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景观生态 绿化工程 设计模式 研究

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内 容 简 介

本书利用景观生态学思想和原理,选择内蒙古金三角地区这一景观生态系统,分别对城市、厂矿、公路等重要景观要素进行了景观生态工程设计模式的研究。尽管这些研究在内蒙古金三角地区进行,但其研究思想、研究方法和设计技术仍适合其他地区参考。

本书适合从事城市规划、城市园林绿化、生态工程设计等方面的科研人员阅读参考,也可供大专院校有关专业的师生参考阅读。

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前 言

地球只有一个。到本世纪末，全球人口总数将超过 60 亿。如此庞大的人类社会群体，正在以加速趋势改造着地球表面景观。尤其是地球表面的生物圈，受人类扰动甚大。由于人类以往的不合理活动，导致地球表面生物多样性迅速减少，人与自然之间关系日趋失调，面对这种状况，人类为了更好地在自然界生存，开始重新调整人与自然之间关系。在这种背景下，刺激了生态学的蓬勃发展。生态学是研究生物与生物、生物与环境之间关系的科学。人类认识自然不是终极目的，而改造利用自然才是最终目标。由此，在全球范围内产生了各种各样的生态工程建设项目，以此来协调人与自然之间的关系。

生态学是在一个相对均质性的空间内研究植物、动物、大气、水和土壤之间的关系，而景观生态学研究的是某一地区不同空间单元的自然环境与生物关系。亦即研究在由若干个生态系统聚合所组成的异质性土地地域内的生物与自然环境之间关系的科学。其独特之处在于：在景观水平上，生态学研究的是整体观及许多本来缺乏联系的学科在解决景观问题上的综合。景观生态学将地理学在研究自然现象空间相互作用时的水平途径与生态学在研究自然现象功能上的相互作用时的垂直途径结合起来，解决许多在其他低级生物组织层次上无法解决或不能解决的问题。它把人类及其活动结合在生态学研究，并且对处于原始状态的景观和受人类严重影响的景观提出了解决途径。由此可见，景观生态学研究的范围比生态学更宽，层次更高。同理，研究景观生态学亦不是人类终极目的，而运用这种理论按人类愿望建设景观生态工程，以此来重建人与自然更优美和谐的家园才是人类宿愿。

景观生态学是 1939 年由德国特罗尔(Troll)首先提出的，而我国在 80 年代初才开始介绍国际上景观生态学的发展。在我国有关森林、农业、草地的景观生态研究较多，而对城市、道路、工矿区的景观生态研究报道较少。就景观的时空变化、动态、多样性乃至对人类的重要性来讲，城市景观生态、工矿区景观生态、道路景观生态与人类生产生活更加休戚相关。尤其是全球范围城市化与工业化的迅猛发展，使自然景观生态系统受到剧烈干扰，而代之的是自然与人造复合景观生态系统或纯人工生态系统。这种全球日益增多的人造景观生态系统，正迅速地改变着人与自然之间的关系，改变着人们的思维方式和生活方式。如何调控这类日益增多的人工景观生态系统，使人与自然在新世界中找到和谐发展的途径，是当今世界热门课题。

