



Fire Management and Associated Public Policies in Turkey

Abstract

This report presents and discusses the underlying causes, past and current status of forest fires, and associated fire management policies in Turkey. Forest fire is a recurrent and multifaceted phenomenon stemming from complex social, economical, ecological and environmental origin. Fire policies were formulated in such a way as to exclude fire on the assumption that it is always bad. However, currently practiced total fire control policy may not be as proper and appealing as it is thought, considering the large fires of recent history have been a result of the policy of total fire exclusion. In addition, pressures brought about by certain realities of ecology and economics, and our increased demands for multiple resources require the development of new policies and attitudes toward fire. At the same time, increasing complexity and sustainable forestry will require a deeper understanding of fire and development of more effective management systems. Effective management systems will not prove successful unless they include the demands and acknowledge the role of fire and society in forests. In this regard, Turkish forestry presents great challenges to the society in general and the forest service and fire researchers in particular.

Introduction

Turkey is a country with a land mass of 77,079 million hectares (ha), of which 20,749 million ha are forested, representing about 26 per cent 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 fire season is predominant in the southern and western Anatolia. In the period 1937-2004, a total of 76,255 fires burned a total of 1,561,026 ha of forest land. This represents 1121 fires on 22,956 ha annually with an average area burned per fire of 20.28 hectares (Figure 1). Although there has been a gradual increase in the number of fires in recent years, due to the increased and effective use of technology in transportation, communication and fire suppression, area burned has been cut substantially and kept at 6 ha on average (Figure 2).

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. Supporting this statement is the fact that the number of fires has doubled in recent years. While natural fires play an important role in many of the forest types, the increasing frequency of recent fires has transformed the fire from nature's tool to nature's threat, resulting in a dramatic decline in the quality of forests with the average fire cycle, in some localities, having been reduced to as little as 9 to 25 years (Neyisci 1986, Alexandrian and Esnault, 1997). Given the status of the socio-economic situation and tourism in the country, it is not very difficult to conclude that the fire risk will steadily increase, resulting in more areas being affected negatively from wildfires.

When analysed with respect to fire causes, it is seen that fire in the country is of a very complex and multifaceted phenomenon involving social, cultural, economical, historical and psychological aspects, and is marked by a prevalence of fires of human origin, with reliable estimates being up to 95 to 97% (OGM 2003). However, fire protection agencies have evolved around an effective fire protection policy with a strong emphasis on fire control with little or no regard given to underlying causes of fires, and fire research concentrated mainly on the prediction (Bilgili et al., 2001; Bilgili 2003; Bilgili and Sağlam 2003) and the immediate effects of fires on flora, fauna and soil (Bilgili et al., 2003; Neyisci, 1989a,b; Neyisci and Cengiz, 1985).

The objective of this paper is to present and analyze the causes of forest fires and public policies affecting forest fire problems in Turkish forests

