Grassland biodiversity and surveying:

A handbook

FAUNA & FLORA INTERNATIONAL

INSTITUTE OF GRASSLAND AND ENVIRONMENTAL RESEARCH

ŽUMBERAK-SAMOBORSKO GORJE NATURE PARK

DARWIN INITIATIVE

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Foreword

Hello and welcome to this handbook on grassland biodiversity and its surveying. This handbook is a supplement to the protected areas training workshop held at the Žumberak-Samoborsko gorje Nature Park in July 2005 and is one of the outputs of the international project "Developing a model for the conservation of Croatia's grassland biodiversity". This three year project is based on a collaborative partnership between Fauna & Flora International (UK), the Institute of Grassland and Environmental Research (UK) and Žumberak-Samoborsko gorje Nature Park, made possible through funding from the Darwin Initiative, a UK government small grants programme.

This handbook is the first of a series of three handbooks on grassland biodiversity and its conservation. The handbooks are targeted towards conservation managers and officers working within Croatia's protected areas network. They assume a graduate level of understanding of biology, ecology or agriculture and aim to provide a link between grassland ecology and practical conservation management. They are not intended to be an exhaustive reference manual, but rather to provide guidance and advice, based on best practice, to conservation managers and practitioners responsible for conserving Croatia's grassland biodiversity.

The main aim of this first handbook is to provide conservation managers and practitioners with an overview of what constitutes grassland biodiversity and the factors that create, maintain and threaten it. In addition, it will provide guidelines and examples of some basic surveying techniques, developed in the Žumberak-Samoborsko gorje Nature Park, which can be easily adapted for the other protected areas in Croatia.

We would like to acknowledge the contribution that Žumberak-Samoborsko gorje Nature Park has made to the development of this handbook. We would particularly like to thank the rangers, Goran Grdinić, Nikica Radić and Slavko Struna for testing the surveys in the field and Zrinka Mesić, Biljana Janev Hutinec, Matija Franković and Damir Otmačić for providing continuous feedback and constructive criticism.

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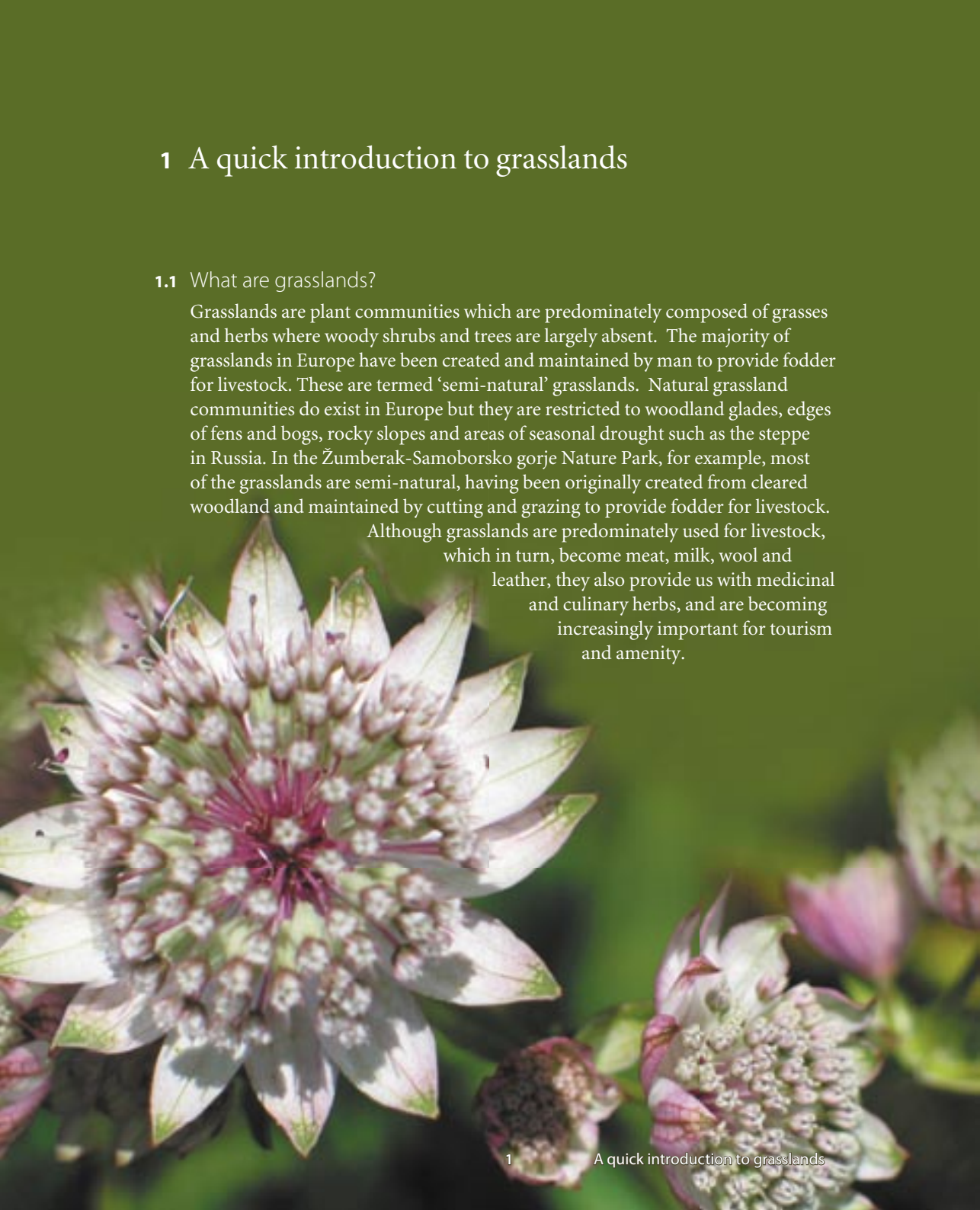
1.1 What are grasslands?

Grasslands are plant communities which are predominately composed of grasses and herbs where woody shrubs and trees are largely absent. The majority of grasslands in Europe have been created and maintained by man to provide fodder for livestock. These are termed 'semi-natural' grasslands. Natural grassland communities do exist in Europe but they are restricted to woodland glades, edges of fens and bogs, rocky slopes and areas of seasonal drought such as the steppe in Russia. In the Žumberak-Samoborsko gorje Nature Park, for example, most of the grasslands are semi-natural, having been originally created from cleared woodland and maintained by cutting and grazing to provide fodder for livestock.

Although grasslands are predominately used for livestock, which in turn, become meat, milk, wool and leather, they also provide us with medicinal and culinary herbs, and are becoming increasingly important for tourism and amenity.



1.2 Importance for nature conservation

Low input, sometimes called 'traditional', grassland management by farmers (i.e. no input of inorganic fertilisers, hay cutting and/or extensive grazing) has created mosaics of grassland habitats, rich in plant diversity.

These grassland mosaic habitats, in turn, support a wide range of invertebrates, birds and mammals by providing food resources (foliage, nectar, seed and prey), shelter and nesting sites. Many of these grasslands provide habitats for many rare and threatened species in Croatia including orchids, lilies and birds such as the corn crake, *Crex crex*.

Due to the high conservation value of Croatia's biodiversity rich grasslands they are a national and European priority for conservation, as demonstrated by the EU Habitats and Birds Directives, national and European red lists and a recent overview of Croatia's biological and landscape diversity (Kutle, 1999).

1.3 Grassland types

Semi-natural grasslands can be broadly divided into three categories: acidic, neutral (mesophilic) and calcareous, which are predominately determined by the underlying geology. Table 1 below summarises these grassland types according to soil pH.

These three main grassland categories can then be further divided into a range of grassland community types which are dependent on site specific environmental factors and differences in farm management practices. A number of factors will influence the type of plant community which develops. These include topography (aspect, slope and drainage), altitude, micro-climate, whether the site is grazed or cut for hay, the type and breed of livestock present, the successional stage of the grassland and whether fertiliser is added.

