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V. V. Usenya¹, N. V. Gordey¹, G. Ya. Klimchik², L. I. Mukhurov²¹Institute of Forest of the National Academy of Sciences of Belarus²Belarusian State Technological University**METHOD FOR DETERMINING THE RISK OF FIRE FOREST
UNDER WEATHER ON THE TERRITORY OF BELARUS**

For two fire seasons in pine plantations in the observation points has been determined the dynamics of their class of fire danger due to weather conditions depending on meteorological factors. Revealed that the main factors affecting the inflammability forest fuel are rainfall, temperature and relative humidity, forestry and taxation data plantations. When precipitation of up to 10 mm average moisture content of forest combustible materials below 1.5 times, while their more (10 mm or more) – 1.1 times. The total amount of precipitation received under the canopy of pine plantations by 40–60% lower than in open terrain.

Write-off of complex refractive inflammability forests after loss of 5 mm and a sieging is done by multiplying its value by a factor of 0.1 for each mm of precipitation, followed by its increase in dry day. Total cancellation of the complex index inflammability forests produced a roll of the day more than 10 mm of rain.

On the basis of studies to develop techniques for determining forest fire danger due to weather conditions in the Republic of Belarus.

Key words: method, forest fire, class fire risk due to weather conditions, hydrometeorological observations, scale of fire risk.

Introduction. In the Republic of Belarus one of the most urgent problems of forestry is to protect forests from fires.

Currently, the monitoring and forecasting of forest fires is carried out in accordance with STB 1408-2003 “Safety in emergency situations. Monitoring and forecasting of forest fires” on the basis of the of fire-danger scale of forests by N. A. Dichenkov, allowing to determine the class of fire danger of forests on weather conditions [1].

Determination of fire danger class of forests on weather conditions for establishments of forestry of the Republic of Belarus is made by the Weather Bureau on the basis of data obtained from all available weather stations of the Republic. This information for the last days and short-term (up to 3 days) forecast of fire danger of forests in regions and districts in the form of contour lines of different colors according to the classes of fire danger is applied to synoptic maps and delivered to the forestry authorities. Presented data are the basis for the forestry enterprises to take the necessary measures to prevent the possibility of occurrence and spreading of fires and regulating the work.

Analysis of forest fires in the forests of Belarus during the last years, especially in spring and autumn maxima of the fire, showed the discrepancy of the class of fire danger of forests to the weather conditions and their fire danger [2]. Climatic conditions are the most volatile factor that has a big impact on the fire hazard of forests [3].

In this connection there was a necessity to improve the current scale forest fire danger based

on weather conditions and to develop the methods for determining forest fire danger based on weather conditions, which will provide an objective assessment of fire danger of forests and improvement of regulation of operation of forest fire services.

Main part. For the objective evaluation of weather conditions of emergence of fires in forest areas the integration of the main meteorological factors that determine fire danger of forest combustible materials is used, it allows to set the state of fire danger in the woods for the day and make its short-term forecast. System for determining risk of forests fire must take into account the role of weather conditions, both in space and in time, differ rapidly, accuracy assessment and practical application.

To improve the methodology for assessing forests fire by weather conditions in pine stands of II–IV age classes mossy, Heather, fern forest types with a density of 0.8–1.0, and clearings of pine forests mossy stationary observation points were laid by us.

The observation points were located in three climatic regions of the Republic: the Northern (Dvinsky experimental wood base of Institute of wood of NAS of Belarus, Central (Negorelsky leshoz) and South (Korenevsky ALB Institute of forest of NAS of Belarus).

The distance from the observation points to the nearest weather station was not more than 25 km.

In studying the effect of precipitation on forests fire the amount of rainfall for different periods (1, 5, 10, 15, 20, 25 days) was determined. After precipitation and drying ground forest com-

bustible materials (FCM) was estimated using meteorological conditions at different increasing daily weather indicators. We investigated the effect of rainfall on drying time surface FCM to the state of fire. We also established the most effective period of accounting of the precipitation, defining the fire of the ground FCM, to identify the number of days required for the summation of the precipitation.

The rate of forests fire for each day of the fire season was determined at the definite time of a day (2 pm).

Based on obtained meteorological data (air temperature, dew point and the number of days without rain) at the observation points was determined by the complex index of forests fire was determined.

