Effect of Numbers and Types of Trees on the Aesthetics of mixed natural forest sites

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Abstract:

This study was conducted on natural growing mixed forests in Amadiya district and on a geographical area estimated at (1013.1) hectares, to estimate the natural aesthetic value of the various sites in which different types of trees grow. Random data were taken from these forests and the number of samples was (20) distributed. On the Amadiya district, with an area of (706.5) square meters for one sample, and from each sample, the botanical characteristics of the trees were collected and their coordinates and topographical characteristics of the sample location were taken, in addition to taking (8) photographs from the center of the samples, and then the photographs were evaluated for their aesthetic value through viewers from different The slides of the community, and it included workers in the educational and environmental field and the general community, and analyzed the evaluation of the viewers using statistical methods to extract evidence of the aesthetic value of the various samples, and that was in (2021 AD-2022 AD), then the data was arranged and different regression methods were used to derive equations After that, different equations were compared to choose the best statistical measures, including residual analysis, D-W test, Ohtomo test, and the statistical program stat graphic was used to prepare different equations with special statistical measures for each of them, so equations that meet the needs of those in charge of testing sites have been reached. Natural tourism in the forests, depending on some characteristics of the growing vegetation cover, selecting the site that gives a good indication of the aesthetics of the site, and the site aesthetics guide model, which depends on the numbers and species of trees, gave the best results.

Keywords: site aesthetics guide, mixed natural forests, mathematical equations, plant covers.

introduction

The forest is an integrated life unit of various types of plant and animal organisms such as trees, shrubs, herbs, and other plants with wild animals, insects, and microorganisms in a state of natural balance. The installation of forest trees is in a state of continuous movement as a result of these interactions between the various elements of the same structure, and since any difference in what was will lead to different repercussions that may change the balanced composition of the entire site (Sun el al. 2018) and the forest is also characterized by the presence of A contrast between the environment inside and outside the forest, and that all the components of the forest compete and integrate and in a state of vital natural balance (Shimizu, 2006). The scenic aesthetic models are well suited for use in forest planning and management, as we can use them in estimating the aesthetic landscapes of forest areas as well as for forecasting. The impact of the assumed changes in those areas by using quantitative variables represented by the physical characteristics of the natural sites of the forest as independent variables, and linking them to physical simulation models, which allows us to predict the effects that occur in the aesthetic landscapes of the site for a short period, in addition to using the forest characteristics that are traditionally measured from (Peng and Han, 2018), moreover, their use complements the information available from the application of a visual management system by providing aesthetic estimates of landscapes that are directly based on public perception and judgment, and which are mathematically related to controllable forest features, and we find site aesthetics in the case of A continuous natural movement between the environment and the living organisms (Kellomäki and Savolainen (1984)) By the natural aesthetic value that is experienced and appreciated by visitors, who may or may not participate in the hike, the aesthetic of a site is valued by a complex combination of different environmental factors and the visitor's assessments of the site, its goals and feelings. However, the main aspect in the aesthetic evaluation of a forest by visitors in forest environments is the visual views from the site in its various variants (López-Rodríguez et al., 2021), so the focus in defining forest aesthetics (as opposed to tourism) is mainly on visual characteristics. Forest environment, visitor

perception, and aesthetic judgment on the beauty of forest landscapes. The sari provides a range of services to people who visit forest lands with a variety of needs and desires, and in so doing receive a variety of physical, psychological, and spiritual benefits. The study aims to estimate the aesthetic value of the natural forest sites by using the method of the psychophysical aesthetic pathway, Scenic Beauty Estimate, which depends on the botanical characteristics of mixed trees.

Materials and methods:

Mixed natural forests are spread in northern Iraq naturally, and many types of trees, shrubs, and perennial and annual grasses grow in them to give the sites aesthetically pleasing natural views (Ruddell et al., 1989) and to sample the study, we made a field tour in these sites to see what they contain plant covers And natural factors on 10/27/2021 AD and looking at the distribution and variation of the vital factors spread in the study area.

