Alfred Toepfer Natural Heritage Scholarship 2016

Study tour report

Nature conservation management of wet grasslands

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Content

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1. Introduction of authors' curriculum, motivations and expectations

On 12 October 1984 I was born in Ventspils, Latvia.

In 2004 I started to study at University of Latvia, where I obtained a bachelor degree in Geography. My BSc diploma research was in the field of vegetation science and dune ecology. In 2010-2012 I completed the International MSc Program in Environmental Sciences at Radbound University Nijmegen, the Netherlands. For my master's thesis, I participated in an international research project on sand deposition, site conditions and botanical quality of riverine levee grasslands, where I focused on syntaxonomy and synecology of riverine dry levee grasslands in the Netherlands and comparable grasslands in Latvia. In my second graduation project, I contributed to the assessment of the engineering effects of vegetation in terms of root biomass and distribution and to estimate the food availability for the meadow bird chicks. This was a part of an integrated monitoring project "Building with nature" aimed to assess hydrological, ecological and morphological variables were recorded in order to evaluate the effects of the pilot sand engine in front of Workummerwaard, Lake IJssel, Fryslan, the Netherlands. After finishing my studies, I started to work in the field of nature conservation and protection at the Nature Conservation Agency of Latvia. Currently, I am working as an grassland expert at the same institution taking part in the project "Preconditions for better biodiversity preservation and ecosystem protection in Latvia".

Within this scholarship my aim was to visit several protected areas where a large-scale floodplain restoration projects have happened in order to see and learn how these sites are managened, monitored and see if goals of the projects have justified themselves. As we know, many ambitiously project activities are implemented during a project life span when finances are secured. However, in reallity, after the end of the project, these activities are left on there own or lies on other shoulders and usually it is a protected areas' administrative body/directorate. And, in many cases, staff of protected areas are missing tools, skills, financial resources or, even worst, they were not involved in the implementation phase of the projects and do not know what is expected from them to do.

Another important aspect of the study trips was to collect different examples about wet grassland management practice – what are the techniques and methods protected areas using in grassland management according to different biodiversity targets (plant, bird, butterfly species etc.)? How the management practice is combined with the agri-environmental programmes? By whom and how monitoring of the effectiveness of grassland management practice is done and how this data is used in decision-making? What is the landowners' opinion about management measures that are set to the national agri-environmental programmes and have to follow in order to get subsidies?

By the Alfred Toepfer scholarship, I broadened not only my practical and professional experience and get new knowledge, but it also benefited to my personal development. I certainly believe that these trips can be useful both for me and the people I met, because I was able to share Latvian practices regarding nature conservation and show the beauty of my country and I made new connections that can be used in the future. Moreover, thanks to the scholarship and gained experience from the Őrség National Park, I am very keen in practical grassland management and research relating to butterflies.

2. General introduction to the topic

Floodplain grasslands play an important role in the context of climate change mitigation and adaption and they serve different ecosystem services such as flood protection, water purification, nutrient and water retention and, of course, food production. However these habitats are strongly threatened by human activities. This is very important for Eastern and Central Europe where many examples from the last decennium have shown a shift in flooding periods from winter to summer which generates more severe consequences. Therefore, nature-based approaches need to be taken into account where restoration of floodplain functions, safety and habitat creation are combined together.

The above mentioned issue – a shift in flooding periods from winter to summer floods due to climate change – seems to appear more frequent among the Latvia's rivers and therefore there is an urgent need for projects with nature-based approaches for climate change mitigation and adaption, and projects with sustainable long-term effect on nature conservation. For instance, this year has shown that we as a country are not ready for floods and we do not know how to cope with it. This summer has been very high in rainfalls, that is not typical for Latvian summers, and consequently large areas were flooded which usually do not flood or happens once in 50 years. One of the versions for the severe floods that has been pointed out is non-working drainage systems as they are clogged, overgrown and therefore do not fulfil its functions. From one point of view this could be the reason but personally I believe that it will not solve the problem as many rivers have been modified and straighten therefore the river ecology, morphology and integrity is changed and we need to seek for other options.

Another problem about floodplain grasslands is an inappropriate management practice or no management at all (in case of Latvia this could be referable to any grassland habitat type). These grasslands are hard to manage due their location, wet soil conditions, floods, topography (steep slopes) and the biomass is not suitable for cattle as it consists from sedges and rash grasses. Grassland management and biodiversity are closely related but at the same time can be negatively correlated. Agriculture has been and still is one of the main driving forces influencing biodiversity in Europe and worldwide. In the last decades agriculture and its farming techniques have changed rapidly or takes another direction - grasslands become abandoned. All these actions are a major cause for the decline of biodiversity in Europe, including Latvia. Semi-natural grasslands (meadows and pastures) belong to the most valuable ecosystems within agricultural landscapes and are a result of stable agricultural management over centuries, by using the grasslands as hayfields or pasture fields (Rūsiņa, 2007). Nowadays in Latvia semi-natural grasslands occupy only 0,7% of the total country area whereas in 1940 was about 23% (Kabucis et al., 2003, Kupča, Rūsiņa, 2016). In fact, the number could be even smaller than 0,7% as the latest data from grassland habitat mapping shows that many semi-natural grasslands have been turned into arable fields, afforested or turned into trunk plant communities that cannot be qualified as habitat of the EU importance anymore. The main reason for such a decline is related to agricultural intensification, land abandonment, land-use change, drainage and in the last years especially habitat fragmentation. All of these actions influence species dispersal and ecological integrity, and a in long term the biological biodiversity will decrease.

The EU has taken this loss of biodiversity into consideration and gives opportunities to the Member States to develop different agri-environmental schemes (AES) under the Common Agriculture Policy (CAP). The AES is a commitment with several requirements that farmers apply for agriculture practice and in return for that receive a subsidy/support payment. In case of Latvia, there is only one AES measure for maintaining biodiversity in grasslands that exists already since Latvia joined the EU in 2004. However, studies show that the support payment has not been sufficient as the quality of biologically valuable grasslands have decreased under the AES. Many reasons can be linked such as unsuitable requirements for management, bad baseline, payment rates are not differentiated. From the farmers point of view the most limited factor is not having a differentiated payment of biologically valuable grasslands according to the management difficulty level.

The aim of the study was visiting several protected areas where large-scale projects on floodplain grassland restoration have been realized and to see how these areas are managed after the end of the project. Thereby the objective was to collect and compare examples how project sites on grasslands are managed and monitored, and how these data are used in decision-making for nature conservation in Estonia and Hungary.

To be able to reach the aim and objective of this study, several activities were implemented:

- visits of the protected areas' headquarters;
- field trips on grasslands areas;
- discussions with experts about protected area administration, management plans, operational plans, grassland management practice and monitoring, available agri-environmental programme, collaboration with landowners, implemented projects;
- presentations about nature protection and conservation in Latvia.

3. Short description of the visited protected areas

Hungary is well known for its strong laws and firmly established framework to protect its nature and wildlife, and nature conservation has a long history. One reason being its well-developed system made up of governmental institutions and large network of protected areas on government owned land. About 9% of Hungary's territory is under federal protection and there are 63 forest reserves that have been designated as protected land. Impressive is also Hungary's contribution to the Natura 2000 network - about 21% of the country's total land area. In total, here are 10 national parks, 35 landscape protection areas and 145 minor nature reserves. The national policy for governing and management of the protected areas is implemented by the Ministry of Agriculture.

Picture 1. National parks in Hungary[1].

However, Hungary's nature conservation is also changing and the first main change happened already 2004 as the Hungarian Government cut already low budget of the National Park Directorates as a result they need to generate their own income. This was a turning point to the Directorates and they started to reshape their strategies and goals, and started to invest money in tourism and its marketing. In this case I would like to mention that not all national parks are popular destinations among domestic and international travellers therefore they are force to find another ways to exist and fulfil their tasks. Some of the National Parks are located in margins of the country, for example, the Őrség National Park does not have a large proportion of international tourists, therefore there are also a limited number of attractions that are offered in English, the same counts for the information such as booklets, information boards etc.

In order to prevent the conservation, guarding and damaging of natural sites and values in Hungary, each National Park Directorate operates a Ranger Service. In Hungary this service has existed for more than 30 years. The Ranger Service operates within the operational areas of the national park directorates in the interest of the protection, conservation and the prevention of the degradation of the natural and protected natural areas and assets. Rangers are equipped with service uniform, a service permit, a service badge, a handgun and other technical devices. Citizens can help the job of the rangers as civil rangers.

As mentioned above Hungary has 10 national parks but their operation areas are much larger than the national park territories, it is well represented in the picture 2.

[1] http://i.imgur.com/DMjccSp.jpg

Picture 2. Operation areas of the Hungarian National Parks[2].

