

# LIFE Project Number < LIFE16 NAT/HU/000599>

### **Final Report** Covering the project activities from 01/08/2017<sup>1</sup> to 31/12/2022

Reporting Date<sup>2</sup> <31/03/2023>

LIFE PROJECT NAME or Acronym

## < OAKEYLIFE - Multilevel and multisite complex restauration of key ecosystem services of the calcareous sand forest steppe habitat >

Data Project		
Project location:Közép-Magyarország (Hungary Magyarország) Dél-Alföld, Bács-Kiskun County, Kunpeszér SCI HUKN 20002 Peszéri-erdő SCI HUKN 20003 Felső-kiskunsági turjánvidék		
Project start date:	<01/08/2017>	
Project end date:	<31/12/2022>	
Total budget:	€ 2,685,487.00	
EU contribution:	€ 1,895,500.00	
(%) of eligible costs:	74,81	
	Data Beneficiary	
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<sup>1</sup> Project start date

**Project Website:** 

www.oakeylife.hu, https://www.facebook.com/oakeylife/

<sup>&</sup>lt;sup>2</sup> Include the reporting date as foreseen in part C2 of Annex II of the Grant Agreement

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## 2. List of key-words and abbreviations

DPP	– Deliverable Products of the Project
COVID-19	- Coronavirus disease
GIS	– Geographic Information System
IAS	– Invasive Alien Species
KEFAG	<ul> <li>– KEFAG Kiskunsági Forestry and Wood Industry Plc.</li> </ul>
KNDP	<ul> <li>Kiskunság National Park Directorate</li> </ul>
LIDAR	– Light Detection and Ranging, is a surveying method that measures distance
	to a target by illuminating the target with pulsed laser light and measuring the
	reflected pulses.
MME	- Hungarian Ornithological and Nature Conservation Society, BirdLife
	Hungary
MS	– Milestones of the Project
N2000	– Natura 2000
PC	– Personal Computer
PR	– Public Relations

### 3. Executive Summary

Our project is mostly on schedule, although there have been some minor delays for some actions. In many cases, COVID-19 had a negative impact on the progress of the project, which also caused some delays. However, our delays were not significant enough to jeopardise the original objectives of the project. In our opinion, the results achieved have contributed to the improvement and restoration of the habitats of the Peszér-forest.

The proposed preparatory work containing the action plan and technological instructions during the implementation were proven mature. Which is a well-set foundation, providing safety for the realization of the project. Such documents with professional nature-conservation and forest-management content were composed, which further on can be the outlines of good practice guides (A1). The constructed GIS database also works as planned, it helps to efficiently allocate resources and technologies (A2). However, we had an initial delay in soil mapping and hydrological examinations (A3), we could finish it by 31 December 2019. The main causes of this are the necessary changing of the soil sampling method, and the belonged period of licensing procedures for the monitoring wells. Despite of the delay, the completion of soil maps and the automatization of monitoring wells are very important successes. These results can still be used today to select the right tree species for afforestation. Groundwater data also provide important information, allowing us to draw conclusions from changes and trends in groundwater levels.

In the case of our professional actions (C actions), we have also achieved exceptional results in the areas we have undertaken or in areas slightly larger than those we have undertaken.

The procured large vehicles are working between the end of summer until springtime, to avoid the hatching period of native bird species. The labour in forest conditions wears out all machines, this results significant service costs.

In the frame of monitoring measures (D2) the field-survey protocol was made, which sets how and what should be examined by our colleagues on the field. In 2018 we decided to record detailed data on invasive species on 25 m x 25 m sized plots. This survey concluded, that Peszérforest is much more infested with invasive trees, than it was assessed before. A remarkable progress of "D" actions was the completion of Peszér-forest invasive tree map, as it indicates the locations for necessary interventions. Following the treatments and interventions, the treated areas were also resurveyed. It was found that in most of the areas treated mechanically (with full soil preparation) the invasive plants had almost completely disappeared. However, the seed bank had started to increase considerably due to the restrictions on shrub cover and the premanagement works. We believe that this is a temporary problem due to the shading effect of the native trees the invasive seedlings will die. A significant proportion of the chemically treated trees have also died.

Furthermore, the forest's habitat map also has been finished, in which we identified 1012 habitat-spots, and 26 habitat-type, which contain 315 habitat-type combinations (based on Á-NÉR).

The thoroughness and importance of the monitoring surveys (D2) are well demonstrated by the fact, that five species (*Cerambyx cerdo, Lucanus cervus, Barbastella barbastellus, Myotis blythii, Myotis dasycneme*) with Community interest were found, which were formerly unknown on the area. Some monitoring tasks were reassigned, with the update of partnership agreements: Kiskunság National Park Directorate took them over from Birdlife Hungary (F1). Communication and Dissemination of results action can really be referred as well advanced and successful (E actions). We could reach and address as many groups with as many people, that in most cases we could reach our expectations for the end of the project. Despite of that, we

continued our campaign to deliver our efforts and achievements to as wide layers of the society as possible.

Another significant event was the completion of our Forest Visitor Centre (Action E8), which has become a focal point of the Peszér-forest, hosting groups from pre-school to university students. It has also become the main location for forestry conservation camps over the last 3 summers and has hosted over 2000 volunteers. This centre allows the site to host educational courses, classes and groups of visitors. Interactive education is also facilitated by the educational trails (E3) implemented by KEFAG and the Kiskunsági National Park Directorate, where 7 different types of boards are placed, starting from the Forest Visitor Centre.

However, the more than 5 years of the project has not passed without problems. The COVID-19 epidemic between 2020 and 2021 significantly reduced the number of events held in the area, and contractors found it difficult to access the area. And with the virus induced recession, the stump chips market collapsed, we were unable to move the stumps off site, so we had to find other alternative methods to process the stumps on site.

KEFAG Plc. could not employ enough forestry workers for the project (6-7 instead of 10). There were significant changes in the number of administrators at both KEFAG Plc. and KNPD. In addition, it has been difficult to find suitable contractors for certain works, such as stump removal and invasive species eradication. In the case of KEFAG Plc. the wages of several persons deviated by more than 20% from the planned wages. This can be explained by the fact that average wages in Hungary are increasing year on year and that in some jobs the planned wages for 2016 have increased significantly.

In case of the Kiskunság National Park Directorate, the main problem was the following: in case of the C7-C13 actions, forest workers could not be directly employed, because of a governmental decision. Instead, they could only be employed via external assistance.

Coronavirus disease of 2020-2021 (COVID-19) also negatively influenced the progression of the project. Due to the restrictions, the contactors could not reach the area in case of the C1 action. Thus, we changed the deadlines of the contracts. This is also why there have been minor delays in some of the professional actions.

In the practice, we applied the new things and paragraphs (e.g. forest grazing) in our forest law an in its execution decree amongst the first in the Great Hungarian Plain. With our practical experiences, we contribute to the writing or modification of future laws.

In creating the clearings, the forestry company, in cooperation with the National Park, the Heritage Protection Authority, the Nature Conservation Authority and the Forestry Authority, has succeeded in creating a clearing from a weak black locust forest that was not allowed to be restored using technologies used in the lowlands. Here, thanks to the collaboration of the above-mentioned organisations, we have achieved a habitat of much better natural condition thanks to the interventions.

During chemical elimination of invasive species, the most often used substance is glyphosate. The banning of this chemical in the European Union will cause a significant problem. Whit this chemical, we can eliminate invasive plants selectively and with great efficiency.

Perhaps the greatest achievement was that it is the first time that a lowland state forestry company worked as a coordinator with professional and non-governmental nature conservation organisations to successfully implement a joint project (habitat development of forest-steppe complexes).

In our opinion, no one has ever launched such a comprehensive communication campaign to raise awareness of the importance of the various functions of lowland forests. As a result, we have published several articles in popular and scientific journals, given TV interviews and radio reports.

By carrying out the above-mentioned D actions, such a detailed survey of Hungarian lowland forests has never been done before.

### 4. Introduction

OAKEYLIFE project, aims to restore ecosystem-services of calcareous sand forest steppe: Peszér-forest, with the protection of pedunculated oak stands, and the characteristic plant and animal species within.

Peszér-forest is situated in the Pannonic biogeographical region, and is one of the smallest areas in the European Union, where several remarkable and endangered habitats can be found.

Naturally, there were attempts to eliminate endangering factors of forest-steppe habitats and to restore these areas in Hungary formerly, but success could be achieved on small scale, in some distinct locations. Until this day, we still not have practical manual to guarantee the subsistence of forest-steppe habitats. This is the main objective of OAKEYLIFE project, implemented by KEFAG Kiskunság Forestry and Woodworking Plc, and its partners: Kiskunság National Park Directorate, and BirdLife Hungary. The name refers to Oak, as a key species, since the focus of the project is on the improvement of native oak stands' nature protection status, and the substitution of invasive tree species.

The programme is implemented in NATURA 2000 classified Peszér-forest (HUKN200002), which is an area of special interest. This is the most species- and habitat-rich habitat-complex of calcareous sand sites of the Pannonic biogeographical region. On this area various items of forested steppe can be observed: Subcontinental peri-Pannonic scrubs (40A0), Pannonic sand steppes (6260), Euro-Siberian steppic woods with *Quercus spp*. (91I0) and Pannonic inland sand dune thicket (*Junipero-Populetum albae*) (91N0) types.

The aim of OAKEYLIFE is to identify, measure, and eliminate the factors endangering these local habitats, and with this to improve their overall nature-protection status.

The implementing professionals are required to take actions to restore the most important supplying, controlling, sustaining and cultural ecosystem-services. The programme is meant to improve nature-awareness, social responsibility, and also gathers knowledge and practically tested expertise for professionals dealing with similar problems.

During the programme's technical actions, we surveyed and eliminated endangering factors. Maybe the most important object of survey is the sinking level of groundwater. On the field of elimination: the fragmentation of habitats must be dissolved, along with the control of invasive plant species dispersal and the balancing of age-structure of forest habitats.

Unfortunately, vast majority of society, often even professional and authority specialists are not aware sufficiently of these environmental problems, and therefore they do not take enough care of protecting endangered forest steppe habitats.

The most serious problem currently is the widespread dispersion of invasive tree species, which we expelled with our technical actions. Furthermore, we must get rid of the stump-piles formed at former forest-renewal works.

Another serious problem affecting the whole sand-ridge between Danube and Tisza rivers is the sinking of groundwater level. It is crucial to measure and monitor the process, to be able to assess further subsistence of habitat-types.

In OAKEYLIFE programme the professionals connected the clearing of Peszér-forest with structured ecological corridors. To act against the even age structure of forest stands, they reduce shrub-coverage to promote the succession towards forested-steppe oak forests, or pioneer softwood forests, which will help the succession towards climax forest biocoenosis. In summary, the project beneficiaries have established site-specific species-rich mixed transition forests to replace the current mostly alien tree species, which can ensure the survival of the lowland oak forests.

It is important to know, that the clearings of Peszér-forest are special margin-habitats, and they have emphasised role in upholding biological diversity. With the well-keeping of the already

existing, partly forested clearings and the properly structured ecological corridors it is possible to link isolated populations of weakly dispersing species – like the threatened species of scarce fritillary (*Euphydryas maturna*). Besides scarce fritillary (*Euphydryas maturna*), the project also aims the protection and preservation such species of community interest like sand iris (*Iris humilis ssp. arenaria*) and sword lily (*Gladiolus palustris*).

It is worth to know, that forest steppe is accommodated to continental climate, and rather resistant consociation to climatic impacts. This means, it is capable to moderate the negative effects of climate change on biodiversity. The forest types of the habitat complex to maintain may provide balanced meso- and micro-climate, and so can guarantee the subsistence of less adaptive plant- and animal-species in the area.

The educational activities of the project with the <u>www.oakeylife.hu</u> webpage and our Facebook page: https://www.facebook.com/oakeylife/, along with the local visitor centre renewed and delivered in 2019 the people can directly recognize NATURA 2000 sites and species with community importance. Additionally: why and how much importance lies in halting the decline of biological diversity.

Thanks to the monitoring actions of the project, we detected new species of community interest (5 species), which were previously not known from the area. In addition, several protected and endangered species and species of Community importance have been found in the area.

During the implementation of the professional actions (C1-C13), the specimen numbers of some organisations of community interest (*Euphydryas maturna, Gladiolus palustris*) have already grown. The nature conservation value of the Peszér-forest (HUKN200002) grew, as well as the proportion of the areas with community value.

The elaboration of our management guidelines (A1) and writing of the best practice study tomes contributed to the possibility of similar interventions being concluded in different areas.

### 5. Administrative part

The partnership structure formed during the planning of the project were proven operable in the implication. The main council of the partners is the Steering Committee made up by the leaders of each organisations. It holds meetings yearly according to the plans, with a slight difference: the meetings are not always in January, but moved to the autumn regarding that the start of the project was in August. In 2020, in 2021 and in 2022 we held it in January and February. In the spring of 2022, we also held a field visit with the steering committee to check on the progress of the project and on potential delays.

On these meetings the Executive Committee members and directly the project manager reports about the achieved results and together they evaluate the situation. Other important reference is the monthly progression report, which was not in the initial plan. This contains every important event in Hungarian, and a shorter English version is also prepared. This latter report is sent monthly to the Executive Committee of the project. Quarterly these reports are submitted in English too. These reports were sent monthly in Hungarian and quarterly in English to Mr András Kovács, the representative of the external monitoring team, NEEMO. With the monthly reports we believe we have contributed to a better understanding of the progress of the project. We held 4 meetings with the Executive Committee per year, the last one in December 2022. In total, there have been 17 such meetings. At these meetings, the current tasks and problems were discussed with colleagues working on implementation.

Unfortunately, during the COVID-19 pandemic period (2021-2022), we were not able to meet the Executive Committee in person, so online meetings were held.

Ad-hoc meetings, field visits, office meetings were held regularly in Kunpeszér, Kerekegyháza, Kecskemét, and the number of these meetings exceeded 70.

The major field and office ad-hoc meetings were recorded, to be able to oversee and supervise the said information.

The first Progress Report was sent to EASME and NEEMO in January of 2019. The Mid-term report of the project was sent to EASME and NEEMO on 05.06.2020. Prior to that we had several meetings with the NEEMO representative Mr. András Kovács. The second Progress Report was sent on 05.11.2021 to CINEA, including Ms. Illenia Babetto, who is the new project manager of our LIFE project from October 2021, and Mr. András Kovács. The annual field and administrative inspections by NEEMO were carried out every year, in March 2018, May 2019, March 2020, May 2021 and June 2022 by Mr. András Kovács. I would like to underline that field inspections were also carried out during the pandemic period (2020-2021). However, during these periods the administrative checks were carried out online.

There were some changes in the structure of project management in the project period: at KEFAG beneficiary Dr. Dániel Andrési took over the project manager position from Dr. Gábor Bárány starting at 1 May, 2019. At Birdlife Hungary the project leader position was moved from Mr. Bálint Halpern to Ms. Judit Hartdégen in November of 2019. In November 2020, Mr. Arnold Erdélyi took over the project management at MME.

In case of the realisation of the tasks, the field visitations and the administrative coordinations are regular. The National Park and the MME made a cooperative agreement regarding the takeover of some tasks, which was signed in early April of 2020 (there was a delay because of the COVID 19 pandemic).

In addition, the MME handed over 18,000 EUR to KNPD through cost savings, for which a partnership amendment was concluded in December 2022 between the MME and KEFAG Plc. and between KNPD and KEFAG Plc. Prior to the agreement, we consulted with Mr. András Kovács (NEEMO) and the lawyers of each organisation.

The significant divergences from the work plan are listed in point #8. During the making of the action plans, we discuss the concurrent changes. In case of every DDP and MS, I signalled the forthcoming deadline towards the partners in advance. In some cases however, the significant changes in the deadlines are caused by changed technologies (e.g. In the case of forest conversion (action C3) the grinding of stumps was added.).

Due to the COVID-19 pandemic, the project was audited by the European Commission only in February 2023. Here we were able to report on the project results to the project manager, Illenia Babetto.

During all major volunteer work, camps, field courses in Kunpeszér, the project was represented by the project management (project manager and project coordinators).

The following picture shows the organograms of the individual organisations, the roster (including names and positions) of the people working in the project can be found in the annex (F1\_8).



### 6. Technical part

The Evaluation of the Project Implementation table (6.3.) contains additional data on the achieved results.

6.1. Technical progress, per Action

## A1 – Creation of action plans (including management guideline and schedule for the present LIFE-project)

The realization of the action is in progress, and practically will continue during the whole period of the project.

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The planned and realized DPP the action-plan in the project is the most important management and follow-up instrument for the project-management (A1\_1-5). Practically it is an extended Gantt-chart (F1\_3), containing the specific milestones and the deadlines and operators for the different Deliverable products of the projects. Completed and refreshed in deadline.

Naturally, the action plans were updated every year and presented to the Board at the annual Steering Committee meetings. In this way, the required DPPs were fulfilled. The annual action plan updates allowed managers to more easily review the progress of the project and any delays.

In addition, KEFAG Plc., the KNPD and MME have prepared technological instructions for each of the professional and monitoring actions. The technological instructions prepared for the professional actions helped the forest workers to carry out each professional action properly, while the technological instructions prepared for the monitoring actions facilitated reproducibility. These instructions also contributed to facilitate the preparation of best practice studies.

#### Milestones:

- MS1 (Compilation of project performance indicators by project manager and its approval by steering committee 15/08/2017) has been reached in time.
- MS2 (Updated Management Guideline for the project (with all necessary spatial data) -31/08/2018) has been reached in time.
- MS3 (Approved Management Guideline for the project (without spatial data) 30/09/2017) has been reached with some delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (Action plan for the project -31/08/2017) has been reached in time.
- DPP2 (Updated action plan for the recent project  $\frac{31}{01}{2018}$ ) has been reached in time.
- DPP3 (Management guideline for actions 30/09/2017) has been reached with some delay compared to the original schedule.
- DPP4 (Updated action plan for the whole project  $\frac{31}{01}{2018}$ ) has been reached with some delay compared to the original schedule.
- DPP5 (Updated action plan for the whole project -31/01/2020) has been reached with some delay compared to the original schedule.
- DPP6 (Updated action plan for recent project -31/01/2021) has been reached in time.
- DPP7 (Updated action plan for recent project 31/01/2022) has been reached with some delay compared to the original schedule.

#### A2 – Creation of GIS-database for Peszér-forest area

Foreseen start date: 01-08-2017 Actual start date: 01-08-2017Foreseen end date: 31-12-2022 Anticipated end date: 31-12-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period in accordance with the specification laid down in the Grant Agreement.

Within the frames of this action a complex system of different GIS databases has been implemented, enabling us to manage (to store, to process and to analyse) different data types (e.g. 3D spatial/surface models, a soil map, a database of hydrologic data, different databases of particular biotic data, etc.). All data (spatial and other information of management interventions, monitoring data, etc.) having been collected during the project period have been loaded into these databases.

This database system served four basic purposes:

- to provide suitable spatial data for thematic maps (such as the thematic map for representation of soil heterogeneity, and the thematic map for water balance), for preparation of different spatial models (such as the 3D distribution model of distribution of key habitat types of the project area, the 3D spatial model of distribution of key species, the 3D spatial model of distribution of microhabitats influencing the distribution of key species) and for various assessments (such as the 3D spatially explicit habitat viability model for key habitats and species and further PVAs, HVAs) to be performed/created within the frames of this certain action,
- to provide suitable spatial data for planning the implementation of concrete conservation actions (such as the conversion of structure of forest stand in action C3, the recultivation of stump-depots in action C4, the creation and maintenance of ecological corridors in action C5, the creation of small-scale forest clearings by KNPD in action C9 and the improvement of conservation status of pre-forests of steppic Oak woods C10),
- to record all the spatial information on activities/interventions having been implemented during the project period (i.e. what has been done, when and where), including the data originating from monitoring the effects of specific interventions,
- and to make it possible to monitor the progression of certain actions and the project as a whole (e.g. by easily comparing the planned extent and the realized extent of a certain action).
- In detail, the following deliverables were prepared within the frames of this action.
- Two thematic maps (the thematic map for representation of soil heterogeneity, and the thematic map for water balance) has been created based on the results of soil sampling and analysis and hydrologic data collection performed within the frames of action A3. These maps were used for the high-definition spatial plans of the concrete conservation action to be performed within the frames of the project and also for future silvicultural and conservation interventions (after the project).
- Three spatial models (a 3D spatial model of key habitat types in Hungarian project sites, a 3D spatial model of key species in Hungarian project sites, a 3D spatial model of microhabitats influencing the distribution of key species in Hungarian project sites) were created based on the biotic data collected within the frames of D2. These distribution models form the basis for different analyses to be performed within the frames of the project and after the project, as well.
- Qualitative habitat viability models were created for targeted habitat types of Community interest of the whole project area (Subcontinental peri-Pannonic scrubs

(40A0\*), Pannonic sand steppes (6260\*), Euro-Siberian steppic woods with Quercus spp. (91I0\*), Pannonic inland sand dune thicket (Junipero-Populetum albae) (91N0\*))

- Qualitative population viability analyses were carried out for a couple of key species (*Hypodryas maturna, Iris humilis ssp. arenaria, Gladiolus palustris*).

The actual conservation actions of the project were supported by adequate spatial data about edaphic, hydrologic conditions in order to be able to apply adequate methods and to find the best solution (e.g. the soil and hydrologic conditions determine the best composition of tree species for forest stand renewals). Accordingly, the conversion of structure of forest stand in action C3, the recultivation of stump-depots in action C4, the creation and maintenance of ecological corridors in action C5, the creation of small-scale forest clearings by KNPD in action C9 and the improvement of conservation status of pre-forests of steppic Oak woods C10) were accomplished using the above mentioned spatial data.

We recorded all the spatial information on all accomplished activities during the whole project period and the collected data were incorporated into this database system. It means that all the spatial data collected within the frames of the concrete conservation actions (C1 to C13) have been into the database. The data about the specific interventions/activities include the specification of the activity, the exact place of the activity as shape file, the exact time of the activity (for Actions C7 and C9-C12). Also, data originating from monitoring the effects of specific interventions and other type of data originating from biotic monitoring were loaded into the database, as well.

#### Milestones:

- MS1 (A frame system of a functional GIS-database is created and available for all project partners) 31/03/2018) has been reached in time.
- MS2 (A thematic map for representation of soil heterogeneity based on the data of soil mapping collected in the frame of action A2 -31/03/2018) has been reached with some delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (A thematic map for representation of soil heterogeneity based on the data of soil mapping collected in the frame of action 31/08/2018) has been reached with some delay compared to the original schedule.
- DPP2 (3D spatial model for microhabitats influencing the occurrence of key species in Hungarian project sites 31/03/2018)
- DPP3 (3D spatial model of distribution of key habitat types in Hungarian project sites 30/09/2022) has been reached in time.
- DPP4 (3D spatial model of distribution of key species in Hungarian project sites 30/09/2022) has been reached in time.
- DPP5 (A set of habitat viability models for targeted habitats of Community interest of the project 30/09/2022) has been reached in time.
- DPP6 (A set of habitat viability analyses for key targeted species of Community interest (Hypodryas maturna, Iris humilis ssp. Arenaria, Gladiolus palustris) 30/09/2022) has been reached in time.

#### A3 – Hydrological and soil mapping of project area

The realization of the action is in progress, and will be during the project period because of the collection for groundwater data.

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The method planned in the action (sampling with tractor mounted device with 3-point suspension) were changed by the management for nature conservational considerations.

Following a consultation with the Technical Monitor of the project, we obtained manual sampling borers without exceeding the budget, and our physical workers are collecting the soil samples (2 of our 6 persons). This process is obviously slower than the mechanized, therefore the soil map could not be ready as planned (12/2018), new deadline for the soil map was 30/06/2019. We succeeded in finishing the collection of samples in for the new deadline. In October of 2019 the laboratory examinations also finished. 2,526 samples from 638 sample points were collected, and 9 parameters analysed on each. The spectrophotometer purchased and used during the project was of great help in the analysis of the samples. The use of this instrument has made the analysis of the samples faster.

With these results the soil-type map of Peszér-forest was completed in December of 2019 (A3\_1). The soil maps have been a great help in determining the species of trees to be used for artificial reforestation in a given forest area. The maps made it easier to prepare the list of native tree species that could be planted, so that 16.37 ha of 52.51 ha were planted with oak and 33.14 ha with grey poplar main tree species.

The data of the groundwater monitoring wells are regularly read and saved. In the annexes the soil map is presented by depth layers, and the groundwater data by measured parameters  $(A3_1)$ .

The laboratory examinations were performed continuously on the samples, until the soil map was finished in December 2019. The soil-map represents the different parameter-values in all individual sample plots, for every collected sample  $(A3_1)$ .

The licensing procedure of the automatic groundwater wells took much longer time, than expected. This resulted practically 1 year delay between the original deadline (02/2018) and the accomplishment (01/2019). The delay affects the amount of the collected data, but until the end of the project period the collected data will be still sufficient for valuable conclusions. After the implementation of the monitoring wells we started manual data collection, until the automatization. Finally, in July 2019 the automatization of the groundwater monitoring wells has been completely finished. The following datasets are available: water temperature, groundwater level, water conductivity. Data is forwarded every four hours; therefore, the changes can be observed continuously. The maintenance of the groundwater monitoring wells required additional work, as batteries had to be replaced every 3-4 months in the wells. The well surroundings were treated and maintained 3-4 times a year with the grass mower purchased in the project. In addition, the regulatory inspections required for the monitoring wells have been and will continue to be carried out every year. The wells have given valuable results on the groundwater levels in the Peszér-forest, which is considered high in the lowlands, fluctuating between 2.5 and 4.5 metres. In the driest year 2022, the groundwater level did not go below 4.5 metres.

After we finished the data collection, we employed the forest workers of the action in the C1 action.

#### Milestones:

- MS1 (Installation of automatic ground water monitoring wells (3 pcs.) 28/02/2018) has been reached with some delay compared to the original schedule.
- -
- MS2 (Establishment of sampling pits, collection and on-the-spot analysis of soil samples (638 pcs.) 31/08/2018) has been reached with some delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (A thematic map for water balance based on the hydrological data collected in the frame of action A2. – 31/08/2018) has been reached with some delay compared to the original schedule.

- DPP2 (Soil map of the project area  $- \frac{31}{12}/2018$ ) has been reached with some delay compared to the original schedule.

#### C1 – Elimination of invasive trees on area managed by KEFAG

The realization of the action is in progress.	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 02 - 2018$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The planned equipment (chainsaws, mulcher and tractor) in the action has been obtained (C1\_1-3). Instead of the planned 200 hp tractor we obtained a 220 hp (VALTRA T234) tractor more suitable for our needs, after following a consultation with the Technical Monitor of the project. We were also able to use this machine in our C5 and C6 professional actions.

We have experienced a much higher invasive coverage compared to the preliminary estimates of the project. In the course of the professional action, box elder (*Acer negundo*), tree of heaven (*Ailanthus altissima*), common hackberry (*Celtis occidentalis*) and black cherry (*Prunus serotina*) were considered invasive in the KEFAG property and interventions were also carried out against these plants.

