



STANDARDS OF PRACTICE TO GUIDE ECOSYSTEM RESTORATION

A contribution to the United Nations Decade on
Ecosystem Restoration

SUMMARY REPORT



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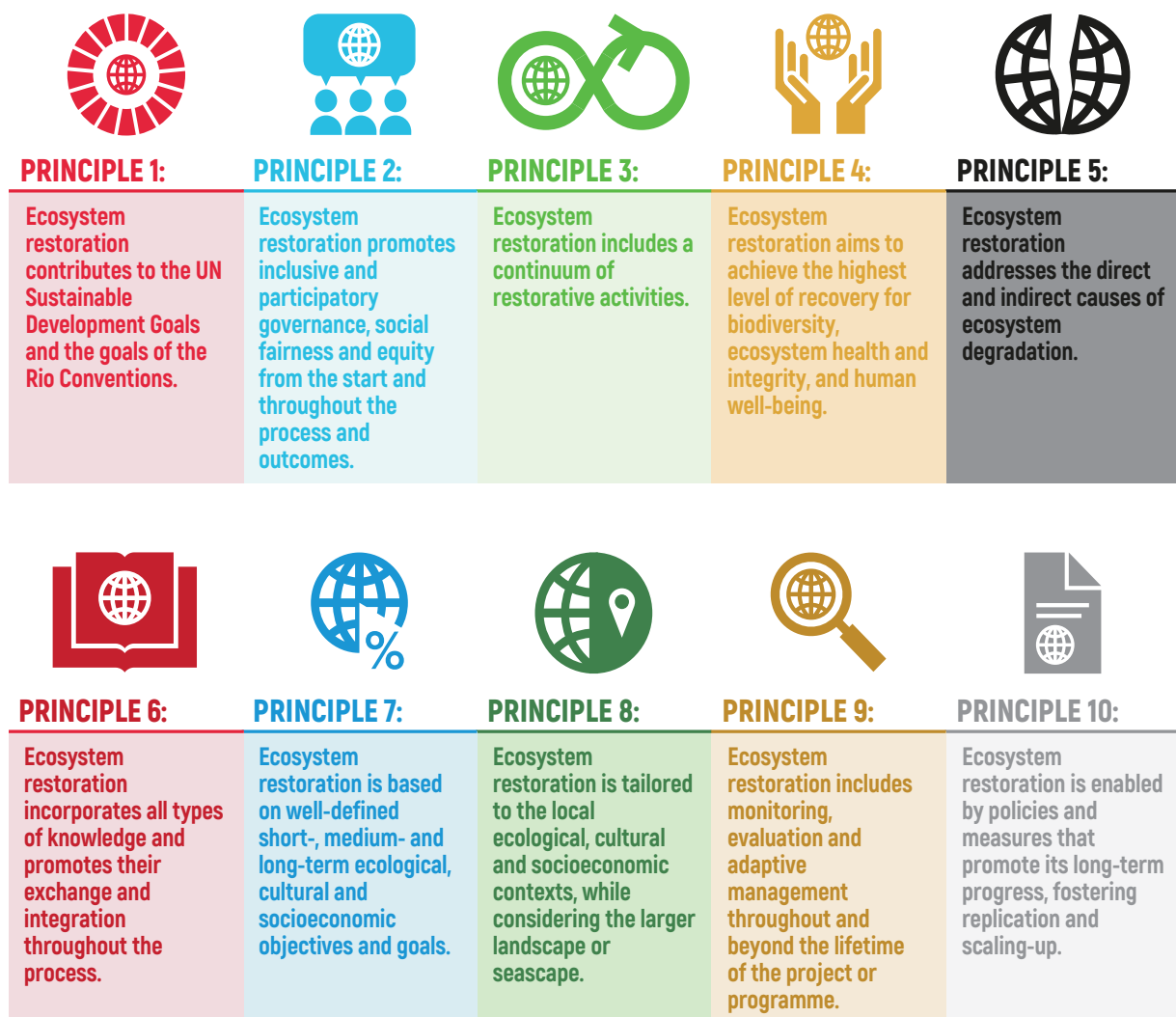
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INTRODUCTION

The United Nations Decade on Ecosystem Restoration 2021–2030 (hereafter “UN Decade”) recognizes the critical need to prevent, halt and reverse the degradation of the world’s ecosystems. Effective restoration of degraded ecosystems is of paramount importance for recovering biodiversity, ecosystem health and integrity, ecosystem goods and services, climate-change mitigation and human health and well-being. UN Decade partners, through a consultative process, offered ten [principles](#) (Figure 1) for ecosystem restoration to create a shared vision and increase the likelihood of achieving the highest level of recovery possible.

