

# Trees and Shrubs of Zerafshan State National Reserve, Uzbekistan

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## Abstract

The riparian (tugai) forest ecosystems of Central Asia are a biodiversity hotspot with unique many trees and shrubs. Intense human pressure and global warming have caused habitat destruction in Zerafshan State National park and it's 23.5 ha. There grow more than 300 higher plants. We analysed the wild flora and the remains of the species diversity that previously existed on the site of the forestry enterprise, the modern biodiversity of trees and shrubs in the described territory are represented by 52 species from among representatives of 21 plant families. These monitoring and results indicated that some tree species might in the near future become extinct in the wild. We therefore recommend that the local people be encouraged to stop using these trees.

## Keywords

Riparian Forest, Tugai Ecosystem, Monitoring, Human Pressure, Trees

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## 1. Introduction

Uncontrolled use of plant resources for human well-being drives the loss of plant biodiversity worldwide [1] [2]. The study of plant biodiversity, development of ways of their integrated conservation and restoration continues to be an urgent problem. Such work is also carried out on the territory of the riparian forest of Uzbekistan, where a relatively large number of various plants grow [3] [4] [5] [6].

More than 300 species of vascular plants grow on the territory of the reserve. Among this biodiversity, a special place belongs to the basis of the riparian forest—woody and shrub plants.

For a long time, different species of *Populus*, *Salix*, *Elaeagnus*, *Tamarix*, *Pyrus*,

*Rubus*, *Prunus*, *Ulmus*, *Juglans*, *Quercus*, *Halimodendron*, *Rosa*, *Cerasus* and etc. have grown on the territory of the reserve. One of the valuable plants of the reserve is the population of *Hippophae rhamnoides* L. which of the largest area in Uzbekistan.

Before the establishment of the reserve in 1975, this territory belonged to the Samarkand forestry organization, where the species of *Acacia*, *Gleditschia*, *Acer*, *Fraxinus*, *Ulmus*, *Juglans*, etc., which have planted. One of the great interests is the *Malus Niedzweckiana* Dieck. and the Red Book species *Rhus coriaria* L. that has recently appeared in the reserve.

The *Elaeagnus angustifolia* L., *Berberis integerrima* Rgl., *Atraphaxis seravschanica* Pavl *Halimodendron halodendron* Vass. etc. were well tolerated under the arid conditions.

## 2. Material and Methods

### Study Site

Riparian forest of Zerafshan State Reserve is located in the Samarkand region and covering an area of 23.5 ha (Figure 1). The Zerafshan State Nature Reserve is situated in the south-eastern part of Samarkand region. It extends from the Chapan-Ata mountain upstream along the right bank of the Zerafshan river. The nature reserve consists of two separate parts, the distance between them being 300 m. The width of each part is 100 - 140 m and the average length is 47 km.

The climate of this region is typical for continental subtropics and is distinguished by large amplitudes. The amplitude is very high both during the year and the day.

