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POTENTIALS OF FOREST ZABRAN IN SAVA'S FORLAND NEAR OBRENOVAC FOR FUNCTION OF RECREATION

Milijana Cvejić, Suzana Mitrović¹

Abstract: The occasional flooded area in Sava's forland near Obrenovac belongs to the category of the forest with the reduced productive function. The researches conducted during 2008 for the needs of the creation of the Plan for reconstruction, recultivation and arrangement of the devastated area in the location Zabran in Sava's forland near Obrenovac, demonstrated the need for the recreational use of this area. Creation of the Plan for the use of the devastated forest area for function of recreation in the open area (by the Project Cvejić, M, 2008), the recreational needs of the inhabitants will be satisfied and the current forest vegetation will be preserved.

Key words: forest, nature protection, recreation

PRIKAZ PLANA KORIŠĆENJA DELA ŠUME ZABRAN U FORLANDU SAVE KOD OBRENOVCA ZA PREUZIMANJE REKREACIONE FUNKCIJE

Izvod: Povremeno plavno područje u forlandu Save kod Obrenovca pripada šumi sa umanjenom proizvodnom funkcijom. Istraživanja koja su obavljena tokom 2008. godine za potrebe izrade Plana sanacije, rekultivacije i uređenja devastirane površine na lokaciji Zabran u forlandu Save kod Obrenovca, su pokazala da postoji potreba za rekreativnim korišćenjem ovog područja. Planom korišćenja devastiranog šumskog područja za funkciju rekreacije na otvorenom (po projektu Cvejić, M., 2008), zadovoljile bi se rekreativne potrebe stanovnika i očuvanje postojeće šumske vegetacije.

Ključne reči: šuma, očuvanje životne sredine, rekreacija

¹ Milijana Cvejić, graduate engineer, Suzana Mitrović, graduate engineer, Institute of Forestry, Belgrade

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INTRODUCTION

The recreational function of the forest is the secondary, non-profitable function in the relation with the primary, productive function (Forest Law, (Official Gazette of the Republic of Serbia, Number 46/1991, 83/1992, 54/1993, 60/93 i 54/1996). The use of forest Zabran in the part of the forland for the function of recreation has not been analyzed and planned so far. The forland of forest Zabran is spontaneously used nowadays for the recreation despite of its nature limitations. The aim of the paper is the review of the Plan for arrangement and use of the devastated area in the location Zabran in Sava's forland near Obrenovac.

2 OBJECT OF RESEARCH AND METHOD OF WORK

The area of the research includes the part of forest Zabran in Sava's forland near Obrenovac, between the Sava River flow in the northeast, to the embankment and part of the forest in the protected part, at the west vorder of the area. South border consists of the current camp, and the north border consists of the digged channel. The investigated area covers an area of 42,100 m². The area is flooded occasionally and characterized by the deep level of the ground water.

The method of work included the field researches and procession of the data from the readily-available studies and plans: Study on the condition of the current forest vegetation (Zabran- picnic's forest, 2004 – 2008), Plan for the general arrangement of the part of the Obrenovac's forest Zabran (2007), as well as the data from the archives of the Hydrometeorological Service of Serbia, for the Belgrade area (2007).

The analysis of the collected data was conducted by the following method in the creation of the plan, i.e. assessment of the suitability of the area for the function of recreation.

3 RESULTS OF THE WORK

3.1 Nature characteristics of the area

3.1.1 Climate

Obrenovac is characterized by the moderate-continental climate². Mean monthly temperatures reflect the regularity in the range between the minimum in January and maximum in July. There are between 30 and 40 days with the maximal temperature (temperature sometimes reaches 40-42°C). As a rule, winters are severe and changeable. The greatest difference between the hottest and coldest day is 16.7°C.

The early frosts occur in November, and late frosts occur in late March, which is not expected to have an adverse effect on the vegetation. The average period devoid of frost lasts between 180 and 215 days. The sunshine lasts between 2,000 and 2,100 hours. The minimum of precipitation is in February and September (434 mm), and maximum is in May and June (691 mm). The precipitation in the form of hail most usually occurs in May and June, but it can also occur in the period April-September. The snow layer varies from year to year, in regard of the depth and duration. The depth ranges between 5 and 70 cm, and the duration of it between 2 and 66 days. Southeastern wind kosava is the

² The Hydrometeorological Service of Serbia for Belgrade Station (2008), Climate, Belgrade

important characteristic of this region. It mainly occurs in winter and spring, as well as in autumn months. Most usually it is dry and cold wind, reaching the speed from 18 to 40 km/h, and usually blows in the strong gusts, which at the moments reaches the storm speed, from 90 to 115 km/h. The second wind in this area is west-northwestern wind. It mainly occurs in summer, and it is less intensive than kosava. It also causes soil drain.