3.1. Sites visited in Hungary

Őrség National Park

The Őrség National Park includes the Őrség, Vendvidék, the alley of the river Rába (the Inner Őrség), the area around Szentgyörgyvölgy. It covers a total of 44 settlements, close to 44,000 ha. The National Park was founded in 2002. Őrség is a special forest, hilly region formed by rivers and streams, where the waterless, hardly accessible valley bases are surrounded by dense hilly hills. Largest part of the landscape is taken by forests, making up about 63%.

The National Park directorate is participating in a breeding programme and have livestock's of Hungarian cold-blooded horse of the Murafaj type and Hungarian herds. In total, they own about 281 cattle and 48 horses.

In addition to natural values, the landscape is characterized by outstanding ethnographic and cultural heritage values.

Picture 3. Őrség National Park

Balaton Uplands National Park

The National Park lies along the northern shore of Lake Balaton in a 1-15 km wide band, from Balatonszőlős to the Kis-Balaton. The area of the national park (almost 57 000 hectares) includes six former Landscape Protection Areas: Kis-Balaton**,** Keszthely Mountains**,** Tapolca

[2] https://www.eea.europa.eu/soer/countries/hu/nature-protection-and-biodiversity-national

Basin**,** Káli Basin**,** Pécsely Basin and Tihany Peninsula. The Balaton Uplands National Park was formed in 1997 (BUNP, 2017). Each of these areas is unique and visitors are able to see the Park from various angles. For example, the Kis-Balaton is also protected by the International Ramsar Convention and is known as a large wetland habitat. It is important to notice that the National Park partly overlap with the Bakony-Balaton Geopark.

The Natura 2000 areas, covering partly the National Park and going beyond its area ensure the possibility of the conservation of habitats, plant and animal species which are of European importance. The primary objective of the Balaton Upland National Park is a comprehensive conservation and protection of natural assets and areas. Besides protection it is also important to interpret the beautiful landscapes, living and non-living natural values and to provide possibilities for the present and future generation for learning and relaxing in nature (BUNP, 2017).

As recognition of its outstanding geological values (spring coves, geyser cones and stratified flint and lime sedimentation) and the work of nature conservation in this region, the Tihany Peninsula was awarded of the European Diploma in 2003. The singularly colourful geological picture is the fertile background to a flora and fauna of exceptional diversity. This is the region of the Carpathian Basin where the wildlife typical of the woods and steppes of the plains meet that of the small hill ranges that stretch to the north of Lake Balaton.

Picture 4. Balaton Uplands National Park

3.2. Sites visited in Estonia

Despite the fact that Estonia is a small country it has a beautiful wildlife that in other Western European countries has already disappeared. Forests and woodlands cover almost half of the country and wetland habitats are well represented by over 1400 lakes, numerous bogs and rivers.

Picture 5. Protected areas in Estonia[3].

For preserving biological diversity, 18% of Estonia's land area and 26% of the water area has been taken under protection (Keskkonnaamet, 2017). After the collapse of the former USSR, Estonia's one of the key nature conservation decisions was to preserve already existing protected areas, regardless of land ownership. Estonia has different categories of protected areas: national park (in total 5), nature reserve (159), landscape protection area (152), protected area with old protection regulation (80), limited-conservation area (335), species protection site (1426), individual protected nature monument (1153), natural objects protected at the local government level (20), parks and stands (534).

Estonia has great floodplains resulting from a combination of floods and human activities. In the western part of Estonia the Kasari River basin is the biggest in the country and it is located in the Matsalu National Park which was one of the visited places.

Matsalu National Park

The Matsalu National Park was formed in 2004, before that it was called as the Matsalu Nature Reserve and was founded in 1957. The main purpose for establishing the nature reserve was protection of birds and their habitats. Nowadays the National Park – a territory of 48 610 ha – covers the low Matsalu Bay and consists of semi-natural communities, coastal meadows, floodplains and wooded meadows on approx. 50 islands and islets in the Väinameri Sea (Keskkonnaamet, 2016 a).

The main idea for establishing the National park is to protect characteristic biotic communities of Western Estonia and preserve the natural and cultural heritage of this region. This Park is one of the most important nesting and stopover sites for waterfolw in Europe.

Floodplains in this National Park sum up about 4000 ha and it makes the largest of its kind in Northern Europe. During the spring floods, Kasari's flood meadows are transformed into an extension of the Matsalu Bay, forming a huge field of water. The water stays for several weeks till the ice cover of the bay has been melted and the floodwater runs off into the sea. It should be also noted that flooding occurs also from the bay, especially during strong storms (Keskkonnaamet, 2016 a).

[3] http://www.biodiversitya-z.org/content/estonia

Picture 6. Matsalu National Park

Soomaa National Park

In Estonian the word ‘soomaa’ means ‘swamp land’ or ‘land of mires’. And we do not need to guess twice that this protected area has been established for protection of mire and floodplain landscapes.

Territory of the Soomaa National Park was established on a basis of a botanical reserve of Halliste wooded meadow founded in 1957 and four wetland reserves - Kikepera, Ördi, Kuresoo and Valgeraba founded in 1981. The Soomaa National Park as we see nowadays was established in 1993 merging above mentioned protected areas into one. Nevertheless, in 2005 the boundaries of the National Park were reviewed and it was enlarged including also the Riisa bog. The Soomaa National Park was created to protect mires, flood meadows, forests and habitats of endangered species as well as the cultural heritage of the south-western part of Estonia (Keskkonnaamet, 2016 b).

The National Park is well known for its floods and locals even gave a name to this phenomena as “fifth season” – being a high-water season. The entire protected area of about 39,844 ha gets flooded once or twice a year. Nevertheless, people who live there have used it and are well prepared, and actually cannot wait when the ice starts melt and rivers run off their beds. In fact, the locals have turned this natural phenomena into a popular touristic attraction as many people come to this region to see floods (Soomaa.com, 2017).

Picture 7. Soomaa National Park

Pärnu Rannaniidu Nature Reserve

Pärnu Coastal Meadow Nature Reserve was established in 2007 for protection of coastal lagoons, shifting dunes, boreal Baltic coastal meadows and many protected species of those habitats. The total area of the Nature Reserve is 371,4 ha and most of it (about 90%) is located in the Pärnu city. Coastal meadows are temporarily flooded areas by the sea and these meadows

have developed in combination with sand deposition, natural disturbance (floods, waves, wind) and extensive management activities.

This area used to be grazed by cattle in the 1970s-80s but due to socio-economic reasons this area was abandoned. In the next following decades the area has been overgrown with high reed stands decreasing the biodiversity of coastal meadows and lagoons, at the same time, declining recreational area for the city residents and visitors as Pärnu is most popular summer vocation location in Estonia.

In 2012 a project to improve the conservation status on the coastal meadow and lagoon habitats has started. Since the project implementation – habitat restoration, reintroduction of grazing, building tourism infrastructure, awareness rising towards the general public – the number of visitors of the area have increased up to 10% and time they spend in this area also has increased (Environmental Board, 2016).

Picture 8. Pärnu Coastal Meadow Nature Reserve

4. Main outcomes

4.1. Overview of river floodplains

River floodplains are characterized by high economical (Costanza et al. 1997) and ecological values (Antheunisse, 2007). These systems provide many functions, such as food, drinking water, sand and clay extraction and nutrient retention, and all kind of other functions, some related to the river, others not. Moreover, natural river systems are rich in terrestrial and aquatic flora and fauna as a result of the dynamic hydrological processes and gradients (Ward et al. 1999). The dynamic interactions of water, sediment and biota, within the gradient from the main river channel to its floodplains, create a wide variety of riverine habitats (de Nooij et al. 2006). Although river systems are high in species diversity and, at landscape level, provide many functions, they are considered to be among the most degraded ecosystems in the world (Turnhout et al. 2012). Tockner et al. (2001) write that many former floodplains have disappeared or are functionally extinct from the river landscape, for example, in Europe by almost 90%.

The impact of climate change on the river discharge in the recent decades has increased and will continue to change even further, especially due to human interference (Middelkoop et al. 1997, NRP projects 958273, 2001). According to Banach (2010), Eastern European countries are facing an increasing tendency of summer inundation event along large rivers, which is expected to become more frequent in the near future. These weather conditions and climate change together with the effects of the land-use change on hydrology and discharge capacities

will bring catastrophic river flood events. For that reason, climate change and its impact on the rivers should be included in the process of making decisions about the river further management and policies.