From the initial inventory, it was noticed that there is a discrepancy in the characteristics of the study site, and to represent it in an accurate and real way, (20) circular samples were taken, each with a radius of (30) m and an area of (706.5) m 2, and from each of them measurements were taken, measuring the diameter at chest level, measuring the height of trees (m), crown center height (m), crown width (m), classification of trees according to their type, tree crown coverage area (m2), and to determine the point of preference for taking a picture of a scene, it is usually either random or a biased choice depending on the preference for the viewer Or the observer of the scene and the appreciation of the aesthetics of the site, and it was chosen to take the picture with the bias of a scene in the site, so after fixing the point of taking the picture, we take a number of possible pictures to ensure the appropriate representation of the scene and as indicated by (Hull and Reveli 1989), and we relied on taking photographs of the sample One, by determining the center of the sample to take the picture, by fixing the selected sample with a radius of 30 meters, and from the center of this sample whose coordinates are fixed, we take a central tree for this purpose. On a group of observers, (Cook and Cable, 1995) recommended relying on a group of observers consisting of people with experience in working in the environmental and natural field and another group with a lower percentage of the first

from the educated class of society, and another from the general public. These segments The different views are general and true about the aesthetic landscape of any site to be evaluated. Therefore, (12) viewers with specialization in the environmental field, (4) university students, and four others from the general community were tested. After selecting the observers, photographs of the study and adult samples were shown. (160) images, with eight images per sample, and the evaluation was conducted on these images, and the opinions of the values were taken by showing the eight images consecutively to the observer, with a period of time of (30) seconds for one image, and a time was determined through a stopwatch, and so the evaluation was conducted by the observers, The observer of the scene gives an aesthetic value, depending on the sensory perception of the scene, which appears through the aesthetic indicators represented by the tree vegetation, and from the statistical methods recommended by (al el. Daniel, 1977) in the study of aesthetic landscapes that depend on photography and evaluation of images for different observers is the method (Mean Rating), in which the images are arranged according to what has been taken in the field and which represent the aesthetic scene, and to address the differences between the values of one scene and for the different observers residing in the same scene We use the standardization arrangement, and in this way the order of judgment for the observers is converted individually into standardization by applying the following relationship:

$$Zij = (Rij - Rj) / (S_{xi})$$

Zij = standard order z of the estimated scene value I from observer j.

Rij = value of scene I estimated by observer j.

Rj=average of observers' values for scene J

S_{xi} = deviation.

Estimate sample standard deviation:

$$S_{xi} = \sqrt{\frac{\sum_{i=1}^{n}(x_i \bar{x})^2}{n-1}}$$

$\bar{x}$ = average values of observations

Xi = the real value of the watch

n = the number of study samples

The statistical measures were used in testing the equations, namely, the coefficient of determination, the standard error, the standard error attributed to the mean, the residuals analysis, and the P-value measure.

Results and discussion

The richness of the site with species and the increase in their number and diversity with the presence of high biodiversity leads to giving the site an aesthetic better than if it was at a lower level in terms of the number of species present in the site, and this is indicated by the existence of a link between the evidence of the site's aesthetic and the botanical characteristics represented by the numbers, types, and shapes of trees This has been indicated by many researchers, including (Han, 2010, and Bell el al. 2007).

It is noted that the botanical characteristics of trees are associated with each other, as there is a correlation between the average diameter of the wooded trees and the number of existing trees. The natural topography of the site, the height above sea level, the directions of the samples, and the degree of slope have a significant impact on the aesthetic view. By increasing the number of trees and the direction of the sample, it gives fewer values, due to the decline and decrease of the distribution, so the relationship is usually negative. As for the increase in numbers and the decrease in species, it leads to a decrease in the aesthetics of the site as well. It was indicated (Han, 2007) that the differences in the appearance of the site formed by trees or shrubs have a relationship with changes in the shapes of trees in the site, which have an effective impact on the aesthetic landscape.

One of the most important effective influences related to the scene desired by the viewer is (tree types, distribution, densities, and other vegetation covers), in addition to the topography of the site, organic matter, and plant characteristics that give the optimal image of the site with its various changes, and this requires containing it in the administrative inventory curriculum, which is a characteristic Spatial and temporal variation of the aesthetic landscape, and it represents the basic component of the aesthetic landscape, and from these characteristics, we can prepare an aesthetic index and this is what was indicated by (Leopiod, 1969). Karah Mountain) with a wide contrast in the vegetation cover and its spread, as well as differences in the environmental characteristics, which give a variation in shapes and colors and form a natural aesthetic scene (USDA, 1973), and provide a selection of the most important characteristics related to what distinguishes the site, that visitors to forest areas prefer natural mixed forests This does not give it different aesthetic scenes in the types and forms that it forms during the periods, and thus it determines to a large extent the light entering the forest. And their average diameters as indicated by (Li et al., 2020). Field data were taken for each of the average diameters, the number of trees scattered throughout the site, and the site's aesthetic evidence, which were estimated and analyzed through different regression methods, and we were able to connect to the equations as in Table (1).