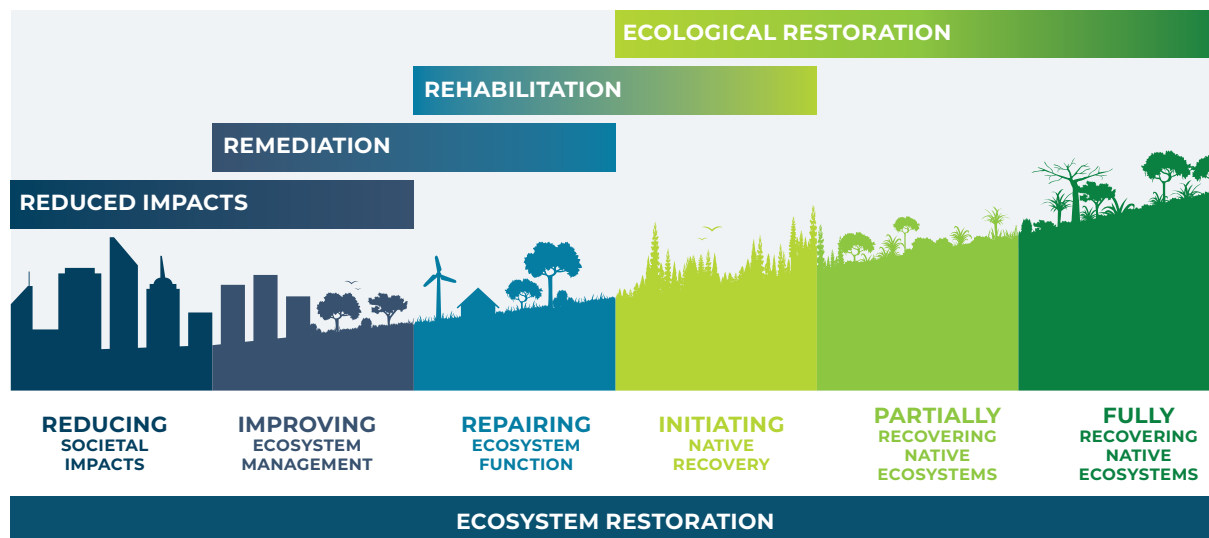
Figure 1. Ten principles for ecosystem restoration to guide the United Nations Decade on Ecosystem Restoration



Source: FAO, IUCN CEM & SER. 2021. *Principles for ecosystem restoration to guide the United Nations Decade 2021–2030*. Rome, FAO.

To facilitate application of these principles to restoration projects, the *Standards of practice to guide ecosystem restoration* (hereafter, *Standards of practice*) provides key recommendations for the entire restoration process, which can be applicable across all sectors of society, land or sea uses, ecosystems and regions, and to the broad array of ecosystem restoration activities under the UN Decade (Figure 2). The goal of this document is to provide an overview of the *Standards of practice*.

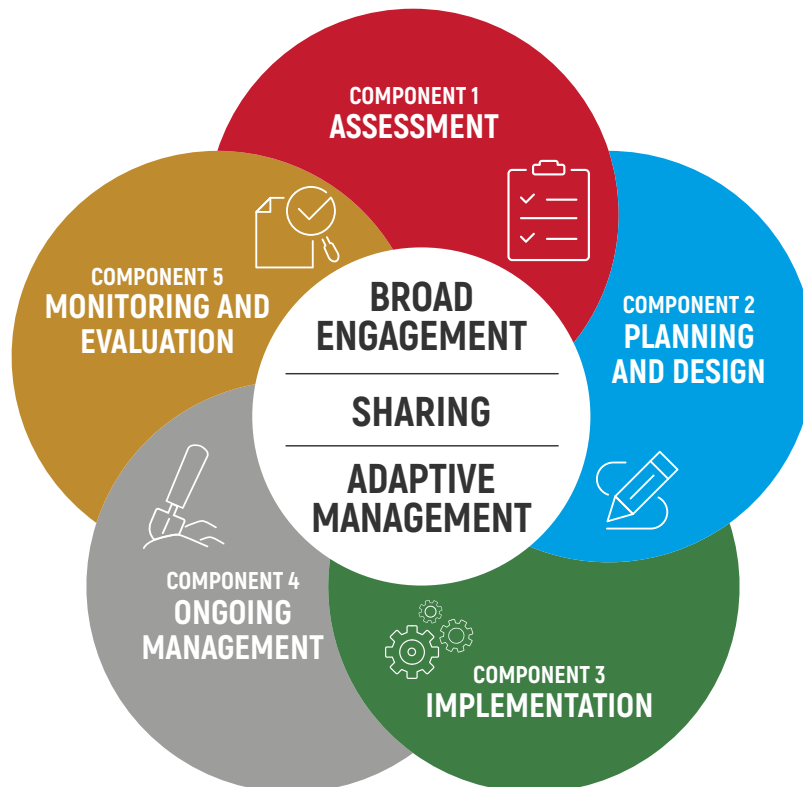
Figure 2. Restorative management activities arrayed along a continuum of ecological recovery