Tockner et al. (2006) emphasise that understanding patterns and processes in natural river corridors are prerequisite for a sustainable conservation and management of their biodiversity. Many restoration project on floodplain grasslands have concentrated only on restoring these grasslands in context of biotic aspect– usually cutting shrubs, trees, top-soil removal etc. – but not so much on the river geomorphology. Geomorphology is considered to be the central and most important abiotic process, as it is closely correlated with geology and determines hydrological processes and soil developments. In general, morphodynamics created several landforms (within the channel bed and floodplain) along the lateral and longitudinal gradient in the river system and subsequently promote suitable habitats for biotic elements. Wolfert (2001) emphasize that morphodynamic and hydrodynamic processes and patterns determine and control biological patters of fluvial systems, for example, the mechanical and physical influences of flowing water on substrate, vegetation and animals as well as erosion and sedimentation. Form that can be concluded that development of plant communities and faunal groups on banks and floodplains is linked to aspects of flood regime, whereas soil development and succession regulates the community composition.

Restoring hydrodynamic processes are a second important foundation for the riverine ecological rehabilitation (Smits et al. 2000). For the river systems many ecological concepts have been developed to link the physical, biotic and chemical processes, where in the lateral zone flood pulse is found to be of strong importance. The flood concept states that periodic flooding comprises the most important factor determinating the biota and river systems (Junk et al. 1989) (Fig. 1). From the Fig.1. can be understand that strong interactions between the aquatic and terrestrial zones during the flood cause changes in physical and chemical processes. In general, in the course of inundation nutrients are taken up very quickly which is reflected by the fast growth of macrophytes and plankton production. Moreover, the floods transfer nutrient-rich mud with dead leaves and wood which is important for terrestrial food webs (Van den Brink et al. 1996). When floodplains are desiccating, the remaining decomposing plants and detritus form an important food supply for birds and nutrients for the ecosystem, as well as vegetation regeneration starts.

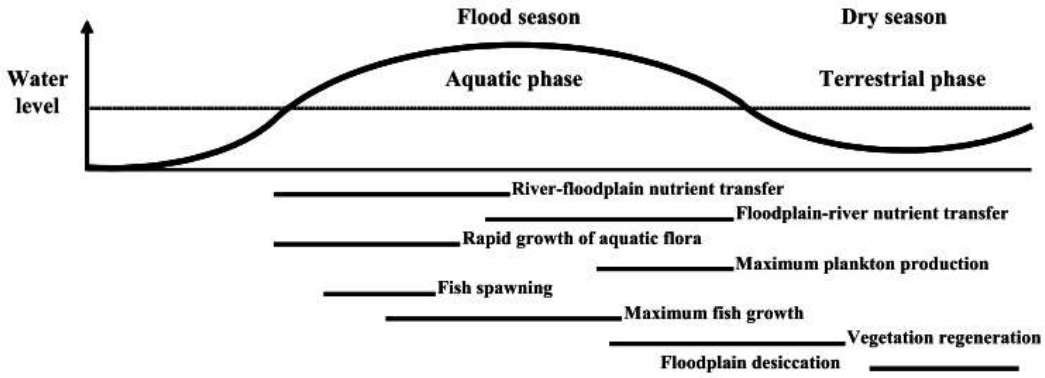


Fig. 1. Effects of flood pulse on various physical and biological characteristics of river system (Junk et al. 1989).

4.2. Semi-natural grasslands in Latvia

Semi-natural grasslands (meadows and pastures) represent one of the most diverse and species-richest and, at the same time, the most threatened habitat groups. Species-richness and ecological functions of semi-natural grasslands depend on active and regular management measures. Semi-natural grasslands host about one third of vascular plant flora in Latvia, numerous specialist species and rare, threatened species. Many grassland-related species, both rare and common, are declining along with habitat loss and deterioration. Numerous bird species including those of the Birds Directive are breeding in semi-natural grasslands or use them as nesting and feeding grounds, e.g. *Crex crex, Gallinago media, Philomachus pugnax, Vanellus vanellus, Grus grus, Aquila pomarina, Sylvia nisoria, Acrocephalus paludicola*, and other.

Maintenance of grasslands, especially semi-natural grasslands, is crucial for ensuring conservation of numerous species, e.g. ca. 40 % of the nationally protected vascular plant species are found in grasslands, 82% of the Latvian population of *Crex crex* nests in grasslands. The results of the Habitats Directive's Article 17 report (the last one was in 2013) on the status of species and habitats show that all grassland habitats of the EU importance are in a favourable conservation status. The species and habitat types are threatened mostly by lack of appropriate management or management applied in insufficient extent and/or regularity as well as by different national, regional and global scale changes in environment, often caused by socio-economic impacts (e.g. land use change), global environmental trends (climate change). All countries that I have visited are facing more or less the same threats – change in rural lifestyles and land use, conversion to arable lands, abandonment and overgrowing, eutrophication, afforestation, hydrological modifications (drainage), invasive and expansive species, leisure activities, fragmentation and isolation.

Floodplains may consist of different plant communities belonging to different grassland habitats. In this study I mostly looked at the floodplain grasslands, according to the EU Habitats Directive "Norther boreal alluvial meadows (habitat type code 6450)", that mostly are found along the large rivers and lakes. Theses grasslands are flooded usually in early spring when snow is melting but may happen also in autumn due to rains. Some of the floodplain grasslands are flooded once in two or three years but usually it occurs every year, sometimes even twice.

At present days it is very "stylish" to talk to general public about ecosystem services to get the acceptance about different habitats that sometimes are sensitive, for example, floods, safety issues and nature conservation. Thinking about floodplains and its ecosystem services usually are considered:

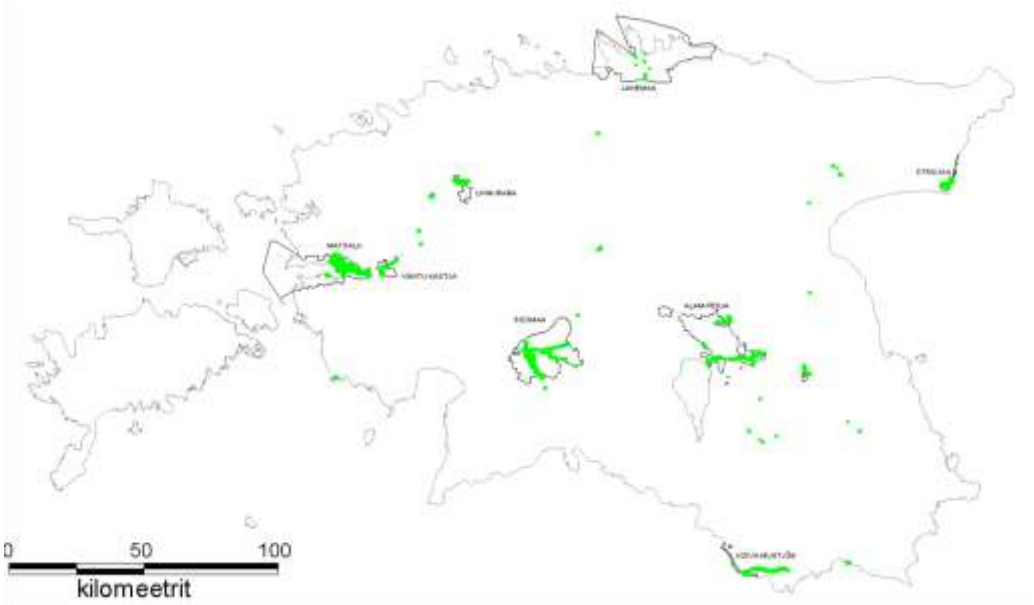
1) Flood regulation - rivers that flow in natural stream bed (undammed, unchanged) serve as a hydrological buffer in case of a flood and relieve the influence derived from the fluctuation of water level on areas that are situated downstream;
2) Regulation of biogeochemical and energy cycles - nutrients (N, P) brought by flood water will accumulate on a floodplain, thus floodplain soils will become rich in nutrients and flowing waters will become poor in nutrients;

3) Bioproductive function - hay from floodplain grasslands has been used as forage for hundreds of years; nowadays, it has alternative uses in bioenergetics;
4) Habitat for plant and animal species - feeding and nesting areas for both the birds who live on a floodplain or its surroundings and transit migrants, nesting and feeding places for different land and water invertebrates and vertebrates, spawning areas for fish;
5) Social functions - culture historical, aesthetic-recreational and scientific, recreation.

4.3. Floodplain grasslands in Estonia

The surface area of Estonian floodplain grasslands with a high nature conservation value is estimated to be 16,000 hectares. Several inventories have been organised in order to obtain an overview of the nature conservation condition of floodplain grasslands. As of 2009, the data base of the Estonian Seminatural Community Conservation Association includes 20,233 ha of floodplain grasslands. In comparison with historical data the maximum surface area of Estonian floodplain grasslands was reached at the turn of the 19th century about 150,000 hectares, whereas by the end of 1970s was left nearly 26,000 hectares. In 1990, the surface area of floodplain grasslands was estimated to be 20,000 hectares, after which it has been somewhat growing thanks to national and European subsidies, yet the surface area does not considerably exceed 20,000 hectares. Extensive (at least about 1,000 ha) representative floodplains can be found in Matsalu and Soomaa National Parks, Alam-Pedja Nature Reserve and Koiva-Mustjõe Landscape Protection Area (Metsoja, 2011).

