(FROM ANNEX 13 OF FINAL REPORT)

MONITORING REPORT

1. Introduction

The aim of action F.2 ("Biological monitoring of grasslands, marshes and wooded areas") was to evaluate the progress of habitat management actions carried out in the LIFE-Nature project. Three different monitoring activities were foreseen in the revised application: monitoring of grassland restoration (C1), monitoring of grazing of marsh edges (D1 and D2) and monitoring of wooded areas (C2 and D3). Because actions C2 and D3 were not successful, we allocated monitoring efforts to follow the effect of fire management (D2) and the extensive cultivation of wildlife lands (D4). The latter activity was also requested by the EC in their letter of 18/04/2007.

Each activity involved four distinct phases: (i) planning, (ii) selection of sampling sites and carrying out the surveys (sampling), (iii) sorting and identification of individuals in the field (botany) or in the laboratory (zoology, except for birds), and (iv) data processing, analysis and report-writing. Planning of the monitoring activities was conducted mainly in 2004 and early in 2005 in several meetings with cooperating researchers and other experts from the University of Debrecen. Based on results from the baseline assessment of plant communities and habitat types (A2), we first identified the most appropriate taxa and design for monitoring, and the sampling and analytical methods to be used throughout the four years of the programme. We then selected the sites and determined the methods of monitoring. Fieldwork was started in the spring (April) and continued throughout the vegetation period until late September in each year. All biological monitoring was organised by personnel at the Department of Evolutionary Zoology and Human Biology of UD as Partner in this project, and tasks that required taxon-specific expertise from specialists were sub-contracted. Personnel at UD conducted most field samplings, and laboratory work (sorting and identification) was subcontracted.

2. Monitoring of grassland restoration (action C1)

2.1. Objectives and methods

For the monitoring of action C.1 (grassland restoration), the principal aim was to follow the colonisation of the newly restored habitats by the species characteristic to the target habitat types. We established a monitoring system on most fields restored in the year following restoration by allocating one sampling site per c. 25 ha restored land. The previous history and seed mixture used were recorded for each sampling site (total 27 sites, the number foreseen in the revised application; see maps in this **Annex** for locations). At each site, we established two 5x5-m permanent plots to mark the sampling sites and to keep grazing animals out. Within each permanent plot, four 1x1-m subplots were designated. We subdivided the plots into subplots to facilitate the monitoring of the small-scale mosaic structure characteristic to the target alkali and loess grasslands. For restorations in 2005-2007, we established 216 subplots in 54 permanent plots at 27 sampling sites in two spatial blocks (western and eastern lands).

The subplots were originally marked with metal stakes and the plots were marked with narrow (< 8 cm) wood poles in 2006. However, many of these stakes disappeared by the next spring. Many of the metal stakes were stolen, whereas grazing livestock or mowing machinery caused great damage among the wood poles. Therefore, it was necessary to construct more sturdy and more visible markings. Based on our good experience with the 5x5-m wood exclosures established in action D1 at the central grazing site in 2006, we decided to mark our permanent plots with similar exclosures from 2007. The exclosures kept out large grazing animals (livestock, deer etc.) and served as controls, where no further management (grazing or mowing) occurred. As such, they provided baseline information on the secondary succession of vegetation, which then could be compared to the succession outside the exclosures, where management by grazing and mowing occurred. As a result, from 2007, we surveyed both the inside and outside of the wood exclosures (i.e., the number of quadrats surveyed doubled).

The botanical survey of the quadrats was carried out once in early summer, when the maximum number of flowering plants can be identified. In botanical surveys, we recorded plant species composition and relative coverage by species and collected phytomass samples for analysis in the lab. We also took soil samples for analysis of the seedbank. Invertebrate surveys were carried out using sweepnetting and pitfall trapping adjacent to the plots six times during the vegetation period to record as many invertebrate taxa varying in phenology as possible. The survey of birds was conducted twice, once in spring and once in early summer to record most breeding birds and species using the restored lands. Of the taxa foreseen in the revised application, Collembola and worms were not monitored due to their low indicator potential and lack of accessible experts. Carabidae ground beetles, orthopterans, spiders and birds were used. In 2006, a considerable part of our sweepnet material consisted of leafhoppers and true bugs, therefore, the monitoring of these taxa was included in 2007 and 2008.

2.2. Results

Thanks to the usually arriving rainy periods following sowing in September-October, *Festuca* shoots appeared 2-3 weeks after seeding. *Festuca* were the earliest green plants early in spring but by May they were overgrown by weeds. In the spring and early summer of Year 1, weedy species dominated, however, *Festuca* clumps began to appear. When weeds were mown in June, a lower green grass storey comprising mainly of *Festuca* was found, in many places in closed swards, and mixed with small weeds and other grass species sown or present in the seedbank in some other places.

