Technical Measures for Structural Adjustment and Renewal of Pinus sylvestris var. mongolica Plantation in Sandy Land

Xiaoxia Bai

College of Life Sciences, Yulin University, 719000, China

Abstract: According to the characteristics of Zhanggutai sandy land, the regeneration and transformation of Pinus sylvestris var. mongolica is divided into five forest models: tending thinning forest; grassland forest sparse; green umbrella forest; Block cutting is clear; mother forest and seed garden. There are five methods for renewal and transformation: Zhangwu County Xiaodian Yang Timber Forest; camphor, oil, red, Bansong, Pinus sylvestris var. mongolica, Pinus sylvestris var. mongolica mixed forest; Wumang maple, Cone, Xinjiang poplar, Caragana landscape forest; forest, Huzhizi, Huaihuai and other mixed forests; coniferous and broad-leaved oak irregular mixed forest, such as camphor, oil, red Spruce, sugar maple and oak. The corresponding methods for updating and renovating technical measures are proposed. The regeneration and transformation of Pinus sylvestris var. mongolica plantation in Zhanggutai sandy land should be based on the natural vegetation restoration system, with the enclosure structure as the main factor, transformed into stable coniferous broadleaf, shrub, unequal age, multi-layer mixed Lin and other models or integration. The practice over the years has shown that the shrub-grass mixed forest dominated by Mongolian pine forest should be built on the land of the loose forest of degraded disease in the Mongolian pine forest. Abstract In the healthy plantation, the broad-leaved economic tree species should be increased, and the ecological and economic mixed forest should be built to improve The comprehensive productivity of the mixed forest of Pinus sylvestris var.

1. Introduction

The Zhanggutai area of Zhangwu County, Liaoning Province is one of the earliest areas of artificial introduction of Pinus sylvestris var. Its largest age is 46 years old. Currently, more than 25 years of forests in the region have experienced a large number of deaths that are susceptible to disease. How to update and renovate existing and identified update models for drought resistance. The Sandy region of Scotch Pine is not only important for sustainable and stable development of more than 200 square hectares of drought-resistant Pinus sylvestris forest in this area, but also manages large Scale of drought resistance. The northern part of the three provinces of Pinus sylvestris. According to statistics, there are 38,266 square hectares of Pinus sylvestris var. mongolica in the northwestern part of the province, with a decline of 24,766 square hectares, accounting for 64%. Poor management will continue to develop in large areas. A considerable part of the forest pine forest will be destroyed, which will cause huge losses and impacts on the construction of three shelter forests, sand control and sand control projects in the north. Therefore, structural adjustment and renewal of Pinus sylvestris var. mongolica plantation has become an important issue to consolidate the achievements of the construction of the three protective forests in the north of the province and the construction of shelter forests and ecological environment in the province. Aiming at the characteristics of Zhanggutai area, some management and technical measures for the structural adjustment and transformation of Pinus sylvestris var[2].

The scorpion pine wood is native to Daxing'anling and Hulunbeier sandy land in China, and has the characteristics of drought tolerance, cold tolerance, thinness resistance and strong adaptability. Since the introduction of sand-fixing afforestation in the Zhanggutai area of Liaoning Province in the 1950s, artificial afforestation has developed rapidly. According to statistics, in addition to Tianjin, in the three northern regions, a total of 12 provinces (cities, districts) introduced and promoted Pinus sylvestris. Has been successfully promoted in more than 300 counties. By the end of 1993, the area

had reached 630,000 square hectares. However, due to the early high-density greening and lack of scientific theory to guide management in the later stage, extensive management of single tree species blindly leads to single structural problems, reduced productivity, frequent occurrence of pests and diseases, and low ecological function of drought resistance. Plantation[1]. Many studies have shown that mixed forests are the key to solving this problem. The transformation of the existing pure forest of Pinus sylvestris var. mongolica into a mixed forest is an effective way to improve the function of the Pinus sylvestris Linn. plantation forest, stabilize the system, and fully exert its overall function. Through the adjustment experiment of the stand structure of pure Pinus sylvestris var. mongolica plantation, the ways to restore the productivity of Pinus sylvestris var. mongolica plantation were discussed to realize the sustainable management goal of Pinus sylvestris var. mongolica plantation.