Interventions were carried out in two ways, mechanical and chemical. In the case of the mechanical method, we can talk about two additional methods. In the case of heavily infested areas with invasive tree species and with no significant conservation value, not only trees that had reached seed-bearing age, but also individuals in the sapling stage and in the soil seed bank were destroyed by the used technology. Seed production was eliminated by cutting the infested patches, including cutting the seed-bearing trees. Subsequently, as these invasive tree species germinate extremely well from both root and stump, both stumps and roots had to be removed to prevent regrowth. Seeds of invasive tree species that are planted in the soil can remain germinable for several years or even decades, so after the removal of seed-bearing trees, stands of invasive tree species can still regenerate from seeds for a very long time. However, the next step in the technology used, deep ploughing after stump removal, places the seeds deep enough in the soil that they are no longer able to sprout. Thus, with the method we used (clear cuttingstump removal-deep ploughing), we were able to achieve nearly 100% efficiency in the removal of invasive trees. Of course, in such a case, the stumps had to be removed from the area, because the stump piles would soon develop into infestation hotspots of invasive tree species. Such results were also achieved in Action C3, where 52.51 ha were subjected to such mechanical interventions, resulting in a reduction of almost 100% in the presence of invasive plants in these areas.

The other mechanical method is the removal of emerging seedlings. Depending on the tree species, seedlings can be removed up to 10-20 cm in size without their roots being embedded in the soil. These operations require a lot of work, so they have been mostly applied in the KNPD managed areas during the C7 action with volunteers.

In addition to mechanical methods, chemical methods have been used in our asset management areas. In the case of chemical methods, we used the hack and smear method for smaller diameter trees, whereby the bark of seedlings and saplings was treated with herbicide on both sides. This method can be used up to 3 cm diameter. For trees with larger diameters, the drill-injection method was used, whereby trees were drilled at a height of ~1m along the circumference of the tree at 2-3 cm intervals and then chemical was injected. The specificity of the chemical method is that they are selective, but they require a lot of work as each tree has to be visited. In the beginning, the chemical method was only used in the spring and autumn periods, as this is when the chemical reaches the whole plant, getting down to the roots. Our experience has shown that they can be used throughout the growing season, except on the

hottest days. On hot days, the intervention may even result in the death of the native plants due to significant evaporation of the herbicide.

The chemical spraying tasks was delayed because of the delayed start of the project and the long licensing procedure. To minimalize the damage in the remaining forest stands and habitats we established sample plots after several official coordination occasions. After the examinations from September 2018 we started the interventions with KEFAG Plc. own forestry workers employed for the project. Our workers attended the basic plant protection training, which is a condition for the implementation of the IAS restriction.

According to our experience, it was a problem to hire entrepreneur with adequate experience and qualification. To solve this problem, we asked for involving our own employees in these tasks. The required wage cost for this ( $\in$  50,000) therefore was reallocated from the external assistance fee ( $\in$ 250,000) for the action. We also asked for the price of the necessary chemicals from the cost of the planned consumables, which originally included seedlings purchases ( $\in$  7,500  $\in$ ). This reallocation was also was granted. Furthermore, we asked to produce the necessary seedlings in our own nursery instead of the originally planned purchase, thus increasing the security of sand adapted origin, which also was allowed.

In Progress report 2, we indicated that COVID-19 caused significant problems in progress, as contractors were unable to progress with the works, and in many cases were unable to come to the site. We then asked for the first round of works to be completed by spring 2022 and the second round of works to be completed by the end of October 2022.

A major problem at the beginning of the project was the low number of contractors, despite the calls for tenders published on the website, but fortunately we have since managed to attract several contractors to carry out the chemical works (Fekete-Bérc Forest Kft., SM Consulting Erdő és Természetvédelmi Szolgáltató és Fejlesztő Kft. Carpinus-Oriental Kft.).

During the implementation we realized, that the complete removal of invasive trees could be extremely hard on those areas, where there are many small seedlings and shoots of them. To get forward, we concentrated on larger trees first (above 5 cm diameters) to prevent seed dispersal. We also implemented the total soil recultivation (before planting) as an effective method of removing invasive saplings and shoots. Additionally, we are trying to form well-structured forests with high canopy closure, which is unfavourable for many invasive plant species.

The action was implemented. However, due to the rapid spread of the invasives, we were able to concentrate on individuals over 3 cm in diameter. Thanks to the mild weather, the second round of treatments was completed in early November 2022. We completed the 403.8 ha undertaken in two phases. In the first round, individuals over 3-5 cm were treated. In the second round, we treated individuals that had grown to 3 cm. With this method, we do not allow the trees to grow into seed-bearing age, so that they cannot reproduce any further. And properly closed forests slow down the growth of invasive trees, which can even die due to lack of light.

#### Milestones:

- MS1 (Completion of the first round of chemical treatment of invasive trees -31/10/2020) has been reached with delay compared to the original schedule.
- MS2 (Completion of chemical retreatment of invasive trees 31/10/2021) has been reached with delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (Best-practice study focusing on the elimination of invasive trees - results and lessons of Actions C1 and C7 - 31/07/2022) has been reached with delay compared to the original schedule.

#### C2 – Reduction of scrub-cover of overgrown areas

The realization of the action is in progress.

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 01 - 2018$
Foreseen end date: $30 - 03 - 2019$	Actual end date: $31 - 03 - 2021$

With this intervention, a natural vegetation dynamic process can be accelerated, leading to the establishment of oak forest steppe stands. In Hungarian forest steppes, young or middleaged stands are rather under-represented, so this type of intervention leads to a more balanced age structure.

Low-intensity shrub cover control during regeneration felling is an effective tool for forest managers to ensure the favourable development of the pre-forest and the survival of oak forest steppe stands. Also important is the control of shrubs to ensure the juvenile growth of successional stands.

In many cases, the young native stands in the Peszér-forest have reached a level of shrub cover that has negatively affected the biodiversity of the forest stands and the growth of the main tree species of the forest. By controlling shrub cover, the tree species of the target stand can grow above the shrubs and then, with a higher crown closure, such continuous closed shrub stands cannot develop. The shrub cover was controlled by mechanical means, using manual and mechanical equipment. The 103,26 ha committed were exceeded, altogether 104,29 ha of shrubs were cut. We closed the campaign with an over-performance of 101%.

The planned equipments (bushcutters) in the action has been obtained (C2\_1-3). The work is carried out using manual and mechanical equipment, with our own workers and contractors.

The scrub-control could not be finished to deadline (MS 30 March 2019) because the vegetation period and the hatching period limits our time suitable for this work. Scrub-control can be performed between 15 September and 15 March. The works were completed on 31 March 2021, as previously requested.

However, the shrub cover reduction suddenly brings a large amount of light to the forest floor, which causes a boom of the seed bank of woody invasive species. However, we have observed that the native stand closes sooner than these invasive species become established. Thus, their encroachment is only a problem in the first year. In the case of large-scale overgrowth, chemical treatment is necessary.

#### Milestones:

- MS1 (Completion of shrub reduction - 31/03/2019) has been reached with delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (Best-practice study focusing on the intermediate stand treatments targeting to accelerate the formation of Euro-Siberian steppic woods with Quercus spp. – 31/07/2020) has been reached with delay compared to the original schedule.

#### C3 – Conversion of structure of forest stands

The realization of the action is in progress.	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 01 - 2018$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The conversion of non-native forest stands to native tree species will significantly increase the class of naturalness, resulting in more favourable habitats for animal and plant species of Community importance. The forest structure conversion was carried out with full soil preparation after trunk removal. This means that the areas have been deep ploughed with heavy deep ploughs (so-called rigol-ploughs). The areas affected by forest-structure conversion were slightly changed, because the Office of National Heritage did not approve our original plans (Kunpeszér 21A and 26F). New areas were chosen (Kunpeszér 7H, 7O, 8G, 25A, 25D). In selecting the sites, we took into account the invasive monitoring of the MME BirdLife Hungary, which led us to request permission from the forestry authority to carry out logging in the most infested areas. Due to these interventions, we had to divide existing forest subcompartments, which involved the restructuring of stands infested with invasives. Thus, we carried out such works in the following forest subcompartments: Kunpeszér 7H, 7I, 7O, 8G, 10I, 12E, 13B, 13D, 14A1, 18F, 19D, 20C, 20F, 25A, 25D, 25F, 26L, 27F.

The crisis caused by the COVID-19 pandemic has led to the collapse of the global stump chips market. The stump processors went bankrupt, and in September 2021 we did not know how the stumps would be removed, this caused significant delays. In spring 2021, we were unable to plant 17.97 ha of land. A new technology was applied in the field, whereby the stumps were grinded on site. For the areas that had not been stumped, we used this special highpowered stump grinding machine to grind the area to a depth of 30-40 cm and then planted the saplings into that prepared soil. This contractor had to be used because our own machine was not suitable for this work. In Progress Report 2 we therefore requested a transfer of EUR 42,000, which was exceeded by EUR 35,500. We had to use this operation because without it we would not have been able to carry out the operation. Thanks to this intervention, we have restructured 52.51 ha instead of the planned 50.50 ha by the revised deadline of 31.05.2022 indicated in Progress Report 2. The new intervention appears to have been successful, with good seedling survival despite the drought. The interventions have resulted in the chemical-free removal of more than 400,000 invasive tree specimens. From the locally collected propagating material, 110,600 saplings were grown in the Sapling Nursery of Solt, of which 33.14 ha of grey poplar forests and 19.37 ha of pedunculate oak forests were established.

Saplings were planted with planting machines or by hand simultaneously with ploughing. No stump depots were created, the stumps were hauled off the site or grinded and spread out on site. A milestone for the completion of tree felling was set for 01 March 2020, we finished it in the 31 December 2021.

The seedlings used were counted as a self-financed contribution.

In autumn 2022, due to the drought, we had to carry out a significant amount of replanting in the area. In addition, we carried out 3 to 4 mechanical and manual weed control and in-row maintenance operations per year.

#### Milestones:

- MS1 (Completion of clearcutting at forest stands to be transformed 01/03/2020) has been reached with delay compared to the original schedule.
- MS2 (Completion of planting -31/03/2021) has been reached with delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (Best-practice study focusing on the conversion of forest structure in the case of lowland forests – 31/08/2022) has been reached with delay compared to the original schedule.

#### C4 – Recultivation of trunk-depots

The realization of the action is in progress.	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 03 - 2018$
Foreseen end date: $30 - 09 - 2020$	Actual end date: $30 - 04 - 2021$

One of the characteristics of lowland forestry is the stumping (during artificial reforestation), after which the stumps are sorted into so-called stump depots. During the project, we undertook

the removal and recultivation of 2.19 ha of previously created stump depots. This number may not seem very large, but, when you consider that these stump depots are a few hundred  $m^2$  in size, you get a sense of the actual scale of the work.

These structures also contain a part of the topsoil, which has a significant proportion of the germinating invasive tree species seeds and nutrients. This allows the growth of invasive tree species in a concentrated way and under particularly good environmental conditions. Therefore, the removal of the stump depots can be equivalent to the elimination of invasive hotspots.

During the project, a total of 2.31 ha of stump depots – most of which were overgrown by the tree of heaven – were removed and replaced with native tree species saplings.

Fortunately, much of the work was completed before the COVID-19 pandemic, so the problems listed in C3 were not affected.

After the removal of the stumps, deep ploughing was also applied in these areas, thereby rotating the invasive species' seed bank down to a depth of 70-80 cm. Seedlings were either planted at the same time or right after the soil works. Machine works started in the first quarter of 2019. With our work done, invasive centres were significantly reduced, and former stump-depots were planted with native saplings. The action was completed by the date indicated in the Mid-term Report, 30 April 2021. The seedlings used were accounted for as own resources.

The interventions have eliminated invasive, mostly tree of heaven, infested hotspots on 2.31 ha, which represents a 105% over-performance compared to the original plans. In addition, no new stump depots were created and none will be created during the maintenance period. The work was not completed after the seedlings were planted, we carried out 3-4 times a year row and between row weed control and due to the drought periods we had to carry out regular replanting. One negative experience was also noted and reported in the good practice study. If the existing stump depot is very narrow and the surrounding forests are tall, their canopy can overgrow the area of the depots, causing significant shading of the seedlings, which can reduce their growth.

#### **Milestones:**

 MS1 (Elimination of invasive trees growing on trunk depots – 31/08/2017) has been reached with delay compared to the original schedule. To reach this milestone, invasive plants were removed mechanically by deep ploughing. No additional chemical treatments were applied.

#### **Deliverables:**

- DPP1 (Best practice study on the restoration of former trunk depots -30/11/2022) has been reached with delay compared to the original schedule.

#### C5 – Creation and maintenance of ecological corridors

The realization of the action is in progress.	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 01 - 2018$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The scarce fritillary (*Euphydryas maturna*) is a protected butterfly species of Community importance. Of particular importance for the populations of this butterfly species are the sunny ecological corridors and line clearances with shrub margins along their edges since they consist of the main food plants of this butterfly species. In addition to nature conservation interests, the accessibility of the forest, the opening up rate of the forest, is also important from a silvicultural point of view, as it makes it easier to carry out the work.

The aim of the action was to clean and open up the shrub covered corridors and to create new corridors, which will contribute to the strengthening of the butterfly populations. These corridors were created on 15.31 ha instead of the planned 13.22 ha. This means a 116% of

overperformance of the planned area. However, these works require continuous interventions to avoid the overgrowing of shrubs and therefore this task requires repeated mechanical and manual works several times a year, with particular attention to the protection of the butterfly's egg sacs. It is important that interventions can be carried out in dormancy period. Care should be taken to ensure that the feeding plants of the scarce fritillary are not completely mulched during the interventions. The proper method is that in the first phase only one side of the line clearing is mulched and the other side is only done in the second phase. These maintenance highlights have been included in the good practice studies. KNPD staff are regularly consulted on this. The implementation of this action has resulted in a significant increase in the population of scarce fritillary as indicated in Action D1. The action was completed by 30 April 2021 as indicated in the Mid-term report, and maintenance work has been carried out every year since then. KNPD has carried out plant diversification in the line clearing margins, planting the main feeding plants of scarce fritillary.

#### **Milestones:**

- MS1 (Treatment of invasive plants located at trenches and patches to be converted into ecological corridors 30/09/2017) has been reached with delay compared to the original schedule.
- MS2 (Removal of trees located in the planned trace of the corridors -31/10/2017) has been reached with delay compared to the original schedule.

#### **Deliverables:**

- DPP1 (Best practice study on the creation of ecological corridors and restoration of linear facilities 31/12/2022) has been reached in time.
- DPP2 (Best practice study on the reintroduction of native (protected and not protected) plant species' 31/12/2022) has been reached in time.

#### C6 – Creation of forest clearings on area managed by KEFAG

The realization of the action is in progress.	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 02 - 2018$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

Our goal in this action was to restore clearings overgrown by shrubs. However, in some of the predesignated areas we documented such valuable preforestation of native tree species that we have instead established some of the clearings on black locust (Robinia pseudoacacia) stands with low growing potential. As a result, the areas affected by the actions as indicated in the Grant Agreement have been slightly modified. A major result of the project is that the Kunpeszér 21A forest subcompartment (originally an area to be place of forest conversion, C3 action), which was not able to be cleared and planted with native tree species due to restrictions of heritage protection (the medieval settlement of Kunpeszér was located in this area). For this reason, we were forced to include this degraded, invasive forest in this action. After approximately 2 years of administrative management, we have created a clearing on 15.35 ha, a unique project in our country. This intervention is a desirable result from the point of view of forest management, nature conservation and heritage protection. We were able to carry out the work at a cost of EUR 17,000, over and above the EUR 10,000 indicated in Progress report 2, using a specialised, high-performance machine, as in the C3 action. We could not do this work with our own machine because of the presence of old, 10-year-old, dry black locust, which would have destroyed the machine. The clearing of this area was completed by the deadline indicated in Progress report 2, 31 October 2021. In the year 2022, we carried out maintenance work on the clearing 3-4 times a year. Which should also be carried out in the first half of the maintenance period. During the year 2022, the area has been grazed. By the end of the maintenance period, we would like to reduce the number of mulching to one per year, in order to create a sandy grassland of native plants instead of ruderal plants.

The work was carried out on 25.63 ha, exceeding the planned 21.17 ha. We have therefore achieved an overperformance of 121% in this action. The intervention areas are expected to result in the establishment of sand grasslands of high conservation value and the establishment of protected, highly protected and community importance species.

In the future, the maintenance of the clearings will be carried out by repeated mulching and grazing.

#### **Milestones:**

There are no deadline task milestones.

#### **Deliverables:**

- DPP1 (Best practice study on the reintroduction of native (protected and not protected) plant species' -31/12/2022) has been reached in time.
- DPP2 (Best practice study on the restoration of grassy habitats of the sand forest steppe habitat complex' 31/12/2022) has been reached in time.

#### C7 – Elimination of invasive trees on area managed by KNPD

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: 31 – 12 – 2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Net area of treated forest stands (regarding the 1st round of selective chemical treatment of invasive trees): 185.19 ha (100% compared to plans).

Net area of treated forest stands (2nd round of selective chemical treatment of invasive trees): 185.19 ha (100% compared to plans).

Net area of treated forest stands regarding the physical removal of seedlings of invasive trees: 47.92 ha (no such activity was planned, for explanation please refer to the following part).

In our application, we targeted to remove all the seed producing specimens of the 4 main invasive tree species (Tree of Heaven, Common Hackberry, Black Cherry, Maple Ash) and also the Black Locust from the forest stands managed by KNPD. By the end of the project, KNPD has achieved a reduction of 93.28% in the number of seed-producing individuals of invasive woody species in KNPD-managed forests. This level of reduction is the cumulative result of a) spontaneous mortality (negligible, close to 0), b) direct human interventions (selective chemical treatment or mechanical removal of the specimen with the entire root system) and an increase due those specimens that were not yet seed-producers at the start of project and later, during the project period have reached the seed-producing phenophase. For comparison: the monitoring results indicate a 67% increase in the number of specimens of seed-producing phenophase in the untreated (control) areas in the case of the Common Hackberry over the 5 year-long project period, and also a significant increase in the number of seed-producing specimens of other invasive woody species has been revealed.

	No.of individulas v	with min. 5 cm dbh	Domovol
Species	2017. (at project start)	2022. (at project end)	ratio
Tree of Heaven	2.532	88	96.52%
Common Hackberry	3.519	142	95.96%

Black Cherry	3.460	20	99.42%
Maple Ash	1.412	0	100.00%
Black Locust	50.509	3.879	92.32%
In total:	61.432	4.129	93.28%

In our application, we targeted to reduce the number of specimens of invasive woody species, not yet at seed-bearing age (but already reaching 1.3 m in height) to less than 1% coverage. By the end of the project, the number of specimens of invasive woody species, not yet at seed-bearing age (but already reaching 1.3 m in height) has been reduced by 68.32% in the KNPD managed forests. This level of reduction is the cumulative result of a) spontaneous mortality (negligible, close to 0), b) direct human interventions (selective chemical treatment or mechanical removal of the specimen with the entire root system) and an increase due those specimens that originate from generative or vegetative reproduction. For comparison: the monitoring results indicate a 253% increase in the number of specimens not yet at of seed-producing phenophase (but already reaching 1.3 m in height) in the untreated (control) areas in the case of the Common Hackberry over the 5 year-long project period, and also a significant increase in the number of specimens not yet at of seed-producing phenophase (but already reaching 1.3 m in height) in the untreated (but already reaching 1.3 m in height) of other invasive woody species has been revealed.

No.of individulas with < 5 cm dbh			
Species	2017. (at project start)	2022. (at project end)	ratio
Tree of Heaven	28.155	15.504	44.93%
Common Hackberry	109.105	29.568	72.90%
Black Cherry	8.752	3.535	59.61%
Maple Ash	9.589	694	92.76%
In total:	155.601	49.301	68.32%

With significantly reducing the abundance of invasive woody species, we were able to enhance or to secure the naturalness of forest stands managed by KNPD. According to the categories listed in the Hungarian Forest Act, the following transformations have been carried out:

Transformation	Area
Plantation of non-native/invasive woody species $\rightarrow$ Coppice forest (secondary forest) with no invasive woody species	22.40 ha
Plantation of non-native/invasive woody species $\rightarrow$ Semi-natural forest with no invasive woody species	0.8 ha
Plantation of non-native/invasive woody species $\rightarrow$ Semi-natural clearing or thicket with no invasive woody species	5.31 ha
Transitional forest with mixture ratio of invasive woody species exceeding 50% $\rightarrow$ Coppice forest (secondary forest)	35.07 ha
Transitional forest with mixture ratio of invasive woody species exceeding $50\% \rightarrow$ Semi-natural forest	30.02 ha
Transitional forest with mixture ratio of invasive woody species exceeding $50\% \rightarrow$ Semi-natural clearing or thicket	11.39 ha
Securing semi-natural clearing or thicket state (no trasformation)	27.35 ha
Securing coppice forest (secondary forest) state (no trasformation)	15.71 ha

Coppice forest (secondary forest) with mixture ratio of invasive woody species between 10-20% $\rightarrow$ Semi-natural forest with no invasive woody species	
Coppice forest (secondary forest) with mixture ratio of invasive woody species between 10-20%	2.54 ha

 $\rightarrow$ Semi-natural clearing or thicket with no invasive woody species

For the treatment of invasive trees, we applied the methods indicated in our original application. Only the most cost-effective methods with reliable effect and without undesired side-effects were applied in this action. Selectivity of chemical treatments required significant allocation of labour work, as specimens of invasive trees were treated individually (more, than 160,000 specimens). Chemical treatment was always performed in a highly selective way; accordingly, it cannot lead to destruction of other (not targeted) plants. For the chemical treatment ammonium-glyphosate was planned to be used as herbicide, with added materials that provide faster absorption. From 2020, we applied other type of herbicides. The bark of saplings and sprouts of invasive trees with DBH not exceeding 5 cm was mechanically wounded and painted with total herbicide at the wound. In the case of older/higher specimens, bores with diameter of 8 mm were drilled into the trunk at 0.5-1 m height and filled with total herbicide, finally the holes were closed by applying adhesive materials. Asclepias syriaca, Solidago spp. were pointsprayed with total herbicide diluted to 20:1 (5 V/V%). Treated sites were retreated (second treatment was applied in every forest stand managed by KNPD). Specimens of those species, which could be successfully eradicated by physical means, were treated via manual sapling removal and girdling.

Up to the information available, in this action (together with Actions C1, C9, and C10) the largest number of invasive trees has been treated selectively in Europe. It is a contribution to widening the horizon about what is possible in the control of invasive tree species. Also, we have quantified the resource demands for different solutions/technologies of invasive tree species control. We have developed and implemented new technologies & solutions in public authority proceedings and for chemical and mechanical control of invasive tree species.

The same invasive species represent real threat right now or in the close future virtually for all the Hungarian forests (not only the lowland forests). Therefore, the same technologies can be applied for the same species.

#### Milestones

- MS1 (Completion of the first round of chemical treatment of invasive non-arboreal plants -31/08/2018) has been reached in time.
- MS2 (Completion of the first round of chemical treatment of invasive trees -31/10/2020) has been reached in time.

#### Deliverables

DPP1 (Best-practice study focusing on the elimination of invasive non-arboreal plants
 - 31/12/2022) has been reached (edited) in time.

#### C8 – The reintroduction of silvipastoral systems on Peszér-Adacs Meadows

Foreseen start date: 01-08-2017 Actual start date: 01-08-2017Foreseen end date: 30-09-2022 Actual end date: 31-10-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period in accordance with the specification laid down in the Grant Agreement.

Net area of treated forest steppic habitats (regarding the complete selective chemical treatment of invasive trees): 23.73 ha (much larger than the 10.0 ha area indicated in the original plans).

Net area where forest grazing was reintroduced: 23.73 ha (much larger than the 10.0 ha area indicated in the original plans).

In the OAKEYLIFE project, grazing was (re)introduced on a total of 23.73 ha of KNPDmanaged forests and forest steppes. A unit covering 3.26 ha was assigned in a Robinia plantation, where grazing was introduced in order to control invasive woody species. Another unit covering 20.47 ha was assigned in a high nature value, species-rich forest-steppe habitat, where grazing was introduced in order to establish and maintain a suitable vegetation structure for species associated with open vegetation structure (e.g. Sand Iris). During the project period, the number of invasive woody and herbaceous plant species was reduced to detection threshold level. Data collection on the baseline conditions has been completed in time, according to the original plans. The implementation of traditional wood fence around the wooded pasture has been completed (with no costs involved in the project budget). Regular grazing with 0.2 animal unit/hectare grazing pressure has been carried out all over the project period in an experimental design (3 management types: exclusion of all grazing animals, exclusion of domestic grazing animals, grazing by domestic animals and game species, 2 repetitions of each) in the high nature value, species-rich forest-steppe habitat. Due to changes in legal conditions, it was possible to reintroduce forest grazing to Peszér-forest. From 2020 to 2022, a net 3.0 ha (gross 3.26 ha) part of forest compartment Kunpeszér 45 G was grazed by cattle regularly, with a control (ungrazed) part covering net 3.0 ha (gross 3.55 ha). For the experimental grazing design, 4 grazing exclusion units were established, with a permanent fence around each unit, at the grazed forest steppe.

In this action -as a case study -, it has been proven that in the case of sand forest steppe habitat complex: a) forest grazing can be an effective tool for maintaining open habitat patches; b) moderate intensity cattle grazing does not influence the Oak regeneration negatively; c) with the grazing exclusion units, it has also been proven that the grazing of game species (roe deer, dama deer) is a significant factor affecting natural forest dynamics processes; d) moderate cattle grazing in *Robinia* plantations on sandy soils has no effect on the vitality of mature *Robinia* trees and other invasive trees, and it has statistically significant – from nature conservation perspectives: not sufficient - .negative effect on the regeneration of invasive trees, due to harms to apical buds; e) due to much less dense understorey vegetation, it is faster (therefore cheaper) to implement invasive control at grazed plantations.

Grazing in *Robinia* plantations, to achieve containment (preventing younger specimens of invasive trees species, like the Common Hackberry or the Black Cherry, from reaching the seed-producing phenophase) can be an effective tool if combined with particular treatments. As *Robinia* plantations add up to some 25% of the Hungarian forests and plantations, there is huge room for replicability of this actions.

#### Milestones

- MS1 (Accomplishment of complete elimination of invasive plants 31/10/2017) has been reached with some delay compared to the original schedule.
- MS2 (Accomplishment of data collection on the baseline conditions 31/12/2017) has been reached with some delay compared to the original schedule.
- MS3 (Implementation of traditional wood fence around the wooded pasture 31/03/2018) has been reached with some delay compared to the original schedule.

#### Deliverables

- DPP1 (Best practice study on grazing in calcareous sand steppic woods - 31/12/2022 ) has been reached (edited) in time.

#### C9 – Creation of small-scale forest clearings by KNPD

Foreseen start date: 01-10-2017 Actual start date: 01-01-2018Foreseen end date: 31-12-2021 Actual end date: 31-12-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Accomplished legal procedure: permission for creation of small-scale clearings with net extent of 33.93 ha (11.25% larger than planned).

