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Summary of landscape pattern research

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Abstract. With the development of landscape ecology in China, the landscape pattern has been studied as a hot spot and a core issue. The concept of landscape and the development of landscape pattern research reflect the deepening of scholars' understanding of the relationship between nature and people. This paper first briefly introduces the concept of landscape pattern, and attempts to explore the development history of the concept of landscape from horizontal and vertical. The development of the research on landscape pattern in China is summarized from the publication years, research methods and publications. This paper analyzes and discusses the research progress of landscape pattern theory and its application in different fields, and puts forward its research hotspots and development trends, which provides reference for future research of Chinese scholars.

1. INTRODUCTION

The landscape pattern refers to the spatial condition of the landscape, and the spatial combination and distribution of landscape space units with different shapes, sizes and attributes. The landscape pattern is a concrete expression of landscape heterogeneity. When analyzing the landscape pattern, the landscape and the topological characteristics of its unit must be considered. At present, the research on the landscape pattern is mostly limited to the two-dimensional plane, and the three-dimensional model of the landscape pattern is still rare. The purpose of the research and analysis of the landscape pattern is to find potentially meaningful laws or order in the seemingly irregular landscape^[1]. The research on landscape pattern is the core issue of current landscape ecology research.

The study of foreign landscape patterns began in the 1950s. The countries that studied them earlier were mainly in Europe. For example, Germany, the Czech Republic, the Netherlands and other countries. After decades of development, their theories and methodologies are constantly improving. This has played a very good role in promoting landscape planning and agricultural development throughout the world. With the advancement of science, the current evolution of the landscape pattern and its dynamic mechanism has become the focus of academic research. In the early 1990s, the United States, Canada and other countries began to actively use GIS technology to study the landscape pattern, and made some progress.

Since the first meeting of landscape ecology in China in 1989, scholars have invested a lot of



enthusiasm for landscape research, which has led to the study of the entire landscape pattern. Before the 1990s, the main research directions of domestic scholars focused on the location, function, layout, planning and evolution of rural settlements; after the 1990s, the characteristics of landscape pattern, spatial structure, distribution law and diffusion were discussed. Some research progress has also been made. Liu Shaoquan, Chen Guojie and others selected the mountainous area of the Yangtze River Basin in China as a research area, and studied the landscape pattern of mountainous areas from the perspectives of ecosystem, ecological environment and complex ecosystem theory^[2].

2. STATISTICAL ANALYSIS ACCORDING TO THE PUBLICATION PERIOD OF THE LITERATURE

In the early 1990s, landscape ecology was proposed by Fu Bojie in "New Fields of Geography", which briefly introduced the research methods of landscape ecology, pointing out that it is mainly system analysis and dynamic analysis^[3]. Later, Yu Kongjian, Huang Xichou, Chen Changyu, Lin Chao, Xiao Yining, Su Wengui, He Hongshi and others elaborated on landscape ecology, but most of them introduced the concept of foreign countries to everyone, including some concepts and research methods. In these elaborations, the "landscape pattern" is recognized as the basis, and this stage should be the initial development stage of the landscape pattern in China.

Xiao Yanning, Zhao Wei and others published in April 1990, "Study on the change of landscape pattern in the western suburbs of Shenyang"^[4] is a turning point in the study of landscape pattern in China. He indicates that the study of landscape pattern in China is no longer a simple translation. The study of foreigners is to actually present some concepts and ideas of their own. With the publication of this paper, the more research on landscape pattern, the more than 23 papers published in the same year, the preliminary study of landscape pattern in plains, mountainous areas, woodland, scenic areas and arid areas. In these papers, Zhao Jingzhu first proposed the indicator system of the landscape pattern in the "Evaluation System of Landscape Ecological Spatial Pattern Dynamics" published by the Journal of Ecology, with the calculation formula attached, indicating that through long-term research, statistics, calculation and accumulation of these indicators, Based on this, landscape ecological zoning, ecological monitoring, ecological prediction, ecological planning, ecological impact assessment, etc. can be carried out to make timely and timely control of the landscape ecological space, to ensure and promote the development and improvement of natural resources in the landscape area. Protection, management and management enable the sustainable development of the social economy in the landscape area^[5].

Since 1993, Liu Jie, Wu Yanming and others, "The variation of landscape pattern and its ecological significance of Liushu Town, Yingkou City", have shown a steady growth trend in the study of landscape pattern^[6]. After entering the 21st century, the study of the landscape pattern can be said to be spread all over the country, linking mathematics research methods and landscape patterns, urban green space, and applications in desertification research. Various research results have been published, and since then landscape studies have really entered a period of prosperity.