TABLE 1: Broad grassland categories based on underlying geology (soil pH)

GRASSLAND	SOIL PH	EXAMPLE	NOTES
Acid	< 5	Matgrass (*Nardus stricta*) pastures and heaths	Normally occur over acid rocks such as sandstones but can develop over calcareous rocks where soils have been leached of minerals to leave an acidic humus layer.
Neutral	5 - 6.5	False oatgrass *(Arrhenatherum elatius)* meadows	On soils of intermediate moisture and pH.
Calcareous	6.5 – 8.5	Upright Brome *(Bromus erectus)* grasslands	Over calcareous rocks such as limestone and dolomite

An acidic heathland with *Arnica montana*

1.4 Classification of grassland communities

From the beginning of the 20th century European vegetation ecologists have been describing and classifying plant communities within Europe, using predominately phyto-sociological methods. These methods aim to group together plant assemblages which have similar floristic compositions. The most commonly used methodology in Europe, including Croatia, is still based upon the Zurich-Montpellier School (Braun-Blanquet), which was established by Professor Braun-Blanquet in 1928. However, many European countries have now developed their own national vegetation classifications. For example, in the UK plant communities are classified according to the National Vegetation Classification (NVC) (Rodwell, 1992) whilst Croatia recently published its own National Habitat Classification system (Narodne Novine, 2006).

1.5 European Union nature conservation legislation and habitat classifications

Croatia became a candidate country for European Union membership in 2004. It will therefore be important when planning any surveying or assessing conservation priorities to be aware of the current EU nature conservation legislation and associated tools and classifications available.

In brief, nature conservation policy in the European Union is based on two pieces of legislation, the Habitats Directive and the Birds Directive. These two directives provide a framework for the conservation of species and habitats which are of importance to the European Community. The list of habitats and species of nature conservation importance can be viewed in the annexes of the directives and are available at the web address http://europa.eu.int/comm/environment/nature/. The directives require EU countries to carry out an audit of their habitats and species, and using the criteria laid down in the directives, come up with a list of their country's best sites. These are then put forward as candidates for protection under the directives. This network of European sites ('Natura 2000') is strongly protected under European law. The directive comes into force the moment the site is nominated by the member country and is therefore a very powerful piece of wildlife legislation.

Further information on habitats and species within the EU Habitats and Birds Directive on the database EUNIS (European Nature Information System) available on http://eunis.finsiel.ro/eunis/index.jsp

Did you know?
Plant species diversity can be as high as 50 species per m^2 in calcareous grasslands.

2 Factors influencing grassland biodiversity

It may be helpful at this stage to look at some of the ecological factors which help to create and maintain biodiversity rich grasslands. The species diversity and composition of grasslands is dependent on a range of stress and disturbance factors including grazing, mowing, nutrient availability, seasonal drought, water logging and soil pH. It is the relative contribution and intensity of these factors which determines species composition and diversity. Below we examine some of these factors and their influence on grassland biodiversity.

2.1 Nutrient availability

Figure 1 below is a graph showing the number of herb species per m² against the amount of nitrogen (kg) added per hectare of grassland. As you see, after the addition of only 50 kg of nitrogen per hectare plant species diversity dramatically decreases. Why is this?

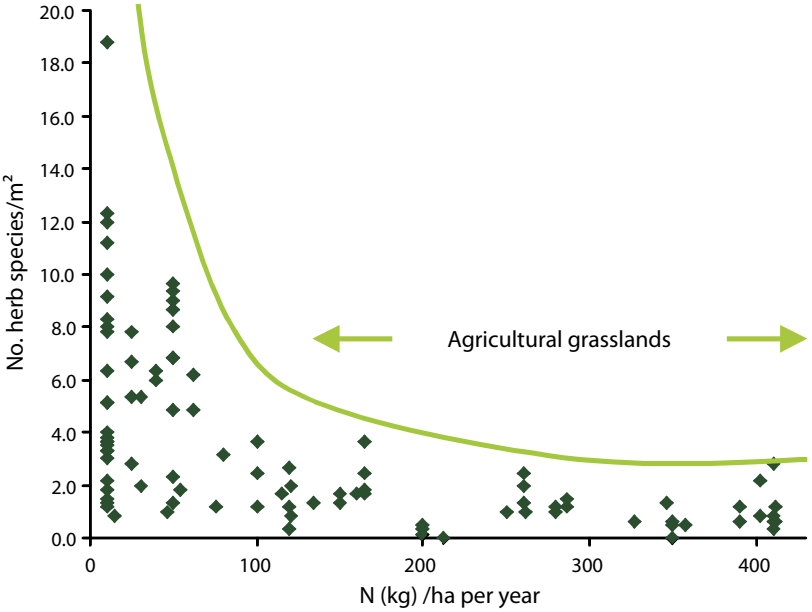


FIGURE 1: The effects of adding increased levels of nitrogen on plant species diversity

Highly fertile soils, with lots of available plant nutrients (nitrogen, phosphorous and potassium) allow competitive species, such as fast growing grasses, to out-compete slow growing species. The grassland becomes dominated by a few species of competitive grasses and has *low species diversity.*

Conversely, low levels of available nutrients suppress the growth of competitive species and allow slow growing species to survive. The result is a *biodiversity rich grassland* composed largely of stress tolerant species (wildflowers).

Key message: The maintenance of low-moderate soil fertility is the key to maintaining species rich grasslands

Cattle and sheep create structural diversity in grassland, which is very important for insect diversity.

2.2 Grazing

Grazing and browsing, by both domesticated and wild animals, maintain plant species diversity as they prevent competitive species becoming dominant in grassland. Grazing animals also create patches of bare soil (shortly grazed turf, hoof prints) that are vital seed germination areas for annuals and short-lived perennials. It has been shown that grazing the re-growth from hay cuts is invaluable for maintaining the species-richness of moderately fertile neutral grasslands as it creates germination sites for spring and autumn germinators. In addition, extensive grazing by livestock creates patches of short and tall vegetation (tufts or tussocks) within grassland. This structural diversity is of major importance to insect and bird diversity and, therefore, the grassland food chain. The habitat requirements of insects vary greatly between species and between life stages of the same species. For example, tall stable swards are essential for web spinning spiders whilst a mixture of very short and tall herbage provide an ideal habitat for grasshoppers and crickets.

Dung pats of grazing animals create bare patches and are ideal for germinating seeds (full of plant nutrients!). They also provide a habitat for specialist insects such as dung beetles.

It is important to remember that different species of domesticated livestock and wild herbivores have very different grazing, browsing and dunging behaviours. These will not only influence species composition but also the structural diversity of the grassland. A short summary of the differences between cattle and sheep grazing is given in Table 2.

Grazing and browsing also help to control scrub invasion, although this may have to be supplemented by occasional mowing.

TABLE 2: The differences between cattle and sheep grazing

BEHAVIOUR	CATTLE	SHEEP
Bite size	Large	Small
Selectivity	Low - will graze on coarse, tall grass	High - can pose a threat to rare plants if they are sensitive to grazing
Dung	Large cowpats Avoid grazing around dung creating a lot of structural diversity	Small droppings Very little avoidance around dung

Conversely, intensive grazing (too much disturbance) eliminates the structural diversity of grassland and reduces the available food resources (pollen, nectar and seed heads) for insects and birds. Intensive grazing on shallow soils can lead to erosion, the loss of species sensitive to grazing and the invasion of grassland by weedy species.

Web-spinning spiders require tall stable swards as found in extensively grazed pastures.

Mowing is sometimes an essential tool to control the succession of scrub.

2.3 Mowing

Cutting grassland for hay not only reduces soil fertility by the removal of plant material but also suppresses the growth of competitive species and scrub. Both these factors help to maintain plant species richness. Ideally the meadow should not be cut till mid-summer to allow plants to set seed and for invertebrates to complete their reproductive cycles (grasshoppers have a protracted life-cycle). Mowing is sometimes an essential tool to control the succession of scrub as grazing alone may not be sufficient.

2.4 Water logging, drought and other stresses

Some plant species are more adapted to specific environmental conditions (water logging, summer drought or acidic soils) than others. This allows specialised plant communities to develop as fast growing species lose their competitive advantage under more stressful conditions. Although some of these plant communities may not be particularly species rich, for example, heathlands, they make a valuable contribution to overall habitat diversity and shouldn't be discounted.

2.5 Conservation value of scrub

In the absence of grazing and other practices, such as hay making, semi-natural grassland inevitably turns to scrub and ultimately woodland. This process is called succession. Succession leads to changes in the soil and the composition of plant and animal communities; soils become deeper and more fertile as leaf litter accumulates, tall competitive grasses dominate and plant species richness declines. Gradually grassland species are replaced by longer lived, slow-growing shrubs and eventually trees.

For this reason, scrub invasion into botanically rich plant communities is

often seen as a major threat to grasslands. However, grassland-scrub mosaics provide 'eco-tones' or gradients between different plant communities. Grassland-scrub eco-tones are key habitats for species that are sensitive to disturbance such as grazing. In addition, they are invaluable areas for birds; providing nesting, roosting and feeding sites. The conservation value of scrub is enhanced if the stand is composed of different species of different ages.

