthorn, etc. *Q. araxina*, *Celtis caucasica* Willd., *Carpinus orientalis*, *Pistacia mutica*, *Acer iberica* grow on dry stony slopes, *Ulmus araxina* Takht. = *U. minor* Mill. *Pyrus salicifolia* forms woodlands with juniper. Such forests are characterized by xerophytic shrubs: *Atraphaxis spinosa*, *Lonicera iberica*, *Cerasus microcarpa*, *Ephedra intermedia* Schrenk. et. Camei, *Rhamnus pallasii* and *Paliurus spina-christi*. As a result, 27 species of trees, 18 shrubs and 11 species of herbs have been registered in the Basitchai State Nature Reserve. Of these species, 17 rare, endangered trees, 3 shrubs, 3 grass species, 6 trees and 2 shrubs of relict and endemic species have been identified.

*Аннотация.* В ходе исследования проанализированы природные виды растений Баситчайского государственного природного заповедника, расположенного на юге Малого Кавказа (Зангеланский район), популяционный статус растений на участках, таксономический состав деревьев, кустарников и трав. С этой целью Министерство экологии и природных ресурсов Азербайджанской Республики и Институт дендрологии НАН Азербайджана ознакомились с текущей ситуацией на территории района. В ходе мониторинга использовались спутниковые снимки, координаты GPS и т. д. Образцы почвы, привезенные с участка, были исследованы по 14 показателям минерального состава с использованием оборудования Palintest, грунтовые наборы 400. В лесном покрове горной части района произрастают дуб пиренейский (*Quercus iberica*) и граб кавказский (*Carpinus caucasica*), 2 вида можжевельника: можжевельник тяжелый (*Juniperus foetidissima*),

можжевельник низкорослый (*J. depressa* Stev.) и гибридный, встречаются фисташка туполистная, рябина, шелковица, ива, тополь, боярышник, наперстянка, горные ксерофильные растения, кустарники, терн и др. На сухих каменистых склонах произрастают дуб араксинский (*Q. araxina*), каркас кавказский (*Celtis caucasica* Willd.), граб восточный (*Carpinus orientalis*), фисташка туполистная (*Pistacia mutica*), клен иберийский (*Acer iberica*), вяз араксинский (*Ulmus araxina* Takht. = *U. minor* Mill.). Ива-груша (*Pyrus salicifolia*) образует редколесья с можжевельником. Такие леса характеризуются ксерофитными кустарниками: *Atraphaxis spinosa*, *Lonicera iberica*, *Cerasus microcarpa*, *Ephedra intermedia* Schrenk. et. Camei, *Rhamnus pallasii* и *Paliurus spina-christi*. В результате в Баситчайском государственном природном заповеднике зарегистрировано 27 видов деревьев, 18 кустарников и 11 видов трав. Из этих видов выявлено 17 редких исчезающих деревьев, 3 кустарника, 3 вида трав, 6 деревьев и 2 кустарника реликтовых и эндемичных видов.

**Keywords:** forest biodiversity, nature reserves, global positioning systems, endemic species, relict species.

**Ключевые слова:** биоразнообразие лесных экосистем, природоохранные территории, системы глобального позиционирования, эндемичные виды, реликтовый вид.

### Introduction

Heydar Aliyev, who fought against the ecological terror policy of the Armenians when the plane-tree forest in Basitchay gorge was threatened with extinction since the 1950s, submitted a project to the Cabinet of Ministers in 1959 to create a reserve to protect the plane-tree forest. Due to the intervention of pro-Armenian officials, this project submitted by Azerbaijan was met with indifference. Armenians, who created a reserve in the Armenian part of the forest in 1960, took an active part in the deplorable condition of the territories belonging to the Azerbaijani side of the forest. With the support of the project submitted by Heydar Aliyev, 107 hectares of natural sycamore forest located in the south of the Lesser Caucasus, Zangilan region, 117 hectares, were transferred to the Basitchay State Nature Reserve by the decision of the Council of Ministers of the Azerbaijan SSR dated July 4, 1974. This is one of the greatest achievements of Heydar Aliyev in the fight against the policy of environmental terrorism in Armenia.