Source: Modified from Valderrábano, M., Nelson, C., Nicholson, E., Etter, A., Carwardine, J., Hallett, J., McBreen, J. and Botts, E. 2021. Using ecosystem risk assessment science in ecosystem restoration: A guide to applying the Red List of Ecosystems to ecosystem restoration. IUCN, Gland, Switzerland. After Gann G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decler, K. and Dixon, K.W. 2019. International principles and standards for the practice of ecological restoration. Second edition. Restoration Ecology 27(S1): S1–S46.

The *Standards of practice* were developed (Annex) through a synthesis of the large volume of existing guidance for best practices for a broad array of restorative activities, from sustainable agriculture to ecological restoration, as well as the [recommendations of the Science Taskforce for the UN Decade](#). Practices have been organized by components of the restoration process (Figure 3). The **assessment** component includes the identification and evaluation of the extent and scale of degradation, considering the site and its context within the land- and seascape. Degradation is defined as the cumulative degree to which an ecosystem’s physical condition, composition, structure and function have been adversely affected by anthropogenic factors. **Planning and design** focuses on determining appropriate restoration activities given the ecological, socioeconomic and cultural contexts, as well as financial constraints. Restoration targets are defined, and specific goals and objectives for the restoration project are developed based on consultations with stakeholders, right holders and experts. Planning foreshadows all the onsite work that will be undertaken during the project’s **implementation**, whereas **ongoing management** considers short- and long-term site needs following the completion of planned implementation activities. Finally, the **monitoring and evaluation** component focuses on measuring progress towards the recovery of the restoration targets and achievement of the project’s goals and objectives, enables adaptive management for possible course corrections, and provides an opportunity to share lessons learned.

Figure 3. The five components of the restoration process along with cross-cutting subcomponents that apply throughout the restoration process



Note: Although presented in a sequential order, the restoration process is not linear, and subcomponents within different components may be conducted simultaneously or in a different order than presented in the *Standards of practice to guide ecosystem restoration*.

Within the *Standards of practice*, each of the five components of the restoration process is presented in sequential order, with subcomponents (SC) detailed within each component, and practices listed within each subcomponent. It is important to recognize, however, that the restoration process is not linear and that some subcomponents and practices may be conducted simultaneously or in a different order than presented in the *Standards of practice*. For instance, the monitoring component, which is presented last in the *Standards of practice*, should begin during the project design phase. Moreover, there are “cross-cutting” subcomponents and practices that may need to be revisited throughout the restoration process. For this reason, some subcomponents are repeated within more than one of the components. For example, practices associated with adaptive management are needed throughout the restoration process. This is because adaptive management requires an iterative process of defining goals and objectives, implementing field trials to fill information gaps and test multiple alternative approaches, learning from restoring through effective monitoring and evaluation, and applying lessons learned to planning, implementation and ongoing management. Although an adaptive approach to restoration improves the likelihood of achieving restoration goals and objectives, it requires a commitment to undertaking adaptive-management activities across the restoration process. Similarly, the likelihood of restoration success greatly increases when each component of the process is informed by and involves inclusive, genuine and continuous engagement of all stakeholders, right holders and underrepresented groups, who might be directly or indirectly involved in, or affected by, restoration activities. In many cases, long-term sustainability of restoration projects is only possible via codesign, co-management and co-governance with local stakeholders and right holders, and, therefore,

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broad engagement should not be limited to a single component, such as planning. Restoration projects that may affect Indigenous Peoples or their territories must respect their collective right to free, prior and informed consent, embedded within the universal right to self-determination. Regular and inclusive reporting and communication of activities, achievements and lessons learned is also required within all components of the restoration process to foster support and enhance benefits of the restoration efforts; as is information sharing. In all cases where cross-cutting subcomponents are included in more than one component of the restoration process, the practices that are recommended are tailored for each component.

The success of ecosystem restoration projects depends on factors beyond the management activities employed at the project site, such as supportive policy, governance, and social and economic conditions. For this reason, many subcomponents and practices within the *Standards of practice* address enabling conditions, including: the socioeconomic and cultural contexts of the project and project governance; open, participatory processes that balance the needs and concerns of those involved in, or affected by, the restoration; tenure, property and use rights; equity, livelihoods and benefit-sharing; integrating all types of knowledge, including scientific and traditional; sustainable financing from different sources and managing tradeoffs between ecological integrity and human well-being. Because factors beyond the scope of the project may affect project success, understanding these conditions prior to project initiation can prevent wasted resources and unintended consequences. In addition, lessons learned throughout the entire restoration process may indicate the need for higher-level steps to leverage restoration efforts, reform tenure regimes, improve access to markets, change policies or repurpose current incentive programmes to reduce degradation and support restoration.

