中国森林生物多样性评价

Evaluation on Forest Biodiversity in China

张颖 著
Zhang Ying

中国林业出版社

中国森林生物多样性评价

张 颖 著

序

　　我国经济社会可持续发展战略和建设祖国秀美山川现代化目标的确立，使林业在供求关系上发生了重大变化，社会对林业的需求已从以木材生产为中心转向生态需求为主导，林业不仅要满足社会对林产品的需求，更要满足社会对生态效益的需求，生态建设已成为林业建设的首要任务，林业在生态建设中也被赋予首要地位。加强森林生态效益的计量研究，是改变长期以来只重视森林的木材价值，而忽视森林的生态价值的状况，加快我国生态建设的基础性工作。最近，根据《中华人民共和国森林法》关于"国家设立生态效益补偿基金"的要求，国家将重点防护林和特种用途林的管护补助资金纳入国家公共财政预算，开始了我国森林生态效益从无偿使用向有偿使用的历史性转变，也为森林生态效益的量化计算提出了新的要求。

　　森林生物多样性是森林生态效益的重要组成部分，不仅为人类提供了必不可少的生物资源，也构成了人类赖以生存的基础，是人类生存与发展非常重要的条件。我国野生动植物资源十分丰富，有脊椎动物六千多种，占世界的百分之十，有植物三万多种，居世界第三位。在这些野生动植物资源中，有七百多种陆栖脊椎动物、一万五千多种植物为我国特有。但二十世纪以来，由于人类发展导致的森林减少和生

态恶化，引起森林生物物种减少，许多珍贵稀有的野生动植物处于濒危状态。据统计，我国处于濒危状态的动植物物种为百分之十五至百分之二十，高于百分之十至百分之十五的世界平均水平。因此，对野生动植物物种、生态系统和遗传情况进行评价和研究，是保护野生动植物和生物多样性的一个基础性、关键性的紧迫问题，也是推动我国生态建设的重要问题。

本书是张颖同志对我国森林生物多样性进行系统评价研究的结果。书中对中国森林生物多样性的价值和实物变化进行了评价，得出了我国森林生物多样性的具体价值量。在此基础上，对森林生物多样性的发展变化状态和保护森林生物多样性的影响因素进行了分析，提出了保护的对策和措施。书中所使用的"压力—状态—响应"评价方法，是首次在森林生物多样性评价中的应用，为我国开展生物多样性的价值测算提供了新的方法。根据对我国生物多样性价值的量化核算，我国森林生物多样性的价值达七万多亿元人民币，使我们进一步认识了我国生物多样性的巨大经济价值，对强化我国的生物多样性保护意义十分重大。希望本书对提高社会的生态意识、森林意识，加强我国的生物多样性保护起到积极的促进作用。

杨继平
2002 年 2 月 22 日

前　言

　　我们知道，人口、资源、环境是当今社会发展的三大问题。特别是环境问题日益引起人们的普遍重视。因此，对环境的评价尤为重要。

　　我国刚进入 21 世纪，就遭到一系列的自然灾害的袭击，沙尘暴、大面积持续干旱、水灾等，直接威胁着人们的生存和社会经济的发展。这既有自然方面的原因，也有社会经济发展和历史等方面的原因。江泽民总书记也指出："如果不从现在做起，努力使生态环境有一个明显的改善，……我们整个民族的生存和发展条件也将受到严重威胁"。因此，积极开展对环境的评价研究是推动环境建设的一个重要组成部分。

　　生物多样性是环境的重要组成部分，是人类赖以生存的条件，是社会经济得以持续发展的基础。它是所有生物种类、种内遗传变异和它们的生存环境的总称。它包括所有不同种类的动物、植物和微生物，和它们所拥有的基因，以及它们与生存环境所组成的生态系统。生物多样性既是生物之间以及与其生存环境之间复杂的相互关系的体现，也是生物资源丰富多彩的标志。

　　森林生物多样性是生物多样性的重要组成部分。它是在森林这个综合地域类型中，所有森林植物、动物和微生物组

成的全部物种（含物种内的基因）和森林生态系统，以及这些物种所在的生态系统的生态学过程。它也同生物多样性一样包括三个层次，即森林遗传多样性、森林物种多样性和森林生态系统多样性。我国有丰富的生物多样性资源，从植物区系的种类数目看，约有 3 万种生物物种，仅次于世界上植物最丰富的马来西亚和巴西，居世界第三位。森林是陆地生态系统的主体，是全球 50%～90% 的陆地生物的家园，它的减少和丧失必将严重威胁物种的生存。因此，对森林生物多样性的评价十分迫切和重要。

　　目前，就所查的资料来看，还没有人对森林生物多样性的评价进行过系统的研究。尽管到 1998 年为止，世界上已有 7 个案例明确对森林生物多样性的价值进行过评价研究，但也都是在森林资源的核算中进行的，也大多停留在探讨、研究阶段，还没有进入到评价的推广应用阶段。对生物多样性的实物评价和保护，Frankel、Soule、Diamond 和 Simberloff 等创造了"最小关键面积"（The Theory of Minimum Critical Size）理论和"岛屿生物地理学理论"（马敬能等，1998)，也涉及到生物多样性的实物评价，但不是针对森林生物多样性。尤其是随着人口、资源、环境问题的日益突出，森林生物多样性发生了什么样的变化？社会经济的发展对它的影响程度如何？它的发展状态如何？影响保护的原因和关键因素是什么和如何进行保护等，人们不得而知。

