

# Ecosystem and its conservation

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**Abstract.** Globally, ecosystems and their restoration and conservation are attracting enormous attention. In recent times, people have gradually realized the importance of ecosystems and the need for ecosystem conservation. At the same time, many scientific conservation measures and methods have been developed, some of which are costly but at least have made a difference in ecosystem restoration. By reviewing a series of related literature, it is possible to see the different views and responses to ecosystems and their conservation in many periods of time, and to realize the seriousness of the situation and challenges facing humanity. The literature review discusses the scientific approach and thinking about the reversibility of ecosystem restoration and rehabilitation.

**Keyword:** ecosystem, ecology, conservation.

## 1. Introduction

The rapid economic and industrial development of mankind in recent times has caused damage to the ecosystem through the irrational exploitation of natural resources, causing serious harm to the environment on which mankind depends, as well as harming people's health and limiting the continued development of the economy. With the emergence of a series of serious ecological problems, such as the destruction of the ozone layer, soil erosion, and the decline of species, people realized the importance of ecological protection. Ecosystem restoration and protection is a huge and long-term project. It may take only a moment to destroy, but it may take generations to repair. Many countries have paid a lot of money and efforts for this, such as enacting relevant laws, establishing relevant departments, and spending a lot of human and material resources. This paper discusses the appropriate and scientific way of conservation by reviewing and comparing information

## 2. Ecosystem

The term "ecosystem" was first used officially in 1935 by British ecologist Sir Arthur George Tansley, who was influenced by Danish botanist Eugenius Warming [1]. The term "ecosystem" refers to a collective unit of organisms and their surroundings in a particular area of nature, where the organisms and their surroundings interact and are for a while in a generally stable dynamic equilibrium. The sun acts as an engine that continuously supplies energy to the solar system, which is an ecosystem in its own right [2].

The biosphere is the biggest ecosystem on Earth; the tropical rainforest environment is the most complex; and people live mostly in artificial ecosystems, primarily in towns and farming. The carbon

cycle, which is closely tied to the global greenhouse effect, is one of several fundamental elements that are continually cycled in ecosystems. Ecosystems are open systems, and in order to maintain their stability, they require a constant input of energy. Ecosystem research is at its maximum level because ecosystems constitute a key structural and functional unit in the study of ecology [3].

An ecosystem is a population of creatures and their living environment that is dynamic and well-balanced. Biomes are made up of certain animal, plant, and microbial species that coexist and are interdependent in a particular range or region of nature. Abiotic and biotic habitats make up the living conditions of various biological communities in a biome. The term "abiotic environment" can also refer to the physical environment, which includes things like different chemical compounds, climatic variables, etc. The biotic community and its surrounding environment, as well as interactions and interactions between various populations of species within the biotic community, are in a dynamic balance of material exchange and energy flow. Biosystem hierarchy: Biosphere > Ecosystems>Communities>Groups>Individuals [4].

Every living creature depends on its environment for air, water, sunshine, heat, and nutrition. During the process of development, reproduction and activity, organisms continually release and excrete numerous compounds into the surrounding environment, and the residue after death is returned to the environment. This law states that all living things are a part of an ecosystem. The scale and complexity of ecosystems in nature varies, ranging from a little lake, a flat plate of bacteria, a tiny ditch, a tiny pond, a blooming shrub, and a meadow to a huge lake, an ocean, a forest, a grassland, and a biosphere that includes all ecosystems on earth. There include freshwater ecosystems, estuarine ecosystems, marine ecosystems, etc., as well as terrestrial ecosystems such as desert, grassland, and woodland [5]. Additionally, they may be separated into artificial ecosystems (such as cities, industries, and mining sites) as well as natural ecosystems (such as the polar regions and primary woods) and semi-artificial ecosystems (such as agricultural fields, charcoal forests, and aquaculture lakes) [6].