Accomplished control of invasive species: 33.93 ha (11.25% larger than planned).

Accomplished reduction of tree/shrub cover: 26.99 ha (88.49% compared to original plans).

Accomplished floral diversification: 26.99 ha (88.49% compared to original plans).

In the OAKEYLIFE project, the official procedure for the establishment of clearings and thickets was carried out on net 33.93 ha of KNPD-managed forests. Of these, 33.93 ha were subject to complete removal of invasive woody species (up to the detection threshold) using the same technologies applied in Action C7, and 26.99 ha to shrub reduction and floral diversification. For shrub reduction, external assistance was involved.

#### Milestones

- MS1 (Completion of treatment of invasive plants 31/10/2018) has been accomplished with slight delay.
- MS2 (Completion of reduction of shrub 31/10/2018) has been accomplished with slight delay and in less extent (26.99 ha instead of 30.5 ha).

- MS3 (Completion of floral diversification of restored small-scale clearings - 31/12/2020) has been accomplished in less extent (26.99 ha instead of 30.5 ha).

#### **Deliverables**

- DPP1 (Best-practice study focusing on the creation of small-scale clearings - 31/12/2022) has been reached (edited) in time.

#### C10 – Improvement of conservation status of pre-forests of steppic Oak woods

Foreseen start date: 01-07-2018 Actual start date: 01-01-2018Foreseen end date: 31-12-2022 Actual end date: 31-12-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Accomplished control of invasive species: 55.79 ha (62.18% larger than planned).

Accomplished reduction of tree/shrub cover: 55.79 ha (62.18% larger than planned).

In the Peszér-forest, even before the project start, the natural regeneration of the Pedunculate Oak was observable, unlike in most of the lowland forests in Hungary. Interestingly, this regeneration did not occur in the oak stands, rather in shrublands, open forest steppes and pioneer softwood stands (with birches and/or aspen). It is the phenomenon of Oak regeneration through other forest stands (pre-forests). In these pre-forests, invasive tree species were also present in relatively high abundance, forming a barrier to the regeneration of species-rich forest-steppic oak stands.

In the OAKEYLIFE project, a strong emphasis was placed on the management of the preforests, not only by reducing invasive woody species but also by cutting back the shrubs that were suppressing the young Pedunculate Oaks. Through repeated interventions, we have succeeded in significantly changing the composition of forest stands by completely eradicating invasive species. In total, the local conservation conditions of 55.79 hectares of birch-oak and aspen-oak stands were improved. A significant proportion - almost 30% - of the Euro-Siberian steppic woods with *Quercus spp*. on sand soils covering some 1,300 hectares in Hungary can be found in the Peszér-forest, emphasising the importance of this Natura 2000 site.

#### Milestones

- MS1 (Completion of treatment of invasive plants 30/09/2017) has been reached with some delay.
- MS2 (Cutting back the supressing bushes/trees to provide growing space for Pedunculated Oaks (first round) 31/08/2020) has been reached with some delay.
- MS3 (Completion of floral diversification at pre-forests 31/08/2022) has been reached in time.

#### Deliverables

- DPP1 (Best-practice study focusing on the management of pre-forests - 31/10/2022) has been reached (edited) in time.

#### C11 – Floral diversification of restored habitats

The realization of the action is in progress. Foreseen start date: 01-07-2017 Foreseen end date: 30-09-2022

Actual start date: 01 - 01 - 2018Anticipated end date: 30-09-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Accomplished planting of *Iris arenaria* 5,000 stems at 10 locations (4 times more than the 1,250 stems indicated in the original plans).

Accomplished planting of *Gladiolus palustris* 200 stems at 5 locations (slightly more than the 150 stems indicated in the original plans).

Planting Lilly of the Valley (*Convallaria majalis*) on gross 2.74 ha at 3 locations and seeding and planting other herbaceous and grass species 18.85 ha. Due to the totally overlapping areas, the total gross area involved in seeding/planting herbaceous and grass species is 18.85 ha (91.50% compared to original plans).

Planting rare tree and shrub species on gross 51.26 ha at 21 locations and planting *Ligustrum vulgare* and *Fraxinus angustifolia subsp. Pannonica* at gross 49.47 ha at 19 locations. Considering the overlap, the total gross area involved in tree/shrub planting is gross 63.42 ha (slightly larger than the gross 61.15 ha area indicated in the original plans).

The total length of inner and outer forest edges occupied by the Scarce Fritillary increased from 5.2 km to 25.6 km (cca. 400% increase) - virtually all inner forest edges occupied. Now, the population size is estimated as 14,000 imagos (cca. 500% increase compared to baseline conditions).

Following the removal of invasive tree species, native plant species were planted and seeded in the restored areas on gross 63.42 ha, with two main purposes. Firstly, certain plant species with poor dispersal ability would have been unable to colonise the restored habitat patches in the forseeable future and so by accelerating natural processes, the populations of these species were significantly increased. On the other hand, we planted saplings of the Hungarian Ash and the Common Liguster specifically for the Scarce Fritillary, because in the Peszér-forest these are exclusively those species that this moth species spawns on.

The plant species richness of the restored areas has been increased by, among others, the establishment of new populations of the Sand Iris and the Marsh Gladiole in the restored dry and mesic clearings. Following shrub clearance, the introduction of other species with poor

dispersal ability into the sandy clearing has improved the extent and quality of foraging habitat for pollinators (butterflies, hymenopterans, etc.).

The Scarce Fritillary has already colonised the newly established habitats during the project period and the first eggs were observed on the planted Hungarian Ash trees. The population, previously estimated at 2,400 individuals, had increased to at least 14,000 by the end of the project period, while the extent of known occupied habitats (typically inner forest edges and mesic forests with incomplete canopy closure) has also multiplied.

We set targets for habitat restoration of different habitat types of the calcaerous sand forest steppe habitat complex to a new level: instead of simply replacing the formerly present, non-native trees by one or two native tree species (mainly Silver Poplar *Populus x canescens*), we focused on the involvement of each and every native tree and shrub species in our restoration activities. Also, we developed new methods for diversification of restored grassy habitats.

The same type of degraded ecosystems that have been restored in the OAKEYLIFE project (characterised by the massive presence of invasive tree species), are present in several tenthousands hectare extent on sand soils at the Hungarian Great Plain.

#### Milestones

- MS1 (End of preparatory phase - 31/12/2017) has been reached in time.

- MS2 (End of translocation phase 31/08/2022) has been reached with some delay. *Deliverables* 
  - DPP1 (Best practice study on the reintroduction/translocation of native (protected and not protected) plant species to restored habitats 31/12/2022) has been reached (edited) in time.

#### C12 – Transformation of roadside shrubberies to forest-steppic Oak groves

Foreseen start date: 01-09-2017	Actual start date: $01 - 01 - 2018$
Foreseen end date: 31-12-2022	Anticipated end date: 31-12-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Accomplished planting of Pedunculate Oak saplings at 50 locations, with additional acorn planting.

In addition to Pedunculate Oak, other regionally rare species (Birch, Tatarian Maple, Field Maple, Hungarian Ash) were planted.

During the OKAEYLIFE project, we planted oak seedlings in thickets along roads crossing grasslands and forests at 50 sites. We collected acorns from locally propagating material. These locations were fenced with game exclusion fencing and were regularly tended (disked) and watered as needed during the project period to ensure the survival of the oak seedlings and to reduce the number of invasive woody and herbaceous species to detection threshold levels. Due to the drought period from 2019 to 2022, the mortality rate of the young oaks planted and acorn seeded was very high, with some years above 95%. Despite this, tens of kilometres of roadside thickets have been diversified with oak. In the action, in addition to pedunculate oak, we also planted Birch, Hungarian Ash, Wild Pear and Field Maple to ensure that the species-rich forest steppes are regenerated as widely as possible. The development of the Pedunculate Oak in the sandy areas is a very slow process (even the seedlings planted in 2017 only reached a maximum height of 2.5 metres by the end of the project period), but the transformations now underway have reopened the possibility of the once most characteristic tree of the lowland areas becoming the jewel of the bush and forest steppes again.

It has already been revealed before the start of the OAKEYLIFE project that the natural regeneration of the Pedunculate Oak take place not in the oak forests, rather in shrublands, open forest steppes and pioneer softwood stands (with birch and/or aspen). In the OAKEYLIFE project, involving scientists, university students and volunteers, we collected data on the extent and the speed of Oak regeneration on sand soils. It has been revealed and proved that a) an invasive fungi is responsible for the lack of natural regeneration of oak forests (published in the Journal of Conservation Biology and from January, 2021 it is available at the Elsevier website: <a href="https://www.sciencedirect.com/science/article/pii/S0006320720309861?via%3Dhub">https://www.sciencedirect.com/science/article/pii/S0006320720309861?via%3Dhub</a> ); b) the vertical growth of Pedunculate Oak is very slow on sand soils (requiring more than 4 decades to reach the 5 m height); c) the natural regeneration of Pedunculate Oak is virtually present in each and every habitat patch which are not disturbed by human interventions.

The same type of roadside shrubberies and unmanaged forest are present virtually all over the whole Kiskunság region (close to 1,000,000 ha extent).

We had to cope with the problem that the local municipalities could not be involved in watering the planted Oaks, therefore we had to do this with our forestry workers and by involving local volunteers. Also, in order to economize on fence material, it was reasonable to merge some locations. In the application we proposed to implement this action at 50 sites (20 locations per site, i.e. 1,000 locations in total covering 8,000 m<sup>2</sup>, using 10,000 meters of game fence). During the project period in total a 6,750 m<sup>2</sup> area has been surrounded and transformed via Oak planting and acorn seeding.

#### Milestones

- MS1 (Completion of acorn/sapling planting 15/10/2018) has been accomplished.
- MS2 (Installation of information tables at created roadside plantations 30/11/2021) has been reached with some delay.

Deliverables

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## C13 – Creation of nursery for Pedunculated Oak saplings originating from verified sand-adapted genotypes

Foreseen start date: 01-07-2017 Actual start date: 01-09-2018Foreseen end date: 31-12-2022 Anticipated end date: 31-12-2022

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period with some (below detailed) alteration from the specification laid down in the Grant Agreement.

Accomplished production of 10,000 Pedunculated Oak saplings originating from sand-adapted subpopulations in a newly established nursery.

During the project, an oak nursery was established, where the saplings to be used in non-forest areas were produced. The seedlings from this nursery were used to convert roadside scrub patches into oak-forest steppes.

We do not intend to continue with the production of stem oak saplings in this nursery because it is more economical to use an external contractor to produce the desired number of seedlings from the propagating material we collect. In the oak nursery, about 50-100 seedlings will be left after the seedling removal, the open soil surfaces will be sown with locally collected seeds of sand-adapted plant species, thus initiating the regeneration of open sand oak stands.

One DPP was planned in this action, which has not been completed: Study on the genetic lineages of Pedunculated Oaks on calcareous sand. Unfortunately, the genetics of oaks is very

complicated, there is no test available to compare the genetics of oaks. Therefore, we could not implement this DPP.

#### **Milestones**

- MS1 (Completion of genetic investigations of lineages of the Pedunculated Oak adapted to calcareous sand - 31/03/2018) has not been accomplished.

#### Deliverables

- DPP1 (Study on the genetic lineages of Pedunculated Oaks on calcareous sand - 31/12/2017) has not been accomplished.

## D1 – Mapping pre-treatment and monitoring post-treatment occurrence of alien species at Hungarian target sites

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The planned activities of this Action have been implemented successfully with necessary alterations from the specification laid down in the Grant Agreement.

Progress: during the project period, the implemented activities were: a) purchasing equipment b) recording the baseline conditions c) continuous post-treatment monitoring

- a) 2 pcs of simple digital cameras for monitoring (2017) (altogether 709 EUR), battery for the digital cameras (2018) (16 EUR) were purchased
- b) recording the baseline conditions (progress compared to plans: 100%)
- c) continuous post-treatment monitoring (progress compared to plans: 100%)

Since the spatial distribution of *Ailanthus altissima*, *Celtis occidentalis*, *Prunus serotina*, *Acer negundo* (IAS target species) was generally found to be highly aggregated, the planned sampling method (1 sample/ha) was not effective for capturing realistic distributions and abundances. Instead of sampling, full-cover mapping was necessarily applied since the beginning of the field surveys of IAS species. A 25x25 m grid was laid out in advance over the project area, delineating 625 m<sup>2</sup> survey units (SUs). We attempted to walk through each SU. For data collection, a relatively simple protocol was set up to allow fast fieldwork: 1.) dbh  $\geq$  5 cm individuals (seed-bearing or potentially seed-bearing specimens' class) were recorded by direct counting, 2.) a mean diameter was estimated per species per SU, 3.) dbh < 5 cm individuals (vital sapling's class) were estimated on a categorical basis, 4.) seedlings were estimated on a rough order of magnitude scale. Data collection was carried out in a GIS environment using field tablets.

For the baseline conditions, we completed 16.100 SUs (including the Szalag-forest), covering 90% of the project area. The remaining 10% was either under ongoing artificial reforestation or typically had impenetrable scrub, and were evaluated on a descriptive basis. *A. altissima* proved to be the most abundant with 50,000 individuals in the dbh  $\geq$  5 cm class with an average of 8 cm dbh (5-50 cm), 1,100,000 individuals in the dbh < 5 cm class, and several million new seedlings / year recruitment. *A. altissima* occurred in 50% of all the SUs. *C. occidentalis* resulted in the most frequent tree species with 25,000 individuals in the dbh < 5 cm class, and a several million new seedlings / year recruitment. *C. occidentalis* occurred in 80% of all the SUs. *P. serotina* occurred in basically two large hotspots with 16,500 individuals in the dbh < 5 cm class, and a several million new seedlings / year recruitment. *P. serotina* occurred in 30% of all the SUs. *P. serotina* occurred in 30% of all the SUs. *P. serotina* occurred in 30% of all the SUs. *P. serotina* occurred in basically two large hotspots with 16,500 individuals in the dbh < 5 cm class, and a several million new seedlings / year recruitment. *P. serotina* occurred in 30% of all the SUs. *P. serotina* occurred in 30% of all the SUs. *A. negundo* was found only in the lower elevations in the south-eastern part of the project area with 16,500 individuals in the dbh  $\geq$  5 cm class with an average of 7.7 cm dbh (5-35 cm), 250,000 individuals in the dbh < 5 cm class, and a several million new seedlings / year recruitment. *P. serotina* occurred in 30% of all the SUs. *A. negundo* was found only in the lower elevations in the south-eastern part of the project area with 16,500 individuals in the dbh  $\geq$  5 cm class with an average of 7.7 cm dbh (5-35 cm), class with an average of 7.7 cm dbh (5-35 cm), class with an average of 7.7 cm dbh (5-35 cm), class with an average of 7.7 cm dbh (5-35 cm), class with an average of 7.7 cm dbh (5-35 cm), class with an ave

250,000 individuals in the dbh < 5 cm class, and a hundred-thousands of new seedlings / year recruitment. A. negundo occurred in 14% of all the SUs. The re-surveys were scheduled to the mostly chemical-based interventions carried out overtime, and the changes were continuously monitored using the same methodology and SUs. Data collected by surveying 1,880 SUs (107 ha) in 2020, 3690 SUs (202 ha) in 2021 and 7315 SUs (420 ha) in 2022 were used to evaluate the success of the interventions. In addition, each year the areas where mechanical interventions have taken place have been assessed on a descriptive basis, 92.6 ha in 2020, 123,2 ha in 2021, and 132.3 ha in 2022. In general, for the dbh  $\geq$  5 cm class, 99.9% of the treated trees had withered and died within a few weeks after treatment. This is a clear indication of the high effectiveness of the chemical treatments. At the stand level, eradication success was found to be 90% in 2020, 86.5% in 2021 and 86.3% in 2022, with the remainder not found by field workers, which is understandable given the large area and dense vegetation. However, based on the data of 2022, about half of the remaining individuals were found in only 2% of the entire surveyed area. Together with the mechanical interventions, the total number of seedbearing/potential seed-bearing trees (98,000) in the project area has been reduced by approximately 60-70%. The cumulative diameter of invasive tree species in the treated areas decreased from 253,000 cm to 48,000 cm. Significant populations remained only in those areas of the Peszér-forest (mainly in the northern part) that were not included in the management plan. For the dbh < 5 cm class the results are different, but this is partly due to the fact that only a relatively small part of the project area was planned to be cleared of saplings. We identified average increases of 86.4% in 2020, 7% in 2021 and 28% in 2022 for this class in the stands surveyed. However, it is important to note that only less than 10% of the forest stands surveyed accounted for more than half of the increase. This means that in 90% of the stands there were in fact declines, which were greatest in the high conservation value areas. In for example Euro-Siberian Steppic Woods with Quercus spp. (9110) habitats, the results often exceeded a 90% eradication success. In addition, our measurements in control areas showed an increase of 500-1,000% in the dbh < 5 cm class in just 4 years. This indicates that these species can spread at tremendous rates without any treatment. For seedlings, substantial changes were only identified in significantly disturbed areas. However, seed bank explosions were compensated by additional mechanical interventions (e.g. deep ploughing) and manual removals in the context of volunteer days. It can be stated with certainty that, including mechanical interventions, the number of individuals of the dbh < 5 cm class eradicated exceeded 1 million. It is also important to note that the non-indigenous R. pseudoacacia has also been removed from the high conservation value stands. This meant treating approximately as many individuals as all four target invasive tree species combined. During the field surveys, a number of other occurrences were also recorded that came to light. Thousands of additional data were collected on important forest structural elements, other non-indigenous or non-native invasive species, and of course protected rare species. A total of 28,985 SUs were completed in about 850 field days, and more than 100,000 individual data were collected and integrated into the project's GIS database.

#### Milestones:

- MS1 (Accomplishment of coenologic survey and collection of biomass samples (pretreatment conditions) – 31/03/2018) has been reached within Action D2 (Habitat Report - Baseline) with some delay compared to the original schedule.
- MS2 (Re-mapping the whole target site for occurrence of invasive plant species 31/03/2018) has been reached with some delay and major alterations compared to the original schedule.
- MS3 (Re-mapping the whole target site for occurrence of invasive plant species 15/12/2018) has been reached with some delay and major alterations compared to the original schedule.

- MS4 (Re-mapping the whole target site for occurrence of invasive plant species 15/12/2019) has been reached with some delay and major alterations compared to the original schedule.
- MS5 (Re-mapping the whole target site for occurrence of invasive plant species 15/12/2020) has been reached with some delay and major alterations compared to the original schedule.
- MS6 (Re-mapping the whole target site for occurrence of invasive plant species 15/12/2021) has been reached with some delay and major alterations compared to the original schedule.
- MS7 (Re-mapping the whole target site for occurrence of invasive plant species 15/11/2022) has been reached with some delay and major alterations compared to the original schedule.
- MS8 (Accomplishment of coenologic survey and collection of biomass samples (post-treatment conditions) 15/08/2022) has been reached within Action D2 (Habitat Report Final) with some delay compared to the original schedule.

#### Deliverables

- DPP1 (Yearly report on occurrence of invasive plant species in the target area -31/12/2018) has been reached in time.
- DPP2 (Yearly report on occurrence of invasive plant species in the target area -31/12/2019) has been reached in time.
- DPP3 (Report on coenologic survey (pre-treament conditions) 31/03/2018) with some delay compared to the original schedule.
- DPP4 (Report on the result of analyses of herbicide residues (pre-treament conditions) -31/03/2018) has been reached in time.
- DPP5 (First report on occurrence of invasive plant species in the target area -30/04/2018) with some delay compared to the original schedule.
- DPP6 (Yearly report on occurrence of invasive plant species in the target area -31/12/2020) with some delay compared to the original schedule.
- DPP7 (Yearly report on occurrence of invasive plant species in the target area 31/12/2021) with some delay compared to the original schedule.
- DPP8 (Report on coenologic survey (post-treatment conditions) 31/08/2022) with some delay compared to the original schedule.
- DPP9 (Report on the result of analyses of herbicide residues (post-treatment conditions)
   31/08/2022) with some delay compared to the original schedule.
- DPP10 (Final report on occurrence of invasive plant species 30/11/2022) with some delay compared to the original schedule.

#### D2 – Monitoring key species and habitats within Natura2000 site

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The planned activities of this Action have been implemented successfully with no significant alteration from the specification laid down in the Grant Agreement.

• Progress: during the project period, the implemented activities were:

- a) purchasing equipment,
- b) regular monitoring of species and habitats of Community interest potentially affected by particular actions of the project,
- c) quantification of reintroduction/recolonization processes of plant and invertebrate species to habitats reconstructed/restored.
- d) Purchase of equipment: 2 pcs of Acer Aspire Swift 3 laptops (2017) (altogether 1736 EUR);
   2 pcs of Fieldbook K80G2 with one more year warranty (2019) (altogether 3255 EUR); 2 pcs of Garmin GLO GPS (2022) (altogether 184 EUR) were purchased
- e) Regular monitoring of species and habitats of Community interest potentially affected by particular actions of the project (progress compared to plans:100%)
- f) Quantification of reintroduction/recolonization processes of plant and invertebrate species to habitats reconstructed/restored (progress compared to plans:100%)

In addition to surveying invasive tree species and target species, particular emphasis has been placed on habitat monitoring, as changes in habitat conditions are indisputably important project indicators. Rather than sampling, full spatial coverage was defined and habitat patches across the entire project area (1,083 ha) were identified and characterised on a semi-quantitative basis during the baseline survey. The methodology was based on the A-NÉR (General National Habitat Classification System), with additional important criteria and more than 110 variables estimated individually. Altogether 1,012 habitat patches were delineated in the project area. Based on the system of Á-NÉR, 26 habitat types were recorded, and from those 14 can be considered as key habitats in the site. The habitat types were presented in mosaics in most of the patches, altogether 315 combinations were described. Several fragments of 7 habitats of Community interest were recorded, 3 of them were priority habitats. Based on the results, the area of Euro-Siberian steppic woods with Quercus spp. (9110) was 200.8 ha and the additional potential area is 184.1 ha, which are outstanding values in the Carpathian Basin. The area of Pannonic sand steppes (6260) resulted in 96 ha with an additional potential area of 13.2 ha. Pannonic inland sand dune thicket (Junipero-Populetum albae) (91N0) have been identified unequivocally only in 1 ha. Area of Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (6410) was 26.1 ha, Alluvial meadows of river valleys of the Cnidion dubii (6440) was 7.8 ha, Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Pandion, Alnion incanae, Salicion albae) (91E0) was 10.4 ha. A locally new type of habitat was furthermore identified, Juniperus communis formations on heaths or calcareous grasslands (5130) on 8.9 ha. Besides the habitats of Community interest, several additional information were collected on a quantitative basis regarding e.g. stand structures and species. Management suggestions (in a categorical system) were also made for the relevant C Actions. In 2022, the habitat map of the project area was fully updated. The quantitative and qualitative data collected over the 5-year project period were processed and additional field surveys were conducted. Baseline and final conditions were compared for each habitat patch on a case-bycase basis, using a multi-factor approach, and the direction of change (significantly worse, worse, neutral, better, significantly better) was determined. Habitat condition changes were assessed across the entire project area, however it is important to note that interventions were only made in less than 2/3 of the area. The results suggest that only a very small proportion of the area has been significantly degraded. However, minor degradation was identified on about 150 ha, largely due to the spontaneous spread of invasive tree species. Negative shifts occurred primarily in localities not affected by interventions and secondarily as a result of forest management according to the annual management plan (outside the project actions). No significant negative or positive changes were identified for 500 ha. However, this is fortunate given the presence of invasive tree species. Improvement in condition was documented on 237 ha and significant improvement on a further 173 ha. It can therefore be concluded that the interventions have improved 410 ha of forest steppe habitat - with an additional improvement of approximately 20 ha of the linear network. The most significant positive changes were identified regarding the condition of the Euro-Siberian steppic woods with Quercus spp. (9110). The interventions have improved the habitat type in 87 patches, covering a total of 100 hectares. Pannonic inland sand dune thicket (Junipero-Populetum albae) (91N0) occurs only in very small areas, but 3 new patches of potential variants have been established on 3 ha. The condition of Pannonic sand steppes (6260) has improved in 15 patches, covering a total of 15 ha. In addition to Natura 2000 indicator habitats, there have of course been significant changes in a number of other habitat types. Most notably, the area of Black locust (Robinia pseudoacacia) stands and spontaneous stands of invasive tree species was reduced by 110 and 115 hectares respectively. In addition, 65 patches of habitat types of no conservation value were completely or partially cleared and prepared in the course of reconstruction works, covering 90 hectares. These patches are now partly composed of young stands of native tree species, partly of heavily opened scrublands or new clearings. It can be concluded, that these habitat patches are still in their initial stages, but it is certain that they will make a major contribution to the maintenance of the forest's natural values in the forthcoming decades. A total of 2100 habitat patches were surveyed in about 300 field days, and more than 50,000 individual data were collected and integrated into the project's GIS database. Closely linked to the habitat mapping, a detailed dead wood survey was also carried out in 2021 during 80 field days, fully covering 120 ha with 2265 SUs (similarly to invasive survey) using a multivariate protocol. The dead wood survey can be considered as an extra project product.