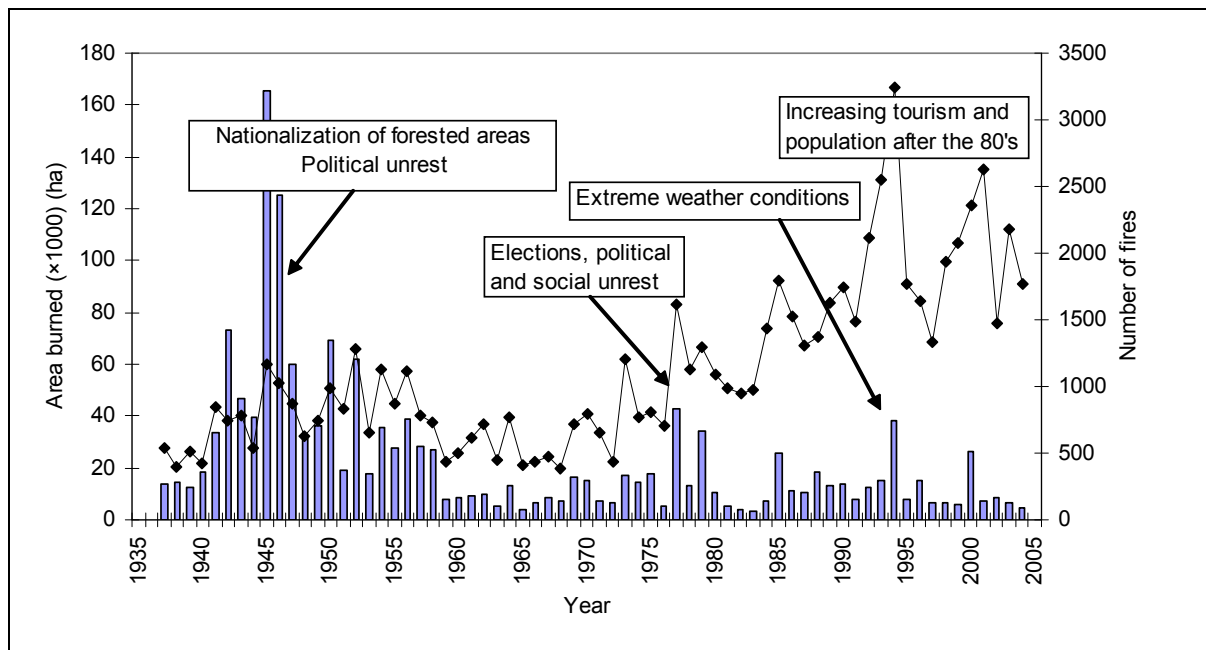


Figure 1. Area burned and number of fires for the period 1937-2004.

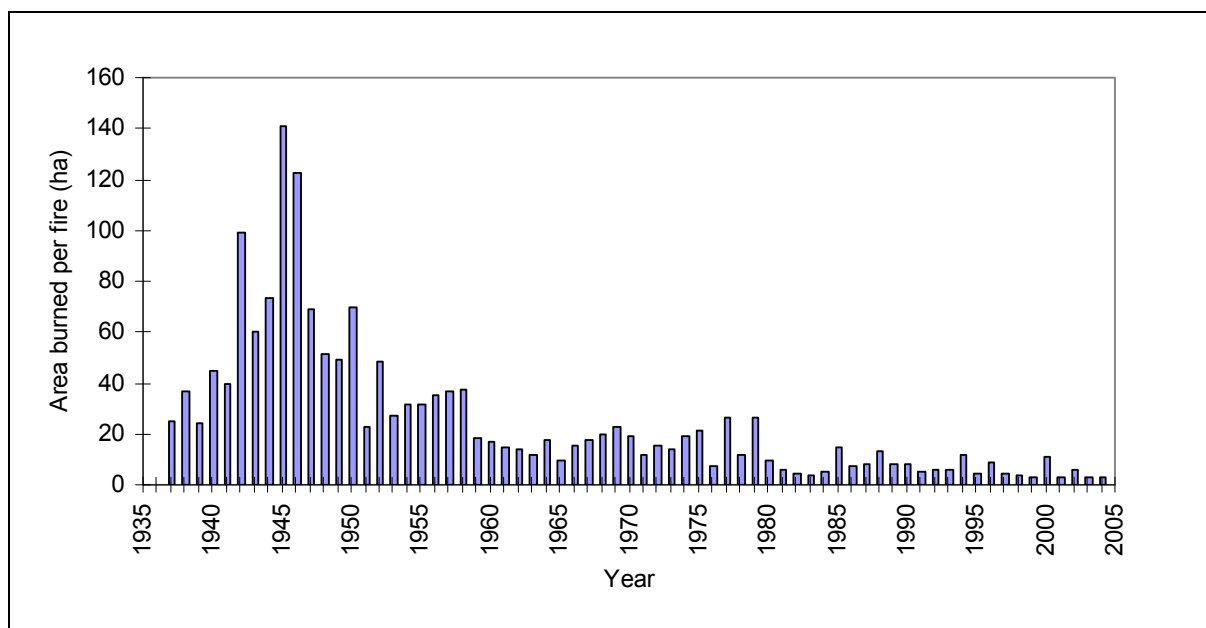


Figure 2. Area burned per fire for the period 1937-2004.

