DINARA

BACK TO LIFE

GUIDELINES FOR DRY GRASSLAND RESTORATION AND SUSTAINABLE MANAGEMENT

LIFE18 NAT/HR/000847

DINARA
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Recommended citation style:

Selanec et al. (2023): Guidelines for dry grassland restoration and sustainable management. Dinara back to LIFE (LIFE18 NAT/HR/000847). BIOM Association, Zagreb, 42 pages.

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AUTHOR'S NOTE

Dear colleagues and associates,

With these Guidelines we would like to share our experience of the dry grassland restoration process in the Dinara area. When we planned the Dinara back to LIFE project, we had the intention to develop a project to restore overgrown grasslands to contribute to the conservation of valuable habitats, but also to make this task easier for others with our experience and knowledge.

The whole process could fill hundreds of pages, and that was not our goal. We have tried to provide key guidelines that can facilitate the planning of the restoration approach and the setting achievable objectives, as well as an overview of the technical data on restoration methods we used.

Although the technical implementation will vary in different areas, the principles on which restoration should be based are always the same. Nature conservation concerns us all and perhaps the most important principle on which its conservation must be based is collaboration.

At the end of this introduction, we would like to express our gratitude to everyone involved in the development and implementation of the Dinara back to LIFE project activities, from our colleagues in the project partnership to all those who contributed to the creation of this successful and positive story through meetings and workshops.

We hope that these pages will inspire you and help you find the answers to your questions. The following pages summarise only part of the experience. You can find a complete overview at www.dinarabacktolife.eu

Tomislav Hudina,
Project manager

1. INTRODUCTION

The Guidelines for Dry Grassland Restoration and Sustainable Management were developed as part of the Dinara back to LIFE project. The project aims to restore part of overgrown grasslands in the Dinara area and contribute to their sustainable long-term management.

The former pastures in the Dinara area have been used for livestock grazing since ancient times and are now largely unkempt. About 30 years ago, the region experienced a great suffering of war, followed by an ageing population and the migration of young people to larger cities. Unfortunately, many rural areas in Croatia share this fate.

In order to protect Dinara, revive its pastures and preserve the birds whose survival depends on the Dinara grasslands, the Dinara back to LIFE project was launched. The main task of the project was to restore the overgrown grasslands in the Dinara area. In the almost four years of implementation, knowledge and experience to implement various restoration methods of grasslands were acquired. The resulting knowledge and experiences are summarised in this document.

The Guidelines aim to contribute to nature protection, forestry and agriculture sectors in considering their role in sustainable grassland use and provide technical instructions for the restoration and management of dry grasslands.

The following project partners participated in the development of the Guidelines: University of Zagreb, Faculty of Agriculture, Croatian Forests Ltd., Local Action Group "Cetinska Krajina" and Association Biom. A significant contribution was made by associates from numerous institutions who attended the workshop on the guidelines for dry grassland management and the international conference Working Together Towards Grasslands Sustainability (Cross-sectoral Approach), or expressed their opinions at numerous meetings and workshops.

2. WHY THE GUIDELINES FOR DRY GRASSLAND RESTORATION AND SUSTAINABLE MANAGEMENT?

The Guidelines for Dry Grassland Restoration and Sustainable Management integrate the experience and knowledge gained in almost four years of implementing the project to restore grasslands on Mount Dinara.

The Guidelines were developed on the basis of internationally accepted approaches and recognised experts from Croatia and the wider European region were involved in the process. A lot of literature was consulted, as well as the experience of the implementing restoration activities (both our own experience and that of experts working on grassland restoration outside Croatia). Important literature as a source of inspiration and methodology:

The Guidelines aim to:

Motivate decision makers, institutions and local communities to plan and implement grassland restoration and management activities

Provide a cross-sectoral perspective and show that sustainable grassland management relies on cooperation, as grasslands are a resource used by many

Disseminate practical knowledge and experience of tried and tested approaches that are useful to those who choose to restore dry grasslands

Methodology for the planning and implementation of nature conservation projects according to Conservation Standards

International principles and standards for the practice of ecological restoration

EU habitat action plan - Action plan to maintain and restore to favourable conservation status the habitat type 6210 - semi-natural dry grasslands and scrubland facies in calcareous substrates (Festuco-Brometalia) (*important orchid sites)

Dinara back to LIFE project experiences and collected insights

Numerous international projects and initiatives have inspired the reflection for the development of these guidelines, with notable examples including:

LIFE to seeds
DOPPS – BirdLife Slovenia

Burren Life Programme
Burren Programme

Josefov Meadows Bird Reserve
Česká společnost ornitologická

Livanjsko polje
EuroNatur Foundation

Wet grassland restoration in Poland
Polish Society for the Protection of Birds (OTOP)

Common pasture Gajna
Brod Ecological Society (BED)

Integrated LIFE project Jedna příroda
Nature Conservation Agency of the Czech Republic

Landscape maintenance with grazing animals - focus on nature conservation and biodiversity
Hirtenkultur

Grassland restoration as a prerequisite for preserving the identity of the island of Cres
Island Development Agency - OTRA

Regional action for preserving mobile pastoralism and nature
Alliance for Mediterranean Nature and Culture

Sustainable use of biodiversity on forest ground – Ecomanager project
Croatian forests Ltd.

Naturavita project, Fearless Velebit project, Karlovac Karst project
Croatian forests Ltd.

Istrian native cattle breed and sustainable land management
Agency for Rural Development of Istria (AZRRI)

3. WHO ARE THE GUIDELINES WRITTEN FOR?

Stakeholder type	Stakeholder	The Guidelines motivate	The Guidelines provide a perspective of cross-sectoral collaboration	The Guidelines share technical knowledge
Government institutions	**Ministry of Economy and Sustainable Development (MINESD)**	MINESD pays more attention to grassland and biodiversity conservation	MINESD recognises all important stakeholders and the challenges they face in managing the Natura 2000 ecological network	MINESD uses methods presented in the Guidelines as conservation measures for Natura 2000 species and habitats
	Ministry of Agriculture (MINA)	MINA recognises the importance of dry grasslands in the areas managed by Croatian Forests Ltd.; MINA is motivated to work on a proposal for new measures and funding for conservation of dry grassland biodiversity	MINA recognises the importance of its role in the conservation of grassland biodiversity and consults with the nature protection sector	MINA develops new ideas for Common Agricultural Policy measures
Self-government units	**Regional administration**	Local and regional administrative units include the objectives related to the conservation of dry grasslands and their biodiversity in their plans	Local and regional administrative units recognise the importance of their role in the conservation of dry grassland biodiversity and consults with the nature protection sector	County administration gets an overview of which conservation activities should be supported
	Local self-government			Local administration gets an overview of which activities should be promoted in the community

Stakeholder type	Stakeholder	The Guidelines motivate	The Guidelines provide a perspective of cross-sectoral collaboration	The Guidelines share technical knowledge
Management pointies for the ecological network	**Nature protection sector**	Public institutions (PI) that manage protected areas started to implement dry grassland restoration	Public institutions recognise important sectors and involve them in restoration activities	Public institutions and Croatian forests Ltd. use the described methods when implementing measures for the restoration and conservation of dry grasslands
	Other sectors	Croatian forests Ltd. recognises the importance of dry grasslands and includes grassland conservation objectives in its plans	Croatian forests Ltd. recognises the importance of its role in the conservation of dry grasslands and actively participates in conservation activities	
Private sector	**Companies, businesses, family farms**	Private companies recognise grassland restoration and conservation as their own activities and invest in their expertise	Private companies involve teams with different professions and experience in their work	Companies, businesses, and family farms wishing to undertake a restoration, either for themselves or as a service for clients, can find necessary technical details in the guidelines.
Science community	**Universities, colleges, polytechnics, institutes**	Science community recognises dry grasslands as a topic of interest for their research	Scientists emphasise the importance of cross-sectoral collaboration	Scientists evaluate and improve methods
Local communities	**Cattle breeders**	Cattle breeders recognise the importance of dry grassland biodiversity	Cattle breeders recognise their role in the conservation of dry grasslands	Cattle breeders adapt their activities to the proposed measures
	Rural development initiatives	They recognise the importance of dry grasslands for the rural landscape and the community	They consult other sectors when planning the use of grasslands	They support the local community in the restoration and maintenance of grasslands
	Environmental civil society organisations	Civil society organisations active in nature conservation recognise the importance of dry grasslands and develop projects for their conservation	Environmental civil society organisations involve other sectors in their activities	They promote the recommended methods and involve their members in the activities

4. THE PRINCIPLES ON WHICH RESTORATION IS BASED ON

Principle — phil. fundamental basis, the foundation from which all that is originates; starting point, inception, beginning, belief [in principle, in general, basic sense]

*definition according to the Croatian Language Portal (https://hjp.znanje.hr)

What are the principles for and why are they important to us?

