

Western Fermanagh Patrick McGurn, EFNCP

Brief description of area (can be a small district, county, region, whatever is most practical)

The mixed geology of an area located in the Western section of Fermanagh has resulted in dry limestone grassland running into poorly drained lowland soils, with exposed sandstone on ridges. Long rounded ridges of glacial deposits, becoming flatter further west, are separated by small rivers which head west in narrow wooded gorges, through circular lakes, bogs and wet meadows. In the eastern section limestone escarpment dominates the skylines. The rugged karst relief has been emphasised by glacial action and includes limestone pavements, cliffs, potholes, sink holes and gorges. 100m cliffs descend into a fringe of ash and hazel woodland. The more enclosed, intimate glen landscapes have a mixture of small loughs, patchy fields, scrub woodland and scattered houses. Land use is dominated by small, enclosed rush-infested pastures. Herb-rich hay meadows are still present, due to the continuance of a traditional, low intensity farming system. There are blocks of coniferous planting, but only low native tree cover which is seen around farms and along river valleys. Small scale settlement, a mixture of modern bungalows and traditional farm houses are dispersed throughout the countryside.

Main grassland habitat type(s) in the area and what farming systems they are associated with (or dependent upon)

The area contains a range of grassland types which include agricultural improved swards dominated by perennial ryegrass, semi-improved grasslands where Yorkshire fog and meadow grasses are abundant, species rich calcareous grassland associated with the limestone grasslands, species rich wet grasslands sometimes cut for hay and fen meadow (*Molinia* meadows) which are extensively grazed but occasionally cut for hay production.

Which habitat type(s) are you going to cover in the example?

Species rich wet grassland specifically cut for hay meadows and Fen meadows are the main habitat types covered in this example.



A Fermanagh hay meadow with ASSI designation managed under agri-environment schemes



Scrub encroachment and afforestation have led to a decline in species rich grassland

Approximate extent of habitat type(s) in the area, in total and within Natura 2000

The Northern Ireland Countryside Survey (NICS) is the most accurate measurement of the area of different habitat types. No specific data is available for the Western Fermanagh, the data available for Fermanagh in general is a good indicator. In Fermanagh the estimated area of as Fen Meadow was estimated to be in the region of 4000ha. Whilst the area of species rich wet grassland was under 6000 ha.

Available data on trends, in extent and condition, plus any personal/expert observations.

Between 1986 and 1991, baseline habitat field survey was carried out in a sample set of quarter kilometre grid squares throughout NI. Habitat change was assessed by surveys in 1998 and 2007. The results of the survey show a continual decline in the areas of species rich grassland and Molinia meadows. From baseline survey to 1998 Species rich wet grassland declined by 29% whilst Fen Meadow declined by 21%. The drivers of changed were mixed and included a switch to more intensive agricultural grassland, increasing areas of scrub/woodland and the change of use to coniferous forestry/roads/buildings.

NICS 2007 showed are that while there was continued semi-natural habitat loss, the rate of loss was lower. Agricultural land use and rural building continued to be the

main processes resulting in habitat loss. Scrub/woodland succession in open habitats was much greater.

Agri-environment schemes have been targeted to maintain the areas of species-rich grassland and have been in operation in the area since 1993 giving payments to farmers for specific management prescriptions of species-rich grassland. These schemes have shown some benefits but have been unable to address the decline in hay meadows. In 2002, 1200ha were under agreement as hay meadow in Northern Ireland but by 2008 this figure had dropped to 655ha. Presently it is estimated that there are 522ha of hay meadows under agri-environment agreement.

Butterflies associated with the habitat type(s), data on trends

In comparison with the rest of Europe, Ireland has a low number of butterflies. Fermanagh contains good numbers of many of the butterfly species. The European Butterfly Indicator for Grassland species monitored a total of 17 different grassland species representative of extensive grassland systems, of these 7 are relevant to the Fermanagh area. These include; Dingy Skipper, Small Copper, Small Heath, Orange Tip, Common Blue, Meadow Brown, Marsh Fritillary. Additional grassland species found in the area include Ringlet and Large Heath in some mosaics. There are some historical records for Wall Brown but it has not been recorded recently. Small Blue was once present in one limestone area but has not been recorded for several years.

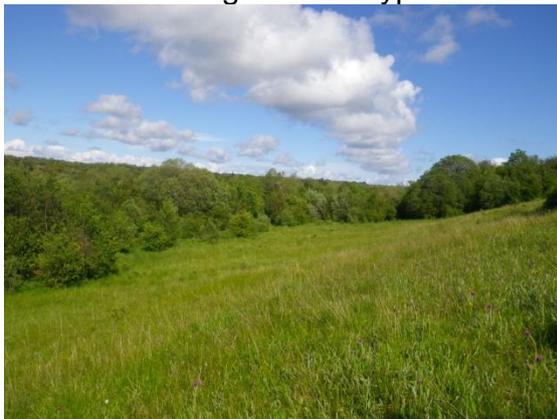
Trends in landuse/farming systems that are affecting the habitat type(s)/butterflies (hard data and observations)

There has been a dramatic change in the farming system in the area. Up until the mid 1980s hay production was still common. Two particular wet summers in 1985 and 1986 led to a loss in the hay crop on many farms. As a result there was a shift to a silage based system. Silage does not lend itself well to feeding in traditional byres and with grant aid most farmers constructed slatted accommodation. For an agricultural point of view this was very successful as it reduced the chances of crop failure allowing heavier applications of fertiliser, more fodder and so increased stock levels. This led to a decline in species-rich wet grassland particular hay meadows. The increasing use of big bale silage production has continued this decline. On the

other side a reduction in cattle numbers is leading to an increase in scrub on some areas with Alder (*Alnus glutinosa*) and Gorse ([*Ulex europaeus*](#)) colonising many former species rich grassland sites. This intensification and abandonment can be evident within a farm, where certain areas are deemed as not worth grazing and excluded from UAA.



Big bale silage has replaced the hay making process and often leads to a more intensive grassland type.



A Marsh fritillary site beginning to scrub up due to a cessation of management.

Existing policy measures and what effects they are having

In general agri-environment schemes in the area are good with the semi-natural vegetation receiving higher payments. As part of the payment there are strict grazing dates and stocking rates that have on some farms lead to a change in management which is not always positive. However the overall policy is good but with increasing financial cut backs many farmers find that when their existing scheme closes there is no new scheme available to enter. In addition recently audits for new entrants no longer involve a farm visit; classification of the land is carried out using aerial photographs. This approach may miss many areas of species rich grassland, specifically meadows and allows no management advice for the field which can only be determined through a visit and discussion with the farmer. If this approach continues then the role of agri-environment schemes as a successful management tool will be limited.

The definition of UAA under SFP is also impacting on some areas. Whilst the scrubbing up of these grassland habitats is detrimental the insensitive mechanical removal of scrub increases the amount of competitive species and can also lead to increased intensification once the field is “opened up”

Proposed improvements to policy measures

LPIS could be used to gather more information on the type of vegetation in the field. Areas of semi-natural vegetation should be recorded both for future protection under EIA Uncultivated land and semi-natural areas regulation and GAEC. It would also allow better targeting of agri-environment scheme monies, farms with high levels of semi-natural vegetation would receive a higher weighting when it came to targeting funds. Inspections for SFP should concentrate more on how the area is managed than on the eligible area. By excluding areas of scrub encroachment and then stacking entitlements there is little incentive for the farm to manage the encroaching scrub sensitively.

Preventing the decline in hay meadows is difficult to address. At present on the Northern Ireland Countryside Management Scheme there is no difference in payment per hectare for a hay meadow and a grazed species-rich field. A

specific hay meadow option with a higher payment if hay is produced is one possible option.



A well managed species rich wet grassland site in Fermanagh. The site contains the butterflies Marsh fritillary, Small heath, Ringlet, Meadow Brown and the moth, Narrow bordered bee hawkmoth. The site is also part of an important area for breeding waders particularly Snipe and Curlew. Controlling the encroachment of Alder (*Alnus glutinosa*) and Gorse ([*Ulex europaeus*](#)) is a difficult task for the owner as he avoids autumn mowing due to the presence of the Marsh fritillary larvae.

How are grassland types recorded on LPIS (Land Parcel Information System) – what categories, and who determines the category for a given parcel, the farmer or the administration?

When completing the Northern Ireland Single Farm Payment (SFP) application the land owner must give each parcel of a land a specific code. Grassland comes under the general code FR1. This includes all types of grassland from intensive perennial rye grass fields to species rich wet semi-natural grassland and eligible heather moorland. Therefore under the general application it is not possible to determine what land is improved or semi-natural. Ineligible parts of the fields for example, pockets of scrub, rock outcrops are given a different code.

There are some examples within the Northern Ireland SFP application where the LPIS does contain categories of grassland types. Any applicant who is a participant in the Northern Ireland Countryside Management Scheme (NICMS) claims their annual payment on an addition column in the SFP application form. Agri-environment schemes in Northern Ireland are whole farm schemes where each habitat type is recorded, originally as a result of a farm visit but as indicated earlier now it is audited using aerial photos. Grassland types within NICMS include Improved, Semi-improved, Semi-natural and Species rich grassland types. The land owner receives a colour coded map of the farm indicating the location and area of the different habitats which they then input into their SFP payment application. Older active agri-environment schemes are also based on whole farm classification with the grassland types Improved, Unimproved and Species-rich grasslands. This information is available on the LPIS but is not recorded on the SFP application. Therefore the total area of land under all agri-environment schemes with the grassland type recorded by DARD is approximately 457,306ha representing approximately 41% of the agricultural area.

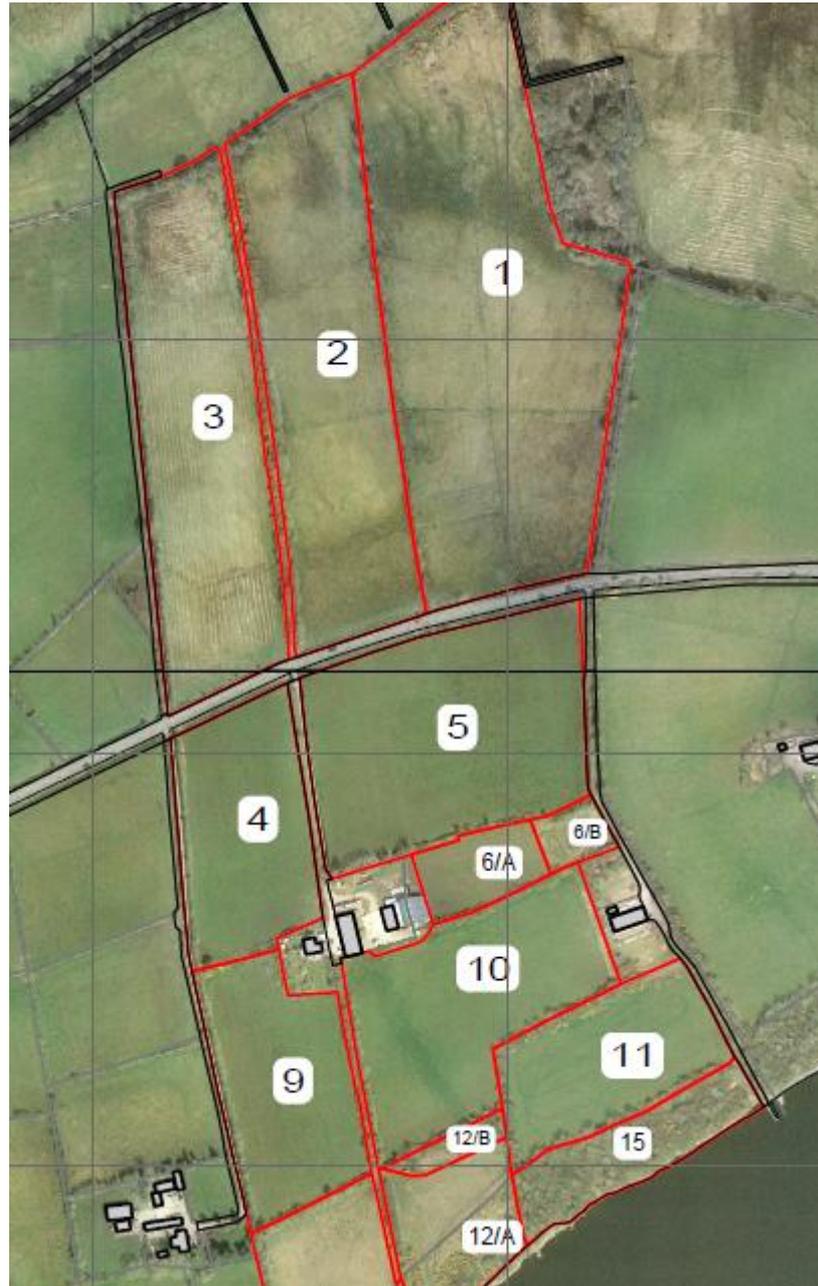
Would it be possible, in theory and practice, to have a separate LPIS category for semi-natural grasslands?

