

# To the condition of the territory of unauthorised disposal of alcohol production waste

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**Abstract.** The article presents the results of a study of the vegetation cover of an unauthorized landfill for alcohol production waste, which is harmful to the environment, biota and public health. Pogigon is located on the territory of the Samarskaya Luka National Park (Rozhdestveno village, Samara region, Russia). The authors established and studied 102 survey sites. The growth of 41 plant species, mainly related to weeds and weed-ruderal representatives, was revealed. Based on the results of studying the vegetation cover, the landfill territory is divided into 4 zones: a concreted zone with accumulated solid domestic rubbish, a zone of alcoholic waste accumulation without vegetation, a zone with strongly degraded plant communities, a zone with weed-ruderal vegetation. The degree of transformation of the vegetation cover under the influence of the alcohol waste landfill was determined.

## 1 Introduction

Environmental pollution is a significant threat to the stability of ecosystems, and also reduces the quality of life of the population. In this regard, the study of the impact of landfills for accumulation and disposal of human production and household waste on the environment is of undoubted relevance and scientific and practical importance [1, 4, 10].

There are 21 waste disposal facilities on the territory of Samara Oblast, but only three of them have been created in accordance with modern quality projects. The rest of the facilities do not have clear acts of commissioning, their operation is carried out with gross violations of the norms established by the legislation, including in the field of ecology. The total number of unauthorised dumps in Samara Oblast is about 500 (according to municipal administrations). According to expert estimates, there are actually more than 2,000 of them, and the volume of waste accumulated on them (10.6 million m<sup>3</sup> or 2,385,000 tonnes) is comparable to the filling volumes of the largest organised polygon.

In the Samara Oblast (European part of Russia, Volga Basin), as early as 2012, an unauthorised landfill was discovered that had accumulated a significant amount of industrial waste from alcohol production in Rozhdestveno village. At that time, a persistent

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unpleasant odour was spreading within the city limits of Samara on the other side of the Volga River, as well as on the territory of Samarskaya Luka in the vicinity of Rozhdestveno village. An inspection of the area revealed that the local distillery did not dispose of production waste, but illegally discharged it on the territory of the Samarskaya Luka National Park [11]. Much later, a decision was made to reclaim this polygon, which was to be completed in 2023.

The aim of our research was to study the state of vegetation cover at the time of the maximum environmental impact of the polygon before the start of reclamation works

## 2 Materials and methods

The study area is located in southeastern European Russia in the middle course of the Volga River between 54°88'7903"N and 51°77'4088"N and 45°79'79"E and 52°56'6412"E. The climate of the region is continental, with sharp temperature contrasts, short transitional seasons, cold winters, hot summers, moisture deficit, high solar radiation, and high probability of spring and fall frosts. The amount of annual precipitation from the northern boundary of the region to the southern boundary decreases from 400 to 250 mm. Duration of the vegetation period from north to south increases from 130 to 160 days. Chernozem, gray forest, dark chestnut and alluvial (floodplain) soil types are typical for the Middle Volga region.

The studied polygon is located on Samarskaya Luka, within the boundaries of the national park of the same name and the key ornithological territory (Figure 1). It was revealed that the landfill had existed on the outskirts of Rozhdestveno village for several years. The illegal dump accumulated not only alcohol production wastes, but also household wastes transported by the local population. As the waste accumulated, the negative impact on the environment continuously increased. Disposal of distillery waste ceased in 2015 and significant degradation of plant communities was observed.



**Fig. 1.** Location of the polygon near the village of Rozhdestveno (Samara Oblast).

In order to stabilise the environmental situation, the area of unauthorised alcohol waste disposal should be reclaimed. The liquidation of this landfill in Samara Oblast was scheduled for 2022-2023. One of the important stages of reclamation is a preliminary analysis of the state of vegetation cover and determination of the degree of its anthropogenic transformation.

An earth embankment runs along the perimeter of the landfill, which can be considered the boundary of the area of maximum anthropogenic impact (Figure 2). The site in the southern part of the landfill site faces the low-rise residential area of Rozhdestveno village. The site represents a fragment of the agro-landscape, being a part of Rozhdestveno village. The periphery of the site is used as cattle pasture. Agricultural land is located in the immediate vicinity.

During the works, floristic, geobotanical and ecological methods were used to study the vegetation cover of the territory. The results of the study can be used to assess the state of vegetation cover in similar circumstances and identify further changes in the territory, including during reclamation. Field work was carried out by route and semi-stationary methods [2-4, 9, 12] on the territory of the site and buffer zone.



