Annex 7 Part 2 to Grassland Recovery Paper

Semi-natural grassland Case Studies from Turkey, Italy, Greece , Hungary

1 An introduction to Turkey's Steppes (grasslands) by Didem Ambarlı, Evrim Karaçetin, Hilary Welch, Geoff Welch

Biogeographically, Inner Anatolia is particularly varied and rich, and very different from the rest of Europe. This is due to the fact that it lies at the junction of three continents, the intersection of three phyto-geographical regions and on an extension of the Eurasian steppes, in a separate biogeographical region from the rest of Europe (European Environment Agency 2012).

'Steppe' is the word used in Eurasia for grassland. It originates from Russian, and is defined by the Forage and Grazing Terminology Committee (1992) as '*semi-arid grassland characterized by short grasses occurring in scattered bunches with other herbaceous vegetation and occasional woody species*'. Steppe and grassland can thus be used interchangeably, but Eurasia's steppes include far more variety than Europe's grasslands. Thus, although the development of phytosociological descriptions, identification of EUNIS habitat types and mapping of steppes has barely begun, it is foreseen that many different habitat types will need to be identified to include all the variety of Turkey's steppes in the Habitats Directive. Further, with half of Turkey's 8,897 plant species occurring on steppe (Vural and Adıgüzel 2007) they can also be expected to support a wide diversity of butterflies.

For butterflies, Turkey is the richest country in Europe, with around 380 species and 45 endemics (Karaçetin and Welch 2011). Lycaenids (hairstreaks, blues and coppers)–a group particularly associated with grasslands–are prevalent with 160 species. Almost one third of these (52 species) are placed in the subgenus *Agrodiaetus* Hübner, 1822, a species-rich group of blues particularly well-represented in Turkey and Iran. In Turkey they are closely associated with the steppes of Inner Anatolia and many are restricted to lowland sites at altitudes of between 900-1800 m. However, taxonomically this is a problematical group and the ecology of *Agrodiaetus* is not yet sufficiently well known to understand the impact of human use on populations.

The identification of Turkey's Prime Butterfly Areas (PBAs) revealed the importance of the steppes of Inner Anatolia for butterfly diversity, with 33 of the country's core set of 65 PBAs located here, all including a considerable area of steppe (Karaçetin *et al.* 2011). The butterflies of steppes include several endemic and threatened species including Mesopotamian Blue (*Polyommatus dama*) an Endangered endemic of the dry steppes of southeast Anatolia, Theresia's Blue (*Polyommatus theresiae*) an Endangered endemic known from only one locality in the Taurus Mountains, and Anatolian False Argus (*Aricia hyacinthus*) a Near Threatened endemic of western Anatolia.

Within Turkey, the most important habitats for butterflies–supporting populations of 52% of all 380 species recorded in Turkey–are the North Anatolian hay meadows (Karaçetin *et al*. 2011). Lying in the foothills of the Caucasus the varied mountainous structure here provides a rich geographical mosaic, and populations of scarce species, such as *Phengaris nausithous*, which require a very delicate management balance, still survive here. This is largely because, at present, traditional agriculture and animal husbandry are still widely practised, but things are changing and land abandonment is an increasing problem. However, currently the widespread construction of hydroelectric schemes in this region is considered the most serious threat.

Figure 1. Turkey's geographical regions. Each region is defined by the presence of mountain chains that physically separate regions and result in climatic, vegetational and cultural differences. Central Anatolia, Eastern Anatolia and Southeastern Anatolia are the regions where dry grasslands (steppes) are mainly located.

Central Anatolia is a 151,000 km^2 rolling plateau in the rain shadow of the Anatolian mountain ranges which lie to the north and south. Elevation ranges from 800 to 1600 m and the geology is mainly composed of sedimentary rocks such as limestone and marl, but there are also scattered volcanic formations. Scattered lakes, wetlands and branches of the Kızılırmak and Yeşilırmak rivers add to the habitat diversity of the region.

At the very centre of the region lies the major depression of Tuz Lake, with halophytic herbaceous vegetation around the saline lake's shores. Historically, the main source of income here was from salt extraction from the lake and livestock keeping on the surrounding hills. But recently an extensive area of salt steppe around the Lake has been destroyed for sugar beet cultivation, grown with high input of groundwater and chemicals.

Plain steppes dominated by *Artemisia* species cover the lowland plains (900-1200 m) and the areas around lakes. Among the numerous herbaceous plants growing here are many of the plant families used as hostplants by the caterpillars of Lycaenid butterflies, including legumes such as *Astragalus, Vicia, Coronilla* and *Hedysarum*.

Peripheral to the region (1200-1600m) are the mountains, supporting a forest-steppe-agriculture mosaic. As the elevation increases, *Astragalus*, *Acantholimon* and *Onobrychis* species–genera which provide the foodplants for many species of *Agrodiaetus* caterpillars–become more dominant. Pine forests or oak-juniper shrublands have a patchy distribution between the areas of montane steppe.

Finally there are the gypsum steppes. Although gypsum has a scattered distribution over only 0.5% of Turkey, it results in a distinctive low-growing and sparse vegetation in discreet areas of Inner Anatolia.

Land use

The plain and montane steppes of Central Anatolia are mostly the result of human activities such as forest clearance, cultivation, fires, grazing and climatic changes over the last 10,000 years (Asouti and Hather 2001; Çetik 1985). Active use of the steppe's natural resources by the villagers and nomads who settled here created a structural mosaic within the vast landscapes. This is comprised of extensive productive lowland plains cultivated with cereals and pulses, interspersed with smaller, more productive patches used for hay meadows and rotational cultivation; alongside these areas the semi-natural steppe vegetation is grazed–mainly by domestic sheep, goats and, to a lesser extent, cattle and rarely wild herbivores–while the neighbouring shrublands and highland forests are managed for their timber, providing fuel and construction materials. Thus the majority of traditional farms are mixed, practising plant and animal production together, and are typically small-scale–more than 83% of farms are smaller than 10 hectares (Karagöz 2006, *In* Redman and Hemmami 2008). This traditional land use contributed to maintaining the region's structural diversity and related biodiversity. Redman and Hemmami (2008) state that until the 1950s arable land formed a mosaic of small plots with complex patterns of land ownership and tenure, surrounded by vast grasslands grazed by the local livestock.

3 HABITAT CHANGE AND THE STEPPE FRITILLARY

Extensively grazed steppic habitats were once the dominant landscape in Central Anatolia, but today most open lowland landscapes are ploughed and cropped and there are very few areas where the original semi-natural vegetation remains and small-scale traditional farming is practised.

Between 1950-1980, the lowland steppes of Central Anatolia were extensively destroyed, degraded and fragmented as–with financial support for mechanization–use of tractors became widespread, large areas of government land were turned over to agriculture, and marginal land and rangelands were ploughed for crop production (Kazgan 2003). Between 1940-2000, the total area of rangeland in Turkey reduced by more than 70%, from 44.2 million to 12.4 million hectares (Karagöz, 2006 *In* Redman and Hemmami 2008). Despite the shrinking size of rangeland, in the same period livestock numbers increased, and by 1965 overgrazing–at levels 3-4 times the land's carrying capacity–was a serious problem (Fırıncıoğlu *et al*. 2007; Redman and Hemmami 2008) resulting in erosion, decreased soil productivity, and desertification. Then, in the 1980s, agriculture lost its state protection and control and came under the effect of the world economy (Kazgan 2003). Almost immediately the rate at which arable land was expanding began to slow down and animal husbandry started to decline (Kazgan 2003) trends which continue today. As a result, land abandonment–which had begun in the 1950s and 60s (Akgündüz 2008)–increased dramatically, and between 1990-2000 five million people (almost 8% of the population) moved from predominantly rural to predominantly urban areas (Redman and Hemmami 2008).

The effect of these dramatic land use changes on steppe plants and butterflies has not been documented. However, it can be assumed that–although land abandonment is probably taking place in the lowlands of Central Anatolia–it is likely to be on a small scale as these are among the areas most suitable for agriculture. Despite this, all Central Anatolian cities, including Ankara, have experienced huge immigration, and this has led to increased and uncontrolled urbanization. Thus, although unsustainable farming remains a threat on lowland grasslands, today the main pressures on the remaining small areas of habitat are from road building, housing, industrial developments, recreation and amenity afforestation.

Against this background it is sobering to consider that there is not a single protected area in Turkey specifically designated or managed to maintain lowland steppe biodiversity. The only exception is Tuz Lake Special Environmental Protection Area (Şekercioğlu *et al*. 2011), a huge salt lake surrounded by salt steppe and intensive agriculture, which is designated for its biodiversity as a whole.

Butterflies associated with flower-rich, dry lowland grassland

With such major changes in grassland use and area, it is certain that the populations of butterflies in the steppes of Central Anatolia have declined in the last 70 years, but there is no systematically collected data which can be

used to quantify the decline. The greatest concern is for those species which occur only or principally at low altitudes, as it is low altitude grasslands which have been most heavily impacted by the changes and reduced to the smallest fragments.