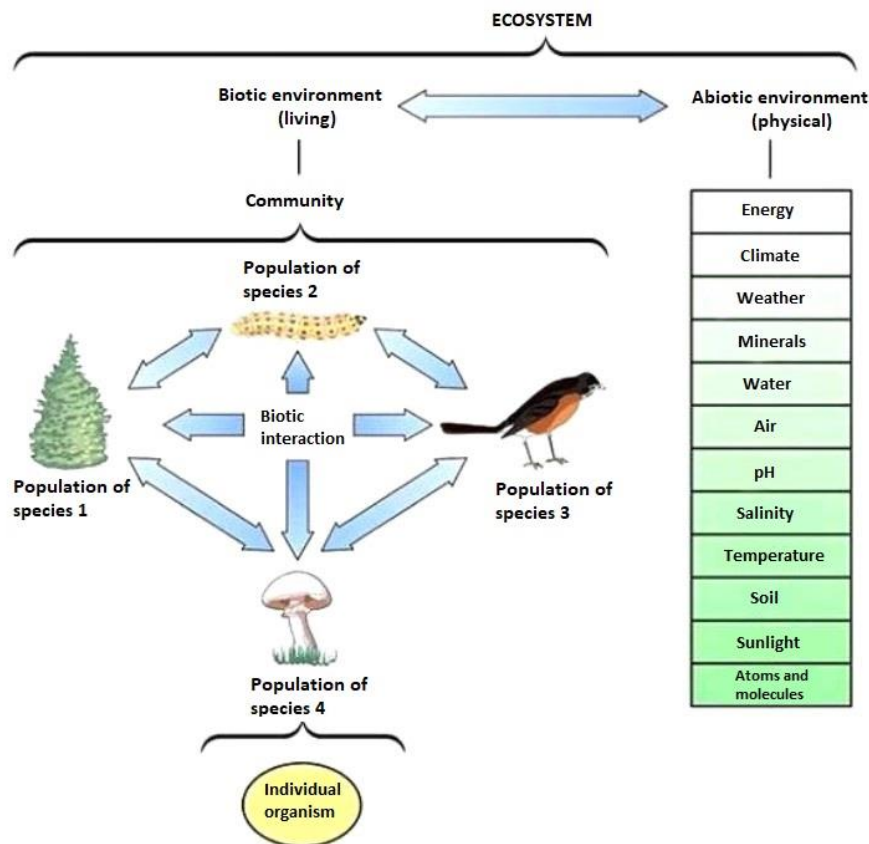


Figure 1. A diagram of the ecosystem cycle [7].

### **3. Related studies and method**

Ecologists view the environment and living things as one unbreakable unit. Later, E.P. Odum came to believe that studying organisms and the environment as a whole was important. He defined ecology as "the science of the structure and function of ecosystems," which includes examining the species, number, biomass, life history, and spatial distribution of organisms as well as the effects of environmental factors on organisms and how they respond to their environment, as well as the laws of nature. He received the Taylor Ecology Prize, the highest distinction in ecology in the United States, for his theory, which had a significant impact on the teaching and research of ecology in colleges. He was also the first to suggest the idea of an ecosystem. Henry David Thoreau, a writer from New England, was the first proponent of coexistence between humans and environment. He conducted a thorough research of local wildlife and wrote about his findings in his book *Walden Lake* in an artistic manner. Because of this, Thoreau has been referred to as "the father of ecological literary critique."

According to a recent ecology paper that was published in the esteemed international academic journal *Nature*, scientists have used the earliest ancient environmental DNA that has been discovered to date to map out what an ecosystem in northern Greenland looked like about 2 million years ago, including the animal and plant species that once lived there. The discoveries disclose an ecology without current analogs and enable extraordinary exploration and understanding of an ancient ecosystem. Conclusions can be drawn by reviewing academic websites and journals, comparing relevant literature, and comparing past and current state-of-the-art literature. Perhaps in the future this is a good measure and way to restore the ecosystem. It provides a new idea and method to restore the previous ecosystem and environment [8].

### **4. Ecological problems facing humanity**

Recently, global ecosystems are increasingly being impacted by human activity. Simultaneously, empirical and theoretical data indicate that natural systems are susceptible to sudden collapse in the face of escalating stresses, with severe ecological and economic repercussions. Once a crucial threshold is crossed, these catastrophic alterations—which occur quicker and more drastically than would be predicted by changes in stressors—can take place. The relational architecture of ecosystems—that is, how species interact with one another, with the physical environment's spatial organization, and with the environment—is what primarily drives ecosystem reactions to disturbances.

An evaluation of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services was just released, there are presently roughly one million species that are endangered. In the meanwhile, the IPCC assessment from 2021 emphasizes that even under the most hopeful emissions scenario, we still have at least a few decades of warming ahead of us.

### **5. Over-harvesting of rare animals and plants**

Driven by economic interests, many regions have blindly or even brutally carried out mining and hunting without regard to the virtuous ecological cycle and overload capacity, and the unreasonable exploitation and the intensity of consumption have had a permanent negative influence on many animal and plant resources. Wild ginseng is an obvious example, and it is already difficult to find patches of wild ginseng in China's ginseng producing areas. Many Chinese herbal medicines, once proven to have a therapeutic effect on a disease, the raw plants are quickly mined out. The evolution of species is irreversible, that is to say, it is impossible for species to degenerate into the species of the past, and species cannot be reproduced once they disappear.

### **6. Catching and killing whales**

The International Whaling Association estimates that roughly 26,000 whales are killed annually (an average of three per hour), with 95% of the total number of whales slaughtered occurring in Russia and Japan. The African rhinoceros is one of the rarest animals in the world. Because the price of rhino horn has increased dramatically, becoming even more expensive than gold, the hunt for rhinoceros has intensified, causing the number of black rhinoceros to decline by 90%, on the verge of extinction. The

blue whale, the largest mammal in the world from ancient times to the present, was still as numerous as 300,000 half a century ago, and today there are only about 2,000 left.

### **7. Invasion of exotic species**

There were no rabbits in Australia before 1859 since they are not native to the country. A farmer did, however, import a herd of two hares from England that year. He had no idea that what he was doing would cause an agricultural catastrophe. Due to the lack of natural predators in Australia, rabbits have grown to be a significant issue throughout time. They harm fields and river sides by eating crops, destroying newly sowed seeds, nibbling on sensitive bark, biting into teeth, and making holes in the ground. They can still invade farmers' crops despite fences. Australian agriculture has seen significant losses over a number of decades.