The detailed invasive tree species and habitat surveys proved to be very time-consuming. For this reason, the target species surveys were carried out within a framework of a formal partnership agreement with KNPD, with the assistance of KNPD in data collection, involving a number of volunteers, university students and experienced researchers. This allowed the production of highdefinition distribution maps for all 14 target species, and monitoring activities were over-completed in case of 7 species. The monitoring activities were carried out according to species-specific methodologies. Before the project, Iris arenaria was known from only 3 localities in the project area. Surveys in 2018-2019 focused mainly on its two largest populations, but also 2 new localities were found in micro-clearings. In 2020, a systematic survey of potential habitat patches was initiated based on the habitat map that has been completed in the meantime. In the process, 16 new populations were found. The entire population of I. arenaria in the Peszérforest, based on the high-input surveys, is as follows: 1.) Ráczház / nearly 10,000 shoots, 2.) Rezervátum-clearing / nearly 2,000 shoots, 3) micro-clearings: 1,000-1,500 shoots. In addition, during the project period, it was possible to raise ex situ more than 10,000 individuals, which were partially planted in 2022 - mostly in newly created clearings. It is expected that the propagation programme will double the local population in the coming years. Gladiolus palustris is found in the project area with only one population. The number of shoots was closely stable during the 2018-2020 censuses, but a drought in the spring caused a decline in 2021, then the tragic drought of 2022 caused the species to stop producing shoots. It is likely that the population is not extinct, but spring rains would be essential for its survival. However, it is worth noting that a new population was found in a patch just outside the boundaries of the Peszér-forest during a field day in 2020. Among the target species included in the project, the survey of Euphydryas maturna clearly required the most effort. The collection of occurrence data started already in 2018 and a systematic survey began in 2019. The latter focused mainly on the road network in the central and south-western part of the forest, where the species was found to be most abundant. Within the systematic data collection, mark-release-recapture was carried out according to many environmental and biological variables, as well as targeted caterpillar nest and egg cluster searches, host plant mapping and other complementary surveys. Systematic data collection in 2019 resulted in 700 marked individuals, but recapture was extremely low. This already suggested a very large population. In the years 2020, 2021 and 2022, more than 2,000 imago were tagged every year, with 300, 170 and 150 individuals found

during recaptures. The searches for egg clusters and caterpillar nests usually ended with tens of hits per year, but in 2022, with increased effort, the search of the latter ended with nearly 200 records. It turned out that the primary host plant of E. maturna in the Peszér-forest is the common privet (Ligustrum vulgare), in which the species differs from the other European populations. The number of imagoes of *E. maturna*, estimated at the beginning of the project, could not exceed a maximum of 2,000-3,000 specimen, but in 2022 the number of imagoes was estimated to be 14,000. The population increase is clearly due to the project interventions. On the one hand, almost the entire network of roads in the area has been cleared by opening up several former ones that had been completely overgrown by shrubs. In addition, semi-shaded habitats were created in large scale by partially clearing scrublands and opening dense forest thickets. Finally, thousands of host and nectar plants important for the butterfly species have been planted. The extent of suitable (edge) habitat for E. maturna has increased by at least an order of magnitude, which also means tens of kilometres of new edges. Before the project, Cucujus cinnaberinus was known from only 4 different localities in the Peszér-forest. In the winter of 2019 and 2020, a detailed survey of the entire project area was carried out, 123 localities were found to have C. cinnaberinus, representing a 22% prevalence. The results suggest that where there is suitable deadwood, the species can be almost certainly found. In addition, the ringing of more than 100 grey poplars (*Populus x canescens*) was also carried out in the project. C. cinnaberinus colonised the fresh deadwood deterministically within 2 years. During the project period, more than 100,000 adult invasive tree species and R. pseudoacacia were eliminated, most of which remained in the area. It can be assumed that C. cinnaberinus population may also benefit from this surplus of deadwood. Before the project, Bolbelasmus unicornis was known from only 3 localities in the Peszér-forest. The species has been surveyed every year during the project period, together with a continuous search for possible new occurrences. In 2018, it was found in 4 new localities, which was finally extended by one new locality in 2022. During the survey, searches were made in several locations in the Peszérforest, but in most cases no specimens were found at all. Over the 5 years, a few hundred occurrences of the species were collected from 8 localities. In 2020, more than 50 individuals were captured in one evening, an outstanding result. Interestingly, in 2019 no specimens were found at all. It was also captured by light traps - part of an experimental survey. The species' presumably suitable habitat (e.g. micro-clearings) increased by more than 55 ha during the project, but it was not detected in these new patches during the project period. Vertigo angustior was sampled in 8 patches of Molinia meadows, and it was found in 7 of these patches. It is likely that it is commonly found in these habitats in and around the Peszér-forest. However, its future survival depends mainly on water availability, similarly to G. palustris. Most probably the largest *Isophya costata* population and also a significant population of *Carabus hungaricus* in Hungary can be found in the Felső-Kiskunság grasslands. They are abundant in the associated open grassland areas of the Peszér-forest as well, and their conservation depends primarily on grassland management. During the project period, they were searched with increased attention in the clearings of the forest area, but no data was collected. On the other hand, dozens of occurrences were recorded on the grasslands in the project period. During the invertebrate and other surveys, data on many other species have also been collected. Two other Natura 2000 indicator species new to the area were found. Lucanus cervus was recorded in 5 and Cerambyx cerdo in 6 localities. For bird species, in addition to ongoing data collection, detailed surveys were carried out in 2020, 2021 and 2022 covering the entire project area. Territory estimates were made for Dryocopus martius and Dendrocopos medius based on a pre-defined transect network method and playback technique, and a minimum number of territories was identified for Lullula arborea as well. For D. martius, 62 occurrences were recorded in 2020 and 72 in 2022. Territorial behaviour was recorded in 29 cases in the former year and 37 cases in the latter. Based on the calculations on territorial behaviour data and distances, it can be concluded that the Peszér-forest provides suitable habitat for at least 15-17 breeding pairs. The estimate of the territorial density (2020) was 13.9-21.3 individuals per 1,000 ha. D. medius was recorded in 52 cases in 2020 and 93 cases in 2022. Territorial behaviour was documented 19 times in the former year and 25 times in the latter. The results indicate that at least 9-13 pairs breed in the Peszér-forest. The territorial density estimate (2020) yielded 8.3-17.6 individuals per 1,000 ha. For the other species, the data collected were not suitable for estimating proper population size. For Lullula arborea, 26 occurrence data were collected in 2020 and 10 in 2022. However, the spatial distribution of the data suggests that the Peszér-forest surely be home to at least 10-12 pairs. In 2020, 20 occurrences were recorded for Sylvia nisoria, and a further 3 in 2021. Lanius collurio was documented 64 times in 2020 and 31 times in 2021. Lanius minor was recorded only in 2022, with 2 new occurrences. However, these species are not associated with the forest interior. Most occurrences were in 1.) forest edges, 2.) around the Szalag-forest, and 3.) in associated grassland areas rich in scrub patches and solitary woody species. The interventions during the project period are likely to have had, or will have a variety of effects on bird species populations. In many patches, interventions have resulted in a more open vegetation structure, which may favour populations of L. arborea, S. nisoria, L. collurio and L. minor. One of the most important environmental condition for woodpeckers is the availability of dead wood. This has certainly been improved in the area by eliminating and partially leaving in the area over 100,000 adult invasive tree individuals. Finally, as an extra project product, a survey of bats in autumn 2019 and summer 2020 has also led to a great number of new results. 12 species were identified, in addition to the Myotis genus. Vespertilio murinus, Hypsugo savii and the strictly protected Nyctalus lasiopterus were also found, which were new species for the area. In total, more than 50,000 individual records were collected during the species surveys and the number of field days exceeded 500 days.

#### Milestones:

- MS1 (Accomplishment of census of Iris arenaria populations 30/04/2018) has been reached in time.
- MS2 (Accomplishment of mapping the distribution/occurrence of species of Community interest (before the accomplishment of project actions) 30/06/2018) has been reached with some delay compared to the original schedule.
- MS3 (Accomplishment of census of Gladiolus palustris populations 15/07/2018) has been reached in time.
- MS4 (Accomplishment of census of Iris arenaria populations 30/04/2019) has been reached in time.
- MS5 (Accomplishment of census of Gladiolus palustris populations 15/07/2019) has been reached in time.
- MS6 (Accomplishment of census of Iris arenaria populations 30/04/2020) has been reached in time.
- MS7 (Accomplishment of census of Gladiolus palustris populations 15/07/2020) has been reached in time.
- MS8 (Accomplishment of census of Iris arenaria populations 30/04/2021) has been reached in time.
- MS9 (Accomplishment of census of Gladiolus palustris populations 15/07/2021) has been reached in time.
- MS10 (Accomplishment of census of Iris arenaria populations 30/04/2022) has been reached in time.
- MS11 (Accomplishment of census of Gladiolus palustris populations 15/07/2022) has been reached in time.

- MS12 (Accomplishment of mapping the distribution/occurrence of species of Community interest (after the accomplishment of project actions) - 15/07/2022) has been reached with some delay compared to the original schedule.

#### Deliverables

- DPP1 (High definition distribution maps for species and habitats of Community interest (before the accomplishment of project actions) 30/07/2018) has been reached with some delay compared to the original schedule.
- DPP2 (Report on the occurrence and abundance of all the species of Community interest (baseline conditions) 30/07/2018) has been reached with some delay compared to the original schedule.
- DPP3 (Report on the results censuses of Gladiolus palustris and Iris arenaria populations
   15/08/2019) has been reached with some delay compared to the original schedule.
- DPP4 (Report on the results census of Gladiolus palustris and Iris arenaria populations 15/08/2020) has been reached with some delay compared to the original schedule.
- DPP5 (Report on the results census of Gladiolus palustris and Iris arenaria populations
   15/08/2021) has been reached with some delay compared to the original schedule.
- DPP6 (High definition distribution maps for species and habitats of Community internet (after the accomplishment of project actions) - 30/07/2022) has been reached with some delay compared to the original schedule.
- DPP7 (Report on success of reintroduction/recolonisation of plant and invertebrate species at restored habitats 30/07/2022) has been reached with some delay compared to the original schedule.
- DPP8 (Report on occurrence and abundance of all the species of Community internet (post treatment conditions) 30/07/2022) has been reached with some delay compared to the original schedule.

#### D3 – Evaluation of the socio-economic effects of the project

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The first survey and summary were completed to deadline (annex D3\_1-2). In our first online questionnaire survey we tried to assess the knowledge of all employees of the three participating organizations about forest visitation habits, nature-conservation and LIFE-programme topics. With this we aimed to compare the knowledge of professionals directly and indirectly working in the project with those professional's knowledge in the topics relevant to our project, who are working on other fields.

Ms. Zsófia Fejes, KNPD OAKEYLIFE project administrator, has carried out a very serious socio-economic analysis in the framework of her Master's thesis in Conservation Engineering. She conducted interviews with 7 people from KEFAG, 4 people from KNPD, 3 people from MME, 2 people from Kunpeszér Hunting Association and the Mayor of Kunpeszér, which served as the basis for her thesis. In addition, a manuscript has been submitted to the Landscape Ecology Journal (Tájökológiai Lapok) entitled "Exploring conflicts and common ground between the main stakeholder groups of the Peszér-forest in relation to the OAKEYLIFE project". The article is currently being published. In her work, she also covers the quantitative evaluation of the socio-economic impact of the project, by which we fulfilled the required DPP.
### Milestones:

- MS1 (Accomplishment of interviews and focus group meetings in the starting phase of the project 30/06/2018) has been reached with some delay compared to the original schedule.
- MS2 (Accomplishment of interviews and focus group meetings in the closing phase of the project -31/10/2022) has been reached in time.

## Deliverables

- DPP1 (The analysis of interviews and focus group meetings focused on the possible socio-economic impact of the project (in the Layman's Report) 31/01/2019) has been reached with some delay compared to the original schedule.
- DPP2 (Summary of the foreseeable socio-economic impact of the project 28/02/2018) has been reached with some delay compared to the original schedule.
- DPP3 (The analyses of interviews and focus group meetings focused on the realized socio-economic impact of the project (in the Final Report) 30/11/2022) has been reached with some delay compared to the original schedule.
- DPP4 (Quantitative assessment on the socio-economic impact of the project 31/12/2022) has been reached in time.

## D4 – Evaluation of the effects of the project on ecosystem services

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The planned drone and a spare battery haves been purchased, we also used this item for our PR activities. In the E2 action, we have made short films introducing Peszér-forest with the drone, which film can be used in one of our undertaken DPPs, "Short films for the internet". We made 5 short films which is available in our YouTube channel.

Data collections have been and will continue to be carried out in the AfterLIFE period. The impact of grazing was carried out in the D5 action. A DPP entitled Study of sustainable meet cow carrying capacity of forest steppes was completed within the deadline.

A Study of sustainable use of ecosystem services provided by the calcareous sand forest steppes related DPP was also completed on time.

Since the start of the OAKEYLIFE project in autumn 2017, thousands of occurrences and other data of many plant and animal species are recorded in the Peszér-forest every year. In terms of data density, rare and/or protected butterfly species are the main pollinators, but we also have information on some beetle species. However, in addition to insect species of high conservation value, it is also important to identify other insect species belonging to the groups of insects primarily responsible for pollination. A DPP has been completed in this respect.

The data from the groundwater monitoring wells established in Action A3 of the OAKEYLIFE project will allow us to monitor groundwater level fluctuations. In this way we have data on the amount of water available in the soil for forest trees. The related DPP has also been completed. In the case of the Peszér-forest, groundwater movement varies between 2.5 and 4.5 m. What was most surprising was that the groundwater level did not drop below 4.5 m during the extreme drought of 2022.

### Milestones:

- MS1 (Preliminary data analyses for publications of particular studies on different ecosystem services – 31/12/2020) has been reached with some delay compared to the original schedule.

# Deliverables

- DPP1 (Study of sustainable meat cow carrying capacity of forest steppes 01/12/2022) has been reached in time.
- DPP2 (Study of sustainable use of ecosystem services provided by the calcareous sand forest steppes -01/12/2022) has been reached with some delay compared to the original schedule.
- DPP3 (Study on the influence of stand types (different plantations and semi-natural ones) on the abundance of pollinators -01/12/2022) has been reached in time.
- DPP4 (Study on the influence of amount of available water on wood-producing capacity of different stand types -01/12/2022) has been reached in time.

# D5 – Monitoring the effects of forest-grazing

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 01 - 2019$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period in accordance with the specification laid down in the Grant Agreement.

Net area where reintroduced forest grazing was monitored: 23.73 ha (much larger than the 10.0 ha area indicated in the original plans) in two different habitat types (*Robinia* plantation and high nature value, species-rich forest-steppe habitat).

Detailed data collection:19,121 records of specimens of invasive and native species (position, height, level of damage by grazing).

In the OAKEYLIFE project, grazing was monitored on a total of 23.73 ha of KNPD-managed forests and forest steppes. A unit covering 3.26 ha was assigned in a *Robinia* plantation, where grazing was introduced in order to control invasive woody species. Another unit covering 20.47 ha was assigned in a high nature value, species-rich forest-steppe habitat, where grazing was introduced in order to establish and maintain a suitable vegetation structure for species associated with open vegetation structure (e.g. sand Iris). Data collection on the baseline conditions has been completed in time, according to the original plans. Regular grazing with 0.2 animal unit/hectare grazing pressure has been carried out all over the project period in an experimental design (3 management types: exclusion of all grazing animals, exclusion of domestic grazing animals, grazing by domestic animals and game species, 2 repetitions of each) in the high nature value, species-rich forest-steppe habitat. Due to changes in legal conditions, it was possible to reintroduce forest grazing to Peszér-forest. From 2020 to 2022, a net 3.0 ha (gross 3.26 ha) part of forest compartment Kunpeszér 45G was grazed by cattle regularly, with a control (ungrazed) part covering net 3.0 ha (gross 3.55 ha). For the experimental grazing design, 4 grazing exclusion units were established, with a permanent fence around each unit, at the grazed forest steppe.

Grazing by cattle had no effect on specimens of invasive trees above 2 m and had only slight (but statistically significant) effect on level of damage.

Grazing exclusion had significant positive effect on preventing specimens of native arboreal species from damage by grazing and on litter accumulation.

Grazing had no negative effect on Oaks.

# Milestones

- MS1 (Accomplishment of recording the baseline conditions - 31/12/2017) has been accomplished.

## Deliverables

- DPP1 (Best practice study on grazing in lowland forests - 30/09/2022) has been reached (edited) in time.

### E1 – Creation and maintenance of project website

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

Web page: <u>www.oakeylife.hu</u> (E1\_1)

Facebook profile: https://www.facebook.com/oakeylife/

YouTube channel: https://www.youtube.com/channel/UCQvYKiQL6jV2r27hlF2PCAQ/ The web page contains the compulsory contents and formal elements required by LIFE. Main purpose of the webpage is infotainment, namely teaching and informing through entertaining.

OAKEYLIFE website data: All users of the webpage in 2019: 24,555 users

Active users monthly on average: 714. Best result on April (in 2021): 1,109 persons. Page views (is the total number of pages viewed): 71,177 pcs. Page views monthly on average: 1,920 pcs.

Number of articles on the website: news: 286 (pieces), in protected species category: 97 (pieces), in all categories (in Hungarian and in English news, results and protected species categories): 383 (pieces). Best website categories and articles: 1. Hungarian main page <u>http://oakeylife.hu/</u>, 2. Nagy hőscincér (Cerambyx cerdo) article <u>http://oakeylife.hu/2018/07/07/nagy-hoscincer-cerambyx-cerdo/</u>, 3. Peszéri-erdő <u>http://oakeylife.hu/peszeri-erdo/</u>

Our Facebook site data: total amount of Facebook posts 377 pcs, all followers 646, most reached post by 7784 persons (September 2022). Our Facebook reach has exceeded 27,200 back to 2019, as we have been able to retrieve data back to this point. For the project as a whole, the number of visitors is expected to exceed 40 000.

### Milestones:

- MS1 (Project website published -31/12/2017) has been reached in time.

# Deliverables

- DPP1 (Fully functional project website -31/12/2017) has been reached in time.

### **E2 – Public relation activities**

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

PR-activity means for us primarily the utilisation of "not paid" communication channels and versatile usage of platforms. The realisation is decided on the base of news value. All online, printed, radio and television media coverage are posted on the webpage, in "Press releases" menu (E2\_1).

(http://oakeylife.hu/category/sajtomegjelenesek/);(http://oakeylife.hu/en/category/press-releases/)

We organized a press tour with the theme of the educational trail prepared by KEFAG Plc., and the Forest Education Centre prepared by the National Park.

(http://oakeylife.hu/2019/11/11/oakeylife-sajtotura-kunpeszeren-2019-11-11sajtokozlemeny/)

Media participating in the press tour: baon.hu, Petőfi Népe county daily newspaper, KTV, MTV, Kossuth Rádió, "A mi erdőnk" magazine, keol.hu.

We committed in the action point to release paid advertisements too, which were not bound to dates. In 2019 a paid press-material was published about the opening of educational trail and Forest Education Centre in a county daily newspaper "Petőfi Népe" (E2\_1).

DPP's: Short films for the internet (5 pcs). Deadline 31/01/2018. 3 short films have been completed with modified deadline, as previously agreed. (31/01/2018.) We have gone well beyond the one small video per year promised in the Mid-term Report, with 13 videos produced, and all the presentations from the opening workshop are available on the project's YouTube portal:

https://www.youtube.com/@oakeylifepeszeri-erdo3948

In the short videos, we presented the main professional interventions: invasives control, ecological corridors, stump grinding, cutting area cleaning before planting. We reported on the Forest Cup in Peszér-forest, where we organised a competition to remove seedlings of invasive tree species. In addition, trainees spending their university internships in the Peszér-forest reported on their experiences. We also posted a video in English: "Silvicultural practices as main drivers of the spread of Tree of Heaven".

The biggest media event of the project was a 15-minute film on the main results of the project, which was ready for the final conference. The 30-minute extended version of the film was also broadcast on Hungarian Television, and we were featured in the main programme of M5's 'Hazai Erdész Vadász' programme 'Reviczkyvel az erdőben'. We were also featured on Duna Television's 'Almárium' programme, where we discussed the project's achievements live on air. In addition to our television appearances, we also appeared on several radio programmes, including Kossuth Radio.

A list of all press releases is attached and appear on the website in Press menu, too.

### **Milestones:**

- MS1 (General design of the project is created 31/01/2018) has been reached in time.
- MS2 (Information boards are installed in nearby villages 31/01/2018) has been reached with some delay compared to the original schedule.

### **Deliverables**

- DPP1 (Leaflets introducing project (5000 copies) 31/01/2018) has been reached with some delay compared to the original schedule.
- DPP2 (Merchandised products 31/01/2018) has been reached with some delay compared to the original schedule.
- DPP3 (Short documentary for internet use (5 pcs) 31/01/2018) has been reached with some delay compared to the original schedule.
- DPP4 (Information boards (5 pieces) 31/01/2018) has been reached with some delay compared to the original schedule.
- DPP5 (Laymen's Report (3000 copies) 31/01/2018) has been reached with some delay compared to the original schedule.

# E3 – Non institutional and institutional educational activities

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period in accordance with the specification laid down in the Grant Agreement.

Hosting, training and involvement volunteers (more than 5,000 person\*days).

Excursions for children and ecotourists: 895 person\*days.

Training professionals: 809 person\*days.

During the project period, a variety of activities were carried out by KNPD:

- Excursions for kindergartens (262 people\*day in total),

- Excursions for primary school pupils and teachers (773 people\*day in total),

- Training and involvement of internship students (615 person\*days in total),

- Hosting and training of university students on field training (total 475 person\*days),

- Hosting and training UNESCO volunteers (634 person\*days in total),

- Courses in the framework of formal university training (280 person\*days in total),

- Hosting and training of participants in forest management camps (367 person\*days in total),

- Hosting and training of national volunteers (total 2638 person\*days),

- Training of own experts (211 person\*days in total),

- Training of external professionals in accredited training courses (111 person\*days in total)

- Hosting and training of external professionals for information sharing (487 person\*days in total).

In addition to our educational and awareness-raising activities in the Peszér-forest, we regularly hosted groups in the "Vackor Vár" Forest School and the Arboretum of Kecskemét. In 2019, we reached nearly 2000 children in these locations. In addition, we have regularly delivered bird feeders to local schools and kindergartens, which we have made as part of the project. In 2020 and 2021, we were not able to host many groups at the Forest School due to the COVID-19 pandemic. In 2022, we reported on the work being done in the Forest School to nearly 500 children.

## MS's:

Interactive educational trail is prepared by August in 2019. (Deadline 31/05/2019) (*Anybody* can reach online the study trail boards on Downloads menu: <u>http://oakeylife.hu/en/downloads/</u> And you can also watch the trail in our short film: <u>https://www.youtube.com/watch?v=xxMSr66OtGs</u>) (E3\_1-4).

Education of professionals: We organized a 2 days training on 20-21/11/2019 as a field tutorial for professionals. The topic was the key species and habitats of the calcareous sand forest steppe, with 48 participants. (Deadline 30/11/2019)

Our mandatory training for forestry professionals on alternative technologies for forest restoration was completed on 3 November 2020 with 28 participants. http://oakeylife.hu/2020/11/05/kepzes-erdeszeti-szakemberek-szamara-az-erdofelujitas-alternativ-technologiairol/ (Deadline 30/11/2020)

We held the symposium for forestry professionals committed in the call for proposals during the professional programme on 27 August at the OEE Forestry Transhumance: MS: Symposium on ecosystem services provided by calcareous sand forest steppes. http://oakeylife.hu/2021/09/01/telthazas-volt-a-151-vandorgyules-peszeri-erdei-programja/ (Deadline 30/11/2020) Read more in Action E4.

DPP's:

The educational material about the key species and habitats of the calcareous sand forest steppe is accessible on our website, on Downloads menu. (<u>http://oakeylife.hu/en/downloads/</u>) (Deadline 30/11/2019)

Educational DVD: According to our previous agreement, instead of DVD, we made an online board game which is available to anyone from OAKEYLIFE website. "Collect acorn!" game is completed by the end of March in 2020 (E3\_5). <u>http://oakeylife.hu/makkgyujto/</u> (Deadline 31/01/2020)

Posters (E3\_6), introducing the species, habitats, and the habitat-conservational operations: We processed the task in two topics, the design of two posters are prepared. From these the press already produced 100 posters. The rest 100 posters will be delivered until May 2020. The

2 pieces of A/1 sized posters are accessible on the webpage. 35 posters have already been distributed to primary and secondary school groups in 2019.

(Anybody can download our posters from the Downloads menu: <u>http://oakeylife.hu/en/downloads/</u>).

(http://oakeylife.hu/wp-content/uploads/2018/03/Peszeri-

erdo\_poszter\_final\_resize\_florakonferencia.jpg

http://oakeylife.hu/wp-content/uploads/2018/11/vedettrovarok\_plakatA1.jpg)

The brochure on species and habitats is ready, with a slight delay compared to the original . (Deadline 31/01/2019)

The Educational material for professionals on alternative technologies for reforestations in the case of protected lowland woods has been completed and is available on our website (Deadline 15/11/2020).

The photo documents of this action contain the annex E3\_7.

# Milestones:

- MS1 (Training for professionals on selective use of chemicals for eliminating invasive plants -30/11/2018) has been reached in time.
- MS2 (Training for professionals on key species and habitats (including species and habitats of Community interest) of the calcareous sand forest steppe -30/11/2019) has been reached in time.
- MS3 (Interactive educational trail is prepared -31/05/2019) has been reached with some delay compared to the original schedule.
- MS4 (Training for professionals on alternative technologies for reforestation in the case of protected lowland woods ("towards the sustenance of species rich coppicing forests")
  30/11/2020 has been reached in time.
- MS5 (Symposium for professionals on the assessment of ecosystem services provided by the calcareous sand forest steppe 30/11/2021) has been reached in time.
- MS6 (Symposium for professionals on grazing in forests pros and cons from the perspectives of forest managers and nature conservation 30/11/2022) has been reached in time.

# Deliverables

- DPP1 (Educational material for professionals on selective use of chemicals for eliminating invasive plants 15/11/2018) has been reached in time.
- DPP2 (Poster introducing species, habitats and conservation efforts (200 copies) 31/01/2019) has been reached in time.
- DPP3 (Brochure introducing species and habitats (1,700 copies) 31/01/2019) has been reached with some delay compared to the original schedule.
- DPP4 (Education material for professionals on key species and habitats (including species and habitats of Community interest) of the calcareous sand forest steppe 15/11/2019) has been reached with some delay compared to the original schedule.
- DPP5 (Educational DVD (500 copies) 30/01/2020) has been reached with some delay compared to the original schedule.
- DPP6 (Educational material for professionals on alternative technologies for reforestations in the case of protected lowland woods 15/11/2020) has been reached with some delay compared to the original schedule.

# E4 – National and international networking

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: 31 – 12 – 2022

We continued strong relationship-building and experience-sharing activity during the whole project period. Despite the COVID-19 pandemic, we visited many places and hosted many colleagues during the project. The abstract is attached to the report (E4\_1-5).

International activities: In 2019 KNPD attended a field-trip in Podijí National Park in the Czech Republic, where we could discuss our experiences about the methods used for selective chemical control of invasive tree species. Later in 2019, the Czech colleagues visited us in Peszér-forest and shared their experiences.

In 2020, we held a meeting with Dr. Sándor Bordács (Head of Department of NÉBIH) in Kunpeszér to discuss the genetic and phenological studies of Scots pine and pedunculate oak. The genetics of Scots pine is continuously being studied at SZIE. In the case of pedunculate oak, the phenological studies have been negotiated and the field selection of individuals has been completed.

In June 2020, a field visit to the Peszér-forest was carried out with active and retired colleagues of KEFAG Plc.

In September 2020, MME, KNPD and DALERD Plc. participated in the final event of the Szalakóta LIFE project with the colleagues of KEFAG Plc. We visited the field works in Csanytelek.

On 26 November 2020, in the framework of a webinar organised by the Food and Agricultural Organization (FAO) and the Forest Invasive Species Network for Europe and Central Asia (REUFIS), we held an international exchange of experiences and lecture on oaks for participants from several countries, where we presented the results of the project so far and the research and work on sand oak in the Peszér-forest. His presentation was entitled "Can we save dryland oak forests? An example from the OAKEYLIFE project".

185 participants from 59 countries registered for the webinar. http://oakeylife.hu/2020/12/19/a-tolgyek-megmentese-a-jovo-generacioiert/

On 5 March 2021, staff from the Duna-Ipoly National Park Directorate visited the Peszér-forest. The exchange of expertise included a visit to the artificial forest restoration and the natural stands of sand oak. In addition to examining the natural surviving regeneration of pedunculate oak, the participants were also shown an oak powdery mildew control experiment http://oakeylife.hu/2021/03/17/szakmai-tapasztalatcsere-a-duna-ipoly-nemzeti-park-igazgatosag-munkatarsaival

Also in March 2021, the international conference "The 1st International Electronic Conference on Biological Diversity, Ecology and Evolution" was held, during which Mr. Arnold Erdélyi gave a presentation on the relationship between invasive tree species and forest management. The presentation is available at https://sciforum.net/conference/BDEE2021.

