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Research on the Progress of Ecosystem Services

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Abstract

Natural ecosystems provide humans with water, air, food and other necessities necessary for survival, and are the most important material basis for human flourishing. When humans use natural resources and develop and utilise ecosystems, they only focus on the economic value and use value of ecosystems, ignoring the ecological value and service utility of natural ecosystems, resulting in the underestimation of the help of ecosystems to human social life and bringing great pressure on the environment in the process of daily life production. Ecologists have therefore adopted ecological economics as a means of classifying natural resource ecosystems that are not used for their intended purpose, based on the different service products that different ecosystems provide to humans, in order to protect different types of natural ecosystems in a more effective and targeted way through human intervention. In the field of ecology, ecosystem services and their valuation are becoming a hot topic of discussion and research.

Keywords

Natural ecosystems, ecological value, service utility.

1. Presentation of Ecosystem Services

Ecosystem services were first proposed by King in the 1960s, and it was not until 1970 that UNU first expanded the concept of ecosystem services to include ecosystem service functions in its Study of critical environmental problems (SCEP), which listed a range of indicators of ecosystem environmental services, including insect damage, pollination, atmospheric regulation and material cycling [7]. Holdren (1974) and Ehrlich (1982) added soil nutrient and maintenance functions. This was followed by Ehrlich (1977) who proposed the addition of ecosystem public service functions, later replaced by natural environmental service functions. In 1981 Ehrlich PR and Ehrlich AH settled on the name 'ecosystem services'. Daily (1997) and Groot (1998) have successively classified ecosystem services by The first book on ecosystem services, Nature's services: societal dependence on natural ecosystems, was published in 1995 at the Annual The first book on ecosystem services, Nature's services: societal dependence on natural ecosystems, was first presented at the Annual Meeting of the PEW, Fellows in Conservation and the Environment, in 1995, and was an important precursor to the

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development of the ecosystem services research framework. With funding from the National Center for Ecological Analysis and Synthesis (NCEAS), Costanza, an ecological economist, established the total value of the world's ecosystem services and natural capital to develop a framework for quantitatively analysing the valuation of ecosystem services, and in 1997 published 'The value of the world's ecosystem services and natural capital'. In this paper Costanza classified ecosystem services into 17 categories: water regulation, sedimentation, water supply, soil formation, gas regulation, erosion control and nutrient cycling, and derived the value of global continental and marine ecosystem services according to willingness-to-pay calculations. It also proposes a framework for valuing ecosystem services, laying the foundation for service value accounting research.

2. Ecosystem Services Research Methods

In the process of research on ecosystem services, Balvanera (2001) and Egoh (2009) have obtained that biodiversity contributes to ecosystem services through quantitative analysis, and that the two are generally positively correlated[10-11]. (2018) experimentally demonstrated that biodiversity affects the supply and resilience of ecosystem services, ecosystem stability and sustainability of ecosystem services, and is the material basis for many important ecosystem service functions [12]. Bagnold (2011) found that ecosystems with high levels of functionally diverse services tend to be species-rich and stable [13]. Some scholars, in the course of their research on land use patterns, one of the key markers of human activity, have found that land use change has a significant impact on changes in ecosystem services, with MA reporting that the expansion and intensification of human activity has caused the ill effects of accelerated soil water and nutrient loss, accelerated soil erosion and soil erosion, and accelerated rates of soil carbon emissions, leading to global ecosystem services in varying This has led to the degradation of global ecosystem services to varying degrees. In a study by Bilbro (2008), it was noted that human-induced changes to forest and grassland ecosystems have increased the vulnerability of ecosystem services, not only in terms of reduced biodiversity and increased greenhouse effects, but also in terms of weakened soil erosion resistance and accelerated soil erosion [14]. Hove (2002) found that the degradation of forest ecosystems may result in the loss of up to 50% of organic carbon from soils, increasing greenhouse gas emissions and contributing to increased global warming [15]. Some scholars have found a correlation between climate change and changes in ecosystem service capacity. liu (2011) found that the occurrence of extreme weather has reduced the capacity of ecosystem food provisioning services and biodiversity maintenance services, suggesting that extreme weather conditions can lead to increased vulnerability of ecosystem services [16]. assessment (2014) noted that climate change affects management and sustainability of ecosystem services. This leads to a reduction in ecosystem service capacity in some areas. Ouyang Ziyun et al. found that land use change affects biodiversity, habitat condition, ecosystem processes and ecosystem diversity, leading to changes in ecosystem services [17].

3. Advances in Research on Mechanisms Driving Ecosystem Services

In recent years, in the pursuit of high-quality socio-economic development, issues relating to the conservation of ecosystems have often been neglected, coupled with the fact that changes in socio-ecological factors can simultaneously affect various ecosystem services to varying degrees, such as the deterioration of ecological conditions and the degradation of the capacity to provide ecosystem services caused by the urbanisation process while improving urban infrastructure development. In addition, Kragt and Robertson (2014) found that agricultural fertilization activities increase agricultural yields while decreasing pollination services, and that services are intrinsically linked and interact with each other due to similarities in the

driving mechanisms of different ecosystem services [18], e.g. Alexandra (2003) showed that pollination services in natural habitats are beneficial for crop growth [19]. Therefore, to avoid trade-offs as much as possible and to achieve synergies between ecosystem services, it is necessary to clarify the relationships between ecosystem services and the factors that influence them. The driving mechanisms of ecosystem services need to be investigated based on a clear understanding of the relationships between them and the factors that influence them.

Changes in ecosystem services are generated through 2 main types of drivers: the first is driven by common drivers. These include direct and indirect drivers, which include not only natural and ecological factors such as precipitation, topography, soils, land use practices and engineering measures, but also internal ecosystem drivers such as vegetation cover and stand density, which also affect ecosystem services. Indirect drivers, on the other hand, influence direct drivers through factors such as socio-economic factors, which in turn influence ecosystem services. Based on quantitative calculations of the value of ecosystem services and supported by night-time lighting data, it was found that the expansion of urban land area has a major impact on all ecosystem services, and that changes in human activity intensity and reforestation projects have an impact on ecosystem services such as soil and water conservation and wind and sand control.

The second form of driver is direct interactions within ecosystem services, where a change in one ecosystem service affects another, and the effects between services can be unidirectional or bidirectional. Research has shown that increasing crop residues can collectively increase the ecosystem service supply of farm production value, land use cover and soil carbon and nitrogen. Identifying the mechanisms driving ecosystem services is essential for developing scientific responses to ecological management, optimising the management of ecosystem services, responding to global change and resolving conflicts between ecosystem services. The key to understanding the mechanisms that drive ecosystem services is to develop scientific management responses, optimise management of ecosystem services, respond to global change and resolve conflicts between ecosystem services.

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