Weed cover appeared beneficial to *Festuca* growth because it provided young grasses a more stable, humid microclimate and protected them from the sun in the summer. The development of *F. pseudovina* (seeded in lower-lying alkaline areas) was stronger than that of *F. rupicola* (seeded in higher-lying, dryer loess plateaus), and the growth of both grasses was stronger in areas shaded by weeds or by tree lines.

In Year 2, the short-lived, weedy plants were replaced by perennial grasses in every site, regardless of the seed mixture sown. In Year 2, none of the short-lived weeds has a cover higher than 5%. Both the relative proportion and species richness of short-lived weeds decreased significantly during the 3 years of secondary succession, whereas those of perennial grasses increased. Several unsown perennial grasses were also established in Year 2, and a slow immigration of species characteristic to reference grasslands was detected (perennials: *Achillea collina*, *Dianthus pontederae*, short-lived: *Melandrium viscosum*, *Trifolium striatum*, *T. strictum*, *T. angulatum*, *Cruciata pedemontana*).

Total species richness of plants decreased significantly from Year 1 to 2 in both types of restoration. From Year 2 to 3, a small but significant increase in both species richness and Shannon-diversity of plants occurred in the loess plots but not the alkali plots, where species richness did not change from Year 2. However, the cover and species richness of perennial herbs was low in Year 2 and increased only slightly by Year 3. In Year 4 (spring/summer of 2009), more species characteristic in loess grasslands appeared (e.g. *Salvia nemorosa* and *S. austriaca*) and the cover and species richness of already established species increased slowly but significantly.

Several ubiquitous invertebrate species typical to agricultural areas (spiders, carabids, grasshoppers) were present in high numbers on the restored lands in Year 1. Some Carabidae species typical to loess grasslands were present in small numbers in several former alfalfa fields, indicating potential recolonising species, but most arthropods detected in Year 1 were disturbance-tolerant generalist species. The changes in species composition between Year 1 and 2, however, were striking. There were numerous species typical of loess and alkali grasslands appearing on the restorations in Year 2 (e.g. *Nesticus cellulans* (Nesticidae, Araneae); *Titanoeca veteranica* (Titanoecidae, Araneae); *Chorosoma schillingi* (Rhopalidae, Heteroptera); *Euchorthippus pulvinatus* (Acrididae, Orthoptera); *Amara fulvipes* (Carabidae, Coleoptera)), probably colonizing the restored sites from the surrounding semi-natural grasslands or former alfalfa fields. Although the number of arthropod species did not change with time, the species composition of the arthropod communities became more characteristic to the target grasslands. An index of naturalness showed that species composition did not differ between arable lands and Year 1 restorations, but differed significantly between Year 1 and 2, and approached the values detected in native grasslands. This favourable change could also be detected in butterflies and bees and wasps with a slight time delay, which appeared in the loess and alkali restorations of 2005 in surprisingly high numbers in Year 4 (2009, not part of the LIFE-project) from Year 3.

A multivariate analysis indicated a clear distinction between alkali and loess plots (please see **Figure 1** below) for plants but not for arthropods. There was a continuous shift in the species composition from the weed-dominated stages towards the reference grasslands. The species composition of plots in Year 2 and 3 was more similar to that of reference grasslands than to species composition in Year 1. We observed higher similarity between the alkali plots and the reference alkali grasslands than between the loess plots and the loess reference grasslands (**Figure 1**).

