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LIFE+2011 BIO/FI/917

FINAL Report

**Covering the project activities from 01/09/2012 to 31/08/2017
30/11/2017 (Revised on 26/3/2018)**

ESCAPE

Ex-situ Conservation of Finnish Native Plant Species

Project Data

Project location	Helsinki, Finland
Project start date:	01/09/2012
Project end date:	31/08/2017
Total Project duration (in months)	60 months
Total budget	1.988.869 €
Total eligible budget	1.976.269 €
EU contribution:	988.069 €
(%) of total costs	49,68 %
(%) of eligible costs	50 %

Beneficiary Data

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2. Executive Summary

The EU Life+ funded project, *Ex-situ Conservation of Finnish Native Plant Species* (ESCAPE) had a clearly defined objective: to permanently improve the ex-situ conservation status of Finnish native plants and make it possible to have a reserve of propagated material to be used in reintroductions and other in-situ conservation efforts. This objective was defined in a previous EU Life+ funded project called *Vulnerability Assessment of ecosystem services for Climate Change Impacts and Adaptation* (VACCIA) that had a wide-reaching impact in several fields. The main deliverable of VACCIA dealing with ex-situ conservation was the *Strategy and action plan for ex-situ conservation of threatened plants in Finland* (Hyvärinen 2011), and it described twelve actions that had concrete and measurable tasks for the future. ESCAPE, in turn, was to fulfil some of these targets, especially those that are in the strategy considered as a responsibility of the botanic gardens of Finnish universities. These include (see Hyvärinen 2011 for details), for example, maintenance and expansion of ex-situ collections, applying multiple ex-situ conservation methods, and building a priority list for the selection of native threatened plants for ex-situ conservation.

The main objective of ESCAPE was achieved by close collaboration of four Finnish parties and with the help of interactive international networks and other contacts. In the end of the project it can be seen that the changes brought about by ESCAPE have permanently changed the situation in conservation of biodiversity in Finland and also had ramifications to elsewhere in Europe. The latter was achieved through project dissemination and networking with European-wide and global organisations.

The project targets were set in a way that the general target to increase the number of taxa in ex-situ conservation to 118 could be achieved even if some of the sub-targets, comprising of

technically different ways to ex-situ conserve would prove to be more difficult than others. However, all the different sectors in ESCAPE did proceed well and the targets set could be achieved and even surpass the expectations in different sectors. The general picture of ex-situ conservation of threatened native plants in Finland looks now very bright and this is solely thanks to the EU Life+ funding of ESCAPE project as is clearly visible if looking the timeline where the onset of ESCAPE is reflected in the total numbers of taxa and accessions/population in ex-situ conservation (Fig. 1.)

The original reference number for threatened wild plant taxa in Finland was 314 (see Miranto et al. 2012) and that comprised of taxa that fell in some of the following categories: (1) IUCN Red List categories (www.iucnredlist.org) Near Threatened, Vulnerable, Endangered, Critically Endangered and Regionally Extinct the Wild, (2) the taxa mentioned in Annexes II and IV of the Habitats Directive (www.eur-lex.europa.eu), (3) the vascular plants for which Finland is considered to be responsible for details see Rassi et al. 2001). Now 175 i.e. 56% of them are in ex-situ conservation. However, internationally the number of threatened species is defined in various ways, e.g. near threatened not included, and depending on the definition the level of Finnish ex-situ conservation the percentage now can vary between 56 and 60%. However, it is likely that the number of threatened species has increased since the last inventory and may in 2020 be markedly higher than a decade ago. Therefore, achieving the post-ESCAPE target – 75% of Finnish threatened native taxa in ex-situ conservation by 2020 – should not be taken for granted but requires joint effort from several actors in the field of conservation.

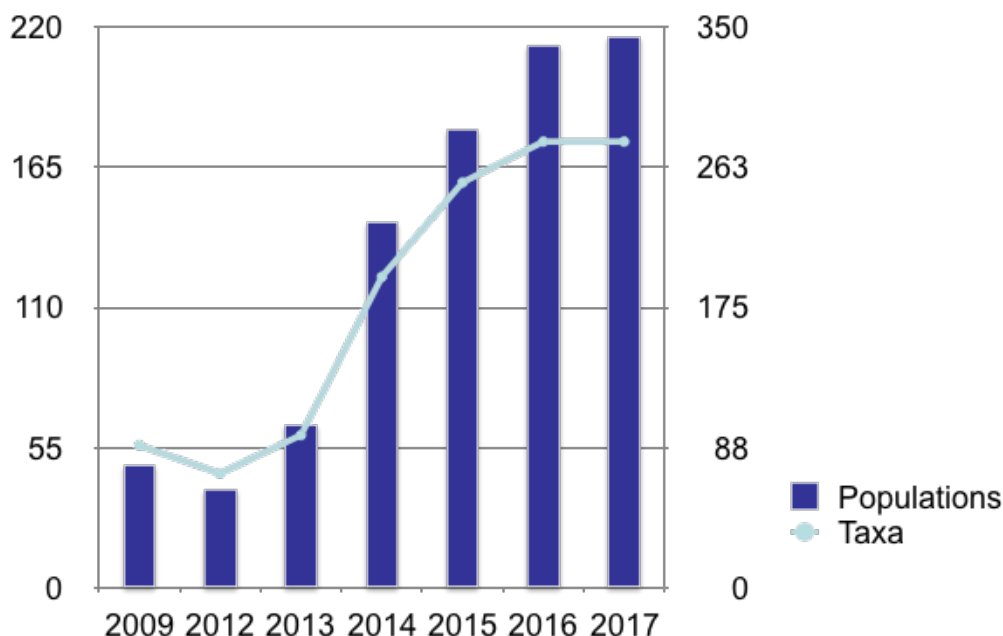


Figure 1. The number of taxa and populations in ex-situ conservation in Finland in 2009 and 2012-2017

The management of ESCAPE in a setting where there were only three partners and University of Helsinki as a coordinating beneficiary was efficient throughout the project. The small number of partners guaranteed that project coordination did not require excessive effort and hence recourses could be used to the actual concrete actions. Annual general operational meetings and visits to the beneficiaries by the project coordinator ensured coherent coordination of all actions. Video conferences were frequently used and hence the carbon footprint of the project kept in minimum. Some differences in the financial administration of beneficiaries needed extra attention from the coordinating partner but with the help of the monitoring officers, problems could be avoided and solutions to open questions were found.

The number of preparatory and concrete conservation actions in ESCAPE was relatively high, actions were largely interdependent and, hence, many of their functions needed careful synchronization. However, the work ethics was good and the sense of the common goal within the project helped substantially in building a coherent work environment between the project parties. This is reflected in project results that especially in concrete ex-situ actions as many of them clearly exceeded the initial targets.

Project dissemination was carried out as planned. In addition to that, throughout the project, there was wide general interest by the media on the project and ex-situ conservation resulting in a number of interviews and feature articles about the work carried out. One could say that the knowledge on ex-situ conservation and its value has increased dramatically in Finland during recent years. This applies not only to the general public, but to conservation professionals and decision makers. Internationally ESCAPE was portrayed as a model for other countries to tackle the ex-situ conservation challenge created by the pressing biodiversity crisis.

ESCAPE has markedly improved the potential to adapt to climate change and habitat loss but should not be viewed as the final solution to the biodiversity crisis in Finland. It is of uttermost importance that all tools in conservationist's toolbox will be used to tackle the problem in the future. Therefore, the most innovative parts of ESCAPE, such as testing assisted migration and micropropagation for endangered plant and bryophyte taxa, may turn to be most valuable in further development of conservation schemes. Also, as genetic methods keep developing more and more accessible, it seems feasible, that in the future even large collections may be accompanied by sequencing of DNA and genetic variation within and between populations can be routinely analysed. This will also help in planning tailored collection programmes for different taxa and aid in using resources in most efficient way.

One of the future long-term benefits of ESCAPE is the gained experience about the present environmental regulation in relation to completely new conservation methods such as assisted migration. This experience will be translated into proposals for the development of new policies and legislation that will allow in controlled conditions the application of such measures.

The ESCAPE project financial report is included in the report with financial tables of all beneficiaries. The coordinating beneficiary UH has compiled the Consolidated Costs tables for the whole project on the basis of information given by the Associate beneficiaries. The whole project independent External audit is also attached as an Annex Audit report, following the regulations in Common Provisions. The project budget was somewhat exceeded, but as shown in Audit report, no major mistakes or discrepancies were found in project accounts. The minor deviations from the original GA budget are explained below in Chapter 6.

As concluding remarks of the most important results of different concrete actions in ESCAPE project the following Actions should be brought up: In preparatory actions, the **priority list** of native plant taxa which most likely will benefit of ex-situ conservation activities was compiled. This list formed basis for the concrete conservation actions in ESCAPE project. As most of the priority list species grow in protected areas and/or are

protected by law, permissions for collecting and other activities were needed, and these **permissions were granted** in most cases making the project activity possible.

The project concrete conservation activities had two parallel major goals:

- 1) collecting plant materials in ex-situ collections the composition and functions of which were developed and tested in the project. These collections include the **seed bank of native plants established in the project**, developing cryopreservation and micropropagation methods and increasing the living ex-situ collections in Botanic gardens. **Altogether 175 taxa were collected in the ex-situ collections**. More details shown in Actions C.1, C.2, C.3, C.4 and C.5 in Chapter 5.
- 2) Parallel and integrated goal was to develop and utilize the ex-situ collections in species conservation activities including reintroductions to nature, population strengthening both in decreasing natural populations but also in living collections in botanic gardens and testing the prerequisites and practices of assisted migration. **Altogether 8 taxa were reintroduced** Action C.8, populations of **8 taxa were increased** (Action C.6) by ex-situ cultivated individuals, **3 taxa were used for trials on assisted migration** (Action C.7) and additionally, **2 bryophyte species were used in ex-situ trials** (Action C.5), all these altogether 18 taxa with variable but mostly rather good results.

As increasing peoples' knowledge and interest on ex-situ conservation was one of the main targets of the ESCAPE project, rather big effort on dissemination activities was implemented in ESCAPE project. The dissemination products include **guidebooks** for ex-situ professionals, scientific and popular **articles, seminars, exhibition** and other events for the general public and an integrated **workshop for school-kids**. These dissemination products are listed and described in the Actions D.5, E.1, E.2, E.3 and E.4 with annexes in Chapter 5, and the obligatory **Layman's report** (Action E.5) produced in three languages on the project website www.luomus.fi/escape.

Literature cited: Miranto, M., Hyvärinen, M., Hiltunen, R. & Schulman, L. 2012: Ex situ conservation of threatened native plants in Finland: analysis of the current status. – *Endangered Species Research* 17: 227-236.

3. Introduction

In Europe, the conservation status of more than half of the habitats and species listed in the annexes of the EU Habitats directive is classified as unfavourable, and the target of halting biodiversity loss by 2010 was not achieved. Therefore, plants protected ex-situ, for instance in botanic garden collections, are increasingly important to supplement in-situ conservation. From ex-situ collections, conserved in the form of living plants, stored seeds, and tissue cultures, plants can be reintroduced to their original or, where necessary, ecologically restored habitats.

ESCAPE project was specifically aimed to improve the ex-situ conservation status of threatened Finnish native plant species. Before the project started only 11% of were ex-situ conserved and often taxa were represented only by few or only one collection from the wild. The general target was to increase the number of taxa in ex-situ conservation to 118 (60% of threatened plant taxa). In order to achieve this, we specifically proposed to a) establish a feasible infrastructure for ex-situ conservation (inc. seed-bank), b) develop methods for cryopreservation and micropropagation of endangered taxa, c) develop living collections in botanic gardens and d) test assisted migration and reintroduction with selected species. Moreover, endangered bryophyte species were included in micropropagation and reintroduction schemes. Dissemination through compiling instructions on ex-situ conservation methodology for conservation professionals and informing general public were also a specifically set targets of the project.

ESCAPE was based on two sites Helsinki in South Finland and Oulu in North/Central Finland according to the locations of botanic gardens involved. The field sites for assisted migration experiments were located in the north of the country but restoration experiments were carried out in all parts of the country. The seed bank is in Kumpula botanic garden in Helsinki (University of Helsinki), and micropropagated and cryopreserved collections are located in the Oulu botanic garden (University of Oulu).

The target species for ex-situ conservation were selected during the project according to a specific assessment protocol taking into account twelve criteria: 1) the red-list status of the taxon in Finland, 2) its reproductive capacity, 3) the population size of the taxon, 4) fragmented distribution area, 5) species' red-list status in areas neighbouring Finland, 6) marginal or disjunct population in relation to its total range, 7) danger of cross-breeding with close relatives, 8) vulnerability to climate change, 9) the species listed in the EU Habitats Directive Annex II (Directive 92/43/EEC of the Council of Europe, 21.5.1992) with status unfavourable or bad, or listed either threatened or near-threatened on the EU red-list, 10) Finnish native plant taxa with European or North-European endemic distribution, 11) Finland's international responsibility species, and 12) species classified as particularly valuable crop wild relative.

ESCAPE can be viewed as part of the adaptive set of measures taken by the society in the face of climate change. However, climate change is not the sole threat behind the reasoning for ex-situ conservation. By far the most important threat to biodiversity is caused by changes in land use. Ex-situ conservation has already proved to be instrumental in rescuing populations and genetic diversity of taxa that suffer from sudden changes in the environment. The impact of climate change is not quite yet so imminent in terms of extinction of species. However, it is most important to act before large scale losses of biological entities take place.

From socio-economic point of view ESCAPE has managed to develop standards and instructions to ex situ conservation, and hence, there is an opportunity to build economically viable business model for ex-situ conservation threatened species. Mainstreaming ex-situ conservation and communicating the importance of ex-situ conservation as part of the general attempt to halt the loss of biodiversity have been most influential socio-economic achievements of the project.

The establishment of gene bank, formed by seed-bank and other ex-situ collections, for Finnish threatened native plant species as well as the methodology developed during ESCAPE has got long-term impacts on the conservation status in Finland and also elsewhere. At the moment 60% of threatened plant species in Finland are in ex-situ conservation and this proportion can even be raised to 75% by the end of the century as recommended by the newest version of the Global Strategy for Plant Conservation. Also one of the long-term developments will raise from the international communication and collaboration during ESCAPE. The extension of the national seed bank to include threatened species from neighbouring EU Countries has been negotiated in several occasions and looks like a natural step forward.

4. Administrative part

4.1 Description of the management system

The description and evaluation of the ESCAPE project management follows the system described in Action F.1 in ESCAPE Grant Agreement and its subsequent changes reported in ESCAPE Inception report 31.5.2013 and in Progress report 31.1.2014.

Presentation of the role of the ESCAPE Coordinating beneficiary University of Helsinki

The responsibility of the operational activities of the ESCAPE project is on LUOMUS Botany unit under general administration of the Coordinating beneficiary University of Helsinki. The operational leadership of the ESCAPE project was on responsibility of the Project coordinator Sanna Laaka-Lindberg, who co-operated closely with the Project leader Marko Hyvärinen, ESCAPE core team members (LUOMUS Head of administration, UH project administration officer, and PR and press officer), ESCAPE Management board (MB) including ESCAPE core team and the beneficiary leaders, and the Action leaders.

The Project coordinator arranged annually operational meetings before the starting of the field season, visited ESCAPE beneficiaries' offices and participated meetings arranged by the Associate beneficiaries and Action leaders. The ESCAPE official meetings included monitors' annual visits, project annual meetings which included MB and Steering group SG meetings. The roles of all ESCAPE staff members are listed in Annex FR Administration. The coordinating beneficiary UH required the Associate beneficiaries' financial reports annually and in the end of the project arranged the external audit concerning all beneficiaries, see Action F.4 below.

Presentation of the role of the ESCAPE Associate beneficiaries

ESCAPE project has three associate beneficiaries: University of Oulu (UO), Metsähallitus (MH) and Finnish Environment Institute (SYKE). The partnership agreements were delivered to the commission with the Inception report in 31.5.2013.

UO has performed the project administrative procedures as an associate beneficiary of ESCAPE following the procedures of University of Oulu EU funding schemes. UO has run the Actions it is responsible for, and participated the planning and operative activities of those Actions UO is participating in. Cooperation in ESCAPE launching, PR, field work with e.g. local ELY-centers and networking worked well and effectively with the coordinating beneficiary UH and UO along the whole project.

Associate beneficiary MH has actively co-operated with the coordinating beneficiary of the project as well as the other project parties on issues concerning project administration. MH staff has given its input to reporting. In the ESCAPE project annual meetings, spring meetings and other events including the monitor's visits MH participants were in contact either in-place or by video communications system. The video conference system was taken into practice in ESCAPE as a MH initiative resulting in minimizing the project travel costs as well as making possible for more people to attend the meetings. It proved to work very well.

Associate beneficiary SYKE co-operated with the coordinating beneficiary UH as well as other project parties on issues concerning project administration. The role of SYKE on preparative issues concerning the permit applications and contacts to local ELY-centers essentially enabled the field work on collecting and concrete conservation actions.

All associate beneficiaries did not completely follow the agreed and EU required schedules of delivering their financial data to the Coordinating beneficiary, but all of them did send the data when specifically requested, thus most of the financial project administration worked adequately well.

The ESCAPE project's management structure

The project management structure was modified by reducing the weight of SG in operational management (see Fig. 2, reported already in Inception report 31.5.2013 and Progress report 31.1.2014).

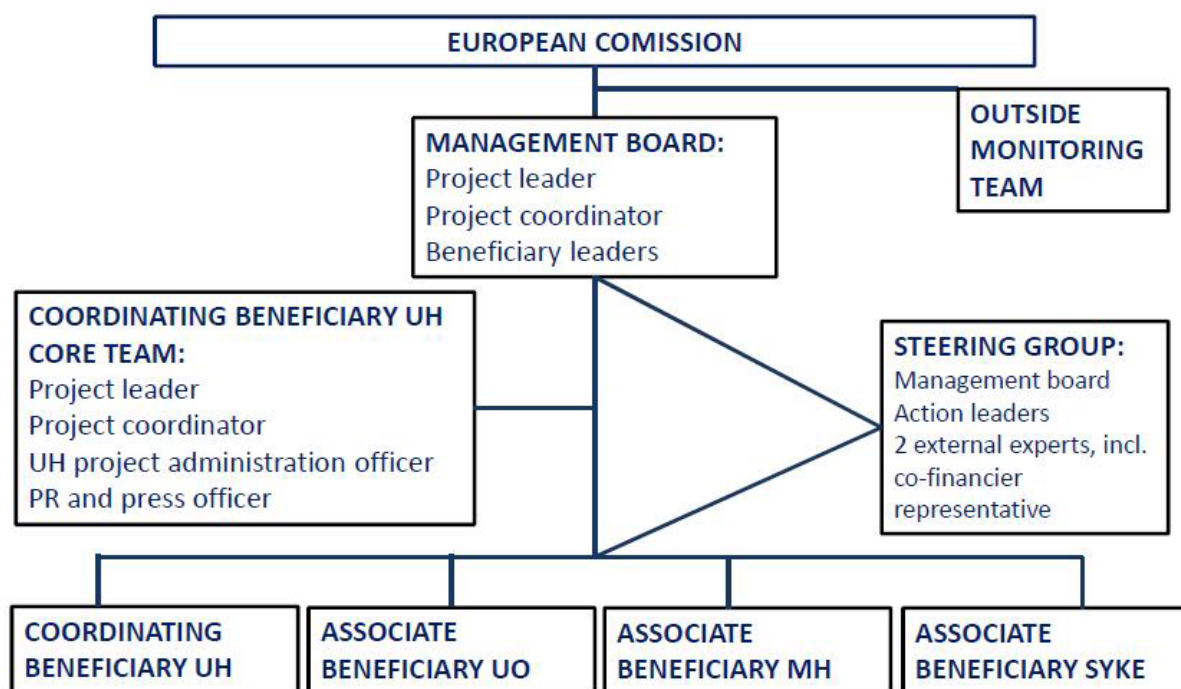


Figure 2. Modified organigram of the ESCAPE project management.

Changes in ESCAPE staff

Some person changes were made on the basis of the original representatives' transfer to other duties or retirement in the ESCAPE beneficiaries' organizations along the project run. These changes are listed in Annex FR Administration.

Reports delivered

The Inception report of ESCAPE project was delivered on 31.5.2013. The Progress report PR1 was delivered on 31.1.2014. Mid-term report (MT) was delivered with a short delay requested from 31.1.2015 to 6.2.2015 (permitted by Mr. Arnoud Heeres, e-mail). Progress reports PR2 was delivered on 31.1.2016 and PR3 on 10.2.2017. Additionally, ESCAPE project internal reports and Milestones have been prepared and filed, and most of them published on the ESCAPE web-site www.luomus.fi/escape.

Extension of the project duration

Some delays in the project initial phase activities were accepted for the Actions A.3 and C.9 (see the letter of acceptance of ESCAPE project Inception report (dated 4.7.2013, ref.nr ENV/E3AH/PR/bp ARES (2013)2573158 by Mrs. Anne Burrill). These did, however, not affect the total project duration. Therefore no substantial extensions on project duration were needed.

Description and schematic presentation of working method

ESCAPE project started on 1.9.2012 and ended most of the practical project activities on 31.8.2017. Basically, no major changes except those mentioned in the action description below (see chapter 5.1) and approved by the Commission were encountered. The project can be divided in four phases with somewhat differing emphasis on main activities:

In the 1. *Initiative phase* (1.9.2012-31.5.2013), the project organization was set up with the project staff members recruited and/or seconded to the tasks in the project. Planning and preparing the project actions was started with special emphasis on putting up the priority list of ex-situ conservation of native plants.