The recommendations proposed in the *Standards of practice* are voluntary. They were developed to assist practitioners, stakeholders and right holders in maximizing ecological, cultural and socioeconomic benefits of their restoration activities. Not all practices, however, will apply to every restoration project. Under the *Standards of practice*, a restoration project includes activities to repair one or more degraded sites. Restoration projects are highly variable with respect to the organizations and people involved (e.g. Indigenous Peoples, local communities, non-government organizations, government agencies and private landowners), resource availability (low budget to highly financed) and spatial scale (small individual sites to multiple sites across landscapes or seascapes). These differences may influence the number and type of best practices that are appropriate for each project. Regardless of whether a project is limited in its ability to incorporate practices from the standards or can implement most of them, a synthetic understanding of the complete set of recommended practices should facilitate decision-making about the practices to include as well as navigating tradeoffs, with the goal of achieving the highest level of recovery possible for nature and people.

This summary of the *Standards of practice* includes an overview of each of the five components of the restoration process, along with their relevant subcomponents. Detailed explanations of the 45 subcomponents and over 250 recommended practices within the five components are included in the full version¹ of the *Standards of practice*. These subcomponents and practices can assist the global restoration community with developing restoration projects that reflect the UN Decade principles. Adherence to the recommendations within the *Standards of practice* should facilitate achieving maximum net gain for biodiversity, ecosystem health and integrity, and human well-being, and promote the engagement of local communities, women, youth, Indigenous Peoples, funders, researchers, governments and others. In addition, the practices should aid in harmonizing across projects, which is critical to achieving the greatest net gain possible through ambitious global restoration initiatives.

¹ The *Standards of practice* are scheduled to be released on the [UN Decade website](#) in the fourth quarter of 2023.

COMPONENT 1: ASSESSMENT

Degraded ecosystems are those that, due to anthropogenic causes, have been altered in composition, structure or function, and that no longer provide the level of services they once did (e.g. water, food, fibre, climate regulation, clean air, nutrient cycling, erosion and coastal flood control) or have lost species of conservation, cultural or economic interest. Prior to planning any restoration project, an assessment of the local ecological, cultural and socioeconomic conditions is needed to identify degradation and to define restoration vision and targets during planning. Most restoration projects are conducted at the local or community level, and local stakeholders and right holders may be aware of the factors causing degradation. Therefore, broad engagement by stakeholders and right holders, as well as incorporation of all kinds of knowledge, is critical in the assessment phase (SC1).



Designing a restoration project starts with a local assessment of the area being considered for restoration (SC2), including a general description of its physical (e.g. topography, hydrology) and biotic components (e.g. species present). The degree of degradation, and its effects on biodiversity, ecological integrity, and human health and well-being must be identified. While degradation may be obvious, the underlying causes must also be determined so that a plan for reducing or eliminating them can be developed. Information on land use, livelihoods and potential social barriers to restoration should be obtained.

Because restoration sites are embedded within larger landscapes or seascapes (SC3), conditions and activities external to the restoration site can greatly affect the outcome of restoration. Consequently, understanding the broader context in terms of biophysical and environmental conditions, socioeconomic realities, policy and legal contexts, and cultural and historical influences is important for achieving desired outcomes from restoration. Potential barriers to restoration and external threats, as well as fragmentation and connectivity, should be evaluated at this scale. It is also necessary to fully identify stakeholders and right holders, as part of the assessment of the larger context of the project.

A detailed inventory of the baseline condition (SC4) of the proposed project area and restoration target to be restored should be conducted in advance of planning or implementation of specific restoration activities. This baseline inventory extends the initial assessment of local conditions (SC2) by measuring specific indicators of the site’s physical environment, biotic composition, community structure and ecosystem functions. This inventory greatly assists development of restoration goals and objectives, and selection of restoration activities. It also provides a benchmark for measuring change following implementation. For this reason, the indicators measured in the baseline inventory should be the same as those that will be measured for project monitoring.

To assess the degree of degradation to the project area and define targets and recovery goals, it is useful to estimate the condition that the project area would be in if degradation had not taken place. Best practice for characterizing this condition is to develop a “reference model” (SC5) from “reference sites” – sites that are environmentally similar to the project site, but that have not experienced a high degree of degradation. The appropriate time to identify reference sites and models is during the assessment phase. Adaptive management, information management and record keeping, and reporting and communication are important in both assessment and planning; however, because best practices are similar across these components, these are only included in planning to reduce redundancy (SC12, SC17, and SC18, respectively).