　　对森林生物多样性的评价要从实物和价值两方面进行。实物评价必须开展科学、细致、扎实的实物调查、统计工作，价值评价则建立在明确的实物统计基础之上。但森林生

物多样性的评价目前不能做到这一点，是一个典型的"黑箱"系统。因此，必须运用"黑箱"的理论和方法对它进行评价研究。在这种理论的指导下，本书首先综述了国内外森林生物多样性的价值评价方法，并分析了每种评价方法的利弊，指出机会成本法是目前森林生物多样性价值评价比较可信的一种方法。在此基础上，运用该方法评价了1998年我国森林生物多样性的价值。其次，对森林生物多样性的实物变化评价进行了研究，在森林质量指数评价方法的启发下，创造了压力—状态—响应评价方法，并采用SPSS软件进行了一系列科学的、基础的和细致的相关分析，设计了评价指标和计算公式，计算并评价了1973～1999年我国森林生物多样性的生态多样性、物种多样性和生物多样性的实物变化。再次，通过势分析发现，我国在森林生物多样性的发展变化中，总体上是不平稳发展的，特别是森林生物多样性压力指数、森林生态系统多样性指数、森林物种多样性指数一直处于不平稳发展变化之中，从而决定了森林生物多样性指数也处于不平稳发展变化之中，其发展状态将发生突变。最后，采用层次分析法分析了影响我国森林生物多样性保护的关键因素，指出人口问题、过捕过猎和森林面积消失是森林生物多样性保护的关键问题，并提出了有关保护对策。

　　本书包括十一章。前四章研究森林生物多样性的价值评价；第五、六章研究森林生物多样性变化的实物评价；第七章至第十一章对支付意愿法及其有关价值偏好的问题进行了讨论，并对北京、云南的生物多样性保护的有关问题进行了实证研究，最后，对我国森林生物多样性的发展变化状态、

保护中存在的问题、影响保护的主要因素等进行了分析，并提出了一些建议。全书紧紧围绕着"评价"进行了一系列研究，这些研究均是作者独立研究的一些初步结论，也是作者首次系统研究的结果。

本书参阅了大量同行的研究成果，在此，表示衷心的感谢。在研究中，一直得到了国家林业局党组成员杨继平先生的关怀，得到了国家林业局宣传办公室封加平主任、曹靖处长、北京林业大学翟中齐教授的支持，也得到了瑞士发展合作组织 James K. Gasana 博士、印度尼西亚国家合作处 Silver Hutabarat 博士、韩国汉城大学 Yeo-Chang Youn 教授的鼓励，在此，表示衷心的谢意。

森林生物多样性乃至生物多样性的评价研究是一项复杂的系统工程。本书仅是一些初步的研究结果，挂一漏万，研究中可能存在一些错误，敬请各位专家、学者指正！本书适用于各高校环境、资源经济专业、环境保护专业、生物、生态专业、生态经济、农林经济专业或环境工程专业等高年级学生和研究生、教师参考，也适用于有关研究单位科研人员及有关部门管理人员参考使用。衷心欢迎各位同仁批评、交流！

张　颖（博士、副教授）
2001 年 12 月

Introduction

As we know, the population, resources and environment are three critical issues at present in the world, especially the environment issue is increasingly arousing people's attention to protect environment. Therefore, the evaluation of the environment is very important.

China has met a series of natural disasters, such as sand dust storm, continuance of drought in large areas, heavy flood and so on directly threatening people's lives and development of society and economy when it is just into 21 century. Those reasons of causing the disasters are not only for the nature's sake, but also from the development of society and economy, as well as the history. Chinese president Jiang zeming also points out that: "If we do not take some measures at present to make great efforts to make environment obviously improved, ······our whole national survival and development will be strictly threatened". Thus, the active introduction of environment evaluation is an important part of the goal of promoting the construction of environment.

Biodiversity is an important part of environment, also is the safeguard of living conditions for human Beings, as well as the sustainable development basis of society and economy. It is defined as the collection of the species of living things, genetic inheritances and mutations and their living environments. The biodiversity includes all the animals, plants and microorganism in the whole species, and genes they have, and the ecosystems that consist of the living things and the living surroundings. Biodiversity is as an embodiment of living things and their living

surroundings, also is a rich and colorful symbol of biology resources.

