Fighting forest and landscape fires in forestry

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Abstract. Wildfire is a serious disastrous phenomenon for nature and the population of our country and the whole world. Wildfires, which result in enormous economic losses, take a toll in human life and affect ecosystems, are a fundamental problem. The article assesses the fire hazards of Leshchevskoe forestry in the Volgograd region. The total area of the forest fund of the forestry is 17004 ha. The area covered by forests is 9313 ha. According to the forest zoning the territory of Leshchevskoe forestry attributed to the steppe region of the European part of Russia of the steppe forest zone. The article contains natural and climatic characteristics of the forestry territories, the indicators of the characteristics of forest and non-forest zones of the forestry fund, the fire hazard classes, the tree species composition and the major forest types. The main causes of forest fires and factors that increase the fire risks of forestry have been identified. The list and terms of measures for the organization of monitoring and control of fire hazards in forests and forest fires, as well as measures for the organization of fire detection, inventory and monitoring systems on the territory of Leshchevskoe forestry are set out.

1. Introduction

Wildfire is a serious disastrous phenomenon for nature and the population of our country and the whole world. Wildfires, which result in enormous economic losses, take a toll in human life and affect ecosystems, are a fundamental problem. Fire causes damage to forestry, agriculture and human settlement [1].

In January 2021, Federal Act No. 454 of 22 December 2020 “On Amendments on Certain Legislative Acts of the Russian Federation in terms of improving activities in the field of fire safety” came into force. The Law introduced a new term - “landscape fire”, and gave a new definition of wildfire. Now these concepts are presented in the Federal Act “On Fire Safety” as follows: “landscape(natural) fire - uncontrolled combustion process, that spontaneously emerging and spreading to nearby surroundings, covering various landscape components”; “wildfire is a type of landscape (natural) fire, spreading in forest” [2].

The causes of wildfires are in many ways connected with geographical and meteorological conditions. There is also a distinction in the frequency of wildfires: long-term, one-year, seasonal, daily. It is connected with alternation of dry and wet periods, with seasonal and daily changes in weather conditions, with a forest type and so on.

This article presents the research of fire hazards on the territory of Leshchevskoe forestry of the
Volgograd region and analyzes the measures on organization of monitoring of fire hazards in forests and on organization of wildfire detection systems.

2. Materials and methods

Research material included:
- fire threat monitoring data in the forests of the Volgograd region;
- the forestry regulation of Leshchevskoe forestry [3];
- particular provisions of the appropriate legal and regulatory instruments of Russia and departmental normative documents [4, 5, 6, 7, 8], related to Forestry;
- requirements of the legislative and regulatory documents in the field of ensuring Fire Safety [2, 9, 10].

3. Results and discussion

Leshchevskoe forestry is located in the south-eastern part of the Volgograd region in the territory of the Leninsky and partially Svetloyarsky district (Table 1). Forest fund of the forestry is located in close proximity to the town Leninsk. Leshchevskoe forestry is bordered to the North by Sredneahtubinskoye, to the South and West by Svetloyarskoe forestry and to the East by the Astrakhan region.

Table 1. Structure of Leshchevskoe forestry.

| No. | Forest district name | Administrative district (Municipality) | Total area, ha |
|-----|----------------------|----------------------------------------|----------------|
| 1   | Leshchevskoe         | Leninsky                               | 4741           |
|     |                      | Svetloyarsky                           | 5323           |
| 2   | Karshevitskoe        | Leninsky                               | 6940           |
| Total for the forestry                        |                                        | 17004          |

The climate on the territory of the forestry is continental and extremely dry. The maximum temperatures in some years ranging from 40-45 °C. The cold period lasts from the middle of November until the end of March, but the real winter with the steady snow cover comes in the middle of December. The annual amplitude of air temperature reaches 33-35°, the average rainfall is just over 300 mm, while the rate of evaporation is above 800 mm [11].

While the average temperature of the coldest month is about -9 °C, in some winters with about 20% coverage heavy frosts may happen with the temperature falling down below -25 °C…-35 °C.

The total area of the forest fund of the forestry as of January 2021, is 17004 ha (Table 2). The area covered by forests is 9313 ha. According to the forest zoning the territory of Leshchevskoe forestry attributed to the steppe region of the European part of Russia of the steppe forest zone [3].

The characteristics of the forest fund lands of the forestry given in this table show that, the area of forest lands is 60.1% of the total forestry area. While 54.7% of the land is covered with forest vegetation, including 8.8% of forest crops.

Table 2. Characteristics of forest and non-forest zones of the forest fund on the territory of Leshchevskoe forestry

| Indicators of land characteristics | Total for the forestry |
|-----------------------------------|------------------------|
| Area, ha                          | %                      |
| 1                                 | 2                      |
| The total area of the lands       | 17004                  | 100.0                  |
Indicators of land characteristics

| Total for the forestry | Area, ha | %  |
|------------------------|----------|----|
| Forest lands, total    | 10211    | 60.1|
| Lands covered with forest vegetation, total | 9290 | 54.7 |
| Non-forest lands, total | 921 | 5.4 |
| Including:             |          |    |
| forest zones which had not reached the normative level of canopy cover | 72 | 0.4 |
| forest nurseries, plantations | - | - |
| natural glades         | -        | -  |
| burned-out forests     | 220      | 1.3 |
| deforestation          | 106      | 0.6 |
| wastelands             | 523      | 3.1 |
| Non-forest lands, total | 6793    | 39.9 |
| Including:             |          |    |
| biofields              | -        | -  |
| arable lands           | 9        | -  |
| hayfields              | 435      | 2.5 |
| pasture                | 2239     | 13.2|
| waters                 | 1912     | 11.2|
| gardens                | -        | -  |
| roads, clearings       | 126      | 0.7 |
| estates                | 114      | 0.7 |
| marshes                | 691      | 4.1 |
| sands                  | 626      | 3.7 |
| other lands            | 641      | 3.8 |

And an important point, that characterizes the potential inflammability of woodland and defines the conditions for the emergence and development of wildfires is the existence and ratio between the stands of different forest types and species composition of the forest (Table 3).