3. ANALYSIS OF RESEARCH METHODS FOR LANDSCAPE PATTERNS OF RURAL SETTLEMENTS

The research method of landscape pattern has evolved from the traditional qualitative description method to the current combination of quantitative statistics and graphic overlay. The advancement of the method is mainly due to the rapid development of aerospace technology, and its development provides a convenient condition for obtaining large-scale multi-scale spatial data. The current research methods of landscape pattern mainly include: non-statistical methods, non-statistical methods, landscape pattern index methods, landscape ecology models, spatial statistical methods, etc.^[7].

Liu Mingwei, Jiang Guanghui, Wei Hongji and others have used MAPGIS as a research platform for the study of landscape patterns. By reference: mean plaque area (MPS), proportion of plaque area (PLAND), number of plaques (NP), total plaque area (CA), plaque density (PD), distance index E, residents Point dispersion degree F and other landscape indices^[8-15]. Among them, PD refers to the

number of plaques per unit area; CA represents the sum of plaque areas in rural settlements; PLAND represents the proportion of the total area of the study area in the study area, indicating the settlements in the study area The scale of construction land; MPS indicates the average size of plaques in the study area, and the larger the average plaque area, the greater the average size of rural settlements; E indicates that there is How many residential plaques are formed, he also expresses the size of the settlements from the side; F represents the degree of accumulation between each rural settlement plaque in the study area and its adjacent plaques, the smaller the value of F, The distribution of the spatial distribution of settlements is more concentrated.

Through the construction of rural settlement landscape ecological analysis and evaluation index system. The ecological assessment of rural settlement landscape is not only to evaluate the settlement environment, but also to evaluate the relationship between consumption patterns, lifestyles, population needs, health status and the surrounding environment and resources, so as to promote the development of rural settlements in a benign direction. Purpose^[16]. Qi Hui et al. constructed an evaluation index system for establishing traditional settlement landscapes from four levels: indicator layer, factor layer, target layer and functional layer^[17]; Zhang Zuqun et al. established settlement landscape evaluation indicators based on analytic hierarchy process and index selection. The system^[18]; Chen Zhizhi et al. applied the weighted average algorithm to construct the evaluation index system of rural settlement ecological environment quality^[19]; Yu et al. applied geographic information system and remote sensing technology, using landscape analysis method, from rural settlement form Landscape spatial pattern analysis in four aspects: scale, land use and resolution^[20].

4. STATISTICAL ANALYSIS OF PUBLICATIONS PUBLISHED IN THE LITERATURE

Statistical analysis of the landscape pattern from 1990 to 2013 found that the literature on landscape pattern research in China is mainly distributed in the Journal of Applied Ecology, the Journal of Geography, the Study of Land and Natural Resources, and the Journal of Ecology. In these publications, the Journal of Ecology is more in-depth in the study of landscape patterns. The literature is distributed in 312 articles of the Journal of Ecology, with a percentage of 5.57%; 112 articles in the Journal of Ecology, with a percentage of 2%; 110 articles of Applied Ecology, with a percentage of 2.0%; and 37 articles of the Journal of Geography. The percentage is 0.7%; 34 articles on Land and Natural Resources Research, with a percentage of 0.6%. It is not difficult to see from these statistical analysis that the landscape pattern is not as good as traditional agricultural and forestry publications in arid research or soil and water conservation related journals, but the number of articles is significantly higher than traditional agricultural and forestry publications. It is a large part of the authoritative journals published in a concentrated manner, which represents an important field of research and analysis of the landscape pattern of the water conservation and drought mechanism. The root cause is that the landscape ecological sequence itself is a discipline that is created by its intersection with other disciplines, and it can be used in many fields. Because of the important position of land resources and agricultural resources in China, the literature related to the landscape pattern has been consistently published in the journals on land resource utilization and agriculture. Secondly, in journals related to science and technology, especially in some GIS and remote sensing technologies, this indicates that the study of landscape patterns needs to be applied to today's technology as a support. At the same time, a small amount of research will appear in some publications related to wetlands, landscape architecture, forestry, grass construction, tourism or coal mining.

5. CONCLUSION

Since the introduction of the concept of landscape ecology in China in 1993, as people continue to deepen their understanding, their research is also increasing. Especially after entering the 21st century, more than 600 articles in 2000 alone were aimed at this aspect of research. At the same time, relevant research and theory related to it have achieved considerable research results, and the scope of research is also expanding, including rural and urban areas, inland deserts, coastal wetlands, plains and mountains. Compared with international research, China's research in the field of landscape pattern

should pay more attention to its combination with the actual situation in China, strengthen the systematic research of method theory, and improve the ability of technical methods to develop independently.

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