Restoration planning is complex and requires an understanding of land and resource tenure security, legitimate tenure rights and cultural values (SC8), as well as clear agreement among stakeholders and right holders on the project governance structure and decision-making processes (SC9). Capacity development (SC10) may be needed to enable and enhance participation of local stakeholders and underrepresented groups in selecting and prioritizing the restoration activities to be implemented (SC11), and to achieve greater consensus among all local communities and authorities as to funding, implementation, access, adaptive management and other aspects of project work. By prioritizing restoration activities, the project can be scaled to the available resources or adjusted if external factors require that changes be made to implementation. The adoption of an adaptive-management framework (SC12) also allows modifications to be made based on evaluation of monitoring results.

Development of the restoration plan (SC13) should be based on the condition of the restored site, as determined during assessment (component 1), and predictions of future conditions resulting from climate change. The plan should specify all details about the project (SC6 to 12), including plans and timelines for implementation, ongoing management, and monitoring activities (components 3, 4, and 5, respectively).

The plan should also detail required financial resources including in-kind contributions (S14) and the laws and regulations (SC15) that must be followed to enable the implementation. Because issues may arise during implementation that can adversely affect restoration outcomes, risk assessment and appropriate risk management (SC16) need to be conducted to reduce these adverse effects. Information management and record keeping (SC17) is also critical in this phase to enable broad engagement, understanding and implementation of planned restoration and ongoing management activities, and adaptive management. Finally, a good communication strategy (SC18) can help create the shared vision and the plan, build trust and avoid problems related to project governance and design.



COMPONENT 2 PLANNING AND DESIGN



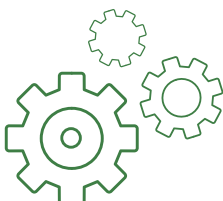
COMPONENT 3: IMPLEMENTATION

Care must be taken to perform restoration activities in a manner that maximizes returns for biodiversity, ecosystem health and integrity, ecosystem goods and services, climate change mitigation, and human health and well-being. To this end, implementation should be done, as appropriate, in the context of participatory governance, social fairness and equity, by promoting fair and safe working conditions, and providing inclusive opportunities for engagement, co-management, decision-making, knowledge integration and the enhancement of livelihoods for local stakeholders, right holders and underrepresented groups (SC19 and SC20). When implementing restoration activities, it is critical to ensure that sufficient human resources, tools and materials are available at the project site (SC21), so that the planned project timeline is met (SC13). All activities should be undertaken in compliance with applicable laws and regulations, and with respect for local and Indigenous Peoples' rights, traditions and customs (SC22).



Ecosystem restoration involves innovation and experimentation, and restoration activities often result in surprises and setbacks. Because of this, it is often necessary to conduct initial experimentation to support decision-making (e.g. choice of species and spacing) or to install and test alternative treatments during the project to enable adaptive management (SC23). Likewise, several types of restoration activities may be needed to prevent or halt degradation, or amend abiotic and biotic conditions to facilitate natural regeneration and establishment of translocated organisms (SC24, SC25 and SC26). For example, it is often important to take action to remove threats from the site, such as grazing, that may adversely affect planted vegetation. Wherever feasible, practitioners should leverage opportunities for natural recovery (e.g. successional processes). However, where the potential for natural regeneration has been lost, additional measures may be necessary (e.g. modification of abiotic conditions to allow establishment or translocation of organisms to the site). In many cases, the use of restoration activities aimed at reducing societal impacts, such as application of sustainable management practices for soil, land, water and vegetation together with additional alternatives to generate livelihoods for local communities (e.g. ecotourism), will help prevent further degradation by satisfying socioeconomic needs. Importantly, when modifying biotic or abiotic conditions, measures should be adopted to avoid or minimize negative collateral damage, or to mitigate these impacts (SC27).

To maximize learning from restoration interventions, it is critical to document in detail the locations, types, intensities, frequencies, and costs of all restoration activities (SC28). For example, if prescribed fire is used, it would be important to document the environmental conditions during the fire, which areas within the fire perimeter burned, and the intensity and severity of the fire where it occurred. This information is critical both for understanding best practice for implementing treatments, monitoring treatment efficacy and effects, and for replication purposes. In addition, reporting and communicating about project implementation is important to raise awareness, mobilize and maintain support from the public, government, and donors, and to foster collaboration and mutual learning with other restoration practitioners (SC29).



