

Protective forest management problems in Russia

Sergey Zalesov^{1,*} and Alfiya Magasumova¹

¹The Ural state forest engineering university, 37, Sibirsky tract, 620100 Ekaterinburg, Russia

Abstract. The distribution of forests by categories of protection is analyzed in accordance with the current normative documents on forest management in the territory of the Russian Federation. It is noted that protective forests are divided into 4 groups of protection categories; each of them includes specific types of protection categories. A considerable number of protection category types involves difficulties in working out the system of silvicultural measures for each of them. It should be noted that special purpose similarities of forest management in a number of protection categories types makes possible to unite them. The rules of wood harvesting, reforestation rules and care of forests rules present only general conception of forest management in protective forests. The standard plantations carrying out one or another protective functions at most, has not yet been worked out till now. As a result when planning and carrying out silvicultural measures experts in the field are forced to take non - standard solutions that infrequently results in disputed situations in work carried out estimation. Besides, maximum effect of measures accomplished is failed to be achieved. As a way to solve the problem it is offered to work out recommendations on zone (subzone) - typologic base in each of the specific protection categories. An increase in the area of protective forests can be achieved through the creation of artificial plantations on disturbed lands and lands that have come out of agricultural use. Thus, the plantations of Sukachev's larch (*Larix Sukaczewii* Dyl.) created on the former arable land at the age of 61 have a stock of 740 m³ / ha with an average growth of 12.1 m³ / ha per year. The latter makes it possible to improve the ecological situation in the region and largely solve the problem of carbon dioxide deposition.

1 Introduction

In spite of the fact that all forests carry out protective functions such as mediating, climate regulating soil-protective, water-regulating and some other [1, 2, 3], it is accepted to single out the main purpose of the forest sites. The latter is called forth forests distribution according to their categories of protection in particular according to forest code of the Russian Federation [Forest Code of the Russian Federation, 2015. Adopted by the State Duma on November 8, 2006 approved by the Federation Council on November 24, 2006, M., 84 p.] all the forest are divided into protective, operational and resumed. Protective forests are intended for one or other protective functions carrying out wood production in these forests

* Corresponding author: Zalesovsv@m.usfeu.ru

is of minor purpose. Wood in these forests is produced mainly in the process of intermediate felling, sanitary felling and selective felling of mature and overmature plantations. The abovementioned fellings are carried out for plantations (stands) sanitation, for purpose species composition forming and plantations (stands) rejuvenation. The general trend of forest management in protective forests is their environment protective and some other useful functions strengthening.

Operational forests are designed mainly for wood harvesting and stand rejuvenation. Therefore in abovementioned forests besides selective felling of mature and over mature stands clear cuttings are also admitted.

Reserve forests in the near future are not planned include into active exploitation, therefore practically only forest conservancy measures, against insects and diseases measures are practically carried out in these forests.

2 Objects and research methods

Based on legislative and regulatory-technical documents as well as the experience of forestry in protective forests an attempt was made to develop proposals for increasing their area and improving the economy in protective forests using the Ural region as an example.

The research is based on the method of trial plots (TP) and analysis of silvicultural efficiency of management in protective forests, including reforestation and afforestation.

3 Discussion results

In its turn, protective forests are divided into groups of protection categories: forests in specially protected nature territories; forests in hydrologic zones; forests provided with nature and some other object protection functions; valuable forests (table 1).

Table 1 data analysis (1) testifies to their extreme fractionality. In a number of cases some categories of protection can be combined without affecting the final result achieving. With that, forest management can be simplified. So in particular forests of spawning belts and forbidden forest belts along water reservoirs, as concerns their nomination, they are very close to water protected forests. In the forests of abovementioned caugories it is necessary to minimize surface outflow. As it promotes polluting and silting rivers and other reservoirs. Besides, it is necessary in abovementioned plantations to ensure surface outflow transfer into inder soil and minimize unjustified water expenses to woody plants transpiration and evaporation from soil surface. All these are especially important in arid conditions.

Table 1. Groups of protection categories in protected forests.

