Research on Landscape Architecture Design Based on Ecological Restoration and Sustainable Utilization

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Abstract. Under the guidance of low-carbon environmental protection thinking, people create low-cost landscape design works through green and healthy design ideas, which will help promote sustainable development from a practical level. Based on the analysis of the relationship between landscape ecology and land, this thesis explores the environmental sustainability of landscape ecology, such as landscape structure and function theory, ecological integrity and spatial heterogeneity, hierarchical scale theory, landscape change and stability theory, etc. Use the interpretation of connotation. Then the macro landscape ecology is introduced into the relatively micro landscape design to further enrich the design concept of modern landscape to meet the new requirements of landscape design development in the new era.

Keywords: Ecological restoration, sustainable development, garden landscape design; low-carbon environmental protection.

1. Introduction

In recent years, with the acceleration of urbanization and the substantial improvement of living standards, people have put forward higher requirements for garden landscape. As people continue to pay attention to ecological concepts and in-depth research, when designing garden landscapes, the long-term development of the ecological environment must be scientifically developed, and human values and moral values must be integrated to reflect the harmony between man and nature. On the whole, the direction of future garden landscape design is to adhere to the principles of people-oriented and sustainable development under the guidance of ecological concepts. When designing gardens and landscapes, the concept of ecological planning should be fully integrated, and the concept of sustainable recycling should be actively advocated. While protecting the ecological environment, it also satisfies people's needs for gardens in the new era to a certain extent. However, the current overall level of landscape design is still in its infancy, and further research is needed in the future. Landscape ecology belongs to the category of macro-scale ecological space research, and its theoretical core focuses on spatial heterogeneity and ecological integrity [1]. As a natural complex on the surface, the ecological environment is a distinctive system as a whole, with outstanding spatial heterogeneity, and ecological integrity is one of the effective ways to achieve sustainable environmental development and utilization. Therefore, the research content of sustainable land use involves the theoretical core of landscape ecology.
2. Basic theory of landscape ecology

2.1. Landscape structure and function theory

Landscape ecology believes that at the landscape scale, each independent ecosystem (or landscape unit) can be regarded as a broad patch, narrow corridor or background matrix, and energy, species and nutrients are in the landscape. The flow between the two forms a landscape function, and the play of the landscape function mainly involves the functional characteristics of corridors, substrates and patches. Landscape ecology studies two aspects of ecological landscape and visual landscape at the same time, focusing on the coordination of form and content, the unity of structure and function, taking human perception of landscape as the starting point of evaluation, and pursuing multiple values of landscape (economic, ecological, social and aesthetics) The realization. Therefore, the use of the ecosystem takes sustainability as its functional goal, and it should pursue the optimization of multiple values of ecology, economy, society, and aesthetics instead of maximizing a single value, and give full play to the ecosystem’s own ecosystem production functions, space and place functions [2]. The landscape function and other three functions integrate technologies, policies and actions to realize the productivity, safety, protection, feasibility and acceptability of ecosystem utilization. Figure 1 shows the theoretical framework of landscape ecology.

The relationship between landscape structure and its ecological process is the core part of theoretical research on landscape ecology. The process at the landscape level includes both natural and human aspects. They play an important role in the formation of the landscape spatial structure, and the landscape structure also has a basic control effect on the process. Therefore, only a certain landscape structure can realize a certain landscape function by "the pattern counter-evolving process, the process counter-evolving mechanism, and the mechanism revealing the law".