During the 2. *Starting phase* (1.6.2013-31.1.2014) the permissions for collecting plant material and other activities were applied (SYKE, UH), management plan for the focal species habitats was prepared and activities in the field were started (MH), e.g. establishing

the monitoring plots and transects, and checking the background data for selecting suitable species and sites. The ESCAPE seed bank was established in Kumpula Botanic garden UH, and facilities for cryopreservation tested and the work started with ESCAPE priority species UO. The PR work towards the ex-situ and species conservation professionals and the general public was initiated, as well as co-operation and networking with other projects.

During the 3. *Data collecting and field action phase* (1.2.2014-31.12.2016) field work was proceeding and active collecting of materials continued. First results of the ex-situ operative work and research were obtained. Several milestone reports were prepared and visibility on the project web-site and other media highlighted. Also many of the intensive outreach activities were performed during this period, see e.g. Actions E.2 and E.3 below.

The last project phase 4. *Publishing and reporting phase* (1.9.2016-31.8.2017) overlaps partly with the previous phase. The material for reports and publications was collected and analyzed, and publications prepared and launched on the website and/or printed. Towards the end of the project, especially the coordinating beneficiary UH staff working hours were directed to publishing tasks. It was realized along the project run, that these activities needed more effort than expected in the original plan. This change in focusing did not, however, affect the whole project run.

The technical management of the Actions was divided in Actions, responsibility of which was agreed in the Project Launching meeting in 6.9.2012. The Action leaders were to follow common rules agreed on and written by the project management board. The Action leaders' instructions are presented in Annex FR Action leader Instructions, and the Action leaders listed in Annex FR Administration.

Planning of the annual field work and scheduling the project activities was done both on the whole project level in ESCAPE spring and annual meetings and in local meetings with Action leaders and other ESCAPE staff. These meetings and other ESCAPE project events (including also the project Deliverable and Milestone deadlines) are listed in Annex FR Calendar2012-2017.

4.2 Evaluation of the management system

The project management process. In the starting phase of the ESCAPE project some problems were encountered on the basis of delay in the start of the project. In practice on the Northern latitudes like in Finland, one field season was lost, and therefore starting of some of the activities was postponed and approved by Commission (see letter of Mrs Anne Burrill 10.4.2013 ENV.E3 CO/PR/em ARES (2013) 639111). These postponed activities included the Action A.3 management plan, which was originally to be finished by 30.6.2013, was completed in 17.12.2013. This delay led to delays in starting the management activities of the Action C.9. Similarly, the establishment of the seed bank in Kumpula Botanic Garden was delayed from the original timing, and consequently the seed collections could not be started before the field season 2013. These delays were completely compensated by the end of the project.

The project activities were divided in Actions grouped on the basis of their main aims (see GA and Technical report, chapter 5.1 below). Responsibility of running the Actions was given to named ESCAPE staff members on the basis of mutual agreement in the project launching meeting in 6.9.2012. These Action leaders are basically specialists on their named activities. The tasks and responsibilities of Action leaders were listed and described in instructions (see Annex FR Action leader instructions) written by MB and distributed to all named persons. Some internal practices in ESCAPE beneficiaries' organizations caused problems to project administration, because some internal regulations of the ESCAPE beneficiaries did not follow exactly the rules in LIFE+ Common Provisions. These include e.g. internal invoicing based on competitive bidding (see Chapter 6.2.4), temporal staff recruitment and regularization, and

time registering systems. With help of monitoring officers at ElleAstrale and Neemo, ESCAPE project found solutions acceptable by Common Provisions and EU Commission. The division of labor between the ESCAPE beneficiaries worked well, and in the cooperative actions no specific problems were encountered in communication or in practice. Somewhat problematic were the geographic distances between the partners, but electronic communication and video conferences reduced these difficulties, and also lowered the travelling costs. The ESCAPE project operated on national level in Finland, which was challenging in organizing the field work efficiently. Therefore e.g. part of the seed collections were organized by local experts and volunteers.

Communication with the Commission and Monitoring team. ESCAPE project arranged annually monitoring visits with ElleAstrale/Neemo Ltd. All meetings were suggested by the monitoring officer, Milka Parviainen/Sonja Jaari, with whom the communication worked well. The meeting dates were 16.1.2013, 24.4.2014, 12.1.2015, 3.10.2016 and 3.11.2017. ESCAPE arranged on request by Commission a Joint mission visit for the EU technical desk Arnoud Heeres and financial desk Päivi Rauma on 29.9.2015. Additionally, project coordinator has been in contact with LIFE+ financial desk Päivi Rauma in two platform meetings: first in Lohja, Finland on 5.9.2012, and second in Rovaniemi, 9-11.6.2014, and also other EU commission representatives in connection to attended Platform meetings.

5. Technical part

5.1. Technical progress, per task

A PREPARATORY ACTIONS, ELABORATION OF MANAGEMENT PLANS AND ACTION PLANS

Action A.1 Target species and site selection

Action leader: Terhi Ryttyäri, SYKE

Time foreseen: 1.9.2012-31.3.2013.

Action Status: Completed

Expected results/ Objectives: A priority list of species in most urgent need of ex-situ conservation and a list of suitable sites for conservation activities prepared. A set of criteria for assisted migration (AM, Actions C.5, C.7) elaborated. Sites for AM and reintroduction experiments selected (Actions C.5, C.7 and C.8).

Deliverables and Milestones:

Deliverables: **Priority List of 100 native plants published** (delivery date 31.1.2013 / DL 31-01-2013) Published on project website https://www.luomus.fi/sites/default/files/escape-100-lajia_300113.pdf and reported in INCEPTION report as Annex 7.2.1. Action A.1 Priority list of 100 native plants).

A set of criteria for AM published in the webpage (delivery date 31.1.2013/ DL 31-01-2013). Published on project website https://www.luomus.fi/sites/default/files/files/am-criteria_310113.pdf and reported in INCEPTION report as Annex 7.2.2. Action A.1 A set of criteria for AM published).

Milestones: **Principles for the selection of vascular plants** (delivery date 31.1.2013 / DL 31-03-2013). The species selection criteria for the priority list is included in https://www.luomus.fi/sites/default/files/escape-100-lajia_300113.pdf)

Completed activities and products of the action: The aim of Action A.1 was to produce a priority list of vascular plant species, which have the most urgent need of ex-situ conservation activities and to prepare a list of suitable sites to carry out the conservation activities, such as which populations are suitable for collecting seeds (Action C.1) and which are in need of

population increase (C.6). The objective of the action was also to elaborate a set of criteria for assisted migration (AM), that would be tested in Actions C.5 and C.7, and to select sites for assisted migration and reintroduction experiments (Actions C.5, C.7 and C.8).

1) The aim of the priority list was to find those vascular plant taxa, which have the highest risk of regional extinction and which, at the same time, would clearly benefit of ex-situ activities (such as reintroductions to the disappeared sites, assisted migration or strengthening the populations with ex-situ propagated individuals). Also those taxa, whose genetic uniqueness needed to be ensured by taking material to seedbank, cryopreservation or outdoor collection in botanic gardens were identified. As a result an ex-situ priority list of 100 native plants was prepared and published as a pdf at http://www.luomus.fi/sites/default/files/escape-100-lajia_300113.pdf . During the ESCAPE project the priority list and the priority criteria https://www.luomus.fi/sites/default/files/files/escape_priorisation_explanations_version_2.3.pdf of the threatened Finnish native plants was continuously used as a basis for selecting and prioritizing the collection activity. The completed activities of the Action A.1 have thus served the other Actions of ESCAPE project as was the target of this Action.

2) A list of suitable sites to carry out the conservation activities was accomplished: After producing the initial priority list for species, the exact sites where the various activities (seed or plant tissue collection, sites for reintroduction) could be carried out, were identified. In this work the Taxon-database (In Finnish: Eliölajit-tietojärjestelmä) maintained by SYKE was the main source. This database includes extensive data on threatened species and their present and former sites and present condition. In selecting the sites for the activities of this project, the following issues were taken into account: the population had to be in a viable state for collecting seeds, the site is ecologically suitable for reintroduction or population reinforcement, it should situate on a protected area to ensure the future succession of the introduction, and when operating on private land the land-owner had to be willing to cooperate. The results consisting of geographical and population data were collected into an excel-file which was delivered to LUOMUS/UH (see Annex FR Action A.1.1). Because of the sensitive nature of the data this Excel-file is not public and it was not published on the project web-site. In the project, the information was widely used to find suitable sites to seed collection and other activities during the project.

3) Developing the criteria for assisted migration (AM): In order to carry out ecologically, ethically and economically sustainable conservation through assisted migration, a theoretical basis for the method was developed and subsequently tested in the Actions C.5 and C.7. The aim was to assess the susceptibility of Finnish plant species to negative impacts of climate change and to establish rigorous criteria for using assisted migration as a conservation method. The practicability and robustness of the theoretical framework was tested by moving model species to future suitable areas. The Assisted Migration Criteria was published on the ESCAPE project's web site: https://www.luomus.fi/sites/default/files/files/am-criteria_310113.pdf

4) Selecting sites for assisted migration and reintroduction experiments: Sites for reintroduction experiments (C.8) were chosen for four species in 2012-2013: *Polygonum oxyspermum*, *Epilobium laestadii*, *Carex viridula* var. *bergrothii* and *Armeria maritima* ssp. *intermedia* (the last was not in the original plan but was selected because the circumstances for the case were optimal: critically endangered species, the site where the plant had disappeared was now protected and under management, see also Action C.8).

Staff members responsible for this action in GA: Action leader/Senior researcher Terhi Rytteri, Species conservation officer Mika Kalliovirta SYKE, Director/Beneficiary leader Leif Schulman, Unit director/Project leader Marko Hyvärinen, Curator Leo Junikka (until 31.3.2016), Mikko Piirainen (from 1.4.2016 onwards) UH. NOTE: The personnel cost

resources allocated to this action in GA for a temporary Planner UH were shifted to Action C.2.

Perspectives for continuing the action after the end of the project:

Producing the top 100 priority list for threatened vascular plants was a useful exercise which will help setting priorities in species conservation also in long term. By this list we identified species which can be helped with ex-situ –activities. On the other hand it raised up cases where other actions are more relevant, or there is still lack of knowledge and knowhow in ex-situ -methods. Concerning assisted migration, the framework developed will enable conservation practitioners to do case-by-case assessments of the possibility to assist target species in their migration.

Problems encountered: The original plan was to establish the ex-situ priority list for species selection for ESCAPE activities and criteria for AM trials, and utilize these. However, EU commission required species selected and named already in the project plan without such criteria. This caused some problems and some species selections obliged by commission were not completely suitable for e.g. AM trials. However, ESCAPE project evaluates these species selections based on the scientifically and societally valid criteria developed in connection to this project.

Action A.2 Permits to collect seeds and plant tissue materials

Action leader: Heidi Kaipainen-Väre, SYKE

Time foreseen: 1.10.2012-30.6.2013, thereafter 1.1.-31.3 annually from 2014-2017.

Action Status: Completed

Expected results/ Objectives: The application process is properly done and any possible conflicts due to lack information or communication between researchers, authorities and land-owners are avoided.

Deliverables and Milestones: Deliverables: None.

Milestones: Permit applications for 60 vascular plants. (delivery date 15.9.2016 /DL 31-01-2017). Reported in Annex PR3 Action A.2.1.

Completed activities and products of the action: The aim of this action was to apply permits for species collection and treatments, as well as permits for habitat management of target species. As a result of this action the application process is properly done and any possible conflicts due to lack information or communication between researchers, authorities and land-owners was avoided.

As most of the ESCAPE target species are threatened and protected by Finland's Nature Conservation Act, and many of them grow in protected areas, both private and state owned, permits of species collection and treatments as well as their habitat management were applied. The applications were written by the action leader Heidi Kaipainen-Väre and project coordinator Sanna Laaka-Lindberg. Altogether 14 original permit applications were sent to ELY-centers and 1 to MH (see a model of the original permission application Annex FR Action A.2.1). Almost all ELY-centers asked several additional questions after which the revised permits were validated. ELY-centers authorized ESCAPE with the permits mainly by 31.12.2013 (see an example: Annex FR Action A.2.2).

Separate and additional permits were applied in 2014 for bryophyte collecting and management (e.g. LAP, EPO, KES), seed collecting in Ahvenanmaa and collecting of species protected by law in relevant ELY- centres.

Complementing seed export permissions were applied for the duplicate seed sets sent to Millennium Seed Bank, Wakehurst Royal Botanic Garden in UK from those ELY-centers (ESA, HAM, KAI, KES, LAP, POK, POP, VAR and POS) which didn't automatically include export permission in the original collecting and storing permission. The original applications for ESCAPE general collecting and action permissions did not cover all species and areas, and thus complementary permissions were applied annually.

Five ELY-centers (ESA, KAS, LAP, POS, PPO) required an annual report on ESCAPE collections and other activities on their areas. By 31.8.2017 altogether 48 permissions based on ESCAPE project applications have been granted. The original general permit applications included the total list of 204 vascular plant species. In Milestone Action A.2, the targeted number of taxa named in permission applications for specific collection and activity permissions was 60. By the Milestone deadline, altogether 81 taxa are named in specific applications (see Annex PR3 Action A.2.1).

Additionally, a student trainee Juuli Vänni on ELY-centers' decision-making process on species conservation permissions in Finland (Turku University of Applied Sciences) utilized the empirical permission application data in her thesis (Vänni, J. 2015: Luonnonsuojeluviranomaisten poikkeuslupaperusteet ja käytännöt ex situ –suojelussa. Turku ammattikorkeakoulu. Turku University of applied sciences. 45 + 2 p., see Annex PR2 Action A.2.1.Thesis Vänni 2015.pdf) under supervision of environmental legislation specialist Elina Vaara and ESCAPE project coordinator Sanna Laaka-Lindberg.

Staff members responsible for this action in GA: Action leader Heidi Kaipainen-Väre SYKE, Project coordinator Sanna Laaka-Lindberg UH.

Perspectives for continuing the action after the end of the project: To persist and collect more material to the seedbank established during ESCAPE-project means, that new permits must be applied regularly. This needs to be planned well in advance before new growing seasons. The environmental administration is going to change in near future (2018/2019) and it is not yet clear which authority will be responsible of permitting the collecting of protected species. However, the principles and the structure of the applications are now clearer than before ESCAPE-project started. The permission process used in ESCAPE project was used as basis for recommendations in ex-situ conservationists guidebook published in ESCAPE project, see Annex FR Action E.1.1. Thus it will guide the future ex-situ users to always consider carefully the need for permissions. Some ELY-centers required the reports on ESCAPE activities in their areas by the end of 2017, which will be followed and fulfilled appropriately.

Problems encountered: Some of the original general activity and collecting permissions were delayed, which caused delay in starting collecting and field work activity in 2013.

Action A.3 Elaboration of management plans for sites and actions involved in conservation

Action leader: Anne Jäkäläniemi, MH (until 31.7.2014), Pauliina Kulmala, MH (1.8.2014 onwards).

Time foreseen: 1.10.2012 - 30.6.2013, postponed to 31.12.2013.

Action Status: Completed

Expected results/Objectives: The expected result of this Action was to compose a detailed management plan for concrete conservation actions (combined for actions in relation to preparatory actions and action hierarchy C.1 - C.8 = 1 plan) and separate management plans for sites selected for focal species in C.7 and C.8 (3-6 plans).

Deliverables / Milestones: Deliverables: None.

Milestone. Detailed management plans ready for sites: (delivery date 17-12-2013, DL 30-06-2013). Postponing the management plan milestone deadline was approved by Mrs Anne Burrill in the letter dated 10.4.2013 (ENV.E3 CO/PR/em ARES (2013) 639111) following the project monitoring. Milestone was completed by the new deadline 31.12.2013. Management plan available at [ESCAPE management plan 17.12.2013](#), see also Annex A.3.1. ESCAPE Progress report.

Completed activities and products of the action:

The field data for detailed management plans was collected during the summer and autumn 2013. General management plan ([ESCAPE management plan 17.12.2013](#)) combining

concrete conservation actions C.1 - C.8, and Special management plan including individual plans for sites selected for focal species were both completed by 31.12.2013. The plans were produced and approved by ELY centres according to Metsähallitus' national standards. General part describes the actions and lists the sites where actions will be implemented. The General management plan is presented as an Annex A.3.1 in ESCAPE Progress report I 31.1.2014. The Special management plan describes the field actions in sites of ESCAPE focal species in Actions C.6, C.7 and C.8, with detailed maps of endangered species localities. Since the Special management plan contains non-public information on threatened species, it is not available on the ESCAPE web-site, but in the archives of MH and ESCAPE project. A final Management plan for Actions C.7 and C.8 and part of the focal species in Actions C.6 was completed by summer 2014, including altogether 25 localities for ESCAPE focal species activities. The completed management plans were the basis for the field activities on the focal species for the Actions C.6-C.9 and D.2 during the whole project, and will guide the monitoring of the success of the Actions after the project.

Data for General management plan for ESCAPE activities C.6-C.9 (a milestone A.3, original deadline 30.6.2013, postponed until 31.12.2013, see Action A.3 in the Inception report 31.5.2013) is A separate Special management plan including individual plans for sites selected for focal species in C.6, C.7, and C.8 was completed by 31.12.2013, and kept in the archives of MH as it contains sensitive information on endangered species localities.

Staff members responsible for this action: Action leader Anne Jäkäläniemi (until 31.7.2014), Pauliina Kulmala (1.8.2014 onwards) MH, Project leader Marko Hyvärinen, project coordinator Sanna Laaka-Lindberg UH

Perspectives for continuing the action after the end of the project: On the basis of the management plan, monitoring of the focal species in Actions C.7 and C.8 will continue on a regular basis for at least 15 years after the project end (see GA). The first monitoring year after the project will be 2023, and after that, the monitoring will be repeated every three years until 2032.

Problems encountered: The field data collecting for the focal sites was delayed by one field season (from 2012 to 2013) because of the ESCAPE project launching was delayed. Because of that, also the beginning of field activities guided by Management plans was delayed. Despite of the delay, the objectives of the C.6-C.8 Actions were well achieved.

C. CONCRETE CONSERVATION ACTIONS

Action C.1 Collection of seeds and other plant material

Action leader: Henry Väre, UH.

Time foreseen: 1.4.-31.12.2013, thereafter 1.4.-31.12 2014 - 2016, 1.4.-30.8.2017

Action Status: Completed.

Expected results /Objectives: The collection of seeds and other plant material will feed material for the actions C.2, C.3, C.4 and C.6. It can be estimated that during the first year of collection (2013) seeds from 50 endangered taxa will be collected totaling of c. 50000-70000 seeds. In the same time material for micropropagation will be collected from 10 taxa. During year 2014 a similar number of seeds will be collected and also tissue material from 15 taxa. It is assumed that a similar effort as in 2015 may be needed to reach the project targets. Total number of seed collected during the project will exceed 50 000, and pieces of plant material over 2000.

Deliverables / Milestones: Deliverables: None.

Milestones: **Seeds from 50 taxa and other material from 10 taxa (DL 28-02-2014)**

Reported on ESCAPE website <http://www.luomus.fi/fi/etasuojelussa-olevat-lajit>

Seeds from additional taxa, adding up to 100 and 25 taxa, (DL 28-02-2015) Reported on website https://www.luomus.fi/sites/default/files/files/escape_milestones_c_1_1_31_2015.pdf

Completed activities and products of the action: The total number of collecting attempts made for seed bank in 2017 was 24. Four collections proved to contain no proper seeds, and one seed sample contained only few seeds that will be sown in the spring 2018 in order to obtain plants to the garden collections (see also Action C.4). Thus, 19 collections, consisting of 15 different taxa, ended up to the seed bank during the last activity year 2017. The seed bank collections increased by five new taxa, and one additional new taxon yielded few seeds for direct sowing. The focus of this reporting period was complementary collecting of species with low numbers of seeds in the seed bank, and increasing infraspecific genetic diversity by sampling more populations of the taxa already in the seed bank. The number of same-site recollections was four and additional populations were gained for eight previously stored taxa. Other plant material than seeds collected during the reporting period covered 25 *Salix pyrolifolia* cuttings and 10 *Viola uliginosa* plants.

Overall results: The list of stored plant materials collected during the reporting period and the entire project is presented in the Annex FR Action D.1.1. The list is compiled in cooperation with Actions C.2, C.3, and C.4, and consists of all the different types of plant material stored in various ex situ conservation facilities in UH and UO.

The total number of taxa collected as seeds either to the seed bank or to the garden collections was 156; an estimated number of good quality seeds is 1 541 785 seeds. Although clearly exceeding the goal, the number is an underestimate as it excludes several accessions collected year 2017 still being processed, and all the orchid accessions, because their exact quantity estimation would need special equipment due to the minute size of the seeds.

Overall, the seed collectors carried out 293 collection efforts. Of these, 253 (86%) yielded a minimum of 100 seeds to be stored at the seedbank. A further 21 collections brought about seeds that were too few to seed bank but that were sown to produce living plant specimens for botanic garden collections or for reinforcement trials. One taxon, *Anemonia trifolium*, with desiccation intolerant seeds, was collected only for direct sowing at the seed lab and further growing in the garden nursery.

Other propagation material than seeds was collected from ten different taxa. It proved out that the number of 35 taxa foreseen in GA was unnecessarily high, as only a few species actually required sampling vegetative plant parts. Whenever possible, propagation by seeds is advisable due to their resilience in transportation and processing, and due to the feasibility of getting wider genetic representation of the population. For these reasons, a great proportion of the micropropagated and cryopreserved material originates from seeds. The numerical target of 2000 pieces of other plant material than seeds has been accomplished. By the end of the project, about 3 000 pieces of plant tissues was achieved, and with bryophyte spores included, the number of other plant parts exceeds 20 000.

Staff members responsible for the action in GA: Action leader/ Senior Curator Henry Väre, Curator Mikko Piirainen, Senior herbarium technician Mari Miranto UH, Curator Annu Ruotsalainen UO, Beneficiary leader Terhi Rytteri, Researcher Martina Reinikainen SYKE.

