The Contemporary State of Reforestation in the Territory of the State Forest Fund of the Primorsky Region

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Abstract. Primorsky Krai is a region unique in its biological diversity. However, the state of the forest fund of the region over the past 70 years has significantly changed because of unsystematic logging and forest fires. There is a special attitude towards forest restoration in the region. First of all, there is an opinion that artificial forest regeneration in Primorye is not effectually, because of the natural conditions which allow the forest to grow well itself. The prevalence of naturally regenerated stands in the areas of the state forest fund is a result. However, the reforesting reserves in the region attend significant areas, agro technical care is required in large quantities, mono breed reforestation can not be used everywhere and natural regeneration by economically valuable species is possible after a long period of forest cultivation. To analyse what has been done and planned for the future we can by studying the forest plan of the subject and reports on its implementation, which we tried to do in this work.

1. Introduction
Reforestation ensures the restoration of forest stands, the conservation of the biological diversity of forests and their beneficial functions. The reproduction of logged-of, dead, damaged forests is carried out by their natural, artificial and combined restoration [1, 2, 3, 4].

Natural regeneration of the forest is a biological process, which consists of a several stages, starting from the formation of pollen and fertilization and ending with the formation of closed young stand.

In different natural zones, renewal has its own characteristics (in terms of fruiting, especially in repeatability of seed years, in terms of seed growth, seedling formation and subsequent formation of the young forest generation). Natural regeneration at felling depends not only on the conditions of growth, the method of felling, the width of the cutting area, but also on the observance of the technology of felling and the equipment used in logging [2, 3].

Artificially forest regeneration involves the cultivation of planting material in forest nurseries and solves the problem of creating productive and sustainable plantings, reduces the growing time of the forest stand and helps to improve its quality composition.

2. Formulation of the problem
Changes in the Forest Code in 2007 [1] did not lead to the solving of critical tasks, such as the conservation of forests in Russia. Obtaining high-quality planting material - seedlings and nurseries of the main forest-forming species in sufficient quantities for forest cultural production is one of the...
main problems of forestry in the Primorsky Region [2, 3]. The problems of reforestation on the lands of the forest fund of Russia and the Primorsky Region in particular, are top of mind today.

3. Actuality
A remarkable singularity of the forests of the Primorsky Region is their multi-species composition. Many valuable trees, shrubs and vines grow here. Therefore, the share of clear-cutting in the region is insignificant, the main share of clear-cutting in the territory of the region is selective cutting. The natural regeneration under the canopy is associated both with the type of forest and forest conditions, as well as with the degree of closure of the main canopy, its density and other taxation indicators.

4. The main part
Reforestation objectives are determined by the forest plan of the subject. By analyzing the forest plan (2009-2018) [2], we can see the following changes. The total volume of reforestation over the past 10 years has amounted to 154.1 thousand ha, including forestry crops accounted for 20.1 thousand ha - 13.0%.

![Figure 1. Total volume of reforestation (2009-2018 years)](image)

The change in the volumes of artificial reforestation by years can be traced according to the following diagram. (fig. 2)
Reforestation volumes for the audit period are 121% of the planned amount, the increase in completed volumes was due to a gradual increase in arrangements of promoting the natural regeneration of the forest.

Measures to promote natural regeneration include: preservation of undergrowth and young growth of valuable forest species during logging, care of the undergrowth in non-forested areas, mineralization of the soil surface.

The situation in 2019 in the region, comparably with the previous revision period, has not changed. (fig. 3)

It should be noted that most of the crops were created during the reconstruction of young growths or under the forest canopy, while the forest cultural fund was used poorly. As a result, land was not transferred to forest-covered land. [5]
The cultivation of standard planting material was planned in nurseries in the amount of 60.8 million pcs. seedlings for 10 years or 6.01 million pcs. in year.

In fact, 43.2 million seedlings were grown it is 71.0% of the planned indicators. Nonfulfillment of planned volumes is connected with insufficient funding and the phase out of forest nurseries in the Primorsky Region.

The main timber species in the reproduction of forests in the region is Korean pine. [5]

The amount of seed harvesting was planned in 159.4 tons for 10 years, the actual volume of harvesting was 12.3 tons for 9 years, it is the 8.6% of the planned volume. The reason of nonfulfillment of planned volumes is insufficient funding of this type of works at the expense of the federal treasury. [2]

Of the reforestation fund, 60% is provided by natural regeneration by growing, of which 22.2% are coniferous and 16.7% are hardwood.

On 46.4 thousand hectares of forest land, forest restoration can only be achieved artificially. Affordable forestry fund is 12.1 thousand ha. On non-forested lands, artificial reforestation is required for 188.1 thousand ha (55.7%), 4.2 thousand ha of them are available for economic impact. [2]

After the adoption of the statute on compensatory reforestation, the need for reforestation areas increases, and non-forested lands are reserved for these purposes. [4]

The natural regeneration in the forests of the region is very successful, according to the forest plan the 90% of the stands are provided with undergrowth and young coniferous and hard-leaved species by the main method of forest reproduction in the Primorsky Region for the planned period (2019-2028). [3] The region plans to promote natural renewal on an area of 154.194 thousand hectares in just 10 years.
Figure 5. Reforestation plans from the forest plan (2019 - 2028), ha.