### **8. Destruction of the ozone layer**

The most catastrophic consequence is the depletion of the ozone layer, which is one of the primary causes of ecological harm, along with soil degradation, soil erosion, land desertification, land salinization, and other types. First of all, it may harm the immune system of humans, weakening the immune system; it can also cause and worsen infectious illnesses, eye diseases, and skin cancer; it increases the incidence of cataract eye disorders, and it can cause and aggravate eye diseases. Second, it will hinder crop growth, lower crop quality and yield, and even result in crop failure; the yield of more than 50% of terrestrial plants, including potatoes, melons, tomatoes, sugar beets, and other crops, will sharply decline; the condition of forests and grasslands will deteriorate, putting ecological harmony and biodiversity at risk. Additionally, it will have an impact on aquatic ecosystems, endangering plankton, reducing the amount of vital nutrients in the marine food chain, making it difficult for fish and shellfish living in shallow water to survive, reducing the number of marine organisms, wiping out a lot of fish, and possibly causing biological species to mutate. The average temperature of the earth's surface will increase by 1.5-4.5 °C due to global warming and the greenhouse effect, partially melting the ice caps at the north and south poles. This, along with the thermal expansion of seawater, will cause the global sea level to rise by 25–100 cm, submerging some low-lying coastal cities. Additionally, too much UV radiation can accelerate the aging and degradation of plastics and other polymer materials, which leads to photochemical air pollution. This in turn creates additional environmental concerns.

### **9. Is ecological damage reversible**

Fundamentally, human development and environmental protection are an eternal contradiction. The process of human transformation of the environment can never be stopped, and it is never possible to stop development. This is because mankind still has many major problems that have not been solved. Everything is contradictory, and humanity is aware of the serious threat that environmental deterioration poses to its way of life [9]. Dealing with the tension between environmental preservation and economic development can only be relative, not absolute, and it can only be concrete and measurable. For instance, if an animal activist saved a carnivore and fed it a live sheep before releasing it, is the live sheep not life? Adopting an absolute attitude toward the environment will only reduce people to their illogical animal state. This cannot be done. Environmental protection must be relative, precise, and quantitative in this case. What damage is excessive and has to be repaired, as well as to what degree, require extensive investigation, statistical analysis, and prognostic forecasting. A case-by-case analysis of unique environmental goals for each distinct place and period in history is also necessary [10]. For instance, the environmental standards of eastern and western China differ greatly in many specific ways. While some natural conditions in the west and the nation have a significant influence, the west also needs to take greater growth into account. As a result, there are both slack and tight regulations. The "irreversibility" of environmental degradation also has to be thoroughly examined. Different types of damage have varying degrees of ability to be repaired; some, like Beijing's blue sky, may be recovered in a few years, while others, like plastic pollution, take several hundred years. Therefore, we must discuss various circumstances in several categories [11, 12].

## 10. Conclusion

Two of the most common methods can be used to restore damaged ecosystems. The main methods of ecological restoration are the species framework method and the maximum diversity method [13]. Framework for species analysis. The term "species framework approach" describes the process of establishing a species or group of species that acts as the fundamental framework for reestablishing an ecosystem. In the plant community, these species often belong to the early or middle stages of succession. The benefit of this strategy is that it only calls for the planting of one (or a small number of) species, and the succession and preservation of the ecosystem depend on the local germplasm resources (gene pool) to grow species and life and achieve biodiversity. This strategy works best when used close to natural ecosystems, such as when limited restoration of degraded regions in protected areas or the establishment of links and corridors between existing natural panels is being done. The maximum diversity approach calls for extensive planting of species in the mature stages of succession, as opposed to pioneer species, to achieve ecological restoration. This involves arranging species as closely as possible to the species composition and diversity level of the ecosystem before degradation. This strategy is appropriate for locations with tiny areas that require heavy artificial management and care, such as metropolitan areas and populous areas in agricultural areas [14]. Additionally, the FAO and UNEP have started the Ecosystem Restoration Decade program in addition to the associated strategy. It runs from 2021 to 2030, the deadline for achieving the Sustainable Development Goals and the last chance scientists have identified to prevent catastrophic climate change. Millions of hectares of ecosystems, from farms to forests, from mountain summits to the deep sea, are intended to be restored. In an unprecedented attempt to heal the earth, this international movement will bring together all tiers of government, businesses and corporations, civil society, and common people. Be a voice for ecosystem protection and restoration by taking action, such as starting or supporting on-the-ground eco-restoration initiatives, making wise decisions, such as switching to sustainable goods, and changing diets. It will spur change and aid in achieving the Sustainable Development Goals by recovering ecosystems. This is an enormous undertaking. These initiatives will not only save the planet's resources but also provide millions of new employment, more than \$7 trillion in yearly revenue, and aid in the eradication of poverty and famine (by 2030) [15, 16].

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