They are a guiding thought for why and how we restore and preserve grasslands. In a multi-year process, they allow us to return to the basic principles on which the restoration idea is based, particularly when a decision needs to be made about changes to the original plan.

Restoration activities are based on a set of principles that guide users in planning and decision making.

These principles have been selected to reflect the key values of collaboration and stakeholder engagement and to create a clearer picture of what we want our outcomes to look like. The principles are values that we want to convey through communication and promote the way we should proceed.

When planning, it is important to consider and follow the principles as they help to connect the visions of all the stakeholders we work with. Adhering to and applying the principles not only leads to better quality results, but also increases the usability of the results for others.

The principles are not here to constrain the process, but are the key for addressing the challenges, deciding on solutions and inspiring the search for better and more comprehensive solutions through collaboration.

THE PRINCIPLES FOR THE GUIDELINES FOR DRY GRASSLAND RESTORATION AND SUSTAINABLE MANAGEMENT

Sustainability and positive impacts on nature and people

Sustainability is a fundamental principle that has directed the development of the Guidelines. The sustainability principle is a framework for the design of policies and activities and is based on the fact that development accepts ecological needs without jeopardising them. The starting point of this principle is that human development should respect and not jeopardise natural resources, as they provide irreplaceable benefits to us and future generations.

Stakeholders inclusion and cross-sectoral approach

Grassland management involves a wide range of stakeholders at different levels, from cattle breeders as users to ministries as decision-makers. Successful restoration with well-designed sustainability is based on the commitment of stakeholders and the promotion of a cross-sectoral approach. Nature protection, forestry and agricultural sectors, local communities, cattle breeders and local self-government units are just some of the groups with a direct interest in management and use of grasslands. Successful restoration requires a shared vision and synergy in planning and acting. Stakeholders from recognised sectors need to be involved in all activity phases, from planning and decision-making to direct participation in restoration and monitoring.

Collaboration with local community

Grassland conservation is almost impossible without collaboration with the local community that lives in and uses the area. The Dinaric grasslands, like many others, have developed semi-naturally, which means they are shaped by centuries of grazing. The local community is a crucial partner for nature preservation, as it is closely connected to nature, and has culture and tradition and the knowledge of the best way to use grasslands, which is passed down from generation to generation.

Dinara back to LIFE and lessons learnt

By establishing Cooperative boards, "Dinara back to LIFE" has enabled interested members of the public to actively engage as collaborators in the project, follow its implementation, and enrich it with their ideas, thus adding further value. Cooperative board meetings were held annually, inviting representatives from livestock breeders, beekeepers, hunting associations, hikers, recreational societies, tourist communities, and other organizations involved in nature conservation and rural development. These meetings significantly connected the project with the local community, providing a space for participants to exchange challenges and propose activities to support the local community.

Compliance with relevant policies

Restoration and conservation activities must have a stronghold in international and national strategies as well as in the relevant laws and regulations so that their implementation is not questionable or illegal. It confirms the importance of implementing the activities and if the legislation is not complied with, this must be ensured.

Defining objectives, planning and monitoring

It is necessary to design restoration and conservation of dry grasslands with the plan. This provides clarity in implementation and the ability to monitor results and control performance.

Adaptive management

In nature conservation projects, it is important to follow the principles of adaptive management. When it comes to the living world, it is important to recognise that change can occur through the effects of factors within our control, but also through factors beyond our control. It is therefore crucial to constantly monitor the state of nature but also the state of society, and adapt our activities. Flexibility must be strategic and if we follow this principle, we will put up with uncertainties more easily, learn from experience and build more efficient partnerships.

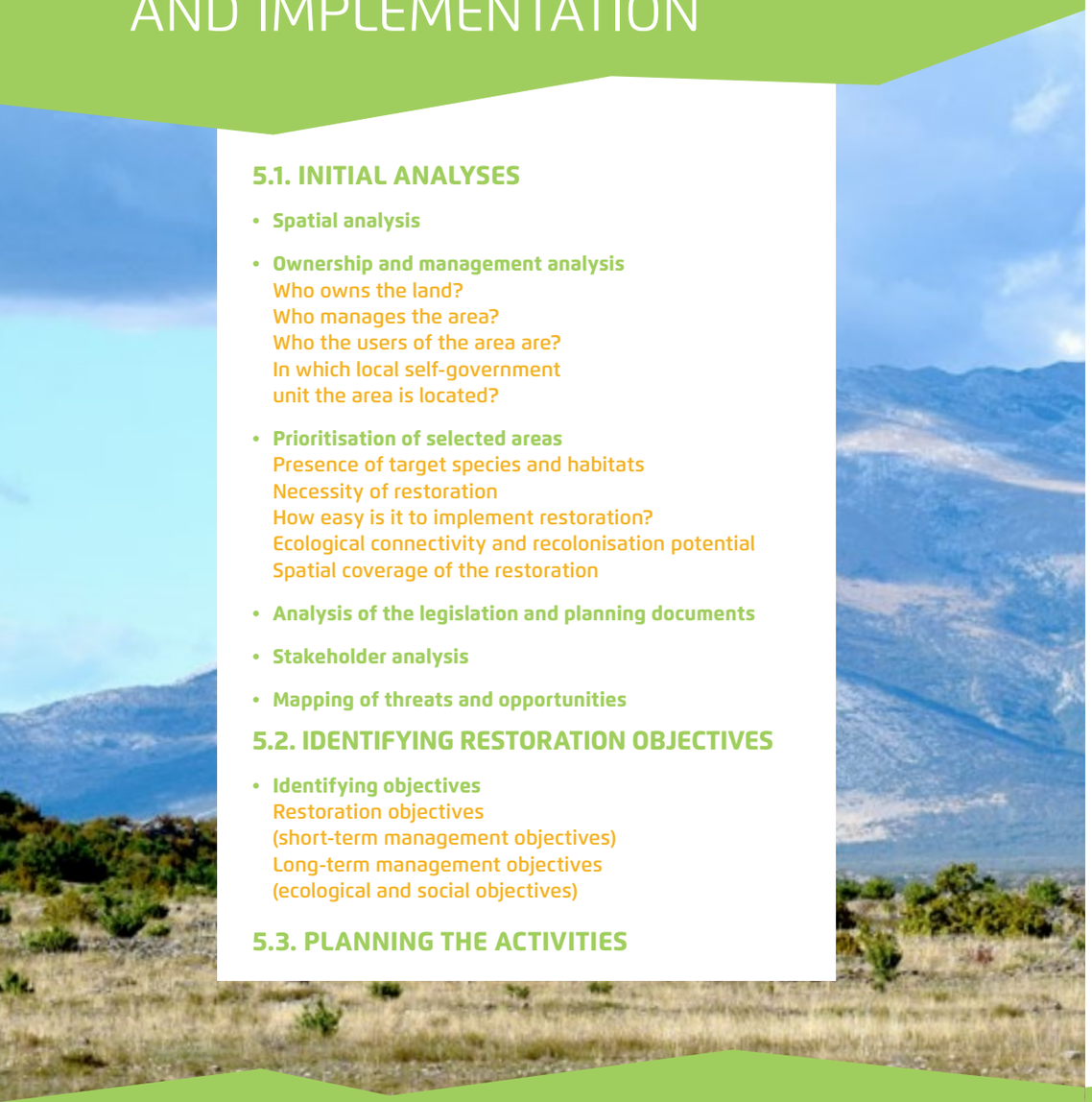
Dinara back to LIFE and lessons learnt

The "Dinara back to LIFE" project originally planned to restore six watering bodies, but due to strong interest from the local community and the benefits for extensive livestock farming and nature, twenty watering bodies were restored. Through cooperative boards and direct contacts, the local community proposed the restoration of numerous bodies of water. Project team recognized the value of traditional heritage and the opportunity for further improving collaboration with the local community through restoration. Increasing activities and reallocating funds for the restoration of additional watering bodies is an example of adaptive management and response to public interest.

