Problems arising in recultivation activities

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Abstract. One of the tenets of land legislation is "the priority of land protection as an essential component of the environment and means of production." However, due to ignoring the law, the area of disturbed lands is increasing annually. Conducting restoration work on such lands should be one of the priorities of the state’s internal policy, as well as a meaningful choice of citizens. At the present stage, there are a number of problems due to which recultivation measures rarely achieve optimal results. This paper presents information about the main factors affecting disturbed lands, analyzes the main problems that affect the effectiveness of remediation measures, and also offers suggestions for solving these problems.

The relevance of restoring disturbed lands is quite obvious in the context of global and, in particular, Russian economic instability. To fully ensure the state economy and its sovereignty, "healthy" lands that are capable of producing the necessary volume are needed. It is also necessary to preserve and enhance the national natural heritage in the environmental aspect.

The purpose of this research work is to identify the main modern problems that arise during the recultivation.

The realities of the modern world dictate to man the search for all kinds of ways to implement ideas for obtaining the maximum economic benefit from his activities, forgetting about the long term. So, due to the huge diverse mineral base, the mining industry in the Russian Federation is the most attractive sector of the economy; the organization of landfills and the disposal of municipal solid waste (MSW) is economically more profitable than their recycling; the use of pesticides and agrochemicals is a guarantee of super-profits in agriculture. However, in the pursuit of profit, humanity is losing its main resource - land. Having a unique land fund of 1712.5 million hectares, our state and citizens do not prioritize the conservation of the natural and economic value of the land [1]. Over the past decade alone, the land area of industry has increased by 4.2%, while agricultural land has decreased by 2.8%. However, both industrial and agricultural enterprises are the main threat to the appearance of disturbed lands. According to the latest data, the total area of disturbed lands in our country is 1072.4 thousand hectares. Figure 1 presents data on the area of disturbed land, worked out and recultivated land in the period from 2013 to 2017 [1].

Analyzing the data of the diagram, we can conclude that the value of the area of disturbed lands is unstable, however, despite the fact that the dynamics of reclaimed land is positive, with the exception of 2014, it does not exceed the quantitative indicator of disturbed lands. This is due to the fact that recultivation is often carried out only after the lands have been worked out, because of this, annually the area of disturbed lands can increase by a greater value than the recultivated lands.
Disturbed lands arise due to the manifestation of a negative anthropogenic impact on the natural landscape, which entails a change in the physicochemical and mechanical properties of the soil, as a result of which its basic regimes change, a biogeocenosis changes, and together leads to the formation of the anthropogenic landscape [2].

The main regulatory act governing the implementation of recultivation is the replacement in 2018 of the Government of the Russian Federation Decree No. 140 “On land recultivation, removal and storage, and rational use of the fertile layer” by the Decree of the Government of the Russian Federation No. 800 “On land recultivation and conservation”. This Decree approves the rules for land recultivation and conservation, which contain the basic concepts used in this field, for example, the concepts of “land degradation” and “disturbed land” have become interrelated concepts, and the definition of “reclamation” should include eliminating the effects of soil pollution, restoration of the fertile soil layer and the creation of protective forest stands [3].

Another important point in the rules is that “land recultivation should ensure the restoration of land to a condition suitable for use in accordance with the intended purpose and permitted use, by ensuring that the land quality complies with environmental quality standards and legal requirements” [3]. Thus, one of the criteria for assessing the degree of land restoration is “intended use”, which, as you know, can be changed or established upon. A striking example is the unauthorized dump in the Wolf’s Pad (Olkhonsky district, Irkutsk region). If you find this area on a public cadastral map, the information on which is entered in the Unified State Register of the payers, then you can find conflicting facts (figure 2).

So, the configuration of the site is inaccurate (the boundaries of the land in the figure are shown by a solid line) and automatically determines the wrong area (the actual area is more than 1 ha, the border is shown by a dashed line). The category of land is indicated as “agricultural land”, and as you know, such land is valuable, and whether the permitted use on such land can be “for waste disposal facilities” remains in question. Also, the status of the land plot is indicated as “temporary”, the year when the status was established is also not indicated, but in reality an unauthorized dump has been located on it for more than 10 years. The situation becomes even more controversial with the fact that this territory is also referred to the territory of the Baikal National Park. In this case, before carrying out restoration measures, it is necessary to establish the form of ownership, clarify the category of land, as well as the intended purpose and permitted use, since according to the legislation this is the basis for the standards for recultivation. From a rational point of view, to take for the minimum level of land quality achieved, it would be reasonable to take the background indicators of this territory, with its peculiarity and originality.

**Figure 1.** Area of disturbed land, worked out and recultivated land for the period from 2013-2017.
One of the major shortcomings of the law is the concept of “self-growth”. If land plots that have been damaged are located in a sparsely populated area, where soil fertility is low, then such land can be left to natural overgrowth. However, this method is unacceptable for ecosystem restoration. For example, the forests of the Appalachian mountain system, located in North America, were strongly negatively impacted in the 20th century due to active coal mining. Many efforts to restore these forests only led to the growth of heterogeneous grass and shrubs. To restore these lands and the potential of the forest, scientists have developed a special technique called the Forestry Reclamation Approach, which includes 12 recommendations for planting valuable hardwood trees, increasing their survival rate, accelerating the process of creating forest habitats through natural succession [4]. Therefore, to prevent foreign mistakes, such a concept as “self-growth” in the field of recultivation should be eradicated.