Perhaps one of our largest national networking events took place in September 2021, when one of the optional activities on the technical day of the 151st National Forestry Association's Annual Meeting (26-27 August 2021) was the presentation of the OAKEYLIFE project in the Peszér-forest, including a half-day field trip. On the professional field day of the meeting, more than 90 foresters from the Carpathian Basin were welcomed in the Peszér-forest. The programme attracted the attention of several sections of the National Forestry Association. http://oakeylife.hu/2021/09/01/telthazas-volt-a-151-vandorgyules-peszeri-erdei-programja

On the basis of the results of the OAKEYLIFE project, we held a professional event for KNPD experts on 27 January 2022 entitled "Regeneration and degradation processes of Euro-Siberian forest-steppe oak forests in the Peszér-forest".

On 07/04/2022, we gave a lecture for the students of the Venczel József Technical School and the Bedő Albert Forestry Technical School and Dormitory (Ásotthalom) of Alföldi Agricultural Technical Education Centre. The title of the presentation was.

We gave a presentation on the conservation and forestry results of the project for qualified forestry staff in the framework of 1 training course:

http://oakeylife.hu/2022/05/28/termeszetvedelmi-es-erdeszeti-eredmenyeink-a-projektbeneloadas-es-kepzes/

Dr. Csaba Vadász represented the project at the ICE 2022 (International Congress of Entomology 2022) conference in Helsinki on 19 July 2022, where he gave a presentation in the LIFE symposium.

Other, not planned networking activity: We participated in 31 different networking programs, as an organizer in Peszér-forest, or as an invited person on conferences. Here we could show and discuss our results on the OAKEYLIFE program (E4\_1-5).

### Milestones:

- MS1 (Collecting contact data to managers of sites where the target habitats of this project are present -30/11/2018) has been reached in time.

### Deliverables

- DPP1 (Report on the lessons and results of the networking visit(s) in 2018 31/12/2018) has been reached in time.
- DPP2 (Report on the lessons and results of the networking visit(s) in 2019 31/12/2019) has been reached in time.
- DPP3 (Report on the lessons and results of the networking visit(s) in 2020 31/12/2020) has been reached in time.
- DPP4 (Report on the lessons and results of the networking visit(s) in 2021 31/12/2021) has been reached in time.
- DPP5 (Report on the lessons and results of the networking visit(s) in 2022 30/11/2022) has been reached with some delay compared to the original schedule.

## E5 – Training staff and volunteers

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

There is no deadline task. Over the duration of the project, we trained more than 5000 volunteers in the Peszér-forest. The Forest Visitor Centre was the main venue for our volunteer training. In addition to local volunteers, we regularly hosted volunteers from abroad from UNESCO. Volunteers from here spent 634 days in the Peszér-forest, where they learned about active conservation work and invasive seedling removal. In addition, they were regularly represented by students from the American School of Nagykovácsi and ACCACE Ltd. In addition, each of them gave a presentation on the Peszér-forest and the interventions carried out there. One such volunteer training was the "Forest Cup", where the main task was to remove the seedlings of invasive woody species in a designated area of the Peszér-forest for a given period of time. Different teams competed in the cup.

In addition to the volunteers, we paid a lot of attention to the training of our own employees, so that forest workers from KNPD and KEFAG Plc. also completed a course on the use of chemicals. They were able to carry out the work in the Peszér-forest on the basis of what they learned in the course.

We have also spent a lot of time training professional staff, the largest of these training activities was the 151st National Forestry Association's National Forestry Congress, where we provided training for more than 90 forestry professionals. In addition, we also provided training in lowland forest management for colleagues from KNPD, MME BridLife Hungary and KEFAG Plc.

#### **Milestones:**

 MS1 (Accomplishment of official training on using chemicals by forestry workers employed by KNPD – 31/08/2017) has been reached with some delay compared to the original schedule.

### Deliverables

- DPP1 (Education materials for training professionals – 31/08/2018) has been reached with some delay compared to the original schedule.

### E6 – Opening Workshop

-	0	-			
Foreseen	start date:	01 - 08 - 20	17	Actual start date: 0	1 - 08 - 2017
Foreseen	end date: 3	31 - 03 - 202	18	Actual end date: 31	-03 - 2018

The opening workshop of the OAKEYLIFE project took place on 28-29 March 2018. On the first day, 28 March 2018, the opening conference took place at the KNPD Nature House, where Ms. Andrea Gulyás, State Secretary of Public Administration, welcomed the participants. At the opening conference, besides the project coordinating organisations, experts from other LIFE projects also gave presentations. On the second day, 29 March 2018, the opening workshop continued in Kunpeszér, in the Peszér-forest. Participants were given an insight into the interventions carried out so far and the work ahead. In the Opening Workshop took part 83 professional participant.

#### **Milestones:**

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- MS1 (Opening Workshop held - 31/03/2018) has been reached in time. **Deliverables** 

E7 – Final Workshop	
Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $30 - 11 - 2022$	Actual end date: 19; 25 – 10 – 2022

As the project neared its end, the final conference of the OAKEYLIFE project was held on two separate dates in October 2022. The final conference was attended by representatives of the Ministry of Agriculture, the other state forestries, National Park Directorates, forestry secondary schools and nature conservation NGOs. On the first day, 19 October 2022, the field tour was carried out, where we toured the Peszér-forest with trucks and presented the major achievements of the Project. On the second day, 25 October 2022, we reported on the results achieved in the project, and on this day, we presented a 15-minute film, which was made within the framework of the project, presenting the main results of the project. In the Final Workshop took part 86 professional participant.

### **Milestones:**

- MS1 (Final Workshop held - 30/11/2022) has been reached in time. *Deliverables* 

## E8 – Establishment of Peszér-forest visitor centre

Foreseen start date: $01 - 08 - 2017$	Actual start date: $01 - 08 - 2017$
Foreseen end date: $31 - 12 - 2022$	Actual end date: $31 - 12 - 2022$

The activities planned to be implemented and the targets having been set for this Action have been implemented successfully during the project period in accordance with the specification laid down in the Grant Agreement.

Accomplished purchase and renovation of an old forester house.

The Visitor Centre was run during the whole project period since the end of the renovation. More than 5,000 visitors (national and international volunteers, university students).

The Forest Visitor Centre, renovated during the project period, provided the infrastructure for the educational, awareness-raising and volunteering activities held locally. The renovation of the dilapidated forestry house purchased at the beginning of the project included the following: - the entire roof structure of both buildings was renovated,

- insulation of the roof slabs of both buildings,

- all masonry repairs and interior and exterior plastering, rendering and whitewashing have been carried out on both buildings,

- new doors and windows have been installed in both buildings,

- new bathroom facilities (two showers, two flush toilets and a hand wash) have been installed in the annex building,

- a new septic tank has been installed,

- the entire electrical wiring system has been replaced,

- a hybrid power supply system (run by party solar panels, partly generator) has been installed,

- a new alarm system has been installed,

- the attic of the main building has been converted into a sleeping area,

- the floor has been renovated in the central room of the main building and the floor of all the other room has been newly constructed (paving)

- the porch of the main building has been renovated,

- the property has been enclosed by a fence,

- the yard of the property has been completely cleared of all non-native species, planted with native shrub species (liguster, hazelnut) and sand-adapted fruit trees (apples),

- an ex situ nursery garden protected by a raschel net has been established in the courtyard of the property.

The Visitor Centre was run during the whole project period since the end of the renovation, hosting more than 5,000 visitors (volunteers, university students, ecotourists).

With the infrastructural background represented by the renovated Visitor Centre, we could involve much more volunteer work in the implementation of project than anticipated, in different ways (for details, please refer to the description of Action E3). This outstanding volunteer involvement significantly contributed to the successful implementation of KNPD's C Actions (especially C7, C11). The renovation of the Visitor Centre was implemented at a very good price/value ratio, as most works were carried out by the employees of KNPD.

### Milestones

- MS1 (Purchase of land) has been accomplished.

- MS2 (Renovation of buildings) has been accomplished.

### Deliverables

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# F1 – Project management

Foreseen start date: 01 - 08 - 2017Foreseen end date: 31 - 12 - 2022 Actual start date: 01 - 08 - 2017Actual end date: 31 - 12 - 2022

See above (pages 8-9) 4. Administrative part. For partnership agreements see annex F1\_1-2 The F1\_8 annex contains the hierarchical structure of the workers of OAKEYLIFE project and the organogram (F1\_7). The partnership agreement between KEFAG-KNPD and KEFAG-MME BirdLife Hungary is presented in Annex F1\_1-2.

### Milestones:

- MS1 (Project partnership agreements are signed by all parties 31/08/2017)
- MS2 (Regular report to steering committee by executive committee 31/01/2020) has been reached in time.
- MS3 (Regular report to steering committee by executive committee 31/01/2018) has been reached in time.
- MS4 (Regular report to steering committee by executive committee 31/01/2019) has been reached in time.
- MS5 (Regular report to steering committee by executive committee 31/01/2021) has been reached in time.
- MS6 (Regular report to steering committee by executive committee 31/01/2022) has been reached with some delay compared to the original schedule.

## Deliverables

- DPP1 (Project partnership agreement 31/12/2018) has been reached with some delay compared to the original schedule.
- DPP2 (Updated LIFE project performance indicator table (in Progress Report #1) 31/05/2020) has been reached in time.
- DPP3 (Updated LIFE project performance indicator table (in Mid-Term Report) 31/12/2021) has been reached in time.
- DPP4 (Updated LIFE project performance indicator table (in Progress Report #2) 30/11/2022) has been reached in time.
- DPP5 (Updated LIFE project performance indicator table (in Final Report) 31/12/2022) has been reached with some delay compared to the original schedule.

# F2 – Independent financial audit

We selected the independent audit company. The financial audit will be carried out by Mr. Gábor Oláh, who is the independent auditor at KEFAG Plc., the coordinating beneficiary. The name of the financial audit company: GABOL Audit Könyvvizsgáló és Tanácsadó Kft. The address of the company: 3000 Hatvan, Irinyi János u. 10.

Registration number: 004062

The name of the independent financial auditor: Mr. Oláh Gábor

The address of the auditor: 3000 Hatvan, Irinyi János u. 10.

The membership card number: 000081

Number: 004855

The project was audited in March 2023. The auditor did not identify any weaknesses in the financial audit of the project. On this basis, the project financial report has been prepared.

### **Milestones:**

- MS1 (Selecting the independent audit company -30/11/2017) has been reached in time.

### **Deliverables**

- DPP1 (Independent Audit Report - 31/12/2022) has been reached with some delay compared to the original schedule.

#### F3 – After-LIFE plan

Towards the end of the project, in November-December 2022, the After-LIFE plan of the project was drawn up in consultation with the project partners. In the After-LIFE plan, the tasks to be carried out during the maintenance period were identified on an action-by-action basis. The aim of the plan is to maintain the results achieved during the implementation of the project at least at the same level for another 5 years. In addition to our own resources, we intend to seek additional subsidies funding for maintenance. The maintenance period runs until 31 December 2027.

#### **Milestones:**

#### **Deliverables**

DPP1 (After-LIFE Plan - 01/12/2022) has been reached with some delay compared to the original schedule.

#### F4 - Monitoring (measuring) and reporting the performance indicators

The Key Level Project Indicators table is sent as an annex. The indicators show that we have achieved significant results during the project. Thanks to the invasive eradication and forest conversion works, the naturalness of the forests of the Peszér-forest has increased significantly. Thanks to legislative changes, a grazing system has been introduced on more than 10 ha of HUKN20003 N2000 areas. Populations of species of community importance have increased significantly. Invasive alien species have been removed from a large area, although the target of 803.9ha was not reached, due to much higher invasive cover than estimated before the project.

Our PR communication activities were very successful, with over 70,000 visits to our website. We were also active on Facebook and YouTube. Our training courses reached a large number of people from pre-school to university age, and we also hosted several volunteers at our Forest Visitor Centre in the Peszér-forest. We also highlighted the importance of the project to visiting groups at the Vackor Vár Forest School and the Kecskemét Arboretum. The planned 5,920 visitors were overperformed.

We have significantly increased the potential habitat for Hymenoptera species through the creation of clearings. By establishing a Forest Viitor Centre and developing our hiking trail, the OAKEYLIFE project has played a significant role in enhancing the ecotourism role of the Peszér-forest.

The forest conversion and invasive control works have resulted in more natural forests that are more resistant to invasive species. **Milestones:** 

#### -Deliverables

- DPP1 (Report on progress regarding performance indicators in the Mid-Term Report 31/05/2020) has been reached in time.
- DPP2 (Report on progress regarding performance indicators in the Progress report 31/12/2018) has been reached with some delay compared to the original schedule.
- DPP3 (Report on progress regarding performance indicators in the Progress Report 31/10/2021) has been reached with some delay compared to the original schedule.

Number of the associated action	DPP (Deliverable products of the project)	Proposed deadline	Actual/ implemented deadline
A1	Action plan for the project	2017.08.31	2017.08.31
A1	Updated action plan for the recent project	2019.01.31	2018.10.17
A1	Management guideline for actions	2017.09.30	2018.05.30
A1	Updated action plan for the whole project	2018.01.31	2018.03.15
A1	Updated action plan for the whole project	2020.01.31	2020.03.31
A1	Updated action plan for recent project	2021.01.31	2021.01.28
A1	Updated action plan for recent project	2022.01.31	2022.02.15
A2	A thematic map for representation of soil heterogeneity based on the data of soil mapping collected in the frame of action	2018.08.31	2019.01.31
A2	3D spatial model for microhabitats influencing the occurrence of key species in Hungarian project sites	2022.09.30	2022.09.30
A2	3D spatial model of distribution of key habitat types in Hungarian project sites	2022.09.30	2022.09.30
A2	3D spatial model of distribution of key species in Hungarian project sites	2022.09.30	2022.09.30
A2	A set of habitat viability models for targeted habitats of Community interest of the project	2022.09.30	2022.09.30
A2	A set of habitat viability analyses for key targeted species of Community interest (Hypodryas maturna, Iris humilis ssp. Arenaria, Gladiolus palustris)	2022.09.30	2022.09.30
A3	A thematic map for water balance based on the hydrological data collected in the frame of action A2	2018-08-31	2019.08.31
A3	Soil map of the project area	2018.12.31	2019.12.31
C1	Best-practice study focusing on the elimination of invasive trees - results and lessons of Actions C1 and C7	2022.07.31	2022.11.30

Throughout the project, the following DPPs (Deliverable products of the project) were delivered:

Number of the associated action	DPP (Deliverable products of the project)	Proposed deadline	Actual/ implemented deadline
C2	Best-practice study focusing on the intermediate stand treatments targeting to accelerate the formation of Euro- Siberian steppic woods with Quercus spp.	2020.07.31	2022.07.31
С3	Best-practice study focusing on the conversion of forest structure in the case of lowland forests	2022.08.31	2022.11.30
C4	Best practice study on the restoration of former trunk depots	2022.11.30	2022.12.15
C5	Best practice study on the creation of ecological corridors and restoration of linear facilities	2022.12.31	2022.12.31
C5	Best practice study on the reintroduction of native (protected and not protected) plant species'	2022.12.31	2022.12.31
C6	Best practice study on the reintroduction of native (protected and not protected) plant species'	2022.12.31	2022.12.31
C6	Best practice study on the restoration of grassy habitats of the sand forest steppe habitat complex'	2022.12.31	2022.12.31
C7	Best-practice study focusing on the elimination of invasive non-arboreal plants	2022.12.31	2022.12.31
C8	Best practice study on grazing in calcareous sand steppic woods	2022.12.31	2022.09.30
С9	Best-practice study focusing on the creation of small-scale clearings	2022.12.31	2022.12.31
C10	Best-practice study focusing on the management of pre-forests	2022.10.31	2022.10.31
C11	Best practice study on the reintroduction/translocation of native (protected and not protected) plant species to restored habitats	2022.12.31	2022.12.31
C13	Study on the genetic lineages of Pedunculated Oaks on calcareous sand	2019.03.31	2021.12.31
D1	Yearly report on occurrence of invasive plant species in the target area	2018.12.31	2018.12.31
D1	Yearly report on occurrence of invasive plant species in the target area	2019.12.31	2019.12.31

Number of the associated action	nber of the ociated action DPP (Deliverable products of the project)		Actual/ implemented deadline
D1	Report on coenologic survey (pre- treatment conditions)	2018.03.31	2018.05.30
D1	Report on the result of analyses of herbicide residues (pre-treatment conditions)	2018.03.31	2018.08.31
D1	First report on occurrence of invasive plant species in the target area	2018.04.30	2018.08.31
D1	Yearly report on occurrence of invasive plant species in the target area	2020.12.31	2021.02.01
D1	Yearly report on occurrence of invasive plant species in the target area	2021.12.31	2022.03.01
D1	Report on coenologic survey (post- treatment conditions)	2022.08.31	2022.12.01
D1	Report on the result of analyses of herbicide residues (post-treatment conditions) 2022		2022.11.30
D1	Final report on occurence of invasive plant species	2022.11.30	2022.12.31
D2	High-definition distribution maps for species and habitats of Community interest (before the accomplishment of project actions)		2019.12.31
D2	Report on the occurrence and abundance of all the species of Community interest (baseline conditions)2018.07.30		2020.03.31
D2	Report on the results censuses of Gladiolus palustris and Iris arenaria populations	2019.08.15	2020.03.31
D2	Report on the results census of Gladiolus palustris and Iris arenaria populations		2022.12.31
D2	Report on the results census of Gladiolus palustris and Iris arenaria populations		2022.12.31
D2	High-definition distribution maps for species and habitats of Community internet (after the accomplishment of project actions)		2022.12.01

Number of the associated action	tion DPP (Deliverable products of the project)		Actual/ implemented deadline
D2	Report on success of reintroduction/recolonisation of plant and invertebrate species at restored habitats	2022.07.30	2022.12.31
D2	Report on occurrence and abundance of all the species of Community internet (post treatment conditions)	2022.07.30	2022.12.31
D3	The analysis of interviews and focus group meetings focused on the possible socio-economic impact of the project (in the Layman's Report) 2019.01.31		2022.12.31
D3	Summary of the foreseeable socio- economic impact of the project	2018.02.28	2018.08.31
D3	The analyses of interviews and focus group meetings focused on the realized socio-economic impact of the project (in the Final Report)		2022.12.31
D3	Quantitative assessment on the socio- economic impact of the project	2022.12.31	2022.12.31
D4	Study of sustainable meat cow carrying capacity of forest steppes	2022.12.01	2021.12.20
D4	Study of sustainable use of ecosystem services provided by the calcareous sand forest steppes		2022.12.31.
D4	Study on the influence of stand types (different plantations and semi-natural ones) on the abundance of pollinators	2022.12.01	2021.12.22
D4	Study on the influence of amount of available water on wood-producing capacity of different stand types		2021.12.22
D5	Best practice study on grazing in 2022.09.30 lowland forests'		2022.09.30
E1	Fully functional project website	2017.12.31	2017.12.31
E2	Leaflets introducing project (5000 copies)	2018.01.31	2018.06.15
E2	Merchandised products	2018.01.31	2018.06.15
E2	Short documentary for internet use (5 pcs)	2018.01.31	2022.03.31
E2	Information boards (5 pieces)	2018.01.31	2019.10.31
E2	Laymen's Report (3000 copies)	2018.01.31	2022.12.31

Number of the associated action	DPP (Deliverable products of the project)	Proposed deadline	Actual/ implemented deadline
E3	Educational material for professionals on selective use of chemicals for eliminating invasive plants	2018.11.15	2018.10.31
E3	Poster introducing species, habitats and conservation efforts (200 copies)	2019.01.31	2018.12.31
E3	Brochure introducing species and habitats (1700 copies)	2019.01.31	2020.09.01
E3	Education material for professionals on key species and habitats (including species and habitats of Community interest) of the calcareous sand forest steppe		2019.11.30
E3	Educational DVD (500 copies)	2020.01.30	2020.03.31
E3	Educational material for professionals on alternative technologies for reforestations in the case of protected lowland woods		2020.11.03
E4	Report on the lessons and results of the networking visit(s) in 2018	2018.12.31	2018.12.31
E4	Report on the lessons and results of the networking visit(s) in 2019	2019.12.31	2019.12.31
E4	Report on the lessons and results of the networking visit(s) in 2020	2020.12.31	2020.12.30
E4	Report on the lessons and results of the networking visit(s) in 2021	2021.12.31	2021.12.30
E4	Report on the lessons and results of the networking visit(s) in 2022	2022.11.30	2022.12.30
E5	Education materials for training professionals	2018.08.31	2018.12.31
F1	Project partnership agreement	2017.08.31	2017.08.30
F1	Updated LIFE project performance indicator table (in Progress Report #1)		2018.12.31
F1	Updated LIFE project performance indicator table (in Mid-Term Report)	t performance d-Term Report) 2020.05.31	
F1	Updated LIFE project performance indicator table (in Progress Report #2)	project performance (in Progress Report #2) 2021.12.31	
F1	Updated LIFE project performance indicator table (in Final Report)	project performance (in Final Report) 2022.11.30	
F2	Independent Audit Report	2022.12.31	2023.03.14
F3	After-LIFE Plan	2022.12.01	2022.12.31

Number of the associated action	DPP (Deliverable products of the project)	Proposed deadline	Actual/ implemented deadline
F4	Report on progress regarding performance indicators in the Mid-Term Report	2020.05.31	2020.05.31
F4	Report on progress regarding performance indicators in the Progress report	2018.12.31	2019.01.19
F4	Report on progress regarding performance indicators in the Progress Report	2021.10.31	2021.11.05

The DPPs were met in all cases. Despite delays reported in previous reports, the DPPs were successfully implemented. In all cases, action plans have been adjusted annually to identify minor delays We have planned an "Acorn Collector" game instead of the educational DVD indicated in previous reports. 500 copies of the Layman's Report were produced. The significant delay here is due to an administrative error. The completed DPPs were attached as annexes. Most of the DPPs have a summary in English.

Throughout the project, the following MS (Milestones) were carried out:

Number of the associated action	MS (Milestones of the project)	Proposed deadline	Actual/ postponed deadline
A1	Compilation of project performance indicators by project manager and its approval by steering committee	2017.08.15	2017.08.15
A1	Updated Management Guideline for the project (with all necessary spatial data)	2018.08.31	2018.08.31
A1	Approved Management Guideline for the project (without spatial data)	2017.09.30	2018.05.30
A2	A frame system of a functional GIS-database is created and available for all project partners	2018.03.31	2018.03.31
A2	A thematic map for representation of soil heterogeneity based on the data of soil mapping collected in the frame of action A2	2018.08.31	2019.01.31
A3	Installation of automatic ground water monitoring wells (3 pcs.)	2018.02.28	2019.07.15
A3	Establishment of sampling pits, collection and on-the-spot analysis of soil samples (638 pcs.)	2018.08.31	2019.06.30
C1	Completion of the first round of chemical treatment of invasive trees	2020.10.31	2022.05.31
C1	Completion of chemical retreatment of invasive trees	2021.10.31	2022.10.31
C2	Completion of shrub reduction	2019.03.31	2021.03.31
C3	Completion of clearcutting at forest stands to be transformed	2020.03.01	2021.12.31
C3	Completion of planting	2021.03.31	2022.04.30
C4	Elimination of invasive trees growing on trunk depots	2017.08.31	2021.04.30
C5	Treatment of invasive plants located at trenches and patches to be converted into ecological corridors	2017.09.30	2021.04.30
C5	Removal of trees located in the planned trace of the corridors	2017.10.31	2021.04.30
C7	Completion of the first round of chemical treatment of invasive non-arboreal plants	2018.08.31	2018.08.31
C7	Completion of the first round of chemical treatment of invasive trees	2020.10.31	2020.10.31
C8	Accomplishment of complete elimination of invasive plants	2017.10.31	2018.03.31
C8	Accomplishment of data collection on the baseline conditions	2017.12.31	2018.05.30

Number of the associated action	MS (Milestones of the project)	Proposed deadline	Actual/ postponed deadline
C8	Implementation of traditional wood fence around the wooded pasture	2018.03.31	2020.01.31
С9	Completion of treatment of invasive plants	2018.10.31	2020.12.31
С9	Completion of reduction of shrub	2020.12.31	2020.12.31
С9	Completion of floral diversification of restored small-scale clearings	2022.09.30	2022.11.30
C10	Completion of chemical retreatment of invasive trees	2017.09.30	2020.12.31
C10	Cutting back the supressing bushes/trees to provide growing space for Pedunculate Oaks (first round)	2020.08.31	2020.08.31
C10	Completion of floral diversification at pre- forests	2022.08.31	2022.11.30
C11	End of preparatory phase	2017.12.31	2017.12.31
C11	End of translocation phase	2022.08.31	2022.11.30
C12	Completion of acorn/sapling planting	2018.10.15	2020.03.31
C12	Installation of information tables at created roadside plantations	2021.11.30	2022.11.01
C13	Completion of genetic investigations of lineages of the Pedunculated Oak adapted to calcareous sand	2018.12.31	Not fulfilled.
D1	Re-mapping the whole target site for occurrence of invasive plant species	2018.03.31	2018.08.31
D1	Accomplishment of coenologic survey and collection of biomass samples (pre-treatment conditions)	2018.03.31	2018.07.31
D1	Re-mapping the whole target site for occurrence of invasive plant species	2018.12.15	2019.03.31
D1	Re-mapping the whole target site for occurrence of invasive plant species	2019.12.15	2020.03.31
D1	Re-mapping the whole target site for occurrence of invasive plant species	2020.12.15	2021.03.31
D1	Re-mapping the whole target site for occurrence of invasive plant species	2021.12.15	2022.03.31
D1	Accomplishment of coenologic survey and collection of biomass samples (post-treatment conditions)	2022.08.31	2022.10.31

Number of the associated action	MS (Milestones of the project)	Proposed deadline	Actual/ postponed deadline
D1	Final re-mapping the whole target site for occurrence of invasive plant species	2022.11.15	2022.12.31
D2	Accomplishment of census Iris arenaria populations	2018.04.30	2018.04.30
D2	Accomplishment of census Gladiolus palustris populations	2018.07.15	2018.07.15
D2	Accomplishment of census Iris arenaria populations	2019.04.30	2019.04.30
D2	Accomplishment of census Gladiolus palustris populations	2019.07.15	2019.07.15
D2	Accomplishment of census Iris arenaria populations	2020.04.30	2020.04.30
D2	Accomplishment of mapping the distribution/occurrence of species of Community interest (before the accomplishment of project actions)	2018.06.30	2018.08.31
D2	Accomplishment of census of Iris arenaria populations	2020.04.30	2020.04.30
D2	Accomplishment of census of Gladiolus palustris populations	2020.07.15	2020.07.15
D2	Accomplishment of census of Iris arenaria populations	2021.04.30	2021.04.30
D2	Accomplishment of census of Gladiolus palustris populations	2021.07.15	2021.07.15
D2	Accomplishment of census of Iris arenaria populations	2022.04.30	2022.04.30
D2	Accomplishment of census of Gladiolus palustris populations	2022.07.15	2022.07.15
D2	Accomplishment of mapping the distribution/occurrence of species of Community interest (after the accomplishment of project actions)	2022.07.30	2022.10.31
D3	Accomplishment of interviews and focus group meetings in the starting phase of the project	2018.06.30	2018.08.31
D3	Accomplishment of interviews and focus group meetings in the closing phase of the project	2022.10.31	2022.10.31
D4	Preliminary data analyses for publications of particular studies on different ecosystem services	2020.12.31	2021.04.11.
D5	Accomplishment of recording the baseline conditions	2017.12.31	2018.05.30
<b>E1</b>	Project website published	2017.12.31	2017.12.31
E2	General design of the project is created	2018.01.31	2017.12.20

Number of the associated action	MS (Milestones of the project)	Proposed deadline	Actual/ postponed deadline
E2	Information boards are installed in nearby villages	2018.01.31	2018.08.31
E3	Training for professionals on selective use of chemicals for eliminating invasive plants	2018.11.30	2018.10.03
E3	<b>E3</b> Training for professionals on key species and habitats (including species and habitats of Community interest) of the calcareous sand forest steppe		2019.11.20/21
E3	Interactive educational trail is prepared	2019.05.31	2019.08.30
E3	Training for professionals on alternative technologies for reforestation in the case of protected lowland woods ("towards the sustenance of species rich coppicing forests")	2020.11.30	2020.11.03
E3	Symposium for professionals on the assessment of ecosystem services provided by the calcareous sand forest steppe	2021.11.30	2021.08.27
E3	Symposium for professionals on grazing in forests - pros and cons from the perspectives of forest managers and nature conservation	2022.11.30	2022.11.30
E4	Collecting contact data to managers of sites where the target habitats of this project are present	2018.11.30	2018.11.30
E5	Accomplishment of official training on using chemicals by forestry workers employed by KNPD	2017.08.31	2017.12.31
<b>E6</b>	Opening Workshop held	2018.03.31	2018.03.28/29
E7	Final Workshop held	2022.11.30	2022.10.19; 2022.10.25
<b>E8</b>	Purchase of land	2017.12.31	2017.10.15
<b>E8</b>	Renovation of buildings	2019.08.31	2019.08.31
F1	Project partnership agreements are signed by all parties	2017.08.31	2017.08.30
<b>F1</b>	Regular report to steering committee by executive committee	2020.01.31	2020.01.21
<b>F1</b>	Regular report to steering committee by executive committee	2018.01.31	2018.10.17
<b>F1</b>	Regular report to steering committee by executive committee	2019.01.31	Not fulfilled.
<b>F1</b>	Regular report to steering committee by executive committee	2021.01.31	2021.01.28

Number of the associated action	MS (Milestones of the project)	Proposed deadline	Actual/ postponed deadline
<b>F1</b>	Regular report to steering committee by executive committee	2022.01.31	2022.02.15
F2	Selecting the independent audit company	2017.11.30	2017.11.30

In the case of the milestones, Completion of genetic investigations of lineages of the Pedunculated Oak adapted to calcareous sand was not achieved, as genetic testing of oaks is not possible in this way. Instead, we examined the oaks by morphological traits (fading, flowering, etc.).