Fire Causes

The majority of forest fires in Turkey are caused by people. People-caused fires account for 94 to 97% of all fires, while natural agents are responsible for the remaining 3 to 6%. People-caused fires can be examined under three broad categories – voluntary, involuntary, and unknown fires. Of the people-caused fires, according to the recent statistics, 14 per cent is classified as arson, 58 per cent as negligence and carelessness, 5 per cent accident, and 23 per cent as unknown (OGM, 2003) (Figure 3). The majority of fires are often caused by people through sheer inadvertence or accident. These types of fires usually occur in and around recreation areas and camp sites, at wildland/urban interface or along major highways. Arson fires are set for several reasons. About 8.8 million people live in 17,445 villages in or near forests (Anonymous, 1991). Socio-economic life standards of most of these people are well below the national average. People with low income and low life standards see the forests as an earning ground for their sustenance. So, people set fire in the forest to create jobs that

will earn them some provision or manipulate vegetation to improve and produce useful plants for their animals to graze. Personal conflicts between people and forestry officials or between shepherds or different villagers have also been reported to be a cause for fires.

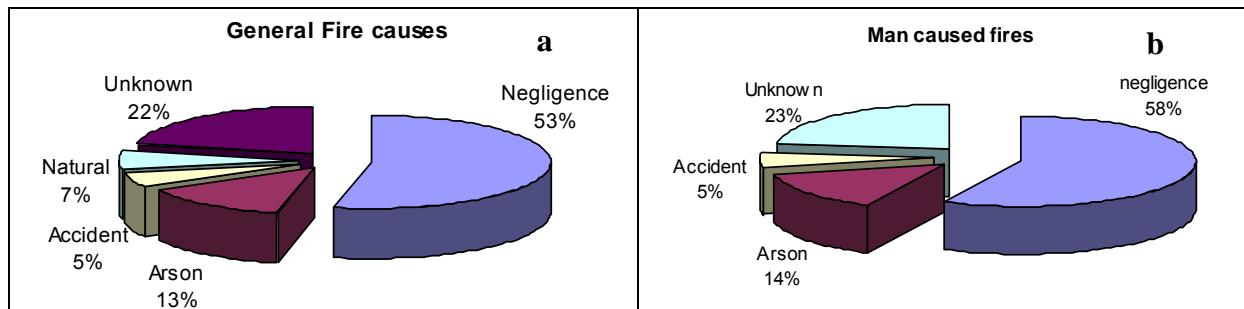


Figure 3. Fire incidences by causes, (a) general, (b) human-caused fires.

When examined in detail, it is very obvious that fire causes are closely related with land management activities, standards of living, population dynamics (Mol et al., 1997) and associated policies. Thus, to better understand the underlying causes of fires, the subject should be examined in relation to these factors.

Land Use and Vegetation

Forest fire activity in the country is highly correlated with weather conditions, land use and vegetation associations (Canakcioglu and Ozkazanc, 1997). Land use is the general term for human activities on earth surface. It includes agriculture, silviculture, pasture, settlements, networks of communication, recreation areas, and so on. The manner in which the land is used in Turkey is usually a combination of tradition and history, economic constraints, technical and financial possibilities, natural delimitations, cultural and psychological motivations, the means of land possession, and politics. Three main land use types prevail in the country, namely forestry, pastoralism and agriculture.

Extensive and intensive forestry practices have transformed the natural fire regimes in many forest ecosystems. By planting or harvesting woods, by collecting fuel biomass, by fighting wildfires, and by setting woodlands on fire both purposely and accidentally, the natural equilibrium of the forest ecosystems has been disturbed and replaced by rather human-made ones.

In Turkey, **pastoralism** still plays an important role. Though rarely, setting fire to natural forest is a way to gain pasture land, while repetitious grazing selects plant species and prevents maturation of vegetation. Overgrazing has been recognized as one of the most destructive processes.

The third area-wide land use in Turkey is **agriculture**. Agriculture and associated debris or residue burning is a very important problem. Policies concerning residue burning, for example, have proved to be useless. Culturally people burn off agricultural residues, assuming that it is good for their field, but there is a strict ban on residue burning with penalties being very severe. Moreover, The migration of the rural population from peripheral regions into cities and the abandonment of traditional agriculture have made possible the reinstallation of brush and forest lands – and with them the return of fire risk.

Forestry, livestock farming, and agriculture – as area-wide activities – Influence to a highest degree the actual fire regimes. These activities are dependent on social and economic factors. Determination and analysis of these factors should be a major task for the research community.