**COMPONENT 3
IMPLEMENTATION**

SC19 BROAD ENGAGEMENT	SC20 SUITABILITY, SAFETY AND WELL-BEING OF RESTORATION IMPLEMENTERS	SC21 MATERIALS, TOOLS AND SUPPLIES	SC22 COMPLIANCE WITH LAWS AND REGULATIONS
SC23 ADAPTIVE MANAGEMENT	SC24 IMPLEMENTING RESTORATION ACTIVITIES	SC25 ENHANCING NATURAL ECOSYSTEM RECOVERY PROCESSES	SC26 TRANSLOCATION OF PLANTS, ANIMALS AND OTHER ORGANISMS
SC27 MINIMIZING COLLATERAL DAMAGE FROM RESTORATION	SC28 INFORMATION MANAGEMENT AND RECORD-KEEPING	SC29 REPORTING AND COMMUNICATION	

COMPONENT 4: ONGOING MANAGEMENT

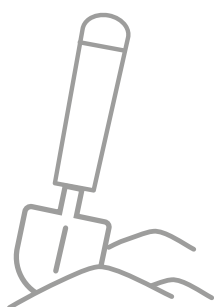
Ongoing management (often referred to as “maintenance”) of restoration sites after the primary project implementation phase is an essential part of successful restoration. Restoration projects are unlikely to succeed in providing ecological, cultural and socioeconomic benefits if the sites are not revisited after the completion of initial restoration activities. Because of this, ongoing management should begin as soon as any project implementation phase is over to minimize potential of regression into a degraded state and maximize progress towards medium and long-term restoration goals and objectives. However, there may not be a clear point of transition from implementation to ongoing management, especially in long-term restoration projects, when implementation phases continue until recovery is secured.

Active engagement of stakeholders and right holders during the ongoing management phase is just as important as it is in the implementation phase of restoration, as it helps promote co-management, collaboration and capacity development for project sustainability. Furthermore, it helps facilitate communication about the project and its values to new generations. Educational and research institutions may be able to support restoration science or implementation projects and incorporate methods and tools into curricula. Information management, record keeping, reporting and communication are also critical during ongoing management. The specific practices for these, however, are the same as for implementation (SC19, SC28, and SC29) and have not been repeated in ongoing management.



Realistic, cost-effective and sustainable plans for ongoing management (SC30) and adequate funding (direct or through revenues generated) (SC31) is essential, especially since personnel and budget resources are generally limited in this phase of the project. Planning and budgeting should consider that some long-term needs for ongoing management can be anticipated (e.g. site protection measures, continued removal of invasive species, management of hydrological regimes and ensuring natural disturbance regimes), while other needs may not be known in advance since ecosystems are dynamic and constantly changing, and unanticipated events can occur. Although they occur after implementation, ongoing management activities should be scheduled and budgeted during the planning phase of restoration (SC13 and SC14) and should allow for the development of both anticipated and adaptive activities (SC32).

To foster continuous improvement, opportunities for the implementation of additional restoration activities at the project site should be explored based on reliable monitoring and adaptive management (SC33 and SC34). Application of lessons learned from monitoring and evaluation and adaptive management is essential over the long-term to plan and implement any necessary corrective measures to avoid adverse impacts and progress to long-term project goals.



COMPONENT 4 ONGOING MANAGEMENT

SC30

ONGOING
MANAGEMENT
PLANNING

SC31

LONG-TERM
RESOURCING

SC32

ONGOING
MANAGEMENT
ACTIVITIES

SC33

ADAPTIVE
MANAGEMENT

SC34

CONTINUOUS
IMPROVEMENT

COMPONENT 5: MONITORING AND EVALUATION

Ecosystem restoration is a long-term process with uncertainties on how to best achieve project goals. Furthermore, climate change is adding to existing unknowns about how ecosystems respond to planned restoration actions. Consequently, it is imperative to monitor and evaluate the restoration project over time to determine: i) the extent to which restoration activities were implemented as planned (implementation monitoring); ii) the degree to which the restoration targets were recovered, and the project goals and objectives were achieved (effectiveness monitoring); and, iii) the ecological, cultural or socioeconomic effects that resulted, whether positive or negative (effects monitoring). When done correctly, monitoring and evaluation enables ongoing management to be adaptive, so that effective actions can be adopted and expanded, ineffective approaches can be discontinued, and promising new methods can be added.

The best outcomes from monitoring will be achieved using a participatory approach that engages stakeholders and right holders, and incorporates multiple types of knowledge, including traditional, local and scientific (SC35). Including people with diverse skill sets and knowledge bases will facilitate the identification of monitoring goals, objectives and key questions to be addressed, based on stakeholder interests and concerns. Experts in assessing biophysical, cultural and socioeconomic indicators are needed to develop monitoring methods that have sufficient power to detect trends and reliably answer



key questions. Broad participation in monitoring is also important to maintain monitoring and adaptive-management frameworks over the long term.

