# Application of middle-young forest tending in forest health management

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**Abstract:** Middle-young forest management plays an important role in forest health management. By promoting forest growth, improving forest quality, enhancing forest resistance to disasters and maintaining the stability of forest ecosystem, middle-young forest management becomes a key link in forest management. This paper will deeply study the key role of middle-young forest care in forest health management, including promoting forest growth, improving forest quality, enhancing forest resilience to disasters, and maintaining forest ecosystem stability. It will analyze the management methods of middle-young forest, namely soil protection and improvement, thinning and thinning, water management, disease and pest control, and discuss how to adjust the composition of stand tree species. Promoting the diversity of tree species, adjusting the proportion of large and small trees, gradually evolving into multi-layer forests, adjusting the degree of stand cover, and promoting the renewal of forests are several technical points, and the ideas of promoting optimization are also explored from the directions of laws, regulations and policies, scientific and technological innovation and technology promotion, and funding investment.

## 1. Introduction

Forest, as the largest terrestrial ecosystem on earth, plays an irreplaceable role in maintaining ecological balance, mitigating climate change, protecting biodiversity, etc. With the rapid development of China's economy, the demand for forest resources is increasing, and the problem of forest health is becoming increasingly prominent. As an important means of forest health management, middle-young forest management can effectively improve forest quality, enhance forest ability to resist natural disasters, and maintain the stability of forest ecosystem, which is of great significance for realizing sustainable forest development.

## 2. The key role of young and middle forest care in forest health management

### 2.1 Promote forest growth and improve forest quality

The growth of trees is directly related to forest quality, and young forest tending provides the necessary management means for forests to promote the healthy growth of trees. Through tending measures, the stand structure can be adjusted to ensure that each tree can get enough sunlight and nutrients, which helps to improve the photosynthesis efficiency of trees and accelerate the growth rate. At the same time, scientific thinning and thinning can remove diseased and weak trees, reduce competition between species, and enable each tree to better use soil nutrients and water resources, thereby improving the overall forest quality[1]. Middle-young forest tending not only pays attention to the growth of a single tree, but also pays more attention to the health of the entire forest ecosystem. By optimizing the structure of tree species and forming rich stands, middle-young forest tending helps to improve the forest biodiversity. Diverse forest ecosystems are more stable and resilient, helping to cope with environmental change and external pressures. Therefore, by promoting the growth of trees and improving the overall forest quality, middle-young forest management can achieve a win-win situation of ecological and economic benefits.

### 2.2 Make forests more resilient to disasters

Forest is threatened by various natural disasters, and young forest tending is a key link to improve the ability of forest to resist disasters. By adjusting the density and species composition of

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trees, tending can reduce the risk of forest being attacked by disasters. For example, moderate thinning can improve stand structure, increase gaps between trees, and reduce the extent of wind damage. Reasonable pest control measures can also effectively reduce the damage of pests and diseases to forests and improve the ability to resist disasters. Especially in the face of fire threats, fire risk management strategies for middle-young forest tending are crucial. By removing combustible materials and arranging fire belts regularly, tending can effectively reduce the occurrence and spread of fires and protect the entire forest ecosystem. Such tending measures not only enhance the forest's ability to withstand natural disasters, but also provide the basic guarantee for sustainable forest management.

### 2.3 Maintain the stability of forest ecosystems

A forest is a complex ecosystem in which various biological and abiotic factors interact to maintain the ecological balance. Scientific management helps to form a forest ecosystem with reasonable structure and complete functions, thus maintaining its stability. By adjusting the composition of tree species and protecting biodiversity, tending can promote the interdependence of different organisms in the forest, forming a virtuous cycle. In addition, by promoting the renewal of understory vegetation and adjusting the canopy of the stand, middle-young forest tending helps to improve soil and water conservation, slow down the flow rate, and reduce the risk of soil erosion, which plays a positive role in maintaining the overall health and sustainable development of the forest ecosystem. Therefore, middle-young forest management not only helps to improve the economic benefits of forests, but also is an important means to maintain the stability of ecosystems.