During the work on species assessments for the Red Book of Butterflies in Turkey in 2010, it was recognised that the steppe fritillary (*Euphydryas orientalis*) appears to have had a major retraction in its range (of 98.9%) between 1930-1980, coinciding exactly with the huge changes in agriculture detailed above, and indicating that the species may be particularly sensitive to agricultural change. It was realised that steppe fritillary may be a useful indicator of what has been happening to the butterflies of flower-rich, dry lowland grassland in the last 70 years.

The grasslands where the steppe fritillary occurs are in the transition between plain and montane steppes, usually in a landscape mosaic with neighbouring arable land and scattered shrublands. In this mixed landscape, settlements–from cities to villages–are also a feature. The vegetation is composed of xerophytic plant species and has an extraordinarily rich flora; one study recorded more than 300 plant species of 30-50 families at a single site. The steppe is dominated by perennial grasses such as *Festuca valesiaca, Bromus tomentellus, Koeleria cristata, Poa annua*, and herbaceous plants include many *Thymus* species. In wind-swept and grazed areas spiny *Astragalus* species are dominant.

Within these grasslands the steppe fritillary has a patchy distribution. It often occurs in limestone areas, and prefers flower-rich openings and small meadows with bare areas, between 50-1900 m. It can be found in hilly landscapes where its foodplant, silver scabious *Scabiosa argentea,* grows on the gentle slopes, and where there are humid areas provided by small springs and damp depressions. It is quite likely that, in the past, it was a widespread species of lowland steppes, but that it is now restricted to hillsides which have not been cultivated or afforested. The populations in Turkey were assessed for the national red list (Karaçetin and Welch 2011) and categorised as Endangered due to the species' restricted range (2000 km^2), small area of occupancy (80 km^2/four locations) and the continuing decline in the area, extent and quality of suitable habitat.

Further, the current prevailing scientific opinion–though not yet proven or published–is that steppe fritillary is a Turkish endemic (Tshikolovets in litt. 2011, Zhdanko in litt. 2011, Korb and Bolshakov 2010). If proven this will greatly increase the species' conservation status and its value as a regional indicator of ecosystem health.

From the butterfly data presented in the landmark publication *Die Tagfalter der Türkei* (Hesselbarth *et al*. 1995)–which includes all butterfly records in Turkey from 1777-1994–the apparent stronghold of the steppe fritillary is centred on the city of Ankara, with the butterfly occurring (historically) in at least 4 different localities. These data also show that much of what is now the city of Ankara was once an important area of dry grassland, supporting more than 120 species of butterflies.

Fortunately, it is possible to understand what has been lost–both in terms of habitats and butterflies–because the Middle East Technical University (METU) campus, a 4000 ha area of steppe on the edge of Ankara, was fenced when the university was established in the 1950s. Thus much of the steppe here is still relatively intact and rich in butterflies. With our interest in species with narrow altitudinal ranges and thus most restricted to the lowland grasslands which are under the greatest pressure from anthropogenic developments, analysis of the METU butterfly list reveals 13 of concern (see table 1). The four most restricted species have not been recorded above 2000 m–*Euphydryas orientalis*, *Iolana iolas*, *Polyommatus ossmar* and *Tomares nesimachus*. Of these, *E. orientalis* is the only one whose decline has been detected because it has evidently always been rare and now appears to have disappeared altogether from large parts of its range. However, there is no reason to suppose that all the other species–which are all still considered common within their areas of occurrence–have not also suffered huge but not yet detectable declines.

Table 1: Species restricted to dry grassland habitats up to 2300 m (using species recorded in the METU campus 10x10 km square, and data taken from Hesselbarth *et al.* 1995)

Species	**Foodplant**	**Altitudinal range**	**Status in Turkey**
Archon apollinus	*Aristolochia*	0-2300 m	LC
Argynnis niobe	*Viola* sp	50-2300 m	LC
Brintesia circe	*Lolium, Bromus, Festuca* spp	0-2200 m	LC
Chazara bischoffii	grasses	570-2300 m	LC
Chilades trochylus	*Acantholimon*	0-2300 m	LC
Euphydryas orientalis	*Scabiosa argentea*	50-1900 m	EN : Endemic
Iolana iolas	*Colutea cilicica*	150-2000 m	LC

Muschampia proteides	*Phlomis* sp	400-2200 m	LC
Polyommatus ossmar	*Hippocrepis comosa & Coronilla varia*	0-2000 m	LC : Endemic
Pyrgus cinarae	*Potentilla* sp	100-2300 m	LC
Thymelicus acteon	*Poaceae* sp	0-2100 m	LC
Tomares nesimachus	*Astracantha* sp	150-1800 m	LC
Zerynthia deyrollei	*Aristolochia*	100-2200 m	LC

Understanding the reasons why lowland grassland in Ankara has disappeared, provides a microcosm of what has been happening all over the country. In the areas where *E. orientalis* was once recorded, urbanization is the second greatest threat after the rapid expansion and intensification of agriculture. More insidious, and probably the major problem in areas not suitable for agriculture, has been tree-planting, particularly of amenity forests close to urban areas. Even METU campus is being afforested, following a plan drawn up in the early 1960s. This is not only destroying the natural vegetation but also resulting in regular spraying to fight against pests in the pine plantations at the expense of butterflies. Sadly, grasslands and their wildlife have no public appeal or perceived value.

4 POLICY AND THE CONSERVATION OF STEPPE

In Europe it has been identified that many of the problems faced by rural populations and biodiversity would be resolved with the implementation of a sustainable land management and rural development policy which spends taxpayers' money to support farmers who maintain a healthy, thriving rural environment.

The environmental requirements of steppe fritillary are not yet clear as we have little knowledge of its ecology, but it seems probable that its survival depends upon active but sympathetic use of a mixed steppe/open shrubland landscape. Due to the habitat complexity and the species' proven sensitivity to change, improving the conservation status of the steppe fritillary is likely to benefit a wide range of species and micro-habitats, making it an effective target for delivering broad spectrum conservation.

Almost nothing is known of how Turkey's varied steppic habitats can be managed sustainably to provide both an economic return and healthy biodiversity. However, we do know that a range of steppe and low-intensity agriculture-related biodiversity is disappearing, although scientific data to prove this is slight and the reasons species are disappearing are seldom understood. Ecological research is extremely scarce in Turkey and there is almost nothing published which is of relevance for policy and conservation practice. Thus the tools to identify, understand and solve the problems faced by the biodiversity of Turkey's steppes are not available.

The principal threats affecting the steppes in which the steppe fritillary occurs are:

- Urban development,
- Agricultural changes – intensification and abandonment, and
- Afforestation.

All of these are exacerbated further by a combination of inappropriate, poorly implemented or absent policy and legislation, and a general lack of awareness of the importance and value of steppe and grasslands in general. These threats, the underlying drivers and potential activities and opportunities to counteract them are explained in more detail below and summarised in table 2, adapted from Karaçetin *et al.* (2011).

The situation with steppe is a classic case of the 'tragedy of the commons' with no-one appreciating the resource or taking overall responsibility for its management with the result that it is 'exploited' in numerous ways, almost all detrimental, leading to a reduction in quality and extent of the habitat.

Drivers of the threats

Urban development

There is rapid and widespread urban development throughout most of Turkey, especially in the western half of the country which, in addition to directly destroying habitat through construction of new housing and associated facilities, is also leading to increasing numbers of people moving from the countryside to the cities. This in turn affects the management of rural landscapes including steppes. This movement of people to cities is also driven by the harsh lifestyle associated with village life. Many villages have only basic infrastructure and facilities and provide few opportunities for income generation. Additionally, nature conservation is given little or no consideration when development plans are being drawn up and implemented. Even when they are carried out, Environmental Impact Assessments seldom

include detailed biological or ecological studies or follow robust and standardised procedures.

Agricultural changes

These range from the direct loss of steppe grasslands through conversion to agriculture, to ‘agricultural improvement’ with the application of artificial fertilisers and use of pesticides and herbicides, to changes in grazing regimes resulting in both overgrazing and abandonment. Increasing agricultural production is being driven by a combination of a growing human population, changes in the global market and government policies which are promoting a change from many small scale producers to a few large scale producers. Although Turkey is developing agri-environment schemes and High Nature Value/ organic farming, the former are production-led and deliver only minimal biodiversity benefits at present, while the latter are still comparatively localised and small scale. There is increasing awareness among producers of the ‘added value’ potential of ‘environmentally-friendly’ and organically grown produce but this is still a small sector in the overall agricultural market. Turkey also has a Rangeland Act which aims to deliver sustainable grazing management of Turkey’s grasslands but, in common with many other legislative instruments, it is poorly implemented and so has few if any direct benefits to conservation.

Afforestation

This is one of the greatest threats to Turkey’s steppes and associated biodiversity because tree planting is very much part of the Turkish psyche. Planting of amenity woodland is widespread throughout the country, and this is encouraged by a national afforestation campaign, started in 2007, to combat soil erosion. This aims to afforest 2,300,000 ha (an area equal to the size of Thrace), and 1,990,470 ha have been planted to date (Ağaçlandırma ve Erozyon Kontrolü Genel Müdürlüğü 2009; 2011). Although it is forbidden to afforest steppe (Ağaçlandırma ve Erozyon Kontrolü Genel Müdürlüğü 2009) planting on grasslands is widespread.