Population

Population and land use are correlated systems. Land use is determined by not only the quantity of human beings, but also their distribution and the quality of their action and interaction. Settlements and communication networks cover more and more of the country's surface. Metropolitan areas expand while at the same time rural homes are mostly constructed within woodlands. The wildland/residential interface shows an increasing disaster risk.

The new tendency of residential urbanization and tourism in "natural" woodlands has raised the peril of careless ignition. Additionally, criminals have discovered in arson a means of reaching their aims (vengeance, delinquency and speculation). There is substantial evidence that social and political unrest leads to an increase of arson fires (Figure 1).

In order to effectively prevent wildland fires, the reasons why they exist and spread have to be clarified. Demographical and political analyses, inquiries in behaviour of individuals and societies, inventories of urbanization, and plans of development need to be carried out. This requires a broad cooperation of various social scientists and geographers. Moreover, the results of such a research should be prepared in forms not only suitable for integration into research models but also for teaching and raising public awareness.

Culture and History

Historically and culturally man has played a major role in shaping forest landscapes in Anatolia. But the effects of anthropogenic fire on the environment have long been neglected and not really considered in the formulation of policies. Being conscious of the importance of human impact on fire regimes, it is hard to understand why overall fire research has neglected the cultural and historical aspect of the topic for such a long time. "An understanding of fire history is necessary to ascertain future effects of anthropogenic fire on the environment and atmosphere. Such studies should include the cumulative influences of past burning practices and current fire regimes, and they should seek to establish trends that can be projected into future scenarios for societies and the ecosystems they inhabit" (Kauffman et al., 1993).

Socio-Economics and Policy

"Forest fires are not an autonomous phenomenon, but a symptom of socio-economic problems" (Vélez, 1993). Depopulation of rural areas, the relinquishing of traditional agriculture, pasture, silviculture, recreational activities, tourism, urbanization, cadastre, arson, and so forth are the results of the socio-economic situation that confronts the Turkish population, and these considerations must frame any policy of fire management.

A political decision might influence fire regimes in a way that can scarcely be foreseen when released. Unfortunately, fire has always been treated marginally, based on the simple assumption that it is always bad. Thus, the policy of total fire control, or fire exclusion has been adopted for several decades with no regards to the ecological effects of fire on forest ecosystems. As a result, the policy of fire control or total fire exclusion has changed ecosystem structures in large areas such that fire danger determined by fuel conditions has been exacerbated.

Land ownership boundaries or borders separating public and private lands are not completely delineated in Turkey. So, there are always ownership disputes and conflicts in and around forests and protected areas.

Tourism is becoming one of the fastest growing sectors in the economy. However, government incentives for tourism have been creating new problems for the sustainability of forest and other natural resources. The relative increase in the number of fires in recent years is clearly an indication of this situation.

Because of the socio-economic constraints and relatively high rate of population increase, many people leave their villages or towns for larger cities with a hope of finding better jobs. Depopulation of these areas naturally results in a population increase and eventually overpopulation of larger urban areas. The lack of the necessary infrastructure and jobs results in an abnormal growth of such urban areas. This results in ill-developed residential areas at the wildland/urban interface. Unfortunately, laws concerning these areas and policies adopted in the past have even worsened the situation. The change of the definition of "forest" or amendments made to it has not helped to solve the problem, either.

The instability in the government and fast change of leadership at the government level, and the expectation of the public from the new leadership an amnesty after every national election, have exacerbated the already bad situation and perhaps encouraged them.

Parallel to the population increase, demographic movements, and public policies, other social and economical issues also play an important role in overall forest fire problem. These involve:

- Communication and transportation networks
- Power lines
- Wildland/urban interface
- Recreation/tourism
- Cadastre

In this regard the following activities should be carried out:

- Demographic and political analyses
- Inquiries about attitude and behaviour of individuals and society
- Complete inventories of urbanisation
- Formulation of development plans
- Realization of a broad cooperation between social scientists and geographers

Fire Management

Fire management in Turkey is a federal responsibility. Duties are carried out by the state forest enterprises functioning under regional directorates. Fire control policies have been developed around a strong emphasis on total fire control as a response to destructive fires. Regardless of the high costs involved, it is the forest service department's responsibility and policy that all the required activities are planned and implemented immediately. In no time, however, have the beneficial use and ecological role of fire been incorporated in fire management planning process. So, fire management deals mainly with fire prevention and control activities. Every State Forest Enterprise has a fire management plan in which all maps of the area in question; resources available and activities to be done are listed for the plan period.