For monitoring to reliably answer questions about restoration implementation, effectiveness and effects, the monitoring and evaluation plan (SC36) requires more than just protocols for making observations about the restoration project. Rather, it requires developing specific monitoring goals and objectives (SC37), as well as questions that will be addressed, and selecting reliable monitoring and sampling designs, based on the indicators selected, for answering those questions (SC38 and SC39). It also requires protocols for collecting data (SC40) in a way that can be repeated over time and for analysing data and interpreting results (SC41). An important, but often overlooked, aspect of monitoring is periodic evaluation of whether the monitoring and evaluation effort is efficiently achieving its goals and objectives and to adapt aspects as needed (SC42). Procedures and timelines for evaluating the efficacy of the monitoring programme should be included in the monitoring plan. The plan should also include procedures and timelines for information management and record-keeping (SC43) and sharing findings (SC44), so that lessons learned can be utilized for adaptive management (SC45).

Development of the monitoring plan should begin during the planning and design phase of the restoration project, before work has started on the project site. This is critical for obtaining required resources and scheduling monitoring activities directly into the restoration project plan. Equally as important, it allows monitoring questions to be directly linked with the ecological, cultural and socioeconomic objectives of restoration. Furthermore, for many monitoring questions, it is essential to collect baseline (or pre-treatment) data, which is only possible if monitoring activities are designed prior to the implementation of the restoration work.

Besides evaluation of implementation, efficacy and effects of restoration activities, there are other equally important goals of monitoring (SC37), including evaluation of project governance, information sharing, building project support and increasing trust among stakeholders and right holders, providing technical training on the restoration process and environmental assessment and providing opportunities for contributing to environmental solutions. Unless the full set of monitoring goals are well articulated in the monitoring and evaluation plan, with specific objectives and methods, the project will not be well positioned to achieve them.



COMPONENT 5 MONITORING AND EVALUATION

SC35 BROAD ENGAGEMENT	SC36 MONITORING AND EVALUATION PLAN	SC37 MONITORING GOALS AND OBJECTIVES	SC38 SELECTION OF INDICATORS
SC39 MONITORING AND SAMPLING DESIGNS	SC40 DATA COLLECTION	SC41 DATA MANAGEMENT, ANALYSIS AND EVALUATION	SC42 EVALUATION OF THE EFFECTIVENESS OF THE MONITORING EFFORT
SC43 INFORMATION MANAGEMENT AND RECORD-KEEPING	SC44 REPORTING AND COMMUNICATION	SC45 ADAPTIVE MANAGEMENT	

ANNEX

BACKGROUND

The Taskforce on Best Practices, which was established under the leadership of the Food and Agriculture Organization of the United Nations (FAO), is a collaborative effort of currently 300 members from more than 100 global organizations, which supports capacity development and knowledge dissemination to help achieve the vision of the United Nations Decade on Ecosystem Restoration (hereafter “UN Decade”). In 2021, the Taskforce on Best Practices, the Society for Ecological Restoration (SER) and the International Union for Conservation of Nature Commission on Ecosystem Management (IUCN CEM) partnered to lead an inclusive effort to draft ten guiding [principles](#) that underpin the full set of ecosystem restoration activities, in collaboration with the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), the EcoHealth Network, the World Wide Fund for Nature (WWF) and the United Nations Environment Programme (UNEP). After the release of the principles in September 2021, and following the same participatory approach, the partnership continued to coordinate the development of the *Standards of practice to guide ecosystem restoration* (hereafter “*Standards of practice*”) to provide guidance on the application of the ten principles across all components of the restoration process in close collaboration with 15 organizations (see authors).

PROCESS AND METHODS

The development of the *Standards of practice* started with review of existing guidance documents for all types of activities defined as ecosystem restoration under the UN Decade, including rehabilitation, reclamation, forest and landscape restoration, ecological restoration, sustainable or ecological agriculture and forestry, rewilding, other effective conservation measures (terrestrial or in aquatic ecosystems) and others. These documents were obtained through a global request distributed via email to members of the SER, IUCN CEM and the UN Decade Taskforce on Best Practices. A total of 201 respondents suggested 127 unique *standards of practice* documents. Suggested documents covered a wide range of management activities, ecosystem types, aims, geographical locations and audiences. After review, the most universally relevant documents were selected for extracting best practices (see list of documents in the *Standards of practice*). To the extent possible, redundant practices were eliminated. Practices were then organized into components and subcomponents of the process. The initial set of components, subcomponents and practices were subject to a series of consultative processes, including: i) a global forum in which 70 scientists and practitioners collaboratively reviewed and revised the practices for each subcomponent within each component (April and May 2022); ii) an invitation to provide feedback and inputs distributed to leads and members of the UN Decade taskforces, the UN Decade Strategy Group, the Science and Policy Committee of SER and leaders of IUCN CEM (August 2022); and, iii) consultations at the XV World Forestry Congress (May 2022), the Thirteenth European Conference on Ecological Restoration (September 2022) and the Twenty-Sixth Session of the FAO