The combination of SFP application and agri-environment scheme application indicates that providing the landowner is aware of the grassland type of a parcel of land, it is possible both in theory and practice to have a separate LPIS category for semi-natural grasslands. However under agri-environment schemes the grassland classification is a result of a specific farm audit using specialised knowledge. Achieving this for a country basis would involve self certification which would be harder to achieve and less accurate. However it would be possible for the government body to aid the landowner. In the 2012 application DARD supplied the applicants with an aerial photo highlighting what they perceived as ineligible using visual imagery. An example of this is shown below with the ineligible areas in yellow labelled OT13, the code for dense scrub. (Image from http://www.gistrategyni.gov.uk/index/news-archive/northern_ireland_farm_mapping.htm)



Under the NICMS audits DARD are also using aerial photography as a means of classifying land instead of individual farm audits. Through combining the two procedures it would be possible to issue a landowner with a map that indicates the areas which are unlikely to be semi-natural, i.e., improved grasslands. This data could then be incorporated into LPIS and errors rectified by the landowner in the SFP application. An example of Northern Ireland farm map is given below. Ground proofing show that fields 4, 5, 5A, 6B, 9, 10 11 are all improved whilst the remaining fields are semi-natural. A visual assessment using good aerial photographs would concur with the actual ground truthing and could be used to estimate the areas of semi-natural vegetation on a farm. The use of satellite imagery and remote sensing may improve results. DARD is presently setting up a £9m contract for an enterprise-wide geographic information system using remote sensing to

improve compliance procedures under SFP and so the identification of semi-natural vegetation could in theory be incorporated in to this. The project is part of DARD's EU Audit Compliance Programme aimed at mitigating the risk of EU penalties.



If this were done, would it provide a good basis for monitoring trends in the extent of semi-natural grasslands, and for targeting support e.g. agri-environment payments?

In theory it would provide a good basis for monitoring trends in the extent of semi-natural grasslands. However it would be difficult to determine how accurate the first year's data is. It could be ground proofed through the

existing annual inspections. When inspection staff determine eligibility they could also check and amend where necessary whether the field is semi-natural or improved. This would give some insight into the accuracy of the procedure. This may involve retraining of staff; however on the current GAEC 6 landowners must retain not damage semi-natural habitats including broadleaved woodland / scrub, moorland, wetlands and species rich grasslands. Therefore it could be assumed that inspection staff already can identify semi-natural vegetation to ensure compliance of the existing SFP rules.

Could sample survey transects provide a good system for monitoring the condition of grassland habitats in the area? If possible, propose what species or other criteria you would monitor, how many sample transects.

Northern Ireland already has in place the Northern Ireland Countryside Survey (NICS). This is an ongoing, sample-based, surveillance programme across Northern Ireland. It assesses the distribution and condition of land habitat types and provides reliable estimates of how land cover changes over time. This is accomplished using the survey of a random selection of quarter kilometre squares; the location of which are kept confidential to maintain the scientific integrity of the survey methodology. The base-line survey was in 1992 with further resurveys in 2000 and 2007. Further details can be found at http://www.doeni.gov.uk/niea/biodiversity/nhresearch/nicountrysidesurvey2/history_of_the_northern_ireland_countryside_survey/nics_report_repository.htm

Could butterflies provide a good system for monitoring the condition of grassland habitats in the area? If so, which species would you monitor, and approximately how many transects would be required to generate robust data.

The European Butterfly Indicator for Grassland monitored a total of 17 different grassland species of which only 9 are relevant to Ireland. These include; Dingy Skipper, Wall Brown, Small Copper, Small Heath, Small Blue, Orange Tip, Common Blue, Meadow Brown and Marsh Fritillary. Some of these species are specific to certain grassland types and so a wider range of species may need to be included for Ireland. This would include more generalist species and therefore may not give sufficient information on the actual condition of grassland habitats. Therefore whilst butterflies are good

biodiversity indicators for monitoring population numbers, to determine grassland condition it should be supplemented with land cover monitoring. Direct vegetation monitoring would be more appropriate for monitoring the condition of grassland habitats. This should incorporate variables on habitat, vegetation structure and composition of importance to butterflies. This monitoring would augment existing butterfly and bird recording schemes carried out at national level across the EU.

Burren Example

James Moran Sligo Institute of Technology and Patrick McGurn EFNCP

Brief description of area (can be a small district, county, region, whatever is most practical)

The Burren (from the Irish *Boireann* meaning 'place of stone') is an area of limestone karst of over 72,000ha, located in the mid-west of Ireland on the Atlantic coast. It is one of Ireland's iconic landscapes and amongst the finest examples of a 'glaciated karst' landscape in Europe. The distinct geology combined with thousands of years of agriculture practiced in the area have produced a unique set of conditions which makes the Burren one of Ireland's most important regions for flora, fauna and habitats.

Main grassland habitat type(s) in the area and what farming systems they are associated with (or dependent upon)

In total, there are three main terrestrial SACs in the Burren, covering an area of 32,725ha, incorporating 16 habitat types listed in Annex I of the Habitats Directive. The terrestrial SACs in the Burren are:

1. Black Head-Poulsallagh Complex SAC (7,805ha) along the north-western coast.
2. Moneen Mountain SAC (6,107ha) encompassing much of the central 'Uplands'.
3. East Burren Complex SAC (18,813ha) which contains much of the lowland region, and features extensive limestone pavement and oligotrophic limestone wetlands.

Habitats Directive priority habitats that occur at the sites include: turloughs (3180), semi-natural dry grassland and scrubland on calcareous substrates

(*Festuco-Brometalia*) (6210), calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210), petrifying springs with tufa formation (*Cratoneurion*) (7220), and limestone pavements (8240). Non-priority habitats include alpine and boreal heaths (4060) and *Juniperus communis* formations (5130) on heaths or calcareous grasslands (5130).

The Burren supports a rich agricultural tradition and several hundred farm families continue to uphold this tradition today. The main enterprise is beef cattle, the type vary depending on the market and support structures. Traditional store cattle were kept, grazing the extensive grasslands and then sold or moved to better land for fattening. In more recent times there has been a rise in beef cow numbers and today most cattle are sold off as weanlings (under 1 year).

The system of “winterage” involves the movement of stock from the lowlands to the uplands in winter. The exact timing depends on the weather and availability of food and is the reverse of the transhumance practice of other areas in Europe. Almost all of the more interesting species and communities of Burren flora are found on winter-grazed grasslands. The unique ‘winterage’ tradition practised in these hills is a fine and fascinating example of how farmers adapted their farm systems over many generations to work with the inherent fertility, and circumvent the particular limitations, of this most unusual of landscapes.

Which habitat type(s) are you going to cover in the example?

Limestone pavements (8240) and semi-natural orchid rich dry grassland and scrubland on calcareous substrates (*Festuco-Brometalia*) (6210).



Limestone pavement (8240)



Semi-natural orchid rich dry grasslands (6210)

Approximate extent of habitat type(s) in the area, in total and within Natura 2000

The area of the Burren is estimated at 72,000ha of which only 1,500ha is state owned with the remainder in private ownership. The SACs cover an area of 32,725 ha which contain 18,900ha of limestone pavement and 1,700ha of calcareous grassland. The habitats occur in a intricate mosaic in which the different plant communities change subtly from one to another along a continuum and therefore the relative proportions of habitat types are difficult to assess accurately (Parr *et al.* 2009). Satellite imagery was used to map the extent and spatial distribution of broad habitat types within 38,413 ha of an area referred to as the high Burren. Within that area 20% (7482ha) was classed as Limestone pavement and 31% (11908ha) as winter grazed grasslands which would cover a range of types of semi-natural dry grasslands (Parr *et al.* 2006).

Available data on trends, in extent and condition, plus any personal/expert observations.

In recent years, a number of changes have threatened this relationship to the detriment of the environment. Farmers have been increasingly required to take on additional work to supplement farm incomes which has meant less time to access remote areas. There also has been an increase in silage feeding on winterages or the use of indoor housing and feeding as alternative to wintering. This reduces

foraging and contributes to abandonment of winter-grazed grasslands and, in some cases, to point source pollution of water resources (Dunford, 2002).

Research has highlighted that on 'undergrazed' sites, diversity levels were 17% lower, and a species-poor, blue-moor grass-dominated sward developed, often the first stage towards eventual hazel scrub encroachment (Dunford, 2002). The significance of this threat is exacerbated by findings from surveys which suggest that many upland areas will be consigned to a future of such neglect (Dunford, 2002). The extensive nature of this problem, and the implications for the agricultural, ecological and cultural wealth of the Burren, suggests that such a discontinuation of agricultural activity is perhaps the greatest future threat to the upland grasslands of the Burren. The visual result of undergrazing and even abandonment is the encroachment of scrub, mainly hazel (*Corylus avellana*) and blackthorn (*Prunus spinosa*). In addition the feeding of additional feed sources, particularly silage, into an intrinsically low nutrient environment is also of concern particularly in terms of the impact on oligotrophic wetlands.

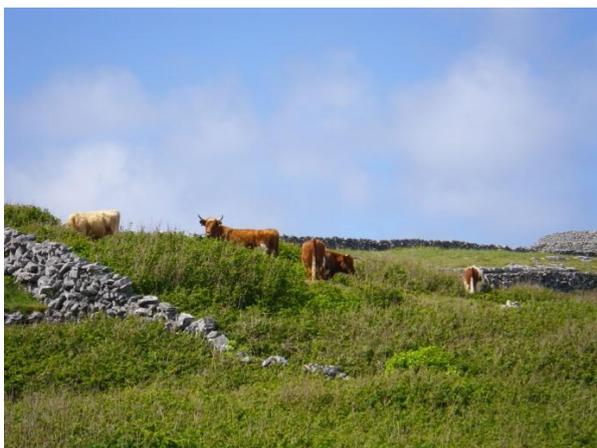
Butterflies associated with the habitat types(s), data on trends

The great diversity of nectar sources and larval food plants makes the Burren ideal butterfly territory. All of Ireland's native butterflies with three exceptions (Gatekeeper, Cryptic Wood White and Large Heath) can be found here. One species, the Pearl-bordered Fritillary, is only found in this region and the Brown Hairstreak is only found here and neighbouring areas. Marsh Fritillary is found in areas where Devil's bit Scabious is plentiful and the Common Blue and Small Blue are common to see. The very grey form of the Dingy Skipper seen in the Burren has been elevated to the sub-species *baynesi*. The area also contains a superb range of moths – two which are endemic to the Burren - the rare Burren Green moth (*Calamia tridens*) and the Irish Annulet (*Odontognophos dumetata hibernica*.)

Trends in landuse/farming systems that are affecting the habitat type(s)/butterflies (hard data and observations)

Farm size in the Burren has doubled since 1970 (to c.240 acres) as small farms have been subsumed into larger entities. The numbers employed on the land have halved over the same period, and today over half of all farm families have a source of off-farm income, further reducing the manpower available to carry on the important, and often time-consuming traditions that define the Burren.

Winter housing of livestock has led some farmers to abandon their winterages whilst the introduction of silage feeding has resulted in point source pollution around feeding sites and lower utilisation of winterages. This results in an increase in rank grasses and scrub at the expense of many of the rarer plants such as Spring Gentian (*Gentiana verna*) and orchid species. Scrub encroachment is a significant problem in parts of the Burren particularly where Hazel (*Corylus avellana*) is spreading on to the semi-natural dry orchid rich grasslands. In 2003 the cover of dense scrub in the main winterage area was measured at 14% but it has been suggested that a further 5-10% was affected by early encroaching scrub (Parr et al., 2006). This is affecting specific butterfly species dependent on maintenance of the open limestone pavement and semi-natural dry orchid rich grasslands. The Brimstone, Brown Hairstreak, Small Blue, Grayling and Wall Brown Dingy Skipper butterflies all like this type of habitat. The future of the Small Blue, listed as Endangered in the Irish butterfly red list published in 2010, is poor if the trends continue. Its sole larval food plant, Kidney Vetch, is unable to survive heavy grazing or being encroached by taller vegetation, such as scrub. It has already been lost from two parts of the Burren National Park where it was previously recorded. There is already a hypothesis that the Pearl Bordered Fritillary is also under threat in some parts of the Burren due to scrub encroachment



Hazel (*Corylus avellana*) encroachment on species rich dry limestone grassland leading to a decline in species such as Spring Gentian (*Gentiana verna*).

Existing policy measures and what effects they are having

Agri-environment schemes

Since 1995, there has been a specific agreement tailored for the Burren under the main agri-environment programme in Ireland, the Rural Environmental Protection Scheme (REPS), which sought to limit summer grazing and supplementary feeding on upland grasslands. In 2000, a high proportion of the farmers (some 70%) in the Burren were in REPS, in part due to inherently extensive nature of farming in the area. Nonetheless, REPS did not deliver sufficiently proactive or targeted improvements on priority habitats to maintain their conservation status. Farmers complained about the lack of flexibility in REPS, such as the prohibition of any summer grazing on winterages, which limited their ability to respond to exceptional circumstances such as disease or extreme weather conditions.

The pilot scheme - 'BurrenLIFE'

The BurrenLIFE Project (BLP) was initiated to develop a model of sustainable agriculture which could be extended to the whole of the Burren region. In total, 20 pilot farms were selected, covering over 2,485ha of farmland designated as SACs, to work with the BLP in developing new interventions while monitoring their impact. Individual farm plans were drawn up, and revised annually, following in-depth consultation between the farmer and the project team. Farmers could nevertheless opt out of all measures on their own discretion. Compensation was made for completed actions, at a rate of between 25-75% of total costs; those actions with a greater conservation value had a higher proportion of their costs paid for. It ran for five years between 2004 and 2009, with a total budget of €2,230,487.

