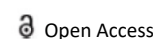




COMMENTARY



Major Challenges for Ecosystem Restoration Due to Climate and Land Use Change

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Description

The enhancement of ecosystem services over the past two decades has been greatly aided by ecological restoration efforts. However, due to climate change and rapid land use change, planning and management of ecosystem service restoration programmes remain difficult. In particular, it is difficult to identify and quantify the specific contribution of natural and human drivers of ecosystem service dynamics, to assess and simulate the combined impacts of climate-land use change interactions on changes in ecosystem services, and to adequately simulate the mid and long-term effects of various ecosystems. We suggest a new framework for restoring ecosystem services programmes as a potential remedy to the problems in order to go past them. The framework includes attribution analysis of changes in ecosystem services, assessment and projections of ecosystem service dynamics under the integrated impacts of climate-land use change interactions, simulation of the mid- and long-term effects of ecological programmes, and identification of ecological restoration threshold. These features make up the framework's logic chain, which is made up of the following elements: theory foundation, techniques support, application cases, and policy implications.

An ecosystem, also known as an ecological system, is made up of all the organisms and the physical setting in which they live. The nutrition cycles and energy flows connect these biotic and abiotic elements. Photosynthesis is how energy enters the system and is absorbed by plant tissue. Animals play a significant part in the transfer of materials and energy through the system by eating plants and one another. They also have an impact on the biomass levels of the microbial and plant communities. In addition to facilitating nutrient cycling, by transforming nutrients held in dead biomass back into a form that can be easily utilized by plants and microorganisms,

decomposers also release carbon into the atmosphere through the breakdown of dead organic matter.

Both internal and external influences affect the ecosystems. External variables that do not directly affect an ecosystem, such as topography, parent material that creates the soil, and climate, control the ecosystem's general structure. For instance, decomposition, root competition, shade, disturbance, succession, and the kinds of species present all regulate internal variables. While the availability of these resources within the ecosystem is normally governed by internal factors, the resource inputs are often controlled by external activities. As a result, interior variables influence ecological processes as well as being influenced by them.

Ecosystems are dynamic systems that are always recovering from previous disturbances and prone to recurring perturbations. Resistance is the propensity of an ecosystem to hold onto a condition that is relatively close to equilibrium notwithstanding a disruption. Ecological resilience is the ability of a system to adapt to change and absorb disturbance while maintaining essentially the same function, structure, identity, and feedbacks. There are many different ways to study ecosystems, including theoretical research, long-term ecological monitoring, examining the variations between ecosystems to understand how they function, and direct manipulative experimentation. Ecosystems can be broadly categorized into biomes. The four components in the concept of an ecosystem, a biotic component, an abiotic complex, the interactions that occur between and within them, and the physical area they occupy, are all taken into account by ecosystem classifications, a special type of ecological categorization. People rely on ecosystems for a variety of products and services. The "physical, material products" of ecosystem activities, such as water, food, fuel, building materials, and medicinal plants, are referred to as ecosystem goods. On the other hand, ecosystem services typically "increase the condition or placement

of things of value.” These include things like the preservation of hydrological cycles, the upkeep of oxygen in the atmosphere, the preservation of agricultural pollination, as well as things like beauty, inspiration, and research opportunities. Human activities such as soil loss, air and wa-

ter pollution, habitat fragmentation, water diverting, fire suppression, imported species, and invasive species all have a negative impact on many ecosystems. These dangers have the potential to abruptly alter the ecosystem or gradually impair biotic processes.