Open communication and transparency

Open communication and transparency are essential for working with people. The success of nature restoration depends largely on the general acceptance of activities and the establishment of collaboration between local communities and various institutions. Openness to dialogue and the availability of all data are the first step in building strong relationships that form the basis for success.

5. PLANNING AND IMPLEMENTATION OF RESTORATION: FROM THE INITIAL ANALYSES TO THE DEFINITION OF OBJECTIVES AND IMPLEMENTATION



5.1. INITIAL ANALYSES

- **Spatial analysis**
- **Ownership and management analysis**
  Who owns the land?
  Who manages the area?
  Who the users of the area are?
  In which local self-government unit the area is located?
- **Prioritisation of selected areas**
  Presence of target species and habitats
  Necessity of restoration
  How easy is it to implement restoration?
  Ecological connectivity and recolonisation potential
  Spatial coverage of the restoration
- **Analysis of the legislation and planning documents**
- **Stakeholder analysis**
- **Mapping of threats and opportunities**

5.2. IDENTIFYING RESTORATION OBJECTIVES

- **Identifying objectives**
  Restoration objectives
  (short-term management objectives)
  Long-term management objectives
  (ecological and social objectives)

5.3. PLANNING THE ACTIVITIES

5.1. INITIAL ANALYSES

We recommend the process of initial analyses and plan development, which, according to the literature and our experience, has proven to be the best preparation prior to the actual work in the field. Initial analyses help us to locate potential restoration areas, select priorities, identify stakeholders and choose partners. Additionally, an overview of the broader context (threats and opportunities) is required.

Where and how to start?

Initial analyses include:
- Spatial analysis of the areas
- Prioritisation of the selected areas
- Analysis of legislation and planning documents
- Stakeholder analysis
- Mapping of threats and pressures

• Spatial analysis

> **Key questions:**
> Which grasslands are of interest to us?
> Which species are of interest to us?
> Where are they located?

The first step in planning the restoration activities is to map the areas and their important values. Essential information to start with is the location of each grassland, its surface, the species using each grassland and the status of the species and habitats. This information presents a key input for further steps, i.e. prioritising the restoration and management of individual areas. It is important to have conservation measures and objectives in mind (if the area is part of Natura2000) in order to make appropriate decisions on what to protect and how.

Although we recognise that it is often difficult to get started due to a lack of data, some data on the values of specific areas must be available in order to implement restoration. The data is important not only to design a good plan for grassland restoration and maintenance, but also to provide insight into the species and habitats near or in analysed sites, so that habitats and species not related to grassland habitats are not potentially harmed by the restoration.

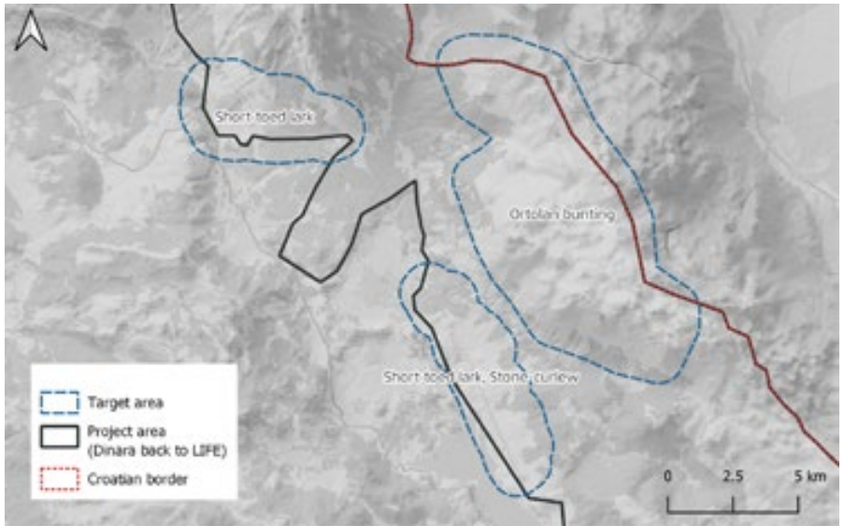
Steps in spatial analysis implementation:

a) Using GIS tools, and based on existing expertise, identify zones for grassland restoration and conservation in relation to specific species of interest;

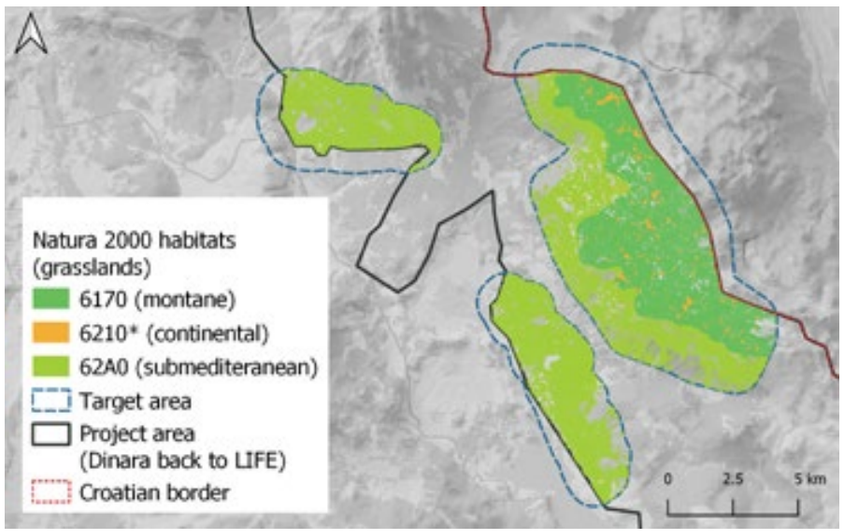
b) Based on the National Habitat Classification (NKS), Land Cover (CLC), orthophoto imagery (DOH) and possibly satellite imagery, define the area of suitable and potential target species habitat;

c) For all mapped areas, create a list of habitats and species that could be affected by restoration activities

The map presented is an example of the first phase of spatial analysis. The map shows the overlap of the distribution areas of three bird species in the Dinara region with the map of grasslands classified according to the degree of overgrowth. The map resulting from the overlap of these two layers shows the priority areas where restoration is needed. Any additional data (e.g. a more detailed map with the schedule of breeding pairs) is an added bonus as it can better show where to start with the restoration. In the following steps, the areas to be restored are selected from the identified priority areas by prioritisation.



Map 1. Distribution of target bird species



Map 2. Distribution of target grassland habitats according to the location of target bird species

• Ownership and management analysis

An important step in the analysis is to consider the ownership and management structure of the area, which has a significant influence on restoration feasibility.

> Who owns the land?
> Who manages the area?
> Who the users of the area are?
> In which local self-government unit the area is located?

Who owns the land?

The answer to this question is important in order to plan the next steps and assess the administrative complexity. If the owner is the Republic of Croatia, it is crucial to know who manages the land so that the necessary consents and permits can be secured on time. If the owner is one or more private individuals, the consent of the owners and their support for the restoration must be obtained to implement the restoration. The most of the grassland in "Dinara back to LIFE" project area were owned by the state.

Who manages the area?

The collaboration with institutions that manage the area is very important for the planning and implementation of the restoration. Implementation must be coordinated with the strategic and programme plans of these institutions. For the activities, it is mandatory to obtain the consent of the institutions managing the area, unless they plan to implement the restoration in the area they manage.

The most common institutions managing the areas in Croatian context are Croatian Forests, Croatian Waters, Hrvatska elektroprivreda (HEP Group), public institutions for management of protected areas and other.

Who are the users of the area?

When planning and implementing restoration, all groups that use the area and the way they use it must be taken into account. The restoration of a particular habitat will affect and change the area. Moreover, the restoration must be consistent with the way the area is used, be it for livestock farming, hunting, mountaineering, recreation or similar. It is advisable to identify the main users and inform them in good time about the restoration plans, as well as to establish cooperation and gain their support.

In the example of the Dinara back to LIFE project, some of the beneficiaries of the area were: hikers, livestock breeders, hunters, mushroom pickers, recreational athletes (running, horseback riding, paragliding...), tourist boards and agencies, etc.