Analysing the total climate characteristics, regularity in the course of the mean annual temperature amplitude, duration of the sunshine, occurrence and intensity of the kosava wind, quantity and rhythm of the precipitation in the summer and winter month, as well as the limit values of the criteria of the climate suitability by Turowski (1972)³, it can be concluded that the investigated area, in relation to the climate characteristics, have potentials for the development of the recreation function.

3.1.2 Vegetation and pedological characteristics

Forland in Zabran (unprotected part of the alluvial plane in the very vicinity of Sava's water flow) belongs to (Forest-industrial base Košutnjačke forests, 2004 – 2008) spatial entities IVa and IVb. The vegetation of forland consists of the pedunculate oak and ash (*Fraxino-Quercetum-roboris-subnundatum*) association on marshy chernozem (humogley), with the characteristics of γ -gley. The association of ash with the clump of mixed pedunculate oak trees at an altitude of 73 m is characterized by the strong antropogenic influence, open canopy, with the cleared shrub layer. The root system of pedunculate oak and ash is additionally moistened by the ground and occasionally by the flood water. Thanks to the capillary raising of ground water, plants are very well-supplied with the soil moisture. Within the forland, in the depression, the ash (*Fraxinus angustifolia*) on alluvial soil (fluvisol) was reported in the small area, where the material of the heavy mechanical composition is present in all layers. These soils are under the permanent influence of the flood and ground waters. The productive potential of this alluvium is not very high. The parasitic plant mistletoe (*Viscum album*) was also observed. Syberian elms demonstrated tolerance to flooding, high level of the ground water and exposure to sun.

Against the criterion of suitability of the percentage of the forest of forland Zabran established by Turowski (1972), it can be concluded that this criterion satisfied the optimal suitabilities, i.e. 60% of the territory is covered by forest, whereas the other parts of the analysed territory, i.e. 40% are open areas and meadows.

3.2 Zabran in Sava's forland

3.2.1 Description of the condition

Forest Zabran is the area where during the year, and particularly during the period from spring to late autumn, a great number of people come for rest and recreation.

The facilities built in the forest point to the fact that the visitors are interested in staying in the area of forest Zabran. In the protected part of the forest lodge and the small number of the private houses (weekend cottages) are situated, as well as the children's

³ Climate (Turowski): For all climate properties linear function was used. The intervals of measuring were determined according to the average minimal and maximal values of the suitabilities of the climate properties. Thus, the mean annual temperature was taken in the interval 0 - 10 °C, mean annual precipitation in the interval 500 - 1200 mm. For the mean annual sunlit the interval is 1,340-1,915 hours, by which the low values are unfavourable, whereas maximal values are very favourable.

playground, catering facilities with the accompanying contents, trimmed path, and shooting club “Odisej”, and several wooden facilities with the sitting eaves.

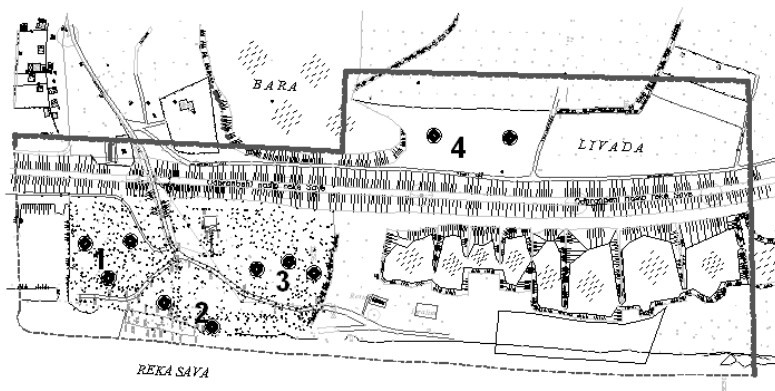
In the area of forest Zabran in the forland the restaurants “Savska terasa” and “Alpska koliba” are located, as well as the improvised camp. Zabran is the favourite vacation area of the citizens of Obrenovac, isolated from the noise, ideal for the nature-lovers.