2.2. Theories of ecological integrity and spatial heterogeneity

Ecological integrity and spatial heterogeneity are the concentrated expression of the core of landscape ecology theory. The landscape is a complex system composed of the organic connections of landscape elements, with hierarchical structure, independent functional characteristics and obvious visual characteristics. A healthy landscape ecosystem not only has structural integrity, but also must achieve functional continuity. The landscape is not a simple collection of various landscape elements, but also has characteristics that each component does not have [3]. The "whole is greater than the sum of parts" of landscape functions is an intuitive expression of the basic idea of ecological integrity. Spatial heterogeneity refers to the unevenness and complexity of the spatial distribution of ecological
variables. The landscape is a mosaic composed of heterogeneous landscape elements. The spatial heterogeneity at the landscape scale includes three aspects: spatial composition, spatial configuration, and spatial correlation. Heterogeneity determines the diversity and biodiversity of landscape patterns and is the core of landscape ecology. It is generally believed that high heterogeneity is conducive to the symbiosis of species, but not conducive to the survival of rare species in the landscape. The increase in heterogeneity within a certain range can help improve the stability of the landscape. It is necessary to consciously increase and maintain the heterogeneity of the landscape of. Figure 2 shows the relationship between ecological integrity and spatial heterogeneity.

![Diagram showing the relationship between ecological integrity and spatial heterogeneity](image)

**Figure 2.** Relationship between ecological integrity and spatial heterogeneity

3. **The development history of modern garden landscape design under the ecological concept**

Ecology is mainly composed of hydrological ecology, plant ecology, environmental ecology and other directions. These important components play an important guiding role in the design of garden landscape, such as system theory, overall theory, coordination in ecology. Basic theories such as mechanism can all have a good guiding role in landscape design. In recent years, my country has paid more attention to the protection of the ecological environment. The theory and practice of ecology have been developed rapidly, and the ecological theory of landscape has been more complete than before. In garden landscape design, especially large-scale landscape design, it played a more important guiding role. Modern urban garden landscape pays more attention to the coordination and unity of ecological technology and landscape aesthetics [4]. On the basis of ensuring the quality of garden landscape, it is required to be consistent with the concept of ecological design and improve the beauty of the landscape. The concept of ecological design was gradually integrated and applied in garden landscape design, starting in the 1970s, but the main research objects of ecology at that time were material flow and energy flow, while the main research object of landscape design was the structure of space. There is no connection point between the two, so it is difficult to apply the concept of ecology in landscape design. After more than 10 years of development, landscape ecology developed rapidly at the end of the 1980s, focusing on the relationship between the various elements in the garden landscape, as well as the combination and function of the landscape structure.

In recent years, on the basis of rapid economic development, my country’s economy has also caused serious damage to natural resources, resulting in a serious lack of existing resources, and the impact of other factors has hindered the development of garden ecological landscape to a certain extent. design. It can be seen that the concept of ecological design at this stage is different from traditional planning and design. The latter is designed under the guidance of cultural, artistic,
functional and other principles, and the main consideration is to meet human needs, while the ecological landscape design idea is to fully consider the sustainable development of the city. From the perspective of long-term development, we must coordinate various factors such as economic and social benefits to better meet the development needs of society [5]. In the future, it is necessary to perfectly integrate the concept of ecological design on the basis of traditional design concepts, while satisfying the short-term development of the city to the greatest extent, and appropriately introducing the concept of sustainable development into the modern garden landscape design.

4. Design strategy for sustainable ecological restoration of garden landscape

4.1. Reasonable plant configuration

First, the design of space. In the design of plant configuration, the space should be designed reasonably to improve the rationality of space processing and distribution. Second, the richness of lines. In the process of plant configuration, the lines should be better enriched. Different plants can be matched to achieve changes in plant lines. In this way, in conjunction with horizontal and vertical tortuous changes, the garden space and the surrounding environment can be segmented, and the interior garden landscape can be embellished and contrasted. Third, create plant communities with strong hierarchical characteristics. In the process of plant matching, plants should be selected and applied reasonably according to the characteristics of the garden itself. The reasonable selection and distribution of the upper, middle and lower layers of plants can make the plant community more hierarchical. Fourth, consider seasonal factors. Plants have rich colours. In the process of configuration, a variety of contrasting colour processing, chromaticity transitions, and multi-colour coordination can be introduced to realize the colour composition of the landscape from the perspective of colour. Fifth, protect biodiversity. When designing the garden landscape, it is necessary to strengthen the protection of the original environment as much as possible, focusing on the protection of the original plant community with zonal vegetation characteristics, and the protection of biological diversity, including native plants and some plants, animals, and microorganisms [6]. In addition, continuous innovation can be combined with the existing environment, and artificial planting can be introduced according to local conditions to create a new biological environment with better viewing effects.