Sheep grazed pastures have a very different botanical composition and structure to meadows that are cut for hay.

2.6 The grassland landscape mosaic – the ideal scenario

A landscape of high biodiversity is made up of a mosaic of semi-natural grasslands under different management regimes. For example, some may be cut, some cut and grazed, and some grazed only. There may be patches of scrub present, interspersed with more intensively managed land such as lucerne, maize and vegetable plots. The value of arable land and its field-margin eco-tones should not be overlooked as it provides habitats for ruderal species whose seeds are an important food resource for grassland birds in winter.

It is the differences in management regimes between landowners that creates and maintains a biologically diverse landscape mosaic. For example, grazed only pastures will be occupied by plant species that can tolerate being grazed (e.g. grasses with growing points, called meristems, that are situated close to the ground) and species adapted to avoid being grazed (e.g. plants with spines, thorns or substances that are toxic to grazing animals such as alkaloids). Grazed pastures have a very different botanical composition and structure to cut meadows. Similarly, meadows that are cut at different times and frequencies will have different floristic compositions due to different selection pressures on flowering and fruiting.

3. Threats to grassland biodiversity

The majority of threats to grassland biodiversity are intricately linked to the economics of livestock farming whether it is land abandonment or agricultural improvement/intensification. As conservationists we cannot disengage the conservation of grassland biodiversity from the range of political, social and economic factors which currently shape agriculture and will continue to do so in the future. It is therefore important that as conservation managers we are aware of the current and future political and economic drivers that directly or indirectly affect farmers' livelihoods and ultimately the choices they make in managing their farm or small holding.

3.1 Agricultural improvement and intensification

The agricultural improvement of semi-natural grasslands could become one of the greatest threats to grassland biodiversity in Croatia. In Britain, it is estimated that less than 5% of the unimproved grasslands that existed in England and Wales in the 1930s are still present today.

Agricultural improvement includes the ploughing and reseeding of grasslands with commercial varieties (usually comprising only a few species of productive grasses and legumes), the addition of inorganic fertilisers, drainage and the use of herbicides to control weeds. The addition of fertilisers and use of fast-growing commercial species increases forage production greatly. Several cuts of forage may be taken throughout the year. This creates a uniform sward structure and limits opportunities for plants to set seed. The result is a poor habitat for invertebrates and birds, with little in the way of food resources.

Alternatively the intensity of livestock grazing the field may be increased. A too high stocking rate could result in *over-grazing* which leads to a uniform sward, soil erosion and the invasion of weeds.

Please note, semi-natural, unimproved grasslands may also be at threat from adjacent land use, for example, *fertiliser run-off from the adjacent field.*

Oak invading an abandoned pasture.

3.2 Land abandonment

Currently, the greatest threat to Croatia's grassland biodiversity is land abandonment. This is particularly evident in the Žumberak-Samoborsko gorje Nature Park where natural succession into woodland following land abandonment is drastically changing the landscape diversity as well as threatening biodiversity at a field level. Land abandonment is most acute on higher altitude pastures and meadows occurring on steep slopes.

3.3 Uniformity of management

Another potential threat to grassland biodiversity is a regimented approach to management; where all fields are managed in the same way and at the same time. This scenario could occur if a large site is managed by just one organisation. This would reduce the diversity of the grassland mosaic as well as possibly eliminating varieties of species (called eco-types) that are adapted to local environmental conditions and/or historical management regimes. For example, different eco-types within a region may have different flowering times due to differences in the timing of traditional mowing regimes on meadows.

A mosaic of different grassland types under different management regimes ensures that a wide range of invertebrates and birds will be able to find shelter or food over the whole season within a landscape. The destructive effect of mowing is also mitigated if there are adjacent uncut meadows where insects, reptiles and birds can escape to (Di Giulio *et al.,* 2001).

3.4 Isolation

Isolation could become a threat to grassland biodiversity if small remnants of semi-natural grasslands become surrounded by woodland or improved agricultural land (small islands surrounded by a sea). In this scenario, there would be very little or no gene flow (seed and pollen) between sites. Colonisation by new populations of species into sites would be limited and existing small plant populations, without the opportunity to cross pollinate, may gradually lose genetic variation.

The destructive effect of mowing is mitigated if there are adjacent uncut meadows where insects, birds and reptiles can escape to.

4 Surveying grassland biodiversity

4.1 Planning your survey

There are a number of key stages to consider when planning and developing a survey. These are outlined in Figure 2 and discussed briefly below.

Prior to embarking on any survey of grassland biodiversity, or for that matter any habitat or species of interest, it is very important to plan ahead and decide the *clear objectives* of your survey. Ask yourself: Why am I doing it? What is the information I need? Remember that as conservation managers the main purpose of a survey should be to *establish conservation objectives* and to assist you in making *management decisions.* Keep reminding yourself of this and it will ensure that you do not collect lots of unnecessary information which will actually confuse rather than aid your decision making.

Setting a clear survey objective will help establish the scope of your survey; for example, whether you need to conduct a detailed survey of just one site or a broad inventory of all the grassland types in your Park.

Before embarking on any type of survey you should establish a clear survey and sampling strategy. This is because it will be virtually impossible for you to survey all the grassland sites in your Nature Park, count all the butterflies in a meadow or talk to every cattle farmer. You will have to decide on:

- The number of sites to survey?
- Which sites to survey?
- How to sample the vegetation or animals at each site?

Depending on the habitat or species you wish to survey you may need to consult scientific experts, such as ornithologist or entomologists, or ecological surveying manuals for specific surveying and sampling protocols.

The difference between surveying and monitoring

A survey is usually a one off event and is used to obtain baseline information from which conservation objectives are set and management actions established. Monitoring is a repeated measure and is used to detect change, i.e. establish whether your management has been effective or not.

In addition, you will have to decide the best time of year/or day to conduct your survey depending on the vegetation type or species. For example, it is best to survey hay meadows in May-June, before they are cut. Upland grasslands can be surveyed slightly later on in the year, from late May-early September. Some of the rare and threatened plants may be early spring bulbs in which case you may have to start surveying as soon as the snow melts.

Do not underestimate the time and resources (financial and human) that will be required for such surveys and inventories to be compiled. This will have a big influence on how many sites you can realistically survey. Finally before you start surveying you need to decide how you will manage and analyse the data that you collect.

If different people or external consultants are to conduct the surveys, ensure that everyone is briefed on the methods to be used and training is provided to maintain

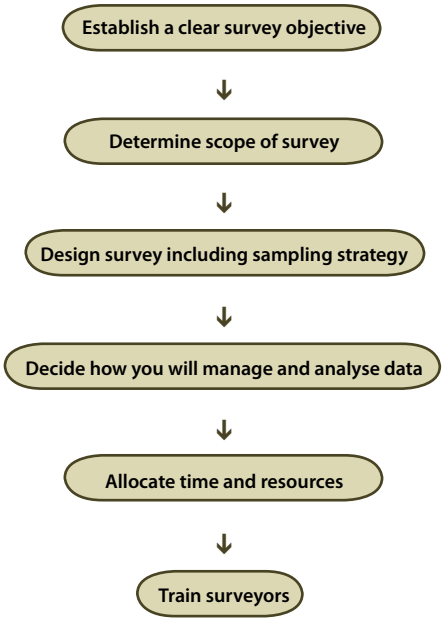


FIGURE 2: **The key stages to planning a survey**

consistency and accuracy of data collection.

4.2 Types of information to collect

There are four broad types of information that will be required for your grassland survey. The level of detail will depend on the objectives and the scope of your survey.

4.2.1 Plant communities and associated animals

Information on the plant communities and associated animals for a site will allow you to interpret the ecological conditions which management should create or maintain in order to conserve key communities and species (Crofts & Jefferson, 1999); i.e. it will enable you to establish the conservation objectives for a site. A species list alone is not sufficient as it doesn't inform us of species abundances or the habitats of sensitive species. The method of recording abundance and distribution will vary depending on the taxon being surveyed. Make sure that you are using appropriate methods by consulting ecological surveying manuals and trained ecologists.

4.2.2 Site characteristics

The physical characteristics of a site such as slope, aspect, soil type and structure, occurrence of any rocky outcrops, drainage etc. will assist in the ecological interpretation of the special features at a site (Crofts & Jefferson, 1999). They will also highlight any possible practical problems associated with management such as the feasibility of using machinery or susceptibility of soils to poaching.

