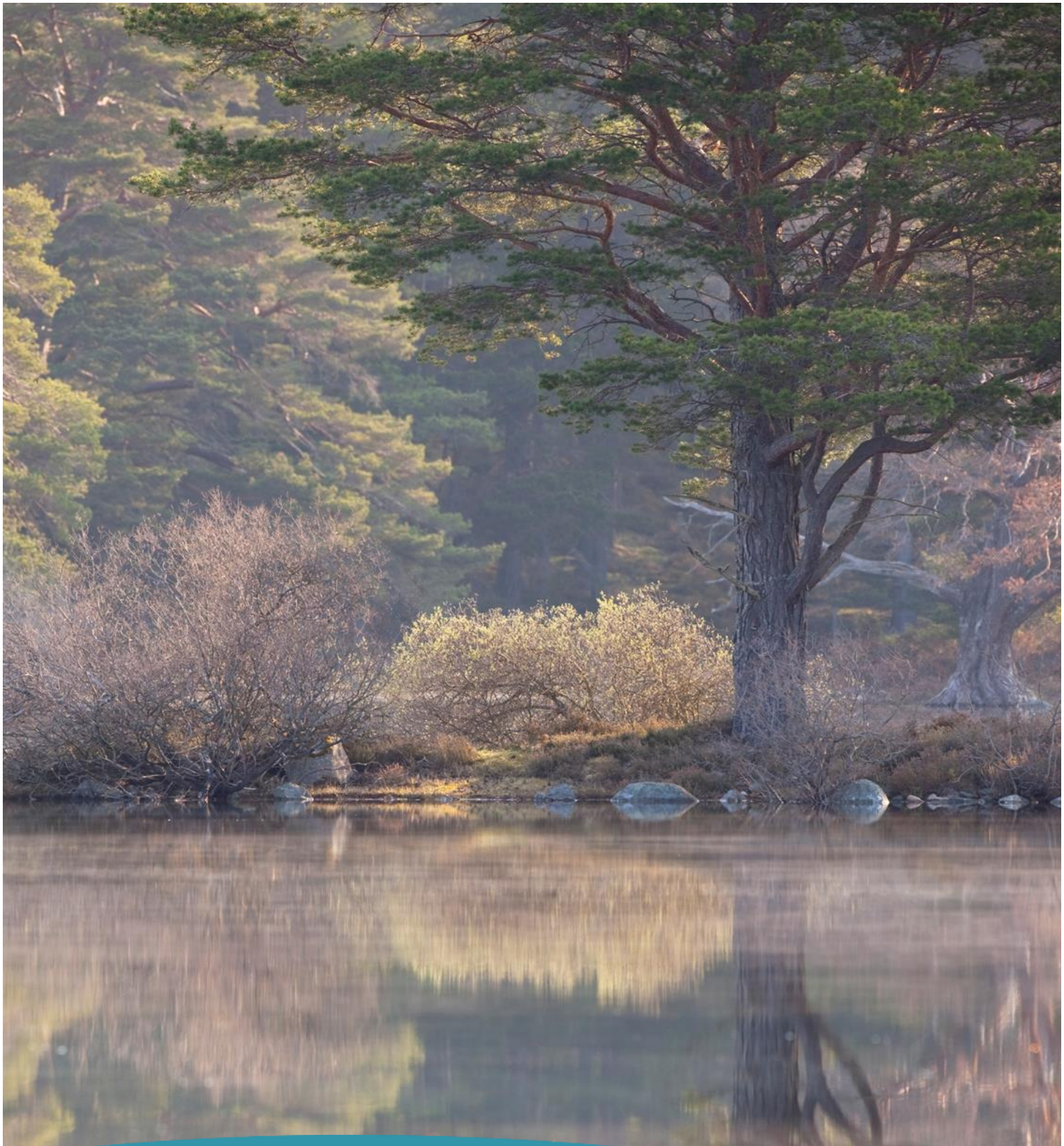

# Landscape Restoration Monitoring Framework

## Guidance for Applicants

November 2021

Cambridge Conservation Initiative

ENDANGERED LANDSCAPES PROGRAMME

Funded by ARCADIA

**Contents**



**Acknowledgements**

This framework is based on a previous framework produced by the British Trust for Ornithology led by David Noble, James Pearce-Higgins and Ian Henderson. This version was revised by Nancy Ockendon with input from Francine Hughes and David Thomas.