## 3. Methods of young forest care in forest health management

### 3.1 Soil protection and improvement

Soil protection and improvement is regarded as the cornerstone of forest health management, the core of which is to establish a sustainable and stable soil environment to provide suitable growth conditions for trees. First of all, careful measures should be taken in the care work, such as the appropriate introduction of mulch and vegetation to adjust the water flow rate, reduce the risk of soil erosion, and form a natural vegetation cover through the selection of suitable cover plants, such as herbs or ground cover, effectively inhibit the erosion of the soil by rain, and protect the structure and texture of the soil. Secondly, soil improvement is an important link in the care of young and medium forests. By introducing appropriate amount of organic matter, soil improvement can be realized and soil organic matter content can be increased[2]. The addition of organic matter can effectively improve the physical properties of soil, enhance the water retention capacity of soil, and provide a more stable water source for the growth of forest trees. At the same time, the activation of soil microorganisms is also a key step, which can be achieved by introducing an appropriate amount of organic fertilizers and biological bacteria. This measure helps to promote the propagation and activity of microorganisms in the soil, thereby improving the vitality of the soil and the efficiency of nutrient cycling, and providing more abundant nutrient supply for trees.

### 3.2 Thinning and thinning

Thinning and thinning are regarded as the core methods in the care of young and middle forest, and the organic combination of the two is very important to optimize and adjust the stand structure. In thinning operations, the primary task is to remove trees with poor growth and pests, while removing those individuals that cause excessive competitive pressure on surrounding trees and affect their healthy development, which is conducive to improving the health level of the entire stand and laying a solid foundation for the future development of the forest. At the same time, thinning is implemented to moderately remove some trees to improve the light transmittance of the stand, thereby promoting the growth of the understory. In the specific operation, selective thinning can be used to carry out targeted cleaning according to the growth status and characteristics of different trees. In thinning, we should pay attention to the retention of representative trees and

selectively eliminate individuals that are not conducive to the healthy development of the whole forest. Through scientific and reasonable thinning and thinning operations, we can optimize the stand structure, improve the overall health level of the forest, and lay a solid foundation for sustainable ecological development in the future.

### 3.3 Water management

Water control is regarded as the top priority in the care of the young forest. Water, essential for plant growth, is managed differently in wet and dry areas. In humid areas, excessive soil retention may prevent proper respiration of tree roots. Therefore, it is particularly important to build a scientific and reasonable drainage system to ensure that the soil has good permeability and remove excess water in time to ensure the healthy growth of the young forest. In arid areas, providing adequate water for trees becomes the key. Through careful planning and implementation of irrigation systems, water distribution can be accurately adjusted to better meet the growth needs of young and medium forests, thus improving water use efficiency. In this process, the difference of water demand of different tree species should be fully considered, and the maximum utilization of water resources should be realized through scientific water management, so as to promote the healthy growth of young forest and the play of ecological benefits. In order to better adapt to various climate and terrain conditions, it is also possible to establish artificial water sources in areas with suitable terrain by planning vegetation structures and adopting afforestation to form small-scale water bodies, which not only helps to improve the humidity in local areas and create a more suitable growth environment for young and medium forests, but also effectively improves the water utilization efficiency. Promote the development of the whole care work in a more scientific and sustainable direction[3].

### 3.4 Pest control

The prevention and control of diseases and pests is very important in the care of young forest, and a variety of technical means can be adopted. First of all, regular inspection is an important way to find pests and diseases, through regular inspection, can find signs of pests and diseases in time, take more effective control measures, block the breeding process of pests, so as to protect the health of young forests. Secondly, biological control measures, the introduction of natural enemies and the use of microbial agents can be adopted to control the number of pests by establishing a natural ecological balance and reduce the harm to young forests. In addition, it is necessary to strengthen the health management of the tending area and timely clean up plant residues such as fallen leaves and dead branches, which can reduce the accumulation of disease sources, reduce the breeding conditions of pathogens and pests, and improve the overall resistance of young forests. The comprehensive application of these methods can reduce the harm of diseases and pests to young forests and ensure the healthy growth of trees.