4.2.3 Past and current management

This type of information is very important when actually deciding what management actions will be required to maintain key habitats and species. Remember that the current management may have only recently been implemented and may not be sustainable in terms of maintaining the botanical diversity of the grassland. For example, grazing may have replaced hay making because the farmer has become too old to continue the traditional labour intensive practice; in this case continuation of grazing could in the long-term result in loss of botanical interest (e.g. species sensitive to grazing). It is therefore very important to find out what management practice(s) have been imposed on

the grassland site over the previous five to ten years, as this is likely to be the key to setting a sustainable management action plan.

The sorts of questions you need to ask are:

- Has the site been grazed, mowed or managed differently in recent years?
- How has management changed in recent years?
- Has the land been grazed and what are the species, breed and numbers etc?
- How long are the animals on site (grazing period)?
- If mowed, how often is it mowed and on what dates?
- Has there been any supplementary feeding of livestock, addition of fertilisers etc?
- Are there any successional changes due to under-grazing?
- Is there any evidence for recent agricultural improvement or intensification such as fences and water feeders?

This sort of information can be obtained by conducting interviews and holding meetings with local farmers or landowners (see section 5.4). Sometimes the information will have to be obtained from evidence collected during site visits such as the presence of dung and sward structure.

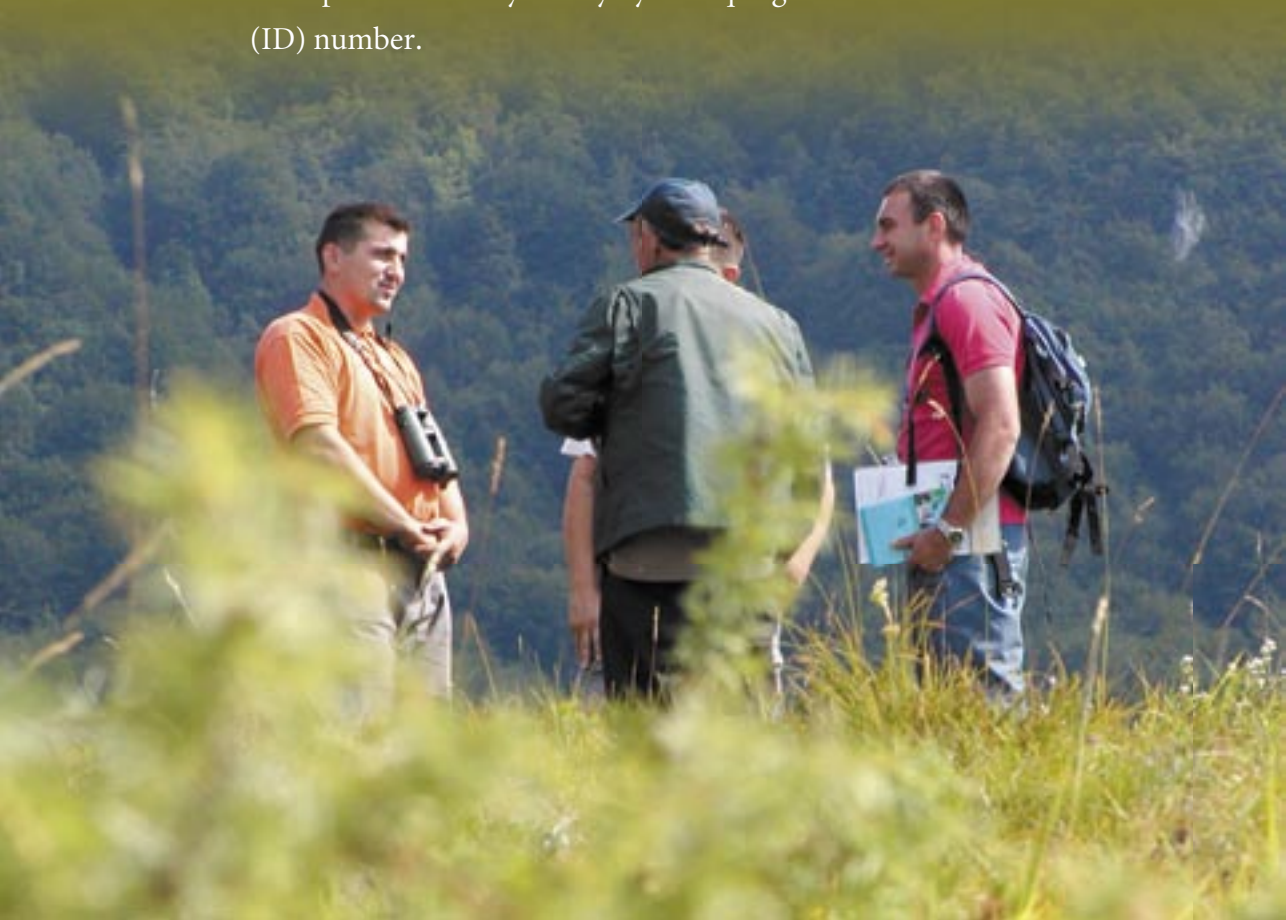
It is also important to note what threatens the community or species of interest so that these can be mitigated with management. Things to look out for include: evidence of intensification of livestock production, land abandonment, addition of fertilisers either on the site or on adjacent land, nearby land development, changes in habitat quality etc.

4.2.4 Farmer livelihoods and the socio-economic context

The threats to grasslands in your protected area may become more or less apparent as soon as you start surveying it. However, it is important to understand the socio-economic and political factors which have led to any changes in grassland management, whether it be abandonment/or increased intensification. Your future management action plans should not only address the ecological management of grasslands in isolation. The socio-economic and political factors which determine how farmers manage their land and the choices and opportunities that are available to them should also be considered. Information on the broader context can be obtained by a desk top study but how this actually relates to farmer livelihoods can only be obtained through meetings and discussions with farmers. You may have to obtain advice from a social scientist to ensure you collect appropriate data in a sensitive manner. Engaging with local farmers and other stakeholders at an early stage of surveying will help develop new partnerships for future management initiatives and make sure management action plans are well informed, realistic and appropriate to local peoples' needs.

5 Examples of surveys

To show a range of different grassland survey techniques we have included four different types of grassland survey, with associated recording forms, that have been developed for the Žumberak-Samoborsko gorje Nature Park (ŽSGNP). As you will see these can be easily adapted for your own specific protected area. The threatened plant survey and farmer interview are all connected to the rapid biodiversity survey by a unique grassland identification (ID) number.



5.1 A rapid biodiversity survey

5.1.1 Introduction

The Žumberak-Samoborsko gorje Nature Park is a relatively new park and the project team decided during the planning stages that a basic rapid survey, one which would highlight sites of conservation priority, was required. This would allow those sites of special interest or value to be investigated in more detail at a later stage. A copy of the rapid biodiversity survey form is in Appendix A. The principle behind the survey form is that each site or grassland is given a total score (evaluated) based on a set of biodiversity and threat indicators. This allows for comparisons between sites and for nature conservation priorities to be determined.

In addition, the survey form collects some basic site data and has a section on past and present management. These should be completed during the initial visit if possible, or if not, at a later stage once priority sites have been chosen.

The rapid biodiversity survey is predominantly based on visual assessments and observations in the field. It does not require specialist ecological knowledge and so can be carried out by a wide range of people.

THINGS YOU WILL NEED	Aerial or ortho-photographs of site
	Clip board, surveying form (Appendix A) and pencil
	Compass and clinometer (for measuring slope)
	GPS
	Digital camera
	Botanical identification guide
TIME REQUIRED	45-60 minutes per survey depending on the size and complexity of the site and experience of the surveyor.
LEVEL OF TECHNICAL ABILITY	Low-Moderate
INFORMATION MANAGEMENT	Access database
DATA ANALYSIS	Access database and GIS for spatial data (high conservation value meadows, grazing stock numbers, patterns of threat etc.)

5.1.2 Filling out the form: a step by step guide

Use the example rapid biodiversity survey form (Appendix A) with our step by step guide to assist you through the different sections of the form. In addition, you may find an aerial or ortho-photograph (Figure 3) of the site useful for orientation.

Appendix A — Rapid Biodiversity Survey

1 *General Site Information*

a) GRASSLAND No. 38 **b)** RECORDER Slavko Struna **c)** GPS 5538230;5082510

d) DATE 21.07.05 **e)** LOCATION 6.5 km from Kordić in direction of Vidovina on right hand side of road, in front of hunter's lodge.

2 *Physical Attributes*

a) SLOPE *(circle)* 0-5 5-10 10-20 20-30 >40 **b)** ALTITUDE 678 m **c)** ASPECT N. E.

