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INTRODUCTION

Siberian pine (*Pinus sibirica* Du Toir.) forests grow on 16520 hectares of the total 95.2 thousand hectares of forest covered area, which is 17.3 percent of the forest covered area of green zone forest foundation area [1]. Siberian pine is known for its high emissions of phytoncides and essential oils, which purify the ambient air, and is an ecologically valuable tree that is a major concern in Ulaanbaatar today. In recent years, the genetic resources of Siberian pine forests have been severely damaged due to climate change, increasing forest pests, forest fires, and the illegal use of non-timber resources. Therefore, this study aimed to assess the state of Siberian pine forests, determine the impact of recreational use, and study the quality of seeds. As a result of this study, the map of Siberian pine forests distribution and the map of the state of the Siberian pine forests of green zone in Ulaanbaatar were developed.

METHODS

In the green zone of Ulaanbaatar, we used plot sampling method and established sampling plots in areas the harvest of pine nuts for industrial and domestic purposes. The main parameters for the establishing the sample area and the forest measurement were determined by the methodology of N.P.Anuchin [2]. The assessing the condition of forest trees and the recreational degradation were determined by the methodology of D.Tsendsuren [3]. A.A.Korchagin's [4] assessment of seed quality is used for determining the seed yield.

Table 1. Location of the sampling plots

Name of sampling plots	Coordinate	Elevation, m	Area names
Deendii	N47°58'56.4" E107°18'28.2"	1963	Deendii in Gachuurt
Sanzai	N48°09'30.1" E106°53'02.7"	1578	Baga Bayan
Jigjid	N48°03'10.2" E106°51'37.1"	1557	Jigjid
Nukht	N47°49'20.3" E106°51'50.7"	1582	Nukht in Bogdkhan mountain
Turgen	N47°49'07.8" E106°53'44.5"	1935	Turgen in Bogdkhan mountain
Uliastai	N48°07'08.5" E107°11'32.8"	1826	Bayangol in Uliastai
Khandgait	N48°06'18.9" E106°56'20.0"	1682	Khandgait
Terelj	N48°06'18.9" E106°56'20.0"	1605	Bugatyn davaa in Terelj

RESULTS

In the green zone growing Siberian pine forests of the age classes IV-V. By assessment of site index Siberian pine forest in the green zone of Ulaanbaatar classified in II-IV classes, and density determined in 0.5-0.8.

Table 2. Basic parameters of forest measurement of the sampling plots

Sampling plots	Forest composition	Age class	Number of trees (trees/ha)	Stocking level	Site index
Deendii	8L2SP+B	IY	1680	0,7	IY
Sanzai	8SP2L+BP	III	1020	0,6	II
Jigjid	6P3SP1B+L	IY	1460	0,8	II
Nukht	7SP3P	IY	1160	0,7	II
Turgen	9SP1S	IY	940	0,8	III
Uliastai	5SP5L	YII	800	0,5	IY
Khandgait	5S3SP1L1B	IY	1940	0,7	IY
Terelj	9SP1L	IY	1460	0,8	IY



L-Larch, SP-Siberian Pine, P-Pine, B-Birch, S-Spruce

A total of 64.6% of Siberian pine trees in the green zone are damaged with certain levels of mechanical damage, having slow growth, thinning crowns and being dried out. The forests of Jigjid, Uliastai and Khandgait are relatively less degraded and the is beginning to change. Dendii, Bugatiin Davaa in Terelj, Sanzai Siberian pine forest environment rests are moderately degraded, Nukht in Bogd Khan and Turgen Siberian pine forest environments and habitats have been changed and severely affected by recreational use.

Table 3. The state of the Siberian pine forests

Name of Sampling plots	State level of forest stands	Degradation rate of recreational use
Deendii	Slow-growing and degrading	III –Forest has been moderately degraded
Sanzai	Slow-growing	III –Forest has been moderately degraded
Jigjid	Slow-growing	II – Forest area is starting to change
Nukht	Slow-growing	IV – Forest area is being degraded
Turgen	Slow-growing and degrading	IV – Forest area is being degraded
Uliastai	Slow-growing	II – Forest area is starting to change
Khandgait	Slow-growing	II –Forest area is starting to change
Terelj	Slow-growing and degrading	III –Forest has been moderately degraded

Compared to the increase in the diameter of Siberian pine trees, growth has generally declined since the 1990s. The growth of Siberian pine forests shows that, with the exception of Jigjid and Uliastai Siberian pine forests, growth has generally declined. In particular, the decline in the diameter growth of Siberian pine trees in Dendii, Nukht and Turgen confirms the results of the assessment of the state of Siberian pine forest.

