Journal of Agriculture and Environmental Sciences
June 2016, Vol. 5, No. 1, pp. 155-161
ISSN: 2334-2404 (Print), 2334-2412 (Online)

Published by American Research Institute for Policy Development
DOI: 10.15640/jaes.v5n1a16
URL: https://doi.org/10.15640/jaes.v5n1a16

The Impact of Forest Stand's Species Richness on Scenic Beauty of the Landscapes

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Abstract

In this paper is described the visual impact of forest stand's species richness on tourists. Objects of the investigation were specific forest landscapes in Bulgaria. For the study, many coniferous and deciduous forest stands were investigated from aesthetical point of view. The aim of the study was to investigate some visual aspects in forest landscapes, concerning colorful and seasonal effects of forest stands. The impact of species richness of the tree and shrub vegetation on the aesthetic preferences of tourists was determined. The result of the analysis shows different degree of species diversity and its visual impact over the observers. Some practical conclusions are drawn for putting into landscape design practice. The research reported conclusions concerning landscape preferences and the role that physical and behavioural expectations for places could play in the cognitive categorization of landscapes into different types.

Keywords: visual impact, scenic beauty, aesthetic, landscape preferences

1. Introduction

Forest vegetation is a dynamic factor, which scab with mainstream of the time because of its biogenic nature and as a result of economic activity in forests. It is susceptible to sudden changes caused by natural or anthropogenic influences. The recreational activities can also lead to undesirable changes in forest vegetation. This warrants a precise analysis of these characteristics that determine the recreational value of forest areas and can be affected when these areas are used for recreational purposes.

Literature survey shows that the criteria for aesthetic evaluation of forest stands in most cases are not related to their taxation indices. Therefore a lot of conclusions from most general matter were made.

(Tandy, 1979) recommended different aged and mixed stands as more attractive for tourists. Choose to mixed stands gives (Brahe, 1987) too, but he uses a quantitative measure for a recreational assessment of the forest stands - number of trees per unit area.

(Deja, 1981) does take into account the type and age of forest stands assessing the suitability of forests for recreation. The classification of different forest types is made according to species composition and soil moisture. Priority is given to the evaluation of mixed forests aged over 80 years and in certain habitats to the highest level of fitness have fallen forest stands aged over 40 years.

(Brush, 1984) highlights the importance of seedlings and subforest plants as a horizontal limiting the visual intrusion in the stands, but it takes two criteria regarding age structure and species diversity of the plantations. Depending on the visual effects in some cases he recommended as more suitable different aged and mixed stands, while in other cases - different aged and pure stands.

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We can draw the following conclusions from literature review of scientific developments affecting the subject concerning visual impact of forest landscapes:

- It is preferable for the forest stands to be mixed coniferous-deciduous or deciduous-coniferous in terms of their shared vision and attractiveness.
- The visual appearance and impact on the species richness of the forest stands largely depends on two other forest features of the plantation - namely completeness and construction.

2. Material and Methods

Species diversity of forest tree vegetation is a major environmental factors that play a role as a visual recreation resource. This applies particularly to the territory of the Training and Experimental Forest Range "Yundola", which is located in a typically forest area and more than 90 percent of its territory is covered with forests. Their role can be seen in two main aspects:

- as a major landscape component produced highly emotional and psychological impact;
- as a component creating a special environment for recreation and microclimate, especially in terms of functionality.

Operating with forest taxation indicators of the last revision at the forestry, this paper analyzes the species composition of forest stands in terms of its importance in shaping the external appearance of the forest landscape. Species richness of the forest stands is essential for the appearance and recreational attraction of forests. It is analyzed in three main aspects. The first is called "common characteristic" (Figure 1) and is based on the principle shown in Table 1.