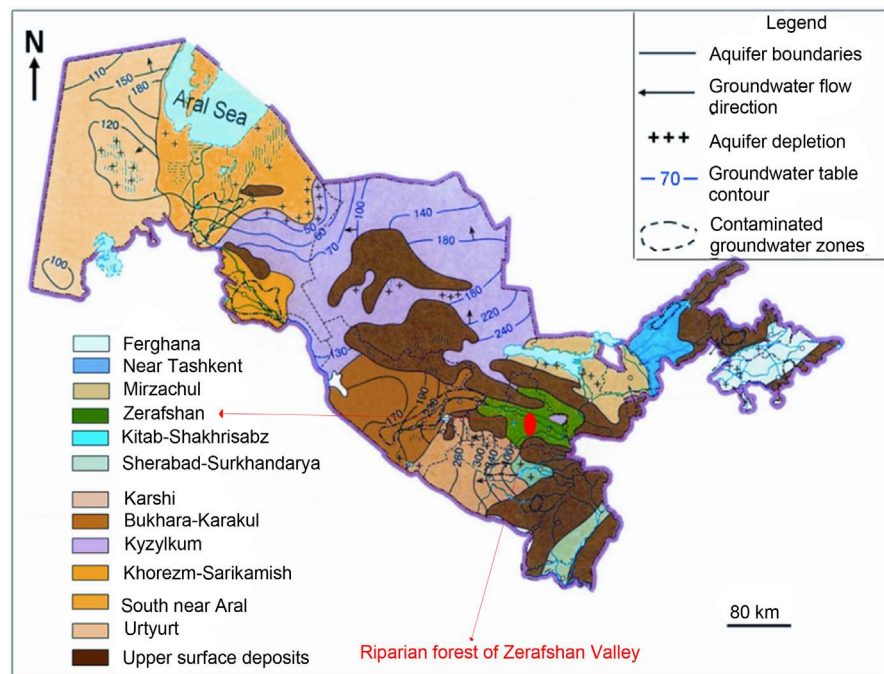


Figure 1. Map of the Zerafshan state reserve.

The coldest month is January ( $-27$ ), and the hottest is July ( $+41$ ). In summer there is a lack of rain and the greatest aridity (Figure 2).

Precipitation in the area of the Zarafshan State Reserve is quite a small amount: from 100 to 400 mm. and falls on the autumn-winter period. Precipitation falls in the form of rain and snow—from early December to the first ten days of March (Figure 3).

The number of days with snow cover does not exceed 30 days. The territory of the Zerafshan River basin is notable for a long duration of the sunshine, which is 2877 hours per year. The number of clear days is 150 - 160 days (Figure 4).

Samarkand. Mainly these focal species have used as wood and medicinal by local people.

*Elaeagnus angustifolia* has got a firewood and it uses by local people. *E. angustifolia* and *Hippophae rhamnoides* are medicinal plants and people collect fruits of these focal species. And other species below are use as firewood by local people (Figure 5).

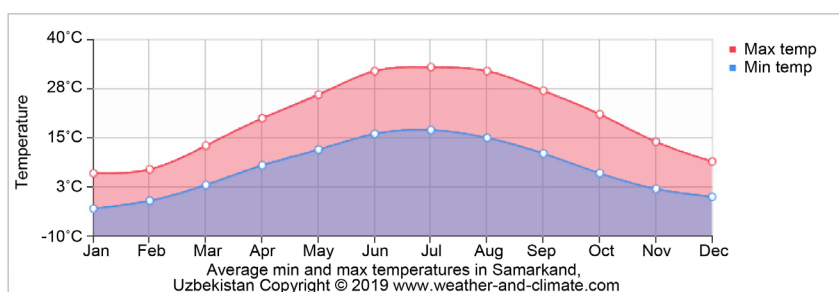


Figure 2. The mean minimum and maximum temperatures over the year, Samarkand.

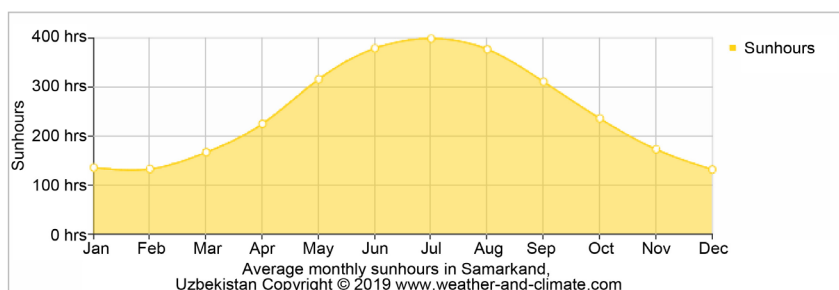


Figure 3. The monthly total of sun hours over the year in Samarkand.