针对上述问题，本书利用景观生态学思想和原理，选择内蒙古金三角地区这一景观生态系统，分别对城市、厂矿、公路等重点景观要素进行了景观生态工程设计模式的研究。

所谓内蒙古金三角地区是指由自治区首府呼和浩特市、包头市、伊克昭盟东胜市在地理位置上构成的三角地带。呼和浩特市是全国最早成立的少数民族自治区内蒙古自

治区的首府,是该自治区政治、经济和文化中心。包头市是中国中西部地区最大的重工业城市,东胜市及其周边地带是国家中西部重要的能源基地。三城市构成的三角地区资源富集。包头市白云鄂博的稀土蕴藏量居世界首位,约占世界总储量的 73%,占全国储量的 97.7%以上,有“稀土之乡”之称。伊克昭盟拥有全国 80%的动力煤资源,是国家“以山西为中心的能源化工基地”的重要组成部分。东胜煤田含煤面积 12 000km²,是世界上少有的特大煤海。储量丰富的超低灰、低硫、低磷、超高发热量(25 104~29 288J/kg)的不粘结煤是世界七大高发热量煤种之一。鄂尔多斯山羊绒驰名中外,羊绒产品畅销世界。最新探明的鄂尔多斯特大石油天然气田,开采前景广阔。达拉特电厂、托克托电厂构成了目前世界上罕见的特大电厂群落。本地区可谓遍地是“金”,被誉为“金三角”地区。

金三角地区地处我国第三大“经济引擎”的环渤海经济圈西部边缘和中西部地区的东北端。(北)京—包(头)—兰(州)铁路横穿本区,东连环渤海区域的枢纽京、津地区,西接欧亚大陆桥,具有十分重要的战略地位。随着环渤海地区的经济腾飞和国家经济战略重点的西移,本区经济正在崛起,并以其独特的资源优势和重要的战略地理位置,推动环渤海地区 and 中西部地区加速发展。

然而,金三角地区地处我国农牧交错的生态脆弱带,水土流失严重的黄土高原以及植被荒芜的库布齐沙漠、毛乌素沙地覆盖了金三角的绝大部分区域。气候干旱少雨,风力强劲,冬春季节沙尘肆虐,荒漠化程度严重,生态承载力低下。大规模的资源开采,兴建道路、工厂等经济建设以及随着人口激增和经济发展而兴起的都市化进程,对本区生态环境造成严重压力,甚至带来严重污染和破坏,加剧其荒漠化程度,进而成为影响和制约社会经济持续发展的“瓶颈”。因此,为实现本地区人口、资源、环境和社会经济的可持续协调发展,必须把绿色景观生态建设工程作为一项重要的基础性战略重点,优先发展。就此,本书围绕影响这一地区经济与社会发展的关键问题,选择影响重大、代表广泛、意义深远的国家和自治区重大建设项目——大电厂、高速公路、重要城市开展景观绿化工程设计模式研究,为把金三角地区建成生态优化的“绿色生态金三角”,提出了融环保、景观观赏、绿化、美化、香化等多功能以及民族文化和地区特点为一体的各具特色的景观绿化工程示范模式,旨在积极推进本地区经济发展与生态建设和景观优化、持续、协调发展。

托克托电厂位于呼和浩特市郊区托克托县境内,是国家“九五”期间利用世界银行贷款兴建的重点工程。该工程是目前世界罕见的国内最大电厂群。它对于提高华北电网供电能力,促进京、津、唐地区以及整个环渤海区域和中西部地区的发展具有极为重要的作用。根据世界银行要求和资格审查,托克托发电有限公司委托内蒙古林业科学研究院编制了以保土固沙为主要目标的《托克托电厂 A 厂新建工程周边生态环境绿化工程建设报告》(中文版、英文版)。该报告对电厂周边 400km² 区域内的生态系统进行了系统分析诊断,运用现代林业生态工程技术,制定了大范围的具有生态保护和景观观赏价值的多功能绿化工程方案,1996 年通过了世界银行组织的由 10 个国家的专家组成的审定委员会的评审。认为在火电建设中搞这样大范围的绿化工程设计在世界上属于创新

项目。这在国内外尚属首次,对于今后同类项目的实施具有示范作用。

呼包高速公路连接自治区首府呼和浩特市和全区最大的工业城市包头市,是我国“五纵七横”国道主干线丹东至拉萨高速公路的一部分。是我国西北少数民族地区建成营运最早的一条高等级公路。它的建成对于推动少数民族地区社会经济的繁荣与发展起到了积极作用。公路绿化、美化是公路建设中不可分割的重要组成部分,其绿化、美化的质量直接影响公路的功能和档次。因此,公路绿化工程受到了自治区有关部门的高度重视。内蒙古林业科学研究院编制的《呼包高速公路绿化工程设计》着力体现地方绿色文化特色,运用林业科研最新成果,对公路绿化进行了全方位、立体式、多功能的科学设计,将绿化、美化、香化以及景观观赏和窗口示范等功能和谐优化、融为一体,创建了一条景观环保型“绿色生态公路”。