## 4. Technical points of nursery forest

### 4.1 Adjust the composition of stand tree species to promote diversity of tree species

Adjusting tree species composition and promoting tree diversity are important measures to improve the function of forest ecosystem. In the process of three-dimensional tending, we should pay full attention to the preservation of good growing trees and shrubs in the stand, especially the natural broad-leaved trees scattered in the coniferous forest. Even some trees with poor growth status, as long as they are not dead or diseased trees, should be properly retained to form the understory with shrubs on the premise of not affecting the surrounding trees. These understory trees and shrubs can enrich the vertical structure of the stand, improve species diversity, and enhance the ecological buffering effect of the stand against forest diseases, insect pests, wind and sand disasters, etc. It is an important part of realizing three-dimensional management and constructing multi-level forest with complete biomass. Therefore, in the three-dimensional tending, attention should be paid to the preservation and restoration of shrubs, understory trees and other vegetation, to promote the

vertical structure of the stand and species diversity, in order to enhance the stability of the forest ecosystem and the ability to resist disturbance.

### 4.2 Adjust the proportion of large and small trees and gradually evolve into multi-layer forests

The three-dimensional tending management should gradually adjust the proportion of medium, medium and small trees in the stand, and promote the evolution of the stand to the structure of multi-layer forest. Specifically, when tending and thinning, the old, weak and dead wood is removed, while the large diameter wood with good growth is retained as the upper wood layer; Keep the middle and small diameter trees which grow slightly behind but have great potential as the lower layer; In addition, some secondary tree species such as shrubs with strong growth should be retained appropriately. Through two or three times of systematic tending and thinning, inappropriate trees with high density but slow growth should be eliminated, the growth space of advanced and robust trees should be released, and the growth of small path trees and shrubs in the lower layer should be promoted. Finally, the stand will gradually evolve from a single single-layer forest structure in the past to a multilayer forest with complex vertical structure and rich species composition. The multi-layer forest system has high sunlight utilization efficiency, rich vertical spatial structure, complex interspecific interaction, and stronger resistance to climate change and disturbance than single-layer forest, so it is an important target of three-dimensional care management.

### 4.3 Adjust stand cover and promote understory renewal

In the process of three-dimensional tending management, it is of great significance to take appropriate thinning measures to adjust the stand closure. On the one hand, properly reducing the stand density can make full use of the mother tree to produce more abundant fruit, increase the seed collection amount, and accelerate the natural regeneration process. On the other hand, thinning can greatly improve the living environment of young trees and increase the survival rate and growth rate of existing young trees by increasing the light level under the forest. Especially in the middle tending stage, adopting more intensive thinning and increasing the canopy void is more conducive to improving the light, stimulating the tree fruit and promoting the rapid growth of young trees. Therefore, the moderate thinning of three-dimensional tending not only makes full use of the seed renewal opportunity of mother tree production, but also accelerates the growth of existing saplings to realize the rapid formation of young forests, and creates good conditions for subsequent thinning. Adjusting canopy to promote renewal is the key link of sustainable management.

## 5. To promote forest health management of young forest care optimization ideas

### 5.1 Improve relevant laws, regulations and policies

In the process of promoting the care of young forest, improving the relevant laws, regulations and policies is the basis to ensure the orderly progress of the work. First of all, we should establish a clear legal system, clarify the operation standards of young forest care, establish technical specifications, working procedures and quality standards. The government can issue special laws and regulations on the care of middle and young forests to make detailed provisions on all aspects of care, including the formulation of care plans, the supervision of the implementation process, and the evaluation of care effectiveness, which will help ensure the orderly development of care of middle and young forests within the framework of the rule of law, promote the participants to be more clear about their responsibilities, and ensure the scientific and normative care work. In addition, we should establish and improve the relevant economic incentive and restraint mechanism. Through the incentive policy, encourage the operators to actively participate in the care of young forests, provide economic and tax incentives, and form a positive incentive mechanism. Such incentive measures will promote the attention and active participation of all sectors of society in the care of young and middle-age forests, and promote the smooth progress of the care work [4]. At the

same time, a regulatory body will be set up to strengthen the supervision of the care of young and middle forest to ensure its legal, scientific and sustainable operation. The establishment of supervisory bodies can strengthen the supervision and evaluation of the care work, discover and solve problems in a timely manner, and improve the transparency and efficiency of the work. Such a regulatory mechanism not only helps to ensure the compliance of the care of young and medium forests, but also helps to prevent potential violations and maintain the overall health of the forest ecosystem.

