Definition Of Forest-Ecosystem Restoration

Forest ecosystem restoration is defined as:

*“Directing and accelerating ecological succession towards an indigenous* ***reference forest ecosystem*** *of the maximum* ***biomass****, structural* ***complexity****,* ***biodiversity*** *and* ***ecological functioning*** *that can be self-sustained within prevailing climatic and soil limitations.”*

Where management aims include:

* delivery of long-term watershed services, such as a reliable supply of clean water and reduced risk of soil erosion, floods, landslides and droughts (since restoration aims for a persistent, self-sustaining ecosystem);
* carbon sequestration (since restoration maximizes biomass accumulation);
* wildlife conservation (since restoration maximizes biodiversity) and/or
* delivery of a diverse range of forest products and ecological services that benefit local communities and society.

A **reference forest** is usually a remnant of the original forest ecosystem. The reference ecosystem is a central concept of restoration science. It defines the target, at which restoration is aimed. International restoration guidelines define it as “… *the condition of the ecosystem as it would be had it not been degraded, adjusted as necessary to accommodate changed or predicted change in biotic or environmental conditions (e.g., climate change)”*. Gann et al. (2019).

Restoration cannot recreate the original forest *exactly*, species by species, since the exact species composition for the original forest may not be known for any particular site. Instead, it aims to re-establish similar ecological conditions to those of the reference forest. The definition lists the four most important ones by which restoration success is judged.

Firstly, **biomass** should return to levels similar to those the reference forest. Since just under half of forest biomass is carbon, this is a particularly important where carbon credits are used to finance restoration. As biomass accumulates, it can be partitioned among more different kinds of structure: tree trunks, branches, roots and leaves of different sizes and shapes, climbers, epiphytes etc., resulting in **structural diversity**.

Development of structural diversity leads to habitat diversity, as various different structures provide opportunities for various different plant and animal species to fill their niche requirements. Thus, structural diversity leads to **biodiversity**. As an increasing diversity of plant and animal species interact with each other, essential **ecological functions,** necessary to self-sustain forest dynamics are performed. Animals pollinate flowers and disperse seeds, whilst micro-organisms form the essential symbiotic partnerships necessary to increase survival and growth of tree seedlings; nutrient cycles are re-established etc.

Although restoration aims to maximize these four interrelated indicators of ecological recovery, the amount by which they can be increased is limited by soil and climate. For example, forests in dry areas accumulate far less biomass than those in wetter areas. So, the last part of the definition “… *self-sustained within prevailing climatic and soil limitations” …* is important, in that it allows restoration goals to be adjusted in response to changes in climate and soil.

Reading

Forest Restoration Research Unit, 2005. How to Plant a Forest: The Principles and Practice of Restoring Tropical Forests. Compiled by Elliott, S., D. Blakesley, J.F. Maxwell, S,, Doust & S. Suwannaratana. Biology Department, Science Faculty, Chiang Mai University, Thailand, 200 pp.  Chapter 3. <https://www.forru.org/library/0000152>

Gann, G.D., et al. (2019), International principles and standards for the practice of ecological restoration. Second edition. Restor Ecol, 27: S1-S46. <https://doi.org/10.1111/rec.13035>

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13/9/22