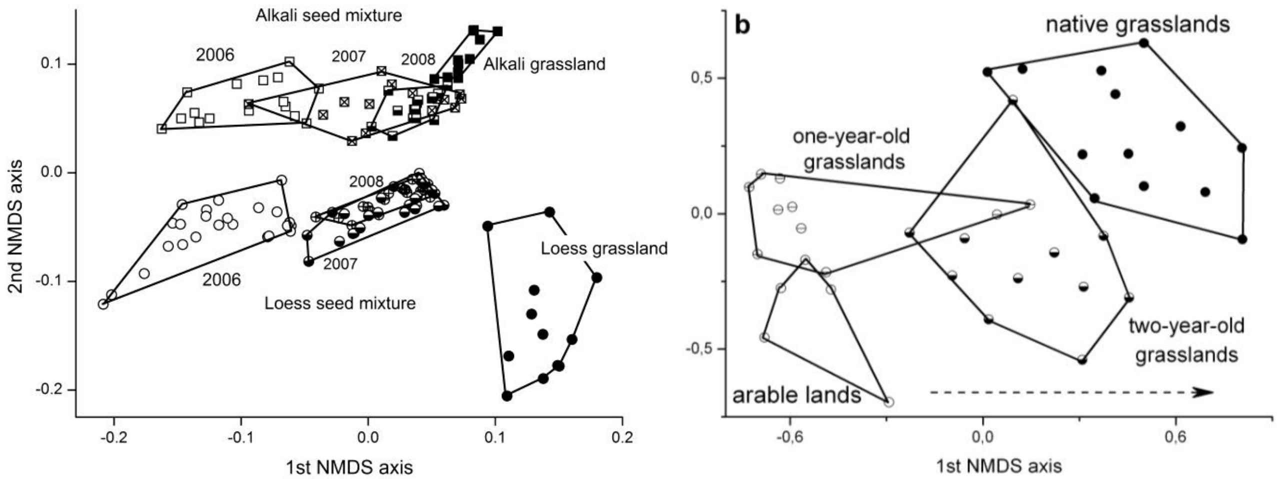


Figure 1. Changes in the species composition of flowering plants (a) and arthropod communities (b) as a result of grassland restoration. Species composition for both plants and arthropods became more similar to those of native grasslands. In alkali restorations, the species set in Year 3 already overlaps with the species set of native grasslands. For arthropods, alkali and loess restorations did not differ, therefore, data were pooled for simplicity.

Many birds used the restored grasslands for feeding (many seed-eater passerines). Kestrels (*Falco tinnunculus*) showed heavy use in early spring and after mowing of weeds, and Red-footed Falcons (*Falco vespertinus*) preferred these areas in most times of the day. Lapwings (*Vanellus vanellus*) nested in high numbers on both grasslands neighbouring marshes and on restored grasslands from early spring and many pairs had chicks by the time weeds dominated the restored lands. Quail (*Coturnix coturnix*) has been found in high densities in restored weedy grasslands regardless of vegetation height. Restored grasslands also provided hiding places for the small number of Grey Partridges (*Perdix perdix*) surviving after the latest release of the reintroduction programme (activity outside the current project). Cranes (*Grus grus*) and especially egrets (Great White Egret *Egretta alba*, Little Egret *Egretta garzetta*) preferred restored grasslands for feeding early in the spring and after weeds were removed by mowing. The heavy use by waterbirds and personal observations suggest that some of the taxa not specifically monitored (e.g. amphibians, e.g. Green Toad *Bufo viridis*, small rodents) were highly abundant on the restored lands.

The species richness or diversity of birds did not differ between alkali and loess restorations. In general, the number of species observed to use the restored lands increased after restoration (**Figure 2a**), with a drop in the extremely dry 2007. The Simpson-diversity of birds increased continuously (**Figure 2b**), whereas the Shannon diversity index did not change (not shown). This discrepancy was because the two diversity indices differ in their sensitivity to frequent and rare species. Simpson's index is more sensitive to frequent species, therefore, the increase of Simpson-diversity can be explained by the tendency that there were increasingly more of the common species on grassland restorations. This was mainly because the bird species present in arable lands in small numbers (e.g. Skylark *Alauda arvensis*, yellow wagtail *Motacilla flava*) have increased greatly in abundance as a result of grassland restoration.

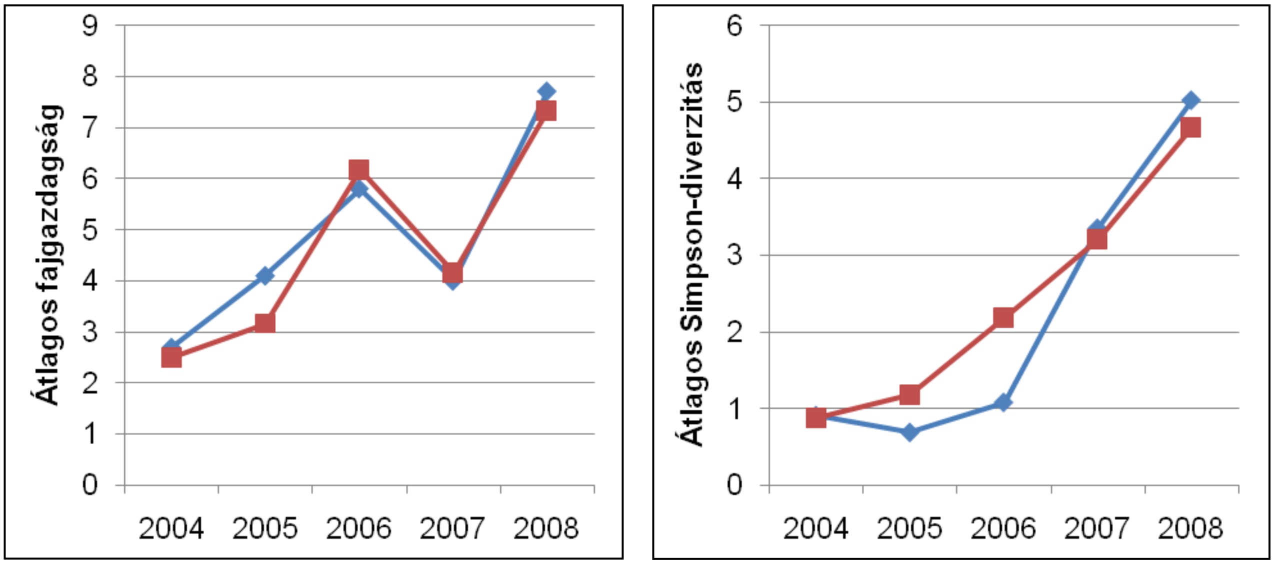


Figure 2. The average number of species (a) and Simpson's diversity index (b) on grasslands restored in 2005 (blue line, rhomboid marker) and in 2006 (red lines, square marker) based on point counts. Grassland restoration was carried out in September-October and point counts were conducted in April-May, therefore, the numbers indicate the effect of restoration only from next year.