东胜市是内蒙古伊克昭盟盟公署所在地。地处金三角的核心地带和东胜煤田的开发腹地,随着地方经济的发展,形成了以煤炭、毛纺、化工、陶瓷为优势的区域特色经济。随着国家对中西部经济发展的高度重视和扶持,其社会经济必将得到迅猛发展。受东胜市人民政府委托,由内蒙古林业科学研究院编制的《东胜市城市园林绿化工程建设总体规划》兼容并蓄了东西方园林艺术精华和现代林业科学技术新成果,对东胜市进行了具有地方文化特色的城镇园林绿化艺术设计。此项设计布局合理,融景观观赏、城市绿化和生态保护于一体,技术含量高,可操作性强,于1997年11月通过了由内蒙古自治区建设厅组织的专家评审。是我区第一部较为全面、系统、科学、合理的城市绿地系统规划设计。

由于国内景观生态学的研究与运用结合得还不够紧密,尤其是在内蒙古金三角这一区域面积大、景观类型多样、景观结构复杂的背景条件下,如何开展城市、道路、电厂的景观绿化工程设计尚无现成模式可鉴。国外景观生态学的运用领域多集中在国家公园的规划、管理,城乡土地利用规划与景观规划以及自然资源的合理利用等方面。各国在进行景观规划时,都有各自的情况、特点、作法与模式,中国不能机械模仿。我们在进行城市、电厂、道路绿化设计时,也未照搬景观规划的惯常模式,而是注重吸收景观生态学的思想、原理、观念以及实质内涵,将其运用到绿化设计中。此外,本书对上述三个设计进行了较大幅度修改,省略了原设计一些章节和大量的图表。这种作法是根据我们自身实际情况进行的一种尝试工作,是否可行,还望读者点评和实践检验。

编著者

1998年6月

Preface

We have only one earth. By the end of this century, population on the earth will be over 6 billions. Such a big human society is in a hardly imaginative speed changing the surface landscape of the earth. Biosphere in the surface of the earth, in particular, is most prone to the disturbances of the human beings. Many irrational activities by the human beings in the past decades have resulted in the fast decrease of the biodiversity in the earth surface. Relationships between human beings and the natural environments are becoming maladjusted. In order to reinstall a harmonic relationship, the human beings begin to make effort to adjust the estranged relationship. Such a demand for the harmonic development stimulated the fast development of the modern ecology, as ecology was primarily regarded as the science concerning the relationship between the living things and their environments. For human beings, to know the nature is not his ultimate purpose, but a mean to make fully use of the nature and make change for the best suit for the human beings. For this reason, different forms of ecological reclamation efforts in the world emerged for the simple purpose to adjust the estranged relationships between the human beings and the natural environment.

Ecology is the science studying the relationships among plants, animals, the atmosphere, water and soil in a fairly uniform space, while landscape ecology studies the relationships between the nature and the living things in a particular space unit in a certain region. That is to say, it studies the relationships between the nature and the living things in a hetero-landform composed of several different ecosystems. In particular, it deals with the overall, and the combined landscape problems among which no relationships can be seen from the specific individual scientific disciplines. Landscape ecology combines the parallel geographical approach for studying the spatial relationships among natural phenomena and the ecological approach for probing the functional interactions among the natural phenomena, therefore, it can resolve many practical and theoretical problems which can not be resolved at lower biological levels. The most important, it combines the human beings and human activities into the ecological studies, and points out the solutions for both the undisturbed original landscape and the severely disturbed landscape. It should also be pointed out that the study of landscape ecology is not the ultimate propose of the human beings, but a mean of using its principle as guidelines for constructing the ecological engineering and reinstalling the harmonic relationships between human beings and the natural environment.