Fire management involves fire prevention and suppression activities. Fire prevention deals with risk abatement and hazard reduction. Risk is associated with ignition, and risk abatement involves raising the level of awareness of general public and various responsibility groups to the dangers of ignition and subsequent forest fires through education and enforcement. It is of the opinion of the forestry service that a strongly favourable public opinion is a vital necessity in any effort to reduce the number of people-caused fires. All the available communication avenues have increasingly been utilized for this purpose. These involve the utilization of the mass media and local media outlets of radio, television, newspaper and magazines, education programs in the schools, military bases, service clubs, signs, and personal contacts. Also, fire law enforcement has been a potentially valuable technique for forest fire prevention since the laws have a potential to educate the public as well as deter the negligent or malicious from destructive behaviour.

Although the role of all stakeholders and interest groups such as non-governmental organizations, local people and academia in overall fire management planning is acknowledged, their contribution to management, policy and program planning has been extremely limited. In this regard, non-governmental organizations help raise the level of awareness of general public and various responsibility groups to the dangers of ignition and subsequent forest fires through education and conducting/supporting relevant activities. These activities involve seminars, TV and radio programs, practical field work, and suggestions brought to the attention of policy makers.

Local people are responsible by law to immediately respond to a fire situation when and if requested. The response of the local people and communities to a fire has risen considerably in recent years. This has mostly been a result of the changing attitudes towards forest fires and of the success of the public awareness campaigns.

Academia has a very important role in all aspects of fire management. However, their effectiveness has been fairly limited. Only in recent years, however, have the scientific studies been increasingly conducted and the results obtained put into practice. The most important step in this regard has been step taken for the establishment of a National Fire Danger Rating System.

Since 1997, there have been substantial improvements in the handling of forest fires. A Fire Command Center (FCC) established in 1997 under the General Directorate of Forestry (GDF), Forest Protection Unit is responsible for all fire management issues, ranging from prevention activities to fire suppression and other related issues. As part of the activities of FCC, a more comprehensive national database on forest fires is being created containing information on all aspects of forest fires. Information gathered on the location and cause of fires is used to develop fire prevention techniques and prevention planning. Important/large fire situations requiring inter-regional cooperation are handled with the help of FCC. All inter-agency or international agreements/procedures are handled by the Forest Protection Unit of GDF with the help of FCC.

As for the fire hazard reduction, fuel modification activities are practiced in all fire prone areas. Despite the high cost involved in the construction and maintenance, firebreaks and fuel brakes have been widely used to break the continuity of forest fuels. Fuel brakes have been constructed along and around the high fire risk and hazard areas such as camp grounds, disposal sites, settlements, major highways, railroads and in and around plantations and productive forests. Although very labour intensive, the practice of clearing and burning surface fuels within 15-20 m on each side of forest stands along major highways is a usual one. As a general rule, fire breaks constructed in plantations and naturally regenerated areas are supported by some fire resistant species (especially *Cupressus sempervirens* ssp. *pyramidalis*). These species are planted along the firebreaks with up to five rows. In areas close to settlements or critical areas, such species as stone pine (*Pinus pinea*) have been heavily utilized (planted) in place of other species. The local people look after these areas to harvest their cones. Not only this practice help maintain an important fire resistant zone but also provide for the local people an opportunity to make a living. One other activity worth mentioning concerning fuel modifications is the charcoal production using some bush species that would not normally be harvested or utilized (Serez et. al., 1997). Those who produce charcoal purchase the wood they cut for a very low price (about 1/10 of what they sell charcoal for). Again, this benefits both forests and people.

Although illegal in forested areas, especially in plantations and naturally regenerated areas, grazing is another land use practices that reduce fire hazard in many localities. Providing it is kept in predetermined or known areas, grazing is allowed by the officials as a precautionary measure. Tensions between the officials and shepherds and between shepherds themselves have been the cause of many fire incidences over the years.