### 5.2 Intensify scientific and technological innovation and popularization

In order to promote the work of nursery forest more scientific and efficient, we must increase the intensity of scientific and technological innovation and technology popularization. In this regard, the government can increase the investment in scientific and technological innovation, and actively support relevant research institutions and enterprises to carry out cutting-edge research and development of nursery forest care technology, which involves the application of remote sensing technology, and monitor the growth of nursery forest through satellite data to provide accurate data support for parenting decisions. At the same time, biotechnology plays a key role in the control of pests and diseases in young and middle forests, supporting eco-friendly tending practices. In addition, the use of information technology also helps to develop a more intelligent care plan, fine management of the young forest, the application of this series of scientific and technological means, will inject new impetus for the young forest care, improve the intelligent level of work. The government can promote the transformation and promotion of scientific and technological achievements, build a communication bridge between scientific and technological research and development institutions and the actual care demand side, through the two-wheel drive of scientific and technological innovation and technology promotion, the care of young forests will better adapt to the development trend of The Times, and promote the entire industry towards a more modern and intelligent direction.

### 5.3 Increase financial input and expand the scale of childcare

The care of young and middle forest is a project that needs sufficient financial support. The government and relevant departments should take measures to increase funding investment to ensure the smooth progress of childcare work. First of all, there is a need for funding for technology research and development, which involves innovation and application of science and technology in the management of middle and young forests, including conducting research projects for middle and young forests and promoting the development and practice of new technologies. Secondly, the funds are used for personnel training to ensure that there are enough professionals to participate in the childcare work. Personnel training can involve many aspects such as basic theory, practical skills and application of science and technology, so that practitioners have comprehensive knowledge of childcare. Finally, the funds should also be used for the implementation of the project, including the specific operation of the parenting plan, the purchase of technical equipment and the monitoring and evaluation of the parenting effect. In addition, the government can raise funds through a variety of ways to ensure the expansion of the scale of childcare. The introduction of social capital is one possible way to attract businesses and social organizations to participate in childcare projects and share some of the economic responsibility. In addition, the government can also carry out public welfare fundraising activities to raise funds from the society, which can not only integrate more social resources, but also improve the public's attention and recognition of parenting work, and form a situation of social co-governance.

### 5.4 Train professional caretakers

In order to ensure the efficient development of middle-young forest care work, the government should take effective measures to train professional care talents, to provide solid support for the scientific and professional care work. To this end, the government can set up professional training institutions to become an important platform for training professionals in the care of middle and young forests. These training institutions should not only cover the basic theory of the care of

middle and young forests, but also cover practical skills and scientific and technological applications, so as to ensure the comprehensiveness and practicability of the training content. In addition, these institutions can also establish close cooperation with scientific research institutions and enterprises, through the combination of practical cases and projects training, so that students can better transform theoretical knowledge into practical ability, improve the effectiveness of parenting work. While promoting the training of professional nurturing talents, the government can also set up a scholarship and professional qualification certification mechanism to encourage more practitioners to actively participate in the training. This incentive mechanism can not only improve the attractiveness of the training, but also help establish the social status and industry recognition of professional nurturing talents. Through these measures, the government can gradually build a sound talent training system. In addition, the government can also consider the establishment of a professional talent pool, including trained qualified practitioners, such a talent pool not only helps to timely grasp the information and dynamics of professional talents, but also provides more abundant and efficient talent resources for the care work, so as to promote the care of young and middle forest to develop in a more scientific and professional direction.

## 6. Conclusion

The care of middle and young forest plays an indispensable role in forest health management. Through scientific and reasonable care means, it has successfully achieved many effects such as promoting growth, improving quality and strengthening the ability to resist disasters. In the process of promoting the care of young forest, a series of measures must be taken, such as improving laws and regulations, increasing scientific and technological innovation, increasing funding investment, training professionals, etc., through these unremitting efforts, it is expected to achieve the sustainable development of forest health management, and effectively protect and manage precious forest resources.

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