Forest biodiversity is again an important part of biodiversity. It is defined as the whole species (includes genes within species) of forest plants, animals and microorganisms and forest ecosystems in the forest integrate zones, and the ecological processes of ecosystem. The definition of forest biodiversity is the same as that of biodiversity which includes three levels, that is forest genes biodiversity, forest species biodiversity and forest ecosystem biodiversity. In China, there is rich biodiversity resources. From the number of category of the plants, there are about 30 thousand biology species, just inferior to Malaysia and Brazil who have the richest category of plants in the world, in which the number of category of plants are respectively 45 thousand and 40 thousand. China occupies the third place in the world. Forest is the main body of ecosystem on the earth, and is a homestead of 50% to 90% of land living things in the whole world. The decrease and loss of the forest biodiversity will strictly threaten the living of species on the earth. Therefore, it is imminent and important to evaluate the forest biodiversity.

Presently, according to the data and by reference materials, no one has systemically studied the forest biodiversity evaluation. In despite of till 1998, 7 cases have definitely studied on value evaluation for forest biodiversity in the world, but they were within in the accounting of forest resources, are mostly rest on the stage of discussion and researching, still lacking popularization and application. For the physical evaluation and protection of biodiversity, Frankel, Soule, Diamond and Simberloff and so on have created "The Theory of Minimum Critical Size" and "Islands and Islets Biogeography Theory" (Ma Jingneng etc. 1998), they also have come down the evaluation of biodiversity, but they have not for the forest biodiversity specially. Especially with the issues of population, resources and environment increasingly coming into prominence, what

will happen for the forest biodiversity change? how will it affect the forest biodiversity due to social − economy development? and what will be the change for the state of forest biodiversity? what are the reasons for affecting protecting forest biodiversity? what are the key factors for protection and how to protect and so on, are still unknown.

Evaluation forest biodiversity must include both of the physical and value parts. Physical evaluation must be based on the practicality survey and scientific, specific and well − knit statistic works. Value evaluation must be based on specific physical statistics of forest biodiversity. But at present the evaluation of forest biodiversity cannot live up to this, because it is a typical "black" system. As a result, the "black" theory and approaches in Cybernetics must be adopted to evaluate the values and changing. Under the guidance of those theory, this study firstly summarized the evaluation methods on Forest Biodiversity at home and abroad, and analyzed advantages and disadvantages of each evaluation method, then pointed out that opportunity cost method is a credible approach to evaluating forest biodiversity at the present time. Based on the above research, this book evaluated the value of forest biodiversity in 1998 in China adoption opportunity cost method. Secondly, this book studied the physical change of forest biodiversity under the elicitation of forest quality index evaluation method in Finland, then created a pressure—state—response evaluation approach, and used SPSS software carrying through a series of correlation analysis scientifically, rudimentarily and meticulously, and designed the indicators and calculation formulas, furthermore calculated and evaluated the physical change of ecosystem biodiversity and species biodiversity in forest biodiversity from 1973 to 1999 in China. The third, through the potential analysis, this book found that the physical change of forest biodiversity generally is unsteady, in particular the index of forest biodiversity pressure、 the index of forest ecosys-

tem biodiversity and the index of forest species biodiversity are always in unsteady change, consequently it is determined that the index of forest biodiversity is in unsteady changing also, and the evolution state will occur mutation. Finally, the author adopted AHP analyzing the key factors affecting protection for forest biodiversity in China, then pointed out that the population issue、excessive catching and over－hunting and forest areas reduction are the key problems in forest biodiversity protection, furthermore gave some protection proposals of forest biodiversity.

This book includes, 11 chapters. The 4 front chapters studied value evaluation on forest biodiversity; chapter 5 and chapter 6 studied on evaluation of physical changing of forest biodiversity; chapter 7 to chapter 11 discussed on Contingent Valuation method and its value preference, then experimentally studied on the issues of protection of biodiversity in Beijing and Yunnan Province in China, finally, researched on the evolution state of forest biodiversity, the issue of protection and the key factors of protection, then gave some proposals for protection. This book closely surrounds the topic of "evaluation" to do a series of researches, which is the author 's independent study and gets the preliminary conclusions from the researching. This is the systematic research results published by the author for the first time.

This book consults many materials, hereon, the author expresses heartfelt thanks for them. During the researching, great solicitude has been got from Mr. Yang jiping, Mr. Feng Jiaping and Mr. Cao jing in State Forestry Administration, P. R. China, and precious support from Professor zhai zhongqi in Beijing Forestry University, as well as encouragement by Dr. James K. Gasana, Swiss Organization for Development and Cooperation, Dr. Silver Hutabarat, Ministry of Forestry Department Kehutanan, Indonesia, Professor Yeo－Chang Youn, Seoul National University, Republic of Korea.

Research on evaluation of forest biodiversity and even biodiversity is a complicated systematic engineering. This book just is some preliminary conclusions, it is think of one and omit ten thousand, some mistakes are unavoidable in this book. The author respectfully hopes every expert and scholar may point out mistakes so that they can be corrected! This book is fit for the senior students, graduate student and teachers' reference book in environment, resources economics, environment protection, biology, ecology, ecological economics, agriculture and forest economics speciality and environment engineering speciality of colleges and universities, also is fit for some researchers in institutes and managers in some administations' reference. Wholeheartedly hopes every college may give me helpful comments and communions!

Dr. Associate professor Zhang Ying
December 22, 2001

目　　录