The plane-tree forest in the Basitchay valley is a unique pearl that belongs not only to Azerbaijan but to all European nature. With the transfer of Zangazur lands to Armenia in the first years of Soviet rule in Azerbaijan, part of the plane-tree forest in the Basitchay valley - trees along the Khachin River and Shikhavuz river valleys - remained in Nerkin-Hand, Sav and Shikhavuz villages of Gafan region. The atrocities committed by the depraved enemy have threatened to destroy the certified Oriental plane trees in the area. The Basitchay State Nature Reserve is dominated by the Eastern plane tree (*Platanus orientalis* L.). There are a large number of specimens 100-200 years old, 80-120 cm in diameter and 25-30 meters high.

### Materials and Methodology

Analysis of natural plant species of Basitchay State Nature Reserve, the population status of plants in the areas, the taxonomic composition of trees, shrubs and grasses were analyzed on the basis of S. Cherepanov (1995), Engler and APG systems [2]. The Diva-Gis system was used to obtain environmental parameters in the study area. Hypsometric height and area coordinates were measured by Garmin eTex 20 model GPS. During the monitoring, various literature from satellite images (V. Hajiyevev, S. Musayev Plants and plant formations recommended for the "Red and Green

Books" of Azerbaijan (1996), H. A. Aliyev, X. H. Hasamov "On the guard of nature" (1993), Alexander E. O. "Protection of rare and endangered trees and shrubs of Azerbaijan and analysis of its condition" (review) (2010), Ibrahimov Tahir. "Reserves of Azerbaijan" (2015), Grossheim A. A. "Flora of the Caucasus" (1939)) and internet [1-6].

The plane-tree forest, which is the object of research, the second in the world and the first in Europe, is protected in the Basitchay reserve. The name of the reserve is of Mongol origin and is named after the Beysut tribe. Plane forests in the Basitchay valley occupy 93.5% of the reserve. The territory of the reserve, located in the Zangilan region, is mainly mountainous, located at an altitude of 600-800 m above sea level. The right bank has steep slopes, and the left bank consists of hills. The area has a temperate-hot climate with dry winters. Its territory consists of alluvial-forest soils, chestnut, grey-brown, grass-meadow soils with brown mountain-forest soils in the surrounding areas. It is characterized by geographical location, soil-climatic conditions, diversity of plant species in forests and fertile soil.

#### *Aims and Objectives of the Study*

The main purpose of the study was to study the natural area of plant taxa of Basitchay State Nature Reserve, assess the ecological condition of the area, determine the level of anthropogenic exposure.

For this purpose, the director of the Institute of Dendrology of ANAS, corresponding member of ANAS Tofiq Mammadov together with the representatives of the Ministry of Ecology and Natural Resources of the Republic of Azerbaijan got acquainted with the current condition of the liberated area. Satellite imagery, various data and GPS coordinates were used during the monitoring.

Natural *Amorpha fruticosa* L., *Platanus orientalis* L., 12-15 km along the Basitchay, which starts from the eastern slopes of the Zangazur range; in the north with xerophytic forest cover consisting of *Pistacia vera*, *Mespilus germanica*, *Celtis caucasica* Willd., *Rhamnus pallasii*, *Paliurus spina-christi*, *Crataegus monogyuna* and others; to the south is a forest massif of *Quercus orientalis* and *Carpinus orientalis* [1].