In accord with the Forest Law (“The Official Gazette of the Republic of Serbia”, number 46/1991, 83/1992, 54/1993, 60/93 and 54/1996) forest Zabran has the economical forest status. This fact points to the implementation of the arrangement measures which do not imply the picnic-recreational forest function. Therefore, previously it was impossible to implement all the arrangement measures necessary for the appropriate arrangement of this complex, since it will enable this forest to serve for the needs of vacation and recreation, which will be its priority function.

3.2.2 The previous use of the investigated part of forest Zabran

The field researches showed that this part of the forest is spontaneously used for the purpose of recreation. The following recreational activities were observed: camping, barbecuing, swimming, boating, canoeing, motorbiking. All these activities are done in an unorganized and elemental way. The consequence of this use is the neglected and slovenly look of this area. Currently, the elements for children’s play which are located in the area freely, without the clear picture of the concept of area and the real needs of the visitors, are situated in the planned area (Picture 1).

Picture 1- The current use of the area of forest Zabran in forland for function of recreation



Legend: 1 - The place of the spontaneous gathering of the campers; 2 - Access to the river and camp and the use of the motor vehicles; 3 - The place of barbecuing; (in the plots 1, 2 and 3 the following are inscribed: the current forest vegetation and earth paths), 4 - Meadow used as rifle range.

According to the review of the current positions of the recreational activity of the visitors it may be concluded that there is a need for the arrangement and transfer of this area in the organized recreational zone which would be able to satisfy both daily and weekend needs of the citizens of Obrenovac and wide vicinity.

3.2.3. Planned development of the recreational function in the location of Zabran

Ecology fund (investor of the Plan) analysed the needs of the citizens for the recreational use of this part of the forest, which is defined by the project task (increase the number of the recreational activities, provide the good communication and accessibility to all the recreational facilities, preserve the current vegetation).

Respecting the nature peculiarities of this area, and in accord with the project aim and analysis of the suitability for the recreation, the plan for the use of the investigated area was suggested. The plan anticipates the composition and functional contents: the type of the highway, the size of the plot, the type of activity, load of the area according to the number of visitors per unit of area and time of stay, which is presented in Table 1.

Among the elements which have been already set for the children's recreation, the new facilities for the active and passive recreation are suggested by the Plan draft of the use. The whole area of the forest Zabran in forland was divided into zones with the contents and accompanying elements for the different types of recreations, for which the need arose in this part of the terrain.

Table 1- Planned content of the investigated area by zones

Zone 1: CAMPSITE		Area 7,124.0 m ²	
Component of the zone	Additional equipment	Size	Unit
Area of Zone 1 for camp-trailers		7,124	m ²
Asphalted path	Path3	121	m
Earthen path	Path1a, b, c	167	m
Total length / Area of the Paths		288/744	m/m ²
The total number of parking places	PP	26/312	piece/ m ²
Activities:	camping		
Number of visitors	100 camp-trailers		
The time of stay of visitors	since early spring to late autumn		
Load of the area of Zone1 by the additional equipment 10.5%			
Zone 2: BEACH		Area: 5,780m ²	
Component of the zone	Additional equipment	size	unit
Total area of Plot T3		5,780	m ²
Total length /Area of Asphalted path	Path4, Path5, Path6	290/580	m/ m ²
Stands used for sitting, sunbathing, watching of the sports events,ramp for launching boats in water		346	m ²
The total length of stands		58	m
Activities:	grass sports, children's play, sunbathing, swimming, water sports, walk along „health path“		
Number of visitors	30 / ha		
The time of stay	daily stay, greatest number of visits at weekend		
Load of the Zone2 by the additional equipment 16%			