Main successes/outputs of the pilot scheme

The BLP project resulted in the development of a blueprint for sustainable agriculture in the Burren, which succeeded in increasing winter grazing on traditional winterages by 25% (as measured in terms of time spent on winterages, i.e. grazing days). This was achieved through:

- Improving access to winterage sites by clearing scrub from 55km of paths and constructing 5km of trackways.
- Installation of water pumps and tanks to address severe water shortages.
- Restoration of 15,000m of internal stone walls to facilitate animal husbandry.
- Scrub clearance over 100ha of priority habitat.
- Development of a low cost concentrate feeding system to meet the high nutritional requirements of suckler cows over the winter periods, resulting in a 61% decrease in silage use.

The BLP was able to produce a set of accurate costs for these various conservation works, as well as developing a series of best practice guides on grazing, feeding, scrub removal and farming for conservation. Monitoring of the impacts of these measures on priority habitats, water quality, animal health and farmer income found all had a positive impact, suggesting that in future a menu of such measures would be required for the conservation of priority habitats.

Proposed improvements to policy measures

As a result of the favourable outcomes of the BLP and strong support from the local farming community, a follow up programme, called the Burren Farming for Conservation Programme (BFCP), was announced by the Irish Government in 2009. It is funded under Pillar 1 of the CAP by the Department of Agriculture with a budget of €1 million pa over four years (2010-2013) using funds under Article 68(1)(a)(i) of EU Regulation 73/2009. This article allows Member States to pay for specific types of farming which are important for the environment. The objectives of the BFCP include ensuring the sustainable agricultural management of high nature value farmland across the Burren and maintaining or enhancing the conservation status of Annex I habitats. While

participants are provided with advice on how to maximise the environmental benefit from their land (via a site visit, development of farm plans and provision of best practice guidance), farmers are expected to use their own initiative to create the optimal output of species-rich grasslands. Actions and priorities are therefore suggested by the farmer; the BFCP team (funded by the National Parks and Wildlife Service) then advise on which actions the scheme can support. The BFCP now includes 158 farmers managing up to 14,600 hectares of land with 47% of the Burren SACs now under management agreement. BurrenLIFE and the subsequent CAP-funded BFCP are presented as an exemplary “good practice” case in the DG ENV project on Guidelines on the Management of Farmland in Natura 2000. Key innovations of this programme which captured the complexity of the biodiversity and management interactions of the area into three practical output based measures include:

- development of a 10 point “health check” scoring system which is the basis of the grazing payments made per eligible field;
- site enhancement capital works which are co-funded by the farmer;
- simplified map and ortho-based farm plans with a high level of farmer input;
- innovative solutions to long term problems (e.g. silage replaced by tailored complementary concentrate feed, rainwater harvesters, solar powered electric fences and water pumps);
- upskilled and well trained knowledge transfer and advisory support service.



The BFCP, a successful measure for restoring the grazing practices to maintain habitats in optimum condition.

How are grassland types recorded on LPIS (Land Parcel Information System) – what categories, and who determines the category for a given parcel, the farmer or the administration?

When completing the Single Payment Scheme application the land owner claims each parcel of land as Forage, Arable or Other. Guidance notes denote descriptors for Forage areas: De-stocked Areas, Grass, Grass Silage, Mixed Grazing, Permanent Pasture, Rough Grazing, Species Rich Grassland, Traditional Hay Meadows and Traditional Sustainable Grazing. Types of land under 'Other' include areas of Forestry, Woodland Scrub and Rocky outcrops. Therefore under the general application it is not possible to determine what land is improved or semi-natural. The only lands included in the species rich grassland, traditional hay meadows and traditional sustainable grazing are those areas receiving payment under these measures in the agri-environment scheme. As a result this data is more of a reflection of distribution of land receiving payments than an accurate reflection of the extent of this type of forage.

<http://www.agriculture.gov.ie/media/migration/farmingschemesandpayments/singlepaymentsscheme/2012/2012EUSPSTandC.pdf> (page 19)

Would it be possible, in theory and practice, to have a separate LPIS category for semi-natural grasslands?

In theory it would be quite simplistic to have a separate LPIS category for semi-natural grassland. The existing Forage category could be split into two, one for improved grasslands (including semi-improved) and the other for semi-natural grasslands. Definitions of moorland and species rich grassland could be provided in the information booklet and the farmer would then decide the appropriate section

In practise this would be more difficult. Under LPIS a land parcel contains several different fields and so with in a land parcel there may be different classifications, although it would be possible to allocate an area of semi-natural grassland but not the exact location within the parcel without further subdivision and digitisation of parcels. The process would also rely on self

declaration which requires an understanding of the different categories by the applicant and a willingness to declare the land as semi-natural. Without a financial incentive the farmer would fear that by separating the land future intensification would be prohibited.

If this were done, would it provide a good basis for monitoring trends in the extent of semi-natural grasslands, and for targeting support e.g. agri-environment payments?

In theory it would provide a good basis for monitoring trends in the extent of semi-natural grasslands. However it would be difficult to determine how accurate the first year's data is. It could be ground truthed through the existing annual inspections. When inspection staff determine eligibility they could also check and amend where necessary whether the field is semi-natural or improved. This would give some insight into the accuracy of the procedure but would also lead to complaints of increased bureaucracy and administrative costs.

The 2011 European Court of Auditors Report "Is agri-environment support well designed and managed" called for more targeting of agri-environmental payments. It favoured targeting funds to geographical areas, types of farms or farming practices by setting appropriate eligibility criteria. The percentage of semi-natural grassland is a good measure of the biodiversity level of different farms, with High Nature Value farms having a higher percentage of semi-natural vegetation. Therefore having a separate LPIS category for semi-natural grasslands would enable a better targeted approach for agri-environment schemes.

Could sample survey transects provide a good system for monitoring the condition of grassland habitats in the area? If possible, propose what species or other criteria you would monitor, how many sample transects.

A system is required to monitor the condition of grassland habitats in Ireland either through a Countryside type Survey as carried out in Germany and

Britain or using existing grassland inventories as a baseline for resurveying. Presently there is an assessment of the status of the designated habitats under the EU Habitats Directive, but not for grassland habitats outside these areas. There is however an **ongoing National Survey of Grasslands of Conservation Value** funded by the National Parks and Wildlife Service (Department of the Environment, Heritage and Local Government). The main objectives of the survey are the compilation of an inventory of semi-natural grassland sites in selected counties, an assessment of their conservation value and the development of a classification of Irish semi-natural grassland. The survey calculates a score for both the conservation value and for threats using pre-determined criteria. This information could be used as a baseline survey for future monitoring of the condition of semi-natural grassland habitats.

Could butterflies provide a good system for monitoring the condition of grassland habitats in the area? If so, which species would you monitor, and approximately how many transects would be required to generate robust data.

The European Butterfly Indicator for Grassland monitored a total of 17 different grassland species of which only 9 are relevant to Ireland. These include; Dingy Skipper, Wall Brown, Small Copper, Small Heath, Small Blue, Orange Tip, Common Blue, Meadow Brown and Marsh Fritillary. Some of these species are specific to certain grassland types and so a wider range of species may need to be included for Ireland. This would include more generalist species and therefore may not give sufficient information on the actual condition of grassland habitats. Therefore whilst butterflies are good biodiversity indicators for monitoring population numbers, to determine grassland condition it should be supplemented with land cover monitoring. Direct vegetation monitoring would be more appropriate for monitoring the condition of grassland habitats. This should incorporate variables on habitat, vegetation structure and composition of importance to butterflies. This monitoring would augment existing butterfly and bird recording schemes carried out at national level across the EU.

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Swedish Baltic Coast by Tommy Lennartsson, Swedish University of Agricultural Sciences

Brief description of area (can be a small district, county, region, whatever is most practical)

Agricultural landscape at the Swedish east coast in the Roslagen region, the Province of Uppland. A low area strongly affected by the Baltic land uplift, implying that all land below 6 m of altitude is no older than 1000 years. The landscape is a mosaic of bare rock, till, clay, and organic soils. The lime-content in the soil is high. The landscape use follows the mosaic topography, creating a patchy landscape of forest, arable land and grassland. Land use is dominated by small farms, until c 1990 with dairy cattle (normally 10-15 cows per farm), but nowadays with beef cattle or sheep.

Main grassland habitat type(s) in the area and what farming systems they are associated with (or dependent upon)

Till and sandy soils are dominated by species-rich dry-mesic grassland. Close to the farms such till hills are open, but the main pastures are and have historically been forested pasture with pine and spruce. Non-drained clay and organic soils have moist or wet meadow vegetation, some fens being rich fens. Large areas of Baltic shore marshes. All grasslands have historically been subject to grazing or mowing. Many wet meadows have been

transformed into arable land along with the draining of the landscape. From c. 1950 a decline in grassland use has taken place and a large proportion of the former grasslands are now in succession.

Which habitat type(s) are you going to cover in the example?

Species rich dry-mesic grassland on mixed till historically used for grazing or mowing, but today only grazing.

Below are some images of the habitats in question.





Approximate extent of habitat type(s) in the area, in total and within Natura 2000

No data available, but it is the most abundant grassland type in the region..

Available data on trends, in extent and condition, plus any personal/expert observations.

Since 1950 at least 80 per cent of the managed unfertilised grassland area has been abandoned. For forest pastures the loss is even higher. The remaining patches are today managed differently, indicating a loss of habitat quality. In particular, the loss of late management (mowing or late grazing), which used to be a common land use type, has been lost. The causes of the loss are mainly the increased use of arable land for fodder production (loss 1950-c 1970), and the loss of farms/farmers (loss 1970 – present). Due to efforts by the regional conservation foundation Upplandsstiftelsen, considerable areas of still species-rich grassland has been restored and with resumed grazing.

Butterflies associated with the habitat types(s), data on trends

The region is among the richest in Sweden regarding butterfly fauna, as shown by extensive inventories of both macro- and microlepidoptera by Upplandsstiftelsen starting in 1996. In this example we focus on the red-listed *Parnassius mnemosyne*.

Trends in landuse/farming systems that are affecting the habitat type(s)/butterflies (hard data and observations)

For trends, see section Available data on trends, above. The butterflies and their host plants are thus threatened by both reduction of grassland area, and non-

historical management in the remaining patches. The latter has only recently been acknowledged as a problem, mainly due to recent research at the Swedish Biodiversity Centre at The Swedish Univ. of Agricultural Sciences. Non-historical management has proved to be the main reason for poor success (for butterflies and host-plants) of resumed management and restoration performed by conservation authorities during the last 25 years. It has also lead to the conclusion that several of the threatened butterfly species in the region are not adapted to managed grassland habitats, but rather to successional habitats. For example, grazing has in some cases been deleterious for *Parnassius mnemosyne*, which has generated a view of the species ecology that does not connect the species to managed habitats. On the other hand, non-management has lead to succession and extinction of almost all populations of the species known in 1990.

In this example, the ecology of *P. mneosyne* was reconsidered through bio-historical analyses in which data on ecology of the species and its habitat were combined with information about historical land use from historical and traditional sources.



The cows just being released on the pasture that was historically late grazed (image 11 sept 2007)

Existing policy measures and what effects they are having

In general agri-environment schemes in the area are good, with the semi-natural vegetation receiving higher payments. This has no doubt halted the loss of managed grassland area, and is a prerequisite for restoration. However, the regulations for payment have since mid 90-ies been aiming at a fairly intense grazing pressure which has been negative for both host plants and the butterflies themselves. In the last five years the EU-commission and the Swedish Board of Agriculture has set up rules for the density of trees in grassland, which has forced farmers to either log their traditional forest pastures and wooded meadows, or to lose some of the payment. Therefore, the restoration efforts by Upplandsstiftelsen has needed to include attempts to obtain exceptions from these regulations, because both intense grazing and logging is negative for several of the target species.

Proposed improvements to policy measures

Based on the bio-historical analysis mentioned above, the grazing in *P. Mnemosyne* grasslands at the Söderön Peninsula was changed in order to resemble the historical land-use, as derived from historical maps, traditional knowledge etc. The historical information seemed to fit the species and its host plant (*Corydalis* spp). The populations responded immediately to late grazing, from the very rim of extinction (e.g. five flying specimens before restoration at the site Boda) to secure population sizes and considerable spontaneous expansion in the landscape. In contrast, other populations in the region, still managed following the idea that the species is a succession specialist fearing grazing, has continued to decline.

In the most recent RDP several modifications of land use have been possible, including some exceptions from general regulations. The use of this toolbox, however, requires communication between farmers and authorities, and between those working with the RDP and with species conservation. Sweden has put very little effort into such communication and into advice to farmers, which in this particular region has led to simplified grazing regimes that has contributed to the decline of the butterfly fauna.

It is necessary to design the RDP in a way that allows grassland management that is both ecologically and historically relevant, and to allocate enough resources to communication with farmers to make the payment system functioning.