As per the key indicator species foreseen in the revised application for restored grasslands, a slow immigration of plant species characteristic to the reference native grasslands (based on the baseline surveys in A2, see key species listed in monitoring report in PR2) was detected (perennials: *Achillea collina*, *Dianthus pontederae*, short-lived: *Melandrium viscosum*, *Trifolium striatum*, *T. strictum*, *T. angulatum*, *Cruciata pedemontana*). However, their cover was not high even in Year 3. In Year 3, only short-lived vetch species were present with considerable cover (e.g. *Vicia hirsuta* and *V. angustifolia*). Additional key species such as *Salvia nemorosa* and *S. austriaca* continued to recolonise the grasslands in 2009 (Year 4 on SW restorations).

As per animal indicator species foreseen in the revised application for restored grasslands, Souslik (*Spermophilus citellus*) now appears to be extinct from the entire project area. This could be related to a lack of appropriately grazed loess grasslands and to high ground water due to much precipitation in 2005 and 2006. We hope that this characteristic species will recolonise the PA from nearby areas once such moderately grazed grasslands reach better conservation status. Siberian/Steppe Polecat (*Mustela eversmanni*) was also not seen during the fieldwork and we also have not observed signs of presence of *Gortyna borelii ssp. lunata* in the project area.

3. Monitoring of grazing of marsh edges (action D.1 and D.2)

3.1. Objectives and methods

The principal aim of monitoring here was to evaluate whether the diversity of species that are typical of more open wetland habitats (i.e. other than reed) increases in the managed areas. To record changes in vegetation by the introduction of grazing, we designated 9 grazed and 9 control plots of 5x5 m (three per each of three major habitat types: alkaline grassland, wet meadow and reedy marsh) in 2006. Wood exclosures were constructed to keep out cattle from the control areas. We also designated and constructed two control transects of 5x40 m spanning over from alkaline grasslands through wet meadows into reedy marshes to record changes of habitat boundaries due to grazing and among years. On the designated sites, enclosures were constructed to keep cattle from grazing the enclosed area, which thus serve as controls for the adjacent grazed area. The botanical survey of the control and grazed quadrats was carried out in summer 2006 and was repeated in 2008. The detailed zoological monitoring of grazed and control sites also was started in 2007, as foreseen in the revised application.

3.2. Results

Grazing by Hungarian Grey Cattle for six weeks early in spring and later by a mixed band of Grey Cattle and Hungarian Mixed breed cattle was highly effective in opening up the reedbeds. Grazed areas, both alkaline grasslands and marshes changed considerably after grazing. Dead plant litter was almost completely removed, and living plant biomass also decreased by grazing. Total plant cover also decreased in grazed sites compared to controls. Because cattle roamed into the marsh in certain places, reed was trampled and disappeared at several such openings. Thus, much of the marsh edges where grazing was present were opened up as intended in the planning of the action. Reed became considerably thinner in grazed areas than within the enclosures. Open water surfaces, small mudflats and some plants typical to wet meadows appeared in marsh edges where cattle grazed reed. In the wet meadow zone around the marsh, trampling and grazing also caused small-scale heterogeneity and started a process leading to the formation of tussocks. Even though the first botanical survey was conducted only six weeks after the start of grazing in 2006, evidence of fresh plant growth in grazed areas was found and several plant species not recorded as flowering in control quadrats did so in grazed areas. Cattle-grazing in grasslands led to the appearance and spread of thorny *Cirsium* species by mid-June. However, a mechanical control (mowing by hand by shepherds) of these weeds just before their flowering time has proved efficient in reducing the density of these species.

Grazing of the marshes, together with high water levels in the spring and most of summer, created what ornithologists in E Hungary called the best birding spot in the Hortobágy region in the summer and autumn of 2006. The summer of 2006 was highlighted by the simultanous and sympatric breeding of three species of marsh terns, which rarely occurs anywhere within their ranges. In particular, Fekete-rét marsh hosted c. 200-300 pairs of White-winged Black Tern (*Chlidonias leucopterus*, rarest of the three species), 400-600 pairs of Whiskered Tern (*C. hybrida*, mostly of S European distribution) and c. 100-200 pairs of Black Tern (*C. niger*, commonest). Terns were often seen to hunt for small fish in openings of marshes and wet meadows created by cattle grazing. The grazed marshes and grasslands provided superb feeding sites for many herons (Grey Herons *Ardea cinerea*, Purple Herons *Ardea purpurea*, Squacco Herons *Ardeola ralloides*, Night Herons *Nycticorax nycticorax*, Bittern *Botaurus stellaris*), egrets (Great White Egret, Little Egret) and ducks, and were the sites where rarities such as the Cattle Egret (*Bubulcus ibis*), Pygmy Cormorants (*Phalacrocorax pygmaeus*) or Glossy Ibis (*Plegadis falcinellus*) were observed.