The concept of landscape ecology was probably first raised by the German scientist Troll in 1939. It was introduced into China in the early 1980's. Since then, a considerable amount of researches in this subject have been reported in the forestry, cropping and grassland sciences,

while the reports in the municipal development, road and industrial constructions are rare. In terms of the spatial and time changes, the diversity, and the importance of the landscapes to the human activities, the researches on municipal landscape, road construction landscape, and the industrial landscape are more closely related to the human livings. Semi-artificial and even pure artificial landscapes were created during the processes of large scaled urbanization movements and fast development of industrialization in the world, which resulted in the destruction of the natural landscapes. Such man-made landscapes are fast changing the relationships between the human beings and the nature, changing the ways of the thinking and living of the human beings. How to control and adjust the ever-increasing artificial landscapes and to find a harmonic way for the coordinated development of the human society and the natural environment is the focus of the modern landscape ecology.

This book, trying to adopt the principle and thinking of the landscape ecology, is a research summary collection of landscape ecological reclamation design models based on the main landscape factors of the cities, industrial sites and roads in the “Inner Mongolia Golden Triangle” region.

So-called the “Inner Mongolia Golden Triangle” is a region enclosed by the three major cities of Huhhot, Baotou and Dongsheng in Inner Mongolia. Huhhot is the capital city of Inner Mongolia Autonomous Region. It is the political, economic and cultural center of the Region. Baotou is the largest heavy industrial city in the Central-west region of China. Dongsheng City and its surrounding areas (Ekezhao League) is an important energy base in the Central-west region of China. The “Triangle” region is rich in many important natural resources. For example, Bayunebo Mine in the Baotou City has the largest rare earth deposit in the world (73% of the world total, 97.7% of the total deposit in China). Ekezhao League has 80% of the total coal deposit in China, is an important component of the Shanxi based energy and chemical material base. Dongsheng Coal Mine is one of the largest coalmines in the world, having a total coal containing area of 12, 000 km². Dongsheng coal is featured with its low contents of ash, phosphorous, sulfur, and high heat generating capacity (25,104–29,288J/kg) and is one of the seven best coals in the world. Cashmere, natural gas and other local products in the Ekezhao League also have high reputations in the domestic and international markets. Dalate Power Plant and Togtoh Power Plant constructs the largest power plant network in the world.

The “Golden Triangle” is located in the west of the “Peri-Bohai Economic Zone (The third largest “economic engine” in China) and the northeast part of the Central-west China. The Beijing-Baotou-Lanzhou railway goes through the region connecting the region with the Beijing-Tianjing areas in the east and the Euro-Asian continent in the west. With the fast development of the “Peri-Bohai Economic Zone” and the westwards shifting of the national economic developmental center in China, the economic development in this region is playing a more and more important role in the national economy.

However, the "Golden Triangle" is in an ecological fragile cropping-animal husbandry interlaced belt in the Loess Plateau. Hobq Desert and Mu Us Desert cover most land areas of the Triangle, together with an adverse drought, cold and windy climatic condition. Large scaled exploitation of the natural resources and industrial constructions with the fast increase of population and economic development in this region will inevitably speed up the urbanization process and exerts great pressures on the natural environment. In some cases, severe pollution and land desertification may occur and become the limiting factors for the sustainable development of the region. In order to overcome the limiting factor and make a coordinated and harmonic social-ecological development in the Triangle region, several pioneering research programs of environmental reclamation, land desertification control and revegetation were conducted in the past years. Based on the research results for the revegetation works on the two key projects (Togtoh Power Plant and Huhhot-Baotou Highway) and the green-putting work for the cities, this book summarized the successful experiences and put forward the models for the future similar operations in this region.