Section 1: General site information

Record the unique grassland ID number **(1a).**

This ensures that there can be no confusion between two sites; essential if there are several surveyors. It also acts as a unique identifier for any additional data which is collected from other surveys.

Clearly write down who the recorder is **(1b).**

This is so that the source of the original data can be tracked down and if there are any queries about the survey.

Measure and write down the GPS co-ordinates **(1c)** of the site.

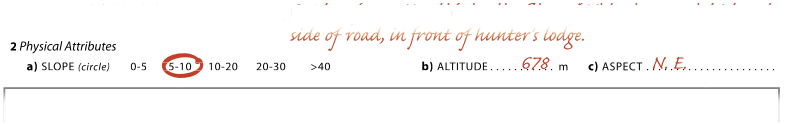
This gives another unique identifier for the site and ensures it can be relocated. It also means that any data collected at the site can be mapped onto a GIS map. The GPS co-ordinates should be taken in the centre of the site to avoid overlap with other sites which could cause confusion.

Record the date the survey was conducted **(1d).**

This is crucial! Remember that what you are recording is the state of that site at one point in time. The information collected now may be useful in several years' time but only if it has a date on it – otherwise it is meaningless. The date also adds value to ecological and field management observations such as hay cuts or flowering times.

A written description of the site location **(1e)** makes the site much easier to find again.

Section 2: Physical attributes


side of road, in front of hunter's lodge.

2 *Physical Attributes*

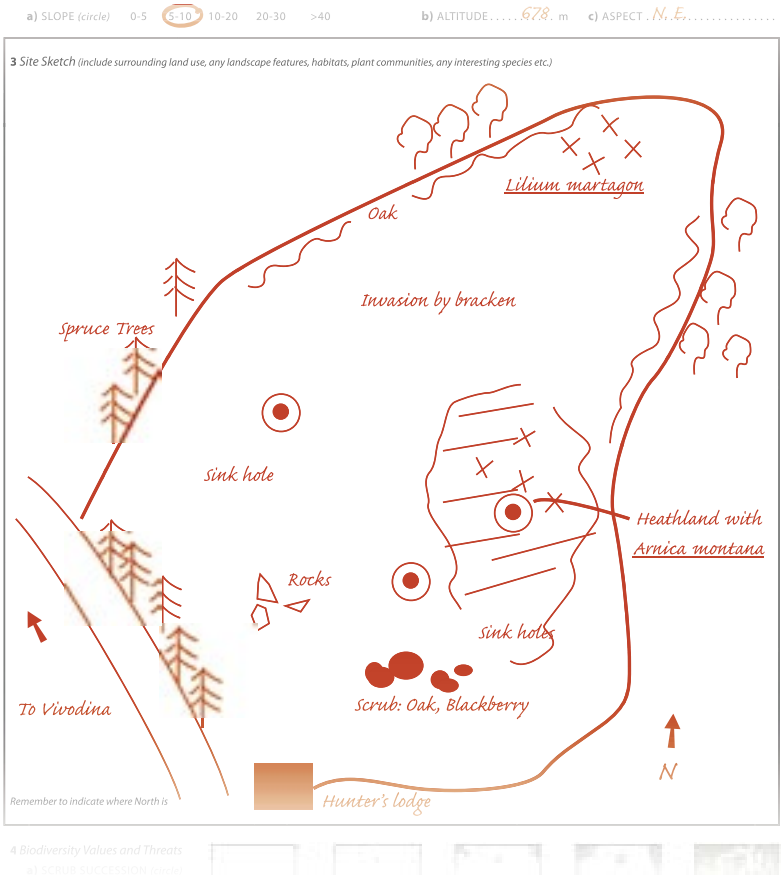
a) SLOPE *(circle)* 0-5 5-10 10-20 20-30 >40 **b)** ALTITUDE.....678..m **c)** ASPECT..N..E.....

Measure the slope using a clinometer or estimate by eye. Circle the most appropriate range **(2a).**

Measure the altitude with an altimeter (remember to re-set it daily at a known altitude) or a GPS, and enter it on the form in metres **(2b).**

The aspect **(2c)** should be recorded as S (south), SE (south-east) etc.

Section 3: Site sketch



A site sketch provides an invaluable resource for any future monitoring and management activities on a site. It also allows other people to relocate any important habitats or populations at a site. Use the aerial photograph of the site (see Figure 3) to assist you in drawing the site sketch. The surveyor should walk around the site making observations as he/she goes. We recommend a structured walk in the shape of a W.

Mark the route you have walked on the sketch **(3a).**

The sketch should indicate where north is **(3b)** and show the location from where

the sketch was drawn **(3c).**

Take a photograph of the overall site.

This acts as a good reference point and should be taken ideally from where the site sketch was drawn.

Mark on the sketch where the photograph was taken from and note down the photograph number **(4i).** Any other photographs of the site, interesting species or features should be noted here as well **(4i).**

The site sketch should include the important physical and biological attributes of the site such as i) notable landscape features (rocky outcrops, sink holes, buildings, trees) and any boundaries and ii) important habitats (ponds, caves), vegetation community boundaries and populations of rare plants.

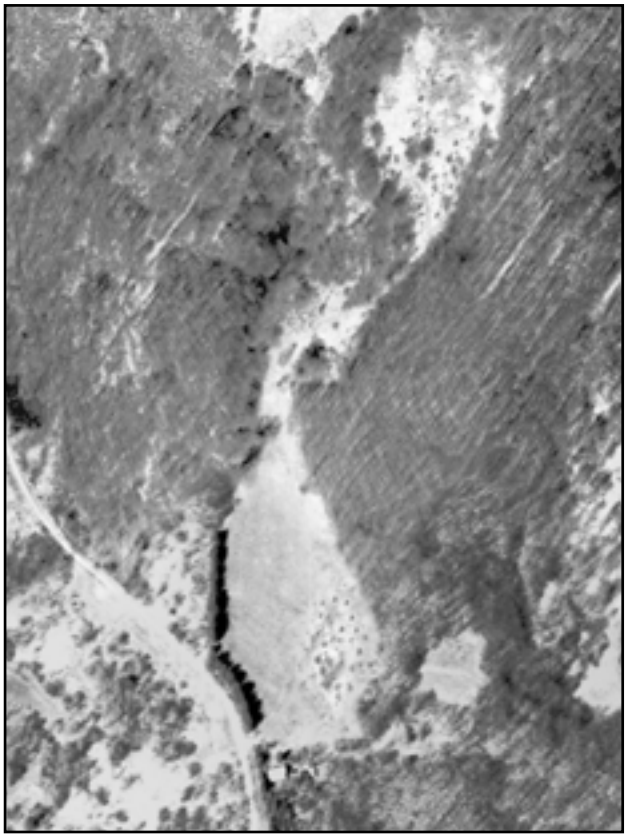


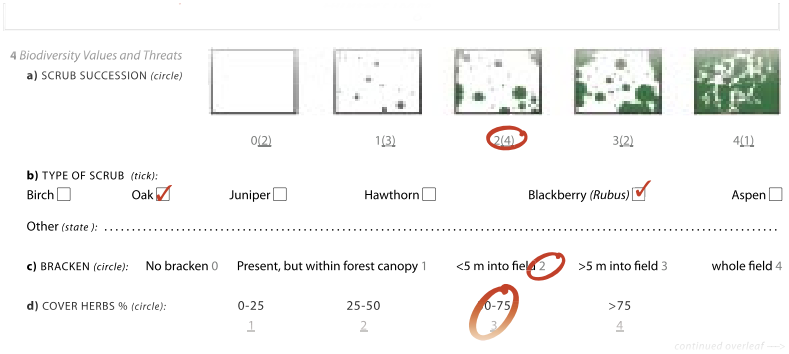
Figure 3: An ortho-photograph of grassland number 38.

Draw and annotate the important physical and biological attributes onto the site sketch **(3d).**

You may find it useful to create a standardised key for the different attributes and features in your Park **(3e).**

Section 4: Biodiversity value and threats

This section of the surveying form assesses the biodiversity or conservation value of the site and the level of threat. This is achieved through the use of biodiversity and threat indicators scored from 0-4. The biodiversity scores are distinguished from the threat scores by having a line under the number. The biodiversity and threat scores are added up at the end of each survey to give a final biodiversity and threat score for the site (in section 6 of the form).


