

A Preliminary Study on the Basic Theoretical Viewpoints and Framework System of Landscape Restoration and Ecology

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Abstract: This paper summarizes the importance of landscape restoration and ecology, and its basic theoretical viewpoints and framework system in the context of the serious problems of ecological environment damage in the current development process of China, with a view to formulating relevant theories for solving real problems. This article is the beginning of a series of research, the follow-up content will be based on the combination of theoretical and practical issues and practice. Based on the actual situation and problems, the article uses field research, literature comparison research and empirical and experimental methods to systematically sort out and study the relevant content of landscape restoration ecology, and gradually form empirical results with practical guiding significance.

1. Introduction

As a frontier discipline of today's world, landscape restoration and ecology provides the transition and development of human beings from industrial society to post-industrial information society with a multi-functional, self-organizing, integrated and comprehensive landscape research concepts and methods based on ecological diversity and heterogeneity. This discipline not only exerts an important and irreplaceable significance for the overall landscape development of the whole world, but also has the reference value for China which now features high energy consumption, low output, severe damage to the ecological environment and diminishing landscape diversity.

2. Overview of the founders of landscape restoration and ecology

Landscape restoration and ecology was established by Professor Zev Naveh, a famous Israeli ecologist and landscape restoration ecologist, with his life-long practice and theoretical research. The publication of his book *Trans disciplinary Challenges in Landscape Ecology and Restoration Ecology* in 2007 is an important symbol of the establishment of this discipline. We can say that Professor Zev Naveh's study and academic research of this discipline constitute the history of this field. He was born in Germany in 1919, moved to the Kibbutz Ginagar farm in the Jezreel valley in 1935, and established Mazuba collective farm in the west of Galilee in 1938. In 1945 he got Master's degree in agronomy and Ph.D. degree in ecology from the Hebrew University of Jerusalem. In 1965 he was engaged in teaching and research of ecology, landscape ecology and restored ecology at the Israel Institute of Technology (Technion) in Haifa, and he retired in 1987. The formation of his integrated and comprehensive theoretical system for multi-functional ecological landscapes has also been influenced and inspired by many experts, scholars and professors in related fields, including H. Biswell, Professor of Fire Ecology; A.M Schults, Professor of Ecosystems; Pedologist H. Jenny; Geneticist H. G. Baker; Evolutionist G. L. Stebbins; Cultural Geographer K. Sauer; Ecologist Frank Egler, the first to think about holism; Professor E.P.Odum, Father of Ecology; Professor Whittaker, a "giant" in the field of plant ecology; Ecologists F.Di Castri and H.Mooney; Professor Florang Haber,

the best plant ecologist in Central Europe; Professor Isaak Zonneveld, one of the founders of landscape ecology.

3. Contrast the concept of ecosystem and landscape from the perspective of landscape restoration and ecology

Landscape restoration and ecology makes a comparative positioning for the concept of ecosystem and landscape, so that the concept of ecosystem is more accurately evaluated and defined in comparison with related concepts in the discipline. Based on the incomplete and inaccurate viewpoint of regarding the discipline to be vague, unclear and unspecific functional system which had never incorporated human systems in the past, it is proposed that ecosystems are functionally interactive, and this interaction manifests itself in the flow of energy, matter, and information between biological and abiotic environments. At the same time, this flowing system has certain boundaries and is intrinsically linked at different scales. According to this, he believes that landscape, as another kind of physical manifestation and visual display based on ecosystem, is an ecosystem with clear boundaries and existence of space and time and an entity closely related to nature and culture. The difference between ecosystem and landscape lies in the subject of ecosystem research, that is, the complexity of its research subject is orderly, one-dimensional, which involves the development process in the sequence of nature-biological-ecological and biophysical information, while the research subject of landscape has been greatly extended on this basis--- it not only focuses on the ecological process of natural biology, but also has to include the content and influence results of human cognition, consciousness, and thought that have an impact on landscape evolution and use culture as a means of information transmission. The influence result is also represented by the intertwined natural landscape pattern and cultural landscape pattern. Therefore, this also defines the dual perspective of landscape research as a coherent and holistic space and thinking system.

4. The importance of integrity in landscape restoration and ecology

It is proposed that the whole landscape concept is incorporated into the framework of restoration ecology, namely the whole landscape restoration, and the proposal stems from the natural environment and cultural ecological crisis caused by the industrialization era that has made restoration ecology so important during the transition of human society to post-industrialization. In Naveh's view, this is a revolution, and the restoration ecology that incorporates the whole landscape concept not only dominates revolution but also promotes the harmonious coexistence between man and nature. At the same time, it is emphasized that the whole landscape restoration should focus on restoring all the factors and processes that promote sustainability in all healthy and attractive landscapes, and at a higher level human land use policies and behaviors are required not to influence and destroy the “dynamic balance of various flows between biodiversity, ecological and cultural heterogeneity”.

5. Ten premise of multi-functional landscape

The theoretical basis of the multi-functional landscape is proposed and 10 preconditions of multi-functional landscape is defined centering on treating it as a natural-cultural hybrid system that is concrete, self-organizing and self-transcending: (1) multi-functional landscape is not one-dimensional, linear, mechanical, but a “living” system that serves as a living and co-evolving part housed in a higher level of self-organizing, non-equilibrium dissipative structure; (2) the function and efficacy of the multi-functional landscape are not the combination of simple factors and will be definitely greater than the sum of the parts, because it is a unique gestalt system; (3) since the multi-functional landscape is part of a living and co-evolving part, it must be part of the natural hierarchical organization system and part of the global ecological sub-level system; (4) as a

holistic vision, multi-functional landscape has two observation perspectives and two aspects, which gives it a complex natural-cultural interaction system; (5) small places contains big landscape, and each multi-functional landscape is a unique gestalt system, and it is also the specific embodiment of the whole human ecosystem format tower structure; (6) the “Overall Landscape Ecological Diversity” index will become a common standard for evaluating the quantitative results of biodiversity, cultural diversity and ecological heterogeneity in multi-functional landscapes; (7) it goes beyond the Archimedes and Descartes rules to further develop the overall vision of the multi-functional landscape; 8) it uses a holistic vision and understands the integrity and comprehensiveness of the landscape from both natural and cognitive systems; (9) the overall assessment made by the interdisciplinary research team will surely become the subject that evaluates the “hard” and “soft” value of landscapes; (10) it realizes the harmonious coexistence between nature and human in the post-industrial society, eliminates the antagonistic relationship between the biosphere and the technological circle, and prompts the further evolution of the human ecosystem to be healthier and more sustainable.

6. Conclusion

Professor Naveh also proposed that the multi-functional and self-organizing biosphere landscape is of great significance not only for the sustainable development of biology, but also for human physical and mental health. At present, due to the unbalanced development of society, the versatility in the urban-industrial technology circle and the industrialized agricultural landscape is being increasingly threatened, so it is the important issues and responsibilities at present and in the future “to restore culture-economic cross-catalytic network in the overall human ecosystem and to transform the relationship between biosphere landscape and technology circle landscape from a hostile and destructive one into one featuring mutual support and coordination.” The research of Landscape restoration and ecology has strong research value and practical significance in the stage situation of the internal separation in the development process of humanities, religion, history, ecology, landscape, architecture, urban, design and etc, and even greater impact on natural and human ecological landscapes by economic development. The important viewpoints and theoretical systems, including the connection of similarities and differences between landscape and ecology, the landscape integrity, and multifunction, will promote practical research and subject development of our country to make adjustable and adaptable measures.

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