Perspectives for continuing the action after the end of the project: Seed bank established in ESCAPE project (see Action C.2) will continue its work after the project ends (see also Annex FR Action F.3.1). More species and accessions will be collected in order to fulfill the agreed 75% of threatened native plants in ex-situ conservation and gathering as wide sample of the species genetic diversity as possible.

Problems encountered: None.

Action C.2 Seed bank and development of feasible seed conservation protocols

Action leader: Mari Miranto, UH.

Time foreseen: 1.4.2013-31.8.2017

Action Status: Completed.

Expected results /Objectives: By the end of 2015 there are 55 threatened native plant taxa stored in the seed bank. By the end of the project this number reaches 80. It is estimated that the seed banking method has to be fine-tuned for 15 species before they are successfully banked.

Deliverables / Milestones:

Deliverables: List: ex-situ conserved native plants in genebank (delivery date / DL 31-05-2017) Presented on project website

http://luomus.fi/sites/default/files/files/escape_deliverable_c2_300517_0.pdf, see also Annex FR Action C.2.1)

Milestones: Seed bank ready to accept seeds (delivery date 19.6.2013 / DL 30-09-2013). Reported in ESCAPE Progress report 310114.

Completed activities and products of the action:

The Action C.2 Overall results include these activities and results implemented during the last year of the project 2017:

- 1) Nineteen seed lots collected during the summer 2017 covering 15 taxa are being processed and stored to the seed bank.
- 2) Germination testing for orchid seeds continued in the collaboration with the Botanical Garden of the University of Oulu. Nine orchid and wintergreen (Pyrolaceae) species cryopreserved the previous year were studied for a suitable germination medium. This year major contamination problems were avoided, and the tests including two different growing media and four different pretreatment methods are still running.
- 3) Initial germination tests were completed for 12 new accessions (18 unique tests). A successful germination method (germination percent $\geq 85\%$) was found for seven accessions (58%), but the tests of two accessions are still in process.
- 4) Repeated tests were carried out for all the 35 accessions that were tested first time in year 2014. The aim was to assess whether the viability of the seeds had declined during the four years storage in the seed bank. Repeated tests were successful for 25 (71%) accessions. Two tests are still running, and eight accessions failed the test (germination percent $\geq 85\%$). For most cases, however, it is estimated that the poorer performance results from random selection of seeds from mixed quality seed lots, seed breaking in the sowing process, or contamination of the growing media, not the reduced viability in the seed bank per se.

Overall results:The seed bank collections amount to 148 taxa, including 53 of the top 100 priority species (see Action A.1

http://www.luomus.fi/sites/default/files/escape-100-lajia_300113.pdf). The number of populations (different origins) is 237 and the number of accessions (recollections in different years separated) is 253 (see Annex FR Action D.1.1). In total, the project studied germination methods for 157 seed accessions covering 112 species, subspecies or varieties (see Annex FR Action C.2.2). This required running 363 tests. A majority, 78 % (122 accessions) passed the test, while 33 accessions require further testing to find out the suitable germination conditions. Two tests are still running. These tests belong to the management protocol of the seed bank also in the future. Furthermore, a master's thesis (Annex FR Action C.2.3) utilizing the seed bank's seed germination test facilities was published and accepted by student trainee Juho Jämsén, participating in the background study on *Crepis praemorsa*, see also Actions C.6.

Staff members responsible for the action: Action leader/Senior herbarium technician Mari Miranto, Project leader Marko Hyvärinen, Senior curator Henry Väre, Curator Leo Junikka (until 31.3.2016), Mikko Piirainen, Secretary Paula Havas-Matilainen UH.

Perspectives for continuing the action after the end of the project: The seed bank in UH will carry on receiving, maintaining, and germination testing seed accessions of threatened and near threatened Finnish plants. In the long term the facility will also store seed accessions from neighboring EU countries that do not have native plant seed banks in their own country (see Escape After-LIFE Communication Plan

http://luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf, Annex FR Action F.3.1).

Problems encountered: Indoor air quality problems in the seed bank and subsequent moving to new premises in 2017 slowed down seed processing and germination testing.

Action C.3 Micropropagation and cryogenic preservation of threatened plant species

Action leader: Anna Liisa Ruotsalainen, UO

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: Development of propagation and cryopreservation methods for 20 endangered plant taxa by March 2016 and 30 taxa by the end of the project and genetically representative sample of these species banked in cryotanks.

Deliverables / Milestones: Deliverables: **List: cryopreserved threatened native plant taxa.** (delivery date 26.2.2016 / DL 28-02-2016) [Deliverable report C3: List: Cryopreserved threatened native plant taxa \(pdf\)](#), see also Annex PR3 Action C.3.1. Deliverable).

Milestones: **First plant tissue samples cryopreserved** (delivery date 12.2.2013 / DL 31-12-2013). The first plant tissues cryopreserved was achieved in good time (12.2.2013) with a botanical garden progeny of *Salix pyrolifolia*, reported in Progress report on 31.1.2014.

Completed activities and products of the action:

In addition to those cryopreserved taxa reported in above mentioned Delivery report, there were 26 taxa in micropropagation scheme in 28.2.2016, which achievement fulfilled the expectation of 20 endangered plant taxa by the March 2016. In the end of the project altogether 41 taxa were either in micropropagation (52 populations, 37 taxa) or cryopreservation scheme (55 populations, 40 taxa) in UO indicating that final objective of the project (30 taxa) was well achieved (see Annex FR Action D.1.1). The amount of samples form a representative set of those threatened native plant populations that were included in the project.

Staff members responsible for the action: Action leader/Curator Annu Ruotsalainen, Beneficiary leader Jouni Aspi, Laboratory technician Sirpa Lehtonen, Planner Jaanika Edesi, Horticulturist Aino Hämäläinen UO, Project coordinator Sanna Laaka-Lindberg UH.

Perspectives for continuing the action after the end of the project: Micropropagation has been one of the basic activities in UO Botanic garden for more than two decades. It is being used and will be used in the future in the basic work in the botanical garden after the project (see also after-LIFE communication plan

[https://www.luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-](https://www.luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf)

[life communication plan.pdf](https://www.luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf) and Annex FR Action F.3.1). Cryopreservation is newer to UO Botanic garden, and during this project it has become a new activity and tool for plant preservation in the collections in UO Botanical garden. New projects, activities and applications related to cryopreservation will be carried out in the future.

Problems encountered: None.

Action C.4 Management of threatened species in outdoor collections.

Action leader: Leo Junikka (until 31.3.2016), Marita Tiiri (1.4.2016 onwards) UH

Time foreseen: 1.4.2013-31.8.2017

Action Status: Completed

Expected results/ Objectives: It is expected that by the end of the project 25 threatened native plant taxa are ex-situ conserved in outdoor collections of the Botanic Gardens of Helsinki and Oulu Universities

Deliverables / Milestones:

Completed activities and products of the action:

The list of ex-situ conserved plant materials collected in ESCAPE project are presented in the Annex FR Action D.1.1. The list is compiled in co-operation with the Actions C.2, C.3 and C.4, and consists of seeds collected for seed bank at the Kumpula botanic garden (UH), and tissues placed in cryopreservation at Oulu botanic garden (UO) and plants in living outdoor

collections and nursery in botanic gardens in UH and UO. By the end of August 2017, altogether 66 taxa of 75 origins have been added to the living ex situ collections in UH Botanic Gardens (Kumpula and Kaisaniemi) and still in the nursery there are 9 other taxa of 10 origins. In UO, there are in the end of the project 36 taxa of 54 origins. 18 living plants of two taxa of three origins were moved from the original habitat in the wild and planted in ex situ collection at Kumpula botanical garden for seed production.

At the end of the project in 31.8.2017 ten of the originally set 17 target species for living collections in the collections are: *Salix pyrolifolia*, *Rubus humulifolius*, *Carex viridula* var. *bergrothii*, *Dianthus superbis* serpentinite variety, *Elymus farctus* ssp. *boreali-atlanticus*, *Artemisia campestris* subsp. *bottnica*, *Cerastium alpinum* subsp. *alpinum* serpentinite variation, *Erigeron acris* subsp. *decoloratus*, *Anthyllis vulneraria* subsp. *polyphylla* and *Puccinellia phryganodes* (UO). *Epilobium laestadii* is grown in vitro in UO, and subsequently available for planting to outdoor living collections. The annuals *Persicaria foliosa* in UO and *Polygonum oxyspermum* in UH were in collections for one year, and *P. oxyspermum* is still available in seedbank. Cryptogams were decided to be neglected, as they need special expertise not available in ESCAPE during the project run, and orchids are only added to the seed bank in ESCAPE from 2015 onwards.

For the promotion of mutual plant exchange program between the botanical gardens of UH and UO, eight taxa grown in UH were sent to UO and 15 taxa grown in UO were received to UH. Together 23 taxa of 27 origins are now grown in both UH and UO botanical garden collections (see Annex FR Action D.1.1). In addition of planting new individuals to the outdoor and in vitro collections in the botanic gardens the following management measures were made: 1) After flowering, all flowers and inflorescences were removed in order to prevent hybridization, 2) The flower beds were weeded and hoed to keep the beds clean and spacious, 3) Plants were watered regularly. The flower beds were also fenced in order to prevent devastation caused by rabbits.

In UH nursery seven taxa of ten origins of threatened plant species were grown in population increasing scheme for natural populations and species reintroductions and they all have been planted back to nature in seven different locations (Annex FR Action D.1.1).

All the methods used to manage and maintain accessions of endangered native species have been documented and this information can be found in a deliverable product Etäsuojeluopas (see <https://www.luomus.fi/fi/kirjat/Etasuojelijanopas> , Annex FR Action E.1.1). A poster “Reinforcing threatened plant populations in Finland” was on display at the (BGCI) 6th Global Botanical Gardens Congress in Geneva, Switzerland in 26-30.6.2017. In order to learn threatened plants management in outdoor collections, the Action leader Marita Tiiri has made two educational trips: one to Royal Botanic Gardens, Edinburgh, UK in 22.6.-5.7.2014 (ERASMUS professional exchange) and one to Botanical Garden of Oslo University, Norway in 15-17.6.2015 and has participated to the 6th Global Botanical Gardens Congress in Geneva, Switzerland in 26-30.6.2017 (travel grant from congress organizing committee). Congress program can be found in <http://www.6gbgc.org/en/sample-page/> . The Action leader has participated in two fieldtrips of species reintroductions: one in Sipoo (*Astragalus glycyphyllos*) in 24.9.2015 and one in Pöytyä (*Carex vulpina*) in 25.8.2017.

Staff members responsible for the action in GA: Action leader/Curator Leo Junikka (until 31.3.2016) Action leader/Horticulturist Marita Tiiri (from 1.4.2016 onwards), Senior Curator Henry Väre, Horticulturist Outi Pakkanen UH, Horticulturist Tuomas Kauppila, Horticulturist Tuula Kangas, Planner Erno Kuusela, Curator Annu Ruotsalainen UO.

Perspectives for continuing the action after the end of the Project: Botanical Gardens of UH and UO will continue maintaining the outdoor ex-situ collections for conservation, research and public awareness. In the future, collections will also be completed with seedlings from the seed bank sprouting tests. More details of continuing the action can be found in

ESCAPE After-LIFE Communication Plan

https://www.luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf (see Annex FR Action F.3.1)

Problems encountered: Some pest, weed and root problems occurred at UH nursery and outdoor collections, but they all got solved during the program. Five of the original 17 target species listed in GA have not been grown in living collections as they were either removed from the activity list of priority species (ferns and aquatic plants, orchids to seedbank only in 2015 onwards). Instead, the targeted number of taxa is compensated by the other priority list species added to the living collections (see also Actions C.1, C.6, D.1).

Action C.5 Development of ex-situ conservation scheme for threatened bryophyte species

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.10.2012-31.8.2017.

Action Status: Completed.

Expected results/ Objectives: Bryophyte ex-situ conservation scheme will be started in selected populations of the model species. One new locality is selected for assisted migration of the model species. Population size of the original bryophyte populations will be measured. Maximum of 10% of the population will be collected for ex-situ propagation and storing in cryopreservation. For increasing the target species population size, ex-situ propagation will be implemented on about 70% of the individuals collected in nature. The remaining 30% will be preserved by cryopreservation. Of the propagated new individuals, about 50% of each origin will be reintroduced to the original populations, about 20% planted to the new locality in assisted migration, and the remaining 30% will be kept in ex-situ as reserved.

Deliverables and Milestones: Deliverables: **Science article on bryophyte ex-situ conservation (delivery date 31.5.2017 / DL: 31-05-2017).** An abstract of a science article on application of assisted migration criteria on the selected ESCAPE focal bryophyte species was published on ESCAPE website on 31.5.2017 (see the Deliverable C.5 ESCAPE) and https://www.luomus.fi/sites/default/files/files/deliverable_c.5_310517_final.pdf). The whole article is under preparation for proper publication, but not yet available for the public as is the rule for most science journals. The article will be submitted to the journal Biodiversity and Conservation.

Milestones: **Bryophyte ex-situ conservation scheme (delivery date 28.2.2017 / DL 28-02-2017).** A bryophyte ex-situ conservation scheme

(https://www.luomus.fi/sites/default/files/files/action_c_5_milestone_bryophyte_ex_situ_conservation_scheme_feb2017.pdf , see also the Action C.5 Milestone, see also Annex FR Action E.1.2) containing basic instructions based on the experience achieved in ESCAPE project activities on bryophyte species conservation was launched on project website in 28.2.2017.

Completed activities and products of the action: The ESCAPE beneficiaries UH and UO established ex-situ collections of living samples of threatened bryophyte species (see also Actions C.3, C.4) Three bryophyte species were selected by consultation of the SYKE Bryophyte protection group (see <http://www.ymparisto.fi/fi-FI/Luonto/Lajit/Lajisuojaus/Eliotyoryhmat/Sammaltuorihma>). Micropropagation and cryopreservation methods for storing bryophyte spores and gametophyte fragments in ex-situ collection in UO were developed (see also Action C.3). With subsequent propagation, reintroduction and population strengthening was tested with two of the focal bryophyte species. The three selected species are mosses *Meesia longiseta* and *Tortula cernua* and a thalloid liverwort *Mannia fragrans*. Suitability of assisted migration as a conservation tool for bryophytes was assessed by applying the AM criteria (see Actions A.1 and C.7). Ex-situ conservation of bryophytes in living collections was initiated in Kaisaniemi Botanic Garden during the ESCAPE project. Targets of Action C.5 were achieved, and a lot of information for further method development was collected in the trials. Work involved development of

techniques for the micropropagation and cryopreservation (see also Action C.3), subsequent cultivation in greenhouse conditions, and tests on management of bryophytes in living collections in botanic gardens. One species was reintroduced into its natural habitat, and another species was brought back to its original locality for testing ex-situ population strengthening.

The permissions for collecting bryophytes were considered and applied (see also Action A.2). With the experiences and results on the methods on ESCAPE focal species, instructions and outlines of future application of ex-situ methods on bryophyte protection were developed and published (see above).

All the other ex-situ conservation targets on bryophytes were tested in the field and laboratory experiments, except those on assisted migration. First of all, the criteria set for applicability of AM (see Action A.1) showed that none of the selected bryophyte species met the criteria, and thus were not suitable for this activity. Instead, a deeper analysis on the suitability of AM on bryophytes will be published as a scientific paper soon. The preliminary results of this study are reported as an abstract on project website (see Deliverable C.5 ESCAPE).

On the basis of population background studies, the sampling in the ex-situ method trials appeared as much easier than anticipated, because the sampling limit of max 10 % of the original population exceeded the need for the sporophyte and shoot material. The anticipated proportions of bryophyte materials to different ex-situ trials were not followed exactly, because amount of material produced in ex-situ cultivation far exceeded the need.

Information and experience on bryophyte cryopreservation and micropropagation was achieved in training period (Sanna Laaka-Lindberg in June 2014) at Royal Botanic Gardens, Kew in UK (<http://www.ebesconet.org/>).

The micropropagation into axenic cultures was carried out as follows (see also Action C.3): rinsing in deionized water to remove additional substrata, incubation in sterilizing agent, rinsing of the material in deionized water (twice), drying on sterile filter paper and plating on Petri plates with nutrient media. We expect that sterilization time, concentration of the sterilizing agent and potentially, incubation temperature will be the most critical steps and need to be adjusted separately for each target species. Cryopreservation work based on protocol developed in Kew (<http://www.ebesconet.org/>), but needs to be improved in future depending on starting material. In general, tissue samples needed two weeks pre-conditioning period, before they were frozen rapidly by immersing in liquid nitrogen (-196°C) and preserved into long-term cryostorage in UO Botanical garden.

The reintroduction of the species into wild was a completely new task. Growing new bryophyte individuals in greenhouse conditions was rather easy when original material was first grown *in vitro*. The reintroduction of bryophytes to nature was highly innovative, and after the initial monitoring (see also Action D.3) the results are rather promising. The general results are compiled in the Action C.5 Milestone and Annex FR Action E.1.2).

Staff members responsible for this action in GA: Action leader/project coordinator Sanna Laaka-Lindberg, Curators Xiaolan He and Nijolė Kalinauskaitė UH, Curator Annu Ruotsalainen UO.

Perspectives for continuing the action after the end of the project: Action C.5 was aiming at developing initiative for bryophyte ex-situ protection and bringing it as a worthy alternative for saving the most threatened bryophytes. The method development will continue in the future, and further information will be achieved in scientific studies on the data collected during the ESCAPE project. These studies will be published later, when all data has been analyzed. The monitoring of the reintroduction success will be continued. The garden ex-situ collections of bryophytes will be supplemented, and new species included in Kaisaniemi Botanic Garden, UH.

Problems encountered: The selection of suitable sites for bryophyte reintroduction trial was limited by lack of suitable localities. Permission for collecting source material of the species in high threat categories was in cases denied by the local authorities. Bryophyte micropropagation tests were harmed by algae and mold contaminations causing delays in obtaining material for reintroductions to nature.

Action C.6 Increasing population size of threatened plant species

Action leader: Ritva Hiltunen, UO (until 31.10.2013), Tuomas Kauppila UO (1.11.2013 onwards)

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: Number of individuals from 5 to 8 threatened taxa (three populations from each) can be markedly increased in a botanic garden in order to be able to use this material to strengthen the populations in the field either by reintroduction or assisted migration.

Deliverables and Milestones: Deliverables: None.

Milestones: **Min. of five taxa in population increasing scheme. (delivery date / DL 31-10-2014).** [Milestone C6: Min. of five taxa population increase scheme 31.10.14.pdf](#), see also Annex FR Action C.6.1.

Completed activities and products of the action: Ten species were thought to take under action in gardens for increasing the population size in the wild. These species were

1. *Arctophila fulva* var. *pendulina*, UO
2. *Armeria maritima* ssp. *intermedia*, SYKE
3. *Astragalus glycyphyllos*, UH
4. *Cladium mariscus*, MH
5. *Crepis tectorum* ssp. *nigrescens*, UO
6. *Hypericum montanum*, SYKE
7. *Melica ciliata*, MH
8. *Puccinellia phryganodes*, UO
9. *Salix pyrolifolia* UO
10. *Viola collina*. SYKE

The following actions are taken with these ten species. All the activities were started and ongoing by 31.10.2014, thus the milestone was achieved. In the end of the project in total 10 plant species and 16 populations have been in population increasing scheme and the project objective was achieved. The monitoring data on the individuals of 8 taxa taken back to nature is shown in Annex FR Action C.6.2

***Arctophila fulva* var. *pendulina*:** In the botanic garden of UO, the tussocks of *Arctophila* (20 pc 2 locations) were taken from the wild and multiplied by micro propagation in 2013. Totally 154 new microplants of *Arctophila fulva* var. *pendulina* produced by micropropagation and transplanted in turf in April 2015. About 100 individuals planted in Liminganlahti-area during the summer 2015.

Armeria maritima* ssp. *intermedia is classified as Critically Endangered (CR) in Finland. It grows on sandy seashore meadows in a restricted area in Hamina, south-eastern Finland. In 2013, seeds were collected from the most abundant site in Hamina, Hietaniemi. However, most of the seeds were eaten by larvae of *Aristotelia brizella*, a very rare species of moth being a specialist on *Armeria*. The remaining seeds germinated well in botanic garden UH (in total 130 new plants) and most of the new pots (72 plants) were taken to Pappilansaaret in 2014 – protected area from where *Armeria* had disappeared in late 1990's (reported in connection with Action C8). In the summer of 2014 June and September altogether 46 pots were planted on Takasaari area to two sites close to each other. In 2014, ten *Armeria* seedlings were in pots ready for the plantings to the collections in botanic garden OU but nine of ten individuals died during the winter 2015. Overwintering in pots in greenhouses seems to be very challenging with the temperature about + 5 degrees.

Astragalus glycyphyllos seeds collected from the only individual left at the site in the years 2013, 2014 and 2015. In total 61 seedlings (collected 2013 and 2014) were planted back to the original site in Porvoo 2015.

Cladium mariscus seeds were sown to the field in Joroinen (origin the same place) 14th September 2015. Four different plots in area Saarikkolammensuo, a little bit outside of the original population. Seeds sown in botanic garden UH proved to be nonviable and no seedlings were got for planting.

Crepis tectorum ssp. *nigrescens* was propagated successfully from seeds. Seeds were collected from isolated population (prevent cross pollination) growing in botanic garden UO. In total 100 plants were grown in garden and 90 transplanted in Kevo Linkkapahta 10th June 2014. Three locations and 300 seeds were sown in Kevo. Species is also growing in vitro. This species is very easy to propagate from seeds in garden conditions and seedlings grow well. Problems occur when plants or seedlings try to adapt to the natural environment which is usually harsher and poorer in comparison with garden conditions. Critical point in this process is how to harden seedlings before planting back in the nature. *Crepis tectorum* ssp. *nigrescens* thrives well in tissue culture and produce easily shoots as well as roots. Further experiments need to be done how microplants produce viable seeds in garden conditions.