## 1. Why monitoring is important

Monitoring is the systematic process of collecting, analysing and using information to track a project's progress towards its objectives and to guide management decisions. Only by effective and robust monitoring can we demonstrate that actions being undertaken to restore a landscape are having the desired impacts. The information collected from monitoring landscape restoration can be used in various ways:

- To demonstrate that a project has achieved, or is making progress towards achieving, its stated outcomes. Projects that have a well-designed and effectively implemented monitoring framework are more transparent and find it easier to account for their actions and expenditure to funders, local communities and other stakeholders.
- To understand the effects of restoration actions as they are carried out, in order to inform adaptive management. Systematically assessing the changes that take place in your landscape can tell you whether your project is on track or whether adaptations are required in order to achieve the desired outcome.
- To add to the wider evidence base. Evidence for what does and doesn't work is still scarce for many actions undertaken as part of landscape restoration. If the findings of your monitoring are shared with the wider restoration community, they can be used by others in decision making, allowing successful results to be replicated and ineffective interventions avoided. Evidence can also be used to influence policy makers, funders and other landowners by demonstrating the benefits that landscape-scale restoration can deliver.

However, monitoring requires resources that otherwise might be allocated to conservation interventions on the ground. Therefore it is critical that careful thought goes into the selection of informative indicators for which data can be collected using practical and efficient methods.

## 2. Monitoring landscape restoration

There are several attributes of landscape restoration projects which may create challenges and thus require special consideration when designing a monitoring plan.

### *2.1 Large spatial scales*

The large areas involved in landscape restoration projects has implications for the selection of indicators and the methodology used to collect data. Some indicators, such as those based on data from remote sensing, may effectively measure change across a whole landscape. Other indicators may focus on only a part of the whole project area, for example a specific habitat where active restoration is planned. Many indicators will rely on a robust sampling strategy, in which data collected at a representative subset of plots or sites can be used to monitor change across the wider landscape.

### *2.2 Long time periods*

The likely timeframes over which responses are expected to be seen in landscape restoration also present a challenge. Many of the desired outcomes may require decades to be achieved. However, projects also need to demonstrate that their landscape is on a trajectory to recovery within the timescale of funding cycles. Therefore, projects need to identify indicators that are able to monitor both the initial responses of the system to the actions being implemented and the longer-term changes the project is hoping for. For the

latter, it is important to select indicators which are feasible to monitor beyond the duration of ELP funding, in terms of the capacity, resources and costs required. Collecting baseline data that describes the status of the landscape before restoration begins is key to demonstrating both these types of change.

### *2.3 Monitoring across a range of dimensions*

Landscape restoration projects often aspire to catalyse change across a range of aspects of a landscape. These are likely to include:

- an improvement in the abundance, distribution, movement or diversity of key species or species' communities;
- an increase in the quantity or quality of natural habitat;
- enhanced natural functioning of ecosystem processes;
- improved resilience to short- and longer-term pressures (including climate change);
- the provision of economic benefits to local communities;
- the provision of sustainable cultural, social and wellbeing benefits to people.

Projects therefore need to monitor the impact of their interventions across a range of different dimensions. Within the ELP we have categorised these changes into three main categories: (i) ecosystems (including species, habitats and ecosystem function), (ii) ecosystem services, and (ii) socioeconomic benefits.