Furthermore, the Steering Committee meeting planned for 31 Januray 2019 was not realised, as the meeting took place 3 months earlier than planned.

In the case of the preparatory actions, there was a delay in soil sampling, as instead of the previous mechanical sampling, we initially dug soil pits, which slowed down the work considerably, and then we purchased a special Edelman-type auger, which accelerated the sampling. The construction of automatic groundwater monitoring wells was also delayed due to regulatory approvals.

Minor delays occurred in the technical actions, which were reported in the previous progress reports and mid-term reports. The delay in the case of action C1 is noteworthy, where the contractors were unable to get to the area in 2020-2021 due to the COVID-19 pandemic, and therefore the contract had to be amended. The number of our own workers did not reach the level foreseen in the Grant Agreement. This is why we had to change the deadline for invasive eradication treatments. The other major delay was in the tree replacement restructuring. Here, stump grinding contractors have not been harvesting and processing stumps due to the COVID-19 pandemic and the collapse of the global stump market. Therefore, another alternative solution to shred the stumps on site had to be chosen. The plantings were completed by the deadline of 30 April 2022, as indicated in Progress report 2.

For the monitoring actions, minor delays occurred due to the significant volume and accuracy of the recording.

For the main education and awareness-raising actions, the planned training was carried out in all cases and the deadlines were met. The completed MS' were attached as annexes. Most of the MS' have a summary in English.

#### 6.2. Main deviations, problems and corrective actions implemented

One of the most serious problems occurring during the realization of the project is attached to human resource management. In Hungary during the last few years the numbers of the employed shows remarkable fluctuations, among others because of the saltatory increase in wages. It is really difficult to find workforce with the required qualification, and it is even hard to keep the workers later on. During the project period, there was an expressed turn over in most positions. This problem was solved by putting larger workload on permanent staff.

Due to this, for example the project administrator duties are issued by the fifth person already, and by the same participant instead of the planned 10 forestry workers for KEFAG, but we could recruit only 7-8 persons. But since we plan to employ them for longer time, we will be able to use up the feasible financial envelope.

Here was also a significant turnover of administrative staff in the Kiskunság National Park Directorate, where 3 project administrators were employed during the timespan of the project.

The situation of employing physical workers is also problematic. Due to governmental decisions, it was not possible to continue employing the forestry workers in 2020, therefore their contracts have been terminated on 31 December 2019. This was indicated in our monthly report sent to NEEMO on the 3 February, and also in the mid-term report in 2020. For coping with this problem, we involved external assistance from the 1 January, 2020. This modification was approved in the approval letter sent to us after the mid-term report. It did not require the modification of the Grant Agreement as the total modification of the project budget was well under the 20% threshold limit.

Regarding the personal costs, some conditions must be mentioned: in Hungary during the last few years, it is more and more problematic to employ manpower for physical jobs, especially in the sector of agriculture and related fields. This made the employers from 2016 to gradually raise wages to be able to keep the employees.

Also, in our project in many cases the personal costs exceeding the planned budget by more, than 20% (see table below). Because of the above mentioned process the beneficiaries had to raise their wages significantly.

The selection of the entrepreneur capable of adequate work quality is also attached to the problem above, especially for skill-demanding tasks, like spraying against invasive species. Other problem was during the realisation was the continuance of licensing procedure, which especially caused time lag in the chemical control of invasive species. However, these lags are not so long affect project feasibility. The fourth outstanding problem occurred in the early state of realisation is attached to forest-structure conversion action (C3). In Kunpeszér 21A and 26F forest-compartments we planned to intervene on altogether 18,14 ha. But the National Office of Cultural Heritage referring to archaeological deposit bound the intervention to preliminary excavation. The cost of this excavation (about 53,000  $\in$ ) greatly exceeds the possibilities in our project budget, so the Executive Committee decided to reschedule the plan, and got approval for this amendment. The forest-structure conversion is implemented in the same magnitude of area submitted in the project, but on other forest compartments. These are the parts of the following forest sub-compartments: Kunpeszér 7 H, 7O, 8 G, 25 A, 25 D, where the actions are already in progress.

Later on, the Kunpeszér 21A forest subcompartment was included in the C6 action. In the case of our previous clearings, pre-forest patches appeared, the felling and crushing of which would have been unfavourable from a nature conservation point of view. As a result, the Kunpeszér 21A forest subcompartment, which was heavily infested with invasives, was included in consultation with several authorities (Heritage Protection, Forestry Authority, Nature Protection Authority).

Another significant problem is the outbreak of SARS-CoV-2 virus (COVID-19) in the first quarter of 2020, which significantly inhibited the progress of certain actions. Fortunately, the visit of the external monitoring team could be held in March 2020, almost in the last possible days. We could also take a field visitation and held the administrative inspection online. The restriction affected work, business, travelling and movement, and so certain contractors could not reach the formerly contracted sites in time. To handle this, we will sign modified contracts. It was also due to the COVID-19 pandemic that the global wood chips market collapsed, putting stump grinders and processors out of business, so we had to use different processes for the C3 operation. The stumps that had already been highlighted were shredded on site using a special shredding machine, and the same was done with the stumps still in the ground. Here we managed to grind the stumps to a depth of 40 cm. The planting took place in the prepared areas. This problem was also reported in Progress Report 2 and a cost transfer was requested.

Despite the problems mentioned above, the project was completed with some delays. The objectives have been met and the natural state of the Peszér-forest has improved significantly. During the project, we have encountered the problem of massive germination of seeds of invasive tree species at those parts of the forest, where – due to our activities – a significant

decrease in canopy closure occurred. Due to this massive germination, the number of specimens belonging to the <1.3 m height category increased by orders of magnitude. Treating the seedlings originating from the seed bank of the Black Cherry and the Common Hackberry seems to require more time than it was estimated. This problem was solved by recruiting and involving volunteers. During the project, nearly 4,000 working days of volunteers have been allocated to the treatment of invasive species (mostly applying physical treatments). Also, we have developed a new device (a lever, which can be called a "root-wrench") for removing the seedlings and saplings of invasive woody species with the complete root.

From the time of submission of our application, personnel and external assistance costs have increased significantly. This problem was solved by allocating extra resources from KNPD's own budget, by allocating 100% of overhead to this and other C actions, and by involving outstanding number of volunteers. In the case of KEFAG Plc., we have made cost transfers and financed a significant part of the salaries as self-financing contributions.

During the application period, we significantly underestimated the abundance of invasive species. This mistake can be attributed to two independent factors. At first, the abundance of invasive trees was estimated using random sampling, which proved to be an insufficient method in case of expressed spatial heterogeneity (for details, please refer to the description of D1 action). Furthermore, no spontaneous spreading (increase in number of specimens) was considered when calculating the resource demands of the planned invasive control. This problem was solved by allocating extra resources from KNPD's own budget to these activities, by allocating 100% of overhead to this and other C actions, and by involving outstanding number of volunteers. During the invasive eradication carried out by KEFAG Plc., we were able to involve our own workers and contractors to eradicate trees over 3 cm in diameter. In areas of high conservation value, KNPD carried out volunteer work on KEFAG-managed property, and seedlings were also removed in these areas. In the most infested areas, stump pile recultivation and forest structure conversion were carried out.

Due to insufficient labour supply, the KNPD could not employ male workers (as employees or with special contract). Due to the Hungarian legislation, fuel chainsaws are not allowed to use by females. This problem was solved by involving external assistance for those activities, which required the application of fuel chainsaws.

For the KNPD a complete batch of BFA (a herbicide applied via bark painting) turned out to be unserviceable due to manufacturing defects. Even the whole amount of malfunctioning herbicide was replaced by the distributor company, the labour allocated to treatment of invasive trees with this batch must have been repeated by us.

The legal procedure of establishment of small-scale clearings has been modified since the time of the submission of our original application. According to the new regulations, all those forest stands (or all those parts of forest stands), where small-scale clearings were planned to establish, had to be officially *a priori* converted into clearings following the necessary legal procedure. This procedure was not sufficiently and unambiguously specified in lays. For coping with this problem, in tight cooperation with the forestry and the nature conversation authorities, we developed a procedure for the establishment of clearings.

The KNPD had to cope with the problem of collecting and producing seeds and reproductive organs of grass and herbaceous plant species to be used in floral diversification. In our original application we indicated that "KNPD will not incorporate any costs of producing reproductive/transportable organs of plant species (to be used for floral diversification of restored areas) in the budget of this project, because it is planned to be financed by an EEEOP project (starting at 2017.01.01). The negotiations with the national contracting authority regarding this EEEOP project are in progress/final phase". Unfortunately, the above mentioned EEOP project was terminated due to budget limits by the Hungarian Contracting Authority. We coped with this problem by involving our own employees and the forestry workers in collecting

and producing seeds and reproductive organs of grass and herbaceous plant species to be used in floral diversification.

### 6.3. Evaluation of Project Implementation

As a result of our interventions, the conservation status of the targeted habitats has improved significantly in line with the measures implemented. One of the main reasons for this is that the area of the Peszér-forest is relatively small, so all interventions have resulted in significantly noticeable improvements and developments.

To ensure the success of each intervention, we carried out a complete site mapping in the Peszér-forest and operated 3 groundwater monitoring wells in the area, which provide data on groundwater depth, water temperature and conductivity. The wells allow us to monitor groundwater fluctuations in the area.

The most serious threat is the presence of invasive tree species, against which we have made significant progress. However, the survey carried out has provided us with highly accurate mapping data that have greatly facilitated the planning of management operations. this action has been successfully completed, with the control of invasive woody plants on nearly 600 ha (of which more than 400 ha on the KEFAG Plc. property) and the limitation of large-scale shrub cover on more than 100 ha. The reduction of shrub cover was necessary to prevent the growth of competitors (shrubs) to the native specimens in the forest areas affected by the intervention. The forest conversion involved replacing the most infested areas with invasive woody plants and the mostly coppiced stands of alien tree species with stands of native tree species. Thus, we have established native stands on more than 52,5 ha, of which 19.37 ha are planted with pedunculate oak and 33.14 ha with grey poplar.

One of the characteristics of lowland forest management is the total soil preparation after stump removal during reforestation. After stump removal, the stumps are sorted into so-called stump depots. During the project, we undertook the recultivation of 2.19 ha of previously created stump depots. These stump depots are characterised by the fact that they are composed of stumps and the upper humus layer, which is rich in nutrients. These few hundred square metre depots are also probable to the spread and reproduction of invasive woody species (*Ailanthus altissima, Celtis occidentalis, Acer negundo, Prunus serotina*), which are the most threatening to NATURA 2000 conservation objectives. During the project, 2.31 ha of stump depots were recultivated.

The scarce fritillary (*Euphydryas maturna*) is a protected species an it is of community importance. Sunlit ecological corridors and gaps with marginal shrubs along the edges are of great importance for the populations of this butterfly species. These shrubs are home to the butterfly's main food plants. The aim of the action was to clear the overgrown openings and to create new corridors, which will help to strengthen the butterfly populations. The ecological corridors were created on 15.31 ha instead of the planned 13.22 ha. An important aim of the project was to reconstruct existing scrub clearings, but in some of these areas, valuable forest stands of native tree species have emerged, so we have instead created a part of the clearings in the place of a weakly growing black locust (*Robinia pseudoacacia*). Here, a clearing of 15.35 ha was created, a unique and desirable solution from a national point of view, both from a forestry, conservation and heritage point of view. Thus, in total, 25.63 ha of work were completed, exceeding the planned 21.17 ha. These clearings benefit several protected and specially protected plant and animal species and significantly increase the biodiversity of the Peszér-forest.

The OAKEYLIFE project has achieved a reduction of more than 93% in the number of seedbearing individuals of invasive woody species in KNPD-managed forests. This reduction is the result of spontaneous mortality (negligible, close to 0), human intervention (selective chemical eradicating or mechanical removal of the entire root system) and an increase due to the seed production of individuals that were not yet seed-bearing. The monitoring results show a 67% increase in the number of seedlings of seed-bearing age in the untreated (control) areas of common hackberry over 5 years, but also a significant increase in the number of seed-bearing age individuals of other invasive woody species. In the KNPD managed forests, the number of invasive woody species not yet at seed-bearing age (but already reaching 1.3 m in height and outgrowing the mouth of the game) has decreased by more than 68%.

During the OAKEYLIFE project, grazing was introduced on a total of 23.73 ha of KNPDmanaged forests and forest steppes (pasture). Of these, 3.26 ha were plantation black locust, where grazing was introduced to control invasive woody species, and 20.47 ha were introduced in high nature value, species-rich forest-steppe habitats, where grazing was introduced to establish and maintain a suitable vegetation structure for species associated with open vegetation structure (e.g. *Iris humilis*). During the project period, the number of invasive woody and herbaceous species was reduced to detection threshold levels.

During the OAKEYLIFE project, the official procedure for the establishment of other details (clearings or scrub) was carried out in 33.93 ha of KNPD-managed forests. Of these, 26.99 ha were subject to complete removal of invasive woody species (up to the detection threshold), as well as shrub reduction and floral diversification of open areas.

In the OAKEYLIFE project, KNPD (partly on land owned by KEFAG Plc. and partly on land managed by KNPD) has improved the conservation status of the foothills of the forest by reducing invasive woody species and removing shrubs that suppress the natural regeneration of the oak on a total of 55.79 ha.

During the OAKEYLIFE project, the KNPD planted locally rare tree and shrub species on 51.26 ha gross (on areas under KNPD management) and Hungarian ash and privet saplings (the initial feeding plants of the scarce fritillary) on 49.47 ha gross, planting of vegetative propagation material of lily of the valley and King Solomon's seal species on 2,74 ha gross, and planting of vegetative propagation material of 5,000 *Iris humilis* on 10 sites and 200 marsh gladiolus on 5 sites.

The OAKEYLIFE project involved the planting of oak seedlings in roadside scrub at 50 sites, supplemented by acorn planting. These sites were fenced with wildlife exclusion fencing and were regularly tended (disked) and watered as needed during the project period to ensure the survival of the oak seedlings and to reduce the number of invasive woody and herbaceous species to detection threshold levels.

During the OAKEYLIFE project, 10,000 oak seedlings adapted to sandy habitats were produced and planted in the KNPD seedling nursery on KNPD-managed areas (HUKN20002, HUKN20003).

During our events and communication activities, we paid special attention to informing the different authorities, volunteers and schoolchildren and kindergarten children of different ages. During the project period, a variety of activities were carried out by KNPD:

- Bird watching sessions for preschoolers (262 people\*day in total),
- ornithological school activities (773 people\*day in total),
- reception and training of trainees (615 person\*days in total),
- hosting and training of university students on field training (total 475 person\*days),
- hosting and training UNESCO volunteers (634 person\*days in total),
- courses in the framework of formal university training (280 person\*days in total),
- reception and training of participants in forest management camps (367 person\*days in total),
- hosting and training of national volunteers (total 2638 person\*days),
- training of own experts (211 person\*days in total),
- training of external professionals in accredited training courses (111 person\*days in total)

- reception and training of external professionals for information sharing (487 person\*days in total).

The forest training centre, renovated during the project period, provided the infrastructure for the educational, awareness-raising and volunteering activities held on site. The renovation of the ruined forester's house, which was purchased at the beginning of the project:

- - the entire roof structure of both buildings was renovated,
- - insulation of the roof slabs of both buildings,
- - all masonry repairs and interior and exterior plastering, rendering and whitewashing have been carried out on both buildings,
- - new shutters have been installed in both buildings,
- - new bathroom facilities (two showers, two flush toilets and a hand wash) have been installed in the annex building,
- - a new septic tank has been installed,
- - the entire electrical wiring system has been replaced,
- - a hybrid power supply system (part solar, part aggregator) has been installed,
- - a new alarm system has been installed,
- - the roof of the main building has been converted into a sleeping area,
- - the walkway has been renovated in the central room of the main building and the other walkways have been newly constructed (paving)
- - the porch of the main building has been renovated,
- - the property has been enclosed by a fence,
- - the yard of the property has been completely cleared of all non-native species, planted with native species of lichens (privet, hazelnut) and native fruit trees (apples),
- - an ex situ nursery garden protected by a raschel net has been established in the courtyard of the property.

During the OAKEYLIFE project, grazing was monitored on a total of 23.73 ha of KNPDmanaged forests and forest steppes (pasture). Of these, 3.26 ha were plantation black locust, where grazing was monitored to assess the suitability for the control of invasive woody species, and 20.47 ha were monitored in high nature value, species-rich forest-steppe habitats, where species associated with open vegetation structure (e.g. grazing was monitored to investigate changes in the abundance of open vegetation (e.g. sand daisy) and the impact of grazing on woody species.

As a result of our survey work, species of community importance and protected species (*Sternbergia colchiciflora, Iris arenaria, Gladiolus palustris Carabus hungaricus, Cerambyx cerdo*) were described. We have confirmed the nesting of some bird species (e.g. *Scolopax rusticola*) in the area and have managed to clarify the distribution and population size of some species of Community importance (*Bolbelasmus unicornis, Euphydrias maturna*). With this information, interventions for the next period can be planned and implemented more accurately. We have regularly reported on the works and interventions carried out in the area, as well as on events in the area, on our website (www.oakeylife.hu) and on our Facebook (https://www.facebook.com/oakeylife/) portal. The main interventions were carried out in our Forest School, the Vackor Vár Forest School and the Forest Visitor Centre in the Peszér-forest, which welcomes groups from pre-school to university age.

The results of the project have been reported in detail in our Layman's Report and a series of good practice studies for farmers and foresters.

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Action	Foreseen in the revised proposal	Achieved	Evaluation
A1 Creation of action plan, management guideline and overall project schedule and compilation of project performance indicators A2 Creation of GIS-database for the project area	Actualisationofactionplansannually,compilationcompilationofproject performanceindicatortablesat reports.Within the frames ofthisactionthisactiona complex systemofdifferentGISdatabaseshasbeenimplemented,enablingustoprocessandanalyse)differentdata types(e.g.spatial/surfacemodels, a soil map, adatabaseofhydrologicdata,differentdatabasesofparticularbioticdata, etc.).	Each year an updated action plan was prepared and performance indicator tables were prepared for the main reports. We continuously updated and extended the GIS database with data from monitoring actions D1-D2 and A3.	With the updated action plan, we were able to monitor the implementation of each action and expected delays. The performance indicator tables allowed us to demonstrate the success of our project. We recorded all the spatial information on all accomplished activities during the whole project period and the collected data were incorporated into this database system. It means that all the spatial data collected within the frames of the concrete conservation actions (C1 to C13) have been into the database. The data about the specific interventions/activities include the specification of the activity, the exact place of the activity as shape file, the exact time of the activity (for Actions C7 and C9-
A3 Hydrological and soil mapping of Hungarian project sites	Site mapping of the total area of the Peszér-forest, installation of 3 ground water monitoring wells	From 638 soil profiles 2526 pcs soil samples were collected. 3 ground water monitoring wells were installed.	C12). Thanks to the soil sampling, we have created a complete soil map of the Peszér- forest. The 3 automate groundwater monitoring wells are continuously sending the results.

Action	Foreseen in the	Achieved	Evaluation
C1 Elimination of invasive trees on area managed by KEFAG	Two rounds of invasive eradication were planned for 403.8 ha.	The works were carried out in two rounds, with the help of contractors and our own workers. The works were carried out over a diameter of 3 cm. During the AfterLIFE period, we will also keep the diameter of invasive trees below 3 cm.	As a result of the works, invasive cover has been significantly reduced. We first started by eradicating the seed-bearing trees, then we eradicated the smaller diameter ones, under 3 cm.
C2 Reduction of scrub-cover of overgrown areas	We have undertaken to reduce shrub cover on 103.26 ha, thus promoting the growth of the native tree stand.	We reduced the shrub cover on 104.29 ha, exceeding the plan.	By reducing shrub cover, we have significantly promoted the growth of the native tree stand and facilitated the permeability and monitoring of the forest.
C3 Conversion of forest structure of plantation formed by alien tree species into coppicing forest in the case of forest stands managed by KEFAG	Conversion of 50.5 ha of planted non- native stands into a forest of native tree species.	After full soil preparation, 52.51 ha were converted to a mixed species forest structure. No stumps depots were created.	We converted poorly growing non-native coppice stands, which were heavily infested with invasive species, into forests of native tree species. This has significantly increased the naturalness of these forests
C4 Recultivation of trunk-depots	Reclamation of 2.19 ha of stump depots, which are hotspots for invasive tree species and typical of lowland forestry.	Following the removal of the stump depots, a complete soil preparation was carried out, followed by sapling planting on 2.31 ha in these areas.	We have eliminated significant invasive hotspots, mostly of tree of heaven. Full soil preparation also resulted in the seed bank being rotated to sufficient depth.
C5 Creation and maintenance of ecological corridors for the Scarce Fritillary	Establishment of ecological corridors in previously overgrown line clearings to improve the habitat for scarce fritillary on 13.22 ha.	Ecological corridors were established on 15.31 ha of scrub- covered clearings where plant diversification was carried out.	As a result of the interventions, the number of scarce fritillary in the area has increased nearly sixfold, with 12,000 individuals counted during the monitoring.
maintenance of	cover, creation of	opened on 25.63 ha. In	interventions, we have

Action	Foreseen in the revised proposal	Achieved	Evaluation
forest clearings on area managed by KEFAG	clearings on 21.17 ha.	some of the clearings, we left the pre-forest patches in place and created clearings in other invasive infested areas.	created clearings in more areas than planned. These areas will need intensive management, but the treatments will result in a significant improvement in the natural condition of the areas.
C7 Elimination of invasive alien plant species by KNPD	Eradication of invasive herbaceous plants on the area in the asset management of KNPD.	In two rounds of treatment, 185.19 ha of woody invasive species were eradicated. 47.92 ha were mechanically removed of seedlings. Herbaceous invasive species were sprayed with herbicide.	There has been a significant increase in the status of naturalness in the KNPD area. All seed- bearing species have been removed from the managed area, and invasive woody species have been eradicated in two rounds on 185.19 ha.
C8 The reintroduction of silvipastoral systems to Peszér- adacs Meadows (HUKN20003)	Introduction of forest grazing in the Peszér-Adacs Meadows on 10 ha area.	Thanks to the changes of legislation, forest grazing has been introduced on 23.73 ha area. This overperformed the planned amount significantly.	In the case of forest grazing, 3.26 ha showed that invasive woody species were unable to reach seed-bearing age as a result of grazing.
C9 Creation of small-scale forest clearings by KNPD	Establishment of micro-clearings by KNPD.	The authority permitting process has been finished on 33.93 ha and 26.99 ha of micro-clearings were established with floral diversification.	Invasive eradication was carried out on 33.93 ha, scrub and shrub cover reduction on 26.99 ha and floral diversification on 26.99 ha.
C10 Improvement of conservation status of pre-forests of Euro-Siberian steppic woods with Quercus spp.	Improving the conservation status of Euro-Siberian steppic woods with Quercus spp. through scrub cover reduction and invasive eradication.	The emergence of pedunculate oak saplings is significant in the Peszér-forest. The oak regeneration was mainly found in scrub patches, which were treated.	Invasive woody species and shrub patches were removed from 55.79 ha. This has significantly improved the conservation status of the Euro-Siberian steppic woods with Quercus spp.