Table 1

#### TAXONOMIC COMPOSITION OF TREE PLANTS IN BASITCHAY STATE NATURE RESERVE

<i>In the forest cover of the mountainous part</i>	<i>On dry rocky slopes</i>	<i>At altitudes from 800 m to 1400 m, in the massif of Surtun</i>
1. <i>Platanus orientalis</i>	1. <i>Quercus araxina</i>	1. <i>Amygdalus fenzliana</i>
2. <i>Quercus iberica</i>	2. <i>Celtis caucasica</i>	2. <i>Amygdalis narica</i> Fed.et
3. <i>Juglans regia</i>	3. <i>Carpinus orientalis</i>	3. <i>Diospyros lotus</i> L.
4. <i>Celtis caucasica</i>	4. <i>Pyrus boissieriana</i> Buhse	4. <i>Juniperus foetidissima</i>
5. <i>Morus nigra</i>	5. <i>Acer iberica</i>	5. <i>Juniperus polycarpus</i>
6. <i>Carpinus caucasica</i>	6. <i>Ulmus araxina</i>	6. <i>Taxus baccata</i> L.
7. <i>Salix</i> L.	7. <i>Pyrus salicifolia</i>	7. <i>Corylus colurna</i>
8. <i>Juniperus depressa</i>	8. <i>Juniperus foetidissima</i>	8. <i>Quercus longipes</i> Steven
9. <i>Pistacia mutica</i>	9. <i>Elagnus orientalis</i>	
10. <i>Populus</i>		

During the monitoring, it was observed that the plane tree, which occupies the first tier of the forest in the area, was mixed with ordinary walnut (*Juglans regia* L.). *Celtis caucasica* was found in the second tier, and poplar (*Populus* L.), elm (*Ulmus* L.), and long-stemmed oak (*Quercus longipes*

L.) were found along the river. The taxonomic composition of trees, shrubs and grasses of the area is grouped and reflected in Tables 1 and 3 [4].

Relict and endemic plant species were also studied in the area and a total of 7 species were identified - 5 trees and 2 shrubs (Table 2).

Table 2

RELICT, ENDEMIC TREES, SHRUBS AND GRASSES  
 OF BASITCHAY STATE NATURE RESERVE

<i>Trees</i>	<i>Shrubs</i>
1. <i>Platanus orientalis</i> L.	1. <i>Punica granatum</i> L.
2. <i>Pterocarya pterocarpa</i> Kunth ex I. Iljinsk.	2. <i>Crataegus eriantha</i> A. Pojark.
3. <i>Corylus colurna</i> L.	
4. <i>Juniperus foetidissima</i>	
5. <i>Diospyros lotus</i> L.	

As a result of the monitoring, 10 species were identified in the forest cover of the mountainous part of the Basitchay State Nature Reserve, 9 on dry rocky slopes, and 8 species in the Surtun massif at altitudes from 800 m to 1400 m.

Table 3.

TAXONOMIC COMPOSITION OF SHRUBS AND GRASSES OF THE RESERVE

<i>Shrubs (18)</i>	<i>Herbaceous plants (12)</i>
<i>Paliurus spina-christi</i>	<i>Iris paradoxa</i> Steven.
<i>Sambucus ebulus</i>	<i>Andropogon</i> sp.
<i>Punica granatum</i> L.	<i>Teucrium</i> sp.
<i>Cotoneaster integerrimus</i>	<i>Thymus</i> sp.
<i>Cotoneaster melanocarpus</i>	<i>Xeranthemum</i> sp.
<i>Rhamnus pallasii</i>	<i>Stellaria media</i>
<i>Berberis densiflora</i>	<i>Poa annua</i>
<i>Rosa sachokiana</i> P. Jarosch.	<i>Geranium molle</i>
Kol jasmini ( <i>Jasminum fruticans</i> )	<i>Urtica dioica</i>
<i>Crataegus eriantha</i> A. Pojark.	<i>Taraxacum vulgare</i>
<i>Atraphaxis spinosa</i> L.	<i>Crocus adamii</i>
<i>Mespilus germanica</i>	<i>Ophrys caucasica</i>
<i>Pyracantha coccinea</i> M. Roem	
<i>Spiraea</i> sp.	
<i>Ephedra intermedia</i> Schrenk. Et. C.A. Mey.	
<i>Cerasus microcarpa</i>	
<i>Lonicera iberica</i>	
<i>Myriacaria squamosa</i> Desv.	

Relict, endemic rare and endangered plants were also studied, grouped and tabulated in the Basitchay State Nature Reserve. 17 rare and endangered trees, 6 shrubs and grasses were observed in the reserve (Table 4) [5].