Table 2 Threats, drivers and potential activities and opportunities affecting steppe and associated biodiversity, especially butterflies, in Turkey–adapted from Karaçetin *et al.* (2011)

Threat	Main drivers	Potential activities/opportunities
1 Urban development		
1.1 Loss and fragmentation of habitat through uncontrolled urban expansion and infrastructure development	1.1.1 Rapid urban growth fuelled by relocation of people to cities and further stimulated by the financial, physical and social hardship of life in villages 1.1.2 Increased standard of living 1.1.3 Butterflies not included in legislation and planning procedures	1.1.1.1 Enable the implementation of legislation and procedures which benefit butterflies and biodiversity 1.1.1.2 Where Environmental Impact Assessments are required, ensure field assessments incorporate detailed biological and ecological research carried out by appropriate experts following scientifically sound procedures, and develop adjustments to the Environmental Impact Assessment requirements in order to benefit butterflies and other biodiversity 1.1.1.3 In collaboration with the end-users (eg. Planners) develop a data dissemination system/format which facilitates the consideration of biodiversity (and butterflies in particular) in Environmental Impact Assessments and other pre-development studies
2 Agricultural change – general		
2.1 Destruction of grassland habitats used by butterflies through intensification of agriculture, characterised by increased inputs (fertilizers and chemicals) and	2.1.1 Increased human population 2.1.2 Pressures of the global market and international investment 2.1.3 National / regional policy leading to a decrease in the number of small	2.1.1.1 Work together with the Ministry of Food, Agriculture & Animal Husbandry and other relevant bodies to use ÇATAK[1] and IPARD funding opportunities creatively to support the development of agri-environment and rural development initiatives, adding a criteria to the project selection process whereby actions which aim to manage or

[1] ÇATAK - the Environmentally Based Agricultural Land Protection Programme, initiated in 2005 as a component of the World Bank supported Agricultural Reform Implementation Project. Its aims are to reduce the adverse effects of agricultural practices on the environment; to prevent erosion, to sustain renewable natural resources, to protect natural vegetation cover and the quality of soil and water in vulnerable areas. The Programme has a total budget of €7.14 million.
IPARD – Instrument for Pre-Accession Assistance in Rural Development
Other potential agricultural policies that have the potential to support habitat and species conservation include Direct Income Support (area-based payments); the Rural Development Investments Support Programme and several animal husbandry and compensatory payment schemes.

monocultures 2.2 Loss of landscape mosaics due to land consolidation	farmers	improve habitats for butterflies and/or other biodiversity are given priority 2.1.1.2 Together with Ministry of Food, Agriculture & Animal Husbandry and other experts, and drawing on the experience of EU member states, define the prescriptions for inclusion in agri-environment measures which will benefit butterflies, promoting landscape mosaics, High Nature Value farming and organic farming practices 2.1.1.3 Ensure that legislation relating to agri-environment payments requires delivery of biodiversity conservation, especially for vulnerable and threatened species and their habitats 2.1.1.4 Research whether there are any opportunities under the 'good agricultural practices' recognised by the Ministry of Food, Agriculture & Animal Husbandry which could be used to improve the environment for butterflies 2.1.1.5 Integrate the consideration of butterflies and biodiversity into organic farming legislation 2.1.1.6 Ensure that all farmers on and around Prime Butterfly Areas receive training in alternative farming practices which attract agri-environment support, stressing the environmental and financial benefits, and practicalities of implementation 2.1.1.7 Encourage and promote rural development initiatives which keep communities together, promote traditional lifestyles and make small-scale agriculture more profitable, encouraging people to stay and manage the countryside.

		2.1.1.8 Develop and market food products from Prime Butterfly Areas which result from agricultural practices and/or the use of local native breeds which benefit butterflies, working with relevant organisations to develop the criteria and process for certification of the products as ‘butterfly friendly’ 2.1.1.9 Raise awareness of the vital role of invertebrates, and of the value of butterflies as visible indicators of ecosystem health, selecting regional flagship species to tackle specific issues

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The Po River Valley by Simona Bonelli & Emilio Balletto

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

The Po river Valley

The Po river Valley also known as the Padano Plains is a major geographical feature of Italy. It extends west to east for approximately 650 km (400 mi), from the Western Alps to the Adriatic Sea, and has an area of 46,000 km² (17,756 mi²). It represents the surface of a sediments-filled system of ancient canyons (the "Apennine Fore-deep") flowing northwards from the Apennines and southwards from the Alps, to in-fill with sediments the ancient northern Adriatic. The geo-political definitions of the valley depend on the defining authority. The Po Basin Water Board (Italian: Autorità di bacino del fiume Po), authorized in 1989 by Law no. 183/89 to oversee "land protection, water rehabilitation, the use and management of hydrological resources for a rational economic and social development and the protection of all related environments". This law defines the Po basin as "the territory from which rainwater or snow and glacier melt flows on the surface, gathers in streams of water either directly or via tributaries...". The United Nations Environmental Program includes the Alps and the Apennines as far as the sources of the tributaries of the Po. The Po river valley has a mild continental, or a humid

sub-Mediterranean, climate depending on the part of the valley one is referring to. Winters are rarely long and snow was once commonplace, but is now decreasing. Prolonged winter droughts increasingly deny sufficient moisture to the soil.

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

Maize is the main crop cultivated in Padano Plains, used in particular in beef and pig systems, and covers more than 50% of the farm area. This cereal is used for grains or for silage. In case of pig farms, and in the dairy farms occurring in the Parmigiano-Reggiano or the Grana-cheese producing areas, maize is mainly cropped for grain. Maize can be grown as a monoculture or in rotation with winter cereals, leys or other herbages. In some area of the Po Valley plains, dairy farms develop a typical cropping system with two crops per year: maize for silage in combination with winter Italian ryegrass (*Lolium multiflorum*) or silage barley (*Hordeum vulgare*).

In livestock farms maize is irrigated, because livestock farming historically developed in water rich area . Availability of irrigation water increases maize yield as well as the length of the growing season.

Where maize is not a profitable crop, permanent or rotational grasslands are cultivated as a mixture of grasses (*Lolium multiflorum*, *Festuca arundinacea*) and legumes (*Trifolium repens* or *T. pratense*) or pure lucerne leys (*Medicago sativa*). Rice fields are abundant in the northwest of the area. In such an agro-ecosystem, some small extensions of original woodlands still survive, as well as some semi-natural wet grassland, used sometimes for hay fodder or grazed.

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

As concerns butterflies, the most important habitat in the Padano plains is the *Molinia coerulea* (Blue Bent Grass) meadows, which are also listed in the Habitats Directive (Annex 1). They generally occur on neutro-alkaline to calcareous soils, with a fluctuating water table.

A Molinia *grassland in Piedmont (NW Italy): At this site* Gentiana pneumonanthe *occurs in separate patches.*

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

Molinia grasslands are very rare. Their total extent in the Padano Plains is probably less than 100 Km^2 .

All *Molinia* habitats have been included in the NATURA-2000 Network.

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

The most important problem is that the Padano-Venetian Plains represent by far the most heavily industrialized and densely populated part of Italy. The few remaining semi-natural meadows and woodlands are under continuous pressure, not only from being increasingly reclaimed for building new factories, warehouses, roads or railway lines, but even more importantly because of the ever increasing subtraction of water from the water table, for human consumption and industrial use.

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

In a recent paper (Bonelli *et al*. 2011) we analyzed the patterns of butterfly population extinctions occurring in Italy. Our analysis revealed that extinctions

were non randomly distributed in space and time, as well as across species. Species vulnerability depends on both ecological requirements and type of threat. Each species, in fact, showed a distinct pattern of vulnerability, depending on threats.

Habitat destruction was pointed out as the main cause of extinction throughout the Italian territory,

but especially in the plains of the north of the Country, while hygrophilous and nemoral species are the most vulnerable. As already pointed out for many other countries (e.g., van Swaay et. al., 2010) a

correct conservation policy should begin by stopping urbanization and intensive agriculture and revitalizing traditional agro pastoral activities.