From the syntaxonomical aspect floodplain grasslands 6450 may also overlap with other Natura 2000 habitat types such as Fennoscandian wooded meadows 6530 and Fennoscandian wooded pastures 9070.



Picture 9. Largest concentration areas of floodplain grasslands in Estonia (Metsoja, 2011).

4.3.1. Management, monitoring system and collaboration

Matsalu and Soomaa National Park have been implementing several projects funded by the EU or national funds towards restoration of semi-natural grasslands, including floodplain

grasslands. Already before entering the EU, the Matsalu National Park has seek for different financial resources to be able to prepare strategical documents and including management of plan of the park. The first management plan was prepared in English in cooperation with WWF Sweden in 1993, although it was a small concerning number of pages but it consisted of the most important information – overview about the park's biological values and its threats, proposed zonation and finer division of the zones into management areas, and finally necessary actions and financial aspects. Director of the National Park stressed that it was a good idea to write the management plan in English because it opened doors to get financial support from various donors. It is interesting to notice that the main threats that are mentioned already 24 years ago are common also nowadays – pressure of drainage, disturbance nesting season, overgrowth due to lack of use, heavy machines. Looking at management actions as they were prepared I noticed that they are detailed and consisted of information where grazing and mowing is needed, also a mechanism of contracting farming and payment compensation was described, moreover a preliminary draft budget was assessed. After the management plan was ready, the lobbying phase has started and consequently the National Park got some money from the Parliament in 1996 to be able to start to implement the management plan. The Matsalu National Park started a "movement" of modern management of grasslands in Estonia – administration contracted farmers who were interested to secure grazing or mowing of designated habitats and they got compensation for that. This mechanism was very successful and many abandonment grasslands were managed again. The compensation as itself included also investment in tractors, fences, animals and was feasible with help of various projects financed with the aid of donors like EU, Ramsar SGF, SIDA and WWF. Such a support has been very important for the site management with the indirect benefits of improving relations between the nature conservation authorities and the farming community, and maintaining viable farming economy. For example, a farmer got 10 cattle for 5 years to be able to start grazing, after the end of the contract the farmer needed to give back to the park administration those 10 cattle of the same sex age and breed but all offspring's that animal got, he/she could kept. In my opinion, this is a very good incentive. Although, this incentive started in the Matsalu National Park but nowadays it is not so much practice there due to several misunderstanding with users/farmers, whereas this incentive is very well known and practiced in the Soomaa National Park.

Currently about thousand hectares of alluvial grasslands are grazed and over one and a half thousands hectares are mown on an average year. In total, about 3000 ha of grasslands are managed in the Matsalu National Park but there are many more areas that need to be restored and managed afterwards. Most grazing is done by cattle, some by sheep and horses, with almost no mixed grazing that is not favorable for the grazing quality. The park administration has done a large task in educating local farmers and introducing meat cattle to their farms. During collective farm era, traditionally milk cattle were grown. As they say themselves– first of all they need to educate themselves about technology options and management activities, and only

then reach to the locals. For example, using solar energy batteries for electrical fences could not be imaged like 10 years ago but now it is a regular practice.

Picture 10. Electrical fence using solar energy.

The most common grassland habitat type in the Soomaa National Park is 6540 that take up to 90%. The total number of floodplain grasslands is about 17500 ha but only 800 ha are managed. The main reason for such a small number of ha that are managed is related to the location of these grasslands – surrounded by forest and bogs – and size, usually small-patches, therefore its management is hard and disadvantageous. Moreover, most of these grasslands are overgrown with shrubs and trees therefore restoration needs to be applied first before mowing/grazing. In my opinion, this is a challenge for the staff members of the park to find different ways how to encourage farmers, land owners and managers in grassland management.

Monitoring system

Another objective of my visit was to find out more about monitoring system – how it is done, by whom and how this data is collected. As predicted the national park administrations do not do any scientific monitoring, data collection and analysis. For the scientific research the national parks collaborate with universities, research institutes and NGOs etc. On countrywide there is a national state monitoring system on different habitats and species which is usually done as an external service. Nevertheless, the collected data and results are used in decision-making process, for instance, on a national level - developing new or renewing management plans for protected area or amending laws. On a regional or local scale collected data from monitoring could be used in process of setting up new rules of the grasslands' management or issuing permits. However, people who I met during my visit admitted that monitoring even if it is not a main responsibly or task of the Environmental Board (a manager of the areas under the protection by the Government of the Republic) some people do it because it is their field of interest, for example, entomologist and ornithologist. Beside the national monitoring system, the Environmental Board can also propose ideas for monitoring depending an areas and its needs. This system is very alike with Latvia.

As I am more interested in restoration projects on floodplain grasslands then I was more keen to know how monitoring is done after the end of projects. First of all, projects that are funded by the EU or other donors, monitoring is usually done during the implementation phase,

sometimes 2 years after the end of the project. Especially in those projects where restoration of hydrological regime has been restored. Secondly, long term monitoring usually is not applied in practice because usually projects are written or planned in a way that no additional financial resources will be needed after it finishes. However, from the experience, we know that not everything goes so smoothly as planned. More likely successful will be those projects that try to involve people from the protected area's administrations because in many causes they can do monitoring after the end of the project and therefore ensuring monitoring initiated by the project will continue. Of course, this counts only when projects are implemented in the territory of protected areas. This could be a win-win situation, especially if among the protected area's staff are specialists like botanists or ornithologists. From my point of view, this is a very vital turning point and could be profitable for both – project implementation and project after-life plan. For example, my own experience has shown that collected data from vegetation surveys under prescribed management can give conclusions about the management effectiveness on species or habitat level.

Management practice

By definition semi-natural grasslands need human intervention, without a proper active management these grasslands will turn into other habitats, in case of Estonia and Latvia it would be a forest. Starting to think of proper management practice many aspects need to be taken into consideration such as grassland structure and composition, values for nature conservation, age, edaphic features, the management history and ownership conditions etc. In the last decades also restoration feasibility needs to be included as grassland abandonment has led to a dramatic loss of this habitat. If grasslands are just overgrown with shrubs, trees or expansive species but other grasslands features such as hydrology, geology, ecology has not changed then it is rather easy to restore.

Grazing

Grazing and mowing as a management method is the most common in all countries, however these methods need to be under control as we know that overgrazing can lead to the soil erosion and desertification. Whereas undergrazing is also not a good practice as it will help to spread tall herbs and scrubs. However, timing or a period of grazing, a number of livestock grazing an area, animal type will influence grasslands either way positively or negatively. The main differences on grassland vegetation depending on the type of animal are compared in Table 1.

Table 1. Comparison of grazers.

Animal type	*Positive*	*Negative*
Cattle	Feed on relatively high vegetation. Opening up areas with shrub encroachment. Grazing in wet grasslands.	Selective grazing. Heavy trampling. Avoid short turf.
Sheep	Feed on short, fine herbage. Low trampling pressure. Very easy to handle. Produce a mosaic of under and overgrazed areas.	Very selective (more than cattle). Avoids wet areas

Horses	Intermediate trampling. Graze steep slopes successfully. Produce a mosaic patches of short and tall vegetation.	Very selective grazers (completely eliminate some plant species). Establishment of weeds.
Goats	Graze also swards. Consume a wide range of coarse vegetation. Create mosaics of tall grasses and shrubs. They do not bite close to the surface – leave approx.3-5cm of herbage.	Aggressive grazers.
Geese	Like short vegetation.	A large number of geese is not advisory as they bite the grass to its root.

The period of the grazing must be carefully selected, especially in areas that are important for grassland birds. Usually these areas have restrictions, for instance, it should be avoided during the breeding season or areas important for overwintering invertebrates autumn grazing should be of low intensity, to keep some rank vegetation on the grasslands. For example, the first LIFE projects in Latvia was focused on grassland birds such as *Crex crex* and, based on its results, the conditions for the second RDP were made concerning mostly on bird biodiversity and not so much on botanical values. One of the conditions was late mowing after 1th of August for all grasslands that entered this programme. Another aspect is to avoid trampling and disturbance of protected species. This can be done by using electrical fences. Depending on the grassland type and its biomass, sometimes supplementary feeding is needed for animals, however this step should be considered twice because in many cases it can be assess as a threat - locally grasslands will enrich with organic matter and invasive species.

