

Video control of wildfires in Serbia

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Abstract: Bearing in mind the significance of the early fire detection and aiming at the fast and adequate action according to modern achievements, this paper reviews the fire monitoring in the most endangered area in the Republic of Serbia - the Deliblato Sands, with special reference to the introduction of video control.

Key words: Deliblato Sands, monitoring, wildfire, video control

Introduction

From 1990 to 2005 there were more than 1,700 forest fires in the Republic of Serbia. The total burnt area of forests was about 40,000 ha (Diagram 1).

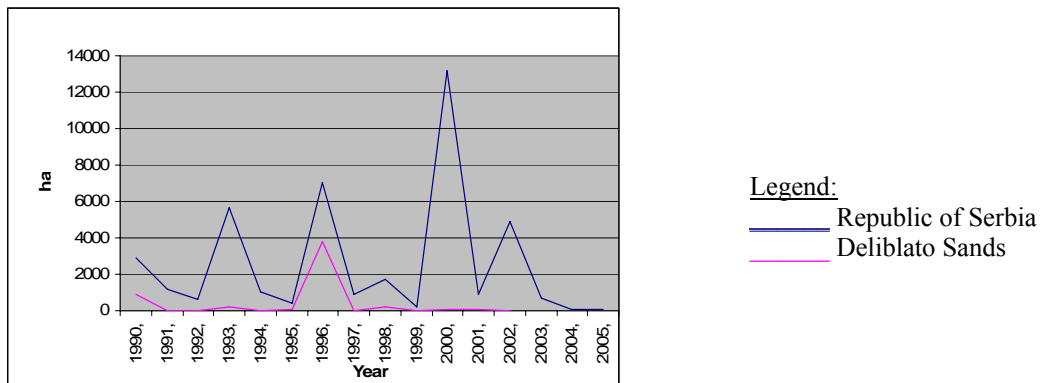


Diagram 1: Review of burned areas by year (ha).

Forest fires in the past decades were among the most significant problems also in forest management at the Deliblato Sands. They occurred as the consequence of the extreme climate and edaphic conditions, the specificity of vegetation, and the lack of awareness of the present risk and potential consequences. Due to the fire frequency and the high resulting damage, this area was classified as one of the most endangered sites in Serbia, and the solution of the problem became a priority task. Numerous measures have been applied, direct and indirect, such as propaganda, education of the population, construction and maintenance of fire breaks and observing towers, use of modern communication means (aiming at the fastest possible reaction), organisation of observation services, elaboration of plan documents (operation plans) etc.

Although during the past time period the measures of preventive fire protection became increasingly complex, only the last large-scale fire (total burnt area 3,815 ha), characterised as the disaster, destroyed 2,235 ha of laboriously established and cultivated pine plantations.

Bearing in mind the significance of the early fire detection, and aiming at the fast and adequate action, in line with modern achievements, it was necessary to introduce the video control in this protected area. The idea was realised by the end of 2006, the system of video control was launched at the site

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Čardak, where the electronic centre is installed. Its main technical characteristics, mode of operation, and data processing are dealt with in this paper.

Study area and method

The Deliblato Sands, the last and the largest oasis of the sand, steppe, forest and wetland vegetation, and one of the most important centres of biodiversity in Europe, covers 35,000 ha. At the end of the 18th century, this area was covered with autochthonic vegetation, which was almost destroyed by extensive tree cutting, overgrazing and deliberately set wildfires.



Figure 1: Map of the Deliblato Sands from 1860

On the map from 1778, this area was presented as a desert and it was named the European Sahara. In 1812, state property was established on 40,000 ha of which 16,800 ha was unfixed sand and the forestation with poplar, birch and pine started in 1818. From 1853, black locust became the main afforestation species till 1907, when the last areas of the flying sand were forested.

From 1953 to 1968, pine became the only species for the forestation of 6,000 ha. This culture was burnt in great forest fires in 1972 and 1990 and in the catastrophic forest fire in 1996.

In the aim of early detection of fire, a modern monitoring system based on electronic video control was installed at the Deliblato Sands by the end of 2006.

Electronic video-control - technical characteristics, system of operation and method of data processing

The base of the system consists of 5 cameras, located on the five existing metal observing towers (height 16 - 20m), which are at visibility distance, and the electronic observation centre, which is in command of the cameras and where the observed data are electronically recorded. Observing towers are situated at the localities: "Korn", "Dubovac", "Đurin Bor", "Devojački Bunar" and "Čardak". The cameras are rotating, with the motorised optical zoom which exceeds by far the capacity of the observation with binoculars.

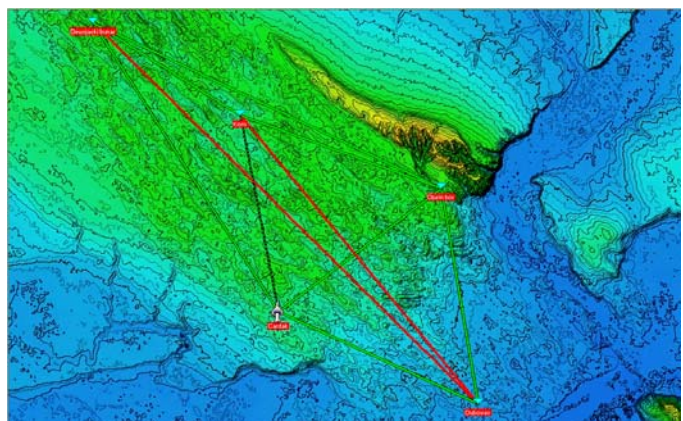


Figure 2: Map of Special Nature Reserve "Deliblato Sands" with location of observing towers with cameras

