

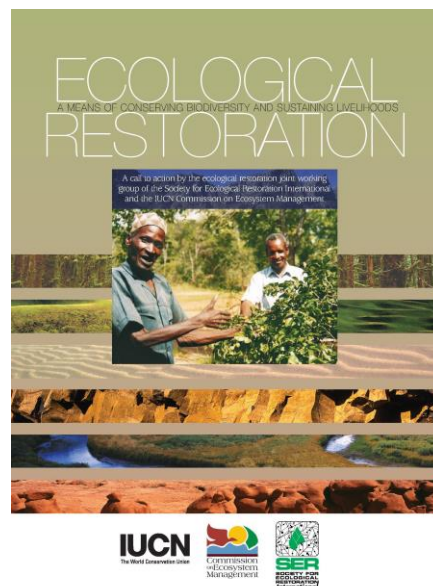
# Ecological Restoration – a means of conserving biodiversity and sustaining livelihoods

A call to action by the ecological restoration joint working group of SER International and the IUCN Commission on Ecosystem Management

George D. Gann & David Lamb, editors

## Introduction

Many of the world's ecosystems have undergone significant degradation with negative impacts on biological diversity and peoples' livelihoods. There is now a growing realisation that we will not be able to conserve the earth's biological diversity through the protection of critical areas alone. This paper explains what is meant by the term "ecological restoration" and outlines how it can provide enhanced biodiversity outcomes as well as improve human well-being in degraded landscapes. In this way ecological restoration becomes a fundamental element of ecosystem management, although until recently, its potential has not always been fully recognised.



Given that many people now depend on what have become degraded ecosystems to sustain their livelihoods, ecological restoration needs to address four elements. These elements are critical to successful ecosystem management. Ecological restoration should:

- Improve biodiversity conservation
- Improve human livelihoods
- Empower local people
- Improve ecosystem productivity

This means ecological restoration can be a primary component of conservation and sustainable development programmes throughout the world. What makes ecological restoration uniquely valuable is its inherent capacity to provide people with the opportunity not only to repair ecological damage, but also to improve the human condition. The conservation benefits of restoration are obvious. What is less apparent, but which is at least as important, is that in many instances, ecological restoration has also been able to renew economic opportunities, rejuvenate traditional cultural practices and refocus the aspirations of local communities.

This paper has been produced by a joint working group of the Society for Ecological Restoration (SER) International and the IUCN Commission on Ecosystem Management. The primary motivation for this paper has been to establish a joint rationale for both organizations as to why ecological restoration is a critical tool for biodiversity conservation and sustainable development. Much of this document was derived from the SER Primer on Ecological Restoration (SER 2002

and 2004). The paper has been also been written to further the Principles of the Ecosystem Approach as endorsed by the Convention on Biological Diversity.

### **What is Ecological Restoration?**

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. It is an intentional activity that initiates or accelerates an ecological pathway—or trajectory through time—towards a reference state (see Boxes 1 and 2).

Ecological restoration has as its goal an ecosystem that is resilient and self-sustaining with respect to structure, species composition and function, as well as being integrated into the larger landscape and supporting sustainable livelihoods. Many healthy ecosystems are a product of human endeavors over very long time periods and therefore restoration commonly requires the participation of resource dependant communities. In this respect ecological restoration supports conservation and sustainable development efforts worldwide.

There are two major challenges involved when undertaking ecological restoration. One is how to undertake restoration across large areas comprising a variety of land-uses. The second is how to equitably balance the trade-offs between improving biodiversity conservation and improvements in human well-being.

### **Principles of Good Ecological Restoration Practice**

Ecological restoration is a well-established practice in biodiversity conservation and ecosystem management. We have itemized fourteen principles of good ecological restoration practice based on experience gained over several decades. These principles, and the Attributes of Restoration Progress below, are consistent with both the scope and intent of the Convention on Biological Diversity's Principles for the Ecosystem Approach.

Principles of good ecological restoration practice include:

#### *Ecosystems*

- Incorporating biological and environmental spatial variation into the design.
- Allowing for linkages within the larger landscape.
- Emphasizing process repair over structural replacement.
- Allowing sufficient time for self-generating processes to resume.
- Treating the causes rather than the symptoms of degradation.
- Include monitoring protocols to allow for adaptive management.