Fire management also relies on early detection, fast initial attack and powerful suppression. Each region has been provided with sufficient resources and manpower to combat forest fires. Available resources include 135 fire trucks, 12 helicopters, 11 airplanes, 882 fire lookout towers, 8472 radios, 650 initial attack crews (of 12-15 men), and 120 standby fire response teams (of 40-50 men). As needed, new resources are being added and new technologies adopted. These forces are allocated to each district based on fire danger levels and area in question.

Fire monitoring is made through 882 fire lookout towers scattered across fire-prone areas. At times of high fire risk, motorized ground troops and sometimes helicopters are used for fire monitoring purposes and for deterring the mischief-maker. Public reports have also become one of the most important information sources for fire incidences. This is mainly ascribable to the promotion and the general acceptance of 177 by the public as the number to call in case of a forest fire.

Except for utilizing the daily temperature and relative humidity to rate fire danger, no system is in place for fire danger rating. However, Some initial steps have been recently taken to establish a fire weather index system in one of the fire sensitive regions. A network of automated weather stations will be established soon for the system. The system will generate current fire danger levels based on past and present fire weather conditions, and fire danger levels for the future based on forecast weather conditions.

Fire workers and technical personnel are trained every year for up to two months. There are two training centres for fire workers where they take theoretical courses and attend seminars given by lecturers and fire experts. The main load of the training lies on the practical field work. Workers are trained to efficiently use the equipment they have. This involves wireless radio communication, chainsaw, hand tools and hose operations, water and retardant use, fire truck/engine and bulldozer operations etc.

Fire Research

Fire is one of the areas that has received the least attention in Turkey. All areas of fire research require attention. But the lack of research facilities and of researchers makes it almost an impossibility. There is no fire research laboratory in the country. There has been very few studies concerning fire behaviour, fire ecology or the role of fire in Turkish forest ecosystems (Bilgili and Saglam, 2003; Bilgili et al., 2003; Neyişçi, 1989a,b; Neyişçi and Cengiz, 1985). Recently, however, attempts have been made to establish a national fire danger rating system. Initial work has been completed and weather measurements started. Based on the litter moisture and weather measurements in a standard fuel type (Red Pine: *Pinus brutia*), Turkish Fire Weather Index System will be developed. Fire behaviour experiments have been conducted in several fuel types. Results of the experiments will constitute the first steps towards achieving the goal of the development of fire behaviour prediction system. Also, the use of Geographical Information Systems (GIS) in fire management is being increasingly utilized. But, all these attempts have been very limited for the reasons that there has been a lack of cooperation between universities and research institutions within the forestry sector, and a lack of mechanisms to support research projects undertaken by other units. But despite the lack of the necessary means to conduct fire research, these recent developments have been the result of genuine cooperation between Karadeniz Technical University, Faculty of Forestry and the General Directorate of Forestry.

Conclusions

Forest fires are a recurring phenomenon in and have a major impact on the sustainability of Turkish forests with complex social, economical, ecological and environmental aspects. Yet, fire policies were formulated in such a way as to exclude fire on the assumption that it is always bad. Currently practiced total fire control policy has been followed by some successes with prospects. But it may not be as proper and appealing as it is thought, considering the large fires of recent history have been a result of the policy of total fire exclusion in those areas. In addition, pressures brought about by certain realities of ecology and economics, and our increased demands for multiple resources require the development of new policies and attitudes toward fire. At the same time, increasing complexity and sustainable forestry will require a deeper understanding of fire and development of more effective management systems. Effective management systems will not prove successful unless they include the demands and acknowledge the role of the fire and society on forests. In this regard following points may be worth mentioning:

- The formulation of national and regional policies should address forest fires as an integral component of ecosystems and land-use.
- Flexibility in policy implementation, and clear and measurable policy objectives are needed to minimize the adverse effects of uncontrolled fires and maximize the benefits from fire prevention or from the controlled use of fires.
- Involvement of all stakeholders in policy development is a must. Especially in the case of fires when almost all fires are started by humans.
- Favourable policies must be adopted for all aspects of fire management (prevention, suppression and fire use) based on local conditions.
- Land-use policies should promote fire prevention and not contribute to deforestation or the degradation of forest resources.
- Personnel policies should be realistic and fire research should have a priority.

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