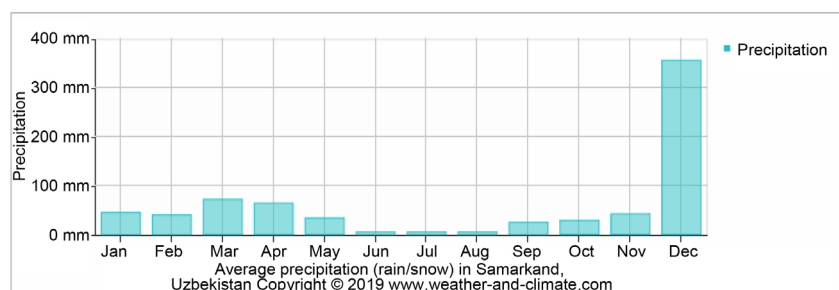


Figure 4. The mean monthly precipitation over the year, including rain, snow, hail etc. in Samarkand. Mainly these focal species have used as wood and medicinal by local people.



**Figure 5.** General view of focal species of Zarafshan state reserve.

Comparative botanical and geographical methods were mainly used in the study of taxonomic taxonomy of collected plants. The analysis of taxonomic units also used the flora of Uzbekistan. The life form of plants was described according to the 9th volume of Plant Identifier of Central Asia [7] into trees, shrubs, semi-shrubs, dwarf-shrubs, or herbs (perennial, biennial and annual). Plant taxonomy was according to Cherepanov 1995 [8].

Geobotanical research methods according to Rabotnov and Shennikov. Described on the basis of Uranov's manuals [9] [10] [11] and developed by Braun Blanquet 1965 [12].

### 3. Results and Discussion

The forests in the study region are mostly calm of *Populus euphratica*, *Tamarix halostachys caspica*, and *Haloxylon ammodendron*, and also some herbs such as *Phragmites australis* and *Halimodendron halodendron*. *P. euphratica*, is the keystone species of the riparian forests which are also reflected to as Tugai forests [13].

Tugai forests are the riparian forests along the rivers in the continental desert regions of Central Asia, *i.e.* the Tarim River, Amu Darya and Syr Darya. They mostly compose of *Populus euphratica*, *Populus pruinosa* and *Elaeagnus oxycarpa* Schltld. As an investigation of land opening industries, large areas of Tugai forests were destroyed after the 1950s. Due to the excessive use of water for irrigation, the remaining Tugai forests are under serious danger. Near natural Tugai forests still exist along the Tarim middle reaches of the Tarim Huyanglin Nature Reserve, Xinjiang, NW China [14].

The Pesquería River (north-eastern Mexico) has long been exposed to significant anthropogenic pressures. For this reason, it has been identified by the Mexican National Commission for the Knowledge and Usage of Biodiversity as a priority resource to be priced and restored [15].

The riparian forests in the Tarim Basin (NW China) are mostly composed of



**Figure 6.** Degradation some part of Zerafshan state nature reserve.

**Table 1.** List of the trees and shrubs of the Zerafshan state nature reserve.

Nº	Species	Life form	Braun-Blanquet, %
1	<i>Pinus sativus</i> L.	Tree	+ = (below one percentage)
2	<i>Juniperus turkestanica</i> Kom.	Tree	+
3	<i>Juniperus zerafschanica</i> Kom.	Tree	+
4	<i>Salix babylonica</i> L.	Tree	+
5	<i>Salix olgae</i> Regel	Tree	1
6	<i>Salix turanica</i> Nas.	Tree	+
7	<i>Salix Wilhelmsiana</i> M. Bieb.	Tree	2
8	<i>Salix turanica</i> Nas.	Tree	+
9	<i>Populus nigra</i> L.	Tree	+
10	<i>Populus Bachovenu</i> Wierzb.	Tree	+
11	<i>Populus pruinosa</i> Schrenk	Tree	3
12	<i>Populus diversifolia</i> L.	Tree	1
13	<i>Juglans regia</i> L.	Tree	1
14	<i>Quercus robur</i> L.	Tree	1
15	<i>Morus alba</i> L.	Tree	1
16	<i>Morus nigra</i> L.	Tree	+
17	<i>Maclura aurantiaca</i> Nitt.	Tree	3
18	<i>Ulmus parviflora</i> Jacq.	Tree	2
19	<i>Platanus orientalis</i> L.	Tree	1
20	<i>Tamarix hispida</i> Wild.	Tree	3
21	<i>Tamarix gracilis</i> Bge.	Tree	+
22	<i>Tamarix arcentoides</i> Bge.	Tree	+
23	<i>Tamarix laxa</i> Willd.	Tree	1
24	<i>Elaeagnus angustifolia</i> L.	Tree	5
25	<i>E.songarica</i> (Bernh. ex Schltdl.) Fisch. ex Trautv.	Tree	2
26	<i>Hippophae rhamnoides</i> L.	Tree	5
27	<i>Crataegus turkestanica</i> A. Pojark.	Tree	1
28	<i>Crataegus songarica</i> L.	Tree	+
29	<i>Prunus divaricata</i> Ldb.	Tree	2