Hypericum montanum is classified as Critically Endangered (CR) in Finland. It grows on dry, open slopes on gravel/sand in a very restricted area in Lohja commune, Southern Finland. It produces plenty of seeds, but the conditions for seedling survival are rarely optimal. Many of the sites have declined despite of management. Seeds were collected in 5th September 2013 from three sites close to each other. Seedlings grew well in the botanic garden UH. In 22nd August 2014 altogether 118 pots of *Hypericum* were planted to two sites in Lampilahti and Vanhakylä to increase the local population size. Most of the seedlings were in poor condition before replanting in the wild and also in the garden. Maybe they were allowed to grow in the pots too long so that their roots did not develop properly.

Melica ciliata seeds from two populations, were collected by MH, 31st August 2010 from Tammisaari. Seeds were germinated in Helsinki botanical garden and totally 91 individuals were planted back to the nature. Some seedlings were also planted in both botanical garden outdoor collections in Helsinki (4 pc) and in Oulu (4 pc). Seeds of *Melica ciliata* germinated easily and without any special problem did not occur.

Puccinellia phryganodes: In the botanic garden of UO, 18 tussocks of *Puccinellia phryganodes* were taken from the wild for growing in order to multiply them by dividing and by micro propagation. Twelve of 18 tussocks from Iso-Matala (taken in 8th August 2014) died during the winter 2015. Six still growing in pots but they are not very viable. New *Puccinellia* plants propagated by micropropagation in botanic garden UO during the winter 2015 and planted by MH to the four different sites in the sea shore of the Bothnian Bay. In total 100 individuals for reintroduction and 100 individuals for assisted migration were propagated by tissue culture. It seems that dividing is not advisable way to multiply this grass.

Overwintering in greenhouse conditions can be challenging for the root system and new growth in pots was poor in springtime. Instead, the micropropagation work well and lots of new viable individuals can be produced in one year period.

Salix pyrolifolia: Five cuttings from the three different locations of *Salix pyrolifolia* were taken and grown in pots aiming to multiply by micropropagation. When cuttings have produced enough new shoots, traditional propagation by cuttings will be taken in action as well. One origin of *Salix pyrolifolia* from Kuusamo died during the summer of 2015. New material was taken 16th November which two cuttings stored in cold room and some buds took into the tissue culture to produce new plants. Five commercial plants purchased from the nursery Tornionlaakson taimitarha for planting these among the garden collections in 2016. No one of any *Salix* get enough new shoots that propagation by cuttings would have been

possible. Micropropagation was also difficult and we didn't get new microplants for transplanting. New cuttings were taken in the winter 2017 and stored under the snow before rooting in 2nd May. Totally 30 cuttings were put in pots and we totally got six pots, including two or three rooted cuttings in each, were ready for transplanting during the summer 2017 (photos). Generally, *Salix p.* is easy to propagate by cuttings but they have to be taken from as young shoot as possible and the number of cuttings should be rather hundreds than tens since all cuttings do not get rooted.

Viola collina is classified as Endangered (EN) in Finland. This protected violet has a small distribution area mainly in Pirkanmaa, South-Western Finland. It grows in dry, mesotrophic herb-rich forests. Collecting seeds proved to be difficult because seeds fall easily and quickly after ripening. In May 2014 we transferred a tussock of violets to Kumpula garden and later in summer these plants produced plenty of seeds from cleistogamous flowers. Seeds germinated well and plants were also taken into tissue culture and two individuals are now growing in pots in UO. In autumn 14 Sep 2015 we took 60 pots to two sites in Sastamala (Kaltsila 1 and Kaltsila 2), 30 plants to each site. Both sites are situated on private land, Kaltsila 1 had five and Kaltsila 2 had four original violet individuals, so both populations were very small. In the garden molluscs attacked the pots. Although they were removed and poisoned already in the garden, we noticed some living animals before planting. They were removed as carefully as possible.

Staff members responsible for this action in GA: Action leader/ Curator Ritva Hiltunen (until 31.10.2013), Action leader/Head Gardener Tuomas Kauppila (1.11.2013 onwards), UO Horticulturist/Curator Leo Junikka (until 31.3.2016), Horticulturist Marita Tiiri UH, Conservation biologist Päivi Leikas MH, Senior researcher Terhi Rytteri, Researcher Martina Reinikainen SYKE.

Perspectives for continuing the action after the end of the project:

Most of these chosen species were not possible to get from three populations in the wild because of the scarcity both of the populations and the quantity of individuals. These trials have shown that many of these threatened species have difficulties in thriving as transplanted in garden pots. Producing new growth vegetatively is often poor. On the other hand, some species like *Crepis tectorum* ssp. *nigrescens* and *Puccinellia phryganodes* grow very well and new seedlings or microplants are easy to produce. We found that some species can look different than wild ones if the growing conditions are "too good". With *Puccinellia* we even thought that we had wrong taxa in handling. Therefore, one bottleneck in the reintroduction process is transplanting and the plants' adaptation after the garden conditions. Anyway, the number of individuals in each population must be much higher than in this project. We need more experience on how we can transplant plants successfully back to their natural site.

Problems encountered: The problems encountered are described above for each target species separately.

Action C.7 Assisted migration (AM) of threatened plant species

Action leader: Marko Hyvärinen

Time foreseen: 1.9.2012 – 31.8.2017.

Action Status: Completed

Expected results/ Objectives: New populations will be established to nine sites (three populations of three threatened taxa).

Deliverables and Milestones: Deliverables: **Science article on the use of AM in conservation:** [Action C.7 Deliverable: Addressing potential local adaptation in species distribution models: implications for conservation under climate change](#) (delivery date 20.3.2017, DL 31-03-2017), and Annex FR Action C.7.1)

Note: 31-10-2015: Deliverable ‘New populations of 3 native plants created by AM’ was changed to a milestone on the basis of recommendation by EU commission Joint mission/Arnoud Heeres on 29.9.2015.

Milestones: **At least two taxa in AM trials**, (DL 31-10-2014). Milestone achievement was presented in the Annex MT C.7.1. This report is not available on ESCAPE website, because it contains information and maps on species localities not open to the general public.

New populations of 3 native plants created by AM (DL 31-10-2015). Originally listed as a deliverable of the project, but changed as a Milestone on the basis of recommendation by EU commission Joint mission/Arnoud Heeres on 29.9.2015 (See Annex PR2 Deliverables and Milestone lists). Reported to project members and EU commission Joint mission visitors by Action leader Marko Hyvärinen on 29.9.2015 and also in ESCAPE annual meeting 4.11.2015. Completed, but planting the third taxa, *Salix pyrolifolia*, was postponed to August 2017 because of problems encountered in micropropagation (see Action C.3 and C.6). Instead of micropropagated saplings, ones grown of cuttings were used for transplants.

Completed activities and products of the action:

The action aimed to test assisted migration both in biological as well as societal and legal context. Action aims at two general targets: first, knowledge on assisted migration should be increased, and second, its use as a potential conservation tool should be recognized by nature conservation authorities and legislation. To demonstrate the potential of this conservation tool, trials on species selected as focal taxa were carried out during the ESCAPE project.

These were done with three threatened native plant taxa created to nine different native sites by means of assisted migration. Hence, creating a total of nine new populations.

The Action C.7 was started already in 2012 in planning meetings in co-operation with the Action A.1 in developing the AM criteria for species selection. These criteria were published at ESCAPE website in January 2013 (see

http://www.luomus.fi/sites/default/files/files/amcriteria_310113.pdf). Ex-situ cultivation of the focal taxa *Artemisia campestris* subsp. *bottnica*, *Salix pyrolifolia* and *Puccinellia phryganodes* was started in 2013 in Oulu Botanical garden (UO). The sites for AM trials were selected in accordance with the local nature conservation authorities. By the end of 2014, one of the taxa was already involved in a field experiment (*Artemisia campestris* subsp. *bottnica*) and the material for other two were at the propagation in UO, and the localities for AM were selected in 2015. With the focal taxa, the whole process regarding site selection and permissions was negotiated with the nature conservation authorities, and hence, a lot of information regarding the first target of the Action C.7 has been gained. This aided also in planning and directing the socio-economic side of dissemination of the project.

Field work on AM trials included the following:

18 plants/clones of *Puccinellia phryganodes* were collected in August 2014 to be cultivated in Botanical garden in UO in summer 2015 this material was used in introduction (AM *sensu lato*) in Pitkänokka of Lumijoki, Säärenperä in Siikajoki and Ulkokrunni in Ii. A total of 60 plants micropropagated at Botanical Garden were planted on 3 different locations. In addition to this, a total of 50 samples of *Puccinellia* collected from its natural population were planted on 5 different locations (see Annex FR Action C.7.2). Seeds of *Artemisia campestris* ssp. *bottnica* were sown at three new sites in 2014. The sites are in Kemi region. In each site, a set of 500 seeds were sown on five 1x1 m quadrats. These quadrats were also fenced in order to exclude any chance of sheep grazing. A total of 150 ex-situ cultivated seedlings/grown individuals were planted on these sites in 2015, 50 plants on each site. *Salix pyrolifolia* cuttings were collected (in 2013 and again in 2017), and propagated in the Botanic Gardens of the University of Oulu. Three sites have been selected for the AM experiments about 12-50 km from the original locality. *S. pyrolifolia* ex-situ grown individuals were

eventually planted in Niesikivalo NW ja Niesikivalo SW (Rovaniemi) and Ruuttulammet (Tervola) sites in August 2017.

Since some experiments have been running such a short time it is impossible to say more than a preliminary estimate of the biological feasibility of the measures. It is obvious that in all three species the selection of the receiving sites has been successful since no marked reduction in numbers of surviving individuals has not been seen yet (For actual results see Action D.2). Especially in case of in vitro be time-consuming process and with *Salix pyrolifolia* even non-feasible and cuttings should be preferred if possible.

In turn, the experiments have yielded a lot of information how well (or poorly) extant legislation in Finland can adopt a completely new conservation measure. A permission to make an exception to regulations (e.g. Nature Directive) is a pre-requisite for any such measure. As legislation does not recognize Assisted Migration the purpose of the experiments had to be clearly stated. In their permissions (POPELY/287/07.01/2013 and LAPELY/309/07.01/2013) to carry out experiments ELY Centres clearly state that the nature of the permit is exceptional and based on expected conservation benefits and, also, every single translocation is subject to prior approval by authorities. They also add a number of other conditions regarding the follow up of experiments and the treatment of the test sites. This Action C.7 has by the end of the project yielded a set of science articles in addition to the planned Deliverable science article (see above and Annex FR Action C.7.1)

- 1) Hällfors, M. H., Vaara, E. M., Hyvärinen, M., Oksanen, M., Schulman, L. E., Siipi, H., & Lehvävirta, S. (2014). Coming to Terms with the Concept of Moving Species Threatened by Climate Change - A Systematic Review of the Terminology and Definitions. PLoS One, 9(7). <https://doi.org/10.1371/journal.pone.0102979>
- 2) Vaara, E. & Hyvärinen, M. (2017) Conservation in the era of climate change: a mismatch between law and ecological knowledge. – manuscript
- 3) See also [Deliverable C.5 ESCAPE: Science article on bryophyte ex-situ conservation 31.5.2017 \(pdf\)](#) Deliverable C.5 ESCAPE

Staff members responsible for this action in GA: Action/Project leader Marko Hyvärinen, Curator Mikko Piirainen, Planner Mari Miranto UH, Planners Koen Frans Verweij and Riikka Nevalainen UO, Conservation biologists Niina Sankari, Panu Keihäs MH.

Perspectives for continuing the action after the end of the project: A lot of information regarding the first target of the Action C.7 (knowledge increase and acceptance of AM) has been gained. This will aid in planning and directing the socio-economic side of dissemination of the project and affect the authorities' considerations on this method as one available for taxa it suits best. The perennial focal plants will profit of the trials in obtaining potentially new localities and thus better changes to survive.

Problems encountered: The delays in starting phase of ESCAPE project caused delays also in preparing the management plan (see Actions A.3 and C.9) and starting the field work in Action C.7. These delays were acknowledged by Mrs Anne Burrill in her letters after the Inception report and monitoring report in 2013 (see the details of the references in Actions A.3 and C.9).

Action C.8 Reintroduction of plant species

Action leader: Anne Jäkäläniemi, MH (until 31.7.2014), Pauliina Kulmala, MH (1.8.2014 onwards).

Time foreseen: 1.4.-30.9, annually from 2014-2016.

Action Status: Completed

Expected results/Objectives: Total of nine populations representing 3-4 threatened native plant taxa will be reintroduced.

Deliverables and Milestones: Deliverables: Science article on integration of ex- and in-situ (delivery date / DL 31-05-2016). A science article 'Suomen uhanalaisten luonnonkasvien

ex situ - suojele osaksi lajiensuojelun kokonaisuutta' written by Marko Hyvärinen was published in LuonnonTutkija 4/2015 ([Annex PR3 action C.8.1. Deliverable](#), see also Annex PR3 Action C.8.1).

Milestones: Reintroductions of four plant populations (delivery date / DL 30-09-2015): A milestone was achieved already in summer 2014 when the first four populations of focal species were reintroduced. The result was announced in the EU Commission Joint mission event in Helsinki on 29-09-2015 in a presentation by Action leader Pauliina Kulmala, and reported in Progress Report 2, January 2016.

Completed activities and products of the action:

The primary task in Action C.8 was the reintroduction of 3-4 ESCAPE focal plants from ex-situ cultivation back to altogether nine original but disappeared localities. The original focal species of Action C.8 listed in GA are *Polygonum oxyspermum*, *Artemisia campestris* subsp. *bottnica*, *Epilobium laestadii* and *Carex viridula* var. *bergrothii*. In the very beginning of the project, however, *Artemisia campestris* subsp. *bottnica* was left out of the Action C.8 for it readily crosses with a more common near relative taxon, *Artemisia campestris* subsp. *campestris*. It could not have been verified if the former ssp. *bottnica* localities had really consisted of pure ssp. *bottnica* only. The species was replaced by *Armeria maritima* ssp. *intermedia*.

The Action C.8 activity was started in 2013 by selecting nine sites for three focal species (*P. oxyspermum*, *E. laestadii*, and *C. viridula* var. *bergrothii*) for reintroductions. These were evaluated and mapped in the field (see the Action A.3 General management plan at http://www.luomus.fi/sites/default/files/files/escape_management_plan_17122013.pdf). Seeds and plants of the Action C.8 focal species were collected for seed bank, common garden experiments and plantations (see Action C.1, C.2 and C.6). All the plants and seeds were planted and sown to permanently marked squares or lines to enable monitoring. Four populations were reintroduced in field season 2014 (reported in Mid-Term Report, January 2015, see Annex FR Action C.8.1 and Annex FR Action C.8.2 for details):

1. The seeds of *Polygonum oxyspermum* were collected in 2014 from the only remaining population of the species in Finland. One week later 200 seeds were sown on Vanhankylänmaa island on 1x1 m² marked squares and covered with sand together with a piece of bladder wrack *Fucus vesiculosus* to fertilize the substrate.
2. 50 tussocks of *Carex viridula* var. *bergrothii* were collected from a stable source population and planted to a former locality of the species at Ruuttulammet protected area about 6 km from the source population. 500 ripe seeds were also collected. The tussocks were planted in 5 1x1 m² squares and the seeds were sown in 5x1 m² line. The exact location of lost population is not known, so the reintroduction site was selected by ecological factors such as suitable species composition.
3. *Armeria maritima* ssp. *intermedia* seeds were collected in 2013, grown in Kumpula Botanical Garden and planted in summer 2014 on an island Etusaari. The species had disappeared from the locality because of overgrowth. Lately, the sheep grazing has restarted. All in all, 72 seedlings were reintroduced, 8 of which were fenced and the others planted to an area influenced by sheep grazing.
4. ESCAPE participated reintroduction of the priority list species *Viola uliginosa* close to its former locality in Tampere. The seeds of this plant were sown and seedlings grown in ex-situ conditions at Kumpula Botanic garden with good success. 40 seedlings were reintroduced in September 2014. Reintroduction of *V. uliginosa* was implemented in close co-operation with consult office Luontotutkimus Pertti Ranta, Tampere city environment officers and local NGOs. An article 'Luhtaorvokki palautettiin Tampereelle' of the reintroduction of *V. uliginosa* written by Pertti Ranta was published in Lutukka 4/2014 (Annex FR Action C.8.3).

The remaining five populations were reintroduced in 2015 (reported in more detail in Annex PR2 C.8.1, Progress Report 2; see also Annex FR Action C.8.1 and Annex FR Action C.8.2).

5. Total of 27 *Carex viridula* var. *bergrothii* tussocks were taken from a viable population in North Karelia and planted to location Jeron rantasuo 14 km away. Before planting, the old ditches, that had caused the drying of the habitat and the disappearance of the species, were filled with peat by an excavator. In addition, 600 seeds were sown.
6. Total of 30 *Carex viridula* var. *bergrothii* tussocks were taken from a viable population in North Karelia and planted to location Ristisuo 95 km away from the source population. In addition, several hundred seeds were sown. The exact location of lost population is not known, so the reintroduction site was selected by ecological factors such as suitable species composition. A detailed report for *Carex viridula* var. *bergrothii* introductions of Jeronjärvi and Ristisuo has been written in the project.
7. Nine tussocks of *Epilobium laestadii* were collected from viable populations of Oulanka National Park and planted to Muotkaojansuu spring fen in Salla. The species was found there in 1980's but has disappeared after that. The plan was to collect and sow seeds also, but there were too few fertile individuals in the source population for that.
8. Eleven tussocks of *Epilobium laestadii* were collected from viable populations of Oulanka National Park and planted to Purkuputaanoja in Kuusamo. The species has disappeared from the site somewhere between 1960's and 1990's. The plan was to collect also seeds, but there were too few fertile individuals in the source population for that.
9. *Meesia longiseta* samples were grown first in vitro and subsequently cultivated in turf pots in greenhouse in UO Botanic Garden. In 2015, 34 turf plots of *M. longiseta* were first acclimatized in open garden in UH Kaisaniemi Botanic Garden before they were reintroduced on September 2015 in its earlier occupied locality close to Hämeenlinna in South Häme (see also Action C.5).

The material and methods of the introductions are also discussed in detail in a deliverable of Action D.2, 'Evaluation report on taxon reintroductions & AM' (see ESCAPE web pages http://www.luomus.fi/sites/default/files/files/arviointiraportti_ex_situ_-_lisattyjen_lajien_luontoon_palautuksista_ajalta_2014-2016.pdf, see also Annex PR3 Action C.9.1).

The project objective for Action C.8 was well achieved, because altogether nine populations representing six different threatened plant taxa were reintroduced during the ESCAPE project. Six populations represented three original focal species mentioned in GA (*P. oxyspermum*, *E. laestadii*, and *C. viridula* var. *bergrothii*). The other three species reintroduced in the ESCAPE project were *Armeria maritima* ssp. *intermedia*, *Viola uliginosa* and *Meesia longiseta*. These highly endangered species well meet the criteria for species reintroductions because they are genetically distinct and their distribution area and population sizes have remarkably decreased (see Problems encountered below).

The Action was completed already in 2015, and the reintroduced populations were monitored every year during the project as mentioned in GA (see also Action D.2 for preliminary results of monitoring). The reintroductions accomplished in Action C.8 during the whole ESCAPE project are summarized in Annex FR Action C.8.1.

An important objective for this Action was to test methods and gain experience on reintroducing species. The focal species for this Action were very varied in terms of for example habitat demands and ecology, and the preliminary results of the reintroductions are variable as well (see AnnexFR Action C.8.1 and Action D.2). These experiences formed a valid basis for the Action E.1 Deliverable Booklet: Toolbox to ex-situ conservationists (see

Annex FR Action E.1.1, <https://www.luomus.fi/fi/kirjat#Etasuojelijanopas>). Among the Finnish nature conservation authorities, the plant reintroductions in ESCAPE project have also generated lots of general, very valuable discussion on issue both for and against.

Staff members responsible for this action: Action leaders/Conservation biologists Anne Jäkäläniemi (until 31.7.2014), Pauliina Kulmala (1.8.2014 onwards), Conservation biologists Niina Sankari, Panu Keihäs MH, Planner Peetu Rytönen UO, Senior Researcher Terhi Rytönen SYKE.

Perspectives for continuing the action after the end of the project: According to the management plan, monitoring of reintroduced populations in Action C.8 will continue on a regular basis for at least 15 years after the project end (see GA). The first monitoring year after the project will be 2023, and after that, the monitoring will be repeated every three years until 2032.

Problems encountered: Three reintroductions that were listed in the Management plan were not accomplished in ESCAPE project. After thorough field inventories, it became clear that there is not enough *Epilobium* material in Central Lapland for reintroducing the species to location Suasoja. Focal species chosen for ESCAPE project are very rare, and plant material could only be taken if it did not threaten the future survival of the population. *Polygonum oxyspermum* was not reintroduced into two planned locations (Lehtinen and Pitkäviiri) because lack of the viable seed material. In addition, the first reintroduction of *P. oxyspermum* established in 2014 failed (see also Action D.2). As the reason for the failure was left unknown, it was no use to repeat the reintroduction with the same method. However, these problems did not affect achieving the project objectives, because the originally suggested species were replaced by species that even better fulfil the demands for species reintroductions, *Viola uliginosa* and *Meesia longiseta*.

In reintroductions of *Carex viridula* var. *bergrothii* and *Epilobium laestadii*, there was no actual ex-situ phase because the tussocks were taken from nature and planted straight to the reintroduction sites (see Annex FR Action C.8.1). The reason for this is that there was not enough good quality seed material available for propagation in botanic gardens. However, reintroducing whole plants produced lots of valuable information on the habitat demands of the species and their behaviour in introductions.