Mowing

Mowing is the most popular management practice in all visit sites because from the practical point of view it is easier than grazing. Mowing removes nutrients from the fields but biomass should always be removed otherwise it causes nutrient enrichment. However timing of mowing is very important and may differ from the point of natural values, for example, if grasslands are valuable for meadow birds than usually late mowing would be more appropriate, also for flowers would be recommended to delay mowing in order to allow setting of seeds. Usually it is not possible as farmers want to start to cut early because grasses and plants contain higher proteins and is most valuable for milk production. However leaving some areas unmown as refuge areas is very recommended for early mowing. Also increasing mowing times in one season will affect the loss of biodiversity but it consequences will not be observed immediately but after some years.

The most unsuitable management practice for grasslands is mowing with mulching or leaving the biomass on the field. This type of management will change the plant communities, rare plant species will disappear and vegetation will be dominated only by few species. In this context, it is worth to mention Latvia because in the last planning period (2007-2013) mulching was allowed but results of this practice resulted that grasslands quality has sharply decreased, grasslands are species-poor and in many cases cannot be qualified anymore as habitats of the EU importance.

It is worse to mention that the Matsalu National Park has another threat to coastal grasslands – reed. Reed has gradually encroached upon the coastline of bay and its expansion has been accelerated by human activities: eutrophication, climate change and the cessation of coastal meadow management. And actually it can be also seen as an invasive species.

Together with partners from Finland a project "*Reed Strategy in Finland and Estonia*" (the Interreg IIIA project) was implemented to find out how effective reed can be for bioenergy and as a construction material, also tested several methods for removing intensive reed beds. Initially the plan was to seek for alternative income sources to local community. Based on the project outcomes, Lihula municipality has built a heating system that uses hay biomass in energy production, including the reed from the Matsalu area. During this project, some areas of reed bed were restored by creating mosaic landscape with open water areas. At present these areas are mown and supported by the agri-environmental subsidy.
From the visited areas I saw that the most common management practice on floodplain grasslands is mowing but I was also surprised that grazing is rather often applied which is hard to see in the Latvian landscape nowadays in the context of nature conservation as an extensive management. Also combination of grazing and late mowing is practiced, especially if grazing is not sufficient as planned, for example, livestock herd is too small. Therefore mowing is applied after grazing for those areas that are under the agri-environment programme as one of the conditions is that 50% of the vegetation on the field has to be short. More information about the subsidy scheme is found in 4.3.2.chapter.

Grassland restoration

As mentioned before the Estonian nature conservation system has faced several changes and one of them was that all forests in protected areas belonging to the Estonian states passed from the Environmental Board responsibility over to the State Forest Management Centre (RMK). The RMK manages and maintains about 40% of Estonian forests including such fields as land use management, forest management, forest survey, timber marketing, visitor management and nature education, nature conservation, seed and plant management (RMK, 2017). As I understood, the RMK is a very important player also in grassland management, especially in the phase of grassland restoration. Why? When grasslands are overgrown with trees and bushes are not suitable for mowing or grazing, therefore before entering into the agri-environmental programme restoration needs to done. And here the RMK comes into as they are the one who are doing the restoration works – cutting trees and shrubs, mulching, stump removal, chopping etc., also renovating ditches and building infrastructure elements such as roads and bridges. However the RMK will not start to do grassland restoration before a contract with a potential tenant is signed. During my visit I had a chance to visit some sites: a) a site that has been just restored – prepared for either grazing or mowing – but extensive management not started yet; b) a site that has been already restored in 2011 and is mown (Picture 11). I was very surprised how these grasslands look now, especially knowing how these areas looked before, and seeing that rare plant species have returned and the biodiversity has increased in general.

Picture 11. a) just restored grassland in 2017, b) grassland restored in 2011 and now is mown.

A very good example of grassland restoration was noticed in the Pärnu Coastal Meadow Nature Reserve, although the visit to this area was not closely related to my field of interest as these grasslands are not floodplain grasslands. But the project outline and reached outcomes are very interesting and I have been following project steps since it launched, therefore it was interesting to see this area with my own eyes. It was interesting to see how this project changed people minds about nature conservation in urban areas where inhabitants of the city saw the benefits from the project. This project is a very good example not only from the restoration and management aspect but also from a social-economical. As Latvia also has some hundreds ha of coastal meadows that are in bad conditions and need an urgent restoration and management, then we could use our neighbour gained knowledge and applied techniques if we would implement a similar project.

Both national parks – Matsalu and Soomaa – have shown good examples about grassland management in those areas that once were project sites. These areas are managed sufficiently and objectives of the projects are still reached after the end of it. The main conclusion is that it is very essential to think beforehand about the project goals and objectives, its sustainability, how certain activities will affect the area and habitats after the project life-span and most important what will happen with these areas afterwards. Those projects that have been implemented in the field of grassland restoration and ongoing projects at the moment in Estonia show that above mentioned aspects are integrated already in the designing phase of the projects and this could be the success of Estonian projects.

4.3.2. Subsidy system for maintaining semi-natural grasslands

In protected areas in Estonia, included the visited national parks, the management practice goes hand in hand with the rural development plan and national subsidy programme for maintaining semi-natural grasslands, including a set of conditions of management methods. The subsidy is available only for grasslands in protected areas, therefore there could be a chance that some very valuable grasslands are left outside from the programme. In this context I want to add a remark that Latvia is the only country in the EU that offers subsidy also outside the protected areas. On my question why the subsidy is available only for the protected areas, respondents answered that they cannot be sure that farmers/managers will be interested in maintaining grasslands in the same way/or under specific conditions when the contract will be over. It would mean that the invested money would be allocated wrongly and not sustainably, therefore

protected areas are safer due to several regulations and restrictions, for example, a permit from the Environmental Board is needed to change a land-use.

Already since 2001 the national scheme of semi-natural habitat management is operating in Estonia under the Ministry of Environment. It included a payment for management practice and additionally also the cost of erecting fences were compensated.

For the new planning period (2014-2020) conditions for the subsidy system has been changed, including the support rates. As I was told the number who participates in the agri-environmental programme (subsidy system) is about 800 with supported area with almost 30 000 ha. Although the target for this programme is 40 000 ha with 1 500 participants and it would be too challenging to say that it will be reached by the end of 2020. This subsidy system is interlinked between two governmental institutions – Estonian Agricultural Registers and Information Board who is a payment agency, and Environmental Board who is the managing body. The Environmental Board is closely working together with farmers/managers and they are the ones who are actually checking the quality of the management practice and if all conditions of the subsidy system are taken into consideration. To enter this system, an applicant needs to be corresponding to those eligible criteria's such as 1) grassland of at least 0,1 ha, 2) inside protected area, 3) is registered at the Environmental Register, 4) land has to be maintainable, in other words, suitable for mowing or grazing, 5) should be covered with grassland plant with exception for lately restored grasslands, 6) coverage of juniper (alvars) is generally not more than 50% but also here might be some exceptions, 7) for coastal grasslands – no overgrown by reed, 8) contract for minimum of 5 years and 9) participants have to attend semi-natural habitat maintenance training. For the new planning period new conditions were set in order to overcome several problems that were observed in the last period (2007-2013). The main problems for the last period and possible solutions are listed in Table 2.

Table 2. Identified problems for the subsidy system in the period of 2007-2013 and possible solutions.

Problems	*Solutions*
Under-grazing	Specifying results for grazing
Coastal grasslands in bad conditions	Specifying eligible criteria (eligible also these area with ponds, lagoons that are characteristic for coastal grasslands, a beginning date for grazing is set-up, no overgrown with reed).
Meadows with junipers (alvars) in bad conditions	Specifying eligible criteria (juniper coverage can be 50%)
Low interest to maintain wooded meadows	450 euros per ha

As already mentioned in the text, the Environmental Board is managing and controlling body that makes sure that participants are maintaining the semi-natural habitats in a way as they (Environmental Board) has approved. All semi-natural grasslands that are eligible for the

subsidy system and participates in this programme need to get approval of the management practice from the Environmental Board, which may have also some restrictions depending on the protected areas. For example, some areas that are designated for bird species need more specific management rules, such as delayed mowing or grazing where general conditions are not suitable. Therefore, this is also a responsibility of the Board, moreover they may do exceptions according to the protection laws, as well as they can set additional work of it is needed, for instance, shrub removal, mowing after grazing etc.

Also payment rates have been changed when comparing both planning periods, in same lines the rate got higher, in others smaller. For example, for mowing wooded grasslands the payment rate is 450 euros per ha, while applying grazing it would be 250 euros. Also new payment rates were established, for instance, grazing on meadow with junipers is 250 euros per ha and maintaining coastal areas that are important for the protection of species the rate is 232 per ha. All the other grassland habitats for mowing would get 85 euros per ha, whereas for grazing – 150 euros per ha.