Zone 3: BARBECUING		Area: 6,699m ²	
Component of the zone	Additional equipment	size	unit
The total area of Plot T3		6,699	m ²
The total length of the earthen path	Path8	451	m
The total number of Parking places	PP	37	pieces
Park mobilier	Shade, hearthen, logs	30	pieces
Activities: barbecuing, nature vacation, walk along „health path“, children’s play			
The number of visits			20/ha
The time of stay			daily stay, the greatest number of visits at weekend
The load of area of Zone3 by the additional equipment			18%
Zone 4: RIFLE RANGE		Area: 8,387m ²	
Component of the zone	Additional equipment	Size	Unit
Total area of Plot T4		8,387	m ²
Protective belt		408	m ²
Park mobilier	Bench, shade, sets of rubbish bins, changing rooms, storage room, toilet	35	pieces
Vegetation	<i>Acer pseudoplatanus</i>	8	pieces
Activities: sports events –shooting with the provided accompanying facilities			
The number of visits			20/ha
The time of stay number of visits is reported only in the time of sports event			
The load of the area of Zone4 by the additional equipment			6.9%
Zone 5: GREAT PARKING AREA		Area 8,340m ²	
Component of the zone	Additional equipment	size	unit
The total area of Plot T5		8,340	m ²
The total length of the asphalted path		288	m
The total number of Parking places	PP	386	pieces
Vegetation	<i>Acer pseudoplatanus</i>	78	pieces
	<i>Ulmus pumila</i>	52	pieces
		130	pieces
Activities: parking and access of the visitors to the recreational facilities and restaunts in forland			
The load of the area of Zone4 by the additional equipment			386 parking places 100%
Time of stay			daily stay, the greatest number of visits at weekend
The number of visitors			-

Highways out of recreational zones			
Asphalted paths	Paths 1, 2, 7, 9	1022	m
The number of parking places			63 p.p
THE TOTAL PLANNED AREA FOR FUNCTION OF RECREATION IN FOREST ZABRAN			
			42,110 m ²

The Plan for the use anticipates five zones for active and passive recreation, by which the highways connect recreational zones and activities within them, which make the all parts of the park in this part of area of forest Zabran in forland be arranged and easily accessible.

3.2.3.3 The description of the project recreational zones

Zone 1 Campsite, covering an area of 7,142 m² is the area arranged for easy and organized access of the vehicles with camp-trailers. The area aimed for the camp was arranged within the current forest. On the earthen base the paths made of broken stone (smoothed huge gravel) were marked, in the aim of the preservation of the nature condition of the ambient totality, providing drainage ability of the terrain and reduction of the quantity of dust in the summer months. By the rim of the camp zone the parking places for the visitors of Zabran are provided.

It is possible to reach the Zone 1 (Camp) from two directions (Path 1 and Path 3), by the asphalted paths which descend to this area from the embakment (Path 9). In the aim of the prevention of the unorganized enters to the campsite along the path (Path 1) the construction of the parking areas with the fence made of wooden logs, at a distance of 50cm, in the direction to the forest, is planned. The kerbs were set by the rims of the parking area in the direction to the highway and are of the greater dimensions in the direction to the forest in order to hinder the enter to the vehicles to the places of the camp which are not aimed for parking in one more way. The activities done in the Zone 1 are: camping, access to the catering facility on the river, parking by the rim of the zone, launching boats in water, water sports.

Zone 2 (Beach) is the zone aimed for active recreation of children and grown-up. The pedestrian paths in the Zone 2 are dimensioned in the dimension of the one-way vehicle-pedestrian paths for serving, 3m wide. The pedestrian paths connect all the contents in the Zone 2. "The health path" is aimed for walking in the park and path for walking on the river bank are made of coloured asphalt, by the method of construction of bicycle paths, on the base of armoured concrete, with white garden kerbs which are dipped in the concrete pillow.

In the sub-unit intended for nautical-aero zone the stands on the already built concrete layer with the sitting and sunbathing stairs made of armoured concrete were set, the dimensions of the stands are 0.29/1.00/6, with 4 prongs of stairs.

In the zone of the beach the base which is well-drained was built of the layers of the huge and small gravel. In the location of Zone 2 the sanitary elements are also anticipated: changing rooms, showers, toilets and accompanying catering stands of the temporary seasonal character, necessary for the recreational function in this location. The activities in the Zone 2 are: grass sports, children's play, water sports, relaxation in the cafeterias, the walk along the "health path".

Zone 3 is the zone for the passive recreation – barbecuing. In the sub-unit of the recreational zone “barbecuing” the construction of the facilities made of hard materials is not allowed. Within the current forest vegetation the second part of the path “health path” and areas for vacation (9 sitting sets of the type “Smrčák”, 3 hearths, and 18 sitting logs) were built. Owing to the occasional flooding of the terrain, the facilities on the surface were anchored in the concrete base, with the starlike steel construction for the increasing of the stability. The activities in the Zone 3 are: barbecuing, nature vacation, the walk along “health path”, children’s play.