Table 1: General characteristics of species diversity of the forest stands

4750 ha wooded area				
1710 ha		3040 ha		
pure stands		mixed stands		
coniferous	deciduous	coniferous	coniferous-deciduous	deciduous-coniferous
1696 ha	14 ha	2040 ha	960 ha	40 ha

This analysis shows the most common feature of species composition and differentiates forest stands of pure and mixed on one hand, and of coniferous, deciduous, coniferous-deciduous and deciduous-coniferous on the other hand.

For pure stands are recognized those who have a value of 9 or 10 percentage contribution of the predominant species and account for 36% of the Forestry woodland (1710 ha). The remaining 64% (3040 ha) belong to the mixed stands. Further, pure stands are differentiated of coniferous and deciduous depending on the dominant species (whether it is coniferous or broadleaf tree). As shown in Table 1., only 1% (14 ha) of the total area of all pure stands accounted for deciduous and 99% (1696 ha) for coniferous.

Mixed stands are divided into three categories - coniferous, coniferous-deciduous and deciduous-coniferous. Mixed coniferous are composed only of conifers. They dominate the territory and the holding cover 43% (2040 ha) of woodland and 67% of the area of all mixed stands. Mixed coniferous-deciduous are these which predominant species is a conifer, but also present in the composition at least one broadleaf species having a percentage contribution. This category occupies 20 percent (960 hectares) of Forestry woodland, and 31% of the area of mixed stands. Mixed deciduous-coniferous have a predominant tree species belonging to the deciduous trees and also present in the composition at least one conifer species having the percentage contribution. They occupy about one percent (40 hectares) of Forestry woodland and 2% of the area of all mixed stands.

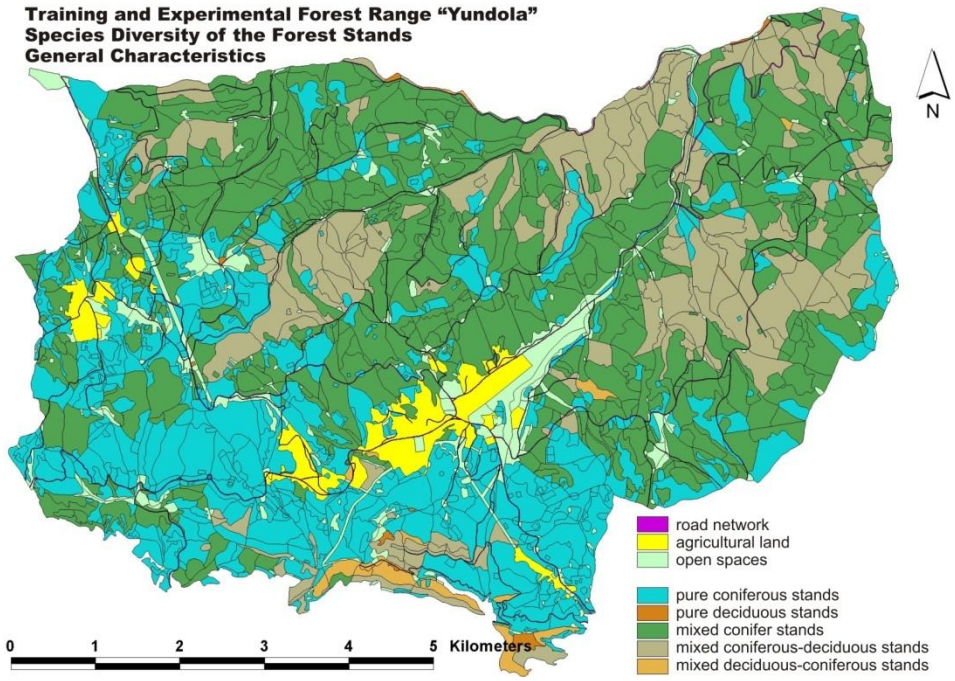

Figure 1: General Characteristics of Species Diversity of the Forest Stands

The second major aspect in the analysis of species diversity is called "quantify the diversity" (Figure 2) because considered it in quantified. Forest stands are categorized in the manner shown in the Table. 2. Pure stands in this analysis are defined slightly differently than those of the previous one. These include only trees that are composed of only one tree species having a value "10" for its participation percentage in the total stock. They occupy 23% (1092 ha) of woodland.