During my visit, together with the land management specialists I had a chance to participate in a field survey when management practice is evaluated. Mainly we visited several grassland habitats that are located in the river floodplains, among them grasslands that are still under the restoration phase and are not included in the subsidy system yet.

Picture 12. Visited grasslands in the Matsalu NP (a blue line is a driven route using a GPS).

During the field visit, the specialists on mowed grasslands collect data on: is grassland mowed or not, is the hay collected (must be collected by 1 September), collected mowed vegetation (hay) that usually is done in reels must be removed from the area by 1st April of the subsequent year. And usually mowing is not allowed before 10th July, however it may differ from the situation to situation. The same counts for the collection of hay – as I wrote before – it is compulsory, but, in some cases, exceptions may be applied, in other words, depending on the grassland habitat, conditions, quality etc. but permissions from the Environmental Board are needed as well as good and reasonable arguments for mulching and leaving hay on the ground.

For grazing the main data that is collected from the field is only one – the results of grazing must be visually identify by 1st October that grass has been eaten short to the extent of 50% and mostly eaten on the rest of the area. Nevertheless, if grazing is insufficient mowing may be applied as well. From grazing there is not set a starting date, exception is coastal grasslands when grazing should start at least on 31st May but depending on protected areas protection laws some exception may be applied. While visiting fields, a GPS device is used to record data from the fields, as well as to see which fields have been visited because afterwards this information is needed to communication with the payment agency and land owners/mangers. Actually I was surprised how large areas one person have to monitor, for example, picture 4 shows an area that has been visited during a period of 3 hours. Due to wet soil conditions, small accidents may happen – you could stick in the mud, as it happened with me, but it was a great experience for me as I barely were driving with such kind of machine before.

All the people with whom I have been speaking agreed that without the help of the subsidy system the semi-natural grassland management would not be as successful as it is now, although there are much more grasslands that are waiting to be restored and maintained. At the same time, they also said that most probably without the subsidies, the interest in maintaining semi-natural grasslands would be very, very low. Already now, the protected areas are facing another problem – collected hay stands are standing along the roads, on margins of fields and not being used. Therefore, the Environmental Board needs to think of other alternative ways how to use this hay. Also from the landscape view those stand with collected hay are very ugly and are changing the traditional sights.

Picture 13. Collected hay in reels that change the view of the landscape.

4.4. Semi-natural grasslands in Hungary – a case from the Őrség National Park

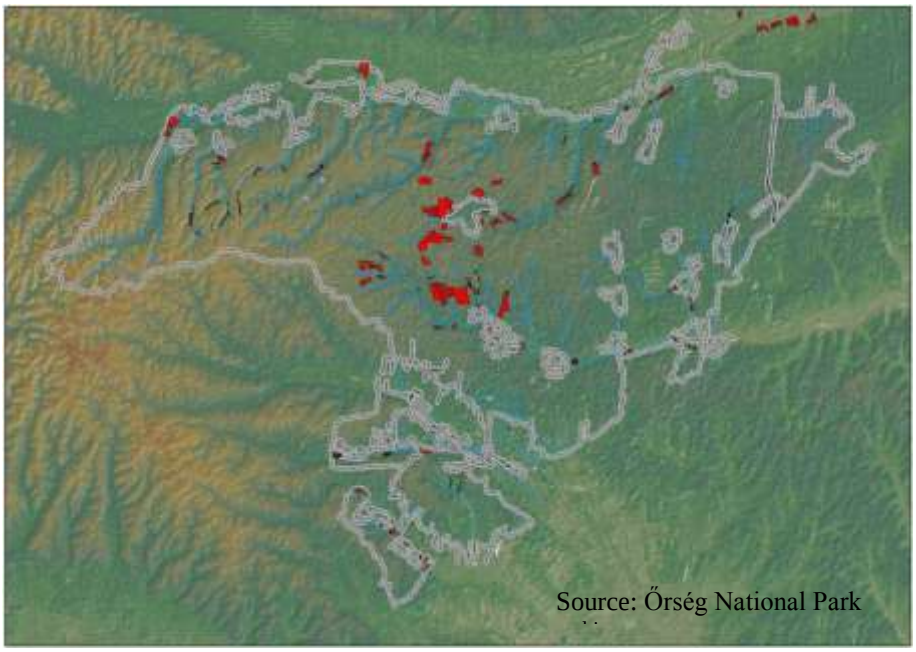
At present about 12% of the country is managed as grasslands but it was roughly 30% in the mid-19th century. This decline is related to already known events such as traditional land-use

practices disappearance, agricultural intensification in more productive regions and abandonment in less accessible regions, rural depopulation, changes in farm size distribution causes a decline in livestock numbers that leads to decrease of grazing and hay cutting intensity (Korosi et al. 2014). However, in the beginning of nature conservation grasslands were not considered as important nature value in Hungary. The first grasslands were designated as protected area in the 1940s (Kelemen and Warner, 1996).

The best insight of grassland management and monitoring I got from the Őrség National Park. In this national park grasslands cover about 10% of the total 44 000ha of the park, but these habitat harbour the most of protected plant and animal species. Semi-natural grasslands of Őrség National Park have a large variety depending on location, elevation and soil conditions. Extensive semi-dry meadows on acidic and permeable sandy or grave soil can be found in the hilly parts. Meadows in less hilly and wetter areas differ from the dry grasslands in species number and composition and these grasslands are also cultivated in a more intensive way. On a very nutrient-poor moist soils in valleys, occasionally also in flooded areas, so-called oligotrophic meadows have developed. These meadows with low number of plant species, which have become endangered due to abandonment and change of land use. And as the last category is wet (mesophilic) meadows on nutrient-rich soils, distributed along the river Mura, in larger stream valleys and near riparian forest patches (Bakan, 2012).

According to the stuff of the national park these grasslands represent one of the most attractive landscape features for visitors and they provide several ecosystem services, for instance, pollination, herbs etc. Visiting several grassland areas it was stressed that these grasslands are facing several threats: succession (= most of the grasslands are secondary habitats which means that without human interference will turn into forests) into forest (the forest cover has doubled especially in the last 100 years), abandoned grasslands are infected by alien species and remaining habitat patches are fragmented and scattered, and, of course, management intensification.

At present, about 800 ha of grasslands is owned by the Őrség National Park which also mean that management of the same amount. According to the Hungarian law all previously cooperatively owned land should be reclaimed by the state in protected areas and the total amount that should be still purchased is about 19 000 ha.



Picture 14. Distribution of managed and owned grasslands by the Őrség National Park.

During the field visits I have visited mainly two types of grassland habitats – Alluvial meadows of river valleys of the *Cnidion dubii* (6440) – a habitat that does not occur in Latvia - and Lowland hay meadows (6510). In Latvia we have another type of floodplain grasslands - Northern Boreal alluvial meadows that are normally ice-covered in winter. They are characterised by past mowing activities and are subject to flooding in spring-early summer during snowmelt. The other grassland habitat Lowland hay meadow is well represented in Latvia as well.

4.4.1. Management and monitoring of wet meadows

Wet meadows and other type of grasslands are managed by either mowing or grazing, or combination of both management practices. Grasslands that belong to the national park are managed according to the yearly management plan that is developed by the Department of Nature Conservation. The management plan is made based on the nature conservation goals – plants, butterfly, birds and other animals but it is also written in accordance to habitat requirements and based on habitat maps and species distribution data. Moreover, these management plans need to be designed in a way that conservation objectives and fodder needs are harmonised. These management plans are developed including several phases – first of all, target species are selected for each grassland and habitat requirements of target species are studied. Secondly, interactions (conflicts) with the needs of other species identified and thirdly optimal way of management is determined and mowing/grazing schedule designed. Usually desirable outcomes are seen after a longer period than a year, therefore it is necessary to keep applying the same practice but also to assess the management effectiveness every year. And only after some time when grassland management outcomes are visible then big adjustments can be applied or management practice can be changed. Another important feature relating to the grassland management is to collect a traditional knowledge on grasslands for this region and use this data in management planning. For instance, several interviews with elder people were done in order to collect data how grasslands were managed, for which purpose, what made it sustainable etc.

In order to collect and evaluate the effectiveness of the management practice, the national park rangers are involved in the grassland monitoring/checking process as they are the ones who know the area the best, they see how grasslands are developing and see the signals that something is going wrong. On the field they record data on invasive species, shrub abundance and estimate an abundance of selected protected and rare species that are easy to recognize and distinguish from other plant species. All this data together with the management activities are recorded in a database. A full vegetation monitoring is done by botanists every third year. Afterwards the collected data is being analysed and conclusion are drawn and used for adjusting management plan. In total, here are 11 different management packages where some of them are related to habitat's requirements, some to target species and other to problems such as alien species such as *Solidago gigantea*, *Impatiens gladulifera, Erigion annus* and other. At present, here are about 300 ha of grasslands that are overtaken by *Solidago gigantea* and the only way how to fight with this species is mowing twice a year. In cases when mowing twice is not feasible then late mowing (September) is more effective to prevent invasion of the above mentioned species (Szepliget M. et al. 2014).