4 Biodiversity Values and Threats

a) SCRUB SUCCESSION (circle)

0(2) 1(3) 2(4) 3(2) 4(1)

b) TYPE OF SCRUB (tick):

Birch ☐ Oak ☑ Juniper ☐ Hawthorn ☐ Blackberry (Rubus) ☑ Aspen ☐

Other (state): .....

c) BRACKEN (circle): No bracken 0 Present, but within forest canopy 1 <5 m into field 2 >5 m into field 3 whole field 4

d) COVER HERBS % (circle): 0-25 (1) 25-50 (2) 50-75 (3) >75 (4)

continued overleaf --->

The succession of grassland to woodland is one of the greatest threats in the ŽSGNP. Circle the diagram most applicable to the level of succession on the site **(4a).**

This automatically gives a threat and biodiversity score. Please note that the intermediate level of succession has the highest biodiversity score as a combination of grassland and scrub provide a range of habitats for invertebrates, birds and mammals.

Place a tick against the species invading the site **(4b).**

The invasion of bracken into grassland is a large threat to grasslands in the ŽSGNP and therefore a decision was made to score this separately. Circle the option most applicable to the site **(4c).**

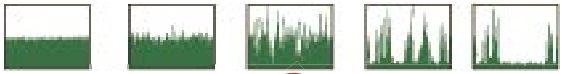
The percentage cover of herbs in grassland is an important indicator of plant biodiversity. For this assessment sedges are considered "honorary" herbs. For these purposes, it is therefore important that surveyors are trained to distinguish between grasses and sedges in the field. The percentage cover of herbs is

Appendix A

Rapid Biodiversity Survey

4 *Biodiversity Values and Threats (continued)*

e) SWARD STRUCTURE



0 1 2 3 4

f) APPROXIMATE SWARD HEIGHT . . . 20 . . . . cm

g) HABITATS/FEATURES PRESENT WITHIN SITE *(please circle):*

Scrub 1 Heathland 1 Bare rock 1 Wetland 1 Pond 1 Stream 1 Anthills 1 Orchards 1 Boar foraging 1

Threatened species 1 Other *(state)* 1 . . . . . .

h) OTHER THREATS *(circle):*

Land development 1 Nearby cultivation 1 Overgrazing by horses 1 Overgrazing *(>5% bare ground, poaching)* 1

Other *(state)* 1 . . . . . .

i) PHOTO *(Reference no. and description):* . . . SS 38–51 . . . . . .

. . . . . .

j) COMMENTS *(presence of threatened species etc):* Small population of Arnica montana (15 individuals) in heathland; 4 plants of Lilium martagon - at edge of field

. . . . . .

. . . . . .

5 *Current and Past Management*

a) INFORMATION FROM *(circle):* Records Owner Manager Neighbour Other

estimated visually by looking down at the sward at your feet (a bird's eye view) and not across it. The visual assessments can be done by stopping at several points along the structured walk, say every 100 paces and looking at the ground at your feet. At the end of the walk an average of all the observations can be taken.

Circle the most applicable rank for the percentage cover of herbs **(4d).**

Sward structure is a good indicator for invertebrate biodiversity and is also estimated visually. Circle the most applicable diagram for sward structure **(4e).**

Sward height is a good indicator of the past management of a site and can be very important for some species of grassland birds. The sward height (cm) should be assessed visually at intervals, say every 100 paces, on the structured walk and the average recorded **(4f).**

Please note that the sward height is the height of the main mass of herbage and not the tops of flowering spikes.

Man-made ponds enhance the conservation value of a site.

There may be additional habitats, species and features at the site which may enhance its conservation value, for example, a pond or patches of heathland.

Circle any additional habitat or feature from the list provided or add your own **(4g).**

Remember that each additional feature contributes one point towards the final biodiversity score (section 6).

There may be other threats on or around the site, such as overgrazing by horses, which may be important for future management decisions and should be recorded.

Circle any additional threat from the list provided or add your own **(4h).**

Make a note of any photographs taken and associated reference numbers in the space provided **(4i).**

Make any additional notes or comments on the biodiversity or threat in the space provided **(4j).**

Section 5: Current and past management

Information on the past and present management of a site can be obtained from a number of sources.

Indicate the source of information **(5a).**

If known, record the owner's name and contact details **(5b).**
This is important for any follow up work.

Semi-structured interviews or informal chats with farmers (see the farmer interview on page **) are an excellent way of obtaining management information. However, a lot of information about a site can be obtained from field observations, particularly if the site is visited several times throughout the season. Table 3 below lists some field observations you may encounter and what they indicate about the current land management. Can you think of any more?

5 *Current and Past Management*

a) INFORMATION FROM *(circle):* Recorder Owner Manager Neighbour Other

b) NAME
(Owner or Manager) .....

CONTACT DETAILS
.....
.....

c) CURRENT MANAGEMENT

Abandoned? **yes / no**
For how many years? .....

Cut for hay? **yes / no**
When? .....
How often? .....

Is it grazed **yes / no**
Grazing Period .....
Which livestock?
Cattle **yes / no** Numbers .....
Sheep **yes / no** Numbers .....

Is it cut for hay and grazed? **yes / no**
When is it cut for hay? August/October
How often? x 2
Grazing period Autumn
Which livestock?
Cattle **yes / no** Numbers .....
Sheep **yes / no** Numbers .....

NOTES ... Site revisited 10/10/05 - recently cut and now grazed with cattle (hoofprints and cowpats)
.....
.....

d) PAST MANAGEMENT

Rotation .....
Arable .....

Cut for hay? **yes / no**
When? .....
How often? .....

Was it grazed **yes / no**
Grazing Period .....
Which livestock?
Cattle **yes / no** Numbers .....
Sheep **yes / no** Numbers .....

Was it cut for hay and grazed? **yes / no**
When was it cut for hay? .....
How often? .....
Grazing period .....
Which livestock?
Cattle **yes / no** Numbers .....
Sheep **yes / no** Numbers .....

NOTES .....
.....
.....

6 *Final Biodiversity and Threat Score*

a) BIODIVERSITY SCORE = ... 14 ... THREAT SCORE = ... 4 .....

The presence of hay rattle (*Rhinanthus* sp.) indicates the grassland is a meadow.

FIELD OBSERVATION/EVIDENCE	INDICATES
Presence, quantity and type of dung (piles, pats or droppings)	Type and numbers of grazing animals (horses, cattle, sheep, goats, rabbits or deer)
Fresh dung	Recent grazing
Short, closely grazed sward	Intensive grazing pressure
A mosaic of tall and short swards	Extensive grazing pressure
Presence of tall thistles in flower	Site has not been cut for several years and has been converted from a meadow to a pasture
Large quantities of leaf litter	Site has not been cut or grazed for many years
Presence of anthills	Site has not been cut for several years
Presence of arable weeds, bare ground and small stones	Probably previously a fallow field
Sward mostly composed of grass species with little or no herbs	Enhanced soil fertility and/or damp moist conditions through the summer
Nibbled branches and shoots on shrubs	Usually goat or deer browsing, but can be cattle, so look for type of dung in the vicinity
Sward very green and mostly composed of grass species	Past application of fertiliser or manure
Presence of hay rattle *(Rhinanthus)*	A hay meadow as opposed to a pasture

TABLE 3: Some field observations you may encounter and the type of land management they indicate.

The management data is divided into two parts; current management and past management.

Using the information acquired from the landowner or from evidence gathered on the site complete the management sections of the form (**5c** and **5d**).

Remember to make notes on any other information you think is relevant to past and current grassland management, for example, the organisation of shepherding within communities or historical patterns of cattle droving.

Section 6: Final biodiversity and threat score

Tally up the biodiversity and threat scores for the survey **(6a).**

6 *Final Biodiversity and Threat Score*

a) BIODIVERSITY SCORE = ... 14 . . . . THREAT SCORE = . . . 4 . . . . . .

After the survey

- You may need to arrange a meeting with the land owner to find out more information about how the site was previously managed.

5.2 A rare plant survey

5.2.1 Introduction

This survey was developed in order to improve the Park's knowledge of the distribution and biology of rare and threatened grassland plants in the Park. Not only will this assist with assessing the conservation value of different sites but most importantly, in conjunction with the other three surveys, will provide information on the specific ecological and habitat management requirements of the threatened plant species within the Park. This survey also provides a good baseline for future monitoring activities.

Before embarking on this survey it will be necessary for the surveying team to familiarise themselves with the grassland species in the plant Red Data book (Nikoli & Topi , 2005) and how to recognise and identify them in the field. Non-botanists should be provided with the appropriate training to enable them to accurately identify the species in question. In addition, a literature search, discussions with botanical experts and visits to the local herbarium will all help the surveying team familiarise themselves with the species and their habitats. U ka Nature Park authority has recently produced a field guidebook on the threatened plants in their Park which you may find a useful resource (Brana & Grgurev, 2005).

