STUDIES ON FIRE-DAMAGED AREA IN TURKEY FOR GIS APPLICATION

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ABSTRACT

Wildfire risk is a major concern in several parts in Turkey, including Aegean district. To be economically and operationally efficient fire prevention and hazard reduction efforts should focus on those damage variable resources. Coincidence of several environmental and socretal factors can indicate where wildfire risk may be unacceptable and where the majority of effort should be placed. Traditional mapping techniques are cumber some to use displaying these areas of high wildfire risk because of large number of factors involved and the difficulty of rapid updates. The aim of this study is to implement a Geographic Information System (GIS) which provides the technology to integrate, analyze and display large amounts of spatial information in a format that is useable for operational decision-making and allows for rapid updates.

1. INTRODUCTION

Fire includes many changes in habitat for both plans and animals, effecting food cover and microclimate . Fire affects in the form of long-term or continuing deterioration in the productivity of the soil and sites are difficult to measure but are naturally of primary concern to the public. Therefore, forest fire not only causes the destruction of forest resources, but also destroys the balance of ecological system. Forest fire even increases the environmental problem, such as air pollution, water pollution and erosion.

Due to development of computer technology, Geographic Information System (GIS) can be considered for management of forestery,geography, urban planning, engineering, data processing, landscape architecture,etc. A geogragraphic information system is a compound of geographic data, computer hardware and software, personnel designed to collect, storage, manage, query analyze and present large volume of spatial data and associated attributes in order to allow users to make better decision, to improve productivity, to spare time, money and man power. A geographic information system provides tools to professionals to improve their efficiency and effectiveness in working with map information and non-graphics attribute data.

2. DESIGN of GEOGRAPHIC INFORMATION SYSTEM FOR FIRE-DAMAGED AREA

2.1. Study Area

Analysis of forest fire-damaged area was conducted the basis information. Research materials were gathered aerial photographs, conventional maps, forest record files and weather records. 98.44 % of forest fires was caused by man effects and 1.56 % was induced by lighting in Turkey.

There are many factors that destroy the forest in Turkey. The most important one among them is the forest fire. The factors are also affective in İzmir Forest Directorate Region The study area is located west of Turkey. The total area of İzmir Forest Directorate is 2.489.861 hectares. 39% of this area are covered by forest that is approximately 968.078 hectares. 2009 forest fire started in this area between the years of 1978-1990. Most of those fires are belong in the "A" class, which is 1.0 and less than 1.0 hectare.

The study area is located in İzmir (Çatalkaya working circle) ,west of Anatolia.Square of working circle is 16226.0 hectares. 8714.54 hectares is covered Pinus brutia Ten. (calabrian pine) and 7511.50 hectares is covered unproductive coppice and maquis of total area.

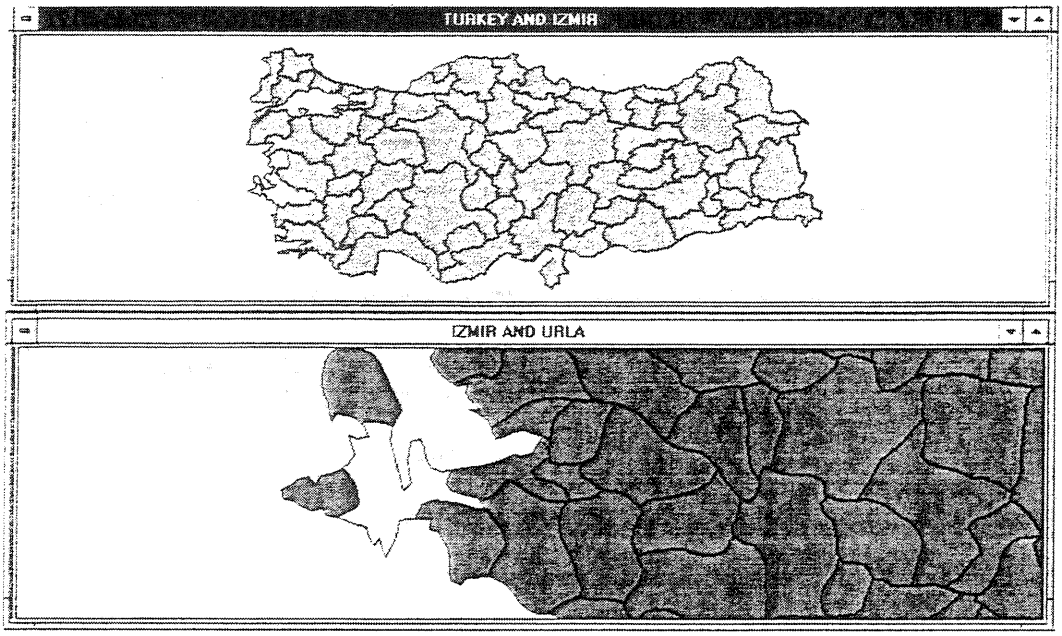

Figure 1 : Study Area (İZMİR - Çatalkaya Working Circle)

2.2. Implementation of Geographic İnformatatiion Area for Fire Damaged Area

The importance of a GIS has not known widely in Turkey although some activity in different agencies has already been initiated but not yet completed. On the other hand forest management activities in Turkey back to 1924 and has made considerable progress since then using aerial photographs and satellite imagery but not in GIS. According to the law issued in 1924, accepted is the principal to manage all the forest in Turkey by use of management plans. It is in 1946 that the forest management plans for Turkey were completed, being the base to the inventory and statistics of the national forestry. Having been signed an agreement in 1955 between the General Directorate of Forestry and General Command of Mapping authorized to take aerial photos in Turkey, forest management plans were made via combined inventory methods using 1:20 000 scale aerial photos and statistical techniques. Among 1963 and 1972 forest management plans covering all the forest areas (20 million hectares) in Turkey were completed and applicated. Among 1973 and 1989, applications and revisions of forest management plans were carried out 11 135 million hectare forest areas.