4.2. Adhere to the harmony and unity of ecological concepts and garden art

In the urban landscape design of our country, sustainable development and ecological construction must be adhered to. In ecological landscape design, the combination of ecological environment and design is a key project. It is necessary to make full use of the potential provided by nature and follow the constraints of nature to carry out landscape design on this basis. The design should use more environmentally friendly recycled materials as much as possible, and recycle a large number of original materials, maximize the function of the materials, reduce the energy consumption in each link, and retain the local traditional cultural characteristics. Integrate nature into the design concept to form an ecological design concept. And follow the ecological planning and design theory, and carry out the modern urban garden landscape design more rationally. Incorporating ecological planning and design concepts into the design is what the designer must do. Under the premise of respecting nature and regionality, find a more favourable design method for urban development, and apply local characteristic culture to the design to make landscape gardens the functionality and aesthetics coexist. Adhering to the concept of ecological landscape design, we should also pursue the art of landscape design, instead of adhering to the ecological concept and abandoning garden art, let alone sacrificing the natural ecological environment while pursuing the artistic landscape [7]. In fact, adhering to the ecological concept and seriously carrying out landscape design can both Satisfying both ecological needs and artistic needs, the two can coexist harmoniously to achieve the purpose of ecological landscape design. For example, in the landscape water supply, irrigation system, rainwater recovery, and then irrigate vegetation through nozzles, it not only meets the requirements of ecological water
sprinkler irrigation, but also reflects the characteristics of landscape art design, harmonious ecological concept and art.

4.3. Reasonable design of landscape ecological restoration
In view of the current ecological garden landscape, the restoration design of its landscape also needs to repair symbiosis and regeneration of the species in the environment, and effectively promote the virtuous circle in the ecological environment. In fact, there will be various situations in the ecological environment, and ecological restoration of the landscape is needed, and the restoration process requires theoretical research on plant-based systems and habitat restoration [8]. In the process of landscape ecological restoration, it is also necessary to make full use of nutrient-rich resources to effectively promote the virtuous cycle of restoration work, reduce the cost of restoration work, and contribute to the construction of conservation-oriented ecological garden landscapes.

4.4. Landscape design is close to the life experience of residents
With the continuous expansion of the scale of cities, the most common thing that residents in cities and towns see every day is reinforced concrete. In the future, people will become more and more close to nature in their leisure time. The increasingly close relationship has become an indispensable and important part of people's lives. This relationship is reflected in many aspects such as social benefits and economic benefits [9]. Therefore, the design of future gardens and landscapes should be based on the concept of sustainable development, and continue to explore and research to ensure that the design of landscapes tends to be more popular, integrate more popular social activities into the landscape of the garden, and have stronger practicality. Such as adding simple exercise equipment, so that more people can enjoy the garden landscape while participating in fitness, improve the utilization rate of the garden landscape, and enable more people to experience the physical and mental pleasure brought by the garden landscape.

5. Conclusion
Under the guidance of the concept of sustainable development, the city promotes low-cost landscape design, which helps to promote the multi-dimensional and comprehensive development of landscape design, and provides good benefits for the low-carbon, environmentally friendly, and circular landscape design. The quality and efficiency of landscape design saves costs and reduces the loss of manpower and material resources. Research on low-cost landscape design based on the concept of sustainable development is an inevitable trend in future landscape design and an important manifestation of actively responding to the national sustainable development concept.

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