As a result of the monitoring, *Platanus orientalis* L., *Taxus baccata* L., *Corylus colurna* L., *Quercus arachnid* Grossh. were found in the area., *Pterocarya pterocarpa* Kunth ex I. Iljinsk., *Celtis caucasica*, *Pyrus boissieriana* Buhse., *Pyrus salicifolia* Pal. Along with rare and endangered relict species such as, *Pistacia mutica*, *Diospyros lotus* L. [3], *Punica granatum* L., *Vitis sylvestris*, *Morus*



*nigra*, *Elagnus orientalis* species have been identified as endangered as a result of the abominable actions of Armenians [2].

Table 4

RARE AND ENDANGERED TREES, SHRUBS AND GRASSES  
OF BASITCHAY STATE NATURE RESERVE

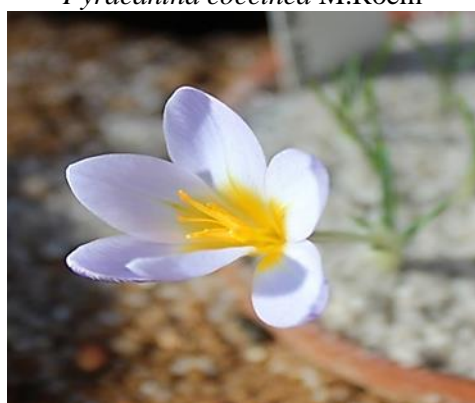
Rare and endangered tree plants	Rare and endangered grasses and shrubs
<i>Juglans regia</i> L.	<i>Pyracantha coccinea</i> M.Roem
<i>Quercus iberica</i>	<i>Rosa sachokiana</i> P. Jarosch.
<i>Celtis caucasica</i> Willd.	<i>Atraphaxis spinosa</i> L.
<i>Corylus colurna</i> L.	<i>Ophrys caucasica</i>
<i>Salix caucasica</i> Anderss	<i>Crocus adamii</i> J.Gay
<i>Taxus baccata</i> L.	<i>Iris paradoxa</i> Steven
<i>Pistacia mutica</i>	
<i>Populus nigra</i> L.	
<i>Pyrus boissieriana</i> Buhse	
<i>Quercus araxina</i> Grossh.	
<i>Pyrus salicifolia</i> Pal.	
<i>Amygdalis narica</i> Fed.et	
<i>Acer ibericum</i> M.Bieb	
<i>Juniperus foetidissima</i> Willd.	
<i>Amygdalus fenzliana</i> Lipsky	
<i>Taxus baccata</i> L.	
<i>Quercus longipes</i> Steven	



*Pyracantha coccinea* M.Roem



*Iris paradoxa* Steven.



*Crocus adamii* J.Gay.



*Ophrys caucasica* Woronow ex

Figure 1. Species included in the Red Book of the reserve

5 species listed in the Red Book in the reserve — *Platanus oriaentalis* L., *Pyracantha coccinea* M. Roem. *Iris paradoxa* Steven. *Crocus adami* J.Gay., *Ophrys caucasica* Woronow observed [3].

The soil sample brought from the territory of Basitchay State Nature Reserve by the Institute of Dendrology of ANAS was analyzed with Palintest Soil equipment. The soil sample brought to the "Plant Ecology" laboratory of the Institute was studied with 14 parameters according to the mineral content by means of "Palintest soil kits 400" equipment. The results are shown in Table 5.

Table 5.

RESULTS OF THE ANALYSIS OF THE SOIL SAMPLE BROUGHT FROM ZANGILAN-BASITSHAY STATE RESERVE

EXAMPLE															
	Depth (sm)	pH	Electric conductivity/m/s	$NO_3^{2-}$	$K^+$	$NH_4^+$	$Cu^{2+}$	$Mg^{2+}$	$SO_4^{2-}$	$P_2O_5^{3-}$	$Ca^{2+}$	Cl	$Al^{3+}$	$Fe^{2+}$	$Mn^{2+}$
	Standart	7	-	0-25 mkq/l	0-450 mkq/l	0-75 mkq/l	0-25 mkq/l	0-500 mkq/l	0-300 mkq/l	0-150 mkq/l	0-250 mkq/l	0-1000 mkq/l	0-50 mkq/l	0-25 mkq/l	0-25 mkq/l
Roadside 1	10-25	7,8	520	>>	350	<<	7,0	120	65	49	4250	2375	0,8	4,2	<<
Riverside 2	10-25	7,1	920	27,0	360	0,5	18,4	370	65	0	3750	2250	<<	21.8	0,0