Action C.9 Habitat improvement

Action leader: Anne Jäkäläniemi, MH (until 31.7.2014), Pauliina Kulmala, MH (1.8.2014 onwards).

Time foreseen: 1.4.2013 - 30.9.2014

Action Status: Completed

Expected results / Objectives: Concerning the case plants, there will be totally of 9 sites (1-3 species), where habitat improvement will be implemented. In addition, habitat improvement will be done in at least 9 sites for plant reintroductions.

Deliverables and Milestones: Deliverables: None.

Milestones: **Habitat improvements carried out at six sites** (delivery date / DL 31-12-2013, postponed to 30-11-2014). Because of the delay in the original field work plan expected to be started in June 2012, the completion of this Milestone was postponed to 30.10.2014 (see the letter of acceptance of ESCAPE project Inception report (dated 4.7.2013, ref.nr ENV/E3AH/PR/bp ARES (2013)2573158 by Mrs. Anne Burrill). Habitat improvement has taken place on 10 sites, so the milestone was achieved within its postponed deadline date on 30.10.2014.

Completed activities and products of the action:

Habitat improving activities for the sites of reintroduction Action C.8, assisted migration Action C.7 and increasing the population size Action C.6 were introduced in the General

management plan (Annex A.3.1 in Progress report 1, January 2014). Habitat managing in the field was started in 2013, and was continued in every field season during ESCAPE project after that. The managing actions were diverse, varying from removing the competing vegetation with hoes and by hand, to protecting the plants from grazing and restoring the fen by filling in the old ditches. All in all, 22 sites of 11 different species were managed in the project (see Annex FR Action C.8.4 Management actions).

The details of the management actions that were accomplished in field seasons 2013-2014 are described in Annex MT C.9.1 (Mid-term report 2015). The managing actions of year 2015 are reported in Progress Report 2 and the actions of year 2016 in Progress Report 3. In 2017, habitats of three new *Salix pyrolifolia* populations (see Action C.7) were managed at the same time as the scions were planted. The managed areas were very small, only a couple of square meters, because only two scions per population were planted (see Action C.7 for details). Some *Salix* and *Rosa* bushes were removed by hand. One location, Niesikivalo NW, was protected from elks by hanging up strongly odorous soap bars all around the plants. All the managing actions on C.6, C.7 and C.8 sites accomplished during ESCAPE project in 2013-2017 are described in Annex FR Action C.9.1.

Staff members responsible for this action in GA: Action leader Pauliina Kulmala, Conservation biologist Hanna-Leena Keskinen MH.

Perspectives for continuing the action after the end of the project: The long-term effects of the habitat managing actions are yet to be seen; for example, it can easily take 10-15 years for a fen to recover after restoration. Monitoring of the Actions C.7 and C.8 will continue regularly for at least 15 years after the project end (see GA). At the same time, also the effects of the habitat management and the changes in the habitat will be monitored. Some minor management activities, like removing excessive hay competing with focal species, can be implemented during monitoring events to ensure successful establishment of the ESCAPE project plants at their sites. The first monitoring year after the project will be 2023, and after that, the monitoring will be repeated every three years until 2032

Problems encountered: The expected result for this action was to improve 9 sites of focal plants and, in addition to this, 9 sites for plant reintroductions. Thus, according to the GA, 18 sites were to be managed during the project, nine of which are reintroduction sites. The field work during the ESCAPE project revealed that of the 9 reintroduction sites (C.8) accomplished in the project, only four needed managing actions. The sites of assisted migration (C.7) and population increasing (C.6), however, have been in poorer condition than expected, and most of them needed slight improving. Thus, only four reintroduction sites of nine stated in GA have been improved during the project. All in all, 22 sites were managed in ESCAPE project, so the total quantitative objective of the project, 18 sites, was well achieved. Most habitat managing actions were very slight, and they have in most cases been accomplished at the same time when visiting the site for other purposes.

D. MONITORING OF THE IMPACT OF THE PROJECT ACTIONS

Action D.1 Monitoring the number of ex-situ conserved species in seed banks, cryopreservation and living collections

Action leader: Paula Havas-Matilainen, UH

Time foreseen: 1.10.2012-31.8.2017, in intervals

Action Status: Completed.

Expected results/Objectives: Up to date records of the number of threatened taxa and their viability in ex-situ conservation are constantly available in garden databases. A list and a number of taxa will also be constantly updated in the project webpages.

Deliverables and Milestones: *Deliverables:* None.

Milestones: **Garden database run a check for data accuracy** (delivery date / DL 15-04-2014)

https://www.luomus.fi/sites/default/files/files/milestone_d1_garden_database_check_for_data_accuracy_escape_150414.pdf see also Annex MT D.1.1 Monitoring results outdoor

Completed activities and products of the action:

Means involved: Monitoring the number of ex-situ conserved species in seed banks, cryopreservation and living collections (see Annex FR Action D.1.1): Number of plant species in ex-situ conservation was continuously monitored and the accessions added to the database. The viability of ex-situ conserved materials was tested annually by germination tests. Vitality of plants in outdoor collections were estimated by applying a scale from 0=dead to 5=active sexual and vegetative reproduction.

The monitoring of the number of ex-situ conserved endangered Finnish native plant taxa in seed bank (UH), cryopreservation (UO) and living collections (UH, UO) was based on the information from two major sources: the Atlantis database in the Botany Unit of FMNH (UH) and the corresponding database in the Botanical Garden of UO. This action provided an insight to the success of the core actions in the project and yielded information about the state of ex-situ conservation of threatened native plant taxa in Finland. The ex-situ protected, registered plants already growing in the collections in UH and UO at the beginning of the ESCAPE project were taken as a part of the project. All new plants collected to the seed bank, cryopreservation and living collections during the project were registered similarly in the databases. The databases were kept up to date (constant monitoring) and reporting models were developed in order to get all kinds of reports of the collections and the number of taxa and origins.

The viability of seeds in the seed bank was expressed as tested germination-%. Similarly, cryopreserved material and in-vitro conserved (micropropagated) materials were tested for their viability (percentage of successful growth after the removal of a subsample from storage). Plants in the living collections were inventoried, in UH at least once per year, the new ones 3-4 times per growing season in order to learn more about these seldom seen plants. In UO, the ESCAPE plants in outdoor collections have mainly been monitored by the section gardener during the project. In 2017 a more systematic inventory was carried out. In the inventory the plant presence/absence, condition (stages 0-5) and number of shoots or individual plants were evaluated. In UH, were most of the ex-situ outdoor collections were new and planted during the project, it was possible to monitor them by a scale of viability ranging from 0 = dead,...to 5 = active reproducing and vigorously spreading (Annex FR Action C.1.1); the scale was modified 2013 and applied 2014 and is based on the comparison of the current plant number with the plants planted.

Because of the separate and dissimilar databases in UH and UO one had to combine the two accession lists manually, paying attention on the duplicates registered with different codes in UH and UO. Despite of the laborious combination work it was possible to give intermediate data of the collections any time but the final data of every growing season was summarized once a year and the progress reported in annual project meetings. The information was compiled and reported in project reports (see Inception report ESCAPE 310513, Annex D.1.1 ESCAPE Progress report 31.1.2014, Annex MT D.1.1 Monitoring results outdoor, Annex PR2 C.1.1 and Annex PR3 D.1.1) and all corresponding communication and dissemination of the project results. A list and a number of taxa was updated in the project webpages once a year (see also Action C.1). All ex-situ accessions dealt with during the project are listed in Annex FR Action D.1.1), but only the ones in the seed bank, cryopreservation and living collections at 31.8.2017 were counted: there were respectable 181 taxa, 352 origins in ex-situ protection at the end of the ESCAPE project.

The confusion with the codes led to minor discrepancies in the numbers describing the accumulation of the ex-situ collections throughout the project, especially when broken down to show species conserved with different storage methods. One plant accession is

recommended to store using multiple storage methods. The Table 5 below (see also Annex FR Action D.1.1) summarizes how many taxa are stored by each ex-situ conservation method.

Table 1. Summary describing the usage of different ex situ conservation methods

	Number of taxa
All	175
Garden collections	87
Cryopreservation	27
Micropropagation	32
Seedbank	148

Staff members responsible for this action in GA: Action leader/ Curator Paula Havas-Matilainen UH, Beneficiary Leader/Director Jouni Aspi, Curator Annu Ruotsalainen,

Perspectives for continuing the action after the end of the project: In ESCAPE project, we didn't get all the priority list species (see www.luomus.fi/escape). Hence, there is still a lot to collect for the first time and re-collections necessary for renewing previous collections. ESCAPE beneficiaries will continue collecting for the seed-bank, cryopreservation facilities and the living collections in the botanic gardens also in the future. Furthermore, maintaining all types of ex-situ collections will continue in UH and UO botanic gardens (see Escape After-LIFE Communication Plan

http://luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf).

Problems encountered: None.

Action D.2 Monitoring the success of species reintroduction and assisted migration

Action leader: Anne Jäkäläniemi (until 31.7.2014), Pauliina Kulmala, MH (1.8.2014 onwards).

Time foreseen: 1.7.-30.9.2013 and 2014, 1.7.-31.12.2015 and 2016, 1.7.-31.8.2017

Action Status: Completed; however, monitoring to be continued after the project on the basis of the GA

Expected results/Objectives: Introduced populations will be monitored annually during the project and every three years after the project. The ESCAPE monitoring report compiling the results based on the measured and/or estimated establishment success and the dynamic changes in population size will be written annually.

Deliverables and Milestones:

Evaluation report on taxon reintroductions & AM (delivery date / DL 30-11-2016). This Milestone was changed into a Deliverable (see Progress report January 2016, Annex PR2 Deliverable and Milestone lists) on the basis of recommendations by A. Heeres on a EU commission joint mission visit in 30.9.2015. Evaluation report was published on 30.11.2016 as a pdf on ESCAPE web pages

(http://www.luomus.fi/sites/default/files/files/arviointiraportti_ex_situ_lisattyjen_lajien_luontoon_palautuksista_ajalta_2014-2016.pdf, see also Annex PR3 Action D.2.1 Deliverable)

Completed activities and products of the action:

The expected result for action D.2 was annual monitoring of introduced populations (Actions C.7 and C.8) during the project. The monitoring in ESCAPE project is based on the General and Special management plans (see A.3) that contain site-specific monitoring plans for Action C.7 and C.8, and, in addition to this, also Action C.6. The first six monitoring plots for C.7 and C.8 populations were established in summer 2014, and the rest were established in 2015 (nine monitoring plots) and 2017 (three monitoring plots). Thus, all in all, 18 monitoring plots

for introduced populations, 9 for the assisted migration species (C.7) and 9 for the reintroduced species (C.8) have been established during ESCAPE Life project (see Annex FR Action C.8.1).

The monitoring plots, the Actions accomplished on each of them, and the monitoring years during the project are listed in Table 2 below (see also Annex FR Action C.8.1).

Table 2. ESCAPE planting activities (AM, reintroduction) are summarized below with indications of different methods for each of the taxa, localities and monitoring period during the project.

Name of the monitoring plot	Action	Species	Plants planted	Seeds sown	Monitoring years so far
Satakari 1	C.7	<i>Artemisia campestris</i> ssp. <i>bottnica</i>	x	x	2014-2017
Satakari 2	C.7	<i>Artemisia campestris</i> ssp. <i>bottnica</i>	x	x	2014-2017
Pitkäletto	C.7	<i>Artemisia campestris</i> ssp. <i>bottnica</i>	x	x	2014-2017
Luusiletto	C.7	<i>Puccinellia phryganodes</i>	x		2015-2017
Pitkänokka	C.7	<i>Puccinellia phryganodes</i>	x		2015-2017
Säärenperä	C.7	<i>Puccinellia phryganodes</i>	x		2015-2017
Niesikivalo NW	C.7	<i>Salix pyrolifolia</i>	x		2017
Niesikivalo SW	C.7	<i>Salix pyrolifolia</i>	x		2017
Ruuttulammet	C.7	<i>Salix pyrolifolia</i>	x		2017
Etusaari	C.8	<i>Armeria maritima</i> ssp. <i>intermedia</i>	x		2014-2017
Ristisuo	C.8	<i>Carex viridula</i> var. <i>bergrothii</i>	x	x	2015-2017
Jeron rantasuo	C.8	<i>Carex viridula</i> var. <i>bergrothii</i>	x	x	2015-2017
Ruuttulammet	C.8	<i>Carex viridula</i> var. <i>bergrothii</i>	x	x	2014-2017
Purkuputaanoja	C.8	<i>Epilobium laestadii</i>	x		2015-2017
Muotkaojansuu	C.8	<i>Epilobium laestadii</i>	x		2015-2017
Peurasuo	C.8	<i>Meesia longiseta</i>	x		2015-2017
Vanhankylänmaa	C.8	<i>Polygonum oxyspermum</i>		x	2014-2017
Iidesjärvi	C.8	<i>Viola uliginosa</i>	x		2014-2017

Data on the establishment success and the dynamic changes in populations have been collected from all monitoring plots annually after establishment. In every monitoring plot, the plants and seeds are planted and sown to permanently marked squares or lines. Plants are marked individually and the number of flowering and non-flowering shoots of every plant is counted. Depending on the species and the amount of plant material available, seeds were also sown on specific seed lines or squares that were thoroughly inventoried annually to find any new seedlings. The establishing of monitoring plots in 2014 and 2016 are described in Mid-term Report 2015 and in Progress Report 3, January 2016. In 2017, three monitoring plots were established for *Salix pyrolifolia* (C.7, assisted migration). The planting was delayed to the end of the ESCAPE project, because the propagating of the species in botanic garden conditions was more difficult than anticipated.

In addition to introduced species, monitoring plots were also established for C.6 sites (increasing population size). All in all, 14 monitoring spots for C.6 were established in 2013-2017, and they have also been annually monitored during the ESCAPE project. The preliminary results indicate the same variation in success as in reintroduced species. The C.6 monitoring spots are described in Annex FR Action C.6.2.

As expected, the success of reintroduced populations in ESCAPE project is highly variable. In the end of the project, 18 - 100 % of ex-situ grown plants in reintroduced populations are still surviving (see Annex FR Action C.8.1 and Annex FR Action C.8.2). Some of the actions have been most successful like three new populations of *Artemisia campestris* ssp. *bottnica* (see Action C.7) that are thriving and producing seedlings three years after seed sowing and two years after planting. For this species, ex-situ introductions look like a considerable means of conservation. Also reintroduced *Viola uliginosa* population seems to be settling nicely to its new habitat and all the plants reintroduced are still alive and flowering every year from 2015 to 2017. Most of the populations, however, have decreased to some extent compared to year of establishment. Several factors have influenced the success of introductions: for example, *Puccinellia phryganodes* seems to be very demanding of its growing site, and the weather can change drastically the conditions on the monitoring plots from year to year. Field seasons 2015-2017 have been exceptionally rainy especially in Northern Finland, which may have affected the results. The effects of grazing can be positive or negative on the population, and the optimal grazing pressure and the favorite spots for grazing animals are often hard to predict. Grazing prevents the habitat from overgrowing but, as in case of *Armeria maritima* ssp. *intermedia*, sheep very eagerly eat the flowers and thus prevent seed development. In addition to planting, seeds were also sown to 7 introduction sites (see Actions C.7 and C.8) in three species, *Polygonum oxyspermum*, *Carex viridula* var. *bergrothii*, and *Artemisia campestris* ssp. *bottnica*. So far, seed germination has been quite poor. In *P. oxyspermum*, 400 seeds were sown and none of them germinated. The reason for this may be seed herbivory, weather conditions or the eroding effect of ice and water. Three years after sowing 1500 *Artemisia campestris* ssp. *bottnica* seeds, 11 seedlings are alive. About 1500 seeds of *Carex viridula* var. *bergrothii* were sown on three populations; plenty of seedlings have germinated on Jeron rantasuo location, where the seeds were sown on bare peat formed in restoring the fen. The future will show the success of the *Carex* seedlings after the competing vegetation will appear to the peat (see Annex FR Action C.8.1 and Annex FR Action C.8.2). However, it must be emphasized that two or three years is a very short time to draw any conclusions on whether populations will stabilize on their new habitats and survive in the future or not. For example, the impact of changing species composition caused by disturbance and the survival of the possible offspring produced by ex-situ plants will be seen in after-LIFE monitoring. All in all, the monitoring of ESCAPE project has so far revealed that ex-situ introductions require high knowledge of species and their demands to be successful. During the project, some separate highly detailed reports on specific species introductions were written of *Artemisia campestris* ssp. *bottnica* (Action C.7), *Puccinellia phryganodes* (Actions C.6 and C.7), and *Carex viridula* ssp. *bergrothii* (Action C.8). Because of sensitive non-public information they contain (accurate locations and detailed maps on highly endangered species), they are stored in MH archives.

An ESCAPE project monitoring report compiling the results of Action D.2 has been presented by Project leader annually in ESCAPE autumn meeting, as suggested in GA.

Staff members responsible for this action in GA: Action leader Pauliina Kulmala MH, Curator Mikko Piirainen, Planner Mari Miranto UH, Beneficiary leader/ Director Jouni Aspi, Curator Anna-Liisa Ruotsalainen, Planner Peetu Rytönen UO, Researcher Martina Reinikainen, Senior researcher Terhi Rytönen SYKE.

Perspectives for continuing the action after the end of the project: The ultimate success of introduced populations will be seen in years to come. Monitoring of the established populations will continue every three years for 15 years' time after the LIFE project. The first monitoring year after the project will be 2023, and after that, the monitoring will be repeated every three years until 2032. All the results of the ESCAPE monitoring will be thoroughly

considered when planning and establishing possible new ex-situ reintroductions for endangered species in future.

Problems encountered: None

Action D.3 Evaluation of bryophyte ex-situ methods developed

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.1.2013-31.8.2017.

Action Status: Completed.

Expected results/ Objectives: Bryophyte ex-situ methods' monitoring results compiled in monitoring scheme in this Action D.3 will contribute to adjustment and development of these methods. The monitoring results will be brought into use when need for project adjustments arises. The results will be reported in action monitoring reports along the course of the project. The final action report will include method evaluation based on the observation and potential adjustments in the Action C.5. The monitoring and evaluation Action D.3 will also be the basis for the instructions booklet to be published on bryophyte ex-situ methods (see Action E.1)

Deliverables and Milestones: None.

Completed activities and products of the action: This action will co-operate closely with the Actions C.3 and C.5. Evaluation process of bryophyte ex-situ method development was started by collecting background information on the focal bryophyte species selected for ESCAPE (see also Action C.5). The good background information on the focal species and their habitats enabled monitoring the method development, and also formed the basis for the method evaluation. Background data was collected on the known localities of all the three focal bryophytes, especially in Southern parts of Finland. The source populations were selected on the basis of these background data collected mostly in 2013 and partly also in 2014-2016.

The evaluation of the method development is based on documentation of the processes in these activities in Action C.5. The technique development on micropropagation and cryopreservation were started in Oulu Botanic Garden in 2013. In 2014, the micropropagation and cryopreservation method development was enhanced by project coordinator Sanna Laaka-Lindberg's visit to Royal Botanic Garden Kew in United Kingdom, where bryophyte ex-situ conservation was initiated earlier and on the basis of that, experiences shared to ESCAPE project staff. Micropropagation and cryopreservation of bryophytes was initiated by testing common species *Leptobryum pyriforme* and *Meesia triquetra*, and expanded subsequently to the focal species *Meesia longiseta*, *Tortula cernua* and *Mannia fragrans*. Initial test with bryophyte shoots (gametophytes) appeared as rather demanding as the shoots were easily contaminated by algae and molds. In 2014 the cultures were started with new technique (surface-sterilized sporophyte and spores), and these were more successful and selected for further use. *T. cernua* grew very slowly in *in vitro* cultivations and suffered from contaminations so badly that no proper material for reintroductions to nature was achieved during the project. However, the method development was better successful in 2017, and experiences with this species brought a lot of information on species demands for *in vitro* cultivation. First observations on successful cryopreservation were obtained in 2014 with the test species *Leptobryum pyriforme*. These observations were confirmed with the focal species *Meesia longiseta*, and greenhouse cultivated shoots of this species were reintroduced into the wild in autumn 2015. As a result of initial method development, a student report was published and included in previous progress report as Annex PR2 Action C.5.1.

The preparation for species reintroductions and population increasing schemes were started with inventories of the known localities of the focal species *M. longiseta* in 2013 and *T. cernua* and *M. fragrans* in 2014. The collection of bryophyte material was restricted to maximum of 10% of the population, which was shown to be more than adequate in most cases. This was shown in source population monitoring: no effect on population size as a consequence of sampling was observed (see monitoring data in Annex FR Action D.3.1).

During the ESCAPE project, the number of ex-situ conserved bryophyte taxa increased from zero to five, including the two test species. The ex-situ conservation scheme for bryophytes was compiled and published on project website (see Action C.5 Milestone) utilizing the monitoring data and experiences gained in ESCAPE activities on bryophyte ex-situ conservation. Population size and reproductive stage was recorded for all the three focal species, and the inventories on population data on them was accomplished by 31.8.2017. The data will be analyzed and published as indicated in after-LIFE communication plan (see Annex FR Action F.3.1).

Population size and reproductive stage was recorded in the focal species source populations in order to obtain background information on the species population dynamics and also to see if the sampling for ex-situ caused any harm to these populations. The summary of the monitoring data is presented in Annex FR Action D.3.1.