Much grassland is lost at generation shifts in the region, and a directed support to young farmers to facilitate land-use succession would be highly beneficial.

How are grassland types recorded on LPIS (Land Parcel Information System) – what categories, and who determines the category for a given parcel, the farmer or the administration?

It is usually possible to determine semi-natural grassland, improved grassland etc, and to some extent also different types of semi-natural grassland. Ineligible parts of the grasslands, even very small pockets, for example, scrub, trees or rock outcrops are given a different code.

Would it be possible, in theory and practice, to have a separate LPIS category for semi-natural grasslands?

The system definitely allows rather detailed mapping of different grassland types. However, the pocket size of 100 sq-metres is ecologically irrelevant since in the region the grassland types are usually a mosaic of different soil types with rock, of open land with scrub pockets or tree stands etc. The grassland type is the mosaic, not the separate pieces in the mosaic.

If this were done, would it provide a good basis for monitoring trends in the extent of semi-natural grasslands, and for targeting support e.g. agri-environment payments?

In theory it would provide a good basis for monitoring trends in the extent of semi-natural grasslands, provided that the fate of each parcel could be tracked. At the moment this is not done due to problematic tagging of parcels

in the databases. Therefore, more or less only the total area in the agri-environment scheme is given, without information about the area of abandoned, restored, continued grassland etc. .

Could butterflies provide a good system for monitoring the condition of grassland habitats in the area? If so, which species would you monitor, and approximately how many transects would be required to generate robust data.

Butterflies are excellent indicators for habitat quality in this butterfly-rich region, and to some extent also for habitat area and landscape quality. This is because butterflies are closely connected to management, vegetation properties, habitat structure (e.g. light and shelter), and floristic composition. It would be necessary to include also microlepidoptera into the monitoring.

Transect inventories of flying butterflies are extremely sensitive to weather and also rather poorly related to the reproduction habitats and sites. In order to obtain a good indicator for grassland condition it would be needed a methodology in which also the reproduction of some species was used. For example, larval colonies or other traces of feeding on the host plants could be counted or mapped. Also, monitoring of the host plants would be useful.

Germany Vogelsberg Mountains by Benjamin Hill, EFNCP

Brief description of area

The Vogelsberg Mountains in Hesse (Germany) is Central Europe's largest basalt formation. It is the result of extensive volcanic activity in the Miocene (15-17 Mio. years BC). Its highest peak, the Taufstein reaches 773 m. The upper parts of the Vogelsberg (>600 m) – the so called "Oberwald" – is totally free from settlements and dominated by deciduous forests with small meadows and pastures as well as coniferous plantations. Typical for the lower areas are different grassland communities separated by hedgerows with an unusual high amount of extensively managed meadows. Another characteristic are the many springs and streams, which radiate from the highest peak in all directions.

Because of this landscape mosaic of forests with semi-natural grasslands the Vogelsberg is one of the most important breeding area in Hesse for several large raptors, e.g. Red and Black Kite, Honey Buzzard and Hobby as well as Black Stork and Great Grey Shrike. This has led to its designation as a SPA with an area of 63.671 ha. Furthermore, a large percentage is protected as SACs under the habitat directive (~20.000 ha).



Main grassland habitat type(s) in the area and what farming systems they are associated with (or dependent upon)

The region contains a wide range of grassland types which is dominated by improved (fertilised) mountain and lowland meadows cut for silage. Species rich meadows, Molinia- and Nardus-grasslands are mostly restricted to nature reserves and SACs.

The main farming activities in the region are dairy production and suckler cows. Irrespective of agricultural production type the livestock densities are comparatively low, ranging from 0,6 LU/ha for sheep and horses to 1,0 LU/ha for the more market-orientated dairy producers.



Which habitat type(s) are you going to cover in the example?

Mountain meadows (CODE 6520) and species-rich Nardus grasslands (CODE *6230) are the focal habitats in this example. Typical plant species are Globe-flower (*Trollius europaeus*) and Mountain Arnica (*Arnica montana*, see below).



LRT 6520
LRT 6230



Round-headed Rampion (*Phyteuma orbiculare*)
Trifolium spadiceum

Approximate extent of habitat type(s) in the area, in total and within Natura 2000

Of the roughly 20.000 ha designated as a SAC under Natura 2000, only 700 ha are characterised as mountain hay meadows (6520). In baseline inventories a further 150 ha have been identified as lowland hay meadows (6510), while app. 60 ha are classified as species-rich *Nardus* grasslands. All other semi-natural grasslands are exceptionally rare: *Molinia* meadows 16,2 ha (6410), *Calluna*-heaths 4,0 ha (4030), with calcareous grasslands (6212) and alkaline fens (7230) comprising <1,0 ha.

Data for the entire region is deficient but it can be assumed that both lowland and mountain hay meadows will be more widespread. At the same time, the rarer semi-natural grasslands are probably mostly covered by Natura 2000-sites.

It should be noted that the region contains other important grassland habitats not listed on Annex 1 of the habitat directive, like different types of wet grasslands and extensively grazed pastures.

Available data on trends, in extent and condition, plus any personal/expert observations

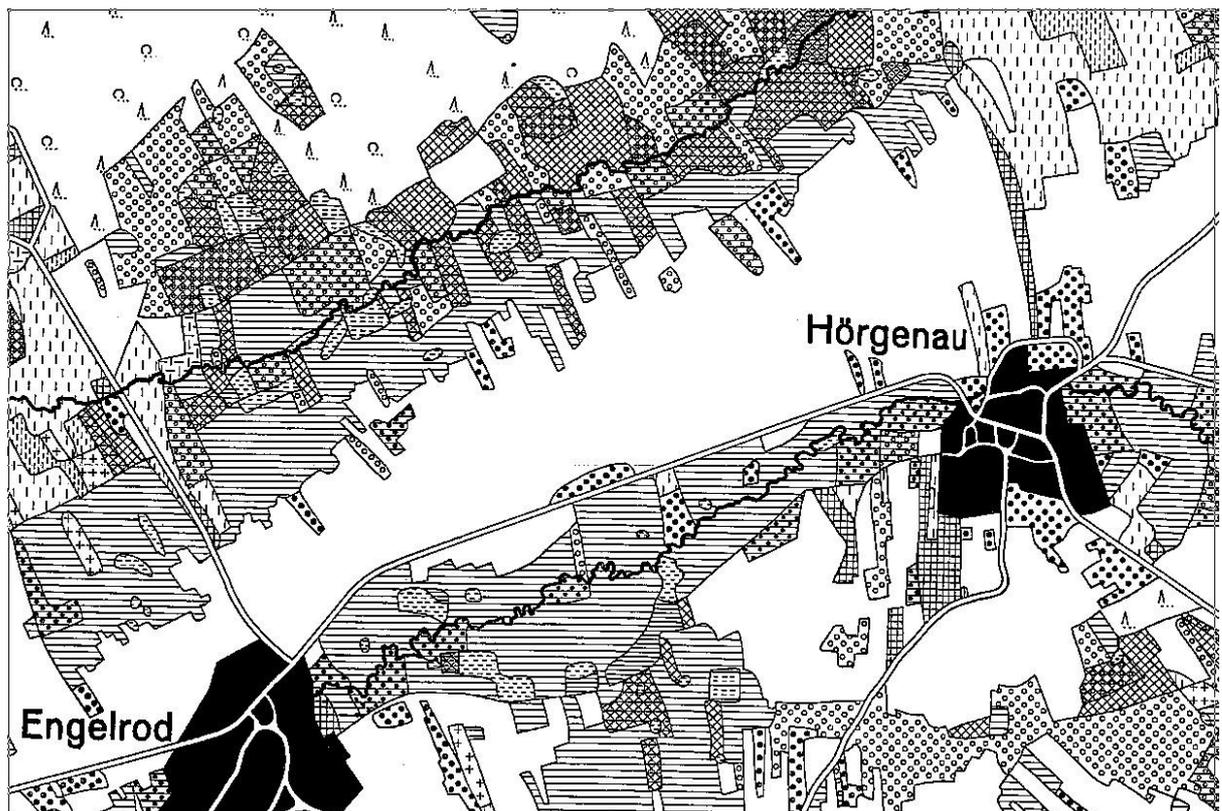
The picture below shows the extent of different grassland types in a typical Vogelsberg municipality in the 1950ies. The high habitat diversity is quite

apparent. Looking at the satellite image taken 50 years later, two facts become obvious:

- The extent of semi-natural grassland has decreased considerably: especially to the north of the small stream Ohe, much grassland has been lost to coniferous plantations.
- There has been a substantial homogenisation process of the grasslands: whereas in the 50ies structurally diverse grasslands dominated in the area, today large-scale meadows are typical.

Other important trends for the region include:

- While the quantitative extent of semi-natural grasslands may have been preserved in SACs and nature reserves, its quality has deteriorated mainly due to eutrophication,
- Intensification has led to the large-scale loss of key species; e.g. today globe flowers are restricted to meadow margins in most areas,
- Nature reserves mostly are no longer integrated into regular farming activities; conservation management by e.g. forest authorities maintain the structural components, but might miss important ecological processes (e.g. dispersal),





Butterflies associated with the habitat type(s), data on trends

A total of 105 butterfly species have been recorded in the Vogelsberg region. Today, only app. 50 % of these remain. Two rather distinct extinction periods can be identified: for roughly 10 % of all species the only records date to the 19th century, these were highly specialised and very scarce butterflies like *Pyrgus alveus* or *Plebeius argyrognomon*. A further 30 % disappeared in the 1960ies to 80ies, in the time of rather drastic changes in the agricultural production. Typical species were Marsh fritillary (*Euphydryas aurinia*), Large blue (*Phengaris arion*) or Scarce copper (*Lycaena virgaureae*).

The most prominent extinction of the past decade has been the Clouded Apollo (*Parnassius mnemosyne*). One of the last known larval habitats was lost due to the construction of skiing infrastructure.

Specialist grassland species occurring today in species-rich Nardus or wet grasslands include Small pearl-bordered fritillary (*Boloria selene*), Bog fritillary (*Boloria eunomia*), Dark green fritillary (*Argynnis aglaja*), Lesser marbled fritillary (*Brenthis ino*) and Woodland ringlet (*Erebia medusa*). Other butterflies depending on species-rich meadows are Green forester (*Adscita statices*), Woodwhite (*Leptidea sinapis*), Chequered skipper (*Carterocephalus palaemon*), Grizzled skipper (*Pyrgus malvae*), Wall (*Lasiommata megera*), Sooty copper (*Lycaena tityrus*), Dusky and Scarce large blue (*Phengaris nausithous*, *P. teleius* – Annex II habitat directive) and Mazarine blue (*Polyommatus semiargus*).

During extensive transect counts in 2012, due to bad weather most of these species occurred in very low densities or were not been recorded at all (e.g. *P. semiargus*).

Unfortunately, there is hardly any data on abundance trends for these species. Furthermore, it is increasingly difficult to distinguish between habitat induced changes and the influences of global warming. A very striking example is the Short-tailed blue (*Cupido argiades*). Extinct in Hesse until 10 years ago, it has now colonised the entire Vogelsberg.



Small pearl-bordered fritillary (*Boloria selene*)
Bog fritillary (*Boloria eunomia*)



Green forester (*Adscita staticeae*)
Scarce large blue (*Phengaris teleius*)

Trends in landuse/farming systems that are affecting the habitat type(s)/butterflies

Currently, the main driving force in land-use changes are the national legislation on renewable energy (EEG). In combination with the political decision to do without nuclear power, this has led to a massive boom in biomass production and the installation of windfarms. This high demand for agricultural land may even speed up the typical processes for mountain areas of intensification and abandonment of the more marginal production sites.



Abandonment / Afforestation
Overgrazing



Intensification
Invasive plants



Windfarms and coniferous tree plantations

Existing policy measures and what effects they are having

The existing agri-environment schemes provide a very valuable asset in conserving species-rich grasslands in the region. Outside of nature reserves, they are responsible for maintaining large parts of semi-natural grasslands. Possible funding in the current AES (HIAP) includes different types of extensive grassland management (max. 360,-€/ha). At present grazing receives higher payments than mowing which is detrimental to maintaining mountain hay meadows.

The AES also allows for specific targeting of grassland habitats and species of both habitat or bird directive, e.g. mountain arnica, whinchat or great grey shrike (max. 660,-€). It takes into account a certain flexibility concerning grazing or mowing dates.

Proposed improvements to policy measures

Due to the high incentives for biomass production and the installation of wind turbines the demand for agricultural land is increasing. Long-term targeting of key habitats therefore is of high importance if conservation objectives are to be reached. Therefore adjusting the payments in accordance with the biodiversity of the habitats would be preferable (higher incentives for mowing of meadows).

Further problems include questions of eligibility of certain grasslands with irregular land-use, but of high conservation potential.

Could butterflies provide a good system for monitoring the condition of grassland habitats in the area? If so, which species would you monitor, and approximately how many transects would be required to generate robust data. - 0.5 page

Using invertebrates for monitoring grassland condition provides a very valuable addition to the more widely used plants, because of their partly more complex life cycles. But, it faces some severe problems: 1) Transect counts are highly influenced by weather conditions, 2) invertebrate abundance tends to fluctuate between different years by orders of magnitude, 3) due to the high level of mobility of butterflies, a large number of visits is needed in order to detect species with a low population density (e.g. Large blue). These problems can only be overcome when analysing large data sets. So, we would need many transects for a given region.