## 3. Monitoring in the ELP: The Landscape Restoration Monitoring Framework

The ELP asks all the Restoration Landscapes that it funds to select indicators using its Landscape Restoration Monitoring Framework. The framework is designed to be flexible, to allow projects to select indicators that inform progress towards their desired objectives and to use sustainable and replicable methods appropriate to their particular context. At the same time, the structure of the framework ensures that all projects select indicators that capture the range of responses expected during landscape restoration. In addition, collecting information according to a common framework will facilitate lesson-learning between projects and allow the ELP to demonstrate the overall impact of its portfolio of projects to donors and decision makers.

As described above, the Landscape Restoration Monitoring Framework splits indicators into three broad themes. Each theme is then further divided into a number of sub-themes (Figure 1). Each project is required to select indicators from every theme, to ensure that the range of responses in the landscape being restored is documented.

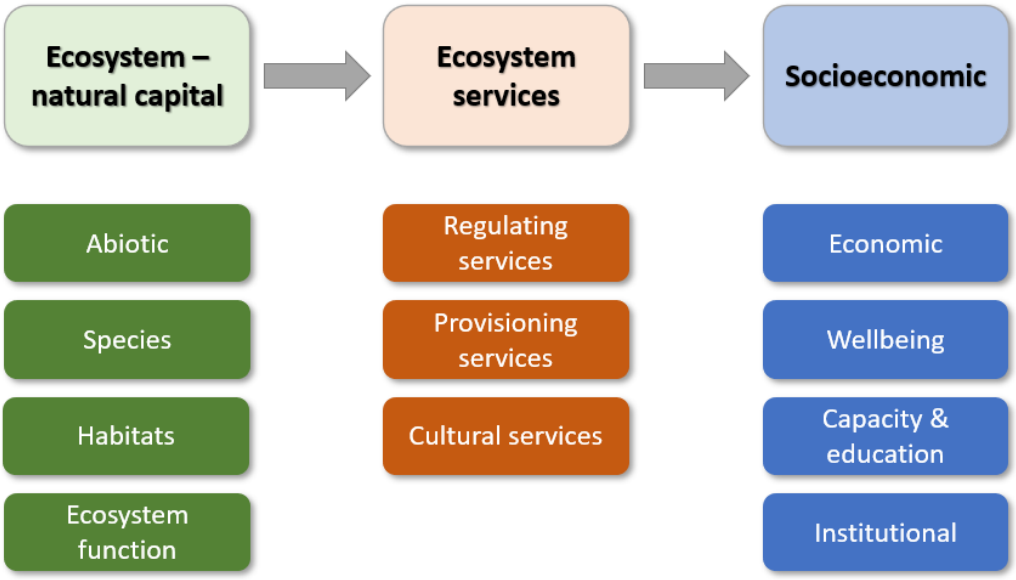


**Figure 1**. The three themes of the Landscape Restoration Monitoring Framework with corresponding sub-themes below. All indicators will be categorised into one theme and subtheme, and indicators need to be chosen from all three themes (for further details please see below).

## 4. Selecting indicators for successful monitoring

### *4.1 Effective indicators*

Selecting appropriate and informative indicators is a critical step in measuring the success of any project. The best indicators fulfil the following fundamental principles of effective monitoring:

- They monitor **outcomes**, not activities or outputs. Indicators should, wherever possible, assess responses to the actions taken to restore landscapes, rather than the implementation of the action itself.
- Clear **targets** are established for each indicator. These can be used to measure success against. Indicators may have both ultimate and interim target outcomes, depending on the expected timescale of the response.
- Include **controls or comparisons** for a subset of indicators for which this is possible. Indicator responses may be affected by factors, such as climate, that are outside the project's control. The aim is to collect data that describes changes that can be attributed to the restoration activities undertaken. Therefore, for a subset of indicators, 'untreated' controls or comparisons should be monitored to demonstrate that any changes seen are due to the interventions. This may be achieved by using similar, matched sites without restoration interventions, or with 'before and after' comparisons.
- The methodology for each indicator should be **robust, representative, consistent** and **systematic**. This can be achieved by designing an appropriate sampling strategy and collecting comparable data using a consistent methodology through time. Methods should be well documented. Data may be quantitative or qualitative.