In accordance with “Form 3.2 GLR. Characteristics of fire-fighting equipment of forests” of the sectoral statistical reporting for 01.01.2021 in the Volgograd region, the average fire hazard class for the forestry is 4.2 and is distributed as follows:

- class I – 238 ha;
- class II – 481 ha;
- class III – 1791 ha;
- class IV – 8144 ha;
- class V – 6350 ha.
Table 3. Information about the distribution of forests of Leshchevskoe forestry, according to the species composition of the forest.

| No. | Names of tree species      | Area, ha |
|-----|---------------------------|---------|
| 1   | Pine                      | 61      |
| 2   | Oak                       | 5036    |
| 3   | Ash                       | 2665    |
| 4   | Elm                       | 56      |
| 5   | Acacia                    | 6       |
| 6   | Poplar                    | 1240    |
| 7   | Willow                    | 53      |
| 8   | Apple tree                | 6       |
| 9   | Marsh elder               | 25      |
| 10  | Currant                   | 94      |
| 11  | Hawthorn                  | 1       |
| 12  | Other shrubs              | 31      |
| 13  | Other tree species        | 39      |
|     | Total                     | 9313    |

A significant part of the forestry fund lands (2510 ha or 15%) relates to the I, II and III classes of natural fire hazard, the most dangerous in relation to fire.

Special protection of forests from fires is responsible for the forest areas, which are classified into the following categories of protected forests:

- forests, located in water protection zones;
- forests, performing protection functions of natural or other objects;
- young growths of coniferous and economically valuable species;
- ripe stands with undergrowth of valuable species.

Factors that increase fire hazards of Leshchevskoe forestry are:

- rugged relief;
- frequent droughts with strong and dry winds;
- significant littering of forests;
- high transport accessibility for inhabitants of towns and human settlements in the surrounding area;
- recreational and other use of forests;
- highway of Srednyaya Akhtuba-Leshchev;
- highway of Leninsk-Leshchev;
- highway of Leninsk-Karshevitoe.

In accordance with the Order of Forestry Agency of 05.08.2020 No.753 “On the establishment of forest fire zoning of Forestry Fund lands and recognition invalid the Order of the Federal Forestry Agency of 07.06.2018 No.468” forests of the Volgograd region are classified as a ground detection and extinguishing zone.

The agents of the specialized state budgetary institution of the Volgograd region “Leshchevskoe forestry” monitor fire hazards in forests and wildfires.

The list and terms of measures on organization of monitoring and control of fire hazards in forests
and wildfires [9]:

1. Organization of monitoring of the forest fire situation through the Information system for remote monitoring of forest Fires of the Federal Forestry Agency – every day, during the fire season.

2. Organization of monitoring while carrying out ground patrol of forests on approved routes and raiding by the State Forestry Inspectors, and also by the Forest fire station forces - during the fire season on the developed routes in accordance with the patrol schedule.

3. Organization of monitoring from observation points - during the fire season in accordance with the Order of the Russian Ministry of Natural Resources of 23.06.2014 No. 276.

4. Identification and accounting of fire hazards classes depending on the weather conditions - every day, during the fire season.

The list and terms of measures on organization of fire detection systems, accounting of fires, and the monitoring system of their development:

1. Organization of monitoring and wildfire detection through the Information system for remote monitoring of forest Fires of the Federal Forestry Agency - every day, during the fire season.

2. Forest inspection in order to detect wildfires is carried out during the fire season in forests depending on the weather conditions (fire hazard class):
   - at II fire hazard class in 10, 13, 16, 19 hours;
   - at III fire hazard class - from 10 to 20 hours at least once every two hours;
   - at IV fire hazard class - from 9 to 21 hours at least once an hour;
   - at V fire hazard class - from 6 to 24 hours at least once an hour;

3. Organization of monitoring and wildfire detection while carrying out ground patrol of forests by the Forest fire station forces.

4. Organization and implementation of ground patrols aimed to monitor fire hazards in forests and wildfires by the State Forestry Inspectors - during the fire season on the developed and approved routes in accordance with the patrol schedule.

5. Accounting of wildfires by the specialized dispatch service - during the fire season.

   Ground patrol of forests that aimed to monitor fire hazards in forests and wildfires is carried out by the Specialized State Budgetary Institution of the Volgograd region “Leshchevskoe forestry” on routes No. 1a, 1b, 1v, 1g.

   The period of patrolling, its length, frequency and time depend on the fire hazard class in forests according to the weather conditions and the natural fire hazard class of forests.

   Ground patrol of forests aimed to monitor fire hazards in forests and wildfires can be carried out by the state forest inspectors of the forestry according to the approved routes and schedules.

4. Conclusion

The actual fire-dangerous season in the forestry lasts from April till October. The duration of the fire season depends on melting and formation of snow cover, as well as on anthropogenic pressures on forest lands, which rise from year to year, that significantly increases fire hazards of the forestry area. The main cause of wildfires on the territory of Leshchevskoe forestry is unidentified causes. That is why it is necessary to plan the works on firefighting management and carry out fire prevention activities to reduce forest burning of the territory of Leshchevskoe forestry.

References

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