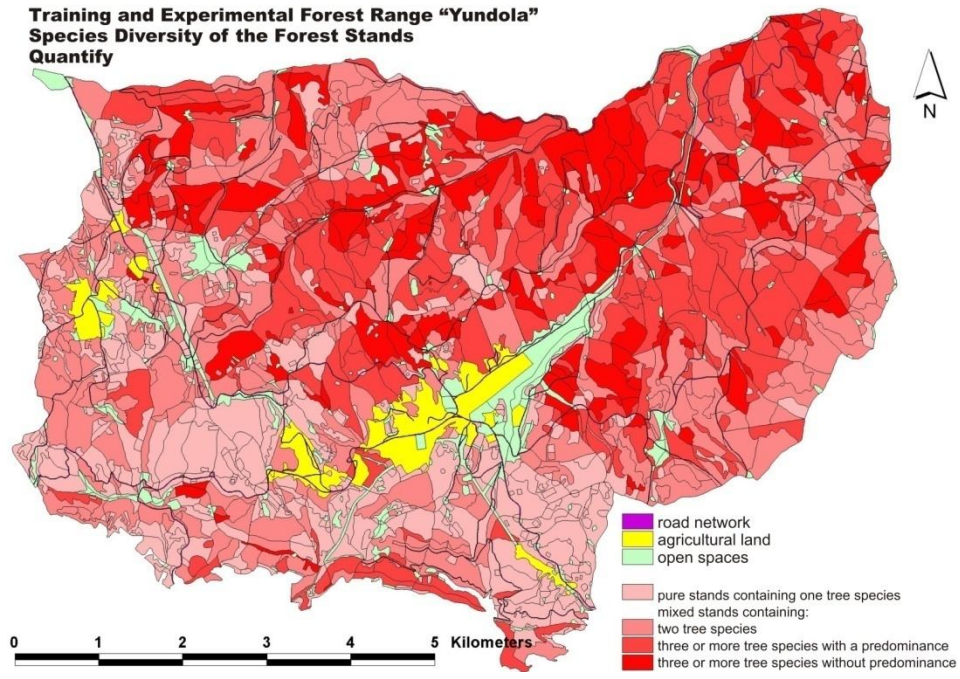

Figure 2: Quantify of Species Diversity of the Forest Stands

Table 2: Quantify the Species Diversity of the Forest Stands

pure stands (composed of one tree species)	mixed stands		
	(composed of two tree species)	composed of 3 or more tree species	
		with a predominance of one of them	without a predominance of one of them
1092 ha	1677 ha	1224 ha	758 ha

As mixed stands are defined all stands composed of two or more tree species having a percentage participation in the stock. They are differentiated into two groups depending on the number of constituent species: stands composed of two tree species and stands composed of three or more tree species. The second group is divided into two subgroups according to the proportion between tree species: predominantly stands and stands without the prevalence of certain tree species. Stands with values "6", "7" or "8" on the percentage contribution of the predominant species belong to the first subset, and those with values lower than "6" - to the second.

Mixed stands consisting of two tree species occupy most significant share of the Forestry woodland - 35% (1677 ha). Plantation consisting of three or more species predominantly one of them occupy 26% (1224 ha) and those without dominance - 16% (758 ha).