Artificial reforestation on an area of 9105 ha is also planned for the period of activity of the forest plan. Combined reforestation is supposed to be carried into effect out on an area of 1620 hectares in the Kavalerovsky, Roshchinsky and Sergeevsky forest districts. [3]

It is planned to expand the assortment of planted tree species, including larch, spruce and Manchurian fir (*Abies holophylla* Maxim.) during artificial reforestation.

Figure 6. Introduction of species into artificial reforestation by forest districts according to the forest plan (2019 - 2028),%
Though, the situation in the region in 2019 did not change significantly - the Korean pine (*Pinus koraiensis* Siebold & Zucc.) remained the dominant of all species for the purpose of artificial reforestation.

![Figure 7. Artificial reforestation by species (2019), ha.](image)

In general we need 1514 thousand pcs. cedar seedlings, 1204 thousand pcs. larch seedlings, 657 thousand pcs. seedlings of spruce and 78 thousand pcs. Manchurian fir seedlings to implement the recommended plan for creating crops in the region.

It will be required about 4,544 tons of cedar seeds of first class, 322 kg of larch seeds, 66 kg of spruce seed and 90 kg of Manchurian fir to grow such number of seedlings. If we will cultivate only Korean pine, as before, we need about 10,400 kg of seeds of first class annually.

Considering for seed class, it is planned to harvest 13 tons of seeds annually. The harvest years of the Korean pine are repeated once every 3-4 years that’s why the maximum size of the insurance fund is 39,000 kg of Korean pine seeds.

Agro technical weeding is planned to cover all created forestry crops once in the first three years of cultivation [3].

Agro technical care for forestry crops in 2009-2017 years was planned on an area of 14375 thousand ha, or an average of 1597 ha per year.

In fact, over 9 years, agro technical care was carried out on an area of 6476.3 thousand hectares, which is 45%. The main reason for the nonfulfillment of the plan was the insufficient financing of work on the timber compartments which were not rented, and on leased - low economic efficiency of this type of work items [2].
Figure 8. Outturn for agricultural care.

Tending cutting in young stands were planned in 15 thousand ha in 2009-2018 years or 1497 ha annually. In fact, was overtaken about 1.5 thousand ha in 10 years, the 100-400 ha annually, and from 2014 to 2016 the works were not done. As a result, the plan is complete in 10%. The reason of the failure is insufficient financing of tending cutting in young stands by the federal budget resources and nonfulfillment by lessees of their obligations [2].

Figure 9. Volumes of tending cutting in young stands by years, ha.

Whereas, of all types of tending cutting the accretion cutting is dominated other in Primorsky Region[6].
For the upcoming period of the forest plan, it is planned to significantly increase the area of tending cutting in young stands to 1300 ha per year to cover all areas with forestry crops. It is planned to significantly improve the quality of forests in the Primorsky region by conversion cuts, which should be assigned to subsurface and non-closed forest cultures created by the reconstruction method. For the transfer of crops, which grows under the canopy, into the cedar (coniferous) economic section, reconstruction is required on an area of 2.096 thousand ha per year [3].

5. Findings
In general, the failure to meet the planned indicators for the care of forest crops and young stands, when harvesting forest seeds and growing planting material, is associated with repeated restructuring of the State enterprise of the Primorsky region "Primorsky forestry association" and other institutions that performed forestry activities [2].

Reforestation is the most important aspect of sustainable forest management, increasing its effectiveness is the most important task of forestry in the region.

The practice of inaction in this area over the years leads to the depletion of the forest resources of the region. The task of all forest users and those who involved in the forest complex is to ensure a systematic increase in the efficiency of the reforestation work in all stages [6].

The development of reforestation rules for all forest regions of the Primorsky region is very relevant and timely. They should take into account regional features of the reproduction of forest resources and current trends in forest policy. It should be noticed that in the Primorsky region a combined reforestation, in which it is possible to reduce the number of planted seedlings in the presence of reliable undergrowth, is practically not planned.

An important step should also be the work on establishing forest seed business. At the same time, it is necessary to take into account the qualitative component of the harvested seeds and their assortment, which in turn requires the restoration of objects of a permanent forest seed base: plus trees and plantations, forest seed and uterine plantations. It is required to update the database of all existing objects of forest seed business and the subsequent monitoring of newly created objects. As a result of the analysis, we propose a number of measures, the implementation of which will help reforestation to be at the proper level in the Primorsky Region.

It is necessary to conduct an inventory of forest crops, with the establishment of the causes of their death and low preservation, for further diagnosis and elimination of negative causes.
The development of nurseries equipped with refrigeration units for the preservation of seeds, in order to provide seed nurseries in lean years.

Charge tenants with long-term agro technical care for forest planting.

Landing in the best agricultural terms (spring).

Reforestation requires a high level of forest protection from fires.

Reforestation should be given great attention and the approach to it should be competent. We do not urge you to rely on the natural forces of nature, but they are also not worth neglecting. With high-quality natural reforestation, agro technical cares are necessary, in its absence - forest crops. The choice of species composition must be approached with knowledge of forest conditions, and this approach can only be correct if the necessary planting material is available. I would like to believe that reforestation in the Primorsky Region will begin a new round and thereby ensure the preservation of valuable forests of Russia at the Far Eastern borders [7].

6. References

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