When looking more closely at the situation in the Vogelsberg, it becomes apparent that in large parts of the region the butterfly assemblages seem to be impoverished to a degree that it becomes hard to discern diagnostic species with indicative value. Furthermore, due to the small size of many semi-natural grasslands, edge-effects and dispersing individuals might mask changes in the conditions.

Due to these limitations, I would advocate to concentrate on a small set of species typical for the different main grassland types of the region. Examples could be *Phengaris* ssp. for lowland hay meadows, *Argynnis aglaja* for Nardus grasslands and *Boloria selene*, *B. eunomia* for wet grasslands.

Regional declines in butterflies associated with semi-natural grasslands in southern Sweden, and how to monitor more effectively

Sven G. Nilsson, Lund University, Markus Franzén, UFZ Centre for Environmental Research & Lars B. Pettersson, Swedish Butterfly Monitoring Scheme

Focus area

Småland and adjacent provinces are typical of the wider forest-dominated landscape of central southern Sweden, with small-scaled farmland covering about 5 % (Anon. 2012). Small to mid-sized towns are dispersed sparsely in the landscape with small hamlets spread in between. Soils are typically oligotrophic with low calcium content and lakes and mires are abundant. Open parts of the landscape is generally surrounded by deciduous trees and/or mixed forest stands but overall, coniferous forests dominate the landscape. The area has experienced drastic changes in landscape composition during the last two centuries, with changes accelerating since the 1950s (Nilsson et al. 2008, Nilsson and Franzén 2009). In terms of semi-natural meadows, nearly all hay meadows have been converted to intensively grazed pasture or mostly converted into forest. Likewise, many pastures and previously grazed woodlands in the area have been abandoned and planted with coniferous forests. Open, arable farmland is mainly found near hamlets and is used for crop and ley. Ley has generally increased and ley fields are today harvested for bale silage repeatedly during the season, often beginning as early as May (Nilsson and Franzén 2009). Most ley fields and other arable fields are today fertilized and the regions' semi-improved grasslands are now mostly intensively grazed for animal production. Traditionally, hay meadows in Småland and other parts of Sweden were harvested late in the summer season but the introduction of bale silage has changed this dramatically during the last decades (Dahlström et al. 2008, Nilsson et al. 2008). These new harvesting methods have also had major effects on the availability of nectar resources in the landscape as the onset of the harvest cycle in early June commonly takes place before flowering peaks in summer (Dahlström et al. 2008, Nilsson et al. 2008). The floral and host plant diversity of these parts of southern Sweden is also affected in more subtle ways as the region is exposed to considerable nitrogen deposition from the atmosphere (wet deposition: 10-12 kg ha⁻¹ year⁻¹; Öckinger et al. 2006) causing a decrease in floral and

butterfly diversity. Nevertheless, despite decreases in semi-natural grasslands, changed harvesting regimes and continuing atmospheric nitrogen deposition, the small-scaled nature of many parts of the Småland landscape still presents some of the most diverse and attractive pastoral landscapes of Sweden. Small-scale farms still occurs with their cattle grazing the landscape's pastures and the butterfly fauna still remains richer than most other parts of Sweden.

Main grassland types in the area

The area contains a wide variety of grasslands, ranging from fertilized and managed swards on former arable fields, to the rare semi-natural, highly diverse hay meadows still being managed by farmers and local enthusiasts in late summer (Franzén and Ranius 2004a, Franzén and Nilsson 2008, Nilsson et al. 2008). Extensively grazed woodlands or tree-rich pastures are not uncommon in the area and mirror some of the 19th century grazing commons, although many of today's tree-rich pastures are formerly open ones that have become more closed over time (Öckinger et al. 2006, Nilsson et al. 2008). Overall, semi-natural grasslands that are intensively grazed and sometimes fertilized are the dominating grassland habitat. Cattle and horse grazing dominate, but sheep farming has also increased in the area.

Habitat types in this example

The butterfly trends within the south Swedish countryside that we present here are focused on species-rich semi-natural pastures, hay meadows, and tree-rich pastures in the landscape (Figure 1). The management of ley fields is also covered. More precisely we present results from southern Sweden covering the provinces Skåne, Blekinge, Småland and Östergötland (Franzén and Ranius 2004a, b, Öckinger et al. 2006, Franzén and Johannesson 2007, Franzén and Nilsson 2008, Nilsson et al. 2008).

Extent of habitat types in the area

The proportion of the landscape that consists of pastures and hay meadows in this area is approximately 5% (Data from the Swedish Board of Agriculture; Anon. 2008). In terms of area, the amount of pasture in some of the provinces covered range from 21,000 hectares in the county of Kronoberg (part of Småland), to 77,000 hectares in the county of Kalmar (covers eastern parts of Småland as well as the island Öland). On average, these southern Swedish provinces each contain about 43,000 hectares of pasture (Data from the Swedish Board of Agriculture; Anon. 2012). The extent of hay meadows with traditionally late harvest in generally is very low, and is about 7,800 hectares for Sweden as a whole (Anon. 2012). Furthermore, in terms of farms larger than 2 hectares, the area is about 35% less (Anon. 2008), demonstrating that much of the hay harvest is done by local enthusiasts rather than being part of regular farm economy. The area covered by old, traditionally managed unfertilized meadows is very low. The area used as hay meadows is also highly variable between provinces as demonstrated by it ranging from 75 hectares in Blekinge to 1,998 hectares in Skåne (Anon. 2012). On average, the area is 566 hectares per province but heavily influenced by the large area in Skåne. In contrast, the area used for short- and long-term ley ranges from 16,000 to 123,000 hectares, with 38,000 in the focal area (Anon. 2012). The

extent of these habitat types within Natura 2000 in the focal area of Småland, Kronoberg County, is 928 hectares pasture (4,4% of the total pasture area) and 70 hectares hay meadows (35% of the total hay meadow area) according to the latest (2012) data from the Swedish Board of Agriculture.



Figure 1. Open habitats associated with a rich butterfly fauna in southern Sweden: Upper left) Taxås nature reserve in Småland, a pasture with one part experiencing late grazing; Right) A recently abandoned meadow in Småland; Lower left) An abandoned pasture in Blekinge. *Photos: Markus Franzén*

Butterfly and burnet moth trends in the area during the last decades

Several studies during the last decade have documented distinct decreases in butterfly and burnet moth species richness in south Swedish provinces (cf. Figure 2). It should be noted that burnet moths are generally included in butterfly surveys in Sweden because of the two groups' similar habitat requirements and ecology and we follow this tradition below (Franzén and

Ranius 2004b, a, Nilsson and Franzén 2009, Pettersson et al. 2012). In Skåne and Öster-götland, two early studies documented declines in butterfly species richness, from around 70 butterfly species in the Ringsjö area of Skåne in the 1870s to half as many in the 1990s (Andersson 2002). In the Östergötland study (Douwes 2004), the decrease was clearly detectable but the area still harboured a high number of butterfly species.

After these two pioneering papers, long term declines in countryside butterfly diversity have been documented in several detailed studies from the focal area of the present report. From Kullaberg in north-western Skåne, a 45% loss from the initial 50 butterfly species has been documented between 1953 and 2005 within a 1000 hectare area of mixed forest and agricultural land (Franzén and Johannesson 2007). In Nöbbele, Småland, a 450 hectare area in a typical agricultural landscape, 44% of the 48 butterfly species present in 1910 were extinct in 2003 (Nilsson et al. 2008). Similarly, a survey investigating changes in the butterfly and burnet moth fauna in a set of 13 pasture-dominated landscapes in Skåne, Blekinge and Småland between 1981 and 2002 found that an average 35% of the original 30 species found in pastures of this study (with a combined area of 328 hectare area) had gone extinct in 2002 (Öckinger et al. 2006). Considerably fewer species had colonised the three areas surveyed, 4% were new at Kullaberg in 2005, 6% were new at Nöbbele in 2003 and on average 18% were new in the 2002 survey of pasture-dominated landscapes.

It is worth noticing that most historical Swedish butterfly information on trends is based on presence/absence data as relatively few quantitative analyses have been carried out over time (Eliasson et al. 2005). However, there is now a nationwide butterfly monitoring scheme in Sweden with about 25% of its 271 monitored sites at least partially covering agricultural land on a yearly basis (Pettersson et al. 2012). This new Swedish data is included in the 2012 revision of the European Butterfly Indicator for Grassland species (cf. Van Swaay et al. 2010).

It should also be noted that the importance of grasslands for the Swedish butterfly fauna is clearly evident from the regularly updated Swedish Red List (Gärdenfors 2010). In total, 130 butterflies and burnet moths have been recorded in Sweden; 117 of these are resident and another 13 species occur sporadically as visitors. While no species have been extinct from Sweden during the last four decades, 40 butterfly and burnet moth species are included in the latest Red List (Gärdenfors 2010). On a province level, an average of 4.2 species has been regionally extinct during the period covered, with Skåne suffering the greatest loss with 9 extinct species. The majority of the Red Listed species are closely associated to species rich unfertilized grasslands (Eliasson et al. 2005, Gärdenfors 2010).

Trends in butterflies and burnet moth associated with these habitat types

In Sweden, we presently have 12 of the 17 different grassland species included in the European Butterfly Indicator for Grassland species (Van Swaay et al. 2010). These include Dingy Skipper (*Erynnis tages*), Large Skipper (*Ochlodes sylvanus*), Orange Tip (*Anthocharis cardamines*), Small Copper (*Lycaena phlaeas*), Little Blue (*Cupido minimus*), Large Blue (*Maculinea arion*), Mazarine Blue (*Polyommatus semiargus*; Figure 3),

Common Blue (*Polyommatus icarus*), Marsh Fritillary (*Euphydryas aurinia*), Wall Brown (*Lasiommata megera*), Small Heath (*Coenonympha pamphilus*), and Meadow Brown (*Maniola jurtina*) (Pettersson et al. 2012). Several of these are characteristic of many types of grassland in the focal area of Småland. Five of them, Dingy Skipper, Orange Tip, Large Blue, Mazarine Blue, and Small Heath have all been listed as disappearing or strongly decreasing in two or three of the detailed studies covering Kullaberg, Nöbbele, and the 13 pasture-dominated landscapes in Skåne, Blekinge and Småland (Öckinger et al. 2006, Franzén and Johannesson 2007, Nilsson et al. 2008) causing major concern for the future. Surprisingly, many species that were numerous just a few decades ago have more or less disappeared from the three surveyed parts of the focal area; among those Silver-spotted Skipper (*Hesperia comma*), Scarce Copper (*Lycaena virgaureae*; Figure 3), Purple-edged Copper (*Lycaena hippothoe*; Figure 3), High Brown Fritillary (*Argynnis adippe*), and Mazarine Blue (Nilsson and Franzén 2009). Among species associated with forests and wetlands, Moorland Clouded Yellow (*Colias palaeno*), Pearl-Bordered Fritillary (*Boloria euphrosyne*) and the glade-inhabiting Wood White (*Leptidea sinapis*) have all decreased (Nilsson and Franzén 2009). The Moorland Clouded Yellow and the Pearl-Bordered Fritillary both utilize Bog Bilberry (*Vaccinium uliginosum*) which is a low nitrogen specialist that may suffer from the ongoing nitrogen deposition. The three spectacular species Black-veined White (*Aporia crataegi*), Poplar Admiral (*Limenitis populi*), and Swallowtail (*Papilio machaon*) have all disappeared from the areas investigated in the three detailed studies (Öckinger et al. 2006, Franzén and Johannesson 2007, Nilsson et al. 2008). While all these species represent considerable losses in diversity, there are also colonising species. Interestingly, two species with nitrogen-favoured larval host plants are currently highly successful and are rapidly expanding their ranges through the focal area: the Map Butterfly (*Araschnia levana*) and the Purple Emperor (*Apatura iris*) (Pettersson et al. 2012).

Trends in land use and farming systems that are affecting the habitat types

The land use in the focal area has changed dramatically over the last decades. Before Sweden joined the European Union in the early 1990s, there was a period where large farmland areas were used as set-asides in order to reduce subsidised production of wheat and other crops. The set aside of these areas had a major positive impact on the population size of several bird species (Wretenberg et al. 2007), while the effect on butterflies remains unstudied in Sweden. Soon after Sweden joined the European Union, the set-asides were taken back into production. At the same time, grazing of pastures intensified for a number of reasons. Partly, a high grazing pressure was said to favour the floral diversity, which had been high during historical periods of intensive grazing. Intensive grazing is also easily quantifiable as the sward is kept to a measurable height and this may also have contributed to the implementation of sward height regulations for farmers to qualify for agricultural subsidies. The movement towards more intensive grazing also led to larger areas being grazed by sheep (Figure 2). Altogether, these changes led to a marked decline in flower availability in summer in the agricultural landscape (Franzén and Nilsson 2008, Nilsson and Franzén 2009). Cattle

farmers and horse owners were encouraged to let their animals graze intensively, and sheep selectively picked the flowers present in pastures. This has had clear negative impacts on many butterflies and disastrous impacts on burnet moths (Nilsson and Franzén 2009).