2. Update Mode Selection

2.1 Seriously ill forest

Sparse forests and grasslands, uneven terrain, intensive sanitation, cut more than 50% of dead trees and canopy dead trees, try to preserve healthy trees and trees that are not susceptible to infection. The (block) update is performed in an area where the terrain is not undulating. The belt (block) cutting width is 40-50 meters, and the reserved bandwidth is 20-30 meters. The reserved area should be increased for sanitary harvesting, and the center of the area should be 20-30 meters for future greening. The cut-off area of the block is controlled at 5-10 square hectares and the shape can be regular or irregular.

2.2 Light disease, disease-free forest

For the thinning of pure Pinus sylvestris var. mongolica, Pinus sylvestris var. mongolica and mixed forests, the thinning of the young, weak or weak sense should be carried out in time. The thinning method combining mechanical thinning and staying good and bad should be adopted, and the susceptible trees should be carefully harvested. The reserve density is shown in Table 1.

Table 1 Table of different forest age and DBH retained strains

Lin Ling (a)	14-15	16-18	19-22	23-15	26-30	31-34	35-40
Breast diameter (m)	8	10	12	14	16	18	20
Density (strain / bm2)	1500	1200	925	750	600	450	450-375

The sparse forest grassland is thinned in areas with poor conditions in the 21-25 years old, and the density of the forest is gradually reduced. Finally, the sparse arbor layer is formed, and the canopy closure degree is 0.2-0.4.

The green umbrella forest has a history of 21-25 years and the terrain is not flat. Trees with poor site conditions are cut down to form green spaces. Trees with better site conditions retain 300-600 square meters of land. The number of vulnerable and compressed trees in the reserved neighborhood has also decreased. The number of trees in the unit area of the reserved block is shown in Table 1. The ratio of green land to woodland is 1-2:1.

The 21~25, mildly susceptible forests were stripped and stripped, and the susceptible plants and pressed trees in the reserved areas and block areas were harvested[3].

For pure pine forests of 7~12, the pure forest can be transformed into mixed forest by grafting. The scion of Pinus koraiensis and Pinus tabulaeformis will adapt to the future of needle mixed forest.

2.3 Mother Forest and Seed Garden

First, sanitary deforestation, deforestation of dead trees and mother trees of more than 50% of canopy deaths were carried out, followed by chemical control measures. In early June and mid-June, artificial or mechanical spraying was carried out with 50% carbendazim 500 times solution or 70% methyltropium bromide 1000 times solution to prevent pine blight. 500 times of methamidophos or methanesulfonate is added for the first spraying to prevent both pine and pine caterpillars.

2.4 Update the transformation goals and scale

The Pinus sylvestris var. mongolica in the Zhanggutai sandy area of Zhangwu County should be artificially renewed on the basis of the natural vegetation restoration system based on the enclosure, which will be transformed into stable coniferous broadleaf, arbor, unequal age, multi-layer Patterns or integrations such as mixed forests.

Artificial afforestation must be moderate. Tree species combination and afforestation density regulation should basically reflect the characteristics of local climax plant communities and ensure high productivity. It should be implemented scientifically based on changes in local soil water supply and groundwater levels. The best condition for the renewal and reconstruction of Zhanggutai artificial sand-fixing forest is not to pursue the growth rate and height of the stand, but to achieve canopy closure and stability in the inter-plant, inter-row, horizontal and vertical directions.

3. Update and Transformation Method

3.1 Different cultivation methods can be used according to different cultivation purposes and site conditions.

According to the requirements of classification management and good site conditions, poplars are planted in the commercial forest area, and investment in water and fertilizer is increased[4]. Double-tube wells are drilled in the field and pumped with diesel. The site selection can be in 10,000 mu of forests and three work areas. Within the forest area of 10,000 mu of Dayiwu, planting coniferous forests and coniferous forests such as Pinus sylvestris var. mongolica, Pinus tabulaeformis, Kolasong, Banxa pine forest and Changwusong forest, divided into Gongyi, Gongji and Shanger . The Wujiao Maple, Trypanosoma, Xinjiang Poplar and Caragana landscape forests mainly consider the needs of tourism and sightseeing. Planting the above species can make the future forest become four landscape forests (flowers, incense, beautification, greening). Each tree can be planted on land of no less than 10 square hectares. Pinus sylvestris var. mongolica, arborvitae, locust, eucalyptus, locust and mixed shrubs, arborvitae and locust can be used as early associated tree species, and eucalyptus and locust can be used as long-term mixed species. The location is in the 10,000-acre forest. Irregular block-shaped coniferous mixed forests such as camphor, oil, red, spruce, sugar maple, oak, hedgehog, and eucalyptus can be planted in Gongyi, Gonger 2 and Shang 2 plots.