Groups of protection categories	Forms of protection category
Forests on specially protected nature territories	- forests of state closed wood; - forests of state nature reserves; - forests of national parks; - nature monuments forests; - forests of natural parks.
Forests in hydrologic zones	- forests in hydrologic zones
Forests of nature and some other objects protection	- forests in the 1 st and 2 nd belts for sources of drinking and watersupply protection; - wind - brakes along railroads for general use, federal highways for general use owned by Russian Federation subjects - forest - park zones; - city forests;

	- forests in the 1 st , 2 nd and the 3 rd zones of health improving areas and health resorts sanitary (mountain sanitary), protection districts.
Valuable forests	- state protective forest belts; - anti - erosion forests; - forests of deserts, semideserts, forest steppes, tundra zones, steppes, mountains; - forests of historical or scientific value - nut-tree forest zones; - fruit-tree forests; - stripe of pine forests; - forbidden forest stripes along water objects; - spawning protection forest stripes.

Management in protected forests carried out nowadays doesn't meet up-to-date requirements. The cause is as the following. The highest possibility of the special protective functions is guaranteed only by the process of standing trees of a definite composition and structure planting. The current normative documents do not provide for this task achieving. So, in particular, the wood harvesting regulations for selective felling [Timber harvesting rules and peculiarities of timber harvesting in forestries, forest parks specified in Art. 23 of the Forest Code of the Russian Federation: approved. By order of the Ministry of Natural Resources and Ecology of the Russian Federation on December 1, 2020 N 993] describe only thinning intensity, number of methods, felling site size and sometimes minimal relative density after cutting carrying out. This is explained by the lack of scientifically grounded reference plantings for each of the protection categories that are carrying out protective functions in a highly possible way. When the given standards are available it is possible to achieve referent plantations indices by purposeful improvement felling carrying out as well as selective felling of mature and overmature plantations.

As forest code (1) permits selective felling carrying out in mature and overmature stands in forests of all protection categories except of special protected natural categories it is time to concertize felling methods according to their protection categories on zone (subzone) - topologic base taking into account forest formations.

So, in particular, at present time everywhere voluntarily - selective fellings are carried out in evenaged pine stands. However, they are intended for carrying out in variousaged stands, as well as they are having in view to form various aged stands. These kinds of felling are intended primarily for daku coniferous stands where by cutting out overmature trees the conditions are created for undergrowth accumulation, its transforming into growing stock and as well as for relative density increasing. In other words, at the expense of various generation specimen growing on one territory it is secured constancy of protective functions carrying out by stands. At the expense of increment gaining by forest thinners, after overmature trees moving off stands relative density is increased, that in its turn makes possible to plan the next method of felling.

When deciding the voluntarily - selective felling in pine stands the problem arises what trees should be moved off in even aged forest stands. As a rule it is preferred move off the most bulky and hence the most valuable trees. As a result of felling stands density decreases till the maximum admissible - 0.5. However, the subsequent increasing of relative density, as a rule, is not observed. The attendant generation undergrowth appearing because of its high love for life doesn't form the second growth under parent canopy and perished in 15-20 years.

The stand share left can't increase its relative density because of its considerable age. As a result of felling there appear pine stands of low density with greenward covering under canopy in highly trophic forest type.

It is naturally that when establishing standard stockings there can occur some deviations from them in specific stands forming stipulated by forest growing conditions. So, in its turn,

it is impossible to form mixed stands in very dry and most forest growing condition type, for example upland pine forests, lichen and sphangous ones. However in dominating forest types to solve this problem is quite possible. Thus, O.V. Tolkach [4] has proved in his investigations that on the territory of the Middle Ural mixed dark coniferous stands with 0.6 - 0.7 density having 2 - 3 units of broadleaved species implement hydrologic functions most effectively.

The Ural region is characterized by the presence of enterprises engaged in the extraction and processing of minerals. The latter is associated with the land withdrawe from the forest fund for quarries, pits dumps of wastes of poor ore dressing as well as processing of minerals and so on as a result, significant aseas of disturbed lands that require reclamation are accumulating around industrial enterprises. Our researches have shown that the main direction of reclamation in the mountain conditions of the Urals is forestry. The creation of artificial or natural plantations on formerly disturbed lands significantly improves the ecological situation in the region and the formed localities are often not only not inferior in the productivity to natural plantations growing in the adjacent territories but even surpass them. Thus, Scotch pine stands (*Pinus sylvestris* L.) created at the golden dump of the Reftinsky H.Station (Sverdlovsk region are characterized by the Ia class of bonitet while the meddle bonitet class of the adjacent plantations is II, 2.