### *4.2 Selecting indicators for landscape restoration*

The aim of monitoring in the ELP is to monitor projects' progress towards their stated outcomes. Therefore, we recommend that the first step in selecting your monitoring indicators is to consider each of the outcomes in your logical framework in turn and identify the indicator(s) that will measure progress towards it. Once you have identified a suite of indicators that will assess progress towards all of your outcomes, it may be necessary to include some additional indicators to meet the minimum number required by the ELP (see 4.3 below). Remember that every indicator listed in your monitoring plan should measure progress towards at least one of the outcomes in your logframe, and you need at least one indicator for each outcome in your logframe.

When choosing the indicators that you will use to monitor in your landscape, it is critical to identify indicators that will provide valuable information for your project and partners. What are the key changes that tell you whether your management is having the desired effects and allow you to adjust your interventions if things are not on track? What are the changes that, if demonstrated clearly, would aid your advocacy of restoration and protection to national or regional agencies and authorities? What would help persuade others that you are providing benefits to people and nature, and thus increase support and/or funding for the project? The answers to these types of questions should help inform the indicators you select.

Some other points to consider:

- It may be possible to use existing national or regional monitoring schemes and associated datasets for some indicators (for example, national monitoring of birds or butterflies, ongoing water quality monitoring, existing social or economic indices). This may have the benefits of lower costs and likely long-term sustainability and may also provide useful comparative data within and outside your restoration landscape. However, please check the spatial resolution of these datasets, to ensure they are likely to be sufficient to detect change at the scale of your landscape.
- Practical aspects to consider include the resources (time, equipment, etc.) and expertise required to collect data for an indicator, the frequency of data collection and the sampling approach. For indicators that require information from control sites (outside the project area or in other areas where no intervention is undertaken), please remember to include capacity and resources for monitoring these areas.
- Monitoring methods need to be sustainable, given the long-term vision of most landscape restoration projects. Within your monitoring plan, projects will need to identify a subset of indicators to be measured beyond the lifetime of ELP funding. Therefore, methodologies need to be feasible to sustain over the expected lifetime of the project.
- For longer-term outcomes, that will not be achieved within the funding period, it may be necessary to use interim measures of progress towards the desired target. These could include the reduction of threats (e.g. distribution of non-native species, sources of pollution, levels of hunting) or the removal of limiting societal barriers (e.g. laws or change in the ownership of land).
- You will be asked to set targets for each indicator in your monitoring plan. This may be difficult for some indicators in process-led open-ended restoration projects, where the precise response of a particular species, community or habitat to the restoration of natural processes may be dynamic and uncertain. However, some information about desired end-points is still important.

Species-level measures are likely to be important in setting some biodiversity targets, but species assemblage or habitat level objectives may allow more flexibility in terms of targets. Examples could include:

  - We will double the area of wetland and improve habitat quality, so therefore expect the populations of most wetland bird species to at least double.
  - Natural grasslands typically have *x* species of grasshopper and *y* species of butterfly; we expect to achieve 60% of that number on the restored site within five years.

- If your organisation lacks experience in a particular area or approach (for example, hydrology or assessing social indicators), consider consulting or collaborating with other individuals, organisations or institutions with expertise in these topics. If there is an area where you feel like your project particularly lacks capacity please talk to the ELP Management Team as soon as possible.

### *4.3 Selecting indicators within the Landscape Restoration Monitoring Framework*

A description and list of example indicators for each of theme and sub-theme in the Landscape Restoration Monitoring Framework are shown in Table 1. Each project's monitoring plan needs to identify and describe at least 10 different indicators and these must satisfy the ELP's minimum requirements for each theme and sub-theme (Table 2). In addition to this, most projects will select a number of other indicators, from any of the themes, that will fill any gaps in information needed to assess progress towards their stated outcomes. All selected indicators should be incorporated into the logframe and described in the monitoring plan.

Please note that for projects given in principle approval, support and advice from ELP is available to help with selection of indicators and methodology for data collection. It may also be possible to seek advice from the wider Cambridge Conservation Initiative community about specific specialised topics.