## Continued

30	<i>Cerasus mahaleb</i> (L)	Tree	2
31	<i>Cerasus vulgaris</i> Mill.Gard.	Tree	1
32	<i>Cydonia oblonga</i> Mill	Tree	1
33	<i>Persica vulgaris</i> Mill.	Tree	+
34	<i>Malus domestica</i> Borkh.	Tree	+
35	<i>Malus Niedzweckiana</i> Dieck.	Tree	+
36	<i>Pyrus communis</i> L.	Tree	+
37	<i>Robinia pseudoacacia</i> L.	Tree	+
38	<i>Gleditschia triacanthos</i> L.	Tree	1
39	<i>Halimodendron halodendron</i> Vass.	Tree	1
40	<i>Ailanthus altissima</i> Swingl.	Tree	1
41	<i>Rhus coriaria</i> L.	Tree	+
42	<i>Acer platanoides</i> L.	Tree	1
43	<i>Vitis vinifera</i> L.	Tree	+
44	<i>Hibiscus treonum</i> L.	Tree	+
45	<i>Fraximus excelsior</i> L.	Tree	+
46	<i>Berberis integerrima</i> Rgl.	Shrub	2
47	<i>Ribes nigrum</i> L.	Shrub	+
48	<i>Atraphaxis seravschanica</i> Pavl.	Shrub	1
49	<i>Rubus caesins</i> L.	Shrub	3
50	<i>Rosa canina</i> L.	Shrub	4
51	<i>Rosa marakandica</i> L.	Shrub	2
52	<i>Rosa Beggeriana</i> L.	Shrub	1

poplar species (*Populus euphratica*, *Populus pruinosa*). In the hyper arid climate of this region, the trees are phreatophytes, which depend on access to groundwater. Essential ecosystem services (ESS) of these forests contain rationing, adjusting, and cultural services. Studies revealed that the wood of the forests could be sustainably used through a temperate harvesting intention [16].

This study investigated the anthropogenic pressure on the tugai forest. We observed Zerafshan tugai forest is under anthropogenic pressure and as well destroyed by erosion (Figure 6).

We analysed wood-shrubs of Zerafshan tugai forest, there were 45 trees and 7 shrubs. Mostly dominated by trees due to tolerance.

We usually identify trees and shrubs morphologic and anatomic characteristics and as well as modern approach is DNA analyse (Table 1).

#### 4. Conclusions and Recommendations

The Zerafshan State Reserve is located near the settlements of four districts of the Samarkand region, does not have a fence, which creates problems for environmental protection measures. The main threat to the conservation and resto-

ration of the reserve's vegetation is represented by deforestation, livestock grazing, collection of food and medicinal plants, and removal of gravel from the river bed. On the one hand, large trees are cut down, and on the other hand, young undergrowth is eaten by livestock. Thus, natural recovery is very slow. The removal of gravel leads to the fact that the level of groundwater goes down, and if you do not additionally irrigate the plants, they can die from lack of water. Therefore, in order to prevent these threats, first of all, it is necessary to conduct wider environmental education among the population and urgently develop ways to preserve and restore riparian vegetation in this area.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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