Table (1): Aesthetic index equations in terms of the number and types of trees and some statistical measures.

No	Equations	R^2 - Adj.	S.E	MAE	D-W
Multiple regression equations					
1	SBE = 164.23 - 0.915788*n + 8.55695*nspc	0.77	15.197	10.040	2.14
- Non-linear Multiple Regression equations					
2	$SBE=-144.895+1132.05*n^{-0.361087}+8.29864*nspc$	0.77	15.564	10.368	1.94

It appears to us from (1) that the different regression models can represent the relationship between the site's aesthetic index and each of the number of trees and their types spread in a natural site, as this relationship gave the corrected

determination coefficient for the first and second equations of (0.77, 0.77) and S. E (15.197, 15.567), while the mean absolute error values of MAE and W-D test،

They were (10.040, 10.368) and (2.14, 1.94). Upon observing these statistical measures, we find that they are generally close to a certain extent in terms of these measures. For each one, we can say that the first equation gives better multiple linear regression than the second equation when we compare them to make sure of preference. Therefore, we performed a graphic selection process for both equations and to determine the relationship between the observations of the independent variables, we performed a residual analysis for both equations, as in Figure (1).

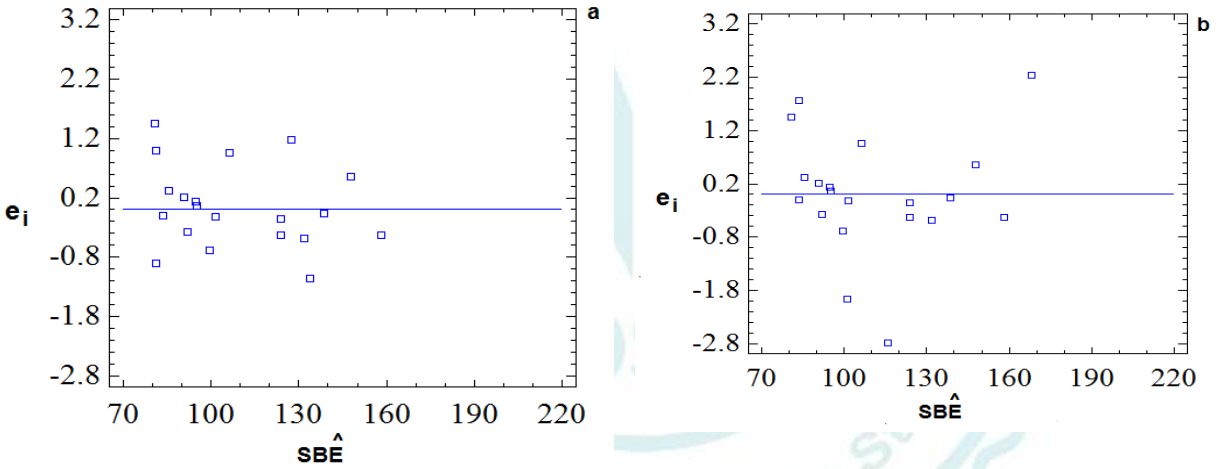

Figure (1) the deviations between the estimated values and the truth and the standard deviation (ei) of the site aesthetic index for the two equations (1a, 2b).

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We note from Figure (1) that there is a normal distribution of random deviations and they do not give any form, which indicates that there is no self-correlation between the independent variables of equations (1, 2) and the validity of using these two equations. We note from the deviation (ei) that the first equation Less Deviant and its

deviation (ei) ranged between a positive value (1.5) and a negative value (1), while the second equation has higher deviation values than that, which confirms the preference of the first equation relative to the second, and to increase confidence and test one of them, which is the most accurate, we use the test (Othomo 1956), which depends on drawing the relationship between the real and estimated values and their distribution on the straight line that bisects the angle from the point of origin, so whenever the points are distributed randomly along the length of the error, this indicates the validity of this equation without the other, so the relationship was drawn for both equations as follows (2).