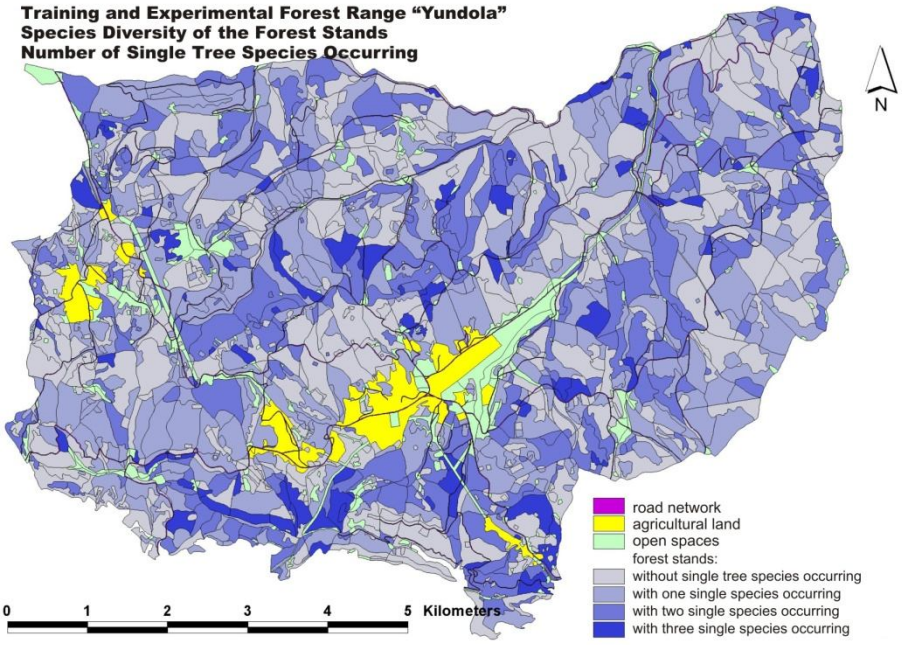

Figure 3: Number of Single Tree Species Occurring in the Forest Stands

The third major aspect in the analysis of species diversity groups forest stands into four categories depending on the number of tree species singly occurring in them (Figure 3). The number of tree species having value "0" for the index "engagement of present composition", and at the same time value "essentially stand" for the item "form" is estimated for each forested subdivision.

Stands without single occurring species dominate (63% or 1,654 ha), second are those with one single occurring species (30% or 776 ha), third - with two single occurring species (6% or 147 ha) and finally - with three or more single occurring species (only 1% or 16 ha).

Figure 4 shows the Collaborative or separate presence of much higher trees and single tree species occurring in forest stands.