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Committee on Forestry (October 2022). All feedback and inputs were evaluated and considered in the creation of a second draft, which was subjected to a one-month open global consultation advertised to the restoration community and available on the UN Decade website. Over 400 individuals from diverse organizations and geographic regions provided comments during the global consultation. Each comment was evaluated and the text was adjusted as appropriate to create the beta version of the *Standards of practice*, on which this summary is based. The final version will be released on the [UN Decade website](#) in the fourth quarter of 2023 after conducting targeted consultations with Indigenous Peoples.



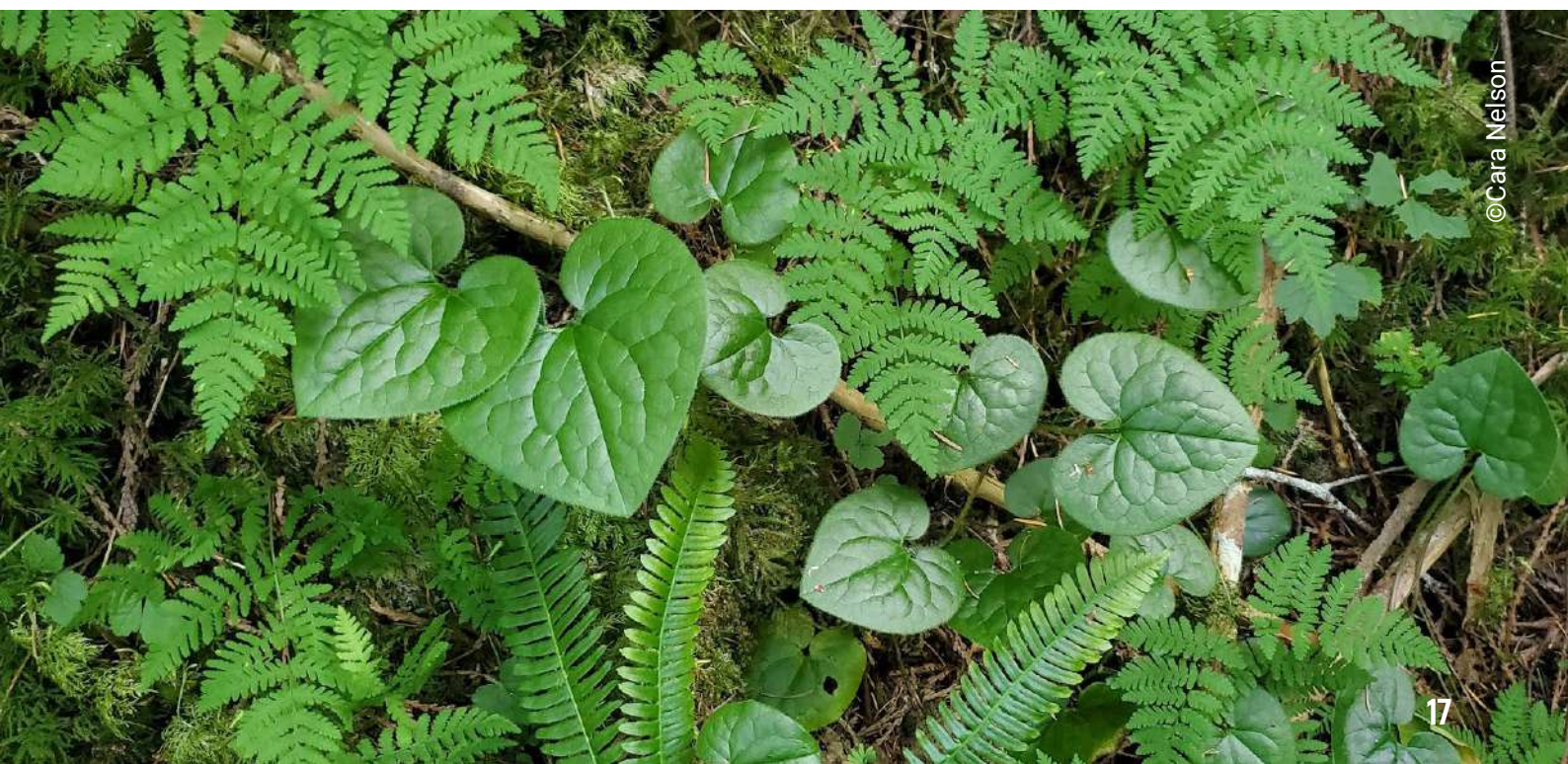
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