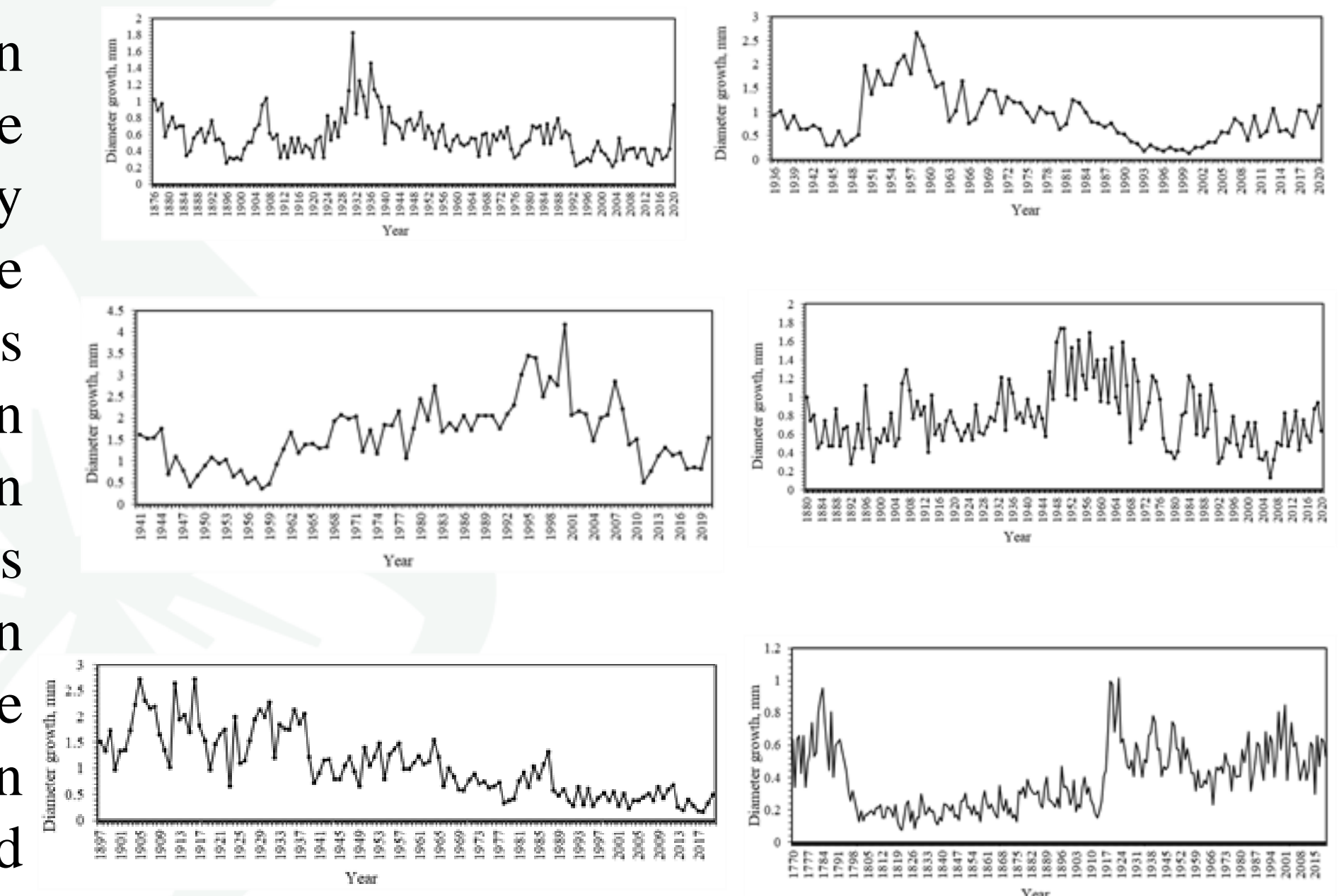


Figure 2. The growth rate of Siberian pine forest trees in Deendii, Sanzai, Jigjid, Nukht, Turgen, Uliastai

CONCLUSIONS

1. According to the assessment of the state of Siberian pine forests in the green zone, not all trees are healthy forests, more than 60 percent are in the category of slow-growing and more than 30 percent are in the category of slow-growing and degrading.
2. The forests of Jigjid, Uliastai and Khandgait are relatively less degraded and the forest environment is beginning to change. Dendii, Bugatiin Davaa in Terelj, Sanzai Siberian pine forests are moderately degraded, Nukht in Bogd Khan and Turgen Siberian pine forest environments and habitats have been changed and severely affected by recreational use.
3. Compared to the increase in the diameter of Siberian pine trees, growth has generally declined since the 1990s.
4. According to the seed yield assessment, the yield is low in Dendii and Jigjid forests, medium in Sanzai, high in Nukht and Turgen, and excellent in Uliastai.
5. In terms of seed viability, it is 82.6 percent or the highest in Nukht and 51.3 percent or the lowest in Dendii.

Reference

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