#### *Human systems*

- Ensuring all stakeholders are fully aware of the full range of possible alternatives, opportunities, costs and benefits offered by restoration.
- Empowering all stakeholders, especially disenfranchised resource users.
- Engaging all relevant sectors of society and disciplines, including the displaced and powerless, in planning, implementation and monitoring.
- Involving relevant stakeholders in the definition of boundaries for restoration.
- Considering all forms of historical and current information, including scientific and indigenous and local knowledge, innovations and practices.

- Providing short-term benefits leading to the acceptance of longer-term objectives.
- Providing for the accrual of ecosystem goods and services.
- Striving towards economic viability.

### **Attributes of Restoration Progress**

A degraded ecosystem can be considered to have been restored when it regains sufficient biotic and abiotic resources to sustain its structure, ecological processes and functions with minimal external assistance or subsidy. It will then demonstrate resilience to normal ranges of environmental stress and disturbance. It will interact with contiguous ecosystems in terms of biotic and abiotic flows and social and economic interactions. It will support, as appropriate, local social and economic activities. Such a state is often difficult to achieve. Nevertheless, significant environmental and social benefits can be realized even in the earliest stages of restoration.

Restoration can take time before all the benefits are evident. The attributes listed below provide a basis for assessing restoration progress. Some are readily measured. Others must be assessed indirectly, including most ecosystem functions, which cannot be ascertained without research efforts that are likely to exceed the capabilities, budgets, and time frames of most restoration projects.

The full expression of all of these attributes is not essential to demonstrate that satisfactory progress is being achieved. Instead, it is only necessary for these indicators to demonstrate an appropriate trajectory towards the intended reference ecosystem condition.

#### *Ecosystems*

- The ecosystem contains a characteristic assemblage of the species that occurs in the reference ecosystem and that provide appropriate community structure.
- The ecosystem contains indigenous species to the greatest practicable extent.
- All functional groups necessary for the continued development and/or stability of the ecosystem are represented.
- The physical environment of the ecosystem is capable of sustaining reproducing populations of the species necessary for its continued stability or development along the desired trajectory.
- The ecosystem apparently functions normally for its ecological stage of development, and signs of dysfunction are absent.
- The ecosystem is suitably integrated into a larger ecological matrix or landscape, with which it interacts through abiotic and biotic flows and exchanges.
- Potential threats to the health and integrity of the ecosystem from the surrounding landscape have been eliminated or reduced as much as possible.
- The ecosystem is sufficiently resilient to endure the normal periodic stress events in the local environment that are an integral part of the dynamics of the ecosystem.
- The ecosystem is self-sustaining. It has the potential to persist indefinitely under existing environmental conditions. Aspects of its biodiversity, structure and functioning will change as part of normal ecosystem development, and may fluctuate in response to normal periodic stress and occasional disturbance events of greater consequence. As in any intact ecosystem, the species composition and other attributes of a restored ecosystem may evolve as environmental conditions change.

### *Human systems*

- Balance exists between ecological processes and human activities such that human activities reinforce ecological health and vice versa.
- The people who are dependant on the ecosystem have a key role in setting priorities and in project implementation.
- Restoration activities are underpinned by economic mechanisms that appropriately assign the costs incurred and equitably distribute the benefits arising at both a local and national level.
- The ecosystem serves as natural capital that assures a supply of environmental goods and services that are useful to people.

Attributes may be more specific according to the nature of the restoration goals. For example, one goal may be that the restored ecosystem will provide habitat for rare species or will harbor a diverse gene-pool for selected species. Yet other goals of restoration may be to provide aesthetic amenities or to accommodate activities of social consequence, such as the strengthening of a community through the participation of individuals in a restoration project.

### **Challenges and Opportunities**

The circumstances that we seek to address are often very challenging. The areas of degraded land now present in various parts of the world are large. Some systems are severely degraded and will be costly to repair. Further, many of these degraded systems are still being used by people and many of these people are poor. We may not succeed in fully eradicating the causes of degradation in these circumstances but there is sufficient evidence from a variety of case studies for us to be optimistic. This evidence makes it clear that ecological restoration will be a key element not only of conservation but also for sustainable development worldwide.