In fact, the most severely threatened Italian butterflies are the hygrophilous species restricted to the plains of the Po river valley. At least one hygrophilous species, *Lycaena helle*, has apparently become extinct in Italy since 1798. At regional level, *Melitaea britomartis*, which in Italy is interestingly a hygrophilous species, became extinct throughout the NW of the country in the 1970s and only survives in the NE (Friuli). Of the remaining hygrophiles, the most endangered are *Maculinea alcon M. teleius*, *Euphydryas aurinia*, *Coenonympha oedippus* and *Lycaena dispar*. All of them occur, either exclusively or at least in some cases, in the *Molinia coerulea* meadows. Of these butterfly species, *Coenonympha oedippus* is present with a strongly limited number of generally isolated populations. A number of populations, however, remain in relatively good conservation status (Bonelli *et al*. 2009). This is not only a consequence of the relative abundance of its larval food plant (*Molinia coerulea*). *Lycaena dispar* is more hygrophilous and occurs primarily in the so-called Magnocaricion of the oxbow lakes etc. The problem here is mainly a consequence of the progressive disappearance of its secondary habitat which, until the mid 1970s used to be in the rice paddies. With the introduction of more efficient cultural practices, including the massive use of highly selective herbicides and the subtraction of water from the paddy for the period of their application, this habitat became increasingly unsuitable for *L. dispar* (as well as for many amphibians). Population sizes dwindled and in many cases inter-population connectivity disappeared. *Maculinea* species are all monovoltine and the status of the hygrophilous species (*Maculinea*

alcon, *M. teleius*) is alarming. It is very unfortunate, in this framework, that the biology of these species was neglected in Italy for a long time. Population studies only began in the last decade (Nowicki et al. 2009), as well as those on the ant species needed to support their larvae and pupae during the late phases of their cycle. Italian populations are virtually never connected to form meta populations and survive as more or less dense but single populations, each experiencing population crashes after one or more bad years. In at least two cases, this led to population extinctions, but the recent summer droughts experienced in N Italy caused a general declining trend. Since 2003, the progressively sinking water table caused a delay in the blooming of *Gentiana pneumonanthe* (food-plant of *M. alcon*) and even the growth of *Sanguisorba officinalis* (food-plant of *M. teleius*) was negatively impacted. The consequence was that the trophic resources available for these two species were severely curtailed and populations declined.

Euphydryas aurinia (s. str.) is threatened and has a restricted range in the Padano-Venetian Plains, where about 40, generally isolated, populations are known to occur. These populations are normally small and suffer many of the negative factors influencing the other hygrophilous species.

Lasiommata (=*Lopinga*) *achine* is in Italy a species of the native woodlands bordering the southern slopes of the Alps, on the margins of the plains of the Po river valley. It is still a rather widespread element in the north-eastern parts of its Italian range, but is known to have become extinct at several sites, particularly in the west of the area (Piedmont). The most important threat for this species is habitat destruction.

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

Leaving aside threats from industrialization and building of infrastructures, the abandonment of traditional land use poses continuously increasing threats. Traditional hay mowing and cattle grazing are disappearing throughout the area, and are replaced by sheep grazing, in the best of cases (so to speak).

Most grasslands with *Molinia coerulea* are under threat by natural reforestation, mainly by Buckthorn (*Rhamnus frangula*), Birch (*Betula*

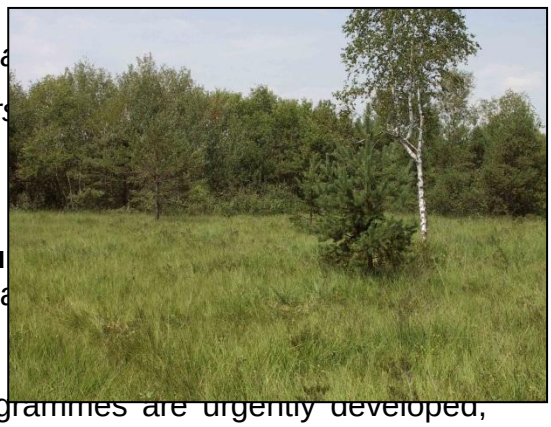
pendula), Poplar (*Populus tremula*), Hornbeam (*Carpinus betulus*), Reed (*Thypa* spp.) and/or Bramble (*Rubus* spp.) invasion. In most cases, this can be prevented only by implementing costly management plans, which for the moment remain only on paper, in the best of cases. Another serious and subtler threat is in indirect land drainage, by increased water subtraction from the water table, for agricultural, industrial and/ or domestic use

Existing policy measures and what effects they are having

Perhaps as a partial consequence of current economic strictures, very few real conservation efforts are currently implemented, with some notable exception for some devoted action-plan in protected areas (for example in the

“Groane” Park, in Lombardy)

A Molinia *grassland in Lombardy (Groa*



reforestation (left) are managed by rangers

equipments (right).

Proposed improvements to policy measu

Since the remaining populations of the enda

persisting only at some very small sites,

requires that site-by-site management programmes are urgently developed, approved and implemented. For the *Molinia* habitats, avoiding abandonment will be crucial, as well as re-introducing controlled cattle grazing and/or hand-haying.

A broad and appropriate application of the Agro environmental Scheme and of the “Rural Development Programme” will be the key for the survival of *Lycaena dispar* in the rice fields.

A rice field in Piedmont where Rumex *spp. pl. and* Lycaena dispar *are quite abundant.*

Wet grasslands of Lake Mikri Prespa, NW Greece: decline, restoration, maintenance and monitoring

by Yannis E. Kazoglou[1], Michael S. Vrahnakis[2] and George P. Fotiadis[3]

[1] Municipality of Prespa, Lemos, GR 53077 (e-mail: ykazoglou@gmail.com)
[2] Technological Educational Institute of Larisa, Department of Forestry and Management of Natural Environment, Karditsa, GR 43100 (e-mail: mvrahnak@teilar.gr)
[3] Technological Educational Institute of Kavala, Department of Forestry and Management of Natural Environment, Drama, GR 66100 (e-mail: gfotiad@for.auth.gr)

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

Lake Mikri Prespa (48 Km^2) is a Natura 2000 site located in Prespa National Park, north-western Greece, on the frontier with Albania, at an altitude of 850 m. a.s.l. with surrounding mountains reaching 1400-2300 m. Its waters outflow to its "bigger sister" Lake Megali (Macro) Prespa (260 Km^2, 840 m. a.s.l.; shared by the three neighbouring countries FYR of Macedonia, Albania and Greece) through an isthmus separating the two lakes. The two Prespa Lakes and their catchment area in the three neighbouring countries constitute the trans-boundary Prespa Park since 2000. The interesting hydrology of the wider area also includes Lake Ohrid (360 Km^2, 680 m. a.s.l.; shared between FYROM and Albania) which receives waters from Lake Megali Prespa through underground karstic openings. These three lakes are amongst the oldest lakes in Europe dating 4-5 million years, a basic reason for the high degree of endemism in the wider Prespa – Ohrid area, which is well-known for its great biodiversity.

[Picture 1: Lake Mikri Prespa]

The three lakes differ in terms of biotic and abiotic characteristics such as water quality and shore development, a fact reflected in the different wetland habitats recorded on their littoral zones and in deeper waters. Thus, the greatest part of the littoral zone of Lake Mikri Prespa, on both national sides, is dominated by reedbeds on grounds with very gentle gradient and fluctuating water levels (low in late summer – mid autumn due to dry conditions and evapo-transpiration, higher in spring due to increased rainfalls

and snow-melt) with differences between yearly minima and maxima levels of 0.50-1.00 m. At specific locations under traditional vegetation management, wet grassland areas are found between the reedbeds and the drier habitats and farmland. This mosaic of habitats around Lake Mikri Prespa is particularly important for wetland biodiversity, namely for many endangered breeding and migrating wetland bird species, including the Dalmatian Pelican (*Pelecanus crispus*), the world's largest breeding colony of which is hosted in the lake reedbeds.

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

Recently, Vrahnakis et al. (2011) updated the record of habitat types (according to the 92/43/EEC Habitat Directive) of the wider Prespa area with focus on those belonging to the National Park. They distinguished 49 habitat types, almost double in comparison to the 29 which recorded in the first effort of 2000; 7 of them are of priority (2 forest habitat types and 5 grassland habitat types). Main grassland habitat types and their characteristics are presented in table 1.

Table 1. Grassland habitat types in the wider Prespa National Park area (Vrahnakis et al. 2011)

A/A	Habitat type (*indicates priority habitat types)	Area (ha)	Relative cover (%)	Farming system
1	*6120 Xeric sand calcareous grasslands	166.91	0.40	Occasional grazing
2	6170 Alpine and subalpine calcareous grasslands	209.35	0.50	Extensified grazing
3	*6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)	6953.2	16.0	Occasional (locally extensified) grazing
4	*6220 Pseudosteppe with grasses and annuals of the Thero-Brachypodietea	355.36	0.85	Extensified grazing
5	*6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	1532.3	3.66	Occasional grazing
6	6290 Mediterranean	209.69	0.50	Extensified

	subnitrophilous grasslands			grazing
7	6420 Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion	119.55	0.29	See below
8	6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	97.59	0.23	Buffalo, cattle grazing, hay cutting
9	6450 Greek hyper-Mediterranean humid grasslands	158.56	0.38	Occasional grazing

The maintenance of the qualitative characteristics of the 6420 habitat type depends on vegetation and water management practices. Vegetation management is directly linked to stock-breeding in the area, specifically (a) water buffalo and/or cattle grazing, (b) summer cutting for hay production, and (c) summer cutting with aftermath grazing by large and/or small stock. Water levels of Lake Mikri Prespa are managed by a sluice-gate system controlling the surface outflows towards Lake Megali Prespa, located at the western extremity of the above-mentioned sandy isthmus between the two lakes. Management of the sluice in some way follows the natural seasonal fluctuation of water levels of the lake aiming at flooding wet grassland habitats in spring to the benefit of wetland biodiversity, and at drying-up the same areas in late summer to allow implementation of farming practices that maintain grasslands. However, upper and lower limits have been set for the water management scheme, namely (a) the increase of water levels in spring is allowed up to a certain extent to avoid extensive flooding/water-logging to adjacent low-laying farmland, and (b) the decrease of water levels in summer is done so as to store adequate water quantities in the lake for the next irrigation season.

