

# THE FUNCTION OF THE URBAN FOREST AND ITS REASONABLE STRUCTURE AND THE RATIO OF SPECIES

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**Abstract:** *in this paper, we have studied a series of problems raised in order to preserve the ecosystem in the city by creating a forest landscape in the city.*

*With the expansion of industry in the city, greenery is reduced and environmental pollution such as air pollution is increasing.*

*In addition, global warming caused by the release of carbon dioxide and the reduction of greenery has put mankind in a serious crisis.*

*With the development of cultural life, people's demands for nature are getting higher, but in reality, with the development of economy in the city, people are getting more and more away from nature.*

*As a solution to these problems, research was conducted to form forest landscaping in the city.*

*The urban forests form a single ecological skeleton with many green areas in the city, which helps to reduce environmental pollution by increasing the greening quantity.*

*In order to obtain the rational structure of urban forests, we surveyed various forests and suggested proper forest structure suitable for the city.*

**Keywords:** *urban forest; landscape; green space; Structure of urban forest; evergreen; deciduous tree.*

## 1. Function of urban forest

The urban forest is a forest located on the lands of urban settlements, within the city limits.

Currently, the industry is developing rapidly and many industrial facilities are growing in the city center. Because of this, the landscaping zone is drastically reduced in the city.

In addition, air pollutants increase with the expansion of the industry.

As a result, the natural cycle of the atmospheric environment in the city is sharply destroyed and serious environmental pollution occur, such as "heat islands" phenomenon [4].

Then, what does urban forests do?

First, it prevents global warming and provides clean air.

According to the data, one sycamore has the effect of operating eight air conditioners with a capacity of 15 square meters per day for five hours [2].

Especially, the heat island phenomenon in the city is not a solution even if there are many forests in the suburbs.

Urban forests are an innovative measure to prevent heat island phenomenon by reducing heat radiation on the city surface and controlling humidity.

Next, environmental protection functions such as water protection, oxygen supply and noise prevention are very large.

According to the data, one hectare of pine tree produces oxygen that can consume 65 people per year [2].

If a zelkova synthesizes light for 8 hours a day, it absorbs 2.5 tons of CO<sub>2</sub> per year and releases 1.8 tons of oxygen, equivalent to the amount of oxygen needed for seven people a year [2].

The noise prevention effect of the urban forest is also very large.

A forest with a width of 10m and a length of 30m reduces noise by 7dB and a highway with a 30m wide and 15m high forest reduces noise by more than 10dB.

Roadside traffic on the roadway and the median can reduce over 75% of vehicle noise [3].

The environmental protection function of the urban forest is also very large, but its aesthetic function and rest space function are also very high.

Due to the industrialization of the city, urban residents far from nature want to rest in nature and always want to be with nature.

## 2. Structure of urban forest

The forests that form in the city are different from the forests naturally formed in the mountains.

It is because the activity of various people progresses in it.

In order to make the structure of the forest in the city rational, it is essential to plan the layer structure (vertical structure) of the forest well.

What is important here is to design the structure in such a way as to maximize the green area ratio while ensuring the basic function of the forest.

- The place where complicated rest activities are performed should be a single structure with high tall trees.

- A quiet resting space (rest chairs mainly arranged) should be planned in a multi-story structure of tall trees, middle trees and small tall trees.

- The forest structure of the pure green space can be made in a more diversified structure. The species of the top layer should be well-defined as sunny and the species below should be selected according to the light requirement. In addition, since the pure green space is planned mainly for the purpose of the taste, the species should be selected so that the shape and color are well harmonized.

In order to make the structure of the forest in the city reasonable, the horizontal structure of the forest should be set well.

What is important here is to design the horizontal structure in the direction of increasing the covering amount of the plant.

It is solved by scientifically choosing and blending bushes and grass plants based on the tall trees that form the forest gardens.

Therefore, tall trees, bushes, and grass plant should be selected and planned according to the morphological characteristics of individual trees and the characteristics of plant communities. The basic direction is to plan the direction of increasing the green zone rate, but to make ecologically sound forest.

In addition, many types of greening must be carried out in the city. You should plan a green space for relaxation and decoration with a service space on the roof and walls of the building, on the veranda and fence, on the piers, and on the lower level of the residence building. Especially at the present time when the number of high-rise buildings is increasing, planning a rest space combined with green space for every several floors becomes an important innovation in indoor greening.