Local self-government area

The areas we plan to restore belong to local self-government units. The units and the local community must be informed about the planned restoration and the natural values of the area, and efforts should be made to gain their support.

• Prioritisation of selected areas

> **Key questions:**
> Where to start with restoration?
> Which are the key areas?

The spatial analysis has defined the sites of interest, i.e. the areas where grassland restoration and conservation activities are needed to preserve the target species. As part of the prioritisation process, the sites we need to focus on first are selected from the analysed sites.

Prioritisation must be carried out by answering questions on specific criteria. Depending on the answer, points (stars) are awarded and a list of priorities is drawn up.

List of criteria for prioritisation of selected areas

1. Presence of target species and habitats
2. Necessity of restoration
3. How easy is it to implement restoration?
4. Ecological connectivity and recolonisation potential
5. Spatial coverage of the restoration

1. Presence of target species and habitats

This criterion assesses the presence of target species and habitats, and prioritises the sites with a greater number of target species and habitats.

Example of how points are awarded:

3 points – the site with the target habitat and at least two target species related to this habitat
2 points – the site with endangered habitat and at least one endangered species related to this habitat
1 point – the site with only one endangered habitat (or there used to be one) or endangered target species.

2. Necessity of restoration

This criterion assesses the need for restoration for a particular site. If the condition of species and habitat is critical and there is a possibility that the habitat or species will soon be lost without intervention, more points are awarded for this site.

3 points – the site with the target habitat and/or target species will be lost in the next five years unless the conservation measures are implemented.

Example: Prioritisation results

Site	1. Presence of target species and habitats	2. Necessity of restoration	3. How easy is it to implement restoration	4. Ecological connectivity and recolonisation potential	5. Spatial coverage of the restoration	Total
Priority area 1	3	2	2	3	1	11
Priority area 2	1	3	3	2	1	9
Priority area 3	2	2	2	1	2	7

2 points - the site with the target habitat and/or target species will be lost in the next ten years unless the conservation measures are implemented.
1 point – the site with the target habitat and/or target species will not be lost in the next ten years, but without intervention the quality of the habitat and/or population stability of the target species will decline.

3. How easy is it to implement restoration?

This criterion allows us to prioritise the areas where restoration is easiest to carry out. The goal is to achieve the greatest positive impact on improving target species and habitat conditions with the least amount of time and money. The restoration feasibility depends on the planned spatial coverage, the price of restoration, administrative complexity, the physical accessibility of the site and other factors. The sites where it is faster, easier and cheaper to secure conditions and begin restoration have a higher priority.

3 points – restoration can begin within the next three years
2 points – restoration can begin within the next seven years or less
1 point – restoration is difficult to implement in less than seven years

4. Ecological connectivity and recolonisation potential

This criterion helps to select the priority areas with the best ecological connectivity with other areas. The areas where the greatest benefit to the ecosystem can be achieved are prioritised.

3 points – weak ecological connectivity between the sites with target species and/or habitats, and this site is of high importance for maintaining ecological connectivity. The nearest sites with target species and/or habitats are far away and recolonisation is hardly possible.
2 points – moderate ecological connectivity of the area with target habitats and/or target species. Recolonisation from surrounding areas with more favourable status of target species and/or habitats is possible.
1 point – strong ecological connectivity and easy recolonisation from surrounding areas where the status of target species and/or habitats is good or very good.

5. Spatial coverage of the restoration

This criterion favours the largest priority areas. The aim of selecting larger areas is to achieve a more favourable ratio between investment and return, i.e. greater impact on the ecosystem.

3 points – the area is larger than 500 ha
2 points – the area is between 100 and 500 ha
1 point – the area is smaller than 100 ha

• Analysis of the legislation and planning documents

An important step in planning the restoration implementation is to ensure that the plans comply with existing legislation and planning documents.

If restoration is planned in an area under a certain protection category (parts of the Natura2000 network, nature parks, national parks, etc.)a management plan for that area must first be drawn up , giving details of the planned activities, zoning and the like. For the restoration of grasslands under the management of Croatian Forests Ltd., the Management programme with ecological network management plan for economic unit(s) in the

area where the restoration is planned should be consulted. Since both the plan and the programme are adopted for a period of ten years, it is important to check as early as possible what period they cover and whether they will change soon, which may be an opportunity to lobby for the necessary changes to carry out the restoration, i.e. to obtain required permits.

Moreover, the provisions of the Law on Forestry and the associated Regulation on forest management, as well as the Nature Protection Act and the associated Regulation on conservation goals and conservation measures of target species and habitat types in areas of the ecological network should be observed, although there is a possibility that certain planned activities may need to be harmonised with other laws and regulations.

• Stakeholder analysis

Stakeholder analysis is a step to identify who needs to be a partner in the planning and implementation of the restoration, as well as any other stakeholders that need to be involved in the restoration.

The Power Interest Matrix (model inspired by Freeman, 1984) is used for the stakeholder analysis. Once all relevant stakeholders have been listed, the next step is to analyse each one by considering their interest and power in relation to the habitat we want to restore.

The analysis provides us with four possible outcomes for each stakeholder. Depending on which quadrant we place them in, there is a strategy for how we should act towards the stakeholders in order to achieve the desired goals.

1 **High influence – high interest**
This category includes the stakeholders who have the greatest influence on the area we plan to restore.

Strategy: with the stakeholders in this category we want to establish close collaboration, engage them and inform them about our activities. Potential partners for restoration implementation will be sought among them.

In the example of the "Dinara back to LIFE" project, this stakeholder group consisted of livestock farmers from the project area, public institutions for managing protected areas, the Ministry of Agriculture, the Ministry of Economy and Sustainable Development, as well as regional and local government units.

2 **High influence – low interest**
This category includes the stakeholders with high power in relation to the area we want to restore, but have a low interest in it.

Strategy: it is advisable to build relationships with them and keep them satisfied, inform them and maintain open communication with them. As these stakeholders can have a major influence on the restoration success, they need to be constantly involved and motivated to increase their interest. One way to do this is to involve them in advisory bodies. Stakeholders in this category might have a crucial role in achieving the restoration sustainability, so it is recommended to sign a collaboration agreement in which they commit to work to maintain the achieved restoration results.

In the example of the "Dinara back to LIFE" project, this stakeholder group included private landowners of pastures and the Ministry of Spatial Planning, Construction, and State Property.

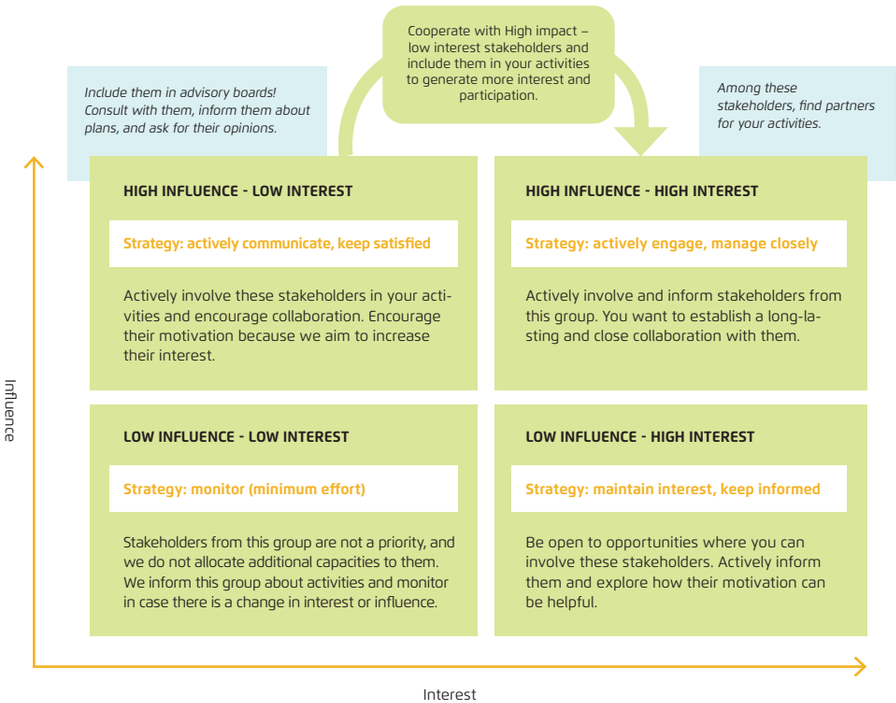
3 **Low influence – high interest**
This category includes the stakeholders with low power but a high interest in the area we want to restore.