The studies revealed that the main factors influencing combustible forest materials fire are the amount of precipitation, temperature and relative humidity, silvicultural-taxation characteristics of plantations.

It is established that when precipitation is up to 10 mm the average moisture of forest combustible materials is 1.5 times lower, and when it is more (10 mm and more) – 1.1 times. The total amount of precipitation entering under the canopy of pine plantations, is 40–60% lower than in open terrain. Daily temperature above 22°C promotes the rapid evaporation of moisture from FCM, which is accumulated in the ground of combustible materials after precipitation in an amount up to 5 mm. Thus, when determining the integrated fire index it should be perfect to perform its reset in the cases where for last days 5.0 mm and more precipitation has dropped.

On the basis of the conducted researches we improved the current system of scale of fire danger in woods on weather conditions in the Weather Bureau (Table).

The calculation of the integrated indicator of forest fire danger on weather conditions is done on the basis of the following indicators: air temperature (t), dewpoint temperature (t_d); number of days after the rain, including the last day of precipitation

(dry days) (n). A day during which the amount of precipitation was not more than 5.0 mm is considered dry.

Measurements of air temperature, dew point temperature and precipitation are carried out every day on the stationary points of hydrometeorological observations by appropriate means of measurement.

The air temperature is determined by the dry bulb of the stational psychrometer, dew point temperature – according to the psychrometrical tables on the basis of records on dry and wet thermometers, the amount of precipitation by Tretyakov precipitation gauge or other measuring means.

Air temperature (°C) and dewpoint temperature (°C) are measured at 2 pm. The amount of precipitation (mm) is determined for the previous day, i.e. for the period since 2 pm of the previous day. The air temperature and dewpoint temperature are measured with an accuracy of 0.1°C, rainfall with accuracy to 0.5 mm.

The integrated indicator of forest fire danger based on weather conditions of the current day is calculated according to the formula

$$G = \sum_1^n (t - t_d)t,$$

where G – the complex index of fire danger of forests on weather conditions; t – air temperature, °C; t_d – the dew point temperature, °C; n – the number of dry days.

A complex index is composed of indicators of fire danger for the dry season.

The write-off of the complex index of fire danger of forests after precipitations of 5 mm or more of rainfall is done by multiplying its value by 0.1 of each millimeter of precipitation, followed its increase in dry days.

A complete write-off of the complex index of fire danger of forests is done at more than 10 mm of precipitation a day.

Class of forest fire danger based on weather conditions is determined on the basis of a complex indicator of forests fire according to the Table.

The scale of forest fire danger based on weather conditions

The amount of precipitation during the 10 days, mm	Classes of fire danger (fire)				
	I full non-fire under the forest canopy	II weak	III average	IV high	V extreme
	The complex index of fire danger				
5–15	Less than 130	131–500	501–4,000	4,001–10,000	More than 10,000
16–25	Less than 230	231–600	601–4,000	4,001–10,000	More than 10,000
26 and more	Less than 330	331–700	701–4,000	4,001–10,000	More than 10,000

The amount of precipitation for the previous 10 days is calculated only in those cases when more than 5.0 mm of rain fell in the previous day, i.e. when the complex index of forests fire is written off. In these cases, the class of forest fire danger based on weather conditions is determined by the scale line of the table that corresponds to the amount of precipitation. In the following days when determining the fire danger class we use this scale line until 11 more than 5.0 mm of rain fall again. Then we again count the amount of precipitation over the past 10 days and by the scale line corresponding to the obtained amount of precipitation, the class of forests fire is determined.

The first calculation of fire risk classes of forests on weather conditions after disappearance of the snow cover is produced by using the bottom

line of the scale table. Further evaluation of fire risk classes of forests on weather conditions is carried out before the end of the fire season.

Conclusion. We conducted research on the improvement of the current scale of fire danger in the system of Hydrometeorological centre on weather conditions, and the method of determining the forest fire danger based on weather conditions in the Republic of Belarus is developed, which is included in the register of technical regulatory legal acts of the Ministry of forestry No. 242 dated 24.03.2014.

The methodology sets out the requirements for criteria and indicators defining forest fire danger based on weather conditions in the Republic of Belarus and provides a more objective assessment of fire danger of forests and the improvement of regulation of forest fire services.

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