3.2 Scorpion pine forest

For large-scale sand-fixing forests dominated by Pinus sylvestris var. mongolica, narrow-band sequential cutting should be adopted, that is, the 5H zone with the width of the plantation height, and the long-side direction is perpendicular to the main harmful wind direction. From the aspects of management, cost and benefit, the regeneration of the container seedlings of the pineapple for 4-6 years and the effect of the mound transplantation are better. Zonal transformation: Poplars are mixed and grown under good site conditions. The slow seedling stage of poplars is 1 year, which is characterized by wide adaptability and rapid growth. The multi-layer mixed forest of needle width and wide is easy to form and has a good application prospect; grafting transformation: grafting of Pinus koraiensis or different rootstocks to convert Pinus sylvestris var. mongolica forest into needle mixed forest[6].

3.3 Optimal crown height ratio of pruning strength

Forests, shrubs, and mixed forests should be preferentially used for sanitary harvesting. For high-density pure forest models, the ecological density should be adjusted first, and artificial crowning should be used to control the height ratio of the canopy.

The optimal ratio of near-crown canopy height to pruning strength is 1:3, leaving 18 rounds of side branches; for mature forests, the optimal ratio of crown height to pruning strength is 1:3, retaining 20 rounds of side branches. For over-ripa ecological forests, it is necessary to use small-area clearing and timely renewal.

The regeneration age of Pinus sylvestris var. mongolica plantation is 56-66 years old. Considering

the update mode and update age can be advanced or delayed for a period of time within this range[5].

4. Branch Technology Update and Transformation

4.1 Update mode

The cuttings of Pinus sylvestris are different from the ridiculous afforestation. Due to lack of water, soil hardening, root cutting, etc., it is not appropriate to afforest this year. It is recommended to adopt the two methods of renewal next year and renewal next year.

4.2 Corrective methods

First, remove the roots with an excavator, then prepare the land with an excavator and a 100 hp tractor. The land preparation time is the fall of the year or the spring of the following year. The strip is prepared 1.2 m wide and 40 m deep, and the hole is prepared 40 m x 40 m x 45 m[8].

4.3 Tree species selection

Since 1952, in addition to the drought resistance of drought-tolerant alfalfa, oil, red, Bansong, and Zhangwusong needle mixed forests, Wujiao Maple, Lima Clove, Xinjiang Populus, Caragana landscape forest, Larix sylvestris , Hu Zhizi, Huaiqi and other strips of mixed forests. After decades of historical verification and ecological selection, not only the above-mentioned tree species are not locally sensitive, but they will also be vigorously cultivated and have a good future. As a mixed tree species of sand-fixing forest, it is feasible in future renovations.

4.4 Seedling culture

Adhere to variety improvement, seedling strengthening, and increase the proportion of mechanized seedlings. In the camphor, oil, red, cloud and larch, the seedlings of 4~5 years old are cultivated, the 3-year-old seedlings are cultivated in the poplars, and the 7~8-year-old stumps are excavated in the pine forest for afforestation[9].

4.5 Green season

In the whole year, afforestation is carried out in many seasons. In spring, conifers and broad-leaved trees are bare rooted seedlings. In the rainy season, coniferous tree container seedlings are used. In autumn, broad-leaved trees are rooted and trunks. In winter, coniferous trees are excavated for 7-8 years.

4.6 Greening mode

Due to the shortage of local labor and the afforestation season, the land with large topography and undulation can be mechanized and afforested on the flat land.

4.7 Afforestation Density

Populus euphratica: plant spacing 2m × 2m × 8m; 2m × 3m; 2m × 2m; Pinus sylvestris: plant spacing 1m × 4m; 2m × 6m; 2m × 4m; 1m × 3m; 3m × 3m, 4m × 4m, cluster 3 to 5 plants per hole; Pinus tabulaeformis: plant spacing 1m × 2m, 1m × 3m; red pine: plant spacing 1m × 2m, 1m × 3m; maple, spruce, zebra pine, oriental arborvitae, Larix principis The line spacing is 1 m × 2 m or 1 m × 3 m[7].