Monitoring the success of the reintroduced *M. longiseta* population in Iittala Peurasuo and the *M. fragrans* locality in Lammi Hämeenlinna, with planted individuals for population strengthening was conducted by photographing individually each of the ex-situ grown bryophyte pots planted. The area of the bryophyte cover and shoot density on the plots was measured and notes on the vitality and reproduction was made. These data are summarized in Annex FR Action D.3.1. Summary of the results in the end of the altogether two years initial monitoring period shows that both origins of *M. longiseta* thrives well. Furthermore, no conspicuous differences were seen between the *in-vitro* growing methods (different substrate qualities). Cryostored and melted shoots survived as well as the controls, showing that cryostorage does not harm bryophyte vitality. The difference on the timing of planting, however, showed at least in these relatively rainy seasons that pots planted in spring survived better than those planted in the autumn. The most relevant methodological result was that it is very important for a flood-demanding species that the planting to suitable depth in a mire habitat should be considered carefully: not too deep, but not too high above the water-bed either. For *M. fragrans* population strengthening plantings, the monitoring time during the project was only some months. The exact site for planting appeared as most important for success of the planted shoots. The plots need to be safe for heavy rain and wind, and also trampling, but simultaneously get enough moisture, e.g. seepage water. The frames for the planting pots need to be made of durable material such as plastic, at least for the starting phase of the monitoring. Monitoring the success of *T. cernua* growth in *in-vitro* conditions showed that the usual substrate might have been too acid and deficient of adequate nutrients. The very slow germination indicated some kind of dormancy in the spores of this species. These data can be utilized in future cultivation of similar species requiring specific substrate conditions.

Percentage of germinating sub-samples after cryopreservation has shown this ex-situ conservation method very well suited for bryophytes, since the germination percentage is nearly 100% in both the two species already in cryopreservation trials in 2015. Monitoring the viability of the germinated samples was started in 2015, with the first monitoring data yet to be digitized. Developing the ex-situ cultivation methods for bryophytes continued in UO. A trainee report with information on the method development on *Meesia* was finished, and used as one documentation on evaluation the method development. Propagation success of *Mannia fragrans* was not high, only 10% of the shoot fragments started to grow, but these 10% may probably be enough for further growing experiments, and thus the method development is continuing. The bryophyte monitoring data with method development results are used for compiling the bryophyte ex-situ toolbox, a guidebook for future activities (see Annex FR Action E.1.2)

Staff members responsible for this action in GA: Action leader/project coordinator Sanna Laaka-Lindberg UH, Curator Xiaolan He UH.

Perspectives for continuing the action after the end of the project: The ultimate success of introduced populations will be seen in years to come. Monitoring of the established populations will continue after the LIFE project likely mostly by volunteers. The first after-LIFE monitoring will be conducted in late autumn 2017. All the results of the ESCAPE monitoring will be thoroughly considered when planning and establishing possible new ex-situ reintroductions for endangered species in future.

Problems encountered: None.

Action D.4 Evaluation of micropropagation and cryopreservation techniques

Action leader: Anna Liisa Ruotsalainen, UO

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: Action D.4 monitoring results including measured plant performances and, as a necessity for method implementation development, measures of workload and cost efficiency will form the basis for improvement of the tested protocols for the threatened plants (in Actions C.3 and C.5). Technical report will be based on these measuring monitoring tools on the initial success of micropropagation of native plants.

Deliverables and Milestone: Deliverables: None.

Milestones: **Technical report on success of micropropagation.** (delivery date / **DL 28-02-2015**). Ruotsalainen, A.L., Hämäläinen, A. & Kauppila, T (2015). Technical report on success of micropropagation. Milestone D4 ESCAPE LIFE+2011 BIO/FI/917. 5 p. (see Annex PR3 Action D.4.1 Deliverable.pdf).

Completed activities and products of the action: Action D.4 was connected with the Action C.3, but also with Actions C.4, C.5 and C.6. The milestone report contains hidden methodological details, thus not shown to general public. The number of species and accessions in the micropropagation scheme and cryopreservation trials steadily increased during the project and all the objectives of the Actions C.3, C.5 and C.6 were achieved (see https://www.luomus.fi/sites/default/files/files/deliverable_report_c3_list_cryopreserved_threatened_native_plant_taxa.pdf). For the orchids, the growth after cryopreservation has been found to be slow, but *Dactylorhiza traunsteineri* was taken to *ex vitro* conditions during the project. For most of the species in micropropagation scheme, the methods work well (Action C.3), but there were some exceptions: *Salix pyrolifolia* material was only possible to propagate via cuttings (even though also cutting propagation was quite challenging, see Action C.6). *S. pyrolifolia* is growing in micropropagation cultures but growth is so slow that obtaining material *ex vitro* was not possible during the project. The opposite case is *Arctophila fulva* var. *pendulina*, which was found to be difficult to propagate and grow in the garden, but it was successfully micropropagated (Action C.6). There was marked progress in micropropagation and cryopreservation success of bryophytes. There has been four species in the work scheme (*Leptobryum pyriforme*, *Mannia fragrans*, *Meesia longiseta* and *Tortula cernua*). *Leptobryum* has been used as a non-threatened model species to test the methods at the start, the other three species are threatened and included in the numbers of final outcome (Action C.3).

Staff members responsible for this action in GA: Action leader/Curator Annu Ruotsalainen, Beneficiary leader/ Director Jouni Aspi UO.

Perspectives for continuing the action after the end of the project:

The micropropagation and cryopreservation activities are continued in UO as a part of basic work of the Botanical Garden and they are a good basis when planning new projects. UO is participating Taimistopohjoinen

<https://www.eura2014.fi/rrtiepa/projekti.php?projektkoodi=A72897> led by Nature Resource Institute (Luke) 1.6.2017 – 31.12.2019 and funded by of EU Regional Funds. Especially, micropropagation is applied for plant material propagation in Taimistopohjoinen project.

Development of micropropagation and cryopreservation methods for orchids and bryophytes are recognized to have especial scientific value in the future.

Problems encountered: None.

Action D.5 Monitoring the socio-economic impact and dissemination activities of the project

Action leader: Marko Hyvärinen, UH.

Time foreseen: 1.6.2012-31.8.2017

Action Status: Completed

Expected results / Objectives: The ESCAPE project's general objectives will be achieved and this will increase skills, knowledge and interest on plant ex-situ conservation issues among the operations staff, conservation authorities and the general public. Professional and public audience's interest and activity was monitored counting the website visitors and downloads. These measures, in addition to more qualitative monitoring of ESCAPE socio-economic impacts constituted the means of monitoring in this activity. ESCAPE published articles in general journals on topical issues relevant to project targets, and present the project objectives and results on project website. The monitoring results of the socio-economic impact of ESCAPE activities were compiled and reported by the action leaders of the concrete actions (C.1-C.9) and by the disseminations (E.1-E.5) on the particular socioeconomic impacts of the respective activities. These were compiled to the monitoring report on Action D.5 and included here in the final report of ESCAPE.

Deliverables and Milestones: Deliverables: None.

Milestones: **Monitoring report on socio-economic impact.** (delivery date 31.3.2016 / DL31-03-2015) Publication of this milestone was postponed to 31.3.2016 as most actions addressing general public took place after the original milestone date and the visitor data needed from the Museum of Natural History was available only in February 2016. The milestone report is available at: https://www.luomus.fi/sites/default/files/files/milestone_action_d.5_escape.pdf , see also Annex PR3 Action D.5.3.

Completed activities and products of the action: Monitoring dissemination activities of the ESCAPE project yielded information on how widely and effectively ESCAPE was recognised among the staff of the beneficiary organizations, among stakeholders, and among both scientific and public audiences. Monitoring on these aspects along the course of the project produce information on which the evaluation of the success of the dissemination activities will be based. The monitoring data and it's evaluation facilitated adjustments in the means and volumes of the planned project dissemination methods. The monitoring data also produced material for project reports.

Monitoring indicators used (and results 31.3.2016–31.8.2017):

1. For monitoring the success on increasing professional skills of ex-situ conservation staff at the beneficiary organizations and other organizations benefitting from ESCAPE activities *the numbers of staff members and other professionals participating in the educational seminars* were used to indicate the level of involvement of the organization in introducing the new methods. In the final phase of the project, a seminar focusing on project results and impacts of its activities was arranged and this was attended on 15th and 16th June by 66 and 53 professionals, respectively, from the fields of environmental administration, universities, and NGOs. Additionally, several university students made their compulsory training period including student reports and/or their BSc or MSc theses in ESCAPE project thus increasing their professional skills. These students and their contributions are listed in Annex FR Administration, and the most recent thesis annexed as Annex FR Action C.2.3.
2. The monitoring of the public visibility and awareness was based on numbers and types of public media in which the ESCAPE project has been presented, e.g. *popular articles and news in newspapers and general journals, radio and/or TV programmes*. A monitoring measure of public awareness was also the two *questionnaires* : the first round in 2013 as a e-form on the web-site (see Annex D.5.1 in Progress report 1), and the second round as a traditional paper-form and put-in-a-box in connection to ESCAPE exhibition (see Annex FR Action D.5.2 for

the forms in three languages and picture presentation of the placement of the questionnaire in ESCAPE exhibition pavilion in 2017, see also Action E.2) The results of the two questionnaires are presented in Annex FR Action D.5.1.

3. The effectiveness of ESCAPE among the networks of conservation authorities, plant scientists and other stakeholders was meant to be monitored by *the numbers of links to ESCAPE web-site* at other organizations' web-pages facilitated by non-ESCAPE actors. However, this measure proved to be impossible to follow and less informative and hence was abandoned in 2015.

4. The quality of, interest in, and success of the materials published by the ESCAPE project was monitored by measuring the *numbers of brochures, reports and other publications delivered* (total of 40 during the project, see www.luomus.fi/escape), and by *numbers of citations in the scientific articles*. The latter could not be yet analysed as scientific publications are only beginning to emerge from the project. The visibility of ESCAPE on the internet was measured by *counting the visitors at the project web-site* which reached 5 876 visitors by the end of the project. The interest and usefulness of the ESCAPE materials published in downloadable form at the project web-site will be monitored by a *counter of downloads*, which were monitored by reviewing the Web server logs and by filtering out downloads by bots. The number of downloads was altogether 1648. Furthermore, *the numbers of contacts and activity of discussions at the ESCAPE profile in the social media* was used as a measure in monitoring the effectiveness of spreading the information on ex-situ conservation via the internet (see also Annex PR3 Action D.5.3). In addition to volumes of the contacts in the social media, also the quality of the discussions and most interesting issues were analysed in the monitoring process. Currently 227 people are following designated Escape Luomus fb-page (<https://www.facebook.com/escape.luomus>) and there are large quantities of photographs and other material. Moreover, very lively discussion has been going on also addressing potential problems in ex-situ conservation.

Staff members responsible for this action in GA: Action leader/Project leader Marko Hyvärinen, Project coordinator Sanna Laaka-Lindberg, IT Specialist Dare Talvitie UH.

Perspectives for continuing the action after the end of the project: ESCAPE project website will remain open and thus all the electronic materials available also after the project ends. The ESCAPE facebook site will also stay open for information and discussions on success and problems concerning plant species conservation. The scientific papers will be published and large amount of data not yet all finished will be used for yet-to-come publications. Basically, the After-LIFE Communication Plan describes in more detail the planned continuation of ESCAPE project dissemination, see Annex FR Action F.3.1, and www.luomus.fi/escape)

Problems encountered: None.

F. OVERALL PROJECT OPERATION AND MONITORING OF THE PROJECT PROGRESS

Action F.1 ESCAPE project management and organisation plan

Action leader: Sanna Laaka-Lindberg UH

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed.

Expected results: Smoothly running project management. Inception Report. Progress reports (3). Mid-term Report. Final Report

Deliverables and Milestones: Deliverables: None.

Milestones: **SG and MB meeting** (delivery date 06.09.2012, **DL 30-09-2012**) reported in Inception report 31.5.2013.

External members of MB selected (DL 01-09-2012) Note: External members selected for Steering group, and reported in Inception report 31.5.2013.

Stakeholder meeting with ELY Centres (date of delivering 21.5.2013, **DL 31-05-2013**)

Reported in PR1 31.1.2014, see Annex F.1.1. ESCAPE Progress report)

Milestone; Combined SG+MB meetings once a year (delivery dates 6.9.2012, 4.11.2013, 29.10.2014, 4.11.2015, 3.11.2016, 13.3.2017 / **DL 31-08-2017**). Reported previously in Inception report, Progress reports PR1, PR2 and PR 3, and in Mid-term report, see also Annex FR Calendar 2012-2017)

Completed activities and products of the action:

Reporting. ESCAPE project reporting schedule included altogether 6 reports. These reports included a financial report and a technical report, Inception and Mid-term reports also an indicator report compiled on the basis of Actions' outcomes during the reporting period. All the Annexes of the ESCAPE reports are listed in Annex FR Action F.1.1

First, Inception report was delivered on DL date 31.5.2013 with 14 annexes.

Secondly, Progress Report 1 was delivered on the deadline date 31.1.2014 with 14 annexes.

The project Mid-Term report was postponed by permission (by an e-mail from Arnoud Heeres) by a week from the original DL of 31.1.2015 to 6.2.2015 as a consequence of obtaining some corrected financial values for reporting both from UH and UO systems. The Mid-term report was delivered on 6.2.2015 with 19 annexes.

The Progress report 2 was postponed from original deadline 31.8.2015 to 31.1.2016, as the main activities of the year 2015 were not fully accomplished by the original deadline date.

The PR2 was delivered on 31.1.2016 with 17 annexes.

The last Progress report PR3 was delivered somewhat late on 10.2.2017 with 21 annexes.

The DL for the Final report is 30.11.2017, with action deadline on 24.10.2017 in order to send the report for monitorer's inspection in good time.

The report feedback has been considered and responded in e.g. in Annexes MT Action F.1. Responses and PR3 Action F.1 Responses.

Project administration: The construction of ESCAPE project administration was modified in order to make the practical implementation of project administration and responsibilities more clear and realistic. The external experts were moved to Steering group (SG). The renewed organization chart was presented in Inception report 31.5.2013.

Responsibilities: The responsibilities and tasks of Action leaders were made known for all named action leaders and delivered to all of them (see Annex FR Action F.1.3).

University of Helsinki (UH) through Finnish Museum of Natural History (agronym LUOMUS) acted as the coordinating beneficiary of the ESCAPE project.

Management Board (MB) was in charge of any remedial actions in the (unexpected) situations. These remedial actions included actions such as rescheduling of deliverables, replacement of personnel, and re-allocation of funding. Very minor issues were made after discussions between the MB members, but any bigger changes were done after consultations with the EU Commission via the monitor at ElleAstrale/Neemo Ltd.

Annual regular meetings of the MB were organized jointly with the project steering group SG in connection to project annual meeting. SG consisted of MB members, project coordinator, action leaders and two external experts. The two external experts represented the major stakeholders of the project Ministry of the Environment (environmental officer Mr. Petri Ahlroth, replaced by Mr. Esko Hyvärinen in 2014) and a representative of research institutes (Prof. Kari Laine, Thule Institute). Annual SG meeting included a seminar where action leaders gave presentations on the progress of their responsible Actions.

The practical management and activities of the project coordination were operated by the core team hosted by LUOMUS (UH). The project operative leadership was conducted in the coordinating beneficiary UH consisting the Project Leader Marko Hyvärinen, Project

Coordinator Sanna Laaka-Lindberg, LUOMUS Head of Administration Heidi Kinnunen (until 31.4.2016, replaced by Tiina Ruokamo 1.9.2016 onwards) and FMNH PR and Press Officer Laura Hiisivuori (replaced temporarily by Ville Korhonen in 2015).

The responsibilities for the main actions A, C, D, E and F were divided between the project beneficiaries on the basis of a mutual agreement. The responsible Action leaders and other ESCAPE staff members are listed in Annex FR Administration, with their main tasks and the Actions to which they contributed.

Action leaders were responsible for the Activity management and reporting in practice. They were instructed by written rules (Annex FR Action leader Instructions).

Consortium agreements were written between the coordinating beneficiary UH and the associated beneficiaries (reported in Inception report 31.5.2013).

Large part of the ESCAPE project activities was based on allocation of the coordinating and associated beneficiaries' permanent staff working months in the project implementation. These allocated working efforts were seconded to perform the tasks included in ESCAPE project. The allocation to ESCAPE was registered and followed by each beneficiary's internal attendance system. Along the project run, it was realized that monitoring, data analysis and reporting and publishing took much more time towards the end of the project, and thus more working hours were allocated to the ending period of the project especially in the coordinating beneficiary organization.

Staff members responsible for this action: Action leader / Project coordinator Sanna Laaka-Lindberg, Project leader Marko Hyvärinen, Head of Administration Satu Seikkula (1.9.2012-31.12.2013, replaced by Heidi Kinnunen 1.1.2014-31.3.2016, Tiina Ruokamo 1.9.2016-31.8.2017) UH, Beneficiary leader Jouni Aspi, Conservation biologist/Beneficiary leader Heikki Eeronheimo (until 31.12.2013), Tuula Kurikka (from 1.1.2014 onwards).

Perspectives for continuing the action after the end of the project: Action F.1 aimed at smooth and unproblematic running of the project administration and finances. Project staff has gained experience and know-how both in project activities and LIFE project demands and procedures, which have increased the capabilities of the staff, thus improving their project professional skills.

Problems encountered: Changes in UH organization caused some delays and difficulties during the project, but these problems were solved and no major harm to general progress of the project was caused.

Action F.2 Networking with other LIFE and/or non-LIFE projects

Action leader: Marko Hyvärinen, UH

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: Several internal and external meetings will be attended and public presentations given on the project and its objectives. ESCAPE project staff will participate to 2 annual dissemination events of EU commission, such as Green Week. The dissemination plan is shown in Table 1 below.

Deliverables and Milestones: No deliverables nor milestones were planned in this action.

Completed activities and products of the action: Action products have been thoroughly reported in previous reports (Inception report, Progress Reports (PR) 1, 2, and 3, and Mid-term report). Since then, ESCAPE and Finnish ex-situ conservation was presented in the 6th Global Botanic Gardens Congress in Geneva, 26-30 June 2017 in the form of a poster (Annex FR Action F.2.1). The general ex-situ conservation status of Finland was addressed in the EBCG meeting in Varna, Bulgaria in 21.-23.4.2017 and in the national meeting of the Finnish scientific collection units (natural history museums and botanic gardens) partly organized by ESCAPE in 15-16 June 2017. The latter also served as the end seminar of ESCAPE and as a stakeholder meeting especially to the Ministries of Education and Environment, and ELY

centres. The Table 3 below contains an updated and commented list of activities foreseen in ESCAPE networking and communication plan in GA.

Staff responsible for the action in GA: Action leader/Project leader Marko Hyvärinen, Project coordinator Sanna Laaka-Lindberg UH.

Perspectives for continuing the action after the end of the project: Essential parts of the ESCAPE project such as the gene-bank (seed bank, living collections, cryogenically stored and micropropagated axenic cultures together) created will continue to be in touch with national and international networks such as Network of Finnish Botanic Gardens, European Botanic Gardens Consortium (EBGC), European Seed Conservation Network (ENSCONET) and Botanic Gardens Conservation International (BGCI). Also relevant new Life+ projects will be contacted.

Problems encountered: None.

Action F.3 After-LIFE Communication Plan

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.1.2017-30.9.2017.

Action Status: Completed

Expected results/ Objectives: After-LIFE communication plan of ESCAPE project will emphasize the continuity of the project actions and sustainability of the results also in future.

Deliverables and Milestones:

After-LIFE Communication Plan (delivery date 15.9.2017 / DL: 31-08-2017) published on ESCAPE website on 15.9.2017 as a pdf-file:

https://www.luomus.fi/sites/default/files/files/escape_deliverable_f.3_after-life_communication_plan.pdf , see also Annex FR Action F.3.1.

Completed activities and products of the action: The After-LIFE communication plan was produced in co-operation between all the ESCAPE beneficiaries' representatives. It was written in English, and published as a report-format document (pdf) on ESCAPE website www.luomus.fi/escape. The report (see also Annex FR Action F.3.1) contains future perspectives on all main activities of the project, including practical aspects such as continuation of seed banking activity, cryopreservation and micropropagation and threatened plant species in botanic garden outdoor-collections. Also spreading information further for species conservation professionals and to the general public is discussed.

Staff responsible for the action in GA: Action leader/Project coordinator Sanna Laaka-Lindberg, UH.

Perspectives for continuing the action after the end of the project:

Action F.3 publication (Annex FR Action F.3.1) contains a plan for future perspectives.

Problems encountered: None.

Action F.4 External audit

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.10.2014-31.3.2015 (for Mid-term report), 1.4.-30.9.2017 (for Final report)

Action Status: Ongoing.

Expected results/ Objectives: Fair and true accounting of UH resulting to correct financial statements

Deliverables and Milestones: None.

Completed activities and products of the action: The External audit planned for ESCAPE Mid-term report was cancelled on recommendation by LIFE desk financial officer Päivi Rauma via monitoring consultant Milka Parviainen (Neemo Ltd.). The External audit for ESCAPE Final report was ordered in spring 2017 by financial officer Tiina Ruokamo and implemented in Helsinki from 9.10.2017 onwards. The External audit was prosecuted by the company PwC Julkistarkastus Oy, which is the auditing company selected by University of

Helsinki in competing bidding procedure. The Audit report is attached to the Final report as an obligatory Annex (see ESCAPE FR Audit report)

Staff responsible for the action in GA: Financial advisor Tiina Ruokamo, Project coordinator Sanna Laaka-Lindberg, UH *Other ESCAPE staff involved:* Annu Ruotsalainen UO, Terhi Rytteri SYKE, Tuula Kurikka MH. *External consulting experts, trainees, volunteers, others involved:* PwC Julkistarkastus Oy auditors, financial advisors Eila Viinikainen UO, Anne Rähä MH, Aila Riihentausta SYKE.

Perspectives for continuing the action after the end of the project:

The external audit is prosecuted after the ESCAPE project actions ended and all financial actions finished.

Problems encountered: None.

5.2 Dissemination actions

5.2.1 Objectives

Table 3 below contains the proposed and the implemented results in dissemination in ESCAPE project. These dissemination products were targeted to ex-situ conservation professionals, but also to the general public.