In forest management activities, locational and descriptive data as well as relationships between them are required. All of these data and relationships can be regarded as geographical information that is subjected to change dynamically. Traditionally locational data consist of covertype maps which define the location of all forest's components such as series, compartments, working cycles, felling blocks, sites, stands, utilization, classes, age classes and topography, as well; whereas descriptive data are composed of conventional inventory data which describe the physical conditions of these components such as the annual growing stock and increment in a working cycle, tree species in a stand class, etc. Neither conventional maps nor forest inventories are sufficient enough to supply locational and descriptive forest data. Updating of these maps and inventories is rather cumbersome and time consuming. Although some CAD and DEM systems are able to manipulate this type of data and solve problems to some extent, the relationship between these two different types of data can not be created. A GIS applicates in forest management seems to be an obvious choice, for it is able to manipulate locational and descriptive data and the relationships between them, as well; even dynamically.

Forest management is the design and implementation of a set of actions in which stands are harvested, products are distributed, cut overs are renewed, and protection against insects, fire and disease is provided. These activities are controlled in timing, amount and geographic space so that their cumulative effect generates a desired mix of benefits such as timber, recreation opportunity, etc. from the whole forest over time. The main objectives of the forest management are to

- find one schedule
- implement that schedule year-by year
- monitor forest performance periodically to look for and remedy divergence between expected and actual outcomes.

It is well-known fact that , GIS is useful for environmental investigation,assesment and management, various analytical capabilities and excellent facilities for presenting the result of these analyses. Identification, manipulation and

integration of descriptive data are processed in relation to fire-damaged area. Answers to quires are provided incorporating elements, for instance:

- What is level of damage?
- How much area has been effected by fire?
- Where is the look out towers, firebreak, telephone?
- Wireless communication system

in İzmir Forest Director Region. Queries are developed and established for data interpretation and analysis.

Used data are conventional maps, aerial photographs and forestry record files. Existing maps drawn to scale of 1:25 000 were gathered from General Command of Mapping. It is used for record files between the years of 1986-1995. These are

Non -graphic data

- compartments number,
- fire dates,
- time,
- fire -damaged compartment's number,
- [illegible] of fire-damaged area,
- species ,
- heat,
- humidity,
- wind and wind direction.

Graphic data

- boundaries of compartment
- cuntour lines

Queries were developed and established for data and analysis. Information stored in the data base is retrieved and subsequently operational functions proceeded. Analysis functions such as overlay, search and grouping particularly as it relates to graphic display is executed mainly using MAPINFO software. Different queries have been carried out between these items.For example, relations have been established between

- fire-damaged area and species,
- wind and heat,
- humidity and heat,
- humidity and fire-damaged area etc.

Some results are listed below with tables and histograms.

YEARS	SPECIES	SIZE OF FIRE-DAMAGED AREA (ha)
1985-1990	Pinus brutia Ten.(Calabrian)	27.37
1985-1990	Maquis	5.45
1990-1995	Pinus brutia Ten.(Calabrian)	25.81
1990-1995	Maquis	4.3

Table 1: Size of Fire -damaged Area

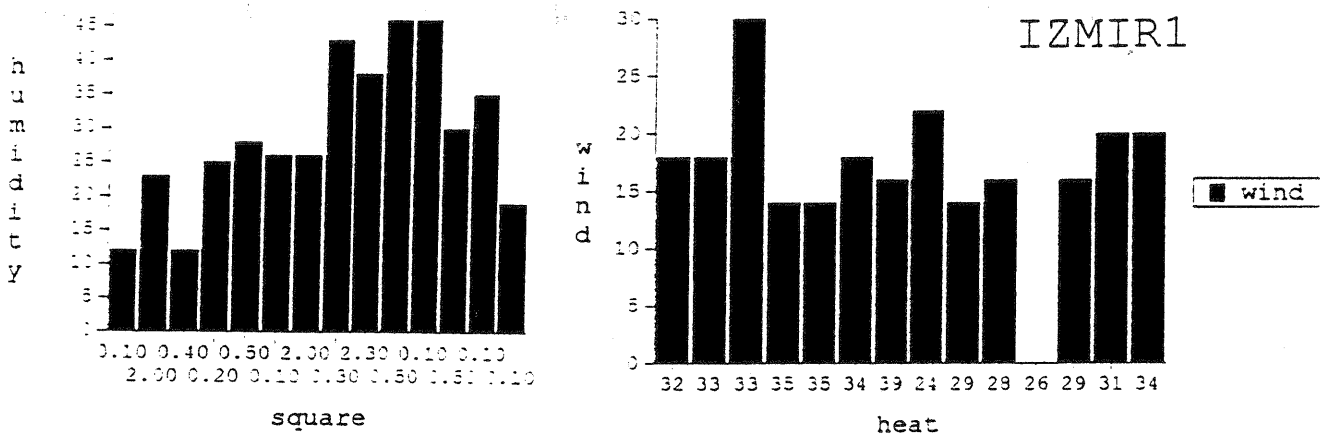

Figure 3 : Histograms of percentage of humidity of heat and square

3.CONCLUSİON REMARKS

On the basis of the results obtained in this study, the use of geographic information system in analyzing forest fire damaged has provided a useful support system. Because, maps and /or recording files answering to custom queries covering defined fire-damaged area from the information system are to be created and presented, more accurately, more quickly, more ratable as compared with conventional methods. Also, all this information and queries can be helped for emergency service immediately..

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