It is recommended that a rapid biodiversity survey is conducted at the site prior to or at the same time as the rare plant survey. This ensures that the general site features, biodiversity value and threats are recorded and can be easily retrieved using the unique grassland ID number. The aim of this survey is to obtain more specific biological and ecological data on the rare plant species themselves.

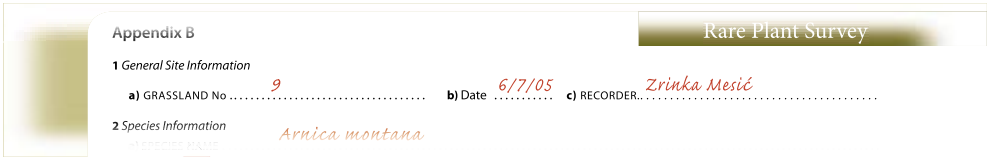
THINGS YOU WILL NEED	Clip board, surveying form (Appendix A) and pencil
	Compass and clinometer (for measuring slope)
	GPS
	Digital camera
	Field identification guide
TIME REQUIRED	45-60 minutes per survey depending on the size and complexity of the site and experience of the surveyor.
LEVEL OF TECHNICAL ABILITY	Moderate
INFORMATION MANAGEMENT	Access database
DATA ANALYSIS	Mapping of information (rare plant localities) onto GIS map

5.2.2 Filling out the form: a step by step guide

Use the example rare plant survey form (Appendix B) with this step by step guide to assist you as you work through the sections.

At each site, survey and explore the range of possible habitats for each of the rare plant species known to occur on grasslands. The rapid biodiversity survey may assist you to locate suitable habitats.

Section 1: General site information


Appendix B

Rare Plant Survey

1 *General Site Information*

a) GRASSLAND No ..... 9 ..... b) Date ..... 6/7/05 ..... c) RECORDER ..... Zrinka Mesić .....

2 *Species Information*

Arnica montana

Once a rare or threatened plant species is located, fill in the grassland ID number **(1a)**, the date **(1b)** and the recorder's name **(1c)**.

The importance of completing these details is discussed in 5.1.2 (the rapid biodiversity survey).

Section 2: Species information

Check the identification of the species using a field guide and write down the species' name, preferably using the scientific name **(2a)**.

If species identification proves to be difficult in the field take photographs of the plant, particularly the features which are commonly used for identification (flowers, seed and habit). **Do not pick the plant!**
Write down the photograph numbers **(2b)**.

Make notes and drawings of the plant's habit, size, colour and any features which may help with identification at a later stage **(2i)**.

Systematically search the surrounding area to ensure no individuals of the population have been missed. Once you are confident your search has been exhaustive, count the number of individuals in the population if there are <20 individuals. If the population size is >20, estimate it visually by extrapolation.

Record the population size and make notes on the population character/

a) GRASSLAND No 9 b) Date 6/7/05 c) RECORDER Zrinka Mesić

2 *Species Information*

a) SPECIES NAME *Arnica montana*

b) PHOTO yes / no PHOTO *(Reference no. and description)* ZM15–21

c) POPULATION SIZE AND CHARACTER *Small population of 15 plants*

d) GPS 5592094;5048835 e) ASPECT SW

f) SLOPE *(circle)* 0-5 5-10 10-20 20-30 >40

g) PHENOLOGY *(circle)* Flowering Fruiting Vegetative

h) HABITAT (of species)
In patch of heathland on a bank with Calluna vulgaris and Chamaespartium sagittale

On meadow which is regularly cut (every year)

i) ADDITIONAL NOTES

3 *Species Information*

demography **(2c).**

Things to note include:

i) The age structure of the population

ii) Is there any evidence of regeneration? -such as the presence of juvenile individuals or seed set.

iii) If the species is dioecious (male and female plants separate), what is the ratio of the different sexes?

iv) Is the population dispersed throughout its habitat or is it clumped?

v) Is it growing clonally (spreading vegetatively from a single plant)?

***Arnica montana* (Vulnerable), a Red Data book species.**

Take a GPS co-ordinate for the locality of the population and record it **(2d)**.
This is for relocation and mapping purposes.

Draw the location of the plant population on the site sketch of the rapid biodiversity survey.

Record the aspect **(2e)** of the population as S (south), SE (south-east) etc.

Measure the slope of the ground at the population locality using a clinometer or estimate by eye. Circle the most appropriate range **(2f).**

Indicate on the form whether the species is flowering, fruiting or in a vegetative state **(2g)**.

Write down a description of the habitat of the species **(2h)**.

Is it growing on the edge of woodland? In long grass? In a wet area? Try to be as precise as possible.

Write down any additional notes on the species which you think are relevant; include things such as specific threats, associated species or pollinators **(2i).**

Repeat for other rare and threatened plants at the same site **(3a-i).**

After the survey:

- Ensure data from the surveying forms are checked and passed onto the database manager.
- Check the identification of any species you are uncertain about.

5.3 A plant community survey

5.3.1 Introduction

Although the grassland plant communities within the Žumberak-Samoborsko gorje Nature Park have been broadly identified using phyto-sociological techniques the project team decided that a more thorough and objective analysis was required to establish a comprehensive classification of grassland types and their distribution in the Park.

The methodology used for the survey is based on the UK's National Vegetation Classification for grasslands and montane communities (Rodwell, 1992). The methodology uses 2m² quadrats to sample homogenous stands of vegetation in a range of grassland communities. The samples are then analysed using cluster or ordination techniques to determine the community types. You will probably require the assistance of a community ecologist or statistician to advise you on data analysis.

THINGS YOU WILL NEED	Clip board, surveying form (Appendix C) and pencil
	A completed rapid biodiversity survey form
	A $2m^2$quadrat
	Compass and clinometer
	GPS
	Digital camera
	Field identification guide
	Hand lens
	Herbarium press and collecting book
	Trowel or other suitable tool for assessing soil depth.
TIME REQUIRED	Up to 10 quadrats per day depending on the experience of the surveyors, the time spent travelling between quadrats and the biodiversity richness of communities.
LEVEL OF TECHNICAL ABILITY	High (surveyors need to be competent field botanists)
INFORMATION STORAGE	Excel
DATA ANALYSIS	Cluster or ordination packages such as TWINSPAN (Hill & Šmilauer, 2005) or CANOCO (ter Braak, 1987)

5.3.2 Filling out the form: a step by step guide

Section 1: General Site Information

First record the grassland ID number **(1a),** the surveyor's name **(1b)** and date **(1c).**

Appendix C

Plant Community Survey

1 *General Site Information*

a) GRASSLAND No ..... 15 ..... **b)** SURVEYOR ..... Anna Gundrey & Zrinka Mesić ..... **c)** DATE ..... 21.07.05 .....

Section 2: Quadrat data

Walk around the site and search for and select a homogenous/uniform stand of grassland vegetation. Avoid vegetation which is transitional or at field boundaries. The previous rapid biodiversity survey may assist you in finding distinct plant community types. Select a representative area of vegetation and place the 2m²quadrat into it.


2 *Quadrat Data*

a) PLANT COMMUNITY No. 11 **b)** QUADRAT No. 3

c) GPS 5532402;5068797 **d)** ASPECT South

e) SLOPE *(circle)* 0-5 5-10 10-20 20-30 >40 **f)** ALTITUDE 1002 m

g) SOIL DEPTH *(circle)* <10cm >10cm

h) SOIL DESCRIPTION *(tick)*

Organic *(peat)* ☐ Mineral *(peat)* ☑ Mineral *(clay-grey)* ☐ Mineral soil with rusty or grey mottles ☐

Systematically record and number each distinct plant community **(2a)** and each quadrat **(2b).**

Do not forget that there will be three quadrats per distinct community.

Take a specific GPS co-ordinate **(2c)** for the first quadrat and draw its location on the rapid biodiversity survey sketch map.

Measure the aspect **(2d)** for the first quadrat and record it.