Strategy: there should be regular communication with stakeholders in this category and they should be kept informed of plans and activities. Although their power is low, their interest must not be ignored and we must be open to opportunities to which they can contribute.

In the "Dinara back to LIFE" project, this stakeholder group consisted of local communities and civil society organizations dedicated to nature and environmental conservation.

4 **Low influence – low interest**
This category includes the stakeholders with low power but also a low interest in the area we want to restore.

Strategy: this stakeholder category is not a priority and activities should be focussed on more important categories. These stakeholders can be informed if the resources are available, but it is sufficient to just pay attention in case a change in their relationship is noticed.

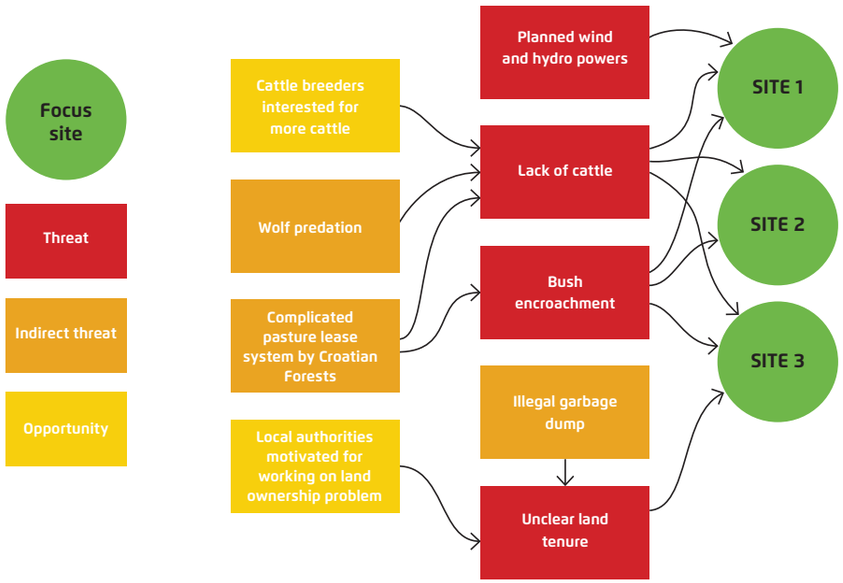


In the example of the "Dinara back to LIFE" project, this stakeholder group included organizations from the tourism sector, hunting associations, as well as mountaineering, recreational, and similar clubs.

• Mapping of threats and opportunities

The mapping of threats and opportunities provides a more comprehensive picture of the problems and serves as a tool to broaden our perspective. The listing of the threats should be simple, and the purpose of this overview is to facilitate the search for additional activities that promote the achievement of the objectives.This analysis questions:

Direct threats -> factors that directly affect our area of interest. Threats may be associated with sites or to objectives.
Indirect threats -> factors whose negative impact poses a risk to our area of interest, but not directly.
Opportunities -> activities that respond to direct or indirect threats.



Taking the Dinara back to LIFE project as an example, this analysis led to the design of additional activities, such as the restoration of paths and water bodies (ponds and wells). The main project activities are aimed at restoring overgrown grasslands. Additional activities are designed to have a positive impact on cattle breeders. By facilitating livestock farming with accessible paths and drinking water sources, we have a positive impact on the use and preservation of grasslands.

5.2. IDENTIFYING RESTORATION OBJECTIVES

After prioritising and selecting the restoration areas, the next step focuses on considering specific restoration objectives and a work plan.

Identifying objectives

When setting the objectives, it is important to be as precise as possible so that these objectives can actually be achieved and the results and impacts measured. It is recommended that the objectives are SMART (Specific, Measurable, Achievable, Relevant and Time-Bound).

Restoration objectives (short-term management objectives)

The restoration objectives are very specific objectives related to the target species and habitats that express the desired status we want to achieve. According to the SMART method of identifying objectives, restoration objectives must respond to the following questions:

- What is the desired status of the target species and habitats?
- On how many hectares?
- Over what period?
- Which indicators will be used?

> An example of a restoration objective:
> Over the next six years, the conservation status of the habitat type 6210* will be changed from unfavourable to favourable on 40 ha within priority area 2.
>
> 75 % of the restored area will be brought into the desired status, and the overgrowth of the area will be below the maximum proportion (30 % of the area).
>
> Over the next three years the conservation status of the ortolan bunting in priority area 3 will be ensured on at least 150 ha.
>
> 75 % of the restored habitat will be brought to a favourable conservation status and the ortolan bunting will nest in the restored area.

Long-term management objectives (ecological and social objectives)

The long-term objectives are broader objectives that take into account the wider impact of restoration. These objectives are used to develop the objectives relating to the ecology on which the restoration has an impact, and the objectives related to society and its benefits resulting from restoration.

Ecological objectives

- How will the status of the target species and habitats develop after restoration?
- How will the target species and habitats be managed?
- What do we want to achieve in terms of threats to the target species and habitats?

> An example of an ecological objective:
> The status of the restored areas of habitat type 6210* in priority area 2 will remain favourable through regular mowing and grazing to prevent regrowth.

Social objectives

What are the desired benefits for stakeholders in restored habitats?

> An example of a social objective:
> Preserved grasslands become desirable ecosystem conditions and cattle

breeders actively participate in their maintenance through grazing. The restored areas are a new food source for their cattle and they influence the development of positive relationship of cattle breeders towards the ecological values of grasslands.

5.3. PLANNING THE ACTIVITIES

In order to have a clear plan on how to achieve the goal with which we started the restoration, it is necessary to develop a concrete plan. Based on this plan, we can determine our progress at any time and whether we will achieve the goal within a given time and with the given resources.

The restoration activities must be planned in such a way that they:

- bring the habitat into a favourable status
- mitigate or stop threats
- mitigate threats to other species and habitats
- ensure sustainability
- define the reference status of the habitat and implement monitoring measures
- achieve the restoration and long-term (ecological and social) objectives

Monika Vrgoč

Activity plan example

Priority area	Activity	Subactivity	Period	Associates	Indicators
Priority area 2	Controlled burning	Obtaining permits	Year 1	MINESD, Croatian Forests Ltd.	All necessary permits were obtained by the end of the first year of implementation.
		Defining the desired condition of the grassland	Year 1	The initiator of the restoration independently or in collaboration with external experts	Document with defined desired condition after restoration and with a plan for the monitoring implementation (what and when to monitor) created.
		Training	Year 1	Experts, firefighters	At least two members of the project team were trained by the end of the first year.
		Communication plan	Year 2,3,4,	Local media	All stakeholders are familiar with the planned activities. The results of all activities are communicated to the target groups.
		Implementing the controlled burning activities	Year 2,3,4,	Firefighters, Croatian forests Ltd., volunteers	From the second to the fourth year of implementation, at least 100 ha were restored by controlled burning.
		Monitoring	Year 0,1,2,3,4,	The initiator of the restoration independently or in collaboration with external experts	The condition of the habitats and target species is assessed each year through regular monitoring.

6. TECHNICAL GUIDELINES FOR THE RESTORATION OF DRY GRASSLANDS BASED ON THE EXPERIENCE GAINED DURING THE IMPLEMENTATION OF THE DINARA BACK TO LIFE PROJECT

6.1. MANUAL REMOVAL OF OVERGROWN VEGETATION

6.2. FOCUSED GRAZING

6.3. CONTROLLED BURNING

6.1. MANUAL REMOVAL OF OVERGROWN VEGETATION

Period (season)

The activity must be planned for the period between 1 September and 31 March so as not to disturb the birds during their breeding season and other animals that use these grasslands to give birth to their young, feed or incubate eggs (for example, reptiles).