In 2007, the opening up of reed has been accelerated by the long drought. Reed has dried out in many areas and trampling by cattle became more important than the effect of grazing. Reed has become fragmented in large areas. This tendency could be detected also at the level of plots surveyed. However, the effect of grazing and trampling depended on both habitat types (dry grassland, meadow, dry reed, wet reed) and locality (thinner, medium cover, dense). Grazing led to an increase of species richness in wet habitats (meadows, dry and wet reed) but not in dry grasslands in medium- and high-cover localities. In contrast, grazing led to a slight increase of species richness in dry grasslands in low-cover localities. Grazing had the largest positive effect on species richness in dense dry reed habitats, but had much less influence on mean vegetation cover. Grazing led to a slight decrease in vegetation cover in meadows and medium- and high-cover (dense) grasslands and had a contrasting effect on wet reed. The latter was because grazing decreased vegetation cover in thinner wet reed, whereas it increased cover in denser wet reed. This effect was particularly important in explaining the establishment of openings in the reed and the formation of tussocks in wet habitats.

The new openings in the reed were occupied mostly by mudflats or open water and by other plant associations to a smaller extent. Some mudflats were covered by pioneer *Nanocyperion* mudflat plant species. By the spring of 2008, the new openings "grew" to be big enough for ducks and geese as well as for gulls and terns. There were at least two colonies of black-headed gulls (*Larus ridibundus*) forming in openings created by the grazing and trampling of cattle. Numerous ducks and greylag geese (*Anser anser*) used the openings to raise young. In summary, grazing contributed considerably to opening up homogeneous reedbeds, and increasing the diversity of habitats in marshes and marsh edges (**Figure 3**).

Figure 3. The effect of grazing demonstrated in one of the two 5x40-m exclosures running perpendicular to the boundaries of habitat types in the SW part of Fekete-rét. The same exclosure is shown in 2007 (left) and in 2009 (right). In the absence of grazing, i.e., within the exclosures, the originally diverse, classic dry-wet alkali transition has disappeared and the number of plant

species decreased considerably. As a result, vegetation became homogeneous and much dead plant material has accumulated (in the foreground of the pictures). Reed has become stronger within the non-grazed exclosure, whereas it has opened up and retreated considerably in the grazed area (in the far back of the pictures).

4. Monitoring of fire management

The aim of fire management was similar to that of grazing in marsh edges, i.e., to open up homogeneous reedbeds. Fire management was fully prepared but was unsuccessful in 2005 and 2006, but finally was highly successful in early September of 2007. Approximately 120 ha of Fekete-rét marsh has burned for several days. To monitor the effects of burning, we randomly selected sampling points in the reedbed in the summer of 2007 (before the fire management). We visited these points using the PDA-GPS unit purchased in the project and carried out a simplified phytocoenological sampling by identifying the species and their cover values in a 2x2 m plot. We have repeated the same procedure in the summer of 2008 at exactly the same points. In total, we sampled 56 points in a large area in 2007, because there was no way to tell exactly where the fire would go. Eventually, 30 of these sampling points burned down. In 2008, we re-sampled all 56 points, but used data only from the 30 burned points to study the effect of fire management.

The results showed that fire management was also highly successful in thinning reed and in creating openings for other plants. We detected 10 species total before the burning and 18 after it. The species appearing in the year after the fire were *Atriplex hastata*, *Bidens tripartitus*, *Chenopodium chenopodioides*, *Galium palustris*, *Inula britannica*, *Persicaria* spp., *Rumex stenophyllus*, *Schoenoplectus lacustris* and *Sonchus arvensis*. The average number of species in the 4-m^2 plots in the homogeneous reed before the burning was 2.9 ± 1.51 (SD, range: 1-6). This number increased significantly, by c. 38% to 4.0 ± 2.36 (1-8) after the fire management. Several species detected before the fire have increased considerably in cover. e.g. *Epilobium tetragonum*, *Lycopus europaeus* and *Rumex palustris*. The cover of reed decreased significantly from 66.9% to 41.2%. These observations suggested that fire management was successful in controlling reed and in enhancing other species.