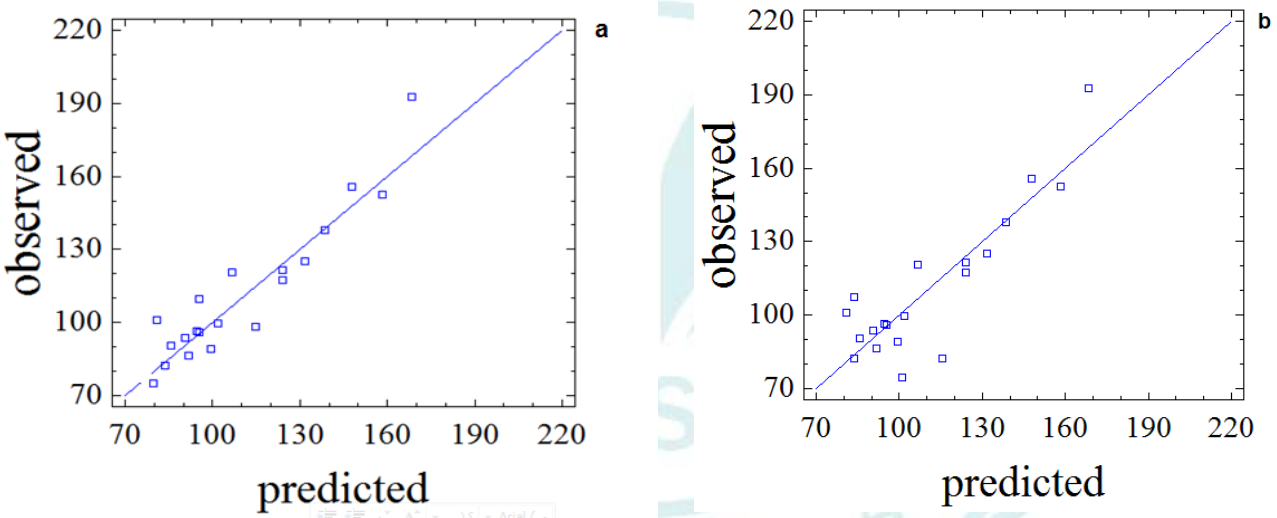

Figure (2) Real and estimated values from the straight line equation and the distribution of points on this straight line for equation (1a, 2b).

It can be seen from the above figure that the first equation is relatively more accurate through the various measures that have been made, so it can be used in the preparation of Table (2).

Table (2): Aesthetic index of the site in terms of the number of trees and species spread in the Amadiya district.

			NSPCC.		
n/sample	1	2	3	4	5
60	117.83	126.39	134.95	143.51	152.06
70	108.68	117.23	125.79	134.35	142.90
80	99.52	108.08	116.63	125.19	133.75
90	90.36	98.92	107.47	116.03	124.59
100	81.20	89.76	98.32	106.87	115.43
110	72.05	80.60	89.16	97.72	106.27
120	62.89	71.44	80.00	88.56	97.12
130	53.73	62.29	70.84	79.40	87.96
140	44.57	53.13	61.69	70.24	78.80
150	35.41	43.97	52.53	61.08	69.64

We note from the above table that there is an increase in the aesthetic value with an increase in the number of species and a decrease in the number of trees, as we see when the number of trees is (50) and one type of tree grows in the site for the sample, so we note that the aesthetic value at that time is (117), but we see a change in the aesthetic value to reach to (15) when there are five species in the forest plot at the same number of trees (50) trees, and also the aesthetic value decreases at the same number, which is five species, but the number of trees in the sample increases to reach (150) trees, so that the aesthetic value reaches (697) and this is what (Karjalainen, E., & Tyrväinen, L. (2002) and (Ribe, 2009) confirm that the increase of species leads to the richness of the site from an aesthetic point of view and the formation of different forms in the site in one season as well as at different seasons of The year, especially broad-leaved and deciduous trees, and their composition are also different layers due to their different heights, and this is what was indicated by (Zhang et al., 2020), and that the increase in the number of trees in the site leads to a decline in the aesthetic value and its reflections on the aesthetic landscape to increase the densities and obscure the vision of the scenery, and this is what we notice in the table (2) Also, both indicated that the density of the trees affected the aesthetics of the site, especially the high densities lead to a reduction in the aesthetic level of the site.

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