Zone 4 is the location used as rifle range, (8.387 m²). By the project it was supplemented with the mobilier for the accommodation of the visitors of this sports event (wood bench, set “Smrčák”, rubbish bins) whereas in the protective embarkment – from the protected side the necessary accompanying facilities (two changing rooms, two store rooms, one sanitary facility) are located. Along with the position and quantities of the accompanying contents necessary in this area, the obligatory measures of protection are also anticipated by the project: enclosing of the location for this sports event and the protection of the visitors. The activities in the Zone 4 are: sports event – shooting with the provided accompanying facilities.

Zone 5 is the great parking area, zone in which the parking area in 5 rows with 386 parking places was built. For greening and providing of the shade in the parking areas of the great open parking area (8,340 m²) the following species are anticipated: Siberian elm (*Ulmus pumila*) 78 seedlings and Sycamore maple (*Acer pseudoplatanus*) 52 seedlings, which are well-adapted to insolation and soil conditions. The base in the parking area is made of concrete raster elements, which are filled with soil substratum and grassed. The parking zone is connected with the catering facilities in the forland belt by the stairs of wooden steps, which are set in the embarkment and which by their form and material serve the function. The activities in the Zone 5 are: parking and access of the visitors to the recreational facilities and restaurants in the forland.

The highways within the whole recreational area out recreational zones are dimension in the dimension of two-way vehicle-pedestrian path with and without parking area and covered by asphalted cork on the base of the armoured concrete with concrete kerbs.

3.2.4. Load of the part of the forland in Zabran for function of recreation by the planned way of use

The load of the area of Zone 1 (Campsite) by the additional equipment is 7.44 m² which accounts for 10% of the total area of the plot 1 (7,124 m²); The number of the visitors is determined by the number of areas for camp-trailers in 100 m². The visit to the campsite implies the stationing of the vehicles with camp-trailers for a longer period, i.e. for the period since the early spring to the late autumn, when the nature condition are no longer favourable to the stay in the open.

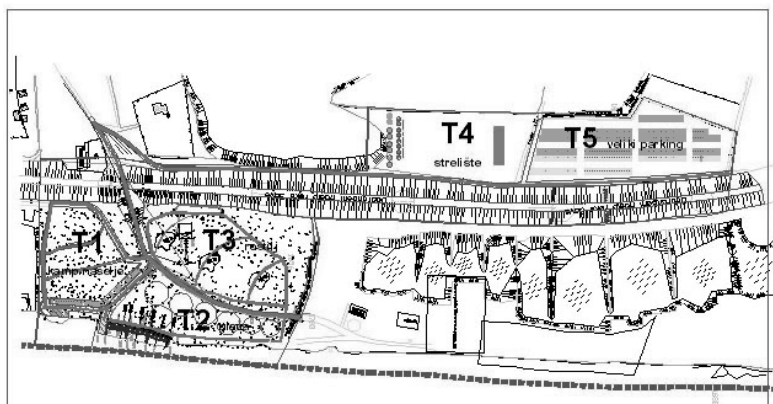
The load of the area of Zone 2 (Beach) by the additional equipment is 926 m² of the used space with 30 visitors/ha, which accounts for 16% load in relation with the total area of the plot 2 (5,780 m²). The number of visits is constant in the period spring-autumn with the increased load on weekend days.

The load of the area of Zone 3 (Barbecuing) by the additional equipment is 30 park elements in 1,211 m² with 20 visitors/ha, which accounts for 18% of the total area of the plot 3 (6,699 m²). The number of visits is constant in the period spring-autumn with the increased loading on weekend days.

The load of the area of Zone 4 (Rifle range) by the additional equipment is in 8,340 m² 20 visitors/ha and 35 equipment elements, which accounts for 6.9% of the total area of the plot 4 (8,387 m²). The number of visits is reported only during the sports event.

The load of the area of Zone 5 (Great parking area) by the additional equipment is 386 parking places in 4,632 m² with 3,708 m² of the access highways, which accounts for 100% of the total area of the plot 5 (8,340 m²). The number of visits is constant in the period spring-autumn with the increased load on weekend days, which is presented in the Picture 2.

