Checklist to optimize nature management

Exchange of ecological knowledge and practical experiences

Drainage, eutrophication, acidification and habitat fragmentation are major threats to natural habitats and their wild flora and fauna in Europe. To combat these threats, measures are taken, e.g. in the framework of LIFE-Nature projects. The successes as well as the failures in restoration and conservation projects and scientific research have resulted in a better understanding of the key-factors and processes involved in the decline and recovery of vulnerable ecosystems. However, for site managers it is generally difficult to obtain the latest knowledge and experience in all relevant disciplines, especially on an international scale.

The success rate of restoration projects grows with increasing insight in ecosystem functioning as well as experience in carrying out restoration projects. Several problems and pitfalls in nature management seriously hamper the process of increasing success. If information on certain key processes in ecosystem functioning and biodiversity is lacking, unexpected negative effects may occur in restoration projects. E.g., if insufficient knowledge is available about local conditions or important biogeochemical processes affecting nutrient availability, rewetting a peatland can result in further degradation of the area.

To help optimising conservation and restoration measures the experience of European managers of nature reserves and the latest scientific knowledge of different disciplines was exchanged and integrated in the framework of an international LIFE Nature Co-op project, focussing on coastal dunes and raised bogs. Steps necessary to perform successful nature conservation and restoration projects were discussed with 130 site-managers and scientists from 13 European countries. Based on common sense and experience a checklist with six essential steps was made to help avoiding the most common ecological pitfalls: the *PROMME*-concept. More detailed background information is available in the freely accessible decision support tool at: **www.barger.science.ru.nl/life**.

By using this *PROMME*-checklist and the decision support tool site managers will be able to deal with ecological knowledge at the proper moments in the process of planning and taking conservation and restoration measures. Pitfalls encountered in previous projects can be avoided and successful solutions to problems in earlier projects can be adopted. This can significantly optimize the restoration and conservation measures and minimize the occurrence of unforeseen negative (side-)effects in ongoing and future nature conservation and restoration projects.

The LIFE Nature Co-op project "Dissemination of ecological knowledge and practical experiences for sound planning and management in raised bogs and sea dunes", co-financed by the European Community, was carried out by the project partners and the many other participants in the workshops. Feel free to contact us:
Gert-Jan van Duinen, Radboud University Nijmegen, the Netherlands, G.vanDuinen@science.ru.nl.

ENGLISH NATURE

ONDERZOEKCENTRUM B-ware

Stichting Bargerveen

Radboud University Nijmegen

STEP	DECISION	PITFALLS
Problem:	Description of the problem in terms of changes in flora, fauna and abiotic conditions on certain spots and the consequences of these changes for the ecosystem as a whole.	1. Reference situation insufficiently known. 2. Several reference situations mixed up. 3. Important aspects easily overlooked; changes noted for only a part of the characteristic species.
Reason:	Identification of the biological, hydrological, chemical, and physical processes which led to the observed changes.	4. Key processes easily overlooked and thereby other processes overvalued. 5. Specific site characteristics not recognised; effects of general key processes depend on site characteristics. 6. Essential investigations not carried out. 7. Causes and effects of disturbed key processes extend beyond problematic area.
Objective:	Formulation of a restoration goal, based on the current and future possibilities to invert the key processes that led to ecosystem degradation.	8. Current and future limitations, objective and expected recovery not well defined, excluding important parts of the ecosystem or species groups (mechanism, degree, scale, period, pattern, species).
Measures:	Selection of the optimal combination of restoration measures for restoring the ecosystem to the defined objective.	9. Temporal and/or permanent side-effects not or ill considered (decline of non target species, disturbance of ecosystem functioning). 10. Combination, scale, intensity and/or timing of the measures not adjusted to site characteristics or species present.
Monitoring:	Determination of (a)biotic parameters that indicate (lack of) ecosystem recovery and of monitoring frequency and period; start of monitoring.	11. Parameters do not indicate (lack of) restoration. 12. Baseline situation not monitored. 13. Monitoring period too short. 14. Monitoring results not (immediately) used for feedback.
Execution:	Actual application of the restoration measures and simultaneous monitoring and feedback.	15. Inexperienced executors. 16. Unexpected situations.

See explanation on the back side

Good discussions with an interdisciplinary and international team of experienced site managers and scientists help to optimize nature conservation and restoration projects.

NIGULA LKA

stichting tot behoud van de ierse venen

Vereniging Natuurmonumenten

staatsbosbeheer

NORDJYLLANDS AMT

Problem

A problem is best defined as a decline of characteristic species belonging to the original situation. This includes situations where only a part of these species is declining, or if a declining group is much larger then a stabile/increasing group. Sometimes, an expected decline has not yet occurred or there is merely a shift in abundance between different characteristic species. For example, a large drainage ditch has been dug in an intact raised bog. The species composition has not yet changed, or *Sphagnum magellanicum* is replaced by more drought tolerant species such as *S. rubellum* or *S. fuscum*.

Reason

A profound understanding of processes underlying the species diversity is essential for all active nature management and for restoration of ecosystems in particular. But when is this understanding sufficient? The online decision support tool (www.barger.science.ru.nl/life) helps to answer this question for bogs and dunes. In general, it is best not to act or to act only locally -by way of an experiment- if you feel that there is still insufficient grip on the problem. Consult an interdisciplinary and international team of experienced site managers and scientists.