Tools

Small hand tools:
light axes, billhooks or hand saws

Hand tools:
loppers with telescopic handles, telescopic saws, chainsaws, strong flat hoes (pick or pickaxe), stronger trimmers with blades

Biomass waste disposal:
professional branch cutter

Spare equipment:
sharpened spare chains for a chainsaw

Protective equipment:
personal protective equipment (safety footwear, safety glasses, chainsaw safety trousers, noise cancelling headphones)

Permits:
Permit from the land manager, and from the protected area manager if it is a protected area (Natura2000 sites under the administration of county or local public institution, nature park or national park)

Associates:
- Forestry workers / technicians

Risks
- Recovery of vegetation
- Safety of the labour force
- Restoration cannot be carried out in rain or snow

Monitoring

The first monitoring must be carried out a few weeks after the activity is completed when any small forgotten trees or low bushes that need to be removed are detected.

The second monitoring must be carried out up to six months after the activity is completed in order to check if the trees have recovered from the cut stumps. If a significant recovery from the stumps

is detected, a repetition of the activity should be considered in the following six months to further weaken the stumps.

Feasibility

Feasibility is not demanding in terms of securing necessary administration and authorisations.

As far as human labour is concerned, restoration work can be very intensive. The intensity depends on the degree of overgrowth of the grassland and the type and size of the overgrowing vegetation.

Competences and skills required (level of expertise, description of skills required, competence in the use and handling of tools, etc.)

- Competence in the use of power tools and hand tools.
- Competence in regular maintenance of tools.
- Experience in coordination and teamwork

Efficiency

The change in habitat is immediately visible and herbaceous vegetation (grass and other low annual plants or perennials) spreads quickly in the areas where the shrubs have been removed.
To achieve long-term ecological results, it is advisable to introduce grazing that prevents the cut shrubs and small trees from growing out of the stumps.

Potential for volunteer involvement

There is great potential for involving large groups of volunteers in one-day or multi-day activities.

Good logistical planning, definition of objectives and provision of appropriate tools for volunteers are required.

Human resources required to organise the volunteer action: volunteer action coordinator (one coordinator for every 15 volunteers), one person to manage the activities in the field and control whether the tools are used correctly (one person for every eight volunteers).

Total estimated costs

The restoration price per hectare: between EUR 300 and 350

During the 17-month period, two restoration workers with an average gross salary of EUR 900 were employed to restore 100 hectares. In moderately overgrown areas, the cost of restoration was between EUR 300 and 350 per hectare, and this includes only the salaries of the workers. If the costs of tools, fuel and amortisation are added, the total price increases by EUR 10 to 20 per hectare.

The organisation of volunteer activities can influence the price per restored hectare which can drop to EUR 200 to 250 per hectare.

Sustainability

The sustainability of this method is high if it fulfils certain conditions to ensure that cut shrubs and low trees do not grow back.

This can be achieved by covering the stumps with woodchips and ensuring that the grasslands are grazed by mixed herds after restoration. When planning the restoration, it is advisable to consider the areas already used by the cattle breeders, as this will extend the direct grazing zone.

Dinara back to LIFE and lessons learnt

As part of the project, two people were employed to manually remove the overgrown vegetation for a total period of 17 months. The recommendation is to employ local people where possible, as they know the area well and raise awareness of the restoration importance.

The employed restoration workers must be responsible and able to use hand and power tools. It is advisable to develop team dynamics. For example, the prickly juniper bushes (Juniperus oxycedrus) are not so easy to remove as the branched and sharp thorns prevent access to the trunk. Teamwork is required to remove the branches to allow access to the trunk and then cut the trunk with a chainsaw. The work is efficient if a few days are spent cutting the branches, and once most of the plants have been prepared, cutting with a chainsaw is quick and easy.

To efficiently remove unwanted vegetation, the trunk must be cut as low as possible to the ground. If the non-coniferous vegetation is removed, it is advisable to cover the stumps with wood chips to prevent them from regenerating.

The disposal of the cut biomass must also be considered, which can be a challenge. The non-coniferous vegetation must be chipped while it is still raw because this process is easier before the wood is dry, fermentation starts earlier and the potential to kill the stumps is higher. Coniferous vegetation, primarily the prickly juniper, is not so easy to chip as the wood is rich in resin that can damage the chainsaw. It is therefore recommended to dry the cut trunks before chipping. The cut and chipped biomass is used for the restoration of nearby burnt areas.

To increase the success and long-term sustainability of restoration, manual removal must always be combined with grazing of the restored area. The recommendation is to select the restoration areas close to cattle breeders who have a proven interest in using them.

6.2. FOCUSED GRAZING

Period (season)

Implementation throughout the year.

The animals do not have to stay in the same location all year round, but can be moved according to the goal we want to achieve (migration within a pasture or within several pastures, for example in a valley or on a mountain).

Livestock type and grazing pressure

Depending on the type of terrain and the accessibility of forage, the type of livestock that best utilise available resources and secure the grassland maintenance must be selected and a herd formed accordingly.

- **Sheep** – they choose small, soft grasses and usually avoid prickly, bitter and hard species.
- **Cattle** – have similar preferences to sheep but require more abundant grazing than sheep, which can be fed on very poor grazing.
- **Horses** – similar to sheep, they choose small and soft grasses, but they require abundant grazing.
- **Goats** – favour browsing whenever possible and are therefore excellent for combining with sheep as they feed on species the sheep avoid.
- **Donkeys** – play a similar role to goats and can be combined with both sheep and cattle to improve grazing efficiency.

Maintenance of grasslands in good condition

The animals can graze constantly on the entire surface of the pasture. On such pastures, the animals choose the species they like and over time the species avoided by the animals increase in population and cover more area, so the overgrowth begins.

Grazing on grasslands with an initial stage of overgrowth

On pastures with an initial stage of overgrowth, grazing must be combined so that most of the animals are

fenced with an electric fence or other type of fence and confined to a small area for a few days. The animals eat and trample most of the vegetation after which they must be relocated to another part of the pasture to allow the vegetation to recover.

Grazing on heavily overgrown grasslands

Grazing must be combined with other restoration methods - controlled burning and/or manual/mechanical removal of woody vegetation, as tall shrubs and small trees can no longer be removed by grazing or browsing. If woody vegetation is removed by burning or cutting, grazing can prevent it from recovering from the stumps.

- on less overgrown, richer grasslands, cattle in combination with a small number of donkeys can be the predominant species.

Additional notes:

- on poorer grasslands sheep can be combined with donkeys and/or goats
- in locations where it is difficult to watch over livestock and where there is a higher risk of predation, cattle and horses are mainly used

Permits

When organising grazing, care must be taken to ensure that it takes place on grasslands that are privately owned by cattle breeders or leased for grazing.

Associates

- **Local cattle breeders:**
  The local cattle breeders are the partners in grassland conservation through grazing. The aim is to ensure that the land is grazed regularly and that this is carried out in the best way for biodiversity. It is crucial to know the basic information about cattle breeders in the field (number of cattle, leased pastures, privately owned pastures, motivation to cooperate).
- **Croatian forests Ltd.**
  Most of the grasslands in the Republic

of Croatia is managed and it is necessary to establish good cooperation with competent forestry authority in order to implement the restoration activities and to communicate the situation in the field. The competent forestry authority must be motivated through cooperation to organise as many tenders as possible for the leasing of grassland for grazing purposes with the aim of long-term and sustainable restoration.

Risks

- **Administrative obstacles and conditions**
  It has often happened that cattle breeders do not graze their livestock on the pastures they have leased or that they graze on the areas that they do not own or for which they do not have concession. Collaboration with cattle breeders can only be formalised in areas where the basis for grazing rights exists, either through ownership or leasing of grazing land.

- **Establishing collaboration**
  Building collaboration can be challenging and a lot of time needs to be spent communicating with cattle breeders. Gaining trust in the work of institutions is likely to require patience and relationship development, but once the collaboration is established, adapting grazing practices should not present a problem. Organisations and institutions can offer financial incentives as an additional motivation for cooperation.

- **Weather conditions**
  Poor weather conditions make it difficult to implement grazing and livestock are additionally fed indoors or in other locations. The impact of the average number of bad weather days on which livestock cannot graze is negligible.

- **Lack of grazing land available for lease**
  The organisation of grazing areas is only possible on private pastures or leased pastures. It can be difficult to find the areas that are prioritised for restoration and at the same time leased by cattle breeders. These areas must be communicated to Hrvatske šume Ltd. to encourage the leasing of more pastures for grazing.

Monitoring

If grazing is used in combination with another restoration method, the monitoring consists of checking the cattle breeders and controlling whether the grazing pressure is sufficient and whether the removal of undesirable species meets our expectations. Depending on the objectives and results, the grazing pressure can be increased (electric fence or another type of fence for smaller pastures).