Modern recultivation measures are not a panacea and do not guarantee the full restoration of degraded lands to their original state, which raises the question - why can't the recultivation reach 100% result?

Firstly, in accordance with Article 8.7 of the Code of the Russian Federation on Administrative Offenses dated December 30, 2001 No. 195-FZ, administrative liability is provided, and a fine is imposed for non-fulfillment of land recultivation or untimely fulfillment, the amount of which depends on the person who caused the violation of the land, natural (from 20 thousand to 100 thousand rubles) or legal (from 400 thousand to 700 thousand rubles) entity [5]. In this case, the recultivation is a lifeline for the “violators”, however, the restoration is also quite expensive, which results in the first problem.

Secondly, along with high cost, a decreasing factor in the effectiveness of remediation measures is the increased complexity of their implementation. An organization or individual does not always have special equipment and machinery for carrying out full-fledged remediation activities. So, during the reclamation of a quarry for mining, at one stage it is necessary to apply a potentially fertile layer of soil, such a layer should have similar physical, mechanical and agrochemical properties. According to Rosprirodnadzor (table 1), the volume of the removed and stored fertile soil layer in the Russian Federation decreases every year.

| Table 1. Removal and use of the fertile soil layer. |
|---------------------------------------------------|
| 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|
| The fertile soil layer removed, million m³ | 1228.5 | 373.6 | 354.2 | 227.8 |

Figure 2. The location of the dump in the Wolf fall.
One of the main reasons for which the volume of removal and storage of the fertile soil layer reduces is the problem of the lack of appropriate modern equipment for the correct removal of the layer, as well as the difficulty of storing the fertile layer for a long time.

The third problem leading to a decrease in effective indicators of recultivation is the inconsistency with current trends in the actual situation in the country. Currently, in the Russian Federation more than 70 million tons of garbage are generated annually without the possibility of its legal disposal due to the absence of a waste recycling complex. On 1 January, 2019, the “garbage reform” came into force, the primary task of which was the elimination of unauthorized dumps and the creation of the processing industry. Currently, there are no modern SMW grounds in the Irkutsk Region, the existing ones are 60% full and some have been in operation for more than 50 years. Since 2019, according to the “garbage reform,” the Regional Operator is in charge of carrying out the full cycle of waste management with the funds collected from the owner as a tariff for handling solid municipal waste [6].

However, in January 2020, “garbage reform” was recognized as ineffective, due to the incomplete awareness of the population about the tariff component for handling SMW, the appearance of shadow operators on the market and the lack of modern sanctioned SMW grounds. Every year in our country there are new centers of natural dumps, and it is extremely difficult to eliminate them in modern conditions. On the one hand, eliminating dumps through burial is a morally obsolete method that is quite costly and environmentally unreasonable. On the other hand, in the Russian Federation there is no sufficient level of equipment for the waste recycling complex that can eliminate the problem of waste recycling. Ultimately, unauthorized dumps continue to appear and grow. In contrast to the Russian garbage system there is the most advanced waste management system in the Republic of Korea. A separate system for the disposal of recyclable waste and a basis on a fee based on the amount of garbage (for the removal of general and food waste) has been the foundation of waste management in the country for decades. The Extended Manufacturer Responsibility Scheme (EPR) in Korea obliges product manufacturers to collect and recycle waste generated from their products, even more stringent restrictions apply to the use of disposable goods. In 2017, every Korean citizen threw out 1.02 kilograms of household waste every day, which is only a third of the 1991 level. Over the same period, the waste recycling ratio in Korea increased to 86% [7]. Apparently, using similar measures in the Russian Federation, it would be possible to prevent the garbage crisis.

Another important problem leading to inefficiency of recultivation measures is the non-use of land for its intended purpose [8]. In 2018, according to the Rosselkhoznadzor, 713.6 thousand hectares of agricultural land were identified, overgrown with weeds, trees and shrubs, due to the lack of measures to improve and protect the lands and their complete non-use. The largest areas were identified in the Northwestern (59.61%), Ural (28.78%), Far Eastern (24.49%) and Central (20.59%) federal districts [1]. Along with the problem of land non-use for its intended purpose, there is a problem of replacing recultivated land, which has an earlier great value for society in the global sense, with land with lower agrotechnical and soil-chemical characteristics [9].

It is difficult to find the correct solution to the above problems affecting the result of recultivation activities in the current economic, environmental and social situation. To solve problems with deviation from the recultivation project, due to the high cost of the measures and simplifying the owner’s responsibilities for carrying out these works, the option of creating a “recultivation department” is possible. It will be in the federal government and will be responsible for the full-fledged development of project documentation on recultivation by competent specialists, as well as direct reproduction of this project in kind, at the expense of the owner, tenant of the land plot, or of the person who the suffered the land violation (figure 3).

Now it is relevant:

| The fertile soil layer used for recultivation, mln.m³ | 1114.6 | 463.9 | 237.8 | 101.5 |
|-----------------------------------------------------|--------|-------|-------|-------|
| Fertilized soil layer stockpiled (at the end of the year), million m³ | 752.1  | 331.9 | 473.6 | 421.7 |
• to inform the population on the need for rational treatment of MSW,
• to introduce the ecological lifestyle,
• to adjust the “garbage reform” program in accordance with the current situation in the country (amending the unified goal of the reform, the consistency and transparency of its structure, the organization of clear rights and obligations of regional operators and the population, specification of the person responsible for the reform),
• to improve this situation in accordance with the modern world trends.

Figure 3. An approximate scheme of the “recultivation department”.

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