Some examples of the management packages in the Őrség National Park:

Narcissus angustifolius

- mowing once a year, after 1 July;
- patches of *Gentiana pneimonanthe* mown every other year in September;

Maculinea spp.

- mowing once a year before 15 June;
- patches of *Gentiana pneimonanthe* mown every other year in September;

Crex crex

- mowing every other year in September

Personally I was very surprised about the research the Department of Nature Conservation is doing in relation to grassland management but not only from the botanical point of view but also in relation to butterflies, birds and orthopterans. I would like to bring one case from the Őrség National Park, the valley of Szentgyörgyvölgy stream where a field experiment was

carried out on a species rich, mesic hay meadows belonging to *Alopecurion-Arrhenatheretum*. The experiment is still going but the first results on plant communities after a course of 7 years of grassland management can be found in Szepligeti M. et.al. (2014). The main idea was to compare and evaluate the effects of four alternative types of management – 1) mowing twice a year that used to be a traditional management of these grasslands, 2) mowing once per year in May that is mostly practiced currently by local farmers, 3) mowing once a year in September that is often proposed for conservation management and 4) abandonment of mowing (Picture 15). The main outcome was that the management that has been applied in this region since many centuries is the most appropriate, in other words, mowing first in the May-June and the second time in August-September. The traditional management is a key to maintain biological diversity of species rich grasslands. This management type corresponds very well with litter and nutrient renewal since more intense mowing facilitate seedlings germination and development in less competitive plant species (Szepligeti M. et.al. 2014). In the same area a research on effect of timing and frequency of mowing on the threatened scare large butterfly *Phengaris teleius* was preformed and results can be found in Korosi A. et al. (2014). This kind of research has encouraged me to do some similar research back in my home.

Picture 15.a. Abandoned grassland.

Picture 15.b. Mown in May and September.

Picture 15.c. Mown in September.

Picture 15.d. Mown in May.

The grassland management implementation is done by the Department of Resource Management, they are also responsible for the machinery, care of animals and animal's infrastructure such as stables and storage buildings. Through several projects the national park was able to reintroduce two breeds of this region – Semental cattle and Murakozi horses. As I

understood there is a large problem for effective implementation – lack of human resources, in other words, it is hard to find good workers who are willing to work. Many people go to Austria for a job hunt because it is relatively close and a pay check is higher than in Hungary. This can be a real problem because large areas have to be managed, some of the areas need to be mown twice per year but due to lack of people it is not always accomplished. Another problem in relation to grassland management implementation is weather and its conditions. For example, summers may be too rainy and therefore the management can be complicated – too wet soils to be able to drive with a tractor, hay cannot be collected, sometimes it is possible to mown only once etc.

In the next years, the Directorate has pointed out that much work is needed to improve the conservation status of grasslands such as getting ownership in grasslands, management of own (=National Park) grasslands for species conservation, grassland restoration, promoting agri-environmental subsidies on private land, as well as to learn and raise awareness among farmers and control them. A cross border project between Slovenia and Hungary has been implemented where one activity was devoted to educate farmers in grassland management. As mentioned before in the text then national park can operates only on its own land but private grasslands take up almost five times more than the area owned by the national park, therefore a good cooperation with farmers is needed as the national park cannot influence management on other lands. Within a cross-border project activities such as informing farmers about protected species at their land, suggesting specific management descriptions for important habitats and a farmer's guide was made. As we know that any field of nature conservation will have problems but what I really liked while I was talking with people was that they have ideas how to solve some of the mentioned problems and I have collected them in Table 3.

Table 3. Main problem with private lands and proposed solutions.

Problems	*Solutions*
Many farmers do not value nature	Involving farmers in planning conservation measures Trainings for farmers and potential farmers
Only few farmers are joining the agri-environmental programmes	Organising cooperation's between farmers Exchange experiences among farmers
Management prescriptions are too general	Make individual management prescriptions that are understood by farmers, even involve them in checking the quality/efficiency of the

	management (for example, recording protected or targeted species).
Farmers do not want to be controlled by the national park	Setting up a consultancy for farmers: regulation, subsidies, application

4.4.2. Agri-environmental subsidies

As a member state of the EU, Hungary gets a support from the CAP and nationally has developed two major packages that have been summarized in Table 4. There are more packages like the Great bustard and the Red-footed falcon conservation grassland packages but they are left aside as these are closely linked to the birds and is not my focus of this study trip.

In the region of the Őrség National Park, farmers or landowners are not willing to participate in the agri-environmental programme and the main arguments are: subsidies are too low, management prescriptions are too general and results are not visible. And those famers who participates in this programme are not willing to mown grass twice per year as they get the subsidy already for the first mowing that usually happens in May-June because the earlier mown grass contains higher proteins than late mown grass which is important for the livestock. Not all grassland habitats need mowing twice per year but some do as described already before. Nevertheless, these programmes need to be popularized among the farmers and here the national parks could step in and spread the information and can be a good bridge between the agri-environmental programmes and local farmers, and at the end can have a win-win situation.

As I understood from the talks there is a real need to develop several subsidies packages for grassland management because currently available subsidies are not suitable for many species.

Table 4. Available agri-environmental schemes for grassland conservation in Hungary.

Horizontal grassland package for all country

	Prescription	**Payment rate (EUR/ha)**
Obligatory	No management on wet soil No fertilization Only grazing or mowing (no mulching) No irrigation No drainage No machine use during night Grazing only by cattle, sheep, goat, horse, donkey, buffalo. Keeping at least 0,2 animal unit per ha	48
Voluntary	5-10% unmown refuge area at each mowing	16
	10-15% unmown refuge area at each mowing	32
	Bird-friendly mowing	5
	Mowing only after 15 June	16
	Grazing density 0,2-1,5 animal unit per ha, with no overgrazing	63

High Nature Value Areas: Uplands bird conservation grassland package

	Prescription	Payment rate (EUR/ha)
Obligatory	No management on wet soil No fertilization Only grazing or mowing (no mulching) No irrigation No drainage No machine use during night Grazing only by: cattle, sheep, goat, horse, donkey, buffalo Keeping at least 0,2 animal unit per ha 10-15% unmown refuge area at each mowing Width of refuge stripe min. 6 m Bird-friendly mowing Reporting the planned date of mowing to the authority at least 5 days before mowing Storing hay on the grassland no longer than 30 days Eliminating invasive plant species Min 1 ha protection zone around the nests of strictly protected ground-nesting birds First mowing only after 31 July on 50% of grassland based on the instructions of the authority institution Fences only with the permission of the national park	138
Voluntary	Grazing density 0,2-1,5 animal unit per ha, with no overgrazing	63

4.4.3. Grassland restoration

The Őrség National Park has large areas that are still waiting to be restored and managed. The methods they used for grassland restoration are usually the same as in other European countries. Most of the semi-grasslands that are found in the Őrség National Park have not been fertilized with nutrients in the past, as well as the streams have not been modified, therefore restoration works usually are rather easy. Most of the time it means to take away trees and shrubs, stump milling/mulching that usually is done more than one time depending on the site conditions, if needed ditches are closed and after restoration usually mowing is applied, sometimes also grazing.

Another path that national park is taking is converting former arable fields into grasslands by sowing with a seed-mix or grazing/mowing intensively. So far it has been done with approx.100 ha.

During talks couple of times were mentioned that many hectares were restored in several projects that have been financed with support of the EU funds. For example, built several stables and other infrastructure building for hay storage, purchased livestock and machines for grassland management. These projects have helped the national park to start to grow animals by themselves and return special breeds of cattle and horse of this region. In general, projects developed by the national park have been designed in a way that grassland habitat restoration can be maintained in a sustainable way also after end of the projects. From the other side maintaining project outcomes in protected areas in Hungary is easier as land is owned by state

compared to other European countries as Latvia where protected areas are under both state and private ownership.

4.5. Restoration of hydrology – a case from the Balaton Uplands National Park

During my stay at the Balaton Uplands National Park I have experienced so many different aspects in one area from wetlands to volcanic rocks and Mediterranean-like climate with its flora in Tihany peninsula. I have been introduced to many projects realized in this national park starting from environmental education and finishing with habitat and species restoration projects. Nevertheless I would like to share one of the most impressive project on marshland rehabilitation project in the Kis-Balaton or also called "Small" Balaton that aims to bring together two main aspects – flood control and nature conservation – in one unified body.