[Pictures 2, 3, 4: grazing, cutting, baling etc]

[Picture 5: Koula sluice]

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

“Mediterranean tall humid herb grasslands of the Molinio-Holoschoenion” (Natura 2000 habitat type code 6420) is the habitat type covered in this example. These grasslands are represented by five vegetation units classified in the Phragmition communis alliance, the Phragmitetalia order and the Phragmito-Magnocaricetea class:

- Sparganietum erecti ass.
- *Carex pseudocyperus* comm.
- Scirpo-Phragmitetum ass.
- *Agrostis stolonifera* comm.
- *Carex hirta* comm.

[Picture 6: wet grasslands from close to show species]

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

The extent of the Mediterranean tall humid herb grasslands (Natura 2000 code 6420) in the whole of Prespa National Park is 120 ha holding 0.37% of the surface area of the Park (at 11 littoral localities). This calculation is based on data recorded in 2010-2011. For these years there are no data for other areas in the country, but according to previous estimations it seems that Prespa National Park hosts one of the largest areas of this habitat type in Greece.

Available data on trends (e.g. over past 10 or 20 years), in extent and condition, plus any personal/expert observations

Wet grassland areas located on the littoral zone of Lake Mikri Prespa suffered great losses and deterioration in the 20th century due to: (a) major land reclamation works (1935-1945), (b) the construction of the irrigation network on the eastern part of the lake where the greatest proportion of intensively cultivated farmland is located (1960-1990), (c) prohibitions in wetland vegetation management since the establishment of the National Park in 1974 related to the protection of reed-nesting birds, and (d) abandonment of traditional activities – such as grazing, reed cutting and fishing in shallow waters – carried out on littoral areas as a result of changes in the local people occupations who switched to bean monoculture since the mid 1980's. In 2000, it was estimated that only 32 ha of wet grasslands at five littoral localities were in good condition, mainly because of ongoing systematic traditional vegetation management by means of grazing and summer cutting. At the same time, important changes in the legislation and planning related to the protected area were widely discussed and approved highlighting what local people knew from many years of daily practice and conservationists had realized and experimented with over the last years: that human intervention by means of grazing and cutting (even winter fire in the case of reedbeds) were indispensable for the conservation of semi-natural habitat types such as wet grasslands.

The decline of wet grasslands in Lake Mikri Prespa was reversed in 2002 (after an experimentation phase in 1997-2001 that led to the production of a management plan for wet grasslands) mainly due to the implementation of the LIFE-Nature project titled "Conservation of priority bird species in Lake Mikri Prespa, 2002-2007 (LIFE02 NAT/GR/8494)" (1.8 million €) co-funded by the European Commission and the locally-based NGO Society for the Protection of Prespa (SPP). Major conservation management works were carried out through this project: (a) the sluice-gate system controlling the outflows towards Lake Megali Prespa was re-constructed to allow for improved water management, (b) systematic management of the vegetation at specific littoral sites led to the restoration of more than 70 ha of wet grasslands, (c) water, vegetation and bird monitoring activities were put in practice to evaluate water

and vegetation management activities, and (d) a management plan was produced for the next 5-year season (2007-2012).

Management and monitoring activities in the after-LIFE project years, i.e. since July 2007 were successfully continued with the support of the SPP, the Municipality of Prespa and the Management Body of Prespa National Park (MBPNP), and in collaboration with local people namely stock-breeders. However, in some cases and since 2011, vegetation management activities have not been as systematic as during the LIFE project implementation period, a fact that should seriously be taken into account by the MBPNP to maintain these precious habitats; that is because, in case of abandonment of vegetation management, wet grasslands will be overgrown by the highly aggressive and competitive high emergent macrophytes such as the common reed (*Phragmites australis*).

[Picture 7: wet grasslands at Karyes with control plot full of reeds]

Plant groups, birds and fish associated with the habitat type, data on trends in these species

Wet grasslands at Lake Mikri Prespa are associated with specific quantifiable elements of biodiversity that can relatively easy be monitored:

- plant species grouped under specific categories namely “high emergent helophytes”, “wet grassland species”, “hydrophytes” and “dry grassland species”,
- wetland birds using wet grasslands mainly for feeding, and
- fish species that use wet grasslands for reproduction (spawning), such as the Carp (*Cyprinus carpio*).

Vegetation and bird use at the littoral wet grasslands sites managed since 2002 have been the subject of a long-term (at least for the Greek reality) monitoring scheme carried out by the SPP; vegetation at four sites was systematically monitored every year from 2002 to 2010 using fixed transects, while bird use is still monitored by means of point-counts every spring – early summer, when the managed sites are totally or partially flooded or water-logged and various bird species feed on them. Fish presence at the managed sites has often been confirmed by visual observations.

The four wet grassland sites monitored in 2002-2010 differed in terms of vegetation management practice/treatment (one grazed by water buffaloes, one mown in summer and grazed by cattle in the aftermath, and two mown in summer), flooding regime, size and vegetation characteristics. Therefore, each site was monitored individually with 3-4 fixed transects (acting as replicates within the site), 35-140m long each, sampled each year in mid July; at sites where summer cutting was involved, sampling took place before cutting so as to measure the effects of the previous year’s cutting regime when plants are at full growth. In addition, this timing was appropriate for “high emergent helophytes” as at that time the common reed and reedmace have reached their maximum growth and structural characteristics (e.g. maximum height and basal diameter) can be safely recorded, while access to the lower

parts of the managed sites (to perform sampling along the transects) was relatively easy due to low water levels.

Transects crossed the lakeshore vertically, that is from the drier parts towards the lake, and ended in the reedbed. The beginning and ending points of each transect were marked by means of wooden or iron poles and plotted by GPS, while bearing of each transect was recorded with a compass. Sampling included species records every 1 meter; all plants touching the needle were recorded (for the calculation of group composition) with caution to record first the highest contact (taken into account for the calculation of group cover). Additionally, reed and reedmace structural characteristics (densities of fresh and dry stems, maximum and random heights, basal diameters and litter height) were measured in 0.5m X 0.5m quadrats taken along each transect every 5 meters, while 2-3 quadrats per transect were also taken in the unmanaged part of the reedbed.

As mentioned above, plant species were categorized in four functional groups: (a) high emergent helophytes (HEH), (b) wet grassland species (WGS), (c) hydrophytes (Hy, present in years with high water levels even in late summer), and (d) dry grassland species (DGS). As group cover was used as the main parameter to describe the evolution of vegetation characteristics under each of the three treatments, “litter” and “bare soil” were also included as separate cover categories. Reed and reedmace structural characteristics average values were calculated also per transect and the mean value (and standard error) of all transects were presented as mean values per site. HEH were the group “targeted” by the treatments, i.e. grazing and cutting aimed at controlling their presence on the managed sites (expressed as reduction in cover in 2002-2010 that reached proportions of 10-30%), while WGS, Hy and DGS were the groups promoted by the three treatments (often gaining in cover scores what HEH were losing). The results of vegetation monitoring for 2007 are indicative of the effects of the three “treatments” on group cover values (Table 2).

Table 2. Mean group cover values in the three treatments in 2007 (sites managed since 2001-2)

Group cover (%)	Treatment 1 (water buffalo grazing, n=4)	Treatment 2 (summer cutting, n=6)	Treatment 3 (summer cutting with aftermath grazing, n=3)
High emergent helophytes	5.9 b	22.9 a	7.8 b
Wet grassland species	60.9 a	68.8 a	70.5 a
Hydrophytes	0.0 a	0.0 a	0.0 a
Dry grassland species	3.9 a	2.1 a	3.6 a
Litter	14.5 a	5.7 b	17.8 a
Bare soil	14.7 a	0.5 b	0.4 b

Totals	100	100	100

Note: values in the same row followed by the same letter do not statistically significantly differ (a = 0.05)

Group cover data were also used to calculate the “Vegetation cover index” as shown by the wet grassland management plan for 2007-2012. This index receives maximum score equal to 1 and scores higher than 0.75 are considered very satisfactory showing that respective treatments maintain high quality of vegetation characteristics at the managed sites. In 2007:

- the buffalo-grazed area got cover index value equal to 0.68 (fairly satisfactory),
- the two summer-mown sites got scores 0.89 and 0.76 (both very satisfactory), and
- the site that was mown in summer and then grazed by cattle got 0.83 (very satisfactory).

Bird monitoring has revealed that, in general, the gradual improvement of managed wet grassland sites (in terms of vegetation characteristics) caused their increased use by birds that feed exclusively on fish or plants, or on fish, frogs and invertebrates. Main species recorded on wet grasslands were Pygmy Cormorants (*Phalacrocorax pygmeus*), Little and Great Egrets (*Egretta garzetta* and *E. alba*), Grey herons (*Ardea cinerea*), Glossy Ibises (*Plegadis falcinellus*), Squacco herons (*Ardeola ralloides*), Greylag Geese (*Anser anser rubrirostris*), Dalmatian Pelicans, ducks and waders. However, especially for fish-eating species, their presence at each grassland site heavily depends on the extent and depth of flooding which are determined by gradients and lake water level scores.