Restoration can be large-scale or small scale, it can be carried out by one or a few individuals or via government programmes involving thousands of participants. It can be well resourced or modestly funded, it can involve ecosystems that can be restored quickly or those that will require hundreds of years before ecological recovery can be said to have occurred. In all cases ecological restoration will improve the biological diversity on degraded landscapes, increase the populations and distribution of rare and threatened species, enhance landscape connectivity, increase the availability of environmental goods and services, and contribute to the improvement of human well-being.

Reference: SER International Primer on Ecological Restoration. [www.ser.org](http://www.ser.org)

#### **Box 1: The Reference State**

A reference ecosystem is an actual ecosystem or its conceptual model that is used in setting goals and planning a restoration project, and later in its evaluation. In its simplest form the reference ecosystem is an actual site, its written or oral description, or both. In other situations, the reference ecosystem is assembled from multiple sites and from other sources. In parts of the world where there is a lack of an actual reference ecosystem, or in situations where it is unclear which ecosystem over time would serve as an adequate reference, a more conceptual approach is required. It should be noted that the concept of the reference is a dynamic one, and that,

typically, the reference represents a point of advanced development that lies somewhere along the intended ecological trajectory of the restored ecosystem (see Box 2).

## Box 2: The Ecological Trajectory

Wherever possible, ecological restoration attempts to return an ecosystem to its historic trajectory. Historic conditions are therefore the ideal starting point for restoration design and planning. The restored ecosystem will not necessarily recover any of its specific former states, since contemporary constraints and conditions may render this impossible. Indeed, the historic trajectory of a severely impacted ecosystem may be difficult or impossible to determine with accuracy. Nevertheless, the general direction and boundaries of that trajectory can be established through a combination of knowledge of the damaged ecosystem's pre-existing structure, composition and functioning, studies on comparable intact ecosystems, information about regional environmental conditions, and analysis of other ecological, cultural and historical reference information. These combined sources allow the historic trajectory or other reference conditions to be charted from baseline ecological data and predictive models, and its emulation in the restoration process should aid in piloting the ecosystem towards improved health and integrity.

## Background to Ecological Restoration: A Means of Conserving Biodiversity and Sustaining Livelihoods

The development of a global rationale for ecological restoration was first suggested by the IUCN Commission on Ecosystem Management (CEM) in preparation for the second joint workshop on ecological restoration with the Society for Ecological Restoration International (SER) held at Taman Negara, Malaysia in 2003. SER delegated the preparation of a draft document to an ad hoc working group composed of SER members George Gann (Chair), Carolina Murcia and Keith Winterhalder. Winterhalder, chair of the SER Science and Policy Working Group, wrote the first rough draft. Other SER delegates who contributed to the document both prior to and during the workshop included then SER Board Chair Eric Higgs, Keith Bowers, Nik Lopoukhine and Steve Whisenant.

The draft global rationale became the focus of negotiations at the Taman Negara workshop. Representatives from the CEM, the Ecosystem Management Programme (EMP) and other IUCN programmes who contributed to the development of the document include: Kamal Batanouny (CEM), Thérèse Beaudet (EMP), Steve Edwards (Coordinator, EMP), Nordin Hasan (CEM), Frits Hesselink (Workshop Facilitator), David Lamb (CEM Ecosystem Restoration Theme Leader), Nik Lopoukhine (CEM, SER), Stewart Maginnis (Forest Programme), Susan Mainka (Species Programme), Hillary Masundire (Chair, CEM), Clive Wilkinson (CEM), Marieke Wit (EMP), and Piet Wit (Deputy Chair, CEM). A working draft titled *Ecological restoration: a means of conserving biodiversity and sustaining livelihoods*, was approved by both SER and IUCN delegations at the conclusion of the meeting. The SER Board of Directors approved the document in April, 2004.

A final draft of the global rationale was prepared in advance of the 3rd World Conservation Congress in Bangkok, Thailand in November 2004 and was printed for distribution at that event

(Society for Ecological Restoration International and IUCN Commission on Ecosystem Management 2004). Gann and Lamb, co-chairs of the SER-CEM Ecological Restoration Joint Working Group, edited this final version. Keith Winterhalder, Andre Clewell and James Aronson, of the SER Science & Policy Working Group, contributed Boxes 1 & 2 and provided other editorial suggestions. Version 1.1 (Gann & Lamb 2006), is published on the web at [www.ser.org](http://www.ser.org), and incorporates this Background and some minor editorial modifications to the original approved document.

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