The data collected at the observing towers “Korn“, “Dubovac“, “Đurin Bor“ and “Devojački Bunar“ by the remote control system are transmitted to the observing tower “Čardak“, and then to the observing (electronic) centre, by which the control of the entire area of the Deliblato Sands is managed from one place. The system for the control of camera positions and optics is sent from the centre to the observing tower Čardak, and from it to other observing towers. This observation system is now operated by two operators and not by ten fire watchers (two on each of the 5 observing towers) as it had been previously. The cameras are equipped with a motorised optical (22-30x) and digital zoom (220-300x), with electronic recording. The quality of observation is manifoldly better, more precise and reliable than the direct observation from the observing towers, i.e. the capacity of the fire watchers with the binoculars (8-10x) to perceive the watched event. Night monitoring (difficult detection of the smoke, i.e. the initial phase of the fire) is for the time being possible only in the part which is covered by the camera at the site Čardak, because it has the additional equipment which enables the functioning of the system in the infrared part of the spectre. The equipping of other cameras is also planned, depending on the finances. Another option is also the device that reacts to temperature (termovision).

The signals from the individual cameras are received by the digital video recorder with multiplexer and they are stored on the hard disk, so they can be used when needed. The digital video recorder can store all the recorded data from 5 to 200 days, depending on the required record quality and the number of images per second, after which the old files can be deleted and replaced by new ones. The Operator can also read the azimuth from the cameras and by crossing two read azimuths indicates the exact location of the fire event or the observed object, etc.

On the observing towers (2 locations) without electrical network connection, the solar panels are erected which produce electricity during the day and the surplus is accumulated in the storage battery which supplies the system.

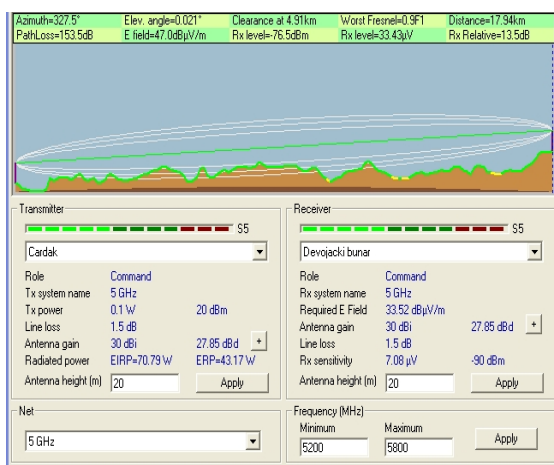


Figure 3: Prediction from Devojački Bunar towards Čardak.

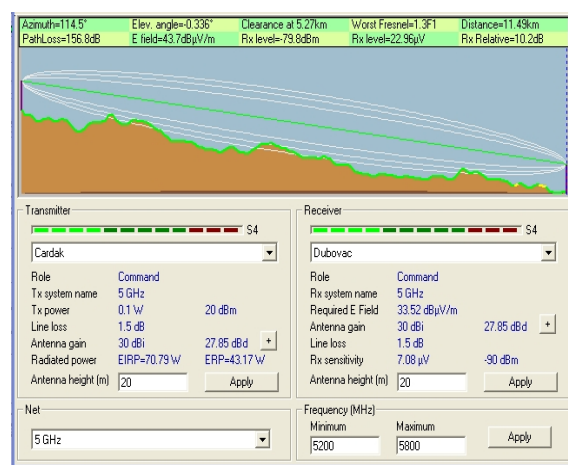


Figure 4: Prediction from Dubovac towards Čardak

As the system was launched only a short time ago, there is not a real statistical period based on which it could be analysed whether this method of electronic video control has justified its existence, i.e. whether it has contributed to the early detection of fire, which was the main goal. It is supposed that next year it will be confirmed that the investment is appropriate, both from the biological, and from the economic aspect.

Conclusion

Electronic video control in the area of the Deliblato Sands at the beginning was in the function of preventive protection against forest fires. However, when it is taken into account that it is a Special Nature Reserve, its appropriateness and feasibility are even more significant. On such a specific site, once destroyed natural vegetation, as well as forest plantations which were established with enormous

efforts, are very difficult to reinstate, so every action on the prevention of their destruction is many times justified.

References

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Summary

From 1990 to 2005 there were more than 1,700 forest fires in the Republic of Serbia. The total burnt area of forests was about 40,000 ha. The most endangered area is in north-east Serbia, Special Nature Reserve the Deliblato Sands (the last and the largest oasis of the sand, steppe, forest and wetland vegetation, and one of the most important centres of biodiversity in Europe, covering 35,000 ha), where in the same period 4,600 ha was burnt. In 1996 there was the biggest forest fire in the history of the Republic of Serbia causing a true ecological catastrophe.

From 1953 to 1968, pine became the only species for forestation of 6,000ha. This culture was burnt in the great forest fires in 1972 and 1990 and the catastrophic forest fire in 1996, when 3,600ha was burnt, of which 2,200ha was forested.

The significance of early detection of wildfires, poaching, etc., developed the idea of introduction of video control. The video monitoring system was installed at five existing observation towers which are 20 m in height. At the observation towers the cameras with motorized optical and digital zoom (additional option is infra-red equipment) have been installed and they transmit images to a control room. Received signals are transmitted to the digital video recorder with multiplexer and saved to the hard disc.

The system of video control of the Reserve will enable the preventative measures of control and early detection of forest fires in the initial phase.