Another trend in recent years has been to harvest hay earlier and earlier, moving the onset of hay harvest back from around Midsummer to early June and now often late May (Franzén and Nilsson 2008, Nilsson et al. 2008). Much of the hay harvest has now also been replaced by repeated bale silage which commonly starts as early as May and then continues 2-3 times throughout the summer (Figure 2). Although much of the bale silage is based on ley harvest from former arable fields, it is also being practised in fields where the grass would have been harvested as hay not long ago (Nilsson et al. 2008). In terms of agronomy, bale silage appears highly successful and productive. It is increasing rapidly in use throughout Sweden and the deployment is nearly 100% in many areas already. Woodland grazing was common 50-100 years ago, but is unfortunately used much less today. This type of management is important for maintaining sparsely vegetated and semi-open woodlands with glades that constitute important butterfly habitats (Nilsson et al. 2008, Nilsson and Franzén 2009). Grazed woodlands in Sweden do not qualify for the same subsidies from EU as semi-natural pastures do and this problem has received much attention lately but remains unresolved (Anon. 2010). Small scale farming is today not an economically attractive profession and this has led to a dramatic decrease in the number of farmers as well as an increase in the number of livestock per farm remaining. Clearly, small farms are disappearing and the remaining ones are increasingly characterised by vast areas of fertilized arable land and large herds (Franzén and Nilsson 2008, Nilsson et al. 2008, Nilsson and Franzén 2009). The disappearance of small to medium-sized farms, many of these being cattle farms that shut down leads to a succession of many semi-natural grasslands that soon will transform them into forests (Figure 2).

Figure 2. Three examples of sites less suited for butterflies: Top left)



Intensified hay cutting of ley fields has a strong negative effect on the butterfly fauna. Here is a storage place for bale silage close to a former Clouded Apollo, *Parnassius mnemosyne*, site in Blekinge; Top right) Succession of former semi-natural grasslands due to abandonment and; Bottom) Intensive grazing early in the season as here by sheep can be devastating for many butterflies, their eggs, larvae and pupae as well as for nectar resources.

Photos: Markus Franzén

Wetlands in the agricultural landscape have been drained in many places, and the fauna of these areas were often seeking nectar on the surrounding meadows and pastures. Thus, because of the twofold effect of wetland

draining and flower-rich pastures and meadows disappearing, species associated with wetlands have declined in the area during the last 50 years (Nilsson and Franzén 2009).

While not being butterflies or burnet moths, the macromoth fauna in general has also declined markedly in the area. This is particularly true for the fauna associated with semi-natural grasslands which harbours several endangered species. Major declines in macromoth diversity were documented in the detailed study of Kullaberg in north-west Skåne (Franzén and Johannesson 2007). Many of the declining species are very sensitive to intensive farming and restricted to non-fertilized grasslands on sandy or calcareous soils. However, there is also new strong evidence that grasslands and ley have a clear positive effect for some moths, both in terms of abundance and diversity (Pettersson 2011). The higher the proportion of grasslands in the agricultural landscape, the higher the macromoth abundance and species richness. Even short-term (2-4 years) ley has been documented to increase macromoth abundance locally (Pettersson 2011).

Existing policy measures, what effects they are having?

Current CAP rules as applied in Sweden favour intensive grazing on the remaining semi-natural grasslands, with strong negative effects on butterfly diversity (Franzén and Nilsson 2008, Nilsson et al. 2008, Nilsson and Franzén 2009). The presumed effects on plant diversity have not been unequivocally verified, compared to the relatively lower and more varied grazing pressure before 1995 in Sweden. Instead the domestic animals have been concentrated on a smaller area, while much semi-natural grassland on small patches and low fertility land has been abandoned.

As an example, the threatened butterfly Clouded Apollo, *Parnassius mnemosyne*, disappeared from most of its few remaining sites in Blekinge when subsidies were applied to manage grasslands (Franzén and Imby 2008) and a similar decline can be expected among other species as intense and early grazing is detrimental for many butterfly species and, in particular, burnet moths (Franzén and Ranius 2004a, b, Franzén and Nilsson 2008; Figure 2 and 3).

Proposed improvements to policy measures

Based on the examples above as well as conservation practitioner experience (cf. Sutherland et al. 2004, Franzén and Nilsson 2008,

and Wennberg 2008). To a certain degree, such habitats are being monitored by the Swedish Butterfly Monitoring Scheme (Pettersson et al. 2012) but the coverage will not match that of the Block Database. Given that some of these areas are moving into and out from CAP relevant habitats, keeping track of these semi-natural grasslands may be a problem that needs to be addressed.

Could sample survey transects provide a good system for monitoring the condition of grassland habitats in the area?

Yes, yearly butterfly counts by e.g. the Swedish Butterfly monitoring scheme, or possibly additional schemes specifically addressing CAP issues, supplemented by yearly targeted surveys by contractors in key areas that are little populated would provide a robust knowledge about trends and the value of the grasslands. The most species rich sites should be particularly targeted since these sites are normally not protected nor covered by other conservation activities. This combination of citizen science and contractor-based surveys has been successfully used for bird monitoring since the 1970s and is becoming widely used in Sweden (Lindström et al. 2012). Using population indices from the TRIM package, it is possible to extract trends for regions, habitat types and specific conservation targets as stated by the government. All this has been tested for the Swedish Bird Survey and is presently being deployed for Swedish butterflies within the national monitoring scheme (Lindström et al. 2012, Pettersson et al. 2012). Additionally, the Swedish Agricultural University is funded, primarily by the Swedish Board of Agriculture, to run NILS, a nationwide biodiversity survey on agricultural land using a 5-year revisiting scheme (e.g., Svensson et al. 2009). In some parts of Sweden, County Administrative Boards run a locally adapted version of this scheme to produce higher-resolution biodiversity data (Anon. 2011).

Could butterflies provide a good system for monitoring the condition of grassland habitats in the area?

Yes, definitely. Butterflies and burnet moths are ideal organisms to value grassland habitats and detect changes. They are easy to observe and identify and have short generation times. Butterflies are a diverse group with some species present more or less everywhere. Their sensitivity to environmental change varies among species and they are diverse and abundant enough to provide good measures of both abundance and species richness in both species-poor and diverse sites. Based on experience from the province of Gotland during the last two years, some 20 transects surveyed three times per year and accompanied by about the same number of localised, more easily monitored point sites would produce good quality data. Larger provinces may need higher numbers but the further one comes in Sweden, these are also often associated with less agricultural land.



Figure 3. Butterflies and burnet moths associated with semi-natural grasslands in the area: Top left) Scarce Copper (*Lycena virgaureae*), Top right) Purple-edged Copper (*Lycaena hippothoe*), Center left) Mazarine Blue (*Polyommatus semiargus*), Center right) Amanda's Blue (*Polyommatus amandus*), Bottom) New Forest Burnet (*Zygaena viciae*) and Narrow-bordered Five-spot Burnet (*Zygaena lonicerae*). Photos: Markus Franzén

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Examples of local declines in semi-natural grasslands, and how to monitor more effectively

Case study: The communities Borsa and Dabaca in the SCI “Eastern Hills of Cluj” (Transylvania, Romania)

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1. Brief description of the area

Borșa and Dăbâca communes are located in the NW of Romania, about 40 km north of Cluj-Napoca (Transylvania). Geographically, the area belongs to the so called “Hills of Cluj”, the south-eastern part of the Someș Plateau, which borders on the Transylvanian Depression. The soils belong to two zonal soil groups: podsolized illuvial soils (argiluvisol) and chernozemic soils (mollisol) on marl and argillaceous marlstone (Pop 1996). The mean annual temperature is 8-9 °C, the annual mean precipitation reaches 600-700 mm (Pop 2001). The research area is characterized by hill chains with medium heights between 450 and 550 m, orientated (N)W-(S)E, leading often to a distinct north/south influence on the hill slopes (Paulini et al. 2011).

The current status of the semi-natural grasslands in the area is highly influenced by the past and present land use as well as by the alarming demographical and socio-economical situation. Until the 1990ies, all potentially exploitable agricultural land has been used, but since about a decade the new phenomenon of land use abandonment can be observed in Borșa and Dăbâca, being in a long-term perspective a real threat for the grasslands, pastures as well as hay meadows. Heavy socio-economical situation, characterized by subsistence farming, high percentage of elderly people and a strikingly low number of people who have a job in the communes, enhances the uncertainty on traditional agriculture future of the area (Paulini et al. 2011).

The extensively-farmed semi-natural pastures and meadows of Borșa and Dăbâca are a valuable but threatened element of the cultural landscape of the new SCI “Eastern Hills of Cluj” within the Natura 2000 network and an important hotspot of plant diversity worldwide. Recent abandonment or reduction of traditional land use practices such as mowing or scrub clearance and intensification of grazing (especially by sheep) are the greatest threats to the cultural landscape of the Hills of Cluj, thus we have identified the need for sustainable conservation strategies in this area.

2. Main grassland habitat types in the area and farming system they are associated with (0,5+0,25 p)

The area harbours a variety of semi-natural grassland habitats caused by the diverse geomorphologic structure, different grassland age and heterogeneous, in most cases non-intensive land use practices. The grasslands belong to dry, mesic, and semi-humid types, formed on calcareous and oligotrophic soils. They are traditionally used as hay meadows managed in local small farming, or as common pastures.

Hay meadows

Many of the traditional hay meadows are landscape units of ca. 40 to 200 ha composed of small meadow parcels. They have a long history of continuous management and are in general characterized by a high number of private owners of small parcels, which lead to a temporal and spatial management heterogeneity, as reported also in other areas of Transylvania (Huband 2008).

These traditional meadows form a distinct landscape feature harbouring the highest plant species richness in the area (see also Wilson et al. 2012) and providing habitat for a large variety of wild fauna. In general, they belong to the semi-dry subcontinental meadow-steppes (*Cirsio-Brachypodion*), often with small patches of intermittently wet meadows (*Molinion caeruleae*) (see table 1). They are mown once to twice per year depending on productivity and weather and not fertilized.

Some of the former cropland has been transformed to new hay meadows during the last two decades, belonging to mesic, often disturbed grasslands (*Cynosurion cristati*) and meso-hygrophilous flood plain meadows (*Agrostion stoloniferae*) (Paulini et al. 2011). Besides these, there are small patches of oatgrass meadows (*Arrhenatherion elatioris*).

Pastures

Traditionally grazing during the summer months was carried out as rough grazing on commons with a long continuous land use history, separated into sheep and cattle pasture, with few exceptions. In spring and autumn the hay meadows are grazed, too. Some rules belonging to the commons grazing system are related to maintaining works carried out by every farmer using the common pasture (Paulini et al. 2011). During the last two decades sheep grazing extended to abandoned cropland, leading to new pastures which in many cases are grazed irregularly.

The main areas of pastures belong to mesic, often disturbed grasslands (*Cynosurion cristati*), and arid subcontinental steppic grassland (*Festucion valesiaca*), latter being a Natura 2000 priority habitat. Minor areas used as pastures belong to the flood plain meadows (*Agrostion stoloniferae*) and subcontinental meadow-steppes *Cirsio-Brachypodion*.

Table 1: Overview of grassland types in Borsa and Dabaca communities. Source (slightly changed): Paulini et al. 2011.

| Phyto-sociological Alliance | Rare species richness | Natura 2000 habitat | Area (ha) | Land use |
|------------------------------------|------------------------------|----------------------------|------------------|-----------------|
| <i>Agrostion</i> | 1 | 6440 | 333 | hay |
| <i>Arrhenatherion</i> | 0 | | 185 | hay meadow |
| <i>Cirsio-Brachypodion</i> | 6 | 6210 | 1175 | hay |
| <i>Cynosurion cristati</i> | 0 | | 2908 | hay |

| | | | | |
|---------------------------|---|-------|------|------------|
| <i>Festucion</i> | 0 | 6240* | 1129 | pasture |
| <i>Molinion caeruleae</i> | 3 | 6410 | 5 | hay meadow |

Old fields

Around 30% of the nowadays permanent grasslands have been used as cropland until 1990. Cultivating was abandoned in the last two decades and fallows were either managed as meadows or pastures or not managed at all, leading to a broad range of different grassland / scrubby stands; they can be called old fields on former cropland. Despite of their young history old fields are often highly productive and their species richness being also comparable with permanent grasslands, as for example Ruprecht (2005, 2006) could show. The unmanaged ex-arable land can sometimes be a threat for biodiversity, as it facilitates the invasion of aggressive alien species, e.g. the Canada golden-rod (*Solidago canadensis*).

The probability of old fields to be converted into arable is higher as for the traditional sites of hay meadows and pastures, as they have a plane relief as former sites of cropland and often still are considered as arable fields by the farmers. In general we can contend that the open land area of the two communities is in parts a highly dynamic system characterized by conversion of arable to grassland and the other way round.

In this paper the traditional hay meadows and to a lesser extent the traditional pastures will be covered because they are the most studied habitat types in the area.

3. The extent of the habitat types in the area and within the Natura 2000 site (0,25 p)

In the study area the grassland area extends over ca. 5735 hectares, which represents 51% of the total surface of Borsa and Dabaca communities (62% of the agricultural area of 9193 ha).