Picture 2- Planned use of the area of forest Zabran in forland for function of recreation



Legend: 1 - Zone 1 – Campsite; 2 - Zone 2 – Beach for the active recreation by water; 3 - Zone 3 – Barbecuing and other types of the passive recreation (*in the plots 1, 2, and 3, the current forest vegetation is inscribed*); 4 - Zone 4 – Rifle range– the area arranged for sports events; 5 - Zone 5 –Zone of the great parking area

By this plan of the use of the area for function of recreation the maximal used area in 42,110 m², without disturbing the current forest vegetation, organized, arranged area with the clearly defined and highways by the well-connected plots for function of recreation, was obtained. Beside the exterior communication by the plan of use the connection on the plots between the recreational activities was also provided. The plan of the use also enables the accession to the motor vehicles to the very location, by which the vehicles park in the parking areas intended for it, which are set in the very forest by the rim of the forest highway, and no tree was removed but the parking areas were set between the existent ones. By the project the sufficient number of recreational facilities was provided, and the existent forest vegetation is not endangered.

4. DISCUSSION AND CONCLUSIONS

The plan of the use anticipates the new organisation of the activities, despite of the fact that the riparian part of the forest is flooded twice a year for several months. By the plan the zones and highways of higher and lower orders are anticipated, by which the following results are achieved:

- By planning the recreational function in the unprotected part of forest Zabran the logical sequence to this function in the protected part of the forest, where the researches showed that the current territorial behaviour of the visitors in accord with the use of the area for recreation, was achieved.

- Planning the forest land in Zabran by the river for function of recreation, contributes to the increase of the offer of the recreational activities in this area;
- Plan suggests that by the future forest management the ratio of the areas should be preserved, which will enable the further improvement of the forest suitability for recreation;
- By planning the use of the area for recreation function without destroying of the current vegetation the stability of the forest ecosystem is preserved;
- By setting of the drainage bases in the zones of the recreational areas the technical reconstruction of the complete area is performed.
- By introduction of the function of recreation in the forest the conditions for the control of the destructive activities in the forests are made more favourable.

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POTENTIALS OF FOREST ZABRAN IN SAVA’S FORLAND NEAR THE OBRENOVAC FOR FUNCTION OF RECREATION

Milijana Cvejić, Suzana Mitrović

Summary

The possibilities of the use of forest in alluvium for function of recreation were researched. The researches showed that for the determination of the type of recreation

in relation to the potentials of the area and needs of the users it is adequate to apply the method of suitability estimation of the area for function of recreation.

The results of the researches show that by the technical-surface terrain reconstruction it is possible to completely use the location for the different types of active and passive recreation, by using adequate and accompanying equipment, without endangering of the current condition of the forest vegetation. The plan of the arrangement and use of the devastated area in location Zabran in Sava's forland near Obrenovac was presented. This plan for the use of the area enables the area for 100 camp-trailers, 449 parking places, 45 elements of recreational equipment, 138 of newly-established seedlings, 2,340 m of paths to be provided on 42,110 m², which is in accord with the permitted load of the zone for recreation in the forest by the preservation of the stability of the forest ecosystem.

PRIKAZ PLANA KORIŠĆENJA DELA ŠUME ZABRAN U FORLANDU SAVE KOD OBRENOVCA ZA PREUZIMANJE REKREACIONE FUNKCIJE

Milijana Cvejić, Suzana Mitrović

Re z i m e

Istraživana je mogućnosti korišćenja šume u aluvijumu za funkciju rekreacije. Istraživanja su pokazala da je za određivanje tipa rekreacije u odnosu na potencijale područja i potrebe korisnika adekvatno primeniti metodu vrednovanja pogodnosti područja za preuzimanje funkcije rekreacije.

Rezultati istraživanja pokazuju da je lokaciju uz tehničko-površinsko saniranje terena moguće kompletno iskoristiti za različite vidove aktivne i pasivne rekreacije uz adekvatnu osnovnu i prateću opremu a da se pritom postojeće stanje šumske vegetacije ne ugrozi. Dat je prikaz plana uredjenja i korišćenja devastirane površine na lokaciji Zabran u forlandu Save kod Obrenovca. Ovako planirano područje omogućava da na 42.110 m² bude obezbeđen prostor za 100 kamp prikolica, 449 parking mesta, 45 elemenata opreme za rekreaciju, 138 novoposađenih sadnica, 2340 m staza, što odgovara dozvoljenom opterećenju zone za rekreaciju u šumi uz očuvanje stabilnosti šumskog ekosistema.

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