The general view of Fekete-rét marsh suggested that reed has retreated and given way to other plant associations, e.g. those dominated by *Typha* and *Schoenoplectus* species. In summary of action D2, it can be concluded that this action was highly successful as it led to an increase in local plant diversity and thus, to an increase in the general diversity of habitats available for plants and animals. One interesting difference between the effects of grazing and fire management was that grazing and trampling created openings that were not typically covered by any vegetation (mudflats, open water), whereas fire management resulted in more diverse vegetation at the managed locations. We can, therefore, recommend the joint use of grazing and fire management to increase the diversity of reedy wetland habitats as the two are complementary rather than supplementary.

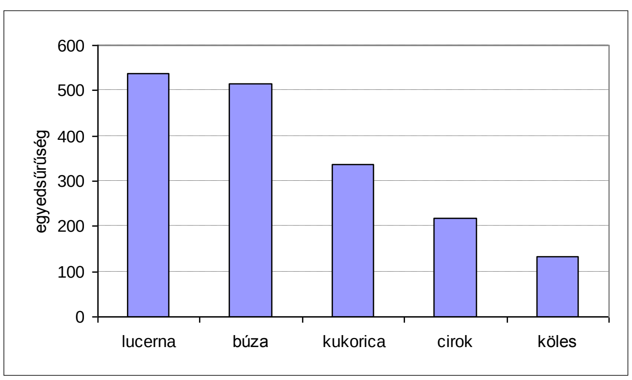
4. Monitoring of small mammals on extensive wildlife lands (action D4)

4.1. Objectives and methods

The principal aim of monitoring the action D.4 (Extensive cultivation of arable lands to produce food for small mammals) was to examine whether extensively cultivated lands provide better conditions for small mammals than intensive arable lands do. We studied the effect of extensive cultivation of arable lands by comparing the small mammal fauna of extensive and neighbouring (outside the protected area) intensively cultivated croplands. To detect species and estimate abundances, we surveyed five different types of croplands (maize, wheat, alfalfa, sorghum and millet) with five sampling methods (hole counts, live traps, owl pellet analysis, survey of footprints and other signs of life, and direct visual observations) between 17/07/2007 and 07/08/2007.

4.2. Results

A total of 13 mammal species were detected during the sampling period on the cultivated lands, from which the steppe mouse *Mus spicilegus* and the common vole *Microtus arvalis* were the most abundant species. The order of importance of extensive crops for small mammal abundance was alfalfa, wheat, maize, sorghum and millet (**Figure 4a**). Alfalfa fields were dominated almost exclusively by *M. arvalis*, whereas wheat and maize were dominated by *M. spicilegus* and other species were also abundant. The results also showed that small mammals reached significantly higher species richness and densities one year after the start of extensive cultivation than in intensively cultivated lands with similar crops (**Figure 4b**). The highest difference was between corn fields, where the average density was five times higher on extensive than on intensive lands, mostly due to the very high proportion of steppe mice. There was a smaller but significant difference on wheat fields. The most important crop for small mammals and thus, for raptors, however, was alfalfa, in which common voles (*Microtus arvalis*) reached very high densities and the total abundance of small mammals, along with steppe mice, reached 540 individuals/ha.



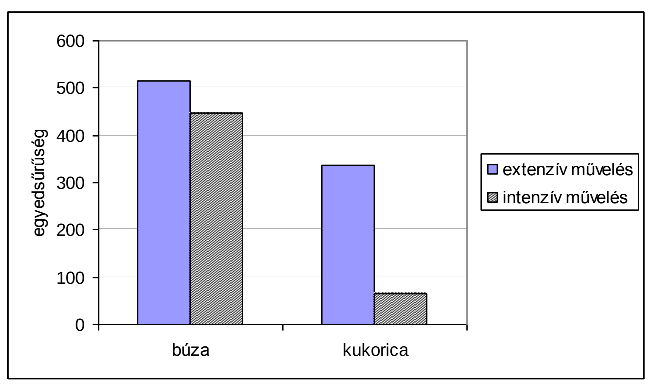


Figure 4. The density of small mammals (in individuals/ha) on extensively cultivated alfalfa, wheat, maize, sorghum and millet (a) and in a comparison of neighbouring intensive and extensive wheat ('búza') and maize ('kukorica') fields (b). Hatched bars in (b) indicate intensively cultivated lands.

A comparison of the abundances of a few species to a previous survey in the same area (conducted in 1971), however, also showed a long-term increase in the density of drought-tolerant species (Common Vole, Common Shrew *Sorex araneus*, Striped Field Mouse *Apodemus agrarius*) and a decrease of the abundance of species typical of wetter habitats (European Pine Vole *Microtus subterraneus*, forest *Apodemus* spp.).

Besides small mammals, wildlife lands created ideal conditions for brown hares (*Lepus europaeus*) and roe deer (*Capreolus capreolus*). The number of observations for both species increased continuously from the start of the extensive cultivation.