There is no field survey about the real extent of the grassland surface of the whole Site of Community Interest "Eastern Hills of Cluj" (ROSCI0295) (ca. 18 900 ha), as it was only designated in 2011. For a first approximation we therefore used the figures of the Corine Land Cover map 2000¹ including the classes "pastures" (231) and "land principally occupied by agriculture, with areas of significant areas of natural vegetation" (243), which results in an estimated surface of grassland of 6800 ha, 36% of the SCI surface.

As we could show for the communes Borsa and Dabaca (Paulini et al. 2011) the data of the Corine Land Cover Map about the grassland surface in landscapes with a high amount of cropland abandonment tends to be insufficiently correct. Because the other communes of the SCI in principle resemble Borsa and Dabaca concerning the formation structure, we assume that the real extent of the grassland area in the SCI is at least 9500 ha (50%), most probably more. This can be only a rough approximation and more exact data about the grasslands of the new Natura 2000 site are needed.

¹ <http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2000-clc2000-seamless-vector-database-4>

In the studied communities, around 33% of the total grassland surface (ca. 5735 ha) are meadows and around 67% used as pastures. These data include the old fields.

4. Butterflies associated with the habitat types and trends (1 page)

Of the 17 butterfly species monitored by the European Butterfly Indicator for Grassland species 1990-2009 (Van Swaay et al. 2010) 15 species are found in Borsa and Dabaca communities: *Anthocharis cardamines*, *Coenonympha pamphilus*, *Cupido minimus*, *Cyaniris semiargus*, *Erynnis tages*, *Lasiommata megera*, *Lycaena phlaeas*, *Maniola jurtina*, *Ochlodes sylvanus*, *Phengaris (Maculinea) arion*, *Phengaris nausithous*, *Polyommatus bellargus*, *Polyommatus coridon*, *Polyommatus icarus* and *Thymelicus acteon*.

Among the species that are listed in Annex II of the Habitats Directive we can find: *Callimorpha quadripunctaria*, *Catopta thrips*, *Cucullia mixta*, *Eriogaster catax*, *Lopinga achine*, *Lycaena dispar*, *Phengaris teleius*, *Phengaris nausithous* – all besides *C. quadripunctaria* are also on the Annex IV, that is they are species in need of strict protection.

Although the research area shows a high species diversity and number of important butterfly species, studies focusing on *Lepidoptera* species associated with semi-natural grasslands have not been published so far, except for the large blues genus *Phengaris* (Rakosy & Voda 2008, Timus et al. 2010).

As the only European site known so far, the mesic and semi-humid traditional hay meadows of Borsa and Dabaca communities, belonging to the vegetation types *Cirsio-Brachypodium* and *Molinion caeruleae*, harbour all European species of *Phengaris* (*P. arion*, *P. teleius*, *P. nausithous*, *P. alcon/rebeli*) (Rakosy & Voda 2008). Continuous and extensive land use, scything of small parcels and extensive grazing in spring and autumn have shaped these land use mosaics with favourable habitat conditions for *Phengaris* species.

More exactly, the preservation of vigorous *Phengaris* populations in the area has been fostered over time through a randomized mowing regime of the parcels owned by different farmers. In this system, every year, a part of the parcels which harbour fragments of *Phengaris* populations remain unmown or are mown very late in summer, maintaining in this way the metapopulation structure of the species and having as a result the preservation of the large blues (Timus et al. 2010). The mowing of adjacent parcels at different dates in general provides a wide range of suitable habitats and hideaways for animal species and therefore contributes to the high biodiversity of the traditional hay meadows.

5. Trends in land use & farming systems and effects on habitat types and butterflies

5.1 Traditional hay meadows

5.1.1 Abandonment of mowing and property structure

During last two decades the traditional hay meadows have been increasingly abandoned. While up to the beginning of the 1990 nearly their whole surface has been mown (in a heterogeneous pattern) nowadays only a part is mown regularly.

One reason for the abandonment of mowing is the decline of small scale agriculture caused by ageing of the population, poor profitability of small scale dairy farming (milk prices at about 0,15 – 0,22 Euros/litre) and rural (agriculture) exodus of the young (Paulini et al. 2011) – trends which can be found in rural Romania in general.

It can be observed, that in some meadows the property structure, which traditionally is characterized by rows of small parcels, is still somehow respected, while in others big continuous areas are mown, which can be reached by tractor, irrespective of the ownership. This leads to a loss of the heterogeneous land use pattern.

Effects on vegetation

The abandonment of regular mowing of traditional hay meadows – without additional influences – leads to a secondary succession towards shrubby vegetation types and forest, which in the long run results in a decline of grassland species diversity. In the studies hay meadows areas of shrub encroachment, e.g. through blackthorn (*Prunus spinosa*), can be observed.

Considering the grassland characteristics, mowing abandonment can lead to changes in plant species composition (Rudmann-Maurer et al. 2007), change in grassland structure and change in abundance and frequency of dominant species. In the studied area for example an increase of the bushgrass (*Calamagrostis epigejos*), both in abandoned hay meadows and abandoned cropland, can be observed.

Effects on butterflies

The abandonment of mowing is likely to have a positive short-term impact on *Phengaris* populations (Timus et al., 2010). The positive effect of land use abandonment on butterfly species diversity in general is supported by the studies of Balmer & Erhardt (2000), Cremene et al. (2005), Schmitt & Rakosy (2007), and Rakosy & Schmitt (2011). However, after 4-5 years, this process will most likely go into reverse and cause the decline of biodiversity, affecting the *Phengaris* populations as well. The same, abandonment of heterogeneous mowing of the numerous meadow parcels potentially leads to an alteration of the metapopulation structure of *Phengaris* spp.

Mark - release - recapture studies carried out in some of the hay meadows of Dabaca community between 2009 and 2011 revealed the severe decline of *Phengaris nausithous* populations (unpublished data, personal observations of N. Timus).

In order to protect the species diversity and the viable metapopulation structures, there is a strong need to develop strategies for maintaining the current mosaic of habitats characterized by different stages of succession, e.g. through more research, support of traditional small-scale farming and active nature conservation management.

5.1.2 Sheep grazing of the hay meadows during summer months

The abandonment of mowing is often correlated with sheep grazing in summer, which was restricted to spring and autumn in the traditional hay meadow management system. Regarding socio-economical effects this contributes to the cessation of mowing where meadows are on the edge of abandonment because the damage through grazing is an additional reason for the farmers to not to mow.

Effects on vegetation

According to Rudmann-Maurer et al. (2007) the change in the hay meadow management system towards grazing has the following consequences: characteristic meadow species are replaced by generalist plant species, colonization of some species indicating high nutrient levels, decrease of light demanding species, general decrease of species numbers. Humid or sub-humid grasslands, to which parts of the traditional hay meadows in the studied area belong, are exposed to the greatest risk for being altered by grazing (Sala 1988, Milchunas et al. 1988).

Effects on butterflies

The effects of summer grazing on the butterfly populations in abandoned hay meadows depend on the intensity and type of grazing. Extensive grazing can have a positive impact because it prevents or slows down the secondary succession towards shrubs and can therefore contribute to maintaining the butterfly diversity of grasslands.

Intensive grazing of abandoned hay meadows contributes to the decline of the *Phengaris* populations and to the deterioration of their metapopulation structure, which is characteristic for these butterfly species (Timus et al, 2010).

5.2 Grazed areas

During the last 20 years an evident change in animal numbers occurred in the studied communities (e.g. from 1992 to 2010 in Dabaca: cattle 885->285; sheep 1930->3100) (source: locality fact sheet). This led to the following changes in the grazing system:

- increase of sheep grazing on former arable land (which in many cases already can be considered as permanent pasture)
- conversion of cow pastures into sheep pastures, (too) low stocking rate on cow pastures
- local overgrazing by sheep
- bad management of commons, abandonment of shrub clearing and other maintaining works

Effects on vegetation

Observed effects are e.g. shrub encroachment on some parts of the common pastures, which are undergrazed because of the supply with new, often more convenient grazing sites (through cropland abandonment). The installation of these new permanent grasslands may also be facilitated by the rough grazing

carried out, as it contributed to the seed dispersal. On the other site also soil erosion phenomena through overgrazing by sheep can be observed.

Effects on butterflies

Concerning the cover of shrubs, a light increase could have positive effects on the diversity of butterflies, birds and other taxonomic groups. A considerable increase in shrub cover is likely to favour only some species of butterflies (and other insects) and lead to a reduction of the specific biodiversity of grasslands and to a decline in population sizes of *Phengaris* spp.

Summing up, the change of grassland management systems are leading to complex ecological processes. More studies concerning vegetation and fauna are urgently needed in order to understand the effects on grassland structure and biodiversity.

6. Trends in extent of the grasslands

Figure 1 shows a comparison between the area of grassland and cropland in Borsa and Dabaca communities at the end of the 1960s, the end of the 1980s and today (Paulini et al. 2011). The permanent grassland area decreased during the last twenty years of communist agriculture from ca. 40% to 30% and increased again during the last two decades to over 60% (of the agricultural area).

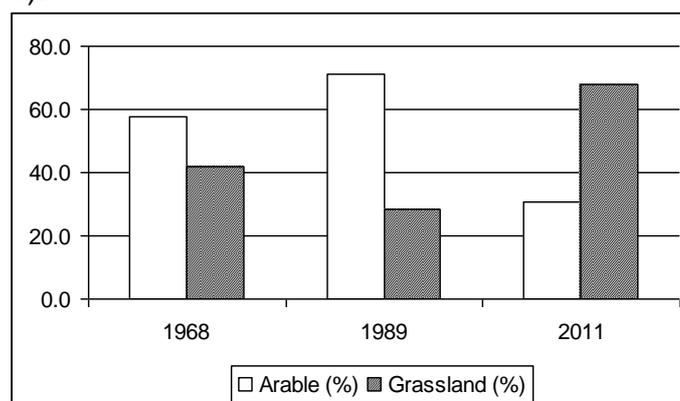


Figure 1: Main land use types in Borsa and Dabaca, 1968, 1989 and 2011, % of the agricultural area (excluding abandoned land). From Paulini et al. (2011)

Sources: 1968: Cadastre map, Agency of Cadastre and Land Registration Cluj;

1989: interviews with experts; 2011: land use mapping

The newly installed permanent grassland (old fields) is semi-natural of varying quality, as described also in chapter 2. We expect the surface of permanent grasslands to decrease again, because an increase of crop cultivation, especially of maize, could be observed during the last 2 years, reconverting the new permanent grassland back to arable.

At the same time, it can be observed that some parts of the traditional meadows and pastures have been overgrown by shrubs, so that they cannot be considered as grassland any more.

7. Existing policy measures and what effects they are having

In the area agricultural subsidies are available through different programmes: Within the framework of the National Rural Development Programme there is an agri-environment scheme available for permanent grasslands; a second smaller scheme has been available in 2011 and 2012 for selected hay meadows within a nature conservation project. Besides these, the farmers obtain direct payments on agricultural land and complementary national payments for livestock. In the following the measures and their effects are explained in more detail:

1. Agri-environment package 6 “Grassland important for butterflies, esp. *Maculinea (Phengaris) spp.*”

This new sub-programme (package) of the national agri-environment scheme was introduced in 2012 for a restricted geographical area of 11 communities including Borsa and Dabaca, due to the occurrence of the butterflies of the genus *Phengaris*. The payments (240 Euros/ha) can be received for all permanent grasslands and the main requirements are:

- the earliest mowing date is the 25th of August
- mowing only allowed by scythe or small hand mowing machines
- grazing with min 0,3 livestock unit/ha (0,3 cows /ha or 1,8 sheep / ha) and max. 0,7 livestock unit/ha (0,7 cow per ha or 4,2 sheep / ha)

Since in the application process hay meadows and pastures are not separated, theoretically meadows can be grazed and pastures mown.

In Borsa farmers (not considering the common pastures) have applied for ca. 60 parcels with the total surface of ca. 100 ha, out of the ca. 3000 ha permanent grassland in the community (including old and new grassland stands). Decisive for the future uptake and success of the measure will be amongst others how strict the controls are carried out.

Some observations about the farmers’ reactions in the first year of this agri-environment programme are described in the following. The effect of the late mowing date was noticeable because of an extraordinary dry year; therefore most of the hay cut after the 25th of August cannot be fed to cattle due to its bad quality. Thus we could observe some frustration because the farmers had to decide between good hay and money. Interestingly enough, the farmers group which is the most important for maintaining the diverse hay meadows through small scale agriculture, the active (semi)subsistence farmers still owning cows, have the biggest disadvantage through this programme.

It will be important to observe if the missing distinction between pastures and meadows leads to a conversion from hay meadow into pasture, as they already are illegally grazed during the summer months (see also chapter 5).

The expected ecological outcomes of the agri-environment programme are positive effects for the populations of the *Phengaris* species which have a late life cycle (*Phengaris nausithous*, *P. teleius*, *P. alcon*). On the other site the late mowing date may be detrimental for the typical plant species composition

of meadows, because the traditional mowing period to which the meadows are adapted is earlier (July to mid of August).