Measure the slope of the ground at the first quadrat using a clinometer. Circle the most appropriate range **(2e).**

Measure the altitude at the first quadrat using an altimeter or GPS **(2f).**

Using a trowel estimate the soil depth immediately next to the quadrat and indicate whether it is <10cm or >10cm deep **(2g).**

Examine the soil texture and colour and tick the most appropriate description on the form **(2h).**

Section 3: Cover data (%)

Before starting to estimate the percentage cover for each species within the quadrat, make a note of the percentage cover of grass species versus the percentage cover of herbaceous species **(3i).**

3 *Cover Data (%)*

a) SPECIES	b) % Cover
Agrostis capillaris	*21*
Anthoxanthum odoratum	*21*
Arrennatherum elatius	*2*

a) SPECIES	b) % Cover
Trifolium medium	
Trifolium montanum	
Trifolium rubens	

c) *Rocks*	*21*
d) *Leaf Litter (dead material)*	*1*
e) *Bare Ground*	
f) *Mosses*	
g) *Liverworts*	
h) TOTAL COVER	*22*

i) ADDITIONAL NOTES *(past or current management regimes, threats)* *10:90 grasses:herbs*

A meadow cut x 1 year

j) PHOTOS *(Reference no. and description)*

Remember that sedges are considered "honorary herbs". The estimation of grass cover (%) herbaceous species cover (%) will act as a check later on.

First estimate the cover of rocks **(3c),** leaf litter **(3d)** and bare ground **(3e)** and record it in the space provided.
Leaf litter is dead plant material that is no longer attached to the plant. A large build up of litter indicates that a site has not been mowed or grazed for a long time.

Next identify all the species in the quadrat. Working systematically (for example, start with all the grass species) list all the species present **(3a).**

Remember to search the quadrat thoroughly to ensure even the smallest, least conspicuous species are recorded. For those species which you are unable to identify in the field, and you know are not rare or threatened, take a herbarium specimen (see box below) and write the collecting number in the species list.

Recording Cover

Cover is usually estimated visually by eye and is the area occupied by the above ground parts of a plant when viewed directly from above. It is calculated as a percentage, but as vegetation often grows in layers, the total cover values per sample will often exceed 100 percent.

For example, the whole quadrat may be covered by one species (100%), but when you look below there may be smaller species growing underneath (say another 30%) and further down a carpet of moss covering a further 20%. The total cover in this case would then be 150%. These total cover values can be easily converted to true percentages once the data has been entered into a spreadsheet.

To help you estimate the cover of plant species in a quadrat you may find it helpful to sub-divide the quadrat into smaller equal squares.

Once all the species in the quadrat have been recorded, you can move on to estimating percentage cover. If working in pairs estimate the cover values independently at first. These can then be compared at the end and final cover values agreed.

Record the percentage cover of all the species in your quadrat **(3b)** except the moss and liverwort species which can be grouped together as 'mosses' **(3f)** or 'liverworts' **(3g).**
For those species with less than 1% cover just write <1%.

Next add up all the individual cover values to obtain a total cover value **(3h).**
The total cover value should be ≥ 100%. If not, you have underestimated the cover values and you need to double check your estimates. Another good check is to see if the proportion of grasses to herbs is the same as your original

estimation.

Make any notes on threats, management regimes, rare plants etc. in the space provided **(3i).**

Record any photographs of the site or plant community **(3j).**

Take another two quadrat samples within the same community at the same site. Repeat the process for any other distinct communities at the same site.

After the survey

- Check the identification of any species.
- Enter the data into an Excel spreadsheet.

Herbarium specimens

Herbarium specimens are pressed, dried samples of plants. A field press is normally used to press, dry and temporarily store the specimens. To aid identification your specimen should ideally have flowers, fruits and roots. Each specimen you collect should be clearly labelled with a unique collecting number, the collector's name, date, population and habitat data. Use your local herbarium, including the botanical experts that work there, to help you identify the species.

5.4 A farmer interview

5.4.1 Introduction

Additional information on the past and present management of high conservation value sites can be obtained through semi-structured interviews (SSI) with farmers and landowners. Semi-structured interviews can also be used to investigate a range of farmer livelihood issues and the underlying socio-economic and political factors which ultimately influence how farmers manage their land.

Semi-structured interviews are really more like a guided conversation than an interview. As they are more flexible than an interview they allow the interviewer to further explore any interesting answers or delve deeper into particular issues. They do, however, require skill and sensitivity on behalf of the interviewer. Advice should be sought from a social scientist at the planning stages of your interviews.

THINGS YOU WILL NEED	Two interviewers
	A pen and discreet notebook
	A list of main questions or issues you wish to address (Appendix D)
	An interview recording sheet
TIME REQUIRED	Maximum of 1hour per interview
LEVEL OF TECHNICAL ABILITY	Moderate
INFORMATION STORAGE	Access
DATA ANALYSIS/RETRIEVAL	Access

5.4.2 Conducting a semi-structured interview: a step-by-step guide

Planning and team preparation

- Decide on the aims of your interview. What information do you require? What issues require further understanding? How can this information be collected? Which target groups do you want to interview? What sampling strategy should you apply?
- Produce a check list of main topics/questions (Appendix D). Try to keep the main questions open-ended by using questions which begin with How? Why? Who? Where? or What? Remember your aim is to have a conversation with the person.
- Develop an interview recording sheet for your SSI so that the key responses can be recording in a systematic way for later comparison and analysis.
- Use role-play to practise your interview technique and familiarise yourself with the key questions.
- If necessary, arrange a suitable time and place for the interview.
- Decide within your pair who will ask the questions and who will take notes.
- As a pair, think about the type of person you will be interviewing and how you will introduce yourself to them. From the onset you want to make the interviewee feel at ease and not intimidated or overwhelmed.

Sensitive listening

- Introduce yourselves to the interviewee and explain clearly why you have asked to talk to them. Try to put them at ease by being friendly, chatty and open. Pay attention to your body language and ensure you give off positive signals such as openness, trust and a willingness to listen.
- Ask if it is OK to take brief notes and remind them that everything they say will be treated in confidence.
- An example of some SSI questions is in Appendix D. Start the SSI with some general questions about themselves, their occupation and family **(2a-d).**

Using the main questions **(3a-g, 4a-c** and **5)** you have prepared as a guide, work through the different sections of the SSI. If you get any interesting responses or wish to delve further into an issue or subject ask further questions.

- Remember throughout the interview to:
  Listen carefully
  Pursue interesting issues/responses further
  Ask for clarification if you don't understand something
  Allow the interviewee to ask questions – remember it's a dialogue!
  Try not to ask closed questions (those that give a Yes/No response)
  Keep an enquiring mind and cross-check answers

Recording

- Use a small notebook as Dictaphones can be intimidating to some people.
- Before and during the interview make sure you note down the interviewers' names **(1a),** the date **(1b),** and the farmer's name and contact details (1c). If you are collecting information on the specific management of pastures or meadows ensure you write down the locality **(1d)** and if you know it, the grassland ID number **(1e)** from the rapid biodiversity survey.
- Record the responses to the key questions and issues on the recording sheet. Make additional notes of any interesting detail or issue not covered by the recording sheet. Also note down your personal impressions of the SSI, for example, maybe the interviewee did not openly say something but inferred it instead.
- After conferring with your partner write up the notes of the SSI and enter the data from your recording sheet onto an Access database.

An example of a main question taken from Appendix D (3c), further subsidiary questions (if you receive an interesting response and wish to find out more) and a

corresponding interview recording sheet is given below. You will need to expand your recording sheet according to your set of main questions and possible responses.

Do you keep any livestock?

Which types/breeds of livestock to you have?

How many do you have?

What do you feed your livestock on?

How do you use your grasslands?

When and how often do you cut your grasslands?

Do you apply any manure or fertiliser to your grasslands?

Do you graze livestock on grassland after is has been cut?

LIVESTOCK TYPE	CATTLE	SHEEP	GOATS	HORSES	OTHER
Breed					
Number					
Production method	Stall only	Stall/Pasture	Pasture only		
Daily grazing regime	Morning only	Evening only	All day	Day & night	
Feed	Hay	Concentrate	Hay/Lucerne	Grass	Silage
Grassland use	Grazing only	Hay only	Hay/grazing		

And so on……

After the interview

To ensure continuous improvement in the SSI process it is good practice to review with your partner how the interview went and see if there are any opportunities for improvement. You can do this by asking yourself some simple questions:

- Did you introduce yourself well?
- Was the interviewee at ease and comfortable?
- Which questions were effective? Which weren't?
- Could some questions be phrased differently?
- Can you improve the interview recording sheet?
- Did you give the interviewee an opportunity to ask questions?
- What was your body language like?

6. List of acronyms

EU	European Union
EUNIS	European Nature Information System
FFI	Fauna & Flora International
GIS	Geographical Information System
GPS	Global Positioning System
ID	Identification
IGER	Institute of Grassland and Environmental Research
TWINSPAN	Two Way Indicator Species Analysis
SSI	Semi-Structured Interview
UK	United Kingdom
ŽSGNP	Žumberak-Samoborsko gorje Nature Park

7. References and further reading

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