Censuses conducted on the same counting points in the area detected a significant increase in the number of bird species from an average of 2.0 species in 2004 (still intensive cultivation) to 3.6 species in 2006 (after the first full year of extensive cultivation). The number of individuals observed did not change significantly in the two years. However, the Shannon-diversity of birds increased from 0.59 to 1.09 by the change from intensive to extensive cultivation, indicating that several rare species were observed in the area in 2006. These rare species included several birds of prey. For example, white-tailed eagles (*Haliaeetus albicilla*) and buzzards (*Buteo buteo*) nesting in the nearby Meggyes forest and northern harriers (*Circus aeroginosus*) nesting in nearby marshes used wildlife lands regularly all year round. The latter two species were also recorded during point counts. Red-footed falcons (*Falco vespertinus*) and kestrels (*F. tinnunculus*) also were regularly seen hunting over the wildlife lands. Outside point counts, we also observed other rare species in the area, such as the imperial eagle (*Aquila heliaca*), spotted eagle (*A. clanga*), short-toed eagle (*Circaetus gallicus*), and the long-legged buzzard (*Buteo rufinus*), which were observed in late summer and fall.

One of the greatest success stories of this project is that great bustards (*Otis tarda*) have started to use the EPMS again for breeding. The EPMS had been an important lekking and nesting site for this species several decades ago, however, high disturbance on arable lands and degraded grasslands/meadows have halted its recolonisation. The first nesting occurred in the PA in 2007, and there were several nests in the PA in 2008 in the eastern part of the PA close to the extensive wildlife lands. Great bustards are now regularly observed in the PA during the fall/winter as well.

In summary, small mammals seem to have uses extensive fields more than intensively managed sites, and this could also be discovered in the use of the area by birds of prey. These results support the idea that creating wildlife lands is beneficial for the mammalian fauna and for the birds of prey that feed on them.

5. Activities related to monitoring and unforeseen in revised application

Three additional activities unforeseen in the revised application were carried out in F2 at no extra cost (i.e., without an increase in total provisional budget). First, UD and HNPD have developed the Master Plan (MP) for the long-term rehabilitation programme of the EPMS. The MP uses existing information sources on the area and provides both a map of potential habitats in the general Egyek-Pusztakócs area (10 682 ha), including the project area (4992 ha), and guidelines for designing various kinds of restoration and rehabilitation measures. The Master Plan (MP) was attached in **Annex 5.4** to the Interim Report.

As per the question of the in letter 04/18/2007 regarding the Master Plan and its conception, it must be emphasised that it was the previous external monitoring team (Mr. Marco FRITZ), who adamantly recommended the preparation of such a plan during the mission of 09/16/2005. According to him, such a plan could have been the basis of project modification/request for an additional clause. It was only for this reason that the Master Plan was developed as most of the information contained in it (except for the potential habitat map) was already written up in various publications (reports, articles, and a PhD dissertation) and was known to the Project Implementation Team and the Advisory Board. The Master Plan was developed for the entire Egyek-Pusztakócs area (>10 000 ha) for two reasons. First, when such maps are made, it makes sense to view a larger area and to address spatial relationships of the focal area to understand the topography, hydrology, geochemistry, vegetation etc. patterns within the focal area. Second, the Master Plan is aimed for the long-term rehabilitation programme, which will likely have a third phase, which will focus on re-establishing connectivity and spatial relationships with the main area of HNP. The Master Plan and the potential habitat map developed in it have been used frequently in publications about the project.

The main conclusion and recommendation of the MP is that any type of restoration/ rehabilitation/reconstruction which increases the "naturalness" of the area should be favourable to the conservation status of the entire EPMS. The naturalness of the area is envisioned in two ways, one is the extent of compatibility between current habitat diversity and habitat diversity suggested by the potential habitat map, and the other is the operation of natural (or semi-natural), multi-scale disturbance processes, resulting in a dynamically changing landscape pattern that prehistorically characterised the area. The MP or its source documents have often been used in the design and planning of actions.

Also beyond the specific monitoring actions foreseen in the revised application, general habitat monitoring was performed by monitoring personnel through the preparation of photo documentation. In addition, we purchased pictures from Rotkiv Bt. in November 2008, who documented many of their actions and also had professional-level pictures of some of the characteristic species of the area. The best of the photographs taken by monitoring personnel or Rottkiv Bt. are provided in the Photo documentation part (**Annex 4** in IR, plus photo material in booklet, layman's report in the FR).

Also as an unforeseen activity, we carried out soil analysis. A repeated question on project missions and from visiting experts was how we had determined where loess or alkali seed mixtures should be sown. The soil analysis gave information on this issue by information on restorations in 2005-2007 and those in 2008 (two subcontracts to GATE Zöld Klub Egyesület). The results showed that our initial anticipation, i.e., that higher plateaus are more of a loessy character and lower-lying areas are more alkali, has been verified by the soil analysis. In addition, the soil analyses detected significant amount of K and P in the soils of most former arable lands, which was likely a result of decades of chemical use (mainly fertilizers) in these areas. This information may explain why restored grasslands started to show signs of homogenisation (seen in **Figure 1** by the more compact arrangements of Year 3 restorations). This activity did not increase the total expenses in this action.