Carrying out reclamation works by terracing mountain glopes adjacent to copper smeeing production allows to form full fledged plantations on site of lifeless landscape (fig. 1 and 2) with their inherent components including undergrowth underbrush and field layer.

It should be especially noted that field layer after reclamation works being carried out, the share of plants entered in the Red Data Books of the Sverdlovsk and Chelyabinsk regions increases sharply. Among these species Kachim Urals (*Gypsophila uralensis* Jess.) and kozlets smooth (*Scorzonera glabra* Rupr.) can be distinguished. These speies are found at all elevation gradients at all remediation sites. Which is very important having in view preserving rare and endangered species.



Fig. 1. Exterior view of the mountain slope area without reclamation work.



Fig. 2. Plantation formed on a reclaimed mountain slope.

Reclamation of disturbed lands on the territory of settlements included in green zones allows not only to improve the ecological situation but also creates conditions for good recreation of the population [5, 6]. In particular the mined open pits of tantalum - beryllium can serve after their filling with water as fire reservoirs and reservoirs for growing valuable fish species. On overburden dumps and mining gorges it is possible to successfully create artificial pine plantations that at the age of 42 form a stock of stem wood up to 334 m³/ha.

The examples cited above indicate that afforestation on disturbed lands in protected forests ensures the creation of comfortable conditions for recreations of the population, improvement of the economic situation: deposition of a carbon dioxide significant amount and the release of oxygen and phytoncides, as well as ensures the redistribution flows of variant, the thereby reducing the recreational load on the plantations adjacent to cities and settlements.

The experience got both in the Urals and in other regions shows that both natural and artificial recreational plantings need thinning [7, 8] and other targeted silvicultural activities. Thinning, in particular allows to increase the stability of plantations not only by systematic recreational loads but also by a possible forest fire. The latter is achieved by reducing ground based combustible materials as well by increasing the diameters of trees best for growing.

An addition, thinning carried out in recreational plantations are landscaping, that is, they form aesthetically attractive landscapes.

The additional resource for increasing the area of protective forests can serve plantations formed on excluded out of agricultural use lands [9, 10]. The experience of creating artificial plantations on the planting former plough lands showed that the sukachevs larch (*Larix sukaczewii* Dyl.) stock wood 61 years after planting reaches 740 m³/ha, i. est the average growth is 12.1 m³/ha. The indicated average growth significantly exceeds the same one in the forests of the Ural region. Taming in to account that the increase in wood is an integral indicator of the implementation of ecological function by the forest stands then it becomes

clear the effectiveness of growing artificial plantations from fast-growing tree species on abandoned agricultural land.

According to p. 102 of the Russian Federation Code in protective and operated forests 7 types of specially protected forest sites are singled out additionally.

1) bank (coastal) protective, soil protective forest sites along water reservoirs, gully slopes;

2) forest edges bordering with treeless spaces;

3) forest seed plantations, permanent forest seed sites and some other objects of forest sled industry;

4) forest reserves sites;

5) forest sites with relic and endemic plants;

6) areas inhabited by rare or threatened to be extincted wild animals;

7) other specially protected forest sites.

Normative documents strictly restricts silvicultural measures carrying out on specially protected forest sites. They are as a rule limited only by selective or clear sanitary felling carrying out. The latter, naturally, is not in keeping with the nature of forests and economy purpose of the stands mentioned so, working out the recommendations for forest management implementation on zone (subzone) typologic base for every group of protection category and for specially protected forest is the most actual task.

4 Conclusion

1. Protective forests are of significant ecologic, economic and social importance.
2. The current normative documents as concerns management in protective forests fails to take into account the specificity of their purpose destination in a full degree.
3. Standard protective plantations indices that are carrying into effect purposeful functions in a concrete region in the highest degree has not been worked out till now days.
4. The area of protective forests can be increased due to afforestation on disturbed lands and agricultural lands excluded from agricultural use.
5. The most actual task of forest science and practice is working out the recommendation for forest management carrying out on zone (subzone) typologic base in protected forests and in specially protected forest sites.

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