If grazing is the first method of maintaining grassland that has just begun to overgrow or is not yet overgrown in woody vegetation, monitoring consists of controlling the grassland and observing the appearance or spread of unwanted plant species and making recommendations for more successful grazing.

Feasibility

The biggest challenge is to find the cattle breeders with whom the collaboration can be implemented. Once established, it works well as there is usually a common interest.

The efficiency of grazing as a restoration method depends primarily on species and number of cattle available and the planned method (grazing the entire area or dividing the grassland into smaller areas where the cattle stay for shorter periods).

Competences and skills required

Experienced cattle breeders know the local conditions, terrain and possibilities well. It is crucial that the local breeders are willing to accept and try out new recommendations through collaboration in order to achieve better grazing results by changing established practices.

Good grazing planning requires knowledge of vegetation phenology, the concept of grazing pressure and the allowable number of livestock units per hectare.

Efficiency

Depending on the chosen method, the results may become visible more quickly or more slowly:

a) If grazing is used to maintain a favourable condition or only to slow down or stop grassland overgrowth, the clear visual changes are not visible so quickly, i.e. maintaining a condition without a change for the worse is already a positive result
b) If grazing is planned in such a way that overgrown parts are fenced and a large number of cattle are placed there for a short period, the effects can quickly become visible because after just a few days the cattle will graze and browse all that is green and additionally tear down and trample down everything they cannot eat.

Volunteers

Although there are cases from all over the world where the care of livestock in remote areas is ensured by volunteers, there are no such cases in Croatia so far.

Cost-benefit ratio

Depending on the commitment, the costs can be minimal (only the time spent communicating with a cattle breeder or discussing the adaptation of the grazing method) to larger amounts when cattle breeders are contracted for specific needs of targeted grazing with mixed herds, for which they have to buy missing animals to fulfil the contract requirements.

Sustainability

Grazing implementation is essential for conservation of most grasslands, as other methods of restoration and maintenance without grazing are only temporary solutions that can last 10 to 20 years, in some cases even less.

Dinara back to LIFE and lessons learnt

The first steps in establishing collaboration with cattle breeders started with questions about their interest in grazing on the project area. The cattle breeders completed the questionnaire manually and digitally, and the data collected provided information on how many cattle breeders there are in the area, how much livestock they own, what type of livestock and how much time it spends grazing. Meetings were then organised with the breeders and the project and grassland restoration plans were presented.

Based on the collected data and interest, those cattle breeders who had leased pastures in the areas prioritised for restoration were selected. Formal collaboration was established with 16 cattle breeders as part of the project. The aim of the collaboration is to provide daily grazing, as it has a better impact on biodiversity and prevents overgrowth. This has been achieved through the introduction of new livestock and the formation of mixed herds whose impact of grazing is more efficient.

The project provided funding for financial incentives to achieve cooperation with cattle breeders. Financial incentives are not a mandatory requirement for collaboration and adaptation of practices, but they are certainly helpful to motivate. If there is an opportunity for financial incentives, it is recommended to use them for expanding the basic herd or introducing the livestock with different types of grazing, for example the introduction of donkeys and goats into the basic sheep herd.

Mixed herd grazing is is a desirable and very effective way of maintaining pastures in a natural way!

6.3. CONTROLLED BURNING

Period (season)

The period of the activity implementation is between December and February. Controlled burning must be carried out under favourable conditions without wind, while the vegetation and soil are at least partially dry, otherwise the fire cannot spread.

Tools

Cartridges with manual burners and gas burners equipped with a long tube, often referred to as weed burners, are the preferred tools for controlled burning. They are user-friendly, compact, and lightweight. Gas burners with long tubes offer the added benefit of allowing users to conduct burning activities while standing.

Diesel and gas drip torches have not proved as a good choice for karst terrain. These devices are very expensive and because of the way they work, there is a risk of dripping on the clothing, which can cause severe burns. They have only proved useful for marking out for the burning lines (boundaries of the burning area).

Protective equipment and appropriate footwear and clothing:

- personal protective equipment (scarf to cover the face and protect against smoke inhalation)
- appropriate clothing (cotton or linen clothing, which is more resistant and less likely to accidentally catch fire)
- sturdy footwear with hard-wearing soles (must be hard-wearing due to the rocky terrain and freshly burnt soil)
- cap and safety glasses

Professional firefighting equipment:

Professional firefighting equipment is provided by the fire department that will be involved in the controlled burning.

Permits

a. under current forestry regulations, controlled burning is only permitted in areas where controlled burning is prescribed as one of the methods of habitat conservation
b. a permit must be obtained from the administrative authority of the area where restoration using this method is planned. In most cases, this is Croatian Forests Ltd. and the public institutions responsible for the management of protected areas if the activities are to be carried out within a protected area (Natura2000, nature park or national park)
c. the activity plan must be coordinated with the competent fire department, which draws up the plan for controlled burning based on an analysis of the potential risk and review of the area
d. on the day the activity is carried out, the permission to light an outdoor fire must be obtained from the competent fire department after confirming that the weather conditions are acceptable
e. if the burning is carried out on private (overgrown) grasslands, Croatian Forests Ltd. may be excluded and the permit of the fire department and the competent public institution is required if it is a protected area
f. it is mandatory to inform the State Inspectorate for Nature Protection and the competent body of the Ministry of the Interior

Associates

Competent fire department

Coordination between the team conducting the controlled burning and the fire department is required. It is necessary to check the site with the fire department team, draw up the plan of burning and risk analysis and secure the presence of the firefighters on the day of implementation to ensure the fire does not spread.

Risks

Controlled burning can only be carried out in areas where it is provided for by the Management programme with ecological network management plan brought by Croatian Forests Ltd. There are hardly any such areas and it is important to advocate to Croatian Forests Ltd. to include this activity in the target areas as part of their Management programme with ecological network management plan.

Unstable weather conditions in winter can cause difficulties in choosing the date for

controlled burning activity. The chosen period must have sufficient dry vegetation to allow the fire to spread, but without wind so that the fire can be controlled. Sudden weather changes or stronger winds are always possible, so conditions must be checked regularly and the activity stopped if conditions are no longer favourable.

During the period in which controlled burning is permitted, the days are very short and the time frame for burning is limited. It is recommended to finish burning by 1.00 pm and to control the area until the end of daylight in case there is still a smouldering fire.

Controlled burning can trigger negative reactions in the local community. Throughout the duration of the project, an opinion survey and co-operation with the local population have shown that the controlled burning as a restoration method causes negative reactions. The prejudices often result from misunderstandings about the method and safety concerns. Great efforts must be made to inform and educate the local population about this method.

Monitoring

- after controlled burning has been carried out, the fire department must secure the area to prevent the fire from spreading
- At the beginning of spring, additional checks must be made to determine how much woody vegetation has been burnt or killed by the fire. Depending on the long-term objectives, burning should be repeated in the same area one or two years later to burn the woody vegetation that was not burnt the first time. In this way, the pastures become more convenient and suitable for grazing

Feasibility

- complicated administration
- current regulations are unfavourable

In locations where it is possible to obtain all necessary permits, this method can be useful for thinning shrubs in more overgrown grasslands to preserve larger trees with thicker bark and completely eliminate the rest of wooden vegetation. Moreover, this method can help on less overgrown grasslands where a large amount of dry organic matter accumulates due to lack of grazing. In the summer months, it can cause a rapid spread of fire, and if burnt occasionally in winter, it can increase the diversity of plant species growing on the pastures - the dominance of grasses and sedges shifts to flowering plants.

Competences and skills required

- it is mandatory to make a detailed plan for activity implementation and to ensure that all participants are familiar with the safety issues in order to avoid accidents and unwanted situations
- it is mandatory to follow the instructions of the fire department to implement the activity safely

Efficiency

A large area can be restored in a short time and if the activity is repeated after two years, the success of the restoration is further increased. Ideally, grazing with mixed herbs should begin or continue after burning to ensure long-term sustainability.

Volunteers

Controlled burning is excellent opportunity to engage a limited number of volunteers, ideally from the local community. By involving community members, it becomes a valuable chance to stronger connections with various users of the area, and to positively influence attitudes towards the controlled burning method.