6. Comparison with plans; expenditure and indicators

This action has been progressing as planned and included three additional unforeseen activities at no extra cost. Each type of monitoring activity has so far been started on time and early enough to collect data on habitats and species before the actual habitat restoration and management activities started. These "before"-type data will be especially important for relating the changes occurring after habitat restoration and management actions.

As per the question of EC in their letter of 11/04/2008 regarding the monitoring of fire management and potential cost savings, it is important to emphasise that these cost savings were spent on the costs of additional of monitoring activities proposed by the EC in their letter of 18/04/2007.

Personnel work in this action mostly comprised of designing and implementing (organization, logistics) the monitoring system and of collecting and collating data, data analysis and report writing. These activities required more time than foreseen, for example, in several months, Ms. Eszter DÉRI spent at least 50% of her working time on this project. Therefore, there is a minor increase in Personnel costs on the side of the Partner.

Travels to the project area to conduct monitoring by some researchers are included in the invoices subcontractors issued (Natura Alapítvány, Antal és társai Bt., GATE Zöld Klub Egyesület, Rotkiv Bt. for Carabidae surveys), whereas most researchers (e.g. botanists, specialists of vegetation-dwelling arthropods, ornithologists) were carried by the project car (4WD) in the field (e.g. to install quadrats, collect sweepnet and phytomass samples, carry equipment, reach counting points etc.). Beyond the strict sampling days, general habitat monitoring was conducted during additional visits to the project area. Travel by the partner, however, also includes trips related to general project management (F1), for which the PC used the car purchased in the project. In fact, many trips to the project area have more than one purpose, i.e., activities related to field actions beyond some given aspect of monitoring. Therefore, part of the trips to the project area would be difficult to separate by action. The project car also was used for internal project meetings, negotiations with stakeholders or subcontractors (given as 'external negotiation' in financial report), networking with other LIFE-projects, national park directorates or universities and to give project presentations in various places in Hungary. The head of the participating Department of UD has authorised the PC-Partner and the PM to use the project car for the implementation of this LIFE project (please see **Annex 2.6**).

External assistance costs involve the costs of botanical and zoological surveys in 2005-2008. No botanical survey was conducted in 2005, when monitoring involved only agricultural fields (alfalfa, sunflower, maize) as the starting points for restoration. The expenses were greater for 2006, when the first full round of zoological monitoring of restored grasslands and agricultural fields designated for restoration in autumn 2006 was conducted parallel with botanical monitoring of restored grasslands and of grazed habitats (grasslands and marsh edges). The annual costs of monitoring were highest in 2007. This was because we doubled the number of surveyed subplots, plots, pitfall traps and sweepnetting transects (i.e., botanical and arthropod surveys) to cover both the control areas within the wood exclosures and the neighbouring managed (grazed or mowed) areas outside the exclosures. The increased amount of work had to be split for some taxa among researchers in 2007. For example, Orthoptera had very high abundances in the dry summer of 2007, therefore, we subcontracted two researchers to reliably estimate species and abundances both on 2005-06 restorations (managed, control), and on arable lands to be restored in fall 2007. The monitoring subcontracts were paid in each year only after researchers submitted the data collected to UD.

The selection of researchers for monitoring subcontracts was based on a questionnaire we had sent to potential researchers in E Hungary in early 2005, in which we specifically asked which taxon group they have expertise and capacity to monitor for the four years of the project and we also asked for price offers based on persondays on their work. In the selection process, we aimed to cover all taxa identified as important in A2 and in the revised application. When two or more offers were received for one taxon, we selected the one that had the best benefit/cost ratio. For grassland Collembola and worms, no offer was received as the few (3) experts on these groups in Hungary did not have the capacity to allocate enough time to the intensive sampling, sorting and identification involved in this project.

Most of the Durable goods foreseen in the revised application have been purchased in 2005 as these were used by researchers in the field surveys. The total cost of the 4WD car was much lower than foreseen (22 240 € instead of 26 000 €), whereas that for the telescope was slightly higher (2528 € instead of 1960 €). As for the digital camera, the partner chose to purchase a fairly basic camera (160 €) easy to use in the field for documentation purposes instead of a professional camera (price foreseen: 2000 €) because the Beneficiary purchased two semi-professional cameras (Canon 350D), one of which was available for use by the Partner. Consumable costs include the materials necessary for monitoring activities (e.g. metal stakes, miscellaneous field equipment, computer accessories etc.). In summary, the expenses paid were mostly as planned and foreseen in the revised application. Indicators for the monitoring activities include the number of reports and publications on the results of monitoring (9 papers, 2 reports, 14 talks, 7 posters).