5. Summary

In summary, structural adjustment has changed the station density, creating superior lighting conditions for the upper layer of drought-resistant Pinus sylvestris var. mongolica and lower layer vegetation, and effectively improving soil moisture conditions in forest land, promoting forest growth, and controlling pine blight Development and increase species diversity of understory vegetation. This is beneficial to alleviate the water deficit of Pinus sylvestris var. mongolica plantation on sandy land, restore the growth potential of trees, and inhibit the further decline of Pinus sylvestris var. In the long

run, due to the complementarity of ecological relationships between mixed species, it is beneficial to improve the utilization of forest resources and forestry productivity. The mixed forest has dense canopy, deep root system and rich litter. It is more conducive to improving forest microclimate, improving soil structure, improving soil fertility and enhancing the resistance of Pinus sylvestris var. mongolica to pests and diseases. It can be seen that according to the existing growth conditions, the characteristics of pure drought-tolerant Pinus sylvestris var. mongolica and mixed tree species, using appropriate methods to adjust the station structure is an effective method to improve drought resistance and stabilize the Pinus sylvestris var. mongolica ecosystem. And the role of wind prevention and sand functioning and achieving sustainable management goals.

According to the characteristics of Zhanggutai sandy land, the regeneration and transformation of Pinus sylvestris var. mongolica can be divided into five modes: tending thinning forest;sparse forest;protecting forest greening;block material Clear cutting;mother tree and seed garden.

There are five methods for updating and renovating: Zhangwu Xiaodian Yangshulin; camphor, oil, red, horn pine, and Pinus sylvestris var. mongolica;five-leaf maple, trypan worm, Xinjiang populus, golden pheasant Children's landscape forest;   mixed forests of Pinus sylvestris, Huzhizi, Huaihuai, etc.; camphor, oil, red spruce, sugar maple, oak irregular mixed forest.

After 5 to 10 years of adjustment and the above model, drought-resistant Pinus sylvestris var. mongolica fixed forest will delay or delay the reduction of fixed forests, and gradually adjust the needle, needle width, and arbor mixed forest, so that the fixed forest is often in the sand area. more stable. In addition, the growth of the second generation of Pinus sylvestris needs further observation.

Acknowledgement

References

[1] Mikhailova T A, Afanasieva L V, Kalugina O V, et al. Changes in nutrition and pigment complex in pine (Pinus sylvestris L.) needles under technogenic pollution in Irkutsk region, Russia. Journal of Forest Research, 2017, 22(2):1-7.

[2] Pyörälä J, Kankare V, Vastaranta M, et al. Comparison of terrestrial laser scanning and X-ray scanning in measuring Scots pine (Pinus sylvestris L.) branch structure. Scandinavian Journal of Forest Research, 2018:1-23.

[3] Esteban L G, Palacios P D, Conde M, et al. Application of artificial neural networks as a predictive method to differentiate the wood of Pinus sylvestris L. and Pinus nigra Arn subsp. salzmannii (Dunal) Franco. Wood Science & Technology, 2017, 51(5):1249-1258.

[4] Dirnberger G, Sterba H, Condés S, et al. Species proportions by area in mixtures of Scots pine (Pinus sylvestris L.) and European beech (Fagus sylvatica L.). European Journal of Forest Research, 2017, 136(1):171-183.

[5] Tamkevičiūtė M, Edvardsson J, Pukienė R, et al. Scots pine (Pinus sylvestris L.) based reconstruction of 130 years of water table fluctuations in a peatland and its relevance for moisture variability assessments. Journal of Hydrology, 2018, 558:509-519.

[6] Jankowski A, Wyka T P, Żytkowiak, Roma, et al. Cold adaptation drives variability in needle structure and anatomy in Pinus sylvestris L. along a 1,900km temperate–boreal transect. Functional Ecology, 2017.

[7] Drori E, Rahimi O, Marrano A, et al. Collection and characterization of grapevine genetic

resources (Vitis vinifera) in the Holy Land, towards the renewal of ancient winemaking practices. Scientific Reports, 2017, 7:44463.

[8] Fernándezdeuña L, Rossi S, Aranda I, et al. Xylem and Leaf Functional Adjustments to Drought in Pinus sylvestris and Quercus pyrenaica at Their Elevational Boundary. Frontiers in Plant Science, 2017, 8:1200.

[9] Arx G V, Arzac A, Fonti P, et al. Responses of sapwood ray parenchyma and non-structural carbohydrates of Pinus sylvestris to drought and long-term irrigation. Functional Ecology, 2017, 31(7):1371-1382.