### *4.4 The ELP's Key Performance Indicators*

As well as selecting project-specific indicators as part of the Landscape Restoration Monitoring Framework, each ELP-funded project will need to collect data for the programme's Key Performance Indicators. These measure the programme's contribution to selected post 2020 Global Biodiversity Framework targets of the Convention on Biological Diversity (CBD), in order to demonstrate impact and provide evidence to donors and decision makers to increase investment in landscape restoration.

### *4.5 Reporting on Monitoring*

Projects will need to submit a baseline report for each indicator listed in their monitoring plan within 18 months of their start date. Such baseline data provide a vital assessment of the landscape prior to the start of your restoration activities. Interim reports for key indicators may then be submitted during the five-year funding period as necessary. A final report is required for each indicator towards the end of the five years, allowing the change in each indicator over the ELP funding period to be assessed.

**Table 1. Description and example indicators for each theme and subtheme of the Landscape Restoration Monitoring Framework**

| Theme: Sub-theme | Change measured and example indicators | |
|---|---|---|
| **Ecosystem – Natural Capital: Abiotic** | Changes in physical or chemical attributes of the landscape | • Hydrological measures such as water levels or discharge rates<br>• Abiotic measures of water quality such as nutrient or sediment load. The EU's Water Framework Directive provides a standardised list of indicators for assessing change in water quality (e.g. ecological and chemical status for surface waters)<br>• Physical measures of soil quality such as pH or moisture |
| | *Current ELP examples: water levels; water discharge rate; change in flood dynamics* | |
| **Ecosystem – Natural capital: Species** | Changes in the distribution, abundance, demography or diversity of species or communities | • Abundance or rates of occurrence of target species<br>• Productivity or recruitment of target species<br>• Species richness or diversity<br>• Measures of the use of area by target species through dispersal or movements<br>• Genetic variability of a species |
| | *Current ELP examples: abundance and distribution of roe deer; cover of macroalgae; frequency of observations of sandbar shark; species diversity of moths; fish species present using eDNA* | |
| **Ecosystem – Natural Capital: Habitats** | Changes in the amount or quality of habitat | • Area of habitat where restoration activities are in place (e.g. through ownership, conservation activities, removal of threats)<br>• Area of habitat in good quality as defined by physical attributes (e.g. % tree cover, % live coral, absence of invasive species, structure of forest from fieldwork or LiDAR data)<br>• Measures of habitat heterogeneity in the landscape |
| | *Current ELP examples: % cover and diversity of forest understory vegetation; species composition and biomass of grassland vegetation; area restored by introduction of natural grazing; area of protected habitat under active enforcement* | |

| | | |
|---|---|---|
| **Ecosystem – Natural Capital: Ecological Function** | Changes in ecological function, including measures of ecological connectivity, ecological integrity and resilience | • Measures of ecological integrity include the amount of dead wood in forests, communities of aquatic insects or soil microbes<br>• Assessments of trophic chains (e.g. number and diversity of predators or their diet)<br>• Ecological connectivity includes measures of physical connectivity (e.g. length of riparian habitats in good ecological condition, distance between patches of target habitat) or functional connectivity (e.g. changes in animal movements or gene flow, arrival of species that have navigated a new corridor e.g. Hughes et al. 2016, Tinsley-Marshall et al. 2021).<br>• Measures of resilience include the heterogeneity of habitats in a landscape |
| | *Current ELP examples: abundance and diversity of deadwood beetles; heterogeneity of marsh habitats; use of landscape by scavenger species; composition and abundance of aquatic invertebrates* | |
| **Ecosystem Services: Provisioning**[1] | Changes in the yield of products from ecosystems[2] | • Yield of wild or cultivated food production (e.g. agriculture, fishery, forestry)<br>• Amount or quality of fresh water available for human uses<br>• Yield of raw natural materials from sustainable use<br>• Availability of products for fuel or fibre, such as wood |
| | *Current ELP examples: catch per unit effort of fish; number, variety and size of fish caught* | |
| **Ecosystem Services: Regulating**[1] | Changes in the benefits humans gain from the regulation of ecosystem processes, including climate, water, soil and air quality, pollination or disease. These may be derived from modelling. | • Amount of carbon sequestered by ecosystems, either from on-the-ground measurements or modelled estimations (e.g. TESSA provides simple methodologies for assessing carbon stocks above- and below-ground, in soil and dead organic matter)<br>• Measures of resilience to drought, floods or fire<br>• Measures or models of the flood risk (e.g. number of households affected by flood events) or water storage capacity of the landscape (e.g. Hughes et al. 2016)<br>• Measures of water quality reflecting pollutants or dissolved organic carbon (e.g. aquatic plants can be used as an indicator of water quality Hughes et al. 2016)<br>• Measures or models of the rate of soil erosion<br>• Pollination services measured by the rate of pollinator visits or pollination success |
| | *Current ELP examples: water discharge rates and flood risk; area where fire risk has been reduced; physical and chemical water quality metrics; regulation of water flow rates* | |