Total estimated costs

Based on the experience from the Dinara back to LIFE project, the cost of a restored hectare is EUR 60. Controlled burning was carried out on 57 hectares, and the costs included the cost of the fire department of EUR 2000, EUR 500 for the working hours of 10 people with an average daily cost of EUR 50 for three working days.
With this method, large areas can be restored quite easily, especially heavily overgrown parts. Even if the burning is repeated after two years, the price per hectare

is still low compared to the positive impacts, namely the improved grazing quality, the reduced rate of summer wildfires that are easier to extinguish if they occur, and the benefits for biodiversity.

Sustainability

- if the burning of the grasslands overgrown by woody vegetation is repeated after two years, the sustainability of the method is further increased, as the areas can be left for up to ten years without intervention and repeated burning
- if the mixed herd grazing has successfully established after controlled burning, long-term sustainability is guaranteed

Dinara back to LIFE and lessons learnt

In the Dinara area, 57 hectares of overgrown grasslands were restored through controlled burning. The implementation was challenging in terms of obtaining permits, while the restoration activities were moderately demanding.

The main challenge is to find the location for which a permit can be obtained. Controlled burning must be included in the Management programme with ecological network management plan submitted by Croatian forests Ltd. It is important to influence the plan proposals as early as possible in order to include controlled burning as a conservation method.

It is necessary to prepare local stakeholders for the intention to introduce controlled burning implementation because, otherwise negative attitudes are to be expected, as well as a loss of working time to explain the reasons for this method and to improve the relationship with stakeholders who feel aggrieved. The recommended means of communication are posts on local websites and the organisation of public presentations explaining the reasons and process.

It is of great importance to plan controlled burning in collaboration with the responsible fire department. It is advisable to visit the area together with the commander of the public fire department in order to assess the risk and make a plan for the activities taking into account the terrain configuration.

Lessons learnt with regard to implementation of activities:

- mark the edges of the fire areas with visible markers. Due to the rising smoke, visibility is reduced and it is important that participants know where the boundaries of the fire area are.
- create a digital map of the burn areas that participants can view on a mobile phone or GPS device.
- plan the controlled burning to start at the edges, as it creates the perimeter belt. Once the belt has been burnt out and at least 1 m of burnt grassland has been created, you can start burning the entire area, from the belt towards the middle.
- when possible, controlled burning should be carried out from the mountain side towards the valley, as this makes it easier to control the speed at which the fire spreads.
- if the vegetation was wet or the morning was frosty, the fire would burn more slowly, if at all, over a larger area. In this case, you should wait a few hours until the vegetation has dried out a little.
- watch out for sudden changes in the weather or increasing wind. As soon as the conditions are no longer favourable, the activity must be stopped.

FINAL WORDING

The Guidelines for Dry Grassland Restoration and Sustainable Management are the result of the Dinara back to LIFE project. They summarise the experience of the dry grassland restoration process in the Dinara area and are intended to provide an overview of the key steps for restoration planning, thus contributing to grassland restoration in other areas as well.

It is impossible to summarise the experiences and lessons learnt in the format of this publication. A complete overview of the project activities and results can be found at www.dinarabacktolife.eu.

The Dinara back to LIFE project is co-financed by the LIFE Programme of the European Union under contract number LIFE18 NAT/HR/000847. The project is co-financed by the Government Office for Cooperation with NGOs, Environmental Protection and Energy Efficiency Fund and Split-Dalmatia County. The presented content is the sole responsibility of Dinara back to LIFE project partners and does not necessarily reflect the views of the European Union, the Government Office for Cooperation with NGOs, Environmental Protection and Energy Efficiency Fund and Split-Dalmatia County.

BIOM UDRUGA / ASSOCIATION

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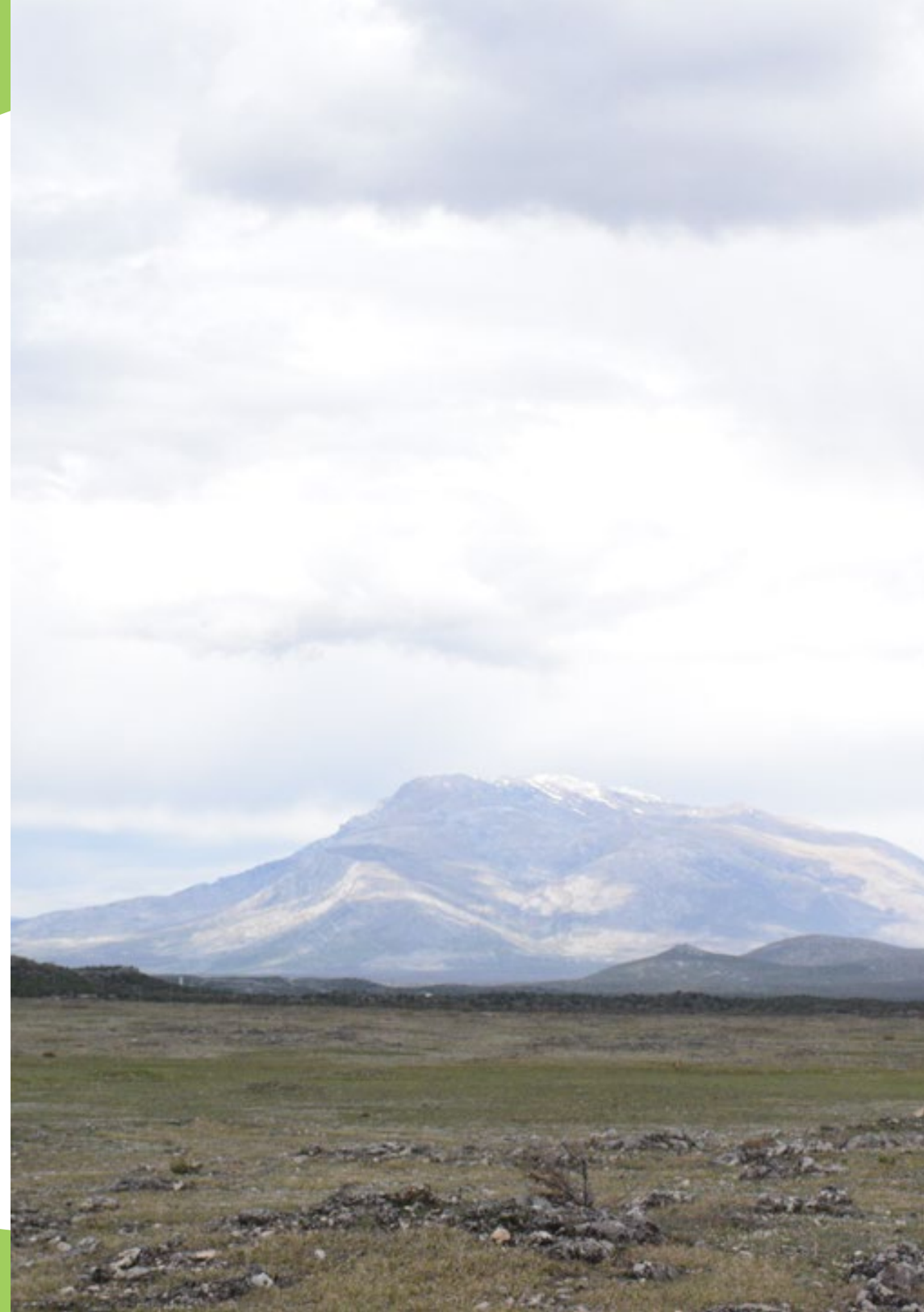

IMPRESUM:

Project title:
Dinara back to LIFE - "Management planning and restoration of Dinara dry grasslands to save biodiversity and support sustainable development" (LIFE18 NAT/HR/000847)

Project acronym:
"Dinara back to LIFE"

Project duration:
15. 1. 2020 – 15. 11. 2023

Project budget:
1.296.509 €

Coordinating beneficiary:
- Association Biom

Associated beneficiary:
- University of Zagreb Faculty of Agriculture
- Croatian Forests Ltd.
- Local action group "Cetinska krajina"

Publisher:
Association Biom

Translation:
Sandra Weitner

Graphic design:
Nikola Križanac

Print:
Kerschoffset, Zagreb

Print run:
XXX

dinarabacktolife.eu