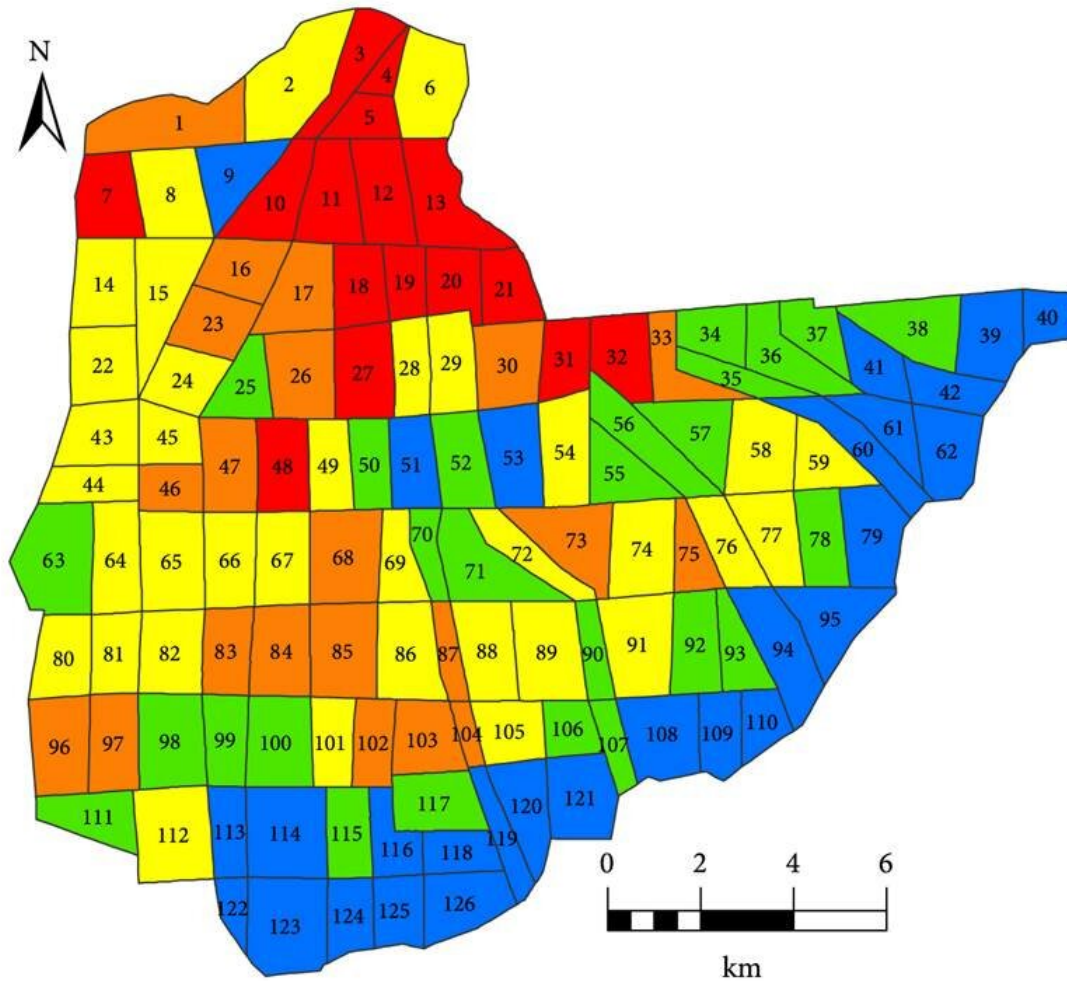


# Scientists identify fire hazard areas in forests near Lake Baikal

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Map with forest fire danger level. Credit: Tomsk Polytechnic University (TPU)

Scientists from Tomsk Polytechnic University are developing a system for predicting the likelihood of forest fires. Using Gilbirinsky Forestry in the basin of Lake Baikal, they created a map of the territory and identified forest areas where the likelihood of fire emergency is the highest due to the vegetative conditions of the territory itself. This data will underpin a geographic information system (GIS) for predicting wildfires.

Nikolay Baranovsky, project leader, associate professor from the TPU Butakov Research Center says, "What are the ways to fight [forest fires](#)? Either predict them to prevent or localize to the smallest areas, or extinguish the fires covering larger areas. We believe that predicting is the most optimal way. It is less expensive and safer for people involved in firefighting. To predict forest fires, we should take into account some important aspects. First, the appearance and spread of [fire](#) are affected by the peculiarities of territory itself: What species of trees, herbs and so on are there. Second, meteorological conditions, including heat, wind, [thunderstorm activity](#) in a territory. Third: human activities such as enterprise operation, trivial bonfires in the forest also affect the situation."

All of these factors can be predicted. Scientists from Tomsk Polytechnic University and their colleagues are working on such a predicting geographic information system to take into account all the factors. They have already developed a model to estimate the anthropogenic impact on a forest area. They created a mathematical model for evaluating the effect of human activities on a forest territory. The scientists consider point, linear, and area objects. For example, campgrounds and settlements are point objects, whereas roads are linear ones. Anthropogenic load in such areas varies and affects the likelihood of a fire differently. Everything depends on the size of an object: The larger the object, the higher a potential load on a territory.

The next factor is the disposition of territory itself toward to fire occurrence, which the scientists studied based on Gilbirinskiy Forestry. The area, located between Lake Baikal and Ulan-Ude in a conservation area, is about 27- km<sup>2</sup>.

Associate Professor Baranovsky says: "Baikal's significance for the entire planet is tremendous, it is an amazing natural area. Every summer, the basin of Lake Baikal suffers from wildfires. It is meaningless to focus on fire statistics of the previous season. There can be abrupt weather changes, for example, and different weather conditions, and the statistics do not take them into account. Therefore, we propose to underpin other data."

Images from the Landsat-8 satellite helped the scientist estimate the disposition of forestry toward fires. Homogeneous areas were identified and classified. The researchers determined the location of water bodies, meadows, swamps, deciduous forests and old coniferous forests.

"First, we ruled out roads, as there is not forest fuel there. Then swamps, water bodies, young forests. The remainder was old, dry forests. These are the most dangerous areas in terms of risks. And these are coniferous forests, not deciduous. It is related to the physical characteristics of [forest](#) fuel," explains the researcher. "As a result, the most dangerous areas were mapped as red, the less dangerous as blue. We can already estimate the disposition of a territory toward fire occurrence and likelihood related to human impact. Now, our colleagues are estimating the likelihood associated with thunderstorm activity."

When these factors are combined in a system, it will be possible to make a short-term [forecast](#) on fire danger. That is, where, exactly, a wildfire is most likely to occur under given weather conditions, given thunderstorm activity, and anthropogenic load. This contributes to a short-term forecast, as it is the most accurate. This can be a basis for taking steps to

pay more attention to certain areas," says the scientist.

**More information:** Ksenia S. Yankovich et al. Classification of Vegetation to Estimate Forest Fire Danger Using Landsat 8 Images: Case Study, *Mathematical Problems in Engineering* (2019). [DOI: 10.1155/2019/6296417](https://doi.org/10.1155/2019/6296417)

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