Proceedings of the Biennial International Symposium "Forest and Sustainable Development"
8th Edition, 25th-27th of October 2018, Braşov, Romania

ASSESSMENT OF FIREFIGHTING FACILITIES AND ROADS REGARDING WITH FIRE-RESISTANT FOREST PROJECT (YARDOP)

Ebru BILICI[1] Burhan GENCAL[2] İnanç TAŞ[2] Abdullah E. AKAY[2]

Abstract: *As a result of natural disasters such as fire, storms, avalanches etc., natural resources have been destroying rapidly in the world. Due to global warming and other factors, forest fires result in serious damages on forest resources in arid regions. Therefore, firefighting activities should be well planned and special attention should be paid to grow fire-resistant forest in the regions with high fire risk. For this purpose, firefighting facilities (i.e. fire breaks, fire lines) and roads for the purpose of fire protection and fire-fighting should be specially evaluated in these regions. Road networks are effectively used during and after a fire and are also used to stop the fire. In this study, the firefighting facilities and roads developed for fire intervention within the Fire-Resistant Forest Project (YARDOP) have been evaluated. Within the project, firefighting facilities have been planned to build a fire-resistant stands. These firefighting facilities can also be used for firefighting purposes. This study indicated that the standards of firefighting facilities and roads used in YARDOP projects are likely to be an alternative solution for many countries, especially in the Mediterranean countries and generally in the same environmental conditions around the world.*

Key words: *forest fires, forest roads, fire breaks and fire lines, YARDOP.*

1. Introduction

Forest fires are one of the most disturbing factors affecting natural ecosystems. Currently devastating wild fires affect vast regions throughout the world [5], in particular the fragile ecosystems of the Mediterranean basin that are known to be at high risk of desertification [10].

Forest fires can cause the destruction of a large number of trees and the death or displacement of wild animals. Intense combustion not only burns forest and plants on the ground, but also changes forestry structure, forest biology, climate, and soil performance [11]. In recent years, substantial efforts have been made towards characterizing, forecasting, modeling, planning, and managing forest

[1] Giresun University, Dereli Vocational School, Forestry Department, Giresun, Turkey;
[2] Bursa Technical University, Faculty of Forestry, Forest Engineering Department, Bursa, Turkey;
Correspondence: Ebru Bilici; email: ebru.bilici@giresun.edu.tr.

fires in several Mediterranean countries [4].

Forest road network are used for various services such as production, afforestation, transportation, recreational functions as well as fire protection purposes [9]. Forest road networks are very important for quick extinguishing of forest fire since fire trucks carrying firefighting team access fire areas by roads. Fire breaks and fire lines are natural or artificial facilities, which are bare or covered with vegetation to prevent the spread of fire [3]. Fire breaks and fire lines, which can be also used for transportation in fire sensitive areas, are crucial for reaching the fire point using the shortest route, early start of firefighting organization, reducing the impact of fire by limiting the burned area [2].

Various projects have been carried out by forest service in order to fight with forest fire and decrease its effect. Fire-Resistant Forest Project (YARDOP), which was developed for rehabilitation of burned areas and building fire-resistant stands, is the most recent and widely used one. The objective of YARDOP is to increase the physical resistance of stands especially in fire sensitive forest areas. YARDOP and its impact have been studied on various researches [1, 7-8].

In the study, two different fire intervention and protection road plans were introduced regarding with current practices of General Directorate of Forestry (GDF) and new approach proposed by YARDOP project. Both plans have been used for fire intervention and protection in Turkey and it is also possible to use both in combination.

2. Fire Protection Roads

There are two different fire intervention and protection facilities specified by GDF. In some cases, both road types are combined where it is necessary.

Fire breaks: These are uncovered installations built with natural and artificial obstacles which do not contain any flammable material. Their width is 6-15 meters with the average of 10 meters (Figure 1).

Fire lines: These are fire prevention green facilities built on sides of the roads. A wider range of fire hazards are prevented by green spaces generated on one-side or both sides of the roads. One-sided width is 30-60 m (Figure 2).