Figure 2. Analysis of soil sample brought from Basitchay State Nature Reserve in the laboratory with Palintest Soil equipment

The first soil sample is taken from the reserve area on March 6, 2021, from a depth of 10-25 cm in a medium-yield area, the analysis revealed that the soil pH was weakly alkaline (7,8), electrical conductivity was 520 cm/m<sup>2</sup>, contains metal ions. There is a lot of nitrate-nitrogen (NO<sup>32</sup>), which indicates that nitrogen bacteria are active in the soil. Potassium ions are present in the area

(K<sup>+</sup>) at 350 mg/g, confirming the low water holding capacity of the soil. If you look at the ammonium ion (NH<sup>4+</sup>) in the soil, almost no organic fertilizer was applied to the area. In the example, copper ions (Cu<sup>2+</sup>) are about 3 times higher than the standard value, the area that belongs to the pasture. Magnesium ions (Mg<sup>2+</sup>), on the other hand, are 2 times lower than the standard, sulfur ions (SO<sup>42-</sup>), and phosphorus (P<sub>2</sub>O<sup>53-</sup>) ions are 3 times lower than the standard. These indicators show that mineral fertilizers have not been applied to the soil for a long time.

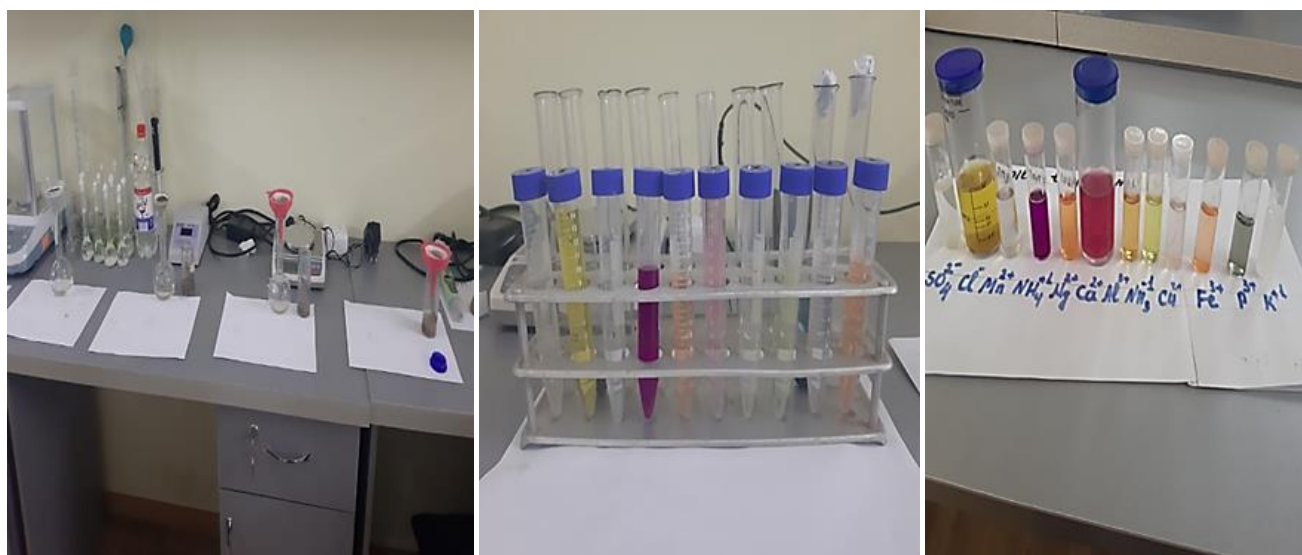


Figure 3. View of analysis of 14 parameters according to mineral content with “Palintest soil kits 400” equipment

In this example, Ca<sup>2</sup> salts and chloride salts 3 times higher than the standard confirms that the area is moderately saline. Aluminum ion is only 0.8 mg / g, iron ion (Fe<sup>2+</sup>) is very small, manganese ion (Mn<sup>2+</sup>) is completely absent. According to the above-mentioned analytical analyzes, the application of organic and mineral fertilizers to such lands can allow obtaining productivity.