Fish presence at the same sites was proved by the presence of fish-eating birds and visual observations of individuals performing vegetation and bird monitoring, as well as local fishermen. What is of particular interest during the spawning season is the presence of the phytophilous Carp, the most important species in economic terms, because of its vivid spawning behaviour: females lay their eggs on grassland vegetation at water depths 10-50cm while males follow leaving their sperm on the eggs and splash the waters to facilitate mixing of the genetic material.

[Pictures 8, 9: birds in wet grasslands]

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

As previously shown, wet grasslands are dynamic human activities-dependent habitats located between another two highly competitive habitat/landuse types: (a) reedbeds, on the deeper water side, with their remarkable ability to re-dominate wet grassland sites in case of discontinuation of vegetation management, and (b) arable land, on the drier/uphill side, which in some cases gets prolonged over wetland soils (e.g. by ploughing) especially in

years with low lake water levels or, more generally, in localities where the boundaries between farmlands and wetlands are not very clear. Fortunately, the latter threat to wet grassland habitats at Lake Mikri Prespa is not very serious mainly due to natural and artificial barriers such as water-logged soils that cannot be ploughed or drainage channels that inhibit field extension towards the lower grounds. It is estimated that less than 3 ha of wet grasslands are affected by arable land expansion at Lake Mikri Prespa, a very low score compared to relevant events recorded in other Greek wetlands. On the other hand, what seems to be of major concern in recent years is the trend to reduce farming practices, such as grazing and hay cutting, at five specific wet grassland sites of Lake Mikri Prespa systematically managed in the period 2002-2010. The losses caused by the non-existence of the water buffalo herd grazing on the littoral zone since late 2011 in combination with the decreasing surface areas mown for hay over the summer periods of 2011 and 2012 should somehow be balanced by the MBPNP in order to make sure that discontinuation of wet grassland management will not diminish any further.

Existing policy measures and what effects they are having –

For the time being, existing policy measures for the wet grassland areas of Lake Mikri Prespa are included in the planning of the Management Body of Prespa National Park as described in the management plan (2013-2017) for the Park and its habitats. The proposed management measures and monitoring scheme are based on previous successful practices described above. Recently, the MBPNP secured part of substantial funding (4.5 million € in total) to execute significant conservation and public awareness works in the coming years. Effects of these policy measures at the moment can only be discussed in theory as the MBPNP will be fully responsible for the management and monitoring of wet grasslands from the summer period of 2013, thus its efforts and results are to be proven in practice.

Proposed improvements to policy measures

Wet grassland management at Lake Mikri Prespa should definitely be continued in the long-term to the benefit of the Prespa Park biodiversity and economic activities such as stock-breeding, fishing and eco-tourism. Recent experience has shown that vegetation management can be secured in collaboration with local stock-breeders who either use wet grasslands for grazing, hay baling or both; thus, the MBPNP saves important funds that otherwise should be spent to pay contractors for grazing and/or cutting the vegetation, and needs to deal with securing that all wet grasslands sites are systematically managed (especially where management is applied since 2002) and with the implementation of the monitoring scheme (discussed in the following chapters). Under such preconditions, improvements to policy measures could include the following actions:

- marking of wetland habitats in the field to physically demonstrate which sites are characterised as wet grasslands (or pastures or hay meadows) found between farmland and reedbeds;

- promotion of water buffalo breeding as a unique tool for the restoration and maintenance of wet grasslands and as source of distinctive animal products;
- promotion of reed use harvested in summer (for feed), late autumn (for thatched roofs) and winter (as biomass for briquettes or pellets);
- promotion of the management of wet grasslands as a win-win combination of traditional farming techniques with nature conservation in environmental education projects;
- explore funding sources for the purchase and maintenance of specialized equipment for hay and reed cutting on difficult terrains.

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?

LPIS is used to describe pastures, meadow and crop plots used by individual farmers in the process of filling in the farming statements each year (in the framework of the Integrated Management and Control System of the Ministry of Agriculture). For public grazing lands, the determination of the category for a given parcel (as well as its size and location on the map) is done by the administration by taking into account information provided by stockmen/farmers, the limits of communal lands and the relevant rights of local stockmen to them. However, there is no specific codification of grasslands in general in the Greek LPIS; the four codes used so far in this system in some way reflect the land use and vegetation category of grazed lands, but do not take into account scientific data on vegetation types and/or photo-interpretation. Thus, for this case-study, there is no particular categorization for wet grasslands of Lake Mikri Prespa.

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

In theory and practice, it would be possible to have a separate LPIS category for semi-natural grasslands; in practice, this would require fine-tuning of important practical issues, such as completing the mapping of their areas including ownership status. Specifically for wet grasslands of Prespa National Park, as well as for all other grassland habitat types in the whole of the area of the Municipality of Prespa, it would be very important to produce a study to determine their use for grazing and stock-breeding in general, and associate it with biodiversity issues in the Natura 2000 sites and their adjacent areas. Substantial preparatory work on the identification and mapping of habitat types on the whole of Prespa National Park and the adjacent areas of Mt Varnous and Mt Sfika located outside the Prespa basin has already been done by Vrahnakis et al. (2011). On a national level and in the course of the ongoing revision of the LPIS in the country, grasslands (as well as grazed phryganic areas, shrublands and woodlands) should be given a separate

code to match specific vegetation types and create a specific layer or sub-layers layers in the relevant Geographic Information System/software.

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?

Most probably, if wet grasslands (as semi-natural grasslands) were to have a separate LPIS category, they would provide a good basis for monitoring trends as a proportion of the whole of semi-natural grassland areas, and could be linked to agri-environment measures especially in protected areas like in the case of Prespa National Park. As a result, the manager of wet grasslands (and/or semi-natural grasslands in other non-littoral environments within the same protected area) could be eligible for agri-environment payments provided that his/her practices do benefit the habitat type and that administration is in position to thoroughly supervise all relevant procedures and effectively monitor the sites.

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.

As previously mentioned, transects have successfully been used for the monitoring of wet grasslands on the littoral zone of Lake Mikri Prespa in 2002-2010. Therefore, it is recommended to continue applying the same method, which is relatively easy to use, with 3-4 transects per locality. In such methods, plant species identification in the field is often a problem and, usually, only very experienced personnel may carry out the task. In the case wet grasslands in Lake Mikri Prespa the previously-described methodology can be simplified to an extent as the observer needs basic training e.g. on locating the transects and getting to know typical plant species such as *Carex pseudocyperus*, *Scirpus lacustris*, *Mentha aquatica*, *Agrostis stolonifera*, *Alisma plantago-aquatica*, *Carex hirta*, *Sparganium erectum* and *Galium palustre*; additionally, instead of identifying species in the field he/she could directly group species under the four functional groups in question (HEH, WGS, Hy, DGS), while in case of “difficult” species, specimens can be collected and shown to a specialist for confirmation of species and functional group. Thus, the method can be performed by non-experienced personnel, however, the task requires ability to walk and stand in muddy waters and heavy soils sometimes flooded up to 80-90 cm or even more. The method should be performed every 2-3 years at the same sites and so as to cover every treatment. Field data should be processed to compile a report to the MBPNP with results on functional group cover and group composition, reed structural parameters and cover index scores as partially presented above and shown by Kazoglou in the period 2007-2010 (reports to the SPP and the MBPNP on vegetation monitoring).

In addition to the transect method, and if resources are available, other more complex and demanding methods are proposed to be used, e.g. once every

five years to collect complementary information on phyto-sociological assets of vegetation (see for example the method used in Vrahnakis et al. (2011) for the monitoring of habitat types by recording typical species, structure, functions and other characteristics).

[Picture 10: transect and tools for sampling]

Could bird and/or fish species provide a good system for monitoring the condition of wet grassland habitats in the area? If so, which would you monitor.

Biodiversity indices based on vegetation and habitat type data should be the main system to monitor the condition of wet grasslands following the recommendations presented in the previous paragraph/chapter. Other biodiversity indices related to wet grasslands, such as those based on the presence and use of birds and fish species on wet grasslands could also be used, but only to complement vegetation indices. That is because the presence of many bird and fish species at wet grassland sites greatly depends on vegetation characteristics but also (and perhaps more) on the flooding regime of each site. The latter is also important for the evolution of flora and vegetation structure at wet grassland sites, but grazing and summer cutting are more determinant for the maintenance of their grassland "character". The extent of flooding and water depth at various parts of each littoral site is particularly important for fish, wildfowl and fish-eating birds. However, other species, such herons feeding on amphibians and invertebrates, may also be present on wet grasslands even if the latter are simply damp or water-logged, but even in this case, it would not be safe to monitor the condition of wet grassland sites solely on the presence of such species: these herons can be present on habitat types resembling wet grasslands such as "Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation, Natura 2000 code 3150 "in their dry phase, therefore vegetation parameters should be the basis for monitoring. In conclusion, data from bird monitoring (e.g. point-counts of Pygmy Cormorants, long- and short-legged heron species, ducks and geese) and fish monitoring during the spawning season with emphasis on Carp (by visual observations or more elaborated techniques like electro-fishing) could be used to provide substantial information on the condition of wet grasslands additional to those based on vegetation monitoring.