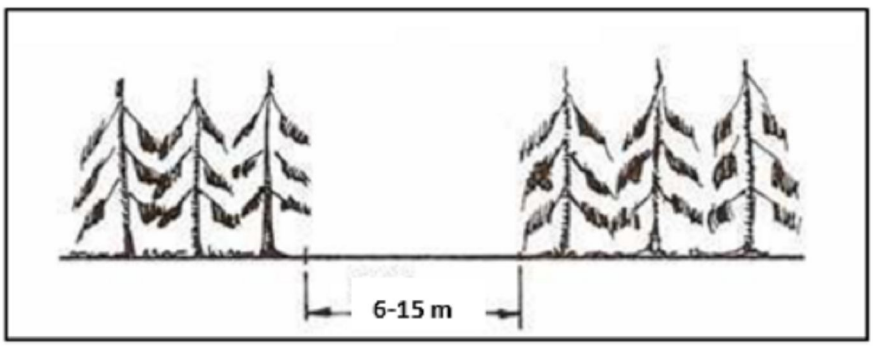

Fig. 1. Fire breaks [3]

Fire breaks and fire lines: These facilities are the combination of fire breaks and fire lines formed on one side or on both sides of the roads. Their width is 60-120 meters (Figure 3). Fire breaks and fire lines installations are made by using natural and artificial obstacles that prevent the spread of fire. They are mostly constructed in forest areas where fire hazards are excessive and extreme. They usually serve four main purposes: a defensive line for fighting against fire, counter-fire application sites, mechanical firefighting, and transportation. It can be said in summary that the aim of these obstacles are to provide a direct barrier to the spread of the fire and to ensure that the fires are kept in small spaces and that the fire damage is minimized.

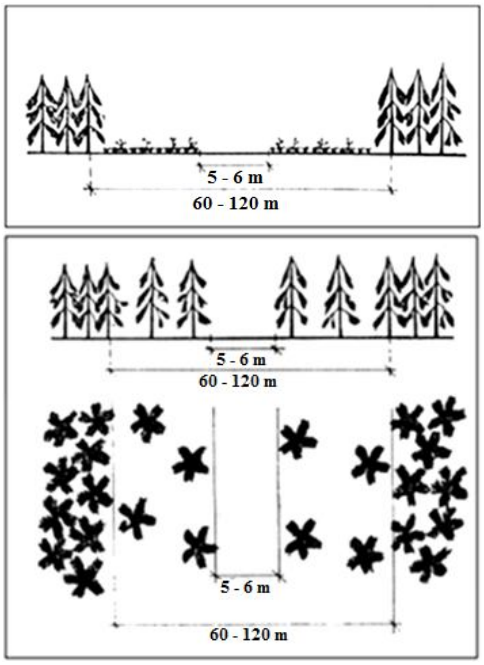

Fig. 2. Fire lines [3]

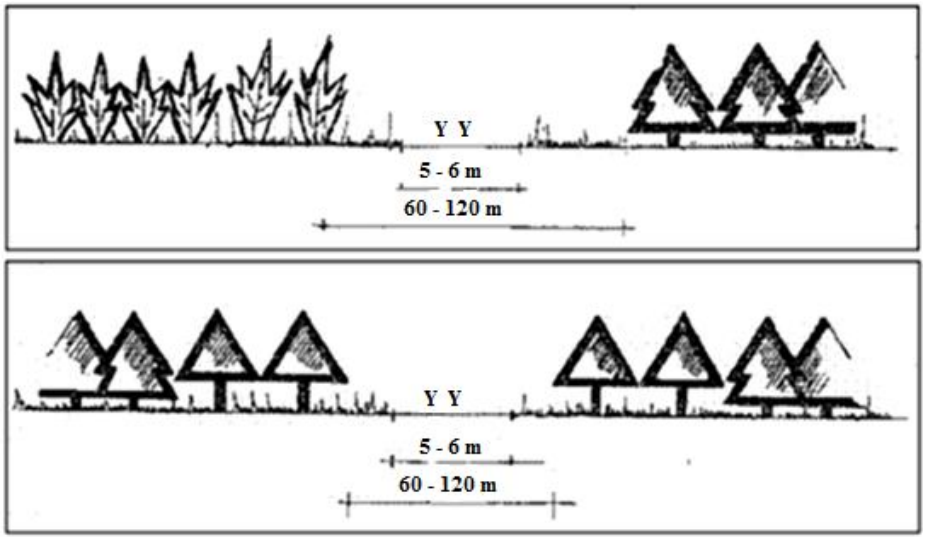

Fig. 3.Fire breaks and fire lines [3]

3. Fire-Resistant Forest Project-YARDOP

Rehabilitation of burned areas and the establishment of fire resistant forests project have been implemented in forest areas with high fire risk. YARDOP project was decided to be developed after the Serik-Tasağıl fires of 2008, which was the largest fire in recent times in Turkey. Projects have been implemented in many

different terrain features throughout high fire risk areas.