The second example is coastal soils with a pH of 7.1, ie a neutral environment. This proves that the area is constantly washed away by water. Due to the leaching of organic and mineral elements from the soil, the electrical conductivity is high due to heavy metal ions — 920 cm/m<sup>2</sup>, nitrate nitrogen is only 27.0 mg/g, potassium ions (K<sup>+</sup>) 360 mg/g, which indicates poor soil moisture capacity. Lack of organic fertilizer in the soil, copper ions, magnesium ions below the standard, 5 times the sulfur compounds, the absence of phosphorus ions confirms that the soil is unsuitable for cultivation. The content of calcium and chloride ions in these soils is higher than the standard and is significantly saline. Aluminium and manganese ions were not found in the sample, and iron ions were close to the standard. It is not expedient to select such lands as arable lands [6].

During the monitoring of Basitchay State Nature Reserve located in the Zangilan region, 27 trees, 18 shrubs and 11 grass species were registered, of which 18 trees, 3 shrubs, 3 grass species are rare and 5 endangered trees and 2 shrubs are relict and endemic plants (Table 6, 7).

Table 6

RARE AND ENDANGERED PLANTS			
	<i>Tree plants</i>	<i>Grasses and shrubs</i>	<i>Relict and endemic</i>
Number of species	17	6	7



Table 7

AREA OF DISTRIBUTION OF TREE PLANTS IN THE TERRITORY OF THE RESERVE

	<i>Of the mountainous part in the forest cover</i>	<i>On dry rocky slopes</i>	<i>At an altitude of 800 m to 1400 m, in the Surtun massive</i>
Number of species	10	9	9

The damage caused to the ecology and natural resources of Azerbaijan as a result of the occupation of our territories by Armenia is immeasurable (Figure 2). Karabakh's natural resources, especially plant resources, have been ruthlessly looted by Armenians. They are the most looted forests after the gold extracted from our occupied lands for 30 years. Trees were cut down and destroyed in a part of the Chinar forest in the Basitchay State Nature Reserve. Red oak trees were uprooted and cut down, furniture was produced and most of them were sold to foreign countries. The reserve was looted by Armenians and threatened to completely destroy the vegetation in the area. All this is the terrorist damage inflicted on nature, natural monuments and the environment as a whole by Armenians.

*Results*

Eastern plane trees were cut down, various explosives were used to destroy the roots of the broken trees, and fires broke out in the area, which led to the destruction of the reserve.

As a result of monitoring, in the forest cover of the mountainous part of the area, *Quercus iberica* and *Carpinus caucasica*, 2 species of *J. foetidissima*, *Juniperus depressa* Stev. and *Pistacia mutica*, walnut, hackberries, mulberry, willow, poplar, hawthorn, rosa, buckthorn, dry-steppe, mountain xerophilous plants, shrubs, blackthorn, etc. found.

On dry rocky slopes *Q. araxina*, *Celtis caucasica* Willd., *C. orientalis*, *P. mutica*, *Acer iberica*, *Ulmus araxina*, *Pyrus salicifolia* forms sparse forests with juniper. These forests include xerophytic shrubs: *Atraphaxis spinosa*, *Lonicera iberica*, *Cerasus microcarpa*, *Ephedra intermedia* Schrenk. Et. C.A.May., *Jasminum fruyicans*, *Rhamnus pallasii* and *Paliurus spina-christi* are naturally distributed.

In general, as a result of monitoring, 27 species of trees, 18 shrubs and 11 species of grasses were registered in the Basitchay State Nature Reserve. Of these, 17 trees, 3 shrubs, 3 grass species were identified as rare and endangered plants, and 6 trees and 2 shrubs were identified as relict and endemic plants.

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