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Grasslands and their butterflies in the Őrség SPA, Hungary

Authors: Szabolcs Sáfián, István Szentirmai

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

The Őrség SPA (including the entire Őrség SCI and Őrség National Park) is situated in Western Hungary on the triple border with Austria and Slovenia. This hilly country covers approximately 46 000 hectares of broad-leaved and mixed woodlands, coniferous plantations, arable land and most importantly large areas of semi-dry unimproved grasslands and damp hay meadows. The formation of this landscape mosaic should be partly acknowledged to the geological and climatic conditions, since the area lies in the transitional climatic zone between the drier and warmer, continental Carpathian basin and the high mountains of the Alps. The Őrség is generally cooler and receives more precipitation in the summer than Central and Eastern Hungary, but usually the winters are also relatively milder. The narrow valleys between hills and the thick, acidic clay soils slows down the vertical and horizontal movement of water significantly, which supports the survival of many higrophilous plant and animal species, including ones that are not normally found at lower elevations such as the Globe Flower (*Trollius europeus*) in the Őrség. Still, the present day landscape, especially the species-rich hay meadows could not be present in the area without the traditional land use of the local inhabitants, who utilized their lands at low intensity for centuries.

It is worth mentioning that the Őrség is continuous with the Goričko Nature Park in Eastern Slovenia and they obviously form a single ecological unit, with similar landscape and habitats.

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

The most widely distributed grasslands are various types of damp hay meadows, which are situated mostly in the valleys, but can also be found on gentler slopes and small plateaus in the Őrség. Amongst them, the most species-rich are the Moor Grass meadows (*Molinetum coerulae*), where other important butterfly foodplants, such as Marsh Gentian (*Gentiana pneumonanthe*) and Great Burnet (*Sanguisorba officinalis*) occur. These grasslands were formed by clearing of the original forest vegetation centuries ago and were traditionally managed for hay production; the meadows were cut (hand scything) twice a year in May-June and August-September, depending on weather conditions. Originally one family owned only a few hectares of grassland, and therefore, the diversity of management maintained the diverse mosaic of differently managed habitat patches. Some of the grassland patches have also been ploughed from time to time, but they became abandoned after a few years of crop production (as the soils are very nutrient-poor), and they could easily be reverted to grassland, with regular hay-cutting.

The other important grassland type is usually situated on the slopes of southern exposure or on hilltops, where the surface of the soil could dry out rapidly and precipitation run off the slopes as water could not be absorbed

due to the thick clay soil. These slopes host a special microclimate, where semi-dry grasslands (meso-climatically atypical to the area) are present with their special flora including Broad-leaved Thyme (*Thymus pulegioides*), two Milkwort species (*Polygala* spp.) and even Heather (*Calluna vulgaris*). These grasslands were also mown regularly, two sometimes three times per year. These grasslands and the associated flora and fauna is among the most endangered habitats in the Őrség area, as the majority of them were afforested in the 1970s, 80s or overgrown by trees and scrub due to abandonment.

Wet hay meadow with Great Burnet

Flower-rich semi-dry meadow

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

Both the damp meadows and the semi-dry meadows are covered in the example.

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

The latest vegetation survey estimated the extent of damp meadows to approximately 1000 hectares in the Őrség area, regardless of the condition of the habitats. The semi-dry meadow habitats cover less than 500 hectares and only a few tens of hectares are actually in good condition.

It is worth mentioning that there are several thousand hectares of damp meadows of similar character found in Western Hungary, the majority of them are in poor condition, partially of fully overgrown by invasive vegetation, scrub or trees. The majority of them are within the Natura 2000 network, but without special incentives the owners find no interest in management of the grasslands.

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

The present situation, cover and condition of grasslands are very well known due to an extensive habitat mapping carried out over the entire SPA in 2010-2011. Solid data on past situation are however, not available since no systematic mapping was carried out before 2010. Doe to the lack of data exact trends can not be established. Nevertheless expert observations and the deviation between official land register and current state of certain fields both suggest that it has been a dramatic decline in both the area and the quality of grasslands over the last 50 years. Experts, who visited the Őrség in the ‘80s, experience that many of the diverse meadows have disappeared by now due to afforestation or overgrowing. This tendency is most typical to Moor

Grass meadows and semi-dry meadows. Among semi-dry meadows mountain hay meadows retreated to very few spots, whereas previously widespread Nardus swards disappeared completely from the area. The comparison of areal photographs between the 1950s and 2000s shows very clearly that the main threat to grasslands is the spreading forest. The area of forest doubled in the last 50 years and parallely the area of meadows and arable lands shrank to their half.

Surrounding of the same village in 1954 (left) and 2005 (right).

Together with their decline in cover the quality of grassland habitats decreased as well. Currently about half of the grasslands are degraded due to either overgrowing by scrubs or invasion by alien plant species. Especially wet meadows are affected by the spread of the invasive Golden Rod (*Solidago gigantean*). Just after 5-10 years of neglection the original vegetation of these meadows may disappear and Golden Rod takes over the area. One can suppose that the proportion of degraded meadows was close to zero during the first half of the last century since animal husbandry thrived and all meadows were mown regularly 2-3 times a year.

Another serious threat to the wildlife of grasslands is habitat fragmentation. Many of the remaining high quality meadows are now isolated by large starches of woodlands, arable fields or degraded meadows. Most of these habitats are barriers for butterflies which they can not cross. These isolated populations are very susceptible for the management of their habitat and are also prone to extinction.

Some positive trends also started in the last decade. From 2002 the Őrség National Park Directorate aims to buy the most valuable grasslands and apply proper management to them. The Directorate also buys overgrown grasslands and has reconstructed ca. 200 ha of them so far. Another initiative of the Directorate is to turn arable fields to grasslands by sowing and grazing afterwards. Natural Heritage Trust, an NGO in Őrség also owns some 30 hectares now and works on their reconstruction as butterfly habitats. Due to agricultural subsidies farmers also started to revert their overgrown grasslands and the removal of scrubs and weeds has started at several tens of hectares of private lands.

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

The key species for the damp hay meadows are Dusky Large Blue *(Maculinea nausithous*) and Scarce Large Blue (*M. teleius*) as both listed in

the Annexes II. and IV. of Habitats Directive (Natura 2000) of the EU. These hay meadows host also small and localized populations of Marsh Fritillary (*Euphydryas aurinia*), while Large Copper (*Lycaena dispar rutilus*) is generally widespread in the Őrség area. Other, nationally important species are Purple-edge Copper (*Lycaena hippothoe*) and Alcon Blue (*M. alcon*).

A series of surveys and a mapping of butterflies in the Őrség revealed, that populations of *M. nausithous* and *M. teleius* are widely distributed in the entire area, and their trend is favourable. The colonies of *E. aurinia* and *L. hippothoe*, however are very small, and are restricted to the continuously managed (mown) damp meadows (Sáfián et al. 2012). Both species were more widely distributed in the Őrség according to surveys in the 1980s (Szabóky, 1994).

Although there is an overlap between the grassland types and the butterflies as well, the semi-dry meadows host a different fauna characterized by warmth loving species, such as Large Blue (*M. arion*), which is associated with Thyme-rich, short-turf grasslands. The abundance of *M. arion* in the area is generally low and the colonies are restricted to the regularly mown meadows. Danube Clouded Yellow (*Colias myrmidone*) was once also associated with drier meadows (and warm open woodland edges), but it became extinct due to habitat loss and severe degradation of still existing habitat patches.

Altogether over 110 species were recorded from the Őrség SPA, including old records. Quite many species were not re-found during the extensive surveys between 2009 and 2011.

The majority of the key species (especially the damp meadow specialists) also occur on the damp meadows outside of the Őrség area, but their status is probably critical and they gradually disappear, when the scrub and invasive vegetation takes over the meadows.

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

Before and during the last century, the majority of the meadows (both damp hay meadows and semi-dry meadows) were utilized by extensive hay cutting (hand scything) for cattle and only occasional grazing (the cattle were usually kept in barn and they were only herded through the meadows in the autumn for the short period of time to clean the meadows after the second cut). This land use has changed gradually, as the emigration from the region was continuous since the 1970s, and now only a few families keep cattle in the traditional way, especially the elderly, and the traditional animal husbandry will come to a complete cessation without significant financial support. Without regular management, the meadows quickly turn into tall-turf, often invaded by the introduced Giant Golden Rod (*Solidago gigantea*) and through natural succession they gradually become scrub or forest.

While farmer families in the last century typically owned and managed only 2-5 ha of meadows, modern farmers manage 50-100 ha to provide fodder for their 50-100 cattle. Since these farmers are very few, they are able to maintain only a small portion of the grasslands. This change in the agricultural structure results in homogenisation of the landscape, where large areas of grasslands are mown by machines as fast as 10 ha per day. For the sake of comparison a good scythe mower was able to cut 0.5 ha per day. Another important difference is that second mowing is very rare nowadays and

therefore organic materials are accumulated in the soil of meadows and their vegetation changes.
An extensive afforestation program in the 1970s also affected the area, when several thousands of hectares of grasslands and/or extensive arable were planted with Norway Spruce (*Picea abies*), Scots Pine (*Pinus sylvestris*) and the introduced Purple Oak (*Quercus rubra*). These forest areas are basically lost for grassland butterflies, as the law of forestry does not allow reversion of forest even if some of the spontaneously overgrown plots are still registered as grassland in the land registry.