This project was first developed in 2008, and then several modifications were made to its standards. According to the latest edition prepared in 2014, the information about the fire-stop and intervention facilities in the project has been updated. The main purposes of the project are defined by [6] as: "To increase resistance to fires in fire-sensitive forests, to reduce the amount of combustible materials to establish fire-fighting areas, to reduce the heat energy released during the fire, to construct lines made of trees and shrubs, to make transportation facilities in case of need, and to set up mixed forests with fire resistant species”. There are three different fire intervention and protection facilities specified YARDOP: fire intervention facility, wild land-urban facility, and wild land-agricultural areas facility.

Fire intervention facility: The width of the transportation facility is between 6-15m.From the transportation facilities, two sides are formed in the 20-30 meter part of the forest. The stand on the edge of the transportation facility is protected to prevent negative external factors while the fire weakening areas are being generated. Fire-resistant species in the weakening area should be preserved. Two types of fire intervention facilities are developed; one for reforestation forest damaged by fire and one for fire-sensitive forests (Figure 4).

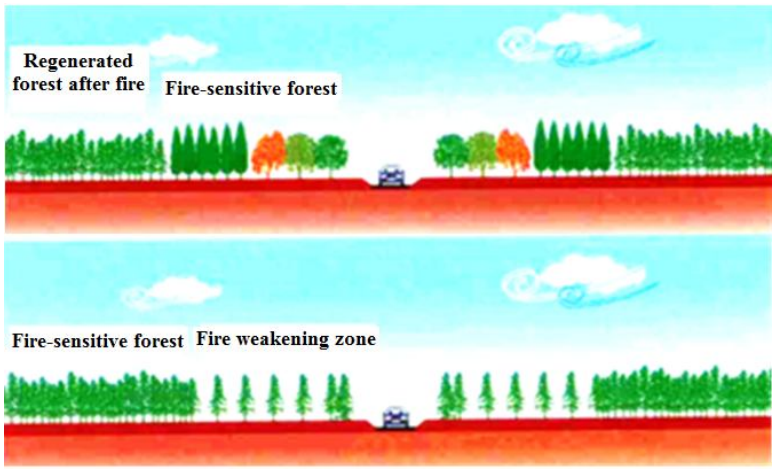

Fig. 4. Fire intervention facility [6]

Wild land-urban facility: Fire weakening zones are established between settlement and fire-sensitive forest lands from the border towards the forest facilities. The width of the transportation facility is between 6-8m. From the transportation facilities, a “weakening zone" will be formed in the 20-30 meter part of the forest. When the weakening areas are built, the edge near the transportation facility should be protected to prevent negative external factors. Again, fire-resistant species in the weakening area should be preserved. There are two types of fire intervention facilities for reforestation forest damaged by fire and fire-sensitive forests (Figure 5).

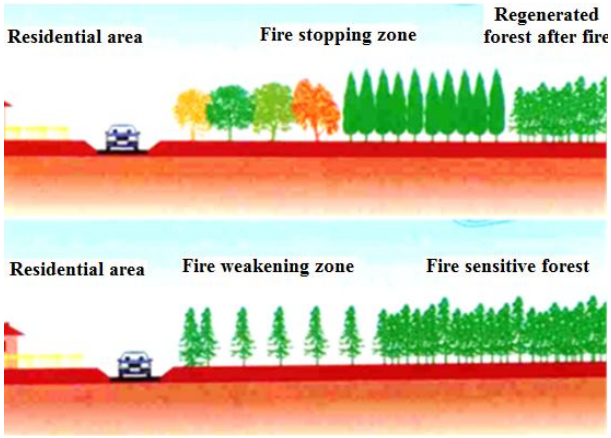

Fig. 5. Wildland-urban facility [6]

Wildland-agricultural areas facility: They are the facilities built from the agricultural land to the forest land. The width should be determined carefully depending on fire sensitivity and terrain structure. Where the transportation facility is not adjacent to the agricultural land, wildland-agricultural areas facility can be installed between the forest land and fire-resistant herbaceous and woody plants which determine the forest-agricultural border. Forest cadastral borders should be taken into account when designing these facilities. There are again two types of fire intervention facilities for reforestation forest damaged by fire and fire-sensitive forests (Figure 6).