**Fig. 2.** Type of polygon (photo by O. Kozlovskaya).

### 3 Results and Discussion

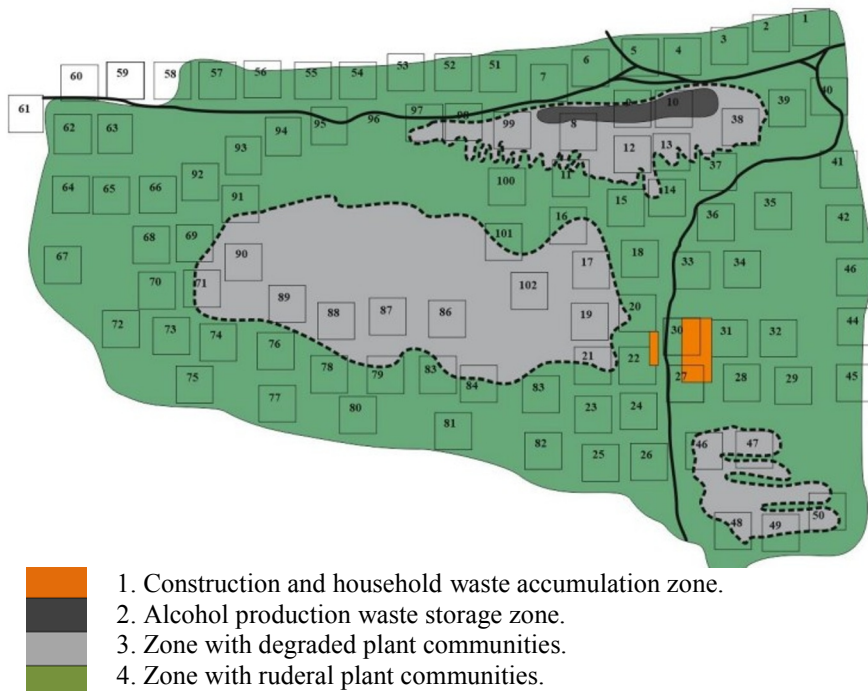
The territory of the planned reclamation works is a site consisting of areas with varying degrees of overgrowth of ruderal vegetation, with single shrubs and trees. Specific features of spatial distribution of plants are related to the type of anthropogenic impact - burial of alcohol production waste, creation of a soil embankment, as well as the use of the former part of the territory as agricultural land and cattle grazing.

During the works 102 sample areas of 10 by 10 m were studied. During the study period, as well as taking into account archival, published data and collection materials, the flora of the polygon is represented by 41 plant species. On the studied sites degraded plant communities differ in floristic composition, number of species, formation and structure.

Species characterised by high abundance in the study area are as follows *Chelidonium majus* L., *Cannabis sativa* L., *Amaranthus albus* L., *Chenopodium album* L., *Chenopodium*

*glaucum* L., *Capsella bursa-pastoris* (L.) Medik., *Lepidium ruderae* L., *Nonea pulla* DC., *Linaria vulgaris* Mill., *Ambrosia trifida* L., *Arctium lappa* L.

Floristically poor communities were observed on the partially concreted site (Zone 1) with the largest accumulation of rubbish. Some household rubbish is stored along the side of the dirt road. In part of the territory there were areas where distillery waste (bard) came to the surface (Zone 2), where vegetation cover was absent. Accumulations of household rubbish were noted on the slopes. In part of the area (Zone 3) a soil layer was removed and an embankment formed, with a small number of plant species recorded within the embankment. The relative flatness of the site and the poor taxonomic composition of the flora (Zone 4) is indicative of both ploughing in most parts of the site and the long-term impact of alcohol industry waste disposal (Figure 3).



**Fig. 3.** Ecological and floristic zoning of the polygon in Rozhdestveno village.

Rare plants protected at the regional and federal level [7, 8] are not registered in the study area.

No special fauna studies have been carried out. However, nesting sites of birds and animal burrows were not recorded. There are only isolated cases of vertebrates entering the site in search of food or during migration. Invertebrate animals were recorded in small numbers and their species composition and abundance differ significantly from neighbouring areas.

## 4 Conclusions

In Samara Oblast, work on studying the impact of landfills on the environment, biota and public health is carried out in different areas [5-6, 11], but the condition of this site within the boundaries of the Samarskaya Luka National Park causes alarm on the part of researchers and the public. The site was used for a long time as a polygon for the discharge

of alcohol production waste, which stopped only in 2015. After that, the polygon was used as a pasture and for solid waste disposal. All this has led to degradation of the vegetation cover, with 40% of the area destroyed and 60% heavily transformed. The flora of the polygon includes 41 plant species belonging to the weed group. There are no rare plant species. Fauna on the territory of the landfill has an insignificant number of species, mainly synanthropic.

Specific features of the spatial distribution of plants on the landfill territory are related to the type of technogenic impact - burial of alcohol production wastes, creation of a soil embankment, as well as the use of the former part of the territory as agricultural land and pasture for cattle.

The vegetation cover of the surveyed area is subject to strong transformation, in general the condition of the territory can be characterised as unsatisfactory. At present, the reclamation of the site has not been completed and is postponed until 2024.

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