Action	Foreseen in the	Achieved	Evaluation
C11 Floral diversification of restored habitats	revised proposalRestoringfloraldiversificationofrestored areaswithherbaceousandwoody species.	The restored areas have been planted by 5,000 hectares of Iris humilis, 200 ha of marsh gladiolus, 18.85 ha of grassland species and 51.26 ha of rare tree and shrub species.	The targets were largely met, with a much larger number of herbaceous species planted, and significant areas of woody species planted, resulting in a five-fold increase in the number of scarce
C12 Transformation of roadside bushy patches to forest- steppic Oak groves	Conversion of roadside scrub into oak woodland steppe. These scrub patches have been planted with pedunculate oak and other tree species	Pedunculate oak was planted on more than 50 places (acorn or sapling planting) furthermore other native species were also planted.	fritillary. Saplings grown from local propagation material have been planted on sites. Their cultivation, watering, and fencing against game browsing was completed. The areas had to be replanted several times due to the severe drought
C13 Creation of nursery for Pedunculated Oak saplings originating from verified sand- adapted genotypes	Establishment of a tree nursery in order to produce oak saplings from local propagation material was planned.	10,000pcsofpedunculateoaksaplingswereproducedwhichusedfortheconversionofroadsidescrubsto	Roadside scrubs were planted by 10,000 pcs of pedunculate oak saplings.
D1 Mapping pre- treatment and monitoring post- treatment occurrence of alien species at Hungarian target sites	Survey of invasive species in the whole area at the start of the project and after the interventions.	During the action, the whole area was divided into 25 x 25 m quadrats. More than 16,000 quadrats were surveyed before the treatments. At the end of the project, surveys were carried out in nearly 13,000 quadrats. Surveys were carried out by tree species and diameter classes.	The operation was completed, with more than 850 field days spent recording. We conducted surveys at the beginning of the project, before the treatments, and at the end of the project, after the interventions. We found that treatments were effective for more than 90% of the larger diameter invasive tree species treated. For smaller diameter trees, we observed an increase

Action	Foreseen in the revised proposal	Achieved	Evaluation
D2 Monitoring key species and habitats at the Hungarian target sites	Monitoring key species and habitats in the project area.	A habitat mapping of the entire Peszér- forest and a keystone species survey were carried out, during which new populations of several species were found in the area.	in the number of individuals. 1,012 habitat patches have been recorded in the Peszér-forest, which can be classified into 2 habitat types according to the Á- NÉR system. The key species included Iris humilis, marsh gladiolus, scarce fritillary, <i>Cucujus</i> <i>cinnaberinus,</i> <i>Bolbelasmus</i> <i>unicornis</i> , and several arthropod, bird and bat species were surveyed. Most of the population size of these species has increased due to our interventions.
D3 Assessing the socio-economic impact of the project actions	Assessment of the socio-economic impact of the project, involving participating organisations and professionals from other fields.	In a first round, we conducted a survey among the project participants. In the second analysis, we examined the impact of the OAKEYLIFE project on farmers and foresters in the areas.	In the first round, the forest visiting habits of the organisations involved in the project, in relation to nature conservation and the LIFE project. In the second round, farmers in the area were interviewed about the project. The analyses revealed here have been published in several places.
D4 Assessing the project's impact on ecosystem services	We looked at the impact of the project on ecosystem services, including the impact of grazing, the role of pollinators and changes in groundwater levels.	During the project period, the impact of forest grazing and the ability of the area to support livestock was studied on 23.73 ha. In our D2 action, we recorded thousands of occurrences of organisms. The groundwater levels of the automatic	The impact of grazing was studied on 23.73 ha in 3 different management types with or without the exclusion of game and domestic animals. The importance of butterflies in pollination was investigated. The

Action	Foreseen in the revised proposal	Achieved	Evaluation
		groundwater wells were tested.	water table ranged from 2.5 to 4.5 m.
D5 Monitoring the effect of grazing in forests	The impact of forest grazing was monitored on 23.73 ha of grazed area.	Forest grazing was carried out on 3.26 ha of an acacia forest and 20.47 ha of a high nature value forest steppe. The impact of grazing on native and non-native plants was investigated.	19,121 pieces of data were collected in the grazing areas. We assessed the position and height of the plants and the impact of grazing on the plants.
E1 Creation and maintenance of project website	Create and maintain a website.	We have set up a website www.oakeylife.hu, where we regularly publish news and our main achievements.	The website was a success, with 71,177 hits. We published 286 news items and 97 articles in the protected category.
E2 Public relation activities	PR appearances in national and international media and press.	We had several PR appearances in Kossuth Radio, MTV, M5 TV, Petőfi Népe, A Mi Erdőnk magazine, other scientific magazines.	In addition to the short films available on our YouTube channel, we also have a 15-minute project film, a 30- minute version of which has been picked up by M5.
E3 Non- institutional and institutional educational activities	Education and awareness-raising in the Peszér-forest and public facilities, Vackor Vár Forest School, Kecskemét Arboretum.	We have provided education and awareness-raising from kindergarten to university age, and we have also hosted thousands of volunteers and introduced the project to hundreds of people in our own ecotourism facilities.	Training of more than 5,000 volunteers, 895 people. Hundreds of kindergarten and university students trained in the Peszér- forest, in local schools and in KEFAG's ecotourism facilities.
E4 National and international networking	Strengthening nationalandinternational contactsatconferencesandother venues.at	Despite the COVID- 19 pandemic, we participated in several national and international events. LIFE project events of partner organisations, international study tours.	We attended the closing of the Kaszó LIFE project, the closing of the Szalakóta LIFE project. In addition, we gave presentations at the REUFIS conference, ICE 2022 (International Congress of Entomology 2022) and

Action	Foreseen in the revised proposal	Achieved	Evaluation
E5 Training staff	We have trained our	We have hosted	The 1st InternationalElectronic ConferenceonBiologicalDiversity,Ecologyand Evolution.Morethan5,000
and volunteers	own staff and volunteers.	volunteers and our own staff on several occasions, as well as international UNESCO fellows.	volunteers were hosted and UNESCO volunteers spent more than 600 days here. Our biggest event was the 151st OEE Transnational Forestry Meeting, where we hosted nearly 100 forestry professionals from the Carpathian Basin.
E6 Opening Workshop	Organisation of an opening workshop following the launch of the project.	The opening workshop took place on 28-29 March 2018. First day conference, second day field part.	In the launch project, we presented the baseline situation and the results of other LIFE national projects, as well as the objectives to be achieved.
E7 Final Workshop	Towards the end of the project Final Workshop.	The Final Workshop took place in October 2022. On 19 Octobre 2022 we presented our results in the field, on 25 Octobre 2022 we gave a presentation.	With a successfully completed project, we have raised awareness among partner organisations about the importance of the Peszér-forest.
E8 Establishment and operation of a forest visitor centre in the project area	Purchase, renovation and maintenance of the Forest Visitor Centre.	During our project, an old forester's house was bought, renovated and used as a Forest Visitor Centre.	With our Forest Visitor Centre, we welcomed more than 5,000 people from kindergarten to university age, as well as volunteers.

# 6.4. Analysis of benefits

# Environmental benefits: Direct/quantitative environmental benefits:

The results of the project have significantly increased the conservation value of the Peszérforest. The positive effects of habitat improvement can be observed in the case of the scarce fritillary (*Euphydrias maturna*), whose population has increased significantly thanks to the creation of ecological corridors. Its population, previously estimated at 2,400, has increased to 12,000! Invasive tree species are the most significant threat to the Peszér-forest. First, we removed the large seed-bearing trees. In the course of the project, invasive woody plants were treated on nearly 600 ha. In the most infested areas, we carried out a complete tree replacement restoration on more than 52.5 ha. In addition, KNPD has carried out a significant amount of volunteer intervention with invasive control. By limiting, eradicating and restructuring invasive species, the natural condition of the forests has been significantly improved. Furthermore, these interventions have significantly improved the conservation status of the area. The creation of ecological corridors has linked populations scattered in different areas into a larger system. A large number of ecological corridors have been created, covering 15.31 ha. The reclamation of stumps also contributes significantly to the improvement of the conservation status of the area of invasive hotspots. In addition, the stumps have been replaced by planting of native species. This has also increased the naturalness of these areas.

In each of the areas affected by the intervention, diversification of the different plants was carried out, with the planting of important feeding plants for scarce fritillary (privet, Hungarian ash).

During the project, 51.26 ha (gross) of KNPD-managed areas were planted with locally rare tree and shrub species, and 49.47 ha (gross) with Hungarian ash and frost seedlings (the initial feeding plants for scarce fritillary), planting of vegetative propagation material of lily of the valley and King Solomon's-seal species on 2,74 ha gross, and planting of vegetative propagation material of 5 000 Iris humilis on 10 sites and 200 marsh gladioluses on 5 sites.

The OAKEYLIFE project involved the planting of oak seedlings in roadside scrub at 50 sites, supplemented by acorn planting. These sites were fenced with wildlife exclusion fencing and were regularly tended and watered as needed during the project period to ensure the survival of the oak seedlings and to reduce the number of invasive woody and herbaceous species to detection threshold levels.

#### Qualitative environmental benefit:

Our treatments have greatly contributed to the expansion of candidate habitats and the number of populations on them. As reported in the direct environmental benefits, we have significantly increased the population of scarce fritillary, and through plant diversification we have increased the number of feeding plants of scarce fritillary, sand daisy and marsh gladiolus. The monitoring activities have also identified candidate habitats that were not previously known. Through our professional actions, we have significantly improved the natural condition of the Peszér-forest. In our opinion, the most important threat to the project area is the presence of invasive tree species and their seed banks. The forest management methods used in the project are aimed at reducing this problem.

The control of invasive herbaceous and woody species was carried out continuously until the end of the project. In the most infested areas, we carried out tree species replacement restructuring with total soil preparation. As a result, the seed bank was rotated to a depth of 70-80 cm. In addition, in the areas infested with seedlings, invasive eradication work was carried out with the help of volunteers.

During the maintenance period of the project, it will be important to continue to limit the presence of invasive tree species using chemical and mechanical methods.

### Economic benefits:

In the case of forests close to nature stands appear to be much persistent compared to artificially formed forests, which makes their management more economic. That is why we intend to transform our forests as close to natural stands as possible. The more biodiversity a
forest has, the more resistant it is. It is therefore important to convert non-native tree species into forests of native tree species. More organisms are associated with native tree and shrub species. In the case of native stands, efforts should be made to close the stands as soon as possible after the removal of invasive tree species.

#### Social benefits:

Thanks to our forest visitor centre and the interactive educational trail, environmental education became conspicuous in the vicinity. We can raise the interest starting from kindergarten-age to university graduates, even to adults of the visitors with our establishments of public welfare. Nowadays more and more excursion-like visits the area, which in this part of Hungarian Great Plains was uncommon before. Nevertheless: with our project we could give employment to some local colleagues.

Thanks to our PR actions, we have received many requests for an insight into this unique lowland forest. The number of days spent by our volunteers exceeded 2,600 working days! In addition, UNESCO volunteers spent more than 600 days in the area.

Interviews were conducted with the various professional groups involved (forestry, national park, hunting, local government) about the interventions in the Peszér-forest. The opinions of each group were compared using socio-economic analyses, which have been the subject of several publications.

The most important social benefits were the Layman's Report and the Best Practice Studies of the project.

#### Replicability, transferability, cooperation:

The area of calcareous sand steppe forests is low both in Hungary, and worldwide. But this project is still applicable from many points of view on other areas to improve nature protection status (i.e.: invasive removal, structure conversion, developed monitoring methods, forest grazing, etc.). The path we trod can be applied by other projects, other countries. A good example for this: the invasive removal method developed at our project has been used successively in Czech Republic.

Several Hungarian state forestries (Nyírerdő Plc., Pilisi Parkerdő Plc., Budapest Forestry Plc.), National Park Directorates (Hortobágy National Park Directorate, Duna-Ipoly National Park Directorate) have also visited the area. They have also applied the experience gained in the Peszér-forest in their own areas. In addition, pedunculate oak seedlings and oak acorns grown from local propagation material have a single brand, sought after nationally, this propagation material adapted to drier areas. In addition, a large number of volunteers turned up and also encountered many new interventions. It is worth mentioning that a special course on the conservation management of lowland forests has been introduced at the Hungarian University of Agricultural and Life Sciences, which will allow future professionals to experience the practical application of the techniques used in the Peszér-forest.

#### **Best Practice lessons:**

The best practice studies were completed by the end of the project. These were compiled into a single document to help farmers and forest managers in similar environments with both positive and negative experiences. An important basis for the study volume was the formulation of the technological actions used in each of the professional actions.

### Innovation and demonstration value:

The innovations and novelties used in the project are remarkable. Based on morphological traits and studies, it is possible that another oak species (*Quercus pedunculiflora*) may also occur in the area. Genetic studies have been carried out on the Scots pine, which is mentioned

in previous references and forest plans as a native species of the Peszér-forest. There is a high probability that it is indeed native to the area.

We have also found dying patches of the tree of heaven in the area, from which we have been able to sample various *Verticillium* fungal species. It is highly likely that these fungal species are the cause of the death of the tree of heaven in the area. Reintroduction trials are currently underway in other areas.

The KNPD has developed a lever-operated tree-pulling device during the volunteer work. This device can be used to successfully remove invasive seedlings that are difficult or impossible to remove by hand.

In the KNPD area of operation, naturally occurring oak saplings have been observed to be killed by the alien oak powdery mildew. An experiment was set up in which new growth patches were treated in 1m diameter circles with various fungicides.

Among our demonstrative assets, I would highlight the Forest Visitation Centre, information panels on interactive trails. The information panels along our trail show the main interventions, natural values and threats.

### Policy implications:

We also raised the attention of local and national authorities regarding our project. We regularly tallied with the forestry authority about our professional actions and their progress. Some of our actions are showing new approach for them, but in the same time we could feel their encouragement. And we hope, that our results may have effect on legislation processes too (the problems of invasive species, forest grazing, etc.). In the practice, we applied the new things and paragraphs (e.g. forest grazing) in our forest law an in its execution decree amongst the first in the Great Hungarian Plains. With our practical experiences, we contribute to the writing or modification of future laws. We will be able to provide new solutions to forest management problems that can be clearly perceived by them, which can later be extended by legislation.

During chemical elimination of invasive species, the most often used substance is glyphosate. The banning of this chemical in the European Union will cause a significant problem. Whit this chemical, we can eliminate invasive plants selectively and with great efficiency. The biological control methods are yet to be sufficient enough to replace this chemical. During the OAKEYLIFE project however, we investigate the effectiveness and selectivity of some fungi strains (*Verticillium spp.*) against *Ailanthus altissima*, which could be useful in future practices and legislation.

According our forest law, invasive species do not count towards the canopy closure of the total forest area. But removing this species could also cause closure lacking areas, which leads to legislative anomalies. We hope that the practical part of our project can help in the elimination of this problem.

In creating the clearings, the forestry company, in cooperation with the National Park, the Heritage Protection Authority, the Nature Conservation Authority and the Forestry Authority, has succeeded in creating a clearing from a weak black locust forest that was not allowed to be restored using technologies used in the lowlands. Here, thanks to the collaboration of the above-mentioned organisations, we have achieved a habitat of much better natural condition thanks to the interventions.

The OAKEYLIFE project created new opportunities, therefore we could hire additional employers. The KEFAG Plc. employed 19 additional employers, the KNPD employed 7 additional employers, and the MME BirdLife Hungary employed 8 additional employers during the project period. During the project period we employed all together 34 additional employers.

# 7. Key Project-level Indicators (KPIs)

The online KPI database was ready at the time of the first progress report, the mid-term report and the second progress report.

The project has achieved and significantly exceeded its targets. For the preparatory actions, we have met them up to the mid-term report. These are towards "Improving the conservation status of target habitats". More accurate knowledge of the populations of species of Community importance also supports this activity. Our communication, education and networking activities have been highly successful, with results significantly exceeding our expectations. This is due to the successful operation of the project website and Facebook profile, and the presentation of 13 informative videos on our YouTube channel instead of the 5 short films we had committed to. In addition, our successful communication was also helped by the fact that we were featured in national media (TV, radio) in addition to local media. This helped us to attract the interest of a wide range of people.

Significant progress has been made in the delivery and operation of the Forest Visitor Centre and the forest trails. Through these activities, as well as the educational/outreach work in our forest schools, we have made a significant contribution to positive environmental education.

The table of indicators is sent in annex (F1\_6).

# 8. Comments on the financial report

# 8.1. Summary of Costs Incurred

PROJECT COSTS INCURRED								
	Cost category	Budget according to the grant agreement in €*	Costs incurred within the reporting period in €	%				
1.	Personnel	1 010 620,00 EUR	1 015 539,08 EUR	100,49%				
2.	Travel and subsistence	179 713,00 EUR	88 607,93 EUR	49,31%				
3.	External assistance	480 875,00 EUR	767 543,99 EUR	159,61%				
4.	Durable goods: total <u>non-depreciated</u> cost	273 275,00 EUR	196 005,35 EUR	71,72%				
	- Infrastructure sub- tot.	24 000,00 EUR	38 322,18 EUR	159,68%				
	- Equipment sub-tot.	249 275,00 EUR	157 683,18 EUR	63,26%				
	- Prototype sub-tot.	0,00 EUR	0,00 EUR	0,00%				
5.	Consumables	362 284,00 EUR	136 283,68 EUR	37,62%				
6.	Other costs	61 820,00 EUR	54 261,65 EUR	87,77%				
7.	Overheads	165 275,00 EUR	157 851,00 EUR	95,51%				
	TOTAL	2 533 862,00 EUR	2 416 092,68 EUR	95,35%				

The table contains the summarized costs arranged to categories from the start of the project until the end of the project 31 December 2022.

The reporting period covers 95,35% of the total project duration. As far as the budget is concerned, the project completions exceed the planned level. Certain cost items (salaries, fixed assets, external contracts) have been overspent. At the same time, some cost items (travel, consumables, other costs) were under-spent. However, the over-spending by cost item is below the 20% threshold for contract modification, i.e. 12.07%, which is shown in the Consolidated table in the annex.

The beneficiaries spending's remarkably exceeded the amount of EU contribution transferred so far as.

The COVID-19 coronavirus epidemic and the subsequent crisis have significantly slowed down the progress of the project and significantly increased the cost of some of the fees. In addition, wages have increased significantly due to high inflation.

Our cost-per-line transfers, or our changes, are listed in the list per action.

Accounting of travel costs within the LIFE project for company owned vehicles is based on unit costs for each car in accordance with our travel regulations. Unit costs are calculated: all cost of a given car of the year divided the all run km's for the year. The travel cost therefore include: fuel cost, service charges, insurance costs, car taxes, road tolls, oils and other liquids and tires.

On the other hand, our employees using the national rules and fees when using their own vehicle.

It is still observable, that personnel costs are exceeding the planned amounts. Wages have continued to rise and the minimum wage has also risen significantly since the start of the fiscal stimulus, explaining the small overshoot in wage costs.

In the case of assets, we have slightly exceeded planned costs. The purchase of equipment and the renovation of the Forest Visitor Centre were completed in the first half of the project. As KEFAG Plc. was allowed to account for 50% of the depreciation of the assets, the additional amounts were made as a self-financing contribution. The depreciation of certain assets did not run out before the end of the project, so for these assets, the costs eligible until the end of the project were allocated and the remaining costs were accounted for as self-financing.

For external contracts, there was a significant overrun of costs. This is due to government decisions that, from 2020, the KNPD could no longer employ forestry workers, but they were employed through a contractor. In addition, we had to resort to several unplanned works that were not originally planned but were indicated in previous reports (action C3 stump grinding, action C6 clearing). Without these overspends, we would not have been able to implement the original project's original activities.

In the case of external assistance, despite significant overspending, we do not exceed 35% of the total project budget.

Despite budget shifts, the following overspending and underspending occurred, which are explained in detail below:

# **Personnel cost**

In the case of KEFAG Plc., the following overspending occurred for each action:

For KEFAG Plc. we exceeded the 518,081 EUR planned for personnel costs. In all previous reports, we have indicated that wages have increased significantly, both for manual workers and for other employees. In addition, in 2022, KEFAG Plc. has implemented a significant wage increase due to the high global inflation. In addition, due to the cost transfers requested in the first Progress report, the number of days worked was also higher at 12,819.75 days compared to the planned 12,068 days.

In the case of MME BirdLife Hungary, the following over-spending occurred in the D1 action: The MME BirdLife Hungary wanted to significantly increase the area covered by invasive tree species surveys in 2022. As this was the last year, we planned to cover the entire forest area and also survey a significant amount of control stands at the same time. This was achieved with more than 7,100 survey units by the end of the year. Among others, Mr. Gergő Halmos was involved in this work, within the framework of the Action D1, doing a small part of field data collection and a larger part of reviewing the data collections of the last 5 years, checking the data and conducting the analyses. In addition, within the framework of Action F1, he was involved in the technical discussions and the final events, assisting Mr. Arnold Erdélyi, the project coordinator.

# Travel

In the case of KEFAG Plc. The following problem has occurred:

The vehicle standard costs in 2022 for individual vehicles have not yet been determined for KEFAG Plc., therefore the vehicle standard costs in 2022 were calculated using the vehicle standard costs in 2021.

# **External assistance costs**

In the case of KEFAG Plc. the following over-spending occurred: C3 action

- original: 0 EUR
- modified: 42,000 EUR
- actual: 77,512.39 EUR

Originally, we had not planned for costs here, but due to the collapse of the global stumps chips market and COVID-19, we were unable to grind the stumps, which had to be shredded on site using a special machine. The transfer of 42,000 EUR indicated in Progress report 2 was not sufficient, the total budget was 77,512.39 EUR. This significant increase in the contractor's fees is explained by the fact that there has been a significant price increase for this work due to inflation. Without this expenditure, we would not have been able to carry out the work in full.

Planting costs for actions C3-C4

- original: 12,000 EUR
- actual: 15,008.94 EUR

Due to the significant drought damage, several areas had to be replanted, resulting in a small overspend. Instead of the planned 12,000 EUR, the planting cost 15,008.94 EUR. Due to the Forest Act in force, it is obligatory to carry out appropriate replanting of the reforestation.

Action C6 - Creation of forest clearings on area managed by KEFAG

- original: 0 EUR
- modified: 10,000 EUR
- actual: 16,997.77 EUR

Originally, we had not planned any costs here, but we were unable to use our own machines for the conversion of Kunpeszér 21A forest subcompartment into clearings. The transfer of 10,000 EUR indicated in Progress report 2 was not sufficient, the total budget was 16,997.77 EUR. This significant increase in the contractor's fees is due to the fact that there has been a significant price increase for this work due to inflation.

In the case of the KNPD, the following expenditures were not planned or were over-executed:

C13 action

- original: 5,000 EUR
- actual: 0 EUR

Explanation: Due to lack of specific marker, it was not possible to carry out the planned genetic investigations. However, the sand adapted Pedunculated Oak specimens could be selected without this investigation, therefore we were able to implement those activities of the project, which were thought to be dependent on the genetic investigations.

C7-13 Forestry workers, E8 Education manager

- original: 0 EUR (only Personnel costs were included in the Application,)
- actual: 141,700.42 EUR

Explanation: Due to governmental decisions, it was not possible to continue employing the forestry workers in 2020, therefore their contracts have been terminated on 31 December 2019. This was indicated in our monthly report sent to NEEMO on the 3 February, and also in the Mid-term report in 2020. For coping with this problem, we involved external assistance from the 1st January, 2020. This modification was approved in the approval letter sent to us after the mid-term report. It did not require the modification of the Grant Agreement as the total modification of the project budget was well under the 20% threshold limit.

Due to insufficient labour supply, we could not employ male workers (as employees or with special contract). Due to the Hungarian legislation, fuel chainsaws are not allowed to use by females. This problem was solved by involving external assistance for those activities, which required the application of fuel chainsaws.

For these activities, the costs of external assistance were as follows:

- original: 0 EUR
- actual: 108,297.38 EUR

Altogether, the total costs of external assistance involved for the C7-C13 actions implemented by KNPD summed up to 249,997.80 EUR.

In the case of the KNPD, the following expenditures were not planned or were over-executed:

# **Durable goods: Infrastructure costs**

E8 Purchase of building for Forest Visitor Centre

- original: 15,000 EUR
- actual: 16,074.07 EUR

The cost of the forester house slightly exceeded the planned costs.

E8 Purchase of garden and indoor furniture

- original: 5,000 EUR
- actual: 5,462.91 EUR

Explanation: due to increased prices, the originally planned costs were slightly exceeded by the actual costs (within 10%).

E8 Masonry works (Renovation works of the Forest Visitor Centre)

- original: 0 EUR
- actual: 15,618.21 EUR

Explanation: In the application, renovation works of the Forest Visitor Centre were classified as external assistance. In our books, these costs are classified as infrastructure, instead of external assistance.

In the case of the KNPD, the following expenditures were not planned or were over-executed:

# **Durable goods: Equipment costs**

A2 GIS license (3 pcs)

- original: 5,000 EUR
- actual: 0 EUR

Explanation: KNPD purchased the necessary GIS licenses from other resources.

C7 Computer for LIFE coordinator, senior forester and forestry administrator (3 pcs)

- original: 2,700 EUR
- actual: 5,493.08 EUR

Explanation: for running GIS software, it was necessary to purchase portable computers with sufficient CPU and RAM. The extra costs (compared to original plans) were covered by the money saved on GIS licenses.

C7 ArcPad software for LIFE coordinator, senior forester and forestry coordinator

- original: 3,000 EUR
- actual: 0 EUR

Explanation: KNPD purchased the necessary ArcPad license from other resources.

C7 Hand-held petrol drill (3 pcs)

- original: 2,700 EUR
- actual: 3,080.23 EUR

Explanation: due to increased prices, the originally planned costs were slightly exceeded by the actual costs (within 10%).

C9 Bushcutter (3 pcs)

- original: 3,600 EUR
- actual: 0 EUR

Explanation: Due to insufficient labour supply, we could not employ male workers (as employees or with special contract). Due to the Hungarian legislation, fuel chainsaws are not allowed to use by females. This problem was solved by involving external assistance for those activities, which required the application of fuel chainsaws. Therefore, it was not reasonable to purchase the fuel bushcutters.

C10 Chainsaw (3 pcs)

- original: 2,550 EUR
- actual: 0 EUR

Explanation: Due to insufficient labour supply, we could not employ male workers (as employees or with special contract). Due to the Hungarian legislation, fuel chainsaws are not allowed to use by females. This problem was solved by involving external assistance for those activities, which required the application of fuel chainsaws. Therefore, it was not reasonable to purchase the fuel chainsaws.

Some items were not included in the Application, like the generator for charging electronic devices. It was necessary to modify the items purchased due to the above-mentioned problems

(for female workers, we were allowed to purchase only electronic devices, not fuel chainsaws and bushcutters).

In the case of the MME BirdLife Hungary, the following expenditures were not planned:

Two pieces of Logic Instrument Fieldbook K80 has been used for monitoring tasks in the OKAEYLIFE project (D1-D2 actions). These devices were purchased by KNPD from outside resources, and provided for project purposes free of charge. During over one year of use the battery length is proved to be enough even for 2 days of intensive use. The tablet could bear heavy rain and minus 15-20 °C, so data collection and protection during bad weather conditions is also solved. The rubbed coat bears the permanent scratching of twigs, accidental droppings from 2 meters high and also keeps dust outside. However, most importantly the tablet is compatible with ArcPad GIS software, which has been used for the previous monitoring works and all the running survey protocols are built up in GIS environment. ArcPad runs under Windows OS (but not Android), and can manage several working layers simultaneously. As during data collection, the database is getting greater, hardware capacity is determining. The tablet's hardware is clearly strong enough for extent database managing.