Existing policy measures and what effects they are having
Since the area is protected on both the national and European (Natura 2000) level there are basically two types of policy measures. The first set of measures applies to all grasslands. Among them the most important are the ban on ploughing up registered grasslands and the preservation of the habitat of protected species. According to the law habitats of protected species are not allowed to alter or destroy. To put this measure into practice however, the exact distribution of protected species should be known and farmers informed about them. Due to relatively low capacity of the national park directorate this measure has only been applied for the most endangered species, such as the Marsh Fritillary and the Alcon Blue.
Existing agri-environmental schemes are a controversial issue since they are a bad compromise between bureaucratic and conservation interest and do not take the interest of farmers into account. Their main weakness is that they are too general and a single set of measures are prescribed to all grassland habitat types. Due to historical facts management prescriptions are bird-biased and prefer late mowing in July or August, which is very rarely suitable for key butterfly species. Late mowing is not at all accepted by farmers because the low quality of late mown hay. A recent development was that mowing dates were changed to either before 1st June or after 15th July in 50-50% of the entire area, respectively. The first option is appropriate for most butterfly since it allows foodplants of the key species to flower and do not endanger the brood in the flowerheads, especially in the Great Burnet and Marsh Gentian. Such early mowing is however, hardly feasible for farmers since they can not start earlier that 20th May and thus have only 10 says to finish. The only inevitably positive prescription of the scheme is the obligation to leave “refuge stripes”, which are unmown stripes or patches of meadow. There area is between 5-15% of the total area of the field depending on the programme joined by the farmer. The results of the a monitoring programme carried out by the national park directorate clearly show that in late mown fields butterflies can only be found in these refuge areas. These are the places were foodplants can flower during the flight period and where they can produce seeds later on. Another problem with agri-environmental schemes is their top-down approach and the lack of involvement of farmers in their development. For this reason farmers are not willing to accept prescriptions and in most cases do not follow then either.
Moreover, present agri-environmental schemes, unfortunately, do not encourage land owners to pull their previously abandoned lands under management

Proposed improvements to policy measures

The Őrség National Park Directorate developed a management plan for hay meadows which puts much emphasis on improving policy measures as well. One of the main objectives of the management plan is to introduce policy measures that promote grassland management and animal husbandry. In the meantime measures should be adapted to the wildlife of grasslands as well. Therefore it should be developed by nature conservationists and farmers together to assure their acceptance by both parties. Such a planning process will hopefully start in 2013 and agri-environmental schemes from 2014 can be based on its results. The new system preferred by the national park directorate should be based on a scoring system, where the amount of subsidies will depend on the level of stewardship they undertake in course of supporting the key natural features. Therefore measures will differ between farms and also between habitat types within farms and will hopefully more reflect habitat requirements of protected species. The new system should also reward variability in management types (such as mowing and grazing) and in the timing of management (mowing date) so it will result in a more divers landscape.

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Romania, Pogany-havas Region, Csík Mountains - Muntii Ciucului , mountain hay meadows

Author Laszlo Demeter

Contact details 530204 M-Ciuc, str. Ion Caianu nr. 67, Romania, e-mail: domedve@gmail.com, phone 004-0741-010448

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

The Pogány-havas Region covers part of the Csík Mountains, situated in the central part of the Eastern Carpathians in Romania. They are of medium altitude within the Eastern Carpathians, between 800 and 1500 m asl. Geologically, they are composed of sediments of Cretaceous and Paleogene age. It is highly fragmented through tectonic movements and it has a sinuous ridge, which is also the watershed of the Carpathians. The area is inhabited by two Hungarian ethnic groups, the Székely in the west and Csángó in the east. While both of them continue a lot of traditional practices, they have distinct land management systems. The Székely have common land ownership system for pastures and forests, and the land of villages is divided into large continuous subunits - hay meadows, pastures, mosaic of hay fields and arable land. The Csángó have a predominantly private land ownership system, in which relatively small meadows, pastures and forests compose the landscape mosaic typical of this area, meadows and pastures being divided from each other by wooden fences.

Fig. 1. The location of th Pogany-havas Region within Romania (red area).

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

The main grassland habitat types are Fescue grasslands, grasslands dominated by Tor-grass and Nardus grasslands. As a general pattern, Fescue and Tor-grass areas are used as hay meadows or cattle pasture, while Nardus grasslands are used as sheep pastures. The main grazing season is between mid May and end of September, when meadows are not grazed. Earlier than this some meadows may be lightly grazed, and from early October, all the meadows are grazed by sheep and cattle.

Which habitat type(s) are you going to cover in the example? Is this a Natura 2000 habitat?

The example covers Fescue and Tor-grass grass habitats, which in the Natura 2000 system are part of the mountain hay meadows, code 6520 and dry grasslands, code 6210.

Approximate extent of habitat type(s) in the area, in total and within Natura 2000 (if area is designated as SAC)

The area is designated from 2011 as an SCI, ROSCI0323 Muntii Ciucului, of 59641 ha.

The following grassland habitat types are found in the area:
Calcareous grasslands, code 6170, 0.5%, 298 ha; Dry grasslands, code 6210, 7%, 4175 ha; Nardusgrasslands, code 6230, 5%, 2982 ha; Mountain hay meadows, code 6520, 20%, 11928 ha; hay meadows, code 6510, 0.2%, 119 ha

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

In general, land use and land management follow old patterns (19th-early 20th century, with elements from earlier times). The largest change happened in the case of mountain hay meadows situated in the western part of these mountains: these have been gradually abandoned in the last two decades. In the same time sheep grazing started to cover the area. Out of 34.2 km2 mountain hay meadows only 11.85% have been mown in 2011 (Fig).

Fig. 2. The mapped mountain hay meadows in 2011. Green areas: mown, yellow areas: unmown meadows.

Obstacles for mowing are: large distance (15-20 km from the villages) and difficult terrain, scrub and sheep grazing.

The available data for this area show that permanent sheep grazing reduces significantly the plant and butterfly diversity of these grasslands.

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

Data on butterflies are available from 2011 and 2012. Altogether 130 species have been identified. Number of species is on average three-four times higher on hay meadows than on sheep pastures, and abundance (number of individuals) is almost ten times higher.

No long term monitoring data are available. It is estimated that if present trends in land use continue, butterfly diversity will strongly decrease in the next 5-10 years.

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

Abandonment: almost 90% of the mountain hay meadows are not mown at present. In the absence of mowing local tree species (poplar Populus tremula, spruce Picea abies) invade the meadows in about 5-10 years, also depending on exposition and distance from closest seed source. This impedes further mowing, if the area is not cleared.

Grazing: light sheep grazing causes trampling and shortening of the sward, making the mowing difficult or not worthwhile. Even land owners who would want to mow mountain hay meadows, often are faced with the fact that their meadows have been grazed/trampled. No fencing is used in this area and the distance from the settlement makes difficult regular visits to the land by the owners. Intensive sheep grazing and manuring changes the composition of vegetation in a very short time (1 year).

Fig. 3. Sheep flock on one of the most species-rich mountain hay meadows of the Csik Mountains, in June 2011.

Fig. 4. Two main threats to mountain hay meadows in the Csik Mountains: invasion of local tree species, here spruce in the foreground; intensive sheep grazing, sheep fold with regularly moved enclosures for the night and milking.

Intensification, mechanization: many farmers switched to using tractors in the past 10 years. This is also an obstacle for managing steep terrain in the mountain hay meadow area, which requires work with smaller machines and hand.

Existing policy measures and what effects they are having

Agri-environment subsidies are available in this area for permanent grasslands, in two packages: HNV grasslands which prescribe late mowing (after 1 July) or low-intensity grazing (up to 1 per ha), and traditional management which prescribe non-mechanized management of land. While uptakes are good and the measures encourage maintaining grasslands as opposed to afforestation, in the case of mountain hay meadows the measures encourage grazing.

Proposed improvements to policy measures, including CAP reform, recording of semi natural grassland on IACS/LPIS systems, and systematic butterfly recording

At present, the agri-environment measures support mowing and grazing with the same amount of money per ha. Because the costs of grazing are lower, especially in more remote area where transportation costs are high, the payments further encourage conversion of meadows into pastures. The policy could be improved by increasing the payments for managing meadows of high conservation value. The problem with such a measure is that there are no country-wide data about the location of mountain hay meadows, and their associated plant and butterfly diversity.

Grasslands are recorded currently in the LPIS system, as category PP (permanent grasslands – pastures and meadows).

Recording, mapping and monitoring groups of species is necessary, in order to monitor the ecological effect of agri-environment payments.

Butterfly diversity is a good indicator of the quality of mountain hay meadows in this area. Systematic monitoring of butterflies could provide valuable data for the development of policies that ensure the continued existence of mountain hay meadows.