Objective

There are several steps involved in the formulation of a restoration objective. After a reference situation has been determined the factors limiting the extent of possible restoration must be investigated, such as atmospheric deposition, climatic change or changes in the surroundings. The second phase is a description of the expected restoration process. When, how and to what degree will key processes, site conditions and species composition be restored? How is the interaction with other areas? Are there deleterious side effects? Sometimes such expectations can only be described after the selection of restoration measures. Describing the expected results in such detail enables efficient monitoring and feedback.

Measure

There is no standardised way of applying restoration measures. Every restoration area has specific site characteristics that need to be included in the process of fine-tuning. The decision support tool can help site-managers to combine and optimise measures, but because it doesn't contain site specific information, it can't give a detailed final recipe for restoration. Discuss alternative approaches with an interdisciplinary team of experienced site managers and scientists.

Monitoring

The reasons for monitoring a restoration process are 1) to see whether measures work out as expected, 2) to collect knowledge that can be applied in similar situations and 3) to be able to adjust the restoration process that is taking place. The selected parameters, species and monitoring density and frequency must indicate the (lack of) recovery of key processes and site conditions and must enable feedback to the objective and measures during the restoration process.

Execution

Finally the designed measures can be executed, although adjustments may be necessary as a result of unexpected events or if the monitoring results show unexpected developments.

Explanation of pitfalls

1. If the reference situation is insufficiently known, it is uncertain whether the objective is a step towards the restoration of a former situation or the creation of a completely new situation. Studying similar ecosystems where the reference situation is still present can help to fill this knowledge gap.
2. If reference situations become lumped or mixed up, the target can become a situation that never existed in the past. For example, a naturally functioning dune slack has turned into species rich dune grassland as a result of cattle grazing, and subsequently the site has been drained. Choose either the dune slack or the wet dune grassland as reference situation. Both targets require a different type of dune management. Be also aware of the fact that a supposed reference situation can be just a phase in an ongoing decline.
3. In order to obtain a balanced view on the problem, one should know which species or species groups are most characteristic for the ecosystem and at least a rough estimate should exist of the trends within these species (groups). Opposite trends might exist for different species (groups).
4. Determining the key processes that have led to the problem is perhaps the most difficult (and most underestimated!) part of designing a restoration project. Many key processes are only recently discovered and knowledge gaps still exist. Too much is expected from measures that are based on knowledge about "classic" processes. For example, a constantly high water table is considered very important in wet ecosystems, but recent results show that this can be very harmful to dune slacks, alder forests and even certain types of raised bog.
5. The quantitative contribution of general processes depends heavily on site characteristics. For example, the risk on internal eutrophication can depend on the type and amount of organic matter that is present, the alkalinity and sulphate content of the water, the iron content of the soil, the annual water level fluctuation and the amount of phosphorous that is bound to soil components.
6. In many cases it is not possible to determine the key processes and their quantitative contribution to the problem. Without additional site-investigations, the further design of a restoration project becomes guesswork. Nevertheless, investigations are often skipped because of the extra costs, the possible delay in the planned restoration process or the lack of required expertise.
7. During analysis of the problem, it often becomes clear that the main causes are situated outside the area and that the problem itself can also have consequences for adjacent areas. For example, a dune grassland decalcifies because adjacent calcareous dunes have been stabilised and the input of sand has stopped. As a result, some flowering plant species decline, causing a decline of a nearby population of rare butterflies. The problematic area should include all these sites.
8. It is important to describe not only the final target, but also the way this situation will be reached. If the expected process of recovery is well described, restoration managers can detect aberrations and act on them in an early stage.
9. A site manager might be tempted to highlight the beneficial effects of planned restoration measures and to ignore possible deleterious effects. This could be useful for political reasons, but should never occur during the actual design. Also, site managers must be aware of the fact that literature on certain measures can be unbalanced as well.
10. The most common pitfalls are that measures are applied too suddenly (e.g. sudden rise of water table), too large scaled (cutting, burning) or too thorough (mowing every corner). Although the beneficial effects for part of the system or species might increase, the deleterious effects often increase much more. For example, a bog manager wants to close a drainage ditch. However, this ditch might be an enlarged natural drainage, or might have developed a valuable flora and fauna itself. Or closing the ditch can cause undesired water flows to other parts of the bog. Or certain species cannot cope with the scale or speed of the rise in water level.
11. This pitfall can occur if the objective is not carefully described.
12. Most monitoring programs stretch over many years during which memories about the start situation begin to fade and discussions about certain crucial details arise. This makes evaluation of measures difficult.
13. This pitfall can occur if the expectations and path-way are not carefully described in the objective. It can be tempting to stop monitoring after the goal has been achieved. For example, in restored dune lakes target plant species often return in the year after restoration, but can subsequently disappear if the water quality is insufficient.
14. Certain events can turn a successful development into a disaster. If monitoring results are not evaluated frequently, it might be too late to act by adjusting the restoration measures (type, timing, spatial scale).
15. Even if the task is described in detail, misunderstandings occur. For example, drivers of civil machinery are proud of delivering neat and precise work. This way of working decreases the internal variation.
16. Practice shows that there are often unexpected turns of events, like extreme weather or terrain conditions and presence of unexpected species or archaeological values. Executors should be able to deal with such things on the spot.