In the OAKEYLIFE project, monitoring activities D1 and D2 could not have been carried out without adequate technical support. The fine-scale data collection was started with 1-1 Logic Instrument K80 fieldbooks by our field surveyors. The equipment was provided by KNPD until the end of 2019 under a verbal agreement. The devices proved to be reliable for both invasion baseline surveys and habitat mapping. In 2019, we could not find a Windows OS-based solution on the market at the time (unfortunately, Win OS was a must for data collection software) that was cheaper in terms of price/value and could certainly withstand the field demands. So, we finally decided to buy 2 new models in 2019. They were then in continuous use until the end of the project. In the year 2022 we managed to find an Android backed program that was able to handle all of our data collector files (e.g. shp-s) at the same time, and we were able to do the resurveys on our smartphones. In 2022, 4 colleagues were doing field data collections, so we purchased 2 additional Garmin GLO GPS-s to the fieldbooks we had been using, which gave our smartphones a much more reliable position and allowed us to do data collections with them as well.

In the case of the KNPD, the following expenditures were not planned or were over-executed:

# Consumables

A2 LIDAR images:

Explanation: Instead of the costs of consumables, LIDAR images were classified as Other Costs.

C7, C9, C10: Herbicide for selective treatment of invasive plant species

- original: 5,750 EUR
- actual: 38,001.00 EUR

Explanation. The price of glyphosate-based herbicides increased approx. 300% during the project period. Also, as we significantly underestimated the abundance of invasive trees, more herbicide was needed, compared to original plans. It led to overspending of costs of consumables, but it did not require the modification of the Grant Agreement as the total modification of the project budget was well under the 20% threshold limit.

Also, to renovate the purchased forester house, it was necessary to purchase construction material. Also, some other consumables (e.g., marker spray) were necessary to purchase. In the case of the KNPD, the following expenditures were not planned or were over-executed:

# Other costs

A2 Aerial photos

- original: 1,350 EUR
- actual: 3,359.12 EUR

A2 LIDAR images (before conservations actions)

- original: 5,000 EUR
- actual: 6,755.92 EUR

A2 LIDAR images (after conservations actions)

- original: 5,000 EUR
- actual: 6,136.41 EUR

Explanation: The increased prices of purchasing remote sensing data reflect the general increase of prices throughout the project period (since the submission of the Application).

As the OAKEYLIFE project draws to a close, it has become clear that the actions coordinated by MME BirdLife Hungary are expected to be fully implemented. However, significant savings were made in our project budget. 18,000 EUR + 1,260 EUR for overheads, i.e. a total of 19,260 EUR, were preallocated from the D1 and D2 action budgets, which MME BirdLife Hungary would certainly not have been able to use. Therefore, the amount was given to the Kiskunság National Park Directorate (KNPD) to be used for field interventions to be carried out last year. The KNPD used the extra budget to create additional clearings in Kunpeszér 34 and 35 forest stands. The works included shrub clearance, use of heavy machinery and green waste management. The interventions are expected to result in an additional spatial increase of sand dune thickets and open sand oak habitats, which are among the priority habitat types listed in the project. The reallocation was therefore considered justified as the amount was used in close connection with the main objectives of the project (under actions C9 and C10).

For the budget shift indicated here, amendments to the partnership agreements between the main beneficiaries, KEFAG and KNPD, and KEFAG and MME BirdLife Hungary have been concluded in 2022. Despite the over- and under-spending indicated above, the project was successfully completed, the 20% cost overrun was not reached at project level for the Consolidated Worksheet table, so no contract amendment was necessary.

The following budget shifts were requested and accepted in previous reports:

Progress report 1.

The following budget reallocations were requested and received in the first Progress Report. Report date: 31.01.2019. The document approving the budget shift is Ref. Ares(2019)1608745 - 11/03/2019.

From		Amount	Where		Explanation
Category	Action	€	Category	Action	
External	E8	9 220	Consumables	E8	The total amount of the money was budgeted for external services. As we tried to contract with local experts, it was reasonable to contract with one sub-contractor. Also, KNPD has purchased he construction material on its own, s it led to more decreased prices. Accordingly, some of the costs ( $\notin$ 9,220) occurred as "Consumables" instead of "External services"
Personal	C8, C9, C10, C11, C12, C13	0	Personal	C8, C9, C10, C11, C12, C13	In the present situation, it is more and more difficult to find employees for forestry works due to the high employment rate in the region and due to relatively low salary we can offer. Instead of the five people planned to be employed in the group, it seems to us that we can employ only four people for the same total sum of money (it is necessary to increase their salaries by 1.2 to 1.25). Accordingly, it will not change the budget, but the daily rate of employees (and therefore the number of working days).
	C7	0	Equipment	C7	€ 10,000 was budgeted for purchasing a second-hand car. We could buy the sufficient car for less amount of money (€ 7,408), so we could purchase a trailer and accessories for the trailer (to carry the necessary equipment). Both the trailer and accessories represented less amount than € 1,000.

From		Amount	Where		Explanation
Category	Action	€	Category	Action	
					Accordingly, it did not change the budget but instead of one element (a second-hand car), three elements (car + trailer + accessories) have been purchased.
Equipment	C7	0	Equipment	C7	€ 3,000 was budgeted for purchasing three high accuracy GPSs and € 2,700 was budgeted for purchasing three laptops. Instead of purchasing laptops and GPS devices, we purchased combined devices (waterproof field books). Three filled books were purchased for € 4,694. Accordingly, it did not change the budget but instead of six elements (three laptops + three GPS devices), three elements (field books with integrated GPS receivers) have been purchased.
	C10	0	Equipment	C10	Instead of purchasing 3 hand- held petrol drills (original budget: 900 $\notin$ /item, in total. $\notin$ 2,700), we purchased one hand-held drill ( $\notin$ 475) which accessories ( $\notin$ 180) and two sets of electric borers ( $\notin$ 1,046) Accordingly, it did not change the budget, but we had to modify the subject of purchase.
	D2	9000	Travel	D1	The two field assistants carry out the surveys with one car. The car is owned by Arnold Erdélyi, who is accounted for in action. D1. Under the rules of the MME, the running costs are accounted for by the driver in the settlement of his own vehicle, so the amount of $\in$ 6,450 planned for the D1 action is low.
Travel	D2	1000	Travel	F1	Originally, the MME did not plan to run the management, but due to the constant contact with the coordinating beneficiary, it is necessary to transfer it.

From		Amount	Where		Explanation
Category	Action	€	Category	Action	
	D2	600	Other	E4	He MME also participates in conferences where the results of the project are presented in the form of lecture or poster.
External	C1	50000	Personal	C1	According to our experience so far, it is a problem to hire entrepreneur with adequate experience and qualification. To solve this problem in the future differently as planned we intend to involve our own employees in these tasks, The required wage cost for this ( $\in$ 50,000) could be reallocated from the external assistance fee ( $\in$ 250,000 for the action.)
	C1	7500			We would like to make the
Consumables	C3 C4	41810 844	Consumables	C1	purchase of the necessary chemicals from the cost of the planned consumables, which originally included saplings. We want to produce the necessary seedlings in our nursery instead of the previously planned purchase, thus increasing the security of sand adapted origin.
Equipment	A3	0	Equipment	A3	The method planned in this action (sampling with tractor mounted device with tree point suspension) were changed by the management for nature conservational considerations. Following a consultation with the Technical Monitor of the project, we obtained manual sampling borers without exceeding the budget (eligible: $\in$ 377.47).
Equipment	C1	0	Equipment	C1	Instead of the planned 200 hp (VALTA T234) tractor more suitable for our needs, after the following a consultation with the Technical of the project.
Equipment	C6	0	Equipment	C6	We do not intend to realise the buying of the 150 hp tractor and the self-propelled cutter planned initially for this action. Following a consultation with

From		Amount	Where	9	Explanation
Category	Action	€	Category	Action	
					the Technical Monitor of the project, we purchased a geodesic GPS (Leica VIVA G515 GNSS RTK rover) equipment, which is not included in the budget of the project. This geodesic GPS equipment necessary for delivering the most accurate data and results (eligible cost: $\in$ 5,422.49).
Equipment	E3	0	Equipment	E3	In order to provide more spectacular trainings, following a consultation with the Technical Monitor of the project we purchased two projection screens, which are not included in the budget for the project (eligible cost: $\in$ 87.37)

The following budget shifts were requested and received in the Mid-term Report. Report date: 05.06.2020. The document approving the budget shift is Ref. Ares(2020)4099022 - 04/08/2020.

	From	Amount		Where	Explanation
Category	Action	€	Category	Action	
Consumables	A3	15,000	Consumables	C3, C4	At action A3 (reagents for laboratory examinations) not all costs were used up. We would like to use up 15,000 EUR from the remaining amount for the planting of our own- produced saplings. As KEFAG is the biggest sapling-producer of the country, and it is technically reasonable to use up saplings grown near to their planting area, to ensure their accommodation to site- conditions. Accounting of these saplings would happen on cost price.

	From	Amount		Where	Explanation
Category	Action	€	Category	Action	•
Consumables	C3, C4	70,000	Other cost	C4	At forest structure- conversion and stump-depot recultivation works besides significant fuel costs remarkable reparation costs emerged for our heavy machines. As well fot the Valtra tractor obtained from project-budget, and for our initial machinery too. This is why we would like to rearrange costs from fuel costs to service costs. We would like to move 55,000 EUR in C3 action, and 15,000 EUR in C4 action to service cost. If it is possible, we would like to account service costs for C3 action too!
Personnel	C7, C8, C9, C10, C11, C12, C13	124,000	External assistance	C7, C8, C9, C10, C11, C12, C13	Due to governmental decisions, it was not possible to continue employing the forestry workers in 2020, therefore their contracts have been terminated on 31st December 2019. For coping with this, we involved external assistance from 1st January 2020. We kindly ask for the approval of this modification.

The following budget shifts were requested and received in the second Progress Report. Report date: 31.10.2021. The document approving the budget shift is Ref. Ares(2022)416695.

In the case of Action C1, we reported that we were unable to employ a sufficient number of forest workers. There was a high turnover of workers, some of whom had worked on the project for 1-1 month.

To solve this problem, we would like to transfer 25,000 EUR from Travel (A3, C1-C6) and 10,000-10,000 EUR from Consumables (C1, C3) to Action C1 External assistance. Justification: We want to end the first round of invasive treatments with contractors, this requires cost reallocation Thus, we request the transfer of 45,000 EUR from the above costs to the C1 action, because with this transfer we can carry out the first round of invasive eradication works until 30 June 2022, and our own employees would start the second round works from the spring. So, we would kindly ask to change the deadline of the second round works to 31Octobre 2022. A significant problem with invasive tree eradication is that the pre-application estimates were limited to sub-areas, and so were inaccurate, and that the observed rate of invasion was

much higher than calculated, so we have to cope with a much larger coverage and task than planned.

Because of the collapse of the global wood-chip market, we suffered significant delays in the C3 action. Businesses engaged in the removal and processing of already pulled stumps have gone bankrupt or are suspending their business. This caused that 17.97 ha of stumped area could not be planted in the spring. In the case of areas that have not yet been cleared, we have to use new, alternative methods, in which we would cut down the stumps to a depth of 30 cm with a large cutter, then loosen the soil with a ridger-bedder machine, and then we could plant it. In the case of action C3, we plan to shred the stumps into the ground with a special, heavy schredder-mulcher machine, as the stump processing contractors gave up their business due to the collapse of the wood-chip market. Our own machine is not suitable for this work. We did not initially plan any costs for this procedure, so we would like to reallocate 42,000 EUR from the following actions: from Consumables costs (fuels for tractors and heavy machines) C1, C3, C4, C5, C6 to External assistance costs C3. If we could reallocate this amount, we could finish this action until the 31May 2022.

In the recultivation of forest clearings, we had to designate a new area, as our previous clearings have naturally developed to such proto-forests that are valuable from nature-conservation point of view. Therefore, the Kunpeszér 21A forest subcompartment to be included in the previous restructuring was selected. Here we were able to work with a contractor with special machines, as our own project tractor was not suitable for this task. We have requested the transfer of the previously indicated amount of 10,000 EUR from Action C2 to Action C6 within the cost of the external assistance. The work was completed by 31 Octobre 2021, so we completed this action significantly earlier than scheduled.

In the case of KNPD's C9 action, only a small amount of progress was made in the forming of micro-clearings, out of 30.5 ha on 5.42 ha. Thanks to the administration of the authorities and the sharing of forest details, we expect significant progress in 2022 in the case of this action as well. So, we would kindly ask for the deadline to be changed to 31December 2022.

In the C12 action the survival of oak seedlings is questionable due to the 3-year long, continuously dry period. We will replant the dried saplings.

Genetic testing of oaks faced the problems already indicated: the gene pool of oaks is not researched enough to perform such tests. Instead, we plan to conduct phenological surveys and studies of ancestry conditions in 2022.

In the case of the milestone in the D4 action, we have a slight delay. So, we would kindly ask for the deadline to be changed by 31 December 2021.

In the case of KNPD, a significant problem has arisen which does not allow for the recruitment of new employees from 1 January 2020. The fixed-term employment contract of the physical staff expired on 31 December 2019. In 2020, they were employed through a contractor, as indicated earlier, so in 2020 their wage costs were reclassified from personal costs to external assistance costs. From 2021, new entrants will be employed by contract of services. The answering of our question about the accounting of these contracts of services as personnel costs is in progress. If this cannot be accounted for as a cost in the personnel cost category, then we may encounter a significant problem in the implementation of the project, which may necessitate an amendment to the contract.

On the part of KNPD, in the case of infrastructure costs, they have a smaller cost overspending of 7%, which occurred due to the purchase and renovation of the Forest Visitor Center. For external assistance costs, the budget overspending is 11% due to the transfer from personal costs to external assistance costs in 2020.

In 2020, persons employed by external assistance contractors used the car purchased by KNPD in the same way, under an agreement. We would like to ask for the permission to continue to account for this cost as a travel expense.

#### 8.2. Accounting system

All the beneficiaries are committed to use double-entry bookkeeping, which is realized by accredited software. All beneficiaries are responsible for accounting its own OAKEYLIFE related invoices. The codes identifying OAKEYLIFE project costs are:

- KEFAG Plc.: FLIFE16
- Kiskunság National Park Directorate: OAKEY LIFE EU; OAKEY LIFE FM; OAKEY LIFE ÖN
- MME Birdlife Hungary:
  - 850-210001 OAKEY LIFE Personnel Cost,
  - 850-210002 OAKEY LIFE Travel Cost,
  - 850-210003 OAKEY LIFE External Assistance,
  - 850-210004 OAKEY LIFE Equipment,
  - 850-210006 OAKEY LIFE Consumables,
  - 850-210007 OAKEY LIFE Other Cost,
  - 850-210008 OAKEY LIFE Overhead.

All invoices, or other documents justifying costs are checked, approved and signed by the responsible project leader of the individual beneficiary before accounting. On the approved invoices the identification code of the project is indicated: OAKEYLIFE (LIFE16 NAT/HU/000599), and the technical action for that the costs occurred. Then the costs of the invoice are assigned to OAKEYLIFE code in the individual beneficiaries accounting systems by the accounting departments.

The time spent on project actions are registered on electronically completed time-sheets. The work is supervised by the employees' direct leader and by project leaders and the project administrator. Their approval is needed to account the working days for the project, as they sign the time-sheets of the employees.

### 8.3. Partnership arrangements (if relevant)

In the OAKEYLIFE project the first two part of the EU contribution for the 3 beneficiaries was transferred to the coordinating beneficiary (KEFAG Plc.). Then the amounts of the other 2 beneficiaries was transferred forward proportionally to them.

The partner organizations have individual accounting systems, they manage their costs on their own. Financial reports with all supporting documents from the partners are called in to the coordinating beneficiary in every quarter year electronically (because of the COVID-19 coronavirus pandemic situation). At this time we summarize the financial spreadsheets. The costs are accounted monthly on the actual monthly HUF/EUR exchange rate. In some cases (calculating automobile costs per km) the costs need yearly supervision, so at the end of each year we correct the amount to be accounted.

8.4.Certificate on the financial statement

Please find the Beneficiaries Certificates of indicators as an annex.

Please find the Financial Statements of indicators as an annex.

Please find the Consolidated Cost Statement as an annex.

Please find the Standard Payment Request as an annex.

Please find the Summary of costs per action as an annex.

# 8.5.Estimation of person-days used per action

Action type	Budgeted person-days (planned)	Budgeted person-days (actual)	Estimated % of person- days spent
Action A: Preparatory actions	1430	1571	110%
Action B: Purchase/lease of land and/or compensation payment for payment rights	-		-
Action C – Concrete conservation actions	12675	10655	84%
Action D: Monitoring and impact assessment	2695	2493	93%
Action E: Communication and Dissemination of results	3546	2180	61%
Action F: Project management (and progress)	3395	2945	87%
TOTAL	23741	19844	84%

Budgeted person-days by group of actions:

In the case of A actions we exceeded the originally planned budget. The cause of this is that in A3 action much more fieldwork was needed, than was planned originally. The proportion of days accounted for the action has also increased compared to the Mid-term report. This can be explained by the fact that water was regularly sampled from the groundwater monitoring wells and the area around the well was regularly mowed. In addition, the project action plan was prepared regularly and the GIS database was also updated regularly.

The under-performance in the case of Action C can be explained by the fact that, due to a government decision, the physical workers for KNPD were employed by a contractor from 1 January 2020, so that the costs incurred here could be accounted for as external assistance. In addition, we were able to employ fewer forestry workers than planned, both from KEFAG Plc. and KNPD. If the KNPD forest workers had not been employed as external contractors, the number of days would have exceeded the planned number. This could be explained by the budget shift described in Progress Report 1.

For monitoring action D, we were slightly short of the planned number of days of employment. This can be explained by the fact that for some species the surveys were carried out with the involvement of students, who carried out the surveys as part of their thesis or dissertation. This contributed to the success of the project.

For Action E, there was a significant underperformance, which can be explained by the fact that the PR coordinator was hired on a full-time basis until 31 July 2022. Thereafter, the new colleague was only employed on a part-time basis. The employment of the education coordinator for KNPD was contracted out due to the previously indicated government decision, so that the costs incurred could be accounted for as external assistances from 1 January 2020. If we had not been able to employ the colleague as an external contractor, the number of days planned for the action would have been met.

There is also a slight under-execution for Action F. This can be explained by the fact that the project administrator planned by KEFAG could only be employed full time in the first year.

From the second year onwards, after several attempts, own staff were employed part-time, which significantly reduced the number of working days involved.

At the project level, 84% of the budgeted person-days were achieved compared to the planned target.

The higher spending on wages was due to the annual wage increases. Indeed, both the minimum wage and the additional wages have increased significantly compared to the budgeted levels. For more details, see chapter 8.1.

8.6 Final table of indicators Please find the final table of indicators as an annex (F1\_6).

8.7 Gantt chart Please find the Gantt chart as an annex (F1\_3).

Kecskemét, 31 March 2023

Dr. Dániel Andrési project manager

# ANNEXES

**Electronically attached deliverable products and a summary of their contents per action** (each directory contains some photos to present our activity):

# A1:

- **A1\_1:** Action plan 2017\_DPP,
- **A1\_2:** Action plan 2018\_DPP,
- A1\_3: Action plan 2020\_DPP,
- A1\_4: Action plan 2021\_DPP,
- A1\_5: Action plan 2022\_DPP,
- A1\_6: Management Guidelines\_A3\_DPP,
- A1\_7: Management Guidelines\_C1-C7\_DPP,
- A1\_8: Management Guidelines\_C1\_DPP,
- A1\_9: Management Guidelines\_C2\_DPP,
- A1\_10: Management Guidelines\_C3\_DPP,
- A1\_11: Management Guidelines\_C4\_DPP,
- A1\_12: Management Guidelines\_C5\_DPP,
- A1\_13: Management Guidelines\_D1\_DPP,
- A1\_14: Management Guidelines\_D2\_DPP.

# A2:

- A2\_1: 3D\_model\_habitats\_OAKEYLIFE\_DPP,
- A2\_2: 3D\_model\_microhabitats\_OAKEYLIFE\_DPP,
- A2\_3: 3D\_model\_species\_OAKEYLIFE\_DPP.

# A3:

- **A3\_1:** Soil-type maps of the Peszér-forest\_DPP,
- A3\_2: Photo documentation of Action A3,
- **A3\_3:** Summary of the action A3.

# C1:

- **C1\_1:** Photo documentation of the Action C1\_1,
- C1\_2: Maps of completed areas.
- **C1\_3:** Best Practice Studies C1 action\_DPP

- **C2\_1:** Photo documentation of the Action C2\_1,
- C2\_2: Maps of completed areas.
- C2\_3: Best Practice Studies C2 action \_DPP

### C3:

- **C3\_1:** Photo documentation of the Action C3\_1,
- C3\_2: Maps of completed areas.
- C3\_3: Best Practice Studies C3 action \_DPP

### C4:

- **C4\_1:** Photo documentation of the Action C4\_1,
- C4\_2: Maps of completed areas.
- C4\_3: Best Practice Studies C4 action \_DPP

### C5:

- **C5\_1:** Photo documentation of the Action C5\_1,
- C5\_2: Maps of completed areas.
- C5\_3: Best Practice Studies C5 action \_DPP

#### **C6:**

- **C6\_1:** Photo documentation of the Action C6\_1,
- C6\_2: Maps of completed areas.
- C6\_3: Best Practice Studies C6 action \_DPP

# **C7:**

- C7\_1: Detailed description of activities carried out in Action C7

### **C8:**

- **C8\_1:** Detailed description of activities carried out in Action C8

### **C9:**

**C9\_1:** Detailed description of activities carried out in Action C9

## C10:

- **C10\_1:** Detailed description of activities carried out in Action C10

# C11:

- **C11\_1:** Detailed description of activities carried out in Action C11

# C12:

- **C12\_1:** Detailed description of activities carried out in Action C12

### C13:

- **C13\_1:** Detailed description of activities carried out in Action C13

### D1:

- **D1\_1:** OAKEYLIFE\_IAS-jelentes\_2018\_DPP
- **D1\_2:** OAKEYLIFE\_IAS-jelentes\_2019\_DPP
- D1\_3: OAKEYLIFE\_Az inváziós fafajok tömegességi viszonyainak becsült értékei 2018\_DPP,
- **D1\_4:** OAKEYLIFE\_IAS\_2019\_melléklet darabszambecsles\_DPP
- D1\_5: OAKEYLIFE\_Inváziós\_újra\_felmérés\_2021\_DPP
- D1\_6: OAKEYLIFE\_Inváziós\_újra\_felmérés\_2021\_2022\_DPP
- D1\_7: Inváziós\_monitoring\_OKAEYLIFE\_ZÁRÓ\_2022\_DPP
- **D1\_8:** Szalag-erdő\_inváziós\_2019

#### D2:

- **D2\_1:** OAKEYLIFE\_habitat-jelentes\_2020\_DPP
- **D2\_2:** Közösségi jelentőségű fajok felmérése a Peszri-erdőben\_2020\_DPP
- **D2\_3:** Zárójelentés\_OAKEYLIFE\_növény\_MME\_2022\_DPP
- **D2\_4:** OAKEYLIFE\_élőhelytérékpezés\_FINAL\_2022\_DPP
- **D2\_5:** Zárójelentés\_OAKEYLIFE\_gerinctelen\_MME\_2022\_DPP
- **D2\_6:** OAKEYLIFE\_gerinces\_MME\_2022\_DPP

### D3:

- D3\_1: OAKEYLIFE socio-ecomoic survey\_2018 febr\_DPP
- **D3\_2:** OAKEYLIFE socio-ecomoic survey\_2018 sum\_MS
- **D3\_3:** OAKEYLIFE socio-ecomoic survey\_2021 sum\_MS
- **D3\_4:** OAKEYLIFE socio-ecomoic survey\_2022\_DPP
- **D3\_5:** OAKEYLIFE socio-ecomoic survey\_2022 DPP\_2

### **D4:**

- D4\_1: Ökoszisztéma-szolgáltatások fenntartható használatáról szóló tanulmány DPP
- **D4\_2:** talajvízelemzés\_DPP
- **D4\_3:** Az élőhelytípusok hatása a beporzó rovarokra\_DPP
- **D4\_4:** Az erdei legeltetés\_hatása\_OAKEYLIFE\_DPP

### D5:

- **D5\_1:** detailed\_ENG\_HUN

#### E1:

- **E1\_1:** Photo documentation of Action E1

#### E2:

- **E2\_1:** Press releases.
- **E2\_2:** OAKEYLIFE\_Layman's report\_DPP

# E3:

- **E3\_1:** Educational trail table 1.
- **E3\_2:** Educational trail table 2.
- **E3\_3:** Educational trail table 3.
- **E3\_4:** Educational trail table 4.
- **E3\_5:** Online game photo.

- **E3\_6:** Protected insects' poster
- **E3\_7:** Photo documentation of Action E3
- E3\_8: KepzesiAnyag\_OAKEYLIFE-alternatív-beavatkozasok-erdeszeknek-2020\_MS
- E3\_9: oakeylife plakát-poster-peszéri-erdő-forest-species-kulcs-fajok\_MS
- E3\_10: oakeylife-brossure-kiadvány-kulcs-fajok-peszéri-erdő-key-species-oktatás

# E4:

- **E4\_1:** networking\_report\_2018\_DPP.
- **E4\_2:** networking\_report\_2019\_DPP
- **E4\_3:** networking\_report\_2020\_DPP
- **E4\_4:** networking\_report\_2021\_DPP
- **E4\_5:** networking\_report\_2022\_DPP

### E5:

- E5\_1: OAKEYLIFE-invazívok-elleni-védekezés-képzési-anyag\_DPP

### E6:

- **E6\_1:** Photo documentation of the opening workshop

# E7:

- E7\_1: Photo documentation of the final workshop

#### E8:

- **E8\_1:** Photo documentation of the Forest Visitor Centre

### F1:

- F1\_1: KNPI\_Partnerségi megállapodás mód
- **F1\_2:** MME\_Partnerségi megállapodás mód
- **F1\_3:** OAKEYLIFE\_GANTT\_Chart
- **F1\_4:** OAKEYLIFE\_Performance Indicators
- **F1\_5:** OAKEYLIFE\_Performance Indicators 2021\_Progress Report

- **F1\_6:** OAKEYLIFE\_Performance Indicators 2022
- F1\_7: Organogram
- **F1\_8:** OAKEYLIFE project hierarchical structure of workers

F:2

- **F2\_1:** Independent auditor's report\_OAKEYLIFE\_DPP
- F2\_2: Contract of the Financial Auditor Report\_OAKEYLIFE
- F2\_3: Cover letter\_OAKEYLIFE\_Independent Financial Report\_2023

F3:

- **F3\_1:** AfterLIFE\_fenntartási terv\_OAKEYLIFE\_DPP

### F4:

- **F4\_1:** OAKEYLIFE\_Performance Indicators\_MTR\_DPP
- F4\_2: OAKEYLIFE\_Performance Indicators\_2021\_PR2\_DPP
- **F4\_3:** OAKEYLIFE\_Performance Indicators\_2022\_FR\_DPP