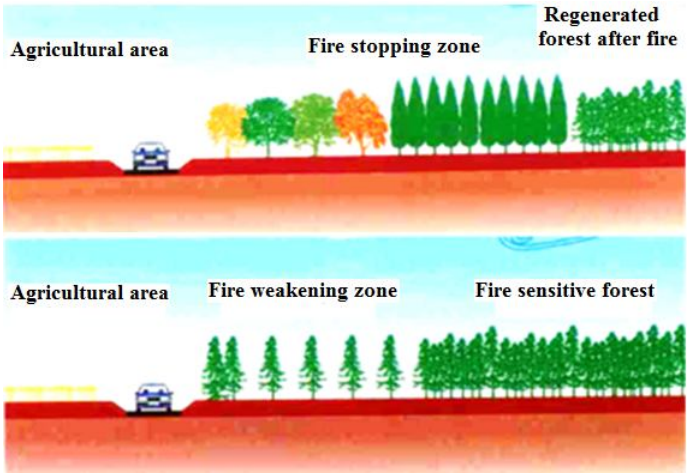

Fig. 6. Wildland-agricultural areas facility [6]

4. Conclusions

As one of the most detrimental natural hazards on forest resources, forest fires can cause serious damages on forest ecosystem especially in arid regions. In order to minimize these affects, firefighting facilities should be installed

where it is necessary and fire-resistant forest should be established in the regions with high fire risk. Firefighting facilities and roads are established to protect the stands from fire hazards especially in productive forest areas. While the facilities and roads are mainly used for fire intervention activities, they also serve for stopping fire or weakening them. These facilities should be well planned according to YARDOP project rules and appropriately implemented in the field to reduce potential damages of the fire on forest ecosystem, especially in the fire sensitive areas.

References

1. Bilgili, E., Coskuner, K.A., 2015. Ecological Assessments of YARDOP (Rehabilitation of Burned Areas and The Establishment of Fire Resistant Forests Projects) Implementations". At: International Forest Fire Conference in Black Sea Region, 6-8 November 2014, Kastamonu, Turkey, pp. 18-19.
2. Bilici, E., 2009. A Study on the Integration of Firebreaks and Fire line with Forest Roads Networks and It's Planning and Construction (A Case Study of Gallipoli National Park). In: Istanbul University Faculty of Forestry Journal, Series A, vol. 59(2), pp. 86-102.
3. Çanakçıoğlu, H., 1993. Forest Protection. Istanbul University, Faculty of Forestry Publication, no. 3624, 633 p.
4. Demir, M., Küçükosmanoğlu, A., Hasdemir, M. et al., 2009. Assessment of Forest Roads and Firebreaks in Turkey. In: African Journal of Biotechnology, vol. 8, pp. 4553-4561.
5. FAO, 2001. Global forest fire assessment 1990-2000. Forest Resources Assessment Programme. Working paper no. 55. Available at: http://www.fao.org:80/forestry/fo/fra/docs/Wp55_eng.pdf.
6. GDF, 2014. Rehabilitation of Burned Areas and the Establishment of Fire Resistant Forest Guidelines. Available at: https://www.ogm.gov.tr/ekutuphane/Tamimler/6976%20Say%C4%B1l%C4%B1%20Tamim.PDF.
7. Güngöroğlu, C., Güney, C.O., Sarı, A., 2014. Evaluating the Implementations of the Fire-Resistant Forest Projects (YARDOP) (Antalya Case Study). II. At: National Mediterranean and Environment Symposium, 22-24 October, Isparta, Turkey, pp. 467-476.
8. Kılıç, M., Cebeci, M.A., 2009. Rehabilitation of Burned Areas and Establishment of Fire Resistant Forest Project (YARDOP). General Directorate of Forestry, 1. At: Forest Fire Prevention Symposium, 07-10 January, Antalya, Turkey, pp. 240-248.
9. Küçükosmanoğlu, A., Hasdemir, M., 1991. Firebreaks importance and location in the forest roads network system. Review of the Faculty of Forestry, vol. 41B (3/4), pp. 83-91.
10. UNCCD, 1994. United Nations Convention to Combat Desertification Report, Paris, France.
11. Zhong, M., Fan, W., Liu, T. et al., 2003. Statistical analysis on current status of China forest fire safety. In: Fire Safety Journal, vol. 38, pp. 257-269.