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The Studies to Support a Fire Danger Rating System in Turkey*

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ABSTRACT

Forest fires are a primary damaging agent of Turkey's forests, and have a significant economic impact. Turkey has a Mediterranean climate, and over half (12 million hectares) of its forests are located in a coastal band area that is160 km wide and 1700 km long. The band starts at the eastern Mediterranean coast and includes the Aegean and Marmara coasts. This band is a fire-sensitive region, with thousands of hectares burned annually. The value of a decision support system, such as the Fire danger Rating System (FDRS), is recognized in Turkey as a key tool in fire fighting and limiting economic impacts. However the information base to implement FDRS does not exist in Turkey. As a result, the study described in this paper was initiated to develop that information.

Keywords: Forest fires, Fire danger rating system, Turkey

1. INTRODUCTION

Forest fires are one of the most important factors to threaten continuity of forests in Turkey as in most of the countries. The ability of fire danger prediction in any area and make the fire planning based on this prediction are important in order to

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minimize the forest hazards. In this way it will be given priority to highly fire danger area for the position of fire crews and equipment and obtained much advantage especially for quick initial attack on suppression activity.

Turkey is a country with a land mass of 77 079 million hectares, of which 20 749 million hectares is forested, representing about 26 percent of country's total land area. About 12 million ha of forested lands is subjected to and under the threat of forest fires. Most fires occur where Mediterranean climate with high temperatures and low to nonexistent precipitation during the fire season is predominant in the southern and western Anatolia. In the period 1937-2004, a total of 74493 fires burned a total of 1 556 150 hectares of forest land. Fire has always had a pervasive influence on Turkish forests and their management, consuming thousands of hectares of forest land annually resulting in high suppression costs and causing great damages in lost timber, real estate and recreational values, and even loss of life. Recent statistics indicate that the country is experiencing an ever increasing wildland fire problem (Bilgili et al. 2004).

2. FIRE DANGER RATING

The protection of life, property and natural resources from wildfires requires increasingly effective forest fire management. For effective decision making fire managers require some means of reliably evaluating and integrating the individual factors influencing fire danger – a fire danger rating system (Van Nest / Alexander 1999). A well funded fire protection program is fundamental to insuring that investments in intensive forest management reach fruition. Fire managers require some means of judging the various elements affecting ignition potential and probable fire behavior for proper fire control and decision making. Forest fire danger is defined a general term used to express an assessment of both fixed and variable factors of the fire environment that determine the ease of ignition, rate of spread, difficulty of control, and fire impact (Stocks et al. 1989).

It is important that fire managers can obtain information about the level of fire danger for a given region for a specific day, in order to allocate manpower, equipment and applicable operational rules to face the situation. Daily weather patterns have a marked influence on fire danger even where human beings are mostly responsible for fires, but days since last rain, the vegetation type and moisture contents of fuel can all be regarded as influencing factors, although their

relative importance may vary between regions. To enable fire managers to evaluate fire danger daily, fire danger rating system have been developed to assist them, some such as the Canadian Forest Fire Danger Rating System (CFFDRS), the National Forest Fire Danger Rating System (NFFDRS) (Deeming et al. 1972; Rothermel 1972), and Australian Forest Fire Danger Rating System (Mc Arthur 1966, 1976; Noble et al. 1980; Crane 1982)

In addition to, different fire danger systems developed in various countries, although varying in appearance and complexity, have the common objective of obtaining a relatively simple and comparable measure of flammability of forest fuels from day to day. Some of these fire danger systems have been adapted for use in other countries such as the Canadian system.

The CFFDRS remains one of the few nationally implemented fire danger rating systems in the world. The CFFDRS is being increasingly by other fire researchers and scientist for applications ranging from fire suppression effectiveness and fire growth modeling to analyses of fire regimes and potential impacts of climate change. Although the CFFDRS was designed for Canadian (Stocks et al. 1989; Van Nest / Alexander 1999; Van Wagner 1987; ForCan 1992; Lee et al. 2002), several countries have adopted system modules and its research philosophy as the basis for their own system of fire danger rating, most notably New Zealand, Fiji and the State of Alaska (U.S.). Evaluations of the system have also been undertaken recently in China, Russia, Chile, Croatia, and the State of Michigan (U.S.) (Van Nest / Alexander 1999). Fire danger rating systems produce qualitative and numerical indexes of fire potential that are used as a guide in a widely variety of fire management applications.

Some common uses of the fire danger rating system include;

- Fire behavior training,
- Preventing planning (information the public of impending fire danger, regulating access and risk associated with public and industrial forest use),
- Preparedness planning (level of readiness and pre-positioning of suppression resources),
- Detection planning (lookout manning and aircraft routing),
- Initial attack dispatching
- Suppression tactics and strategies on active wildfires
- Escaped fire situation analysis
- Prescribed fire planning and execution.

3. FIRE RESEARCHES TO ESTABLISH OF TURKEY FIRE DANGER RATING SYSTEM

Forest fire danger rating systems researches initiated 10 years ago in Turkey. Fuel models were developed in immature red pine and Anatolian Black pine stands (Küçük 2000; Kucuk et al. 2007a) and maquis fuels (Saglam 2002). After that, the statistical models were developed to predict fuel moisture contents by using relations between dead surface fuel moisture contents and weather parameters for determine fire danger situation. First fire behavior research in Maquis fuels resulted by Saglam (2002). Another ongoing project about the fire behavior in immature black pine stands completed by Küçük (2004). In these studies, fire behavior parameters were determined and digital maps of rate of spread, fire intensity and fuel consumption were obtained by using Geographical Information Systems (GIS). The other study, a total of twenty eight line and twenty four small point-source fires were burned under varying weather and fuel loading (FL) conditions in Anatolian black pine (*P. nigra* J.F. Arnold subsp. *nigra* var. *caramanica* (Loudon) Rehder) stands. Relationships between rate of fire spread, and fuel and weather conditions were determined with correlation and regression analyses (Küçük et al. 2007b). Also, total of thirty experimental fires were burned over three years under varying weather and fuel loading conditions in aging slash (Küçük et al. 2007c).

Fire behavior researches have been carried for the last five years in the immature red pine stands, tall maquis fuels with different fuel loading to establish National Forest Fire Danger Rating System (NFFDRS). On the other hand, a new project which about slope effect on fire behavior in maquis fuels has been continued. The applications of these studies should be utilized for fire prone areas of Turkey which have the similar fuel characteristics.

4. CONCLUSIONS

To establish National Forest Fire Danger Rating System, it needs many other researches about the fire behavior and fuel modeling in fire prone area of Turkey. The results obtained from the present studies constitutes the basic and fundamental steps towards establishing fire weather and fire behavior prediction system in Turkey, and should be invaluable in all phases of fire management planning.

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