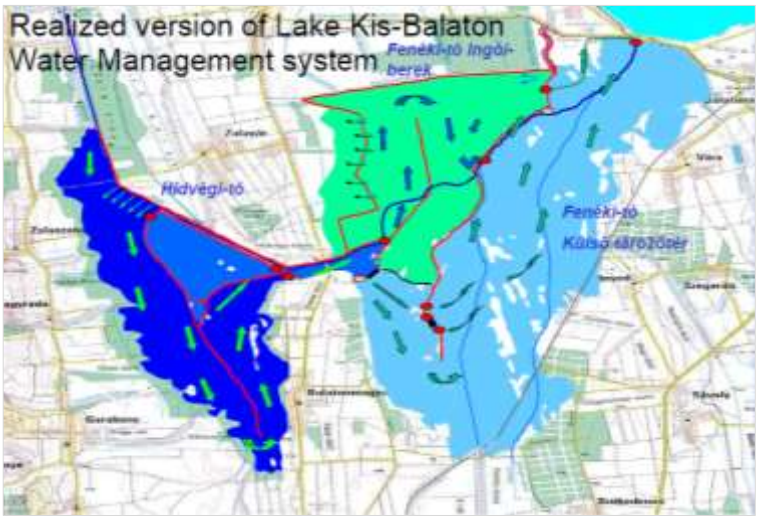
The Kis-Balaton is a huge wetland habitat that hosts about 250 bird species and it is a widely popular destination for bird watching, nevertheless due to different human activities such as flood control, drainage of marsh since 1922 have affected the water quality and loss in biodiversity. From the picture 16 can be seen that the water basin of Lake Balaton is 5176 km2, where only one river (River Zala) and lot of small creeks feed Lake Balaton but only River Sio channel drains it.

Picture 16. Water basin of Lake Balaton.

Back in the 1769 the Kis-Balaton was an estuary with different wetland forms such as reed beds, fens, marshlands, swampland, open water surface, hay meadows, swamp woodlands etc. but due to different water management activities – construction of Sió-lock in 1868 and then completion of the south railway. Heavy drainage and water regulation of the Kis-Balaton stared for agriculture purposes and holiday resorts. All of these activities influenced the water quality of Lake Balaton because a function of its protection has been lost – no water inflow from the Kis-Balaton to Lake Balaton. All of these problems lead to change in vegetation, lack of macrophytes and at the end the Kis-Balaton was a large, open lake, whereas Lake Balaton water quality decreased and algae blooms and siltation occurred more frequent. Moreover a dramatic decay of the reed bed in the Ingó-grave occurred due to high water level, lack of opportunities for flexible operation, lack of the spawning areas and natural zonation.

The problems were recorded very early and wetland reconstruction started already in 1980 under the Kis-Balaton Water Protection System that was divided into two phases. In the Phase I the Hídvégi-pond was constructed between 1981 and 1985. Within first phase 1800 ha with

21 million m^3 water were restored. The phase II started in 1984 with Fenéki-pond construction that finished in 2014 (Picture 17). In this period 5100 ha with 62 million m^3 water were restored.



Picture 17. Water management system in Lake Kis-Balaton.

During the reconstruction a hard task was to combine flood prevention (control) and nature conservation goals – ensure the survival of species to be protected, do not hauled into alien species, do not be harmful to the environment and adhere to the ethical standards. A special attention was given to the native fish species protection and many structures as fish ladders were installed, also invasive and non-native species displacement.

Picture 18. On the left: fish ladders, on the right: water level controlling system-construction.

It is very hard to describe all the things and places I have seen and visited, it is a unique place to be and see by your own eyes as everyone will see the same thing in a different way. Nevertheless the diversity and complex system of wetlands can be observed already now just few years after the project implementation such as temperate water bodies with water buffalos.


Picture 19. Temperate water body with water buffalos.

The only thing what I still want to mentioned is that after the project implementation a 5 year test run is given to analyse, survey, monitor and evaluate the effectiveness of restoration and try out temporary management plan. During this period regular water quality checks will be done and bio-monitoring of target species, plant communities, bird species, macrophytes and fish species. Also to test and analyse operation solutions regarding water flow and levels. This period will be used to test all suggested management activities and based on these results a management plan of the Kis-Balaton will be prepared.

5. Potential gaps with objectives and expectations

Evaluating the collected results and experience I have gained, at the same time, meeting all the people, the objective of this scholarship were achieved fully.

I think that the openness of people and their willingness to show me their daily work, their motivation and work outcomes were the most valuable for me during these trips. I am very grateful to them for their patience because I had a lot of questions and for sharing their knowledge and lessons learnt, that will definitely will be used in my professional career.

As I have been working with semi-natural grasslands with particular interest in floodplain grasslands for some time then I have been collecting and analysing different literature sources on this topic which helped me to understand the complex system of hydrological regime restoration in the Kis-Balaton region and other aspects I met during my visits.

These trips convinced me once more that I have selected the right direction for my professional career and it also reminded me of other unachieved goals. Therefore, I can surely admit that this scholarship and trips helped me to remind why I have chosen the nature conservation as a working field.

In total, I have spent 3,5 weeks in two phases that were enough to do all the activities that I have planned initially.

6. Difficulties, limits

In general, I did not had large difficulties during my study trip planning and implementation phases. Although, it was hard to get in contact with some protected areas, for example, initially I had a plan to visit also some national/regional parks in Lithuania but as I was not able to

establish contacts then I needed to change them. From the other side, I was able to find contacts with people at the Europarc Federation conference that helped to extend my stay in Hungary and Estonia as people who I met helped me to get in contacts with the right people.

At point when more detailed planning has started, I did not run into any problems as I had a very easy communication with my contact persons from the national parks. I think it was easy for both sides as I had a clear vision what I want to see and learn, and I also was keen to learn other things such as cultural heritage, environmental education etc. at the same time.

Nevertheless it was hard to allocate time to visit national parks in Estonia. Initially I had a plan to do it in July/August but as I changed my work position then I needed to change them. I went to Estonia only in late September, therefore I was not able to see the hay collection process but I had a chance to see the evaluation process which, in my opinion, is even better.

Conclusions

1. All visited protected areas, including the ones in Latvia, are facing the same problems – losing highly valuable nature conservation habitats of semi-natural grasslands. This decrease can be explained by the same phenomena as well – rural depopulation, land-use change, abandonment, agricultural intensification etc. Nevertheless, the semi-natural grasslands are the most diverse ecosystems in Northern and Central Europe, for example, 1/3 of the registered vascular plants in Latvia are found in grassland habitats.

2. Semi-natural grasslands cannot exist without human interference and traditionally have been managed by collecting hay and were mown twice per year – early May-June and late August-September, sometimes also grazing but very rarely due to wet site conditions. Nowadays, mowing happens only once per year but its timing differ within countries depending on agri-environmental programmes and its prescriptions.

3. All the people with whom I talked agreed that available financial funds from the EU have helped them to initiate nature conservation management of grasslands, they were able to restore large areas of overgrown grasslands, purchased equipment for grassland management, including livestock, helped to reawaken cultural landscape (renovated traditional houses, stables, orchards) and united local communities.

4. I was quite surprised how well-considered are designed/written projects with sustainable goals that will be met even after the end of the projects. And this approach I saw on every area that once used to be a project site. They have avoided from a situation like *"now is a project but what will happen afterwards we do not know"* that unfortunately can be seen in some projects in Latvia. Another important aspect is involvement of local people, communities and with a help of project they search for consensus to all involved parties in a long term.

5. As member states of the EU, visited countries gets subsidies for agriculture and some of packages of the agri-environmental programmes are devoted to the nature conservation. Nevertheless, this programme is not very popular among the farmers, especially in Latvia and Hungary and main reasons are low subsidies, not understandable and clear results, do not want to be controlled etc. It seems that in Estonia land managers are interested in these programmes as demand exceeds supply, nevertheless it was said that without agri-environmental subsidies

the interest would be very low and most of the land managers are not ‘real’ farmers who are having livestock.

6. As national parks in Hungary have to generate their own income then a lot of touristic attractions have been developed, especially in the Balaton Uplands National Park which is a popular destination. They have put a lot of effort in marketing their products and services which pays off very well. However, there are other national parks like the Őrség National Park which is located far away from the “hot” touristic destination points but have different attractions that can have a high potential among domestic and international tourists but there is lack of information in other languages than Hungarian.

7. Repeatedly I have stressed how much I liked the idea about the field experiment on grassland management practices that has been done in the Őrség National Park and therefore I have decided to do a similar experiment in my country. Nevertheless, this is a large difference between Hungary and Latvia because my employer does not do any scientific research. However depending on the employees background and interests they might do research but it is not in relation to their day-to-day work.

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