Togtoh Power Plant is located in the Togtoh County in the suburban of Huhhot City. It is a national key project using the World Bank Loan in the "Ninth-Five" period. The setting up of this power plant will greatly increase the electricity power supplying capacity of the North China Power Supply Network and promote the economic developments of the Beijing-Tianjing-Tangshan areas, the Peri-Bohai Economic Zone and the Central-west region of China. Entrusted by the World Bank and the Togtoh Power Plant Cooperation Ltd., Inner Mongolia Academy of Forestry Science compiled the "Feasibility Study Report of the Eco-environmental Reclamation Project in the Togtoh Power Plant Workshop A and its surrounding Areas" (Chinese and English versions). This report, paying great attention to soil conservation and land desertification control, analysis the ecosystem in the 400 km² surrounding areas and made a comprehensive revegetation plan for both ecological protection and euphoria-environment attraction. In 1996, this report was approved by the World Bank Environmental Impact Assessment Group composed of experts from 10 countries. The Group commented that: the revegetation design in such a big scale for a power plant was the first in the world, it would be of great demonstrative value for the similar projects in the future.

Huhhot-Baotou Highway connected the regional capital city of Huhhot with the regional biggest industrial city of Baotou. It was one important section of the Dandong-Larsar National Highway which was the first highway in the northwest China's ethnic minority region. The building up of this highway had great significance in promoting the social and economic development of the ethnic minority regions. As an important component of the project, revegetation for soil erosion control and euphoria purpose is paid great attentions by various parts in the Inner Mongolia Autonomous Region. The "Revegetation Design Report for Huhhot-Baotou Highway Project" compiled by the Inner Mongolia Academy of Forestry Science was the condensed results of using advanced techniques and new thinking for a

comprehensive, three dimensional and multi-functional model design which best reflected the local cultural and natural landscape features. The highway was therefore regarded as a "Landscape Environmental Protection Type" green highway.

Dongsheng City is the capital city of the Ih Ju League. It is located in the core area of the Triangle and the Dongsheng Coal Mine Field. With the fast development of the local economic, Dongsheng City has become the center of coal mining, textile industry, chemical materials and ceramics in the League. The State Government has paid more and more attention and supports to the regions in the Central-West China. A great leap in the social and economic development in the Central-West China will soon be realized. Entrusted by the Dongsheng Municipal Government, Inner Mongolia Academy of Forestry Science compiled the "Revegetation Planning and Design Report for Dongsheng City". This reports combined the essentials of the Western and Eastern horticulture arts, together with the advanced forestry and horticultural technology, showing a local cultural imbedded model design for a newly prosperous small city. This report was approved by the technical assessment group composed experts assigned by the Regional Construction Bureau in November, 1997 with the comments of "high technology contained, highly feasible, combining the landscape enjoyment, city green putting and ecological protection together, the first comprehensive, systematic, scientific and purpose-fitting city green field system design.

In China, the application of the landscape ecological principle and the study of the landscape ecological theory are not combined closely at present. Particularly, in the Golden Triangle region, large land area, multiple landscape types and complex structures are involved in the revegetation and landscape installation designs, no models of similar works for the city planning, road construction and power plant buildings existed in China and abroad. The applications of landscape ecology abroad are mainly in the design, management, rural land planning of national reserves/parks, or in the natural resources management. With their own features in the different countries in the world, there is hardly any model which could be adapted to China without considerably modification. At present, we cannot directly refer the previous landscape design models either, since the big differences between the past and the present, and the different situations in the different locations. In the above-mentioned designs, we tried to make use of the concept, the principle, and the thinking of modern landscape ecology into the practical designs. In writing up the book, we also made some necessary modification to the original designs, omitting the large bunch of repetitive figures and tables. We wish that this book can bring some help for the interested readers and we will be grateful for any comment for the book.

Authors

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