

FOREST FIRE RESEARCH IN COLOMBIA

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ABSTRACT

Research on forest fires in Colombia is still in the initial stages. However, knowledge of fire statistics, types and causes of fires, types of vegetation, susceptibility of vegetation to fires, and the relationship between climate and fire occurrence helps in calculating fire risk. All these elements are evaluated by the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) in order to develop fire risk forecasts for Colombia.

Colombia (lat 4°00'N, long 72°00'W) covers an area of 1,141,748 km². As a result of being located in the torrid zone, Colombia has a very high diversity of flora and fauna: 10% of the world's species of fauna and flora are found in Colombia. The country's natural vegetation consists of various ecosystems such as extensive tropical humid forests and swamps. This natural vegetation has been transformed, and one of the causes is the use of fire for expanding the areas of human colonization, damaging not only forested areas, but also other ecosystem types.

Colombia's high diversity of vegetation types includes tropical humid forests, tropical dry forests, tropical montane forests, montane grasslands, swamps, savannas, desert scrub, and agricultural areas. Vegetation in Colombia is affected by fires mainly during the dry periods, when subsurface, surface, crown, and mixed fires occur. Forests cover 56% (670,000 km²) of Colombia's total surface area. These ecosystems include natural and cultivated forests, mangroves, and swamps, among others. The Amazon Basin forest is the largest in the country, with an area of 340,000 km². Other vegetation types found in Colombia are bogs and swamps, grasslands, xeric scrublands, deserts, and lagoons covering an approximate area of 210,000 km². Agroecosystems or agricultural usage zones cover 360,000 km².

The climate differs throughout the country with elevation and is influenced by perturbations in the Intertropical Convergence Zone, waves from the Caribbean Sea, hurricanes, the Amazonian and Pacific Synoptic System, and also by the Pacific Ocean Systems of Middle Latitude of the Northern Hemisphere. El Niño is a major climatic disturbance that lowers the levels of precipitation, causing droughts that result in fires.

Fires in Colombia are the result of the social, natural, and physical causes. Social uses of fire include burning to prepare lands for agriculture, to provide habitat for hunting and recreational activities, and to increase soil productivity. In the northern part of the country (Caribbean Region), fires are more frequent between December and March. In the central area (Andean Region), fires are more frequent between January and February and between July and August. In the East (Orinoquia Region), fires are more frequent from December to March. In the West (Pacific Region), the wettest region of the country, rain occurs from July to August along the border with the Andean Region in the states of Nariño and Cauca. In southern Colombia (Amazonian Region), fires occur less frequently, except when El Niño affects weather patterns.

Fires in Colombia are classified into four types: surface fires, crown fires, subsurface fires, and mixed fires. Surface fires occur on the soil. Crown fires propagate on the upper part of trees. Subsurface fires occur underground and burn organic matter and material found below the land surface. When two or more of these fire types occur, they are called mixed fires.

The IDEAM is developing a predictive model and fire occurrence database. The model is based mainly on observed and predicted weather, and on vulnerability and susceptibility of vegetation to extreme climatic conditions. The model's objective is to issue real-time advisories and bulletins so that the community and the environmental authorities can take preventive measures. The methodology consists of a daily follow-up of hot areas in GOES (Geostationary Operational Environmental Satellite) satellite images and in some cases NOAA (National Oceanic and Atmospheric Administration) images when these are available (hot spots). These "hot areas" are determined with geographic coordinates and temperature information calculated from the infrared thermal channel. The coordinates locate the hot spot on a regional level.

Precipitation data can be obtained from manual and automatic weather stations, daily rain values are recorded, and vegetation moisture deficit indexes can be calculated from this information. These indexes are still being developed; therefore, they are complemented by average precipitation and temperature calculations based on monthly and yearly normal climatic conditions.

Forest fire risk is defined by these indexes and vegetation vulnerability. Committees meet every day to determine the advisories, bulletins, and warnings that are updated daily on the Internet (www.ideam.gov.co). The database is capable of collecting real-time information via the Internet; the IDEAM is currently training environmental authorities and other entities that send information in order to implement the real-time system. The database, constructed with Oracle Database software, contains information from 1986 to the present. It includes information on the location, causes, and types of fires; water sources; types of vegetation; and a follow-up of areas to be restored. It is currently used for the control and tracking of forest fires as well as for the design of fire-prevention policies.

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