| | | |
|---|---|---|
| **Ecosystem Services: Cultural**[1] | Changes in the non-material benefits that people gain from ecosystems, including cultural or spiritual enrichment, aesthetic experiences, recreation and tourism | • Number of public events related to linking people with the landscape<br>• Rate of creative outputs related to the landscape (e.g. number of pieces of art created)<br>• Number of visitors engaged in cultural events and exhibits<br>• Change in people's mood and sense of wellbeing after time spent in nature |
| | *Current ELP examples: park visitor behaviour and attitudes, rate of creative outputs related to a land art festival, time spent on nature-based recreation by local residents and visitors* | |
| **Societal: Wellbeing** | Changes in physical or mental health[3] | • Direct measures of physical or mental health and wellbeing<br>• Measures of self-motivated engagement (e.g. volunteering) related to the project and associated changes in perceived health or job satisfaction<br>• Measures of the extent to which cultural and stakeholder identities, customary rights or access to justice have been taken into consideration, retained or given higher profile<br>• Measures of the extent to which relevant stakeholder knowledge has been taken into account in decision making<br>• Measures of the extent to which relevant stakeholders have access to justice regarding decisions, including dispute resolution processes<br>• Measures of potential negative impacts such as displacement or access restrictions[2] |
| | *No current ELP examples* | |

| | | |
|---|---|---|
| **Societal: Economic** | Changes in economic status or other measures of livelihood of stakeholders | • Contribution of the project to local or regional economies, such as number of nature-based jobs or businesses created<br>• Levels of effective place-based marketing or access to markets as a result of the project<br>• Measure of livelihood among relevant stakeholders, such as income from sustainable harvesting or community-led income generating activities |
| | *Current ELP examples: number of nature-based businesses; number of jobs in sustainable livelihood activities; income of small- and medium-sized conservation enterprises; financial value of conservation fees received; evidence of place-based marketing and wild food brand certification; market price of invasive species* | |
| **Societal: Capacity and Education[4]** | Changes in the capacity of stakeholders to sustain landscape restoration. Processes that increase capacity such as community engagement, empowerment and leadership. Evidence of knowledge and skill transfer. | • Measures of capacity based on the contributions (financial or other) of relevant stakeholders<br>• Measures of knowledge transfer such as educational visits, training or new skills gained<br>• Measures of community empowerment (e.g. the number of local forums or community discussions, levels of participation by target stakeholders, the number and distribution of leadership roles established)<br>• Measures of the strength of local networks include the number of public, stakeholder or volunteer events and participants |
| | *Current ELP examples: levels of engagement from local schools; number of education and awareness-raising activities per year; number of forest owners applying for compensation payments* | |
| **Societal: Institutional[4]** | Changes in processes that remove barriers or change attitudes among stakeholders. Changes that ensure accountability and fair distribution of benefits and burdens among stakeholders. | • Changes in national, regional or local policy or law<br>• Attitudes among land owners or other stakeholders towards ecological restoration<br>• Evidence of the extent of access to information for all stakeholders<br>• Levels of equity in the designation of roles and accountability for decisions<br>• Measures of institutional sustainability, such as the number of partnerships established or the sustainability of relevant institutions |
| | *Current ELP examples: legislative commitment of governments to protected area designation; resources from government for effective management of protected areas; number of recommendations adopted in government decisions; number of institutions supporting conservation* | |