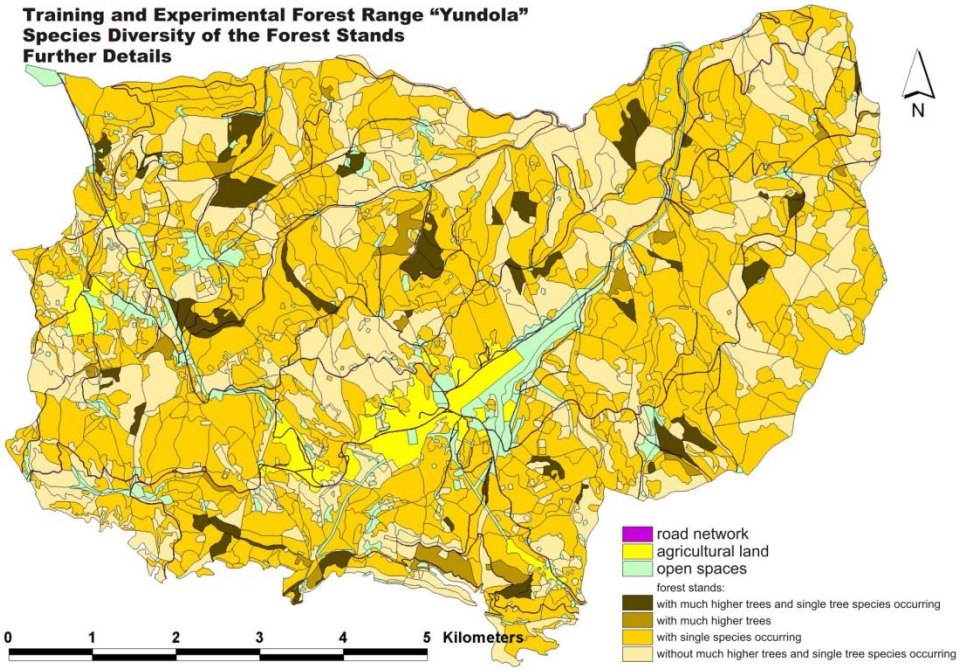

Figure 4: Further Details of Species Diversity of the Forest Stands

Some generalizations can be rendered in result of these analyses:

- The image of forest landscapes in research area, especially in the visual range of the resort is given by pure and mixed conifer stands.
- It can certainly be argued that the northeast area of the Forestry is characterized by relatively high performance at a variety of species in stands.
- It is seen less diversity in the species composition in stands placed in areas with higher concentration of open spaces.

3. Results and Discussion

Here is composed a typological classification of forest stands according to their species diversity based on research described above.

Table. 3. Typological classification of the categories forest stands and signs of their establishment.

class	**generality of species diversity of forest stands**	
	participation 0.9 or 1.0 for coniferous tree species	pure coniferous
	participation 0.9 or 1.0 for deciduous tree species	pure deciduous
	only coniferous tree species ratio≥8:2	mixed coniferous
	only deciduous tree species ratio≥8:2	mixed deciduous
	predominant coniferous and secondary deciduous tree species	coniferous-deciduous
	predominant deciduous and secondary coniferous tree species	deciduous- coniferous
type	**tree species richness (the characteristics of the present composition and its percentage contribution)**	
	value of “10” for the percent involvement of predominant species	composed of one tree species
	participation of two species in the composition of the stand	composed of two tree species
	stands with values "6", "7" or “8" for the percent involvement of predominant species	composed of three or more tree species in prevalence of one of them
	stands with values lower than "6" for the percent involvement of predominant species	composed of three or more tree species without predominance of one of them
subtype	**occurring much higher trees and single tree species in the stand composition**	
	without much higher trees and single tree species occurring	without much higher trees and single tree species occurring
	with much higher trees only	with much higher trees only
	with single species occurring only	with single species occurring only
	with much higher trees and single tree species occurring	with much higher trees and single tree species occurring

In terms of emotional and psychological impact of forest landscapes as positive qualities are considered good visibility to the inside of stands, diversity in species composition and dynamic vertical and horizontal structure of the stands. These qualities are determined in most of whether the stand is passable, the species richness, the presence of singly occurring species and the existence of much higher trees. Selected indicators characterized primarily emotional-aesthetic premises for recreational potential of the meadows. If the forest is operable the surrounding trees makes them transparent membrane from wood-bush vegetation at the same time separating and connecting and creating links with adjacent open spaces and sense of light, space and views. The construction of the surrounding trees determines the dynamic of the plant framework. Much higher trees serve as symbolic elements in the environment and contribute to changing the scale of perception.

4. Conclusion

Completeness and the average height of stands limit the impact of their species richness, while the construction and general characteristics of species diversity determine landscape diversity and the attractiveness of the territory. In this sense, deciduous- coniferous and coniferous-deciduous stands create more favorable structure of the territories for most recreational activities. The main factors of species richness which most contribute to the aesthetic impact of forest vegetation and broad criteria for aesthetic evaluation of stands are classified in Table. 4.

Table 4: The most common criteria for high aesthetic evaluation of forest vegetation

indicators	most common criteria for rated
dendrological richness of forest stands	stands which composition involves more than 2 tree species create more expressive emotional and psychological effects arising from greater diversity in the space
much higher trees and single tree species occurring	presence of much higher trees and single tree species occurring creates greater diversity in structure and color of forest landscapes

It cannot be taken into account the fact that forest stands have a different visual effect when are seen from side and when they perceive as an immediate environment for recreation.

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