2. Pilot programme for selected hay meadows within “Mozaic Project”

Within an interdisciplinary project funded by the Deutsche Bundesstiftung Umwelt (DBU; project number 27559) a pilot agri-environment programme was carried out in 2011 and 2012. The contracted surface in three traditional hay meadows belonged to the semi-dry steppe-meadow vegetation type (*Cirsio-Brachypodium*).

In 2011 the earliest mowing date of 25th of August was applied and tractor and hand mowing allowed. In 2012 the late mowing date was required only for small parts of meadows, where the *Phengaris* population are the highest; depending on the meadows these parts make up 0 to 30% of the surface. The other meadow parcels underlie no constraint for the mowing date. This approach is regarded as a good solution for both, the farmers and nature conservation purposes, but would need a change in the LPIS system, from eligibility on commune to parcel level, to work on a wider scale.

The pilot programme had the same problem as the national agri-environment scheme (at least in 2011), that the active small scale dairy farmers had the biggest disadvantage through the late mowing date. Some farmers may also have been confused by the two programmes running parallel in 2012 (but not for the same parcels). However, the intensive information, regular presence and support, uncomplicated course and controls on 100% of the surface have served as an encouragement and positive example of agri-environment schemes for the farmers, potentially facilitating the uptake of the national schemes.

3. Direct payments (Single Area Payment Scheme)

The direct payments (ca. 110 Euros/ha in 2012) are an important support for farmers in the studied area, especially for the small-scale farmers. However, in some cases they, as well as the agri-environment payments, contribute to the replacement of farming in order to produce food and forage by working the land in order to receive subsidies (see also Sutcliffe et al. in press). This can be a problem for the grasslands, because the sustainable land use, which was respected by the farmers in order to maintain the source they were depending on, plays a minor role.

This trend is particularly obvious for the common pastures, which are experiencing a decline of the traditional management system anyway, and are nowadays often seen as a “cash cow” for private tenants, some local authorities or dysfunctional farmers associations (Sutcliffe et al. in press).

4. Complementary national payments for livestock

Another important venue, especially for the small scale farmers with dairy farming are the complementary national payments for livestock (two subtypes

for cattle and sheep/goats). However, the cattle payments are calculated for the animal number the farmers were having in 2008 (minimum 3 cows), no matter how the actual situation is what can lead to aberrations to the disadvantage of active farmers.

In 2012 the farmers received 460 RON (EUR)/cow/year, which is less than for example in 2009 (571 RON - EUR/cow/year).

8. Proposed improvement to policy measures

8.1 Problem: Endangerment of traditional hay meadows

The solutions should address: support of dairy and small-scale farming, reward of extensive mowing, mosaical use of meadow parcels and prevention of summer grazing of meadows. Proposed actions to take:

- Policy instruments to assure a fair milk price to the farmers (e.g. 3,5 – 0,45 Euros / litre)
- Uncomplicated support of small-scale farmers, young farmers and farmer's associations to reinforce small scale agriculture and structures which improve dairy farming, e.g. through decreasing the necessary co-financing rate for rural development measures or free advisory service for accessing funds
- More information about the policy instruments so that they actually reach a large number of farmers
- Change the reference year for the complementary national payments to the respectively current year and increase the payment for cattle
- Reintroduce hay meadows as own land use unit in LPIS (see also chapter 9)
- Introduce a new agri-environment measure targeted at hay meadows, which stipulates regular mowing and offers a fair rate to the farmers
- Respecting of the mosaical property and land use structure as well as preventing of summer grazing will take place if mowing pays off for the owners
- A special protection for old grasslands could be discussed

8.2 Problem: Decline and quasi-privatization of common pastures

The solutions should address: Protection of common pastures because of their natural value and importance as a system of common values and identity. Proposed actions to take:

- Support for building up functional farmers associations, especially for common pastures

- Requirement of a management plan for common pastures – this is already stipulated in the grassland law 214/2011, Art. 9 and 10² (the law not being yet operative)
- Support the transparency of common pastures administration and subsidy utilisation, e.g. by controls through superordinate office, better information of the farmers

8.3 Problem: Eligibility for agri-environment programmes on communal level

In Romania the eligibility for the agri-environment packages is decided for the communal level unit (LAU 2). For example, in the two studies communes the agri-environment package for High Nature Value grasslands (package 1 + 2) is not available and at the moment it wouldn't be possible to run this and the package 6 for butterfly grassland in parallel within one commune. Under these circumstances highly targeted packages like no. 6 can have more negative than positive effects, as described in chapter 7.

A solution for this dilemma is to introduce the eligibility for agri-environment programmes on parcel level (for a transition period maybe on physical block level), which would improve the targeting of the agri-environment payments, as also requested by the European court of editors in their special report nr. 7.

As long as this is not possible, for our area with important occurrences of *Phengaris* spp. butterflies, we consider no restriction of the mowing date as the best solution (or with the date of 1st June), as there remain unmown meadow parts anyway, at least this can be predicted for the next few years. However, also in this case it would be better to have the option of exceptions of this general agri-environment programme for the parcels supporting the biggest *Phengaris* populations, especially in a Natura 2000 site.

Additionally, for the period in which the eligibility remains on communal level, we suggest to redefine the selection of communes declared as HNV-area for package 1 and 2 by including all the communes being part of Natura 2000 sites as well as other communes, for which scientific studies show the importance of the semi-natural grasslands. This would be a less preferable solution compared with the eligibility on parcel (physical block) level, but nevertheless an improvement to the current situation.

8.4 Problem: No quality criteria used for grassland payments

There is no distinction made between semi-natural and intensively used permanent grasslands, even in the communes accessing the agri-environment package for HNV (semi-natural) grassland, because the LPIS land use categories don't allow for it (See also chapter 9). A solution would be the introduction of a separate land use class for semi-natural grasslands (see chapter 10).

² http://www.dreptonline.ro/legislatie/legea_214_2011_organizarea_exploatarea_pajistilor.php

In the long run, the agri-environment schemes should develop towards better targeted measures in terms of geographical targeting (eligibility on parcel level) and direct targeting to biodiversity outcomes (for example through adding an element of outcome-based payments to the current action-based payments).

9. How are grassland types recorded on LPIS ?

In the year 2012 the situation is the following: In the main category of **arable land** these subcategories linked to grasslands are included: forage plants, temporal grasslands and uncultivated land. In the application form for direct payments 2012 **temporal grasslands** are defined as artificial grasslands, sown on arable land for less than 5 years, while **uncultivated land** is arable land deliberately left uncultivated but kept in GAEC.

The category of **permanent grasslands** is divided into the following 4 subcategories:

- communal permanent grasslands used commonly
- permanent grasslands used commonly
- communal permanent grasslands used individually
- permanent grasslands used individually

The definition for **permanent grasslands** follows the EU wording and therefore bares the same weaknesses, which are discussed for example by EFNCP in **xx**: permanent grasslands (pastures and hay meadows) is land used to grow grass or other herbaceous forage, either natural (spontaneous) or cultivated (sown), which hasn't been included in the crop rotation of the holding for 5 years or longer; in this sense "grass or other herbaceous forage" means all the herbaceous plants traditionally included in the natural grasslands or in the seed mixtures for pastures or hay meadow (independently of the land is used for the grazing of animals).

Interestingly, the subcategories of permanent grasslands have changed over time: In the year 2009 there existed only the division into "natural pastures" and natural "hay meadows". In 2010 the category "communal pastures used commonly" was added, also linked to the fact that from this year on it was not possible any more for the town halls to apply for area based subsidies for communal pastures in use, but they had to be rented. In the year 2011 a new category was added, "permanent grassland used commonly", and in 2012, as mentioned above, the distinction between pasture and hay meadow was abandoned and the aspect of commons used individually included.

There are two trends to observe:

1. Hay meadows and pastures are not longer distinguished (since 2012) – what partly represents an adaptation to reality, because many hay meadows

are grazed and step by step transformed into sheep pastures nowadays. The decision to not have them any more as a distinct land use category can be interpreted that the policy agrees with this development– what in our opinion is alarming and should be revoked (it could be also just an issue of having a simple set of categories though).

This is clearly opposed to our proposal of introducing a separate agri-environment package for hay meadows. More lobbying is needed from the nature conservation part to support the maintenance of the ecologically different and highly valuable traditional meadows and to make policy recognize the importance of protection measures, as many other European countries do – also linked to the obligation to protect species and habitats on the annexes of the bird and habitats directives.

2. The second topic which has created new land use categories every year is the governance of the communal grasslands. The definition of new categories of commons goes along with regulations in the annexes of the direct payment application form.

The frequent changes of grassland categories made during the last years show that there are important and quick developments in the management of grasslands. Nature conservation and science plays an important role by describing the changes and their drivers and offering policy recommendations of how to mitigate possible deteriorations of the semi-natural grasslands.

10. Would it be possible, in theory and practice, to have a separate LPIS category for semi-natural grasslands?

When introducing a new LPIS land use category three things are important: The definition, the identification of the parcels belonging to the category and the information about the change. There are two possible ways to identify parcels belonging to semi-natural grasslands: Carrying out a national survey of semi-natural grasslands / vegetation, what you could call a top-down approach, or using the indication of the farmer about the land use, what would be the bottom-down approach. The first possibility requires many sources in terms of qualified staff, money and time, but has the advantage to be comprehensive and offer much information for nature conservation and spatial planning purposes.

The second approach, identifying semi-natural grasslands on basis of the farmers' indication could be implemented in short time, because it would require only a proper definition and the introduction of a new category of permanent grasslands. The definition could be linked to the way of farming, that is, those grasslands would be called semi-natural, which are managed in

an extensive or traditional way, e. g. with no or little fertilizer, no chemicals, no silage or low stocking rates.

It would be very important to find definitions easy applicable by the farmers and the farmers inform the local authorities, who in many cases are involved in the application process, properly about the semi-natural LPIS category.

The benefits of having a separate LPIS category for semi-natural grasslands are obvious: it would allow a much better targeting of agri-environment payments, which at the moment are paid for all types of grasslands, be it intensively or extensively used. The additional administrative effort seems justified considering importance of Romania's grassland heritage on a European scale. Moreover, there seems to be a clear disequilibrium regarding the level of accuracy with which arable and grassland are recorded: in 2012 there were 58 different subcategories, but only 4 permanent grasslands.

11. If this were done, would it provide a good basis for monitoring trends in the extent of semi-natural grasslands, and for targeting support e.g. agri-environment payments?

The information about land use is not given for all the parcels, the number of declared parcels varying between the physical blocks. Studies would have to be done to find out if the indications of the farmers would be enough to monitor the trends in the extent of semi-natural grasslands.

12. Could sample survey transects provide a good system for monitoring the condition of grassland habitats in the area?

During the vegetation mapping transects of the grassland vegetation were carried out along ecological gradients. However, transect surveys alone do not provide information needed to assess grassland condition. A complementary method is needed, such as vegetation relevés, preferably on permanent plots, in which grassland condition attributes are recorded. There are two categories of grassland condition attributes indicating: (1) evident change of grassland composition, (2) trends in grassland composition. The first category of attributes (called primary attributes) includes plant functional groups sensitive to grassland management such as cover of grasses and herbs for dry grasslands, or indicator species for semi-humid and wet grasslands. Indicator species are meant to show both positive and negative effects of land use on grassland composition, but also local distinctiveness between different grasslands types. Primary attributes should be selected in function of grassland vegetation type to be monitored, respective of management types applied in the area. The second category of attributes

(called secondary attributes) refers to measurements of vegetation parameters (such as vegetation height and litter accumulation) which provide early indication of impending decline in compositional attributes. Assessment of grassland condition method presented here follows the example of Common Standards Monitoring Guidance for Lowland Grassland Habitats, published by Joint Nature Conservation Committee of UK Government, Version February 2004.

13. Could butterflies provide a good system for monitoring the condition of grassland habitats in the area?

Butterfly species composition and relative abundances are sampled using standardised transect counts (Pollard and Yates 1993). The transect length has to be proportional to the grassland area; in general for 1 ha of grasslands 100 m transect have to be surveyed, the transects being divided into segments of 100m.

Lepidoptera in general are accepted as sensitive indicators of environmental quality and changes (Erhardt 1985, Kudrna 1986, Kiser 1987, Porter et al. 1992, Thomas 2005, Wirooks 2005, Schmitt and Rákósy 2007), and especially the *Phengaris* species have been shown to be a good indicator for biotope quality (DeVries 2004 Skórka et al 2007). But knowledge of habitat preference of butterflies and moths gained in one region should be applied with caution in practical management planning elsewhere, even in areas with similar climatic conditions (Pöyry et al. 2005; Baur et al., 1997; Rákósy and Schmitt, 2011).

Results of mark-release-recapture analysis in the area of Borsa and Dabaca communes demonstrate that monitoring just a few species of Lepidoptera will not provide a real vision of grassland habitats. In 2009-2011 every studied species in the same meadow showed a different trend: the population of *Phengaris nausithous* suffered a severe decline in contrast with *P. teleius* that showed an important growth of population, while the *P. alcon* population was stable over the years.

Thus, we consider that a shopping-basket-approach (measuring species richness and abundance of several taxonomic groups instead of just one (Launer and Murphy, 1994; Oliver and Beattie, 1996; Cremene et al, 2005) will be an appropriate system for monitoring the condition of grassland habitats.