More important in shaping the forest structure in the city is to make it ecologically sound and to make his style match the surroundings and to be friendly to people.

The architectural feelings of the general structure of the green space and, corresponding objects are given in the following table 1 [1].

*Table 1. Structure of green space and its application*

o	Green form	Characteristics and expression of green Space	Corresponding greening objects
	Ln - 1	Feeling of cool open space, organized green space and stable space	Grassland park, golf course, Lawn playground, lawn parking
	Ln - 2	Create a variety of strong decorative effects	Regular and natural flower beds in front of the building, and flower park
	Sh	Colorful decoration and foreground creation	Decorative elements such as entrance
	Tb	Relatively dark taste	Quiet learning, relaxation, walking, scenic zones
	Th	Relatively bright and relaxing space	General resting place, active resting place, floating place
	Sh + Ln-1	Creating a wide and open space, creating a square and orderly space	The front courtyard of the building with guaranteed neutrality and the open space of the scenic area
	Sh + Ln-2	The creation technique of colorful decoration beautification space	Places requiring strong decorations such as garden entrances
	Th(Tb) + Ln-1	Creation of cool scenery, relaxation, walking space	Parks and amusement park scenic spot, walking area, golf course surroundings
	Tb(Th) + Ln-2	Formation of taste and rest space by combination of perennial plants	More active rest areas, walk and scenery viewing areas
0	Th + Sh	Increase of green area ratio, various active decoration space	Various form factors in parks, amusement parks and gardens
1	Tb + Sh	Formation of decorative beautification space for four season	Historical sites, scenic spots of monuments, around the entrance

2	Tb + Th	Increase greening quantity and view effect of open space creation	Landscape, monuments, magnificent public buildings and resting places
3	Tb(Th) + Sh+ Ln-1	Seasonal scenery and decoration, space for environmental protection	Landscaping forests, forests surrounding protected areas
4	Th( Tb)+ Sh+ Ln-2	Increase greening quantity for environment protection, emphasize element decoration	Scenery district that combines environmental protection and landscaping effect, green area around cottage

where Ln-1: grass;

Ln-2: Flower;

Sh: bush;

Tb: Needle-leaf tree;

Th: Broadleaf tree

### 3. Species composition ratio

#### 1) Ratio between tall trees and shrubs

Forests are a group of plants based on tall trees that change and develop according to the law of forest development. Of course, there are bushes, grass plants, and other plants in the forests, but it is the tall trees that form the basic forest basement.

The tall trees are morphological features, and they are planted in and around the city so that they can quickly show the effect of the scenery like natural forest and can clearly form the skeleton of urban greenery. And tall trees have many advantages over bushes in terms of timber production and other economic aspects. In addition, tall trees have important significance in increasing the greening of city and all green areas.

It is therefore most important to increase the proportion of tall trees in urban forests to match natural forests.

According to the actual survey analysis, the function of greenery is different for each greening object. Therefore, the ratio between tall trees and bushes should be selected to satisfy the demand. Table 2.

Table 2. Ratio of tall trees and shrubs (%)

N	Greening object	Area ratio		Ratio of number of trees	
		Tall tree	shrub	Tall tree	shrub
1	Nature reserve, landscaping forest, river basin, suburban amusement park	90	10	47~50	50~53
2	Special forests, industrial enterprises, public institutions	80	20	28~31	69~72
3	City park, residential compartment	70	30	19~21	79~81
4	Boulevard	60	40	13~14	86~87

#### 2) Ratio between evergreen tree and deciduous tree

The ratio of evergreen and deciduous tree should be different according to the greening objects.

##### ① decorative greenery and a forest of the park

This should be set differently according to the basic species.

- When evergreens are used as mains, they should occupy more than 85% of area.

This is because secondary trees are more emphasized than basic species when the light leaf color or autumnal color of deciduous trees is more than 15%.

- When deciduous trees are used as basic species, up to 20% of evergreen tree species is not a problem. It is because the evergreens are relatively dark.

##### ② Ratio between evergreen tree and deciduous tree in general green areas.

The ratio between evergreen trees and deciduous trees in general green areas is 4:6 ~ 3:7, which increases the proportion of deciduous trees.

However, it increases the proportion of evergreens when require high decorative effects. This is because evergreens are more ornamental in the year.

### Conclusion

In order to enhance the aesthetic and ecological functions of urban forests, we have systematized the landscaping forms that are appropriate to the object of the city and examined the forest structure and species ratio close to the natural ecosystem.

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