[1] Ecosystem services can be particularly challenging to measure. The TESSA toolkit has some reasonably straightforward methodologies that can be used to assess services such as carbon storage and pollination. It also recommends an initial stage of stakeholder consultation (Peh et al. 2013), which may be informative in understanding which ecosystem services your landscape provides and that are valued.

[2] It is important to note that restoration may have unwanted impacts on some people, for example by reducing access to land or limiting offtake of resources. If this is a risk then it is important to also monitor such negative consequences and explore if appropriate any mitigation measures with those affected. Therefore such indicators can usefully be included in your monitoring plan.

[3]Proxy indicators may be especially relevant under the wellbeing sub-theme within socioeconomic indicators. Such proxies may be easier to measure than direct indicators of health and wellbeing and could include the distribution of costs and benefits of restoration, roles in decision making, and time spent in nature. For example, the number of recreational visitors to a site could be used as a proxy for physical and mental wellbeing, on the assumption that visitors receive these benefits from being in the landscape.

[4]Please note that changes in capacity, education and institutions are not a direct outcome of restoration, but they are likely to be project outcomes that create the conditions for delivering and sustaining landscape restoration.

**Table 2: Minimum Landscape Restoration Indicator Requirements.** All projects must choose at least 10 indicators to monitor and these need to meet the minimum requirements of themes and sub-themes shown here.

| Theme | Sub-theme | Minimum Requirements |
|---|---|---|
| Ecosystem | Abiotic | |
| | Species | At least one indicator must be selected from this sub-theme |
| | Habitats | At least one indicator must be selected from this sub-theme |
| | Function | At least one indicator must be selected from this sub-theme |
| Ecosystem Services | Regulating | |
| | Provisioning | At least one indicator must be selected from this theme |
| | Cultural | |
| Socioeconomic | Economic | |
| | Wellbeing | |
| | Capacity/Education | At least one indicator must be selected from this theme |
| | Institutional | |

Note that although some indicators may fit within more than one of these categories, the minimum response indicators selected for each section should be unique.

**5. Selected references and resources**

Please ask the ELP Science Manager if you have difficult accessing these or any other reference materials.


EU Water Framework Directive (WFD) (2000) The EU's Water Framework Directive provides a standardised list of indicators for assessing change in water quality.

Hughes F.M.R., Adams W.M., Butchart S.H.M., Field R.H., Peh K.S.-H. & Warrington S. (2016) The challenges of integrating biodiversity and ecosystem services monitoring and evaluation at a landscape-scale wetland restoration project in the UK. *Ecology and Society,* **21**, 10 http://dx.doi.org/10.5751/ES-08616-210310

TESSA toolkit, including guidance on using stakeholder engagement to identify key ecosystem services, and simple assessment protocols for pollination, flooding, water quality and use, nature-based recreation, above ground live biomass carbon (M3 & M4), soil organic carbon (M7). The toolkit and approach is described in: Peh, K.S.H., Balmford, A., Bradbury, R.B., et al. (2013) TESSA: A toolkit for rapid assessment of ecosystem services at sites of biodiversity conservation importance. *Ecosystem Services*, **5**, 51-57. https://doi.org/10.1016/j.ecoser.2013.06.003.

Tinsley-Marshall P.J., Rigg A., Skilbeck A., Ball L. & Still R. (2021) Nature's Sure Connected: A practical framework and guidance for evidencing landscape-scale outcomes of landscape-scale conservation. This report describes a citizen science approach to assessing terrestrial invertebrate abundance as a measure ecosystem function, and using plants and invertebrates to assess functional connectivity of an ecosystem.