The products in ESCAPE project functioned as a source of information for several groups. However, also specific activities for different groups were designed. The main stakeholders consist of nature conservation authorities and ex-situ professionals in botanic gardens. Two stakeholder meetings were arranged by ESCAPE project (in 2013 and 2017), and one in cooperation with the network of botanic gardens (in 2014).

One of the most central dissemination target was the increasing of general knowledge and understanding of threatened plants' ex-situ conservation among the general public including future decision makers. For these goals articles in general journals and newspapers and other media (radio, social media), public presentations and events, exhibitions with a wide reception and interactive workshop for school-kids were produced. These activities are presented in more detail above in Actions E.1-E.5 in Chapter 5.2.2 with relevant Annexes.

Table 3. The foreseen and resulting dissemination events and products of ESCAPE project.

ESCAPE Dissemination report		
TARGET GROUPS	PLANNED COMMUNICATION MEANS/PROCESSES	PROJECT IMPLEMENTATION
<i>Internal communication</i>		
Management board	Meeting 1 / year Additional meetings, if needed for special issues	Two project meetings arranged annually
Steering group	Meeting 1 / year, including a seminar with presentations on progress of the Actions	Annual meeting with presentations on Action progress
ESCAPE beneficiaries	6 Project meetings	All ESCAPE beneficiaries attended all annual meetings, altogether 11 meetings. Meetings arranged mostly as video conferences.
	2 Meetings / seminars with stakeholders, see below	2 stakeholder meetings: 22.5.2013, 16.6.2017
	1 Scientific meeting	1 scientific meeting arranged in 10.-11.9.2014
	Internal communication via internet	Internal communication mainly by e-mail
Action leaders	6 Project meetings	See above.
	Local action staff meetings, if needed	Several meetings, see Calendar
	Internal communication via internet	Internal communication f2f, phone, e-mail
<i>External communication</i>		
EU commission	Participation in 2 EU dissemination events Printed and electronic reports and publications	Kick-off, 5xplatform or theme seminars
Authorities	2 Meetings / seminars with stakeholders, see below Information packages on project website Printed and electronic reports and publications	2 stakeholder, 1 orchids Delivered 30.9.2013, 2015
Scientific community	1 Scientific meeting Printed and electronic reports and publications	Workshop 2014
NGO's	2 Meetings / seminars with stakeholders, see below (Circulated) Exhibition on threatened plant's conservation Information packages on project website Printed and electronic reports and publications	1 stakeholder Presented at 5 locations from 2015-2017 Delivered 30.9.2013, 2015
General public	2 Meetings / seminars with stakeholders, see above (Circulated) Exhibition on threatened plant's conservation Children's workshop on plant ex-situ conservation Information packages on project website High-school students, presentation on ESCAPE Two field excursions for forestry students in Koli National park, where ESCAPE reintroductions were discussed as an example of nature management Local public Printed and electronic reports and publications	Kumpula 2016, 2017 UH Presented at 5 locations from 2015-2017 2015 Delivered 30.9.2013, 2015 2017 Oct 2014 and Oct 2016 Researchers' Night - event 2017
Other LIFE projects	1 Scientific meeting Printed and electronic reports and publications Information packages on project website	No Platform meetings arranged

5.2.2 Dissemination: overview per activity

E. PUBLIC AWARENESS AND DISSEMINATION RESULTS

Action E.1 Communication of the value of ex-situ methods as species conservation tools to conservation professionals and lawmakers

Action leader: Sanna Laaka-Lindberg UH

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: (i) An introductory information letter and a brochure of the project produced and disseminated. (ii) Two professional guide books (separately for vascular plants and bryophytes) produced and published in print and electronically (iii) A minimum of three peer-reviewed scientific articles produced, written and published.

(iv) Internet materials including loadable instruction booklets at ESCAPE web-pages with links to web-sites of beneficiaries' homepages, important stake-holders and other related parties. (v) One national scientific seminar and two stakeholder seminars and one international scientific meeting arranged. (vi) Five workshop and/or congress participations by ESCAPE staff (vii) Two lectures on ESCAPE held in SYKE education days

Deliverables and Milestones: Deliverables: **Printed brochure about the goals of the project** (delivery date / DL 30-06-2013) Brochure published in Finnish and in English both in print (see Inception report Annex ESCAPE-esite_FIN AL_HIGHQ and Annex MT E.1.1 ESCAPE Brochure in English) and as pdf on project website (see https://www.luomus.fi/sites/default/files/files/escape_esite_2013.pdf https://www.luomus.fi/sites/default/files/files/e1_escape_brochure_en.pdf)

Article about the launch of ESCAPE project (delivery date / DL 31-03-2013) Published in Lenninsiipi 2013 (<http://www.syke.fi/download/noname/%7B69C95D6C-53E6-4581-9BE9-B2F4A2E51269%7D/37679>, see also Annex FR Action E.1.3 pp. 17-18).

Submit popular article about the launch of ESCAPE (delivery date / DL28-02-2013, NOTE Changed from Milestone to Deliverable following the recommendation by Arnoud Heeres on Commission Joint visit, see Annex PR3 Updated Deliverable and Milestones lists). Published in Bryobrotherella 16 in 2013, see Annex Action E.1 Deliverable 2013.

Article about the project function and achievement (delivery date / DL 30-09-2016). Published in Sorbifolia 2016,

https://www.luomus.fi/sites/default/files/files/annex_pr3_action_e.1.1_deliverable.pdf, see also Annex PR3 Action E.1.1. Deliverable.

Project webpage launched (delivery date / DL 30-11-2012), see www.luomus.fi/escape.

Project logo designed and adopted (delivery date / DL 31-12-2012), reported in Inception report, see also FR p.1.

Booklet: Ex-situ conservation of bryophytes (delivery delayed /DL 30-03-2017), to be published on project website and as printed booklet in the journal Ulmus. For the manuscript see Annex FR Action E.1.2.

Booklet: Toolbox to ex-situ conservationists (delivery date / DL 31-03-2017). Published both as pdf in project website <https://www.luomus.fi/fi/kirjat#Etasuojelijanopas> and as a printed book (see Annex FR Action E.1.1)

Printed brochure about the ESCAPE results (delivery date 17.5.2017 / DL 31-05-2017) Published in Finnish and in English both as a pdf on project website (https://www.luomus.fi/sites/default/files/files/escape_esite_verkko.pdf and https://www.luomus.fi/sites/default/files/files/escape_brochure_en_web.pdf) and as printed copies (see Annexes FR Action E.1.4 and FR Action E.1.5).

Milestones: **Manuscript of Conservationist toolbox** (delivery date /15-12-2016). Reported in PR3 (see Annex PR3 Action E.1 Tool-box manuscript.pdf), which was subsequently distributed among the ESCAPE staff members for comments in spring 2017. The final version sent to the journal Norrlinna editor in 31.3.2017, see Annex FR Action E.1.3).

Project launch meeting (delivery date 6.9.2012 / DL 30-09-2012). Reported in Inception report 31.5.2013.

Completed activities and products of the action: ESCAPE project activities in Action E.1 contained the Deliverables and Milestones listed above. Additionally, (i) an introductory information letter to species conservation authorities with description of project targets and methods was included in the general permission applications to all the ELY-centers (Annex FR Action A.2.1).

- (ii) Two professional guide books (separately for vascular plants and bryophytes) produced and published in print and electronically, as listed above (Annexes FR Action E.1.1 and FR Action E.1.2).
- (iii) The three peer-reviewed scientific articles published are reported and shown in Annex FR Action C.7.1, Annex PR3 Action E.1.2 and Deliverable C.5 ESCAPE.
- (iv) Instructive materials with loadable instruction booklets include links to ENSCONET seed collecting and seed bank curating protocols at http://www.luomus.fi/sites/default/files/files/collecting_protocol_english.pdf and http://www.luomus.fi/sites/default/files/files/curation_protocol_english.pdf at ESCAPE web-pages, and were launched already in the beginning of the project in 2013. The ESCAPE website has links to the beneficiaries' homepages, including also the co-financier Ministry of Environment (see www.luomus.fi/escape).
- (v) Two stakeholder seminars were arranged: on 22.5.2013 in SYKE premises in Helsinki and the ESCAPE final seminar on 15.6.2017 in Nature center Haltia, Espoo, see also Annex FR Action F.2.2. A national scientific seminar was included in the program of the international seed banking workshop in 10.-11.9.2014 (reported in Mid-term report on 6.2.2015), thus all the planned seminars were accomplished.
- (vi) The five foreseen workshop and/or congress participations by ESCAPE staff were exceeded already by the end of 2015 (see Annex MT E.1.4. ESCAPE Dissemination products). (vii) ESCAPE was introduced to SYKE staff on educational excursion in Kumpula Botanic garden in September 2014 (reported in Annex MT E.1.4. ESCAPE Dissemination products) and presented in SYKE YHA-educational seminar 5.11.2015 in Helsinki.

Staff members responsible for this action: Action leader/Project coordinator Sanna Laaka-Lindberg, Project leader Marko Hyvärinen, PR and Press Officer Laura Hiisivuori UH, Beneficiary leader Jouni Aspi, Curator Annu Ruotsalainen UO, Conservation biologist Anne Jäkäläniemi (until 31.7.2014), Pauliina Kulmala (1.8.2014 onwards) MH, Senior Researcher/Beneficiary leader Terhi Rytteri SYKE.

Perspectives for continuing the action after the end of the project: The dissemination products will be available to the species conservation professionals and other stakeholders at the ESCAPE website www.luomus.fi/escape also after the project ends (see also Annex FR Action F.3.1). Also, the further expertize dissemination and consultations will be developed and potentially commercialized at the Botanical gardens UH and UO. Additionally, the future monitoring of the reintroduced populations will accumulate scientific data to be analyzed and published.

Problems encountered: Some of the publication processes of ESCAPE materials have been delayed partly because of the editing procedures of the journals. Seminars and other dissemination events have not always reached as wide audience as expected as a consequence of reasons independent of ESCAPE project actions.

Table 4. contains information on date, total number of participants and event organizers of the conferences, seminars, workshops, stakeholder meetings, LIFE platform meetings and other public events arranged and/or participated by ESCAPE staff during the project run 1.9.2012-30.8.2017.

Seminar / Conference / Workshop and place	Date	No of participants	Organized by ESCAPE	Organized by others (name)
ESCAPE project launch meeting, LUOMUS, Helsinki	6.9.2012	26	Yes	
Stakeholder seminar, Helsinki	22.5.2013	21	Yes	
ESCAPE final seminar, Espoo	15.-16. 6.2017	66 (15.6.) 53 (16.6.)	Yes, jointly with others	Luomus and Haltia Nature Centre
ESCAPE International seed banking workshop,	9.-11. 9.2014	27	Yes	

Helsinki				
European Life+ -project kick-off, London	19.11.2012	c. 60	No	Life+ programme / EU
Life+ Platform meeting, Lohja	5.9.2012	c. 30	No	Life+ programme / EU
Finnish Botanic Gardens Network annual conference, Joensuu	29.-30.8.2013	35	No	Botanica ry
Baltic Sea Gardens Network, Latvia and Lithuania, Jelgava	28.9.2012	22	No	Baltic Sea Gardens Network, Salaspils BG
Baltic Sea Gardens Network, Tallinn	11.12.2012	17	No	Baltic Sea Gardens Network, Tallinn BG
European Botanic Gardens Consortium, Gijon	31.11.-1.12. 2012	19	No	EBGC, Atlantic BG Gijon
European Botanic Gardens Consortium, Prague	25-26. 5.2013	22	No	EBGC, Prag BG
European Botanic Gardens Consortium, Gibraltar	6.-8. 12.2013	19	No	EBGC, La Alameda BG
European Botanic Gardens Consortium, Zagreb	5.-8. 6.2014	26	No	EBGC, Zagreb BG
European Botanic Gardens Consortium, Glasnevin, Dublin	20.-22. 2.2015	23	No	EBGC, Dublin BG
European Botanic Gardens Consortium, Paris	5.7.2015	22	No	EBGC, Museum National d'Histoire Naturelle, Paris
European Botanic Gardens Consortium, Geneva	26.-27.11.2015	25	No	EBGC, Geneva BG
European Botanic Gardens Consortium, Vienna	29.-30.10.2016	22	No	EBGC, University of Vienna BG
European Botanic Gardens Consortium, Balchik	21.-24. 4.2017	22	No	EBGC, Sofia University BG
LUOMUS seminar on climate change research, Helsinki	14.2.2013		No	LUOMUS Zoology unit
European Seed Conservation Network (ENSCONET), Cambridge	18.2.2013	17	No	ENSCONET
Population strengthening activity, planning meeting UUD-Ely, Pasila, Helsinki	1.3.2013	6	Yes, with others	UUD Ely-center, Faunatica,
Networking – planning meetings with Co-Adapt and 5 th Dimension, Kaisaniemi, Helsinki	13.3.2013, 4.2., 1.4., 23.4.2014	13.3.2013 5 4.2.2014 7 1.4.2014 5 23.4.2014 2	Yes, with others	Co-Adapt, 5 th Dimension, University of Helsinki
ELY-center meeting on planning Puccinellia AM, Oulu Botanic Garden,	4.4.2013	7	Yes, with others	POP ELY-center

Oulu				
Seed-collecting workshop, LUOMUS, Kaisaniemi, Helsinki	10.4.2013	9	Yes	
Stakeholder meetings with Finnish Bryophyte protection group, SYKE, Helsinki	10.4.2014, 9.3.2016	10.4.2014 16 9.3.2016 15	No	Ministry of Environment, Species protection groups, Bryophyte group
RIBES, Rome	23.4.2013	32	No	RIBES Network
ESCAPE bryophyte ex situ field-workshop, Ahvenanmaa, and a Field-workshop on reintroduction site evaluation, Hattula	24.-26.5.2013, 25.6.2014	24.- 26.5.2013, 11 25.6.2014 4	Yes, with others	Finnish Bryophyte protection group
Global Botanic Gardens Congress (GBGC5), Dunedin, NZ	20.-25.10.2013	347	No	University of Dunedin, Botanic Gardens Conservation International (BGCI)
Pannonian Seed Bank Development Workshop	24.-25.2.2014	55	No	HUSEEDBANK LIFE08 NAT/H/000288
Turku Society for Zoology and Botany meeting, Turku	27.10.2014	19	No	Turku Society for Zoology and Botany
MH and ELY meeting, Rovaniemi	1/2013	10	No	Metsähallitus (MH)
Plants and climate change seminar, University of Notre Dame, Indiana, USA	3/2013	over 100	No	University of Notre Dame
Finnish Plant Science Days, Helsinki	13.-15.5.2013	170	No	Department of Biosciences, University of Helsinki
Oikos National Ecology meeting, Jyväskylä	2/2013	128	No	OIKOS, Finland
HENVI Science Days, Helsinki	13.-14.5.2014	126	No	HENVI Graduate School, University of Helsinki
SYKE Baltic Sea shore seminar, Helsinki	2/2014	c. 100	No	SYKE
LIFE Platform meeting NATNET, Rovaniemi	10.-12.6.2014	77	No	Lapland Ely-center, NATNET LIFE project
Finnish Botanical Gardens' annual conference, Kaisaniemi, Helsinki	9.9.2014	c. 70	Yes, with others	LUOMUS, Kasvitieteellisten puutarhojen neuvottelukunta
Bryophyte garden ex situ – planning meeting, Kaisaniemi, Helsinki	5.12.2014	5	Yes, with others	LUOMUS Bryophyte herbarium
Stakeholder meeting, Riihimäki town	27.2.2015	7	No	Riihimäki town
Calypso bulbosa conservation seminar, SYKE, Rovaniemi (videoconference in Helsinki)	4.6.2015	c. 25	No	Lappi Ely-center & SYKE
ESCAPE exhibition opening ceremony, Kaisaniemi, Helsinki	16.6.2015	c. 60	Yes	

Planning meeting; LBA science track, Lammi biological station, Hämeenlinna	10.6.2015	7	No	Lammi Biological Station
UH Open University, Course on Botany, Kaisaniemi, Helsinki	5.10.2015	c. 30	No	Open University
ESCAPE exhibition opening ceremony, Oulu Botanical garden, Oulu	16.11.2015	n. 20	Yes	
Hämeenlinna botany club Pulsatilla, autumn meeting, Kumppanuustalo, Hämeenlinna	30.11.2015	17	No	Hämeenlinnan luonnonsuojeluyhdistys
EU Natura2000-day, Kumpula Botanic Garden, Helsinki	20.5.2016	27	Yes	
Opening of UH Lammi Biological station Nature Path	9.6.2016	40	Yes, with others	Lammi Biological Station
Finnish Plant Science Days, Turku	25.-26.5.2016	111	No	University of Turku & Suomen Biologian seura Vanamo ry.
NordGen Crop Wild Relatives seminar, Vilnius	19.-21.9.2016	28	No	NordGen, Vilnius University
Freshabit LIFE IP seminar, SYKE, Helsinki	27.10.2016	c. 150	No	Freshabit, SYKE
ESCAPE circulating exhibition opening seminar in Liminganlahti Nature Center, Liminka	6.11.2016	35	Yes	
Botanic gardens annual meeting and ESCAPE Final seminar planning meeting, Kaisaniemi, Helsinki, videoconference	10.3.2017	11	Yes, with others	TUR, KUO Natural History Museums, LUOMUS etc
LIFE Platform meeting, Örebro, Sweden	18.-20.4.2017	63	No	LIFE project Reclaim & Länsstyrelssen Örebro Län
LIFE Platform Fire LIFE, Lammi biological Station, Hämeenlinna	25.4.2017	35	No	Metsähallitus, Fire LIFE project
EU LIFE Natura2000 25 v Celebration day, Kumpula Botanic Garden, Helsinki	21.5.2017	c. 30	Yes	

Action E.2 Increasing public awareness of ex-situ plant conservation methods and public appreciation for plant conservation in Finland and Northern Europe

Action leader: Kirsi Hutri (until 31.8.2016), Satu Jovero (1.9.2016 onwards) UH

Time foreseen: 1.9.2012-31.8.2017.

Action Status: Completed

Expected results/ Objectives: Both studies and practical experience show that conservation is most successful when it is supported by a positive public opinion. The support from the general public is crucial for

long-term success in plant conservation projects. Sustainability of the project outcomes will strongly depend on public awareness on their importance. This is why the dissemination activities directed to the general public were in an important role in the ESCAPE program.

Deliverables and Milestones / Completed activities and products of the action:

***Deliverables:* Web-based information package on ex-situ methods (delivery date/DL: 30-09-2013).** The web-based information package was specifically focused on ex-situ conservation and its role as a complementary approach to in-situ conservation. Information package on ex-situ methods was completed and published on ESCAPE website on 30.9.2013 (<https://www.luomus.fi/fi/tietoa-suomen-uhanalaisten-kasvien-etasuojelumenetelmista>).

Printed guide book on the exhibition (delivery date: 18.5. 2015. DL 31-05-2015)

The guide book was published well-advance to the exhibition opening. The booklet was published in two languages (Finnish and Swedish Progress Report Annexes PR2 E.2.2. and E.2.3) and was sent out to school teachers in connection with the invitation to Action E.3 workshop. Thus it served also as a beneficial information package for the teachers, who were invited to bring their classes to the exhibition and workshop. For maximal approachability the printed version was also available at the exhibition and additionally in pdf form at the project website (www.luomus.fi/escape).

Exhibition on plant ex-situ conservation (delivery date: 16.6.2015 to 04.10.2015. DL 30-12-2015). The exhibition "Hei, me etäsuojellaan kasveja lähellä / Hej, vi fjärrbevarar växter på nära håll!" was opened for the public in 16th of June 2015, in connection to University of Helsinki 375-anniversary at Kaisaniemi Botanic Garden, UH (6 months prior due-to-date). The exhibition was opened by the project leader Marko Hyvärinen, almost 60 guests attended. The exhibition was based on the expertise of the ESCAPE researches together with the coordinating beneficiary Public Outreach Team (LUOMUS) who contributed most to the practical preparations for the exhibition. Also the LUOMUS Garden Team was involved. The aim was to provide visitors with a good overview of the challenges and new methods information in order to enhance their understanding on ex-situ conservation and the new means created in ESCAPE -project. The exhibition (Annex PR2 E.2.1) included 11 plexiglas posters in a round greenhouse (see Annex FR Action E.2.1). The exhibition manuscript was based on five "mascot" plants selected to showcase different types of threatened plants profiting from ex-situ conservation. Also juridical issues, future aspects and threatened mosses were taken up in the exhibition posters. An interactive board game on seed banking was also created to attract and inspire younger visitors. The ESCAPE exhibition was easily accessible and free-of-charge. The EU Life -logo and the ESCAPE logo, including LIFE flag hung outside the greenhouse were both visible in the exhibition (see photos in Annex FR Action E.2.1).

The exhibition succeeded very well. It was informative, and especially the Seed Bank game received positive feedback from the visitors. Unfortunately, the visitor figures are only estimates, since the visitor are not registered at the outdoor areas of Kaisaniemi Garden. Summer is the most visited time of the year, and it has been estimated that during the period of Escape exhibition about 40 000 visitors visited in Kaisaniemi, and were able to see the exhibition.

During the project period Kaisaniemi Botanic garden underwent large refurbishment. Systematic and sensory gardens were completely changed and new lichen, moss and rock gardens were built. Moss garden includes ex-situ conserved mosses that were collected during ESCAPE. The refurbishment of Kaisaniemi Botanic garden (in the GA anticipated to take place by 2015) was finally finished in 2017 and the whole garden opened on 17 May 2017. This caused immediate increase in numbers of visitors by 27% already in 2017 (61 000 visitors in 2017 vs. 48 000 in 2016). It is expected that the annual number of visitors will be around 100 000 in 2018. These visitors will receive information about ESCAPE and ex-situ conservation.

Circulated exhibition in nature centres and museums (delivery date: 08-10-2015 to 31-8-2017, DL 30-12-2015 + exhibition open also after-LIFE until 30-09-2017). Already from the very beginning, the ESCAPE-exhibition structure was designed keeping in mind that the contents are easily re-useable in various settings and can be show-cased in different compositions. The exhibition was originally designed to fit in a self-assembly greenhouse of about 8m². The touring exhibition was launched in October 2015. It included altogether eleven, bi-lingual posters, guide booklets both in Finnish and Swedish and the bi-lingual Seed Bank game. The circulating exhibition on plant ex-situ conservation was touring in the following locations in Finland:

1. UO Botanical Garden, greenhouse lobby, Oulu 1.10.2015 –31.3.2016, about 5 000 visitors
2. Oulanka National Park, Nature Centre, Kuusamo 1.6.2016 – 30.9.2016, about 35 000 visitors
3. Liminganlahti Nature Centre, Liminka 1.11.-30.11.2016. (At Liminganlahti the touring exhibition was reinforced by an ESCAPE public event that took place on 6.11.2016, 539 visitors
4. Finnish Environment Center (SYKE), lobby, Helsinki 6.4.-5.5.2017, about 200 visitors
5. UH, Kaisaniemi Botanical Garden, Helsinki 19.5.2017-30.9.2017, about 40 000 visitors

The exhibition was easily packed and put up, and carried by Schenker logistics Ltd. from site to site.

During its current lifespan, the exhibition has been available for 80 700 visitors.

Additionally, ESCAPE project and plant ex-situ conservation emphasizing potential of Assisted migration was included as a poster (see Annex FR Action E.2.2) in Muutosta ilmassa / Change in the Air –exhibition at LUOMUS in 22.11.2015 onwards with potential audience of 185 000 visitors.

Staff members responsible for this action in GA: Action leaders/Head of exhibitions Kirsi Hutri (until 31.8.2016), Planner Satu Jovero (from 1.9.2016 onwards), Planner Hasse Hyvärinen, IT Specialist Dare Talvitie.

Perspectives for continuing the action after the end of the project:

Action E.2 was aiming at increasing the general audience knowledge on ex-situ plant conservation. This is an important corner stone for the environmental education at the botanic garden. Hence Action E.2 aims at long-term visibility and educational role for garden visitors will be further continued after the ESCAPE project. The circulating exhibition and guide-book materials will also be available for interested parties in future. The ESCAPE exhibition pavilion and the interactive board game on seed banking will be available for families in Kaisaniemi botanic garden also in the future. Furthermore, the additions of threatened plant species to botanic gardens' living plant collections are and will be used for examples of ex-situ conservation methods on regular guided tours for garden visitors.

Problems encountered: None.

Action E.3 A children's comprehensive workshop on plant conservation

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.10.2014-31.3.2016.

Action Status: Completed.

Expected results / Objectives: One school lesson (45 min) long interactive workshop performance for school-kids of about age 7-12. Literal background materials for teachers loadable in internet, e.g. a booklet with summarized background information on the specific question to be selected as workshop theme, with additional cogitation tasks for classwork in school.

Deliverables and Milestones: Deliverables: **A workshop for children aged 7-12 (Delivery date 1.-3.9.2015, DL: 31-12-2015).** A complete description of the workshop planning, materials and performance was annexed to ESCAPE Progress Report 2 on 31.1.2016. The

workshop manuscript was outlined by Sanna Laaka-Lindberg and Mari Miranto, and the performance characters developed in cooperation with Ohjelmatoimisto Ruutikellari, Kirsi Hutri and Satu Jovero. The timing and structure with choreographic outlines and music was planned and performed by Ohjelmatoimisto Ruutikellari. The theme selected for the workshop was plants' potential for environmental change and plant life-cycle. The workshop consisted of an information part, an interactive part with music and dancing, and a do-it-yourself part, in which the children planted their own ex-situ plant in a pot, that was taken back to the class-room or home window-sill (see Annex PR2 E.3.1). On the basis of the autumn term schedules in schools, the workshop was aimed to 2nd to 4th grades, for kids from 8-10 years. Altogether 12 workshops were scheduled and 9 of them presented 1st to 3rd of September, 2015 at Kaisaniemi Botanic garden (see Annex PR2 E.3.1) around the ESCAPE exhibition pavilion (see Action E.2). Altogether 215 pupils and their teachers from 9 schools participated the workshops. A video trailer on the workshop and a mp3-loadable tune were made available at the ESCAPE website. The school children's parents did not allow wider distribution in the internet, but these will stay available at www.luomus.fi/escape

Milestones: None

Completed activities and products of the action: An agreement on further use of the performance products (tune, video, performance concept, manuscript and other materials) including copyrights was made between ESCAPE project via the coordinating beneficiary University of Helsinki and Ohjelmatoimisto Ruutikellari allowing commercialization of the E.3 Action products (see Annex FR Action E.3.1). An article on the educational use of ESCAPE plant ex-situ conservation in Botanical gardens was published in teacher's magazine Opettajan retkiohjelma in 2016 (see Annex PR3 Action E.3.1 pp. 112-117).

Staff members responsible for this action in GA: Action leader Sanna Laaka-Lindberg, IT Specialist Dare Talvitie, PR Officer Ville Korhonen, Curator/Head of exhibitions Kirsi Hutri, Curator/Planner Markku Liinamaa, Harri Sihvonen and Satu Jovero UH.

Perspectives for continuing the action after the end of the project:

Action E.3 workshop was made as a performance concept which could be used and developed further by the Ohjelmatoimisto Ruutikellari. For this, an agreement on the copyrights and commercialization (see Annex FR Action E.3.1) was prepared and signed by the ESCAPE project and the Ohjelmatoimisto Ruutikellari director Petri Keinonen. Aiming at increasing the general audience knowledge on plant conservation, and especially ex-situ conservation, the generated workshop concept and materials will be available for future use. This concept could be also used in the environmental education at the botanic garden. Hence Action E.3 long-term educational role for the younger generation of garden visitors will be further continued after the ESCAPE project.

Problems encountered: None.

Action E.4 Project website, notice boards and social media

Action leader: Laura Hiisivuori UH

Time foreseen: 1.9.2012-31.8.2017

Action Status: Completed.

Expected results / Objectives: Minimum of 12 printed posters sized about A2 will be attached to easily and widely observable notice boards in strategic places like entrance halls in the ESCAPE beneficiaries' offices after starting of the project. A website hosted at <http://www.luomus.fi/ESCAPE> will be established immediately after ESCAPE project will start. The website visitors will be counted by a counter. The ESCAPE profiles will be opened in appropriate social media after the project starts. The interest towards ESCAPE and its targets may be evaluated on the basis of contacts taken in these media.

Deliverables and Milestones: None.

Completed activities and products of the action: The activities of this Action consist of different ways to enhance visibility and acceptance of the ESCAPE project both within the beneficiaries' organizations and main stakeholders. Visibility and awareness of the project

and its goals are obtained by communication and PR in internet and social media. We also prepared ESCAPE communication Guidelines (see Annex FR Action E.4.1), which were published in May 2014, and were made available for all ESCAPE staff members. Following list includes *activities conducted during the project* by different tools selected for obtaining the Action E.4 targets.

1. **LIFE+ and ESCAPE logos:** The ESCAPE project logo was designed and both logos have been in all of project's publications, Deliverables including notice boards, brochures, Milestone publications, seed collection instructions and project's webpages (see also Action E.1). The ESCAPE project logo was designed by Nijolė Kalinauskaitė as a part of her work in Action C.5.
2. **Notice boards:** The hardcopy poster of the ESCAPE project was published in June 2013 (see Annex MT E.4.2 poster). A downloadable version is available also on the ESCAPE Finnish website ([poster with Finnish texts](#)). QR-code of the ESCAPE-project webpage was attached to the poster. The 12 posters were distributed to ESCAPE beneficiaries for placing them to appropriate locations in their premises (see Annex FR Action E.4.2).
3. **Project website** was created immediately after the project started. On the pages, there are the ESCAPE logo and the EU LIFE+ logo. ESCAPE project has Finnish (www.luomus.fi/escape), English (www.luomus.fi/en/escape) and Swedish pages separately (www.luomus.fi/sv/escape-ex-situ-bevarande-av-finlandska-vilda-vaxterwebsites). Webpages include information on ESCAPE objectives pointing out the main practical targets, the descriptions and specific aims of the ESCAPE actions and as well project performers. Webpages contain also general information on ex-situ conservation and most of the materials published during the project. During five-year project, there were 5 876 visitors in Escape websites (from 1.9.2012–31.8.2017). On the end of the project, there were 40 downloadable documents available in the websites.
4. **Photographs.** Copyrights of the photographs taken on ESCAPE activities for project reports, presentations and publications, as well as for Action result documentation are transferred to ESCAPE project by individual agreements with each project staff member. Additionally, some photographs have been bought from non-ESCAPE photographers or received from volunteers freely for use on ESCAPE purposes. The list of photographers and numbers of their photographs donated to ESCAPE, with updated information on photograph topics and storage sites are listed in Annex FR Action E.4.1. Additionally, a sample set of selected best photos of each ESCAPE beneficiary photograph files is attached as an electronic copy on the Final report (a folder named Annex E.4 Annex Photos) stored on memory stick).
5. **Brochures:** Two brochures on ESCAPE describing the project targets in Finnish and in English was published at the end of June 2013. The first brochure was distributed to all beneficiaries' and several stakeholders' offices during 2013. The brochure on results of the project was published at the end of July 2017, in Finnish and in English. The brochures are also downloadable on ESCAPE website, see also Deliverables in Action E.1.
6. **Publications:** several articles on different aspects of ESCAPE project activities have been published or submitted thus far. These are described in detail in Chapter 5.2 Dissemination. Project products include two handbooks, materials for which are collected in concrete conservation actions C.1-C.9 and monitoring actions D.1-D.5. Many of these dissemination products have been reported and annexed to previous ESCAPE reports. The most recent ones and those possibly not annexed before are attached to the Final report as paper copies in Annex FR Action E.4.8 and listed in Annex FR Action E.4.3.
7. **Public Media:** ESCAPE project has received quite a lot of interest from public media including national and local newspapers, general and professional journals, tv and radio. By the end of the project 31.8.2017, at least 66 articles have been produced on ESCAPE targets, fieldwork and results. A list of publications on ESCAPE project in different media is given in Annex FR Action E.4.3. (hits in Meltwater publication search in October 2017), in Annex FR Action E.4.4. (radio interviews and other hits) and in Annex FR Action E.4.5. (press releases and own news in LUOMUS, UH).
8. **Social Media:** ESCAPE Core Team made the decision that we will use the Facebook page of Botanic Garden of Helsinki University to share information of the project. There are many advantages to use already existing social media pages, first of all we already had in the beginning of the project over 1 500 followers and nowadays over 6 600. Finnish Museum of

Natural History Facebook page, which has over 7 800 followers was also used. In Facebook there were about 40 posts treated project topics.

Furthermore, a Facebook character "Escape Luomus" was created in January 2013. The character has promoted and discussed about ESCAPE news (see also Action D.5). On the end of the project period ESCAPE character has 229 Facebook friends. (See Examples of social media postings in Annex FR Action E.4.6, see also ESCAPE PR3, February 2017) We also figured out using #escape -hashtag on Twitter. Hashtag wasn't very good because of various other users and meanings of same hashtag, and therefore not used.

9. **Other:** We produced as well a project trailer video on Children's workshop: [Escape Project Trailer](#) (YouTube, in Finnish, also annexed as Response ESCAPE-trailer). A theme song on plant conservation was published in connection to children's workshop (see Action E.3): [Talvikkipaju](#) ("The song of the Salix pyrolifolia" by Ruutikellari (SoundCloud).

Staff members responsible for this action in GA: Action leader/PR Officer Laura Hiisivuori (1.9.2012-31.12.2014, 1.9.2016-31.8.2017), Ville Korhonen (1.1.-31.12.2015), IT Specialist Dare Talvitie UH.

Perspectives to continuing the action after the end of the project: The website of the project will exist after the project with all downloadable materials. The seedbank and experiments that going on after the project will be communicated by The University Communications.

Problems encountered: None.

Action E.5 Layman's report of the project progress

Action leader: Sanna Laaka-Lindberg, UH

Time foreseen: 1.10.2016-31.3.2017.

Action Status: Completed

Expected results/ Objectives: ESCAPE Layman's report of 5-10 pages will be produced both in English, Finnish and Swedish languages and both in printed and electronic form.

Deliverables and Completed activities and products of the action:

Layman's report on ESCAPE (delivery date/DL: 30-06-2017)

Objectives accomplished: The Layman's report (ESCAPE Annexes FR Action E.5.1 in English, FR Action E.5.2 in Finnish and FR Action E.5.3 in Swedish) were compiled in co-operation between project trainees in ESCAPE project. Thus, in addition to producing a Layman's report adapted to general people, an educational aspect on training young future species conservation professionals on public communication was fulfilled. An English version of the Layman's report document (pdf) was launched on ESCAPE project website on 30.6.2017. Finnish and Swedish versions were launched on the website later in 2017. The Swedish translation was ordered from a consulting firm Tagfactory/Leena Nikolajev-Wikström.

Changes in Action E.5: Original plan included Layman's report both as electronic and printed versions. As the paperless and low carbon-footprint label of ESCAPE actions were considered important, it was decided to publish only as an electronic version (in three languages see www.luomus.fi/escape).

Staff responsible for the action in GA: Action leader/Project coordinator Sanna Laaka-Lindberg, PR Officer Laura Hiisivuori UH.

Perspectives for continuing the action after the end of the project: ESCAPE Layman's report versions in three languages are supposedly downloaded and used as background information for quick reference for professionals, and as a nut-shell information package on plant ex-situ conservation themes and actions in ESCAPE project for the general public and students.

Problems encountered: The translation of the Layman's report text to Swedish was delayed as the persons helping in translation in UH had just retired by the time this activity was needed. It took some extra effort to find a sufficiently knowledgeable translator in such a tight

schedule. Fortunately, consulting firm Tagfactor / Leena Nikolajev-Wikström was found by the ESCAPE network among conservation scientists, which indicated the benefit of networking in practice.

5.3 Evaluation of Project Implementation

Ex-situ conservation methods used in ESCAPE project were based on those used before with other plants such as ornamentals and crop plants. However, applying this kind of methodology entails a lot of testing and fine-tuning before it can be successfully applied. Sometimes the application procedure can be species specific, not to mention that applying ex-situ conservation to completely new groups, such as bryophytes in this case, may require large-scale methodological screening. However, ex-situ conservation methods used in the project: 1) growing in living collections, 2) seed bank 3) cryogenic storage of living tissues, and 4) micropropagation turned out to be mostly feasible and the success rate was very good. Partially, the success was based on careful planning and compiling the existing knowledge from various sources. A detailed list of project task together with the evaluation of their success is given in Table 5.

In some cases, finding the right propagation method took some time. For example, *Salix pyrolifolia*, an endangered shrub species used in assisted migration experiments (Action C.7, see also Actions C.3 and C.6) was in the end easier to propagate from cuttings than through micropropagation. In micropropagation the growth rate of the axenic culture and the slow post-processing in pots, in order to get samplings that may survive in the wild, may well set serious constraints for the feasibility of the methods not to mention skilled labour cost and start investments needed for a micropropagation facility. However, in some cases micropropagation or cloning *sensu lato* in axenic culture may well be the only way to ensure the survival of rare plant genomes.

Interesting part of the project was the testing assisted migration (Action C.7) as a completely new method to tackle climate change. Not only the biological but also the socio-legal side of the project was new to the actors and to the authorities. The protocol for the permission application, which was naturally a prerequisite for any experiment with endangered species, proved to be strict in a sense that authorities needed to be provided with very detailed plans of the action. However, the environmental authorities largely viewed assisted migration as well as population enhancement (Action C.6) as part of the kind of explorative work that should be carried out and serves aligned interest with their work. It appeared that the project dissemination especially concerning conservation professionals was very successful in this respect.

Most of the project results are very concrete and immediately visible. In long-term it is most important to make sure that the current trend to mainstream ex-situ conservation as part of the everyday work of conservationists will continue and the number of taxa and populations in ex-situ conservation to increase towards the Global Plant Conservation Strategy target 8 (75% of endangered species in ex situ-conservation by 2020). Also, the created pool of ex-situ conserved native plants serves, not only conservation but the research sector as well. This is one of the anticipated long-term benefits that will come apparent after a certain time period. One of the obvious project dissemination results has been international interest in project and ESCAPE is often portrayed as model project for other countries. Moreover, the interest in collaboration using the ex-situ facilities established in ESCAPE has been evident in discussion with neighbouring countries and international networks. Hence, the whole Baltic-Nordic region may in the future develop regional collaboration in ex-situ conservation based on ESCAPE results and facilities established.

Table 5. Project tasks and sub-tasks and the evaluation of their success.

Task (project objectives as main tasks and expected results and selected action targets as sub-tasks, see the revised proposal in GA)	Foreseen in the revised proposal	Achieved	Evaluation
Main task 1: Increase the number of plant taxa in ex-situ conservation	Actions C.1-C.4 Increase the number of endangered vascular plant taxa in ex-situ conservation to 118 by the end of the project.	Yes, at the moment, there are 175 native plant taxa and three bryophytes in ex-situ conservation	Collecting taxa and finding them a suitable ex-situ conservation method was not limiting success in this major target. However, ensuring genetic diversity through collection of 3-5 populations proved to be impossible in most cases due to the rarity of the taxa.
	Sub-task 1.1 (Action C.1) Total number of seeds collected during the project ranges between 50000 and 250 000, and pieces of plant material between 2000 - 5000.	Yes, an estimated number of good quality seeds is 1 700 000 seeds, and number of other plant material particles about 3000	Collecting seeds and finding a suitable protocol for different taxa proved to be faster than anticipated. However, there was a large variation between years in this respect.
	Sub-task 1.2 (Action C.2) By the end of 2015 there are 55 threatened native plant taxa stored in the seed bank. By the end of the project this number reaches 80.	Yes, the seed bank collections amount to 148 taxa.	See above.
	Sub-task 1.3 (Action C.3) Development of in vitro propagation and cryopreservation methods for 20 endangered plant taxa by 3/2016 and 30 taxa by the end of the project and genetically representative sample of these species banked in cryotanks.	Yes, 17 taxa were cryopreserved and 26 micropropagated by 3/2016. In the end of the project 41 were either in micropropagation or cryopreservation.	The numerical targets were reasonably high for this part and extra effort had to be put to achieve them all.
	Sub-task 1.4 (Action C.4) By the end of the project 25 threatened native plant taxa are ex-situ conserved in outdoor collections of the Botanic Gardens of Helsinki and Oulu	Yes, 87 taxa are ex situ conserved in outdoor collections.	The success in seed collection also helped building larger outdoor collections.

	Universities.		
	Sub-task 1.5 (Actions C.1-C.8) Implementation of the ex-situ conservation strategy and action plan for Finnish threatened native plants developed in the Life+ project VACCIA	Yes, implemented as planned.	Those parts of the ex-situ conservation action plan that were included in ESCAPE were successfully carried out.
	Sub-task 1.6 (Actions C.1-C.8) Fulfilment of part of the GSPC ex-situ conservation targets in Finland.	Yes, 2010 GSPC targets for the level of ex-situ conservation (60%) reached.	Very importantly relatively greater proportion on priority species/taxa that are more in danger of extinction are now in ex-situ conservation.
	Sub-task 1.7 (Action A.1) Priority list of native plant taxa (min. of 100 taxa) to be incorporated in different forms of ex-situ conservation.	Yes, list of 100 taxa published in the project webpage and also the logic behind the selection explained in detail in a separate publication.	Nine different factors considered in priority ranking starting from 326 taxa. Total of 116 taxa of them reached the critical point 5 in ranking, thus the published priority list includes 116 taxa instead of 100.
Main task 2: Develop methods and new combinations of conservation methods to ensure genetic diversity.	Actions C.2, C.3, C.5; Develop application of micropropagation and cryopreservation Include bryophytes in ex-situ conservation trials. Form a seed bank.	Yes, both methods are now routine in plant ex-situ conservation. Bryophytes are successfully included. Seed bank up and running.	Developing micropropagation proved to be possible in most trials. Sometimes slow growth rates made it non-feasible though. Cryopreservation was successful with most trials. High success rate in the seed bank.
	Sub-task 2.1 (Actions C.2 and C.3) Establishment of a national gene bank for threatened native plants (seed bank with 80 species and cryogenic storage functional with 30 species by the end of the project)	Yes, see sub-tasks (1.2. – 1.4.).	The national gene bank established during the project will continue to function after the project.
	Sub-task 2.2 (Action C.5) Ex-situ conservation schemes developed for 1-2 threatened bryophyte species, which subsequently form basis for instructions for further development of bryophyte ex-situ methods	Yes, three bryophyte species were taken in ex-situ conservation and tested for micropropagation and cryopreservation methods as well as subsequent	Instrumental knowledge to begin with gained from a training period in Kew Botanic Gardens in the UK. Bryophyte material can be produced in copious amounts in garden conditions when

		greenhouse propagation.	micropropagation is successful.
Main task 3: Use ex-situ conserved plant material and test the possibilities for assisted migration (AM) and reintroduction of plant species.	Action C.7 and C.8, also C.5: Three selected species/taxa are used in both AM and reintroduction experiments.	Yes, all experiments are set with the selected taxa <i>Artemisia campestris</i> subsp. <i>bottnica</i> , <i>Puccinellia phryganodes</i> (herbaceous) and <i>Salix pyrolifolia</i> (shrub)	Procedures carried out successfully with herbaceous species. Delayed start with the woody shrub.
	Sub-task 3.1 (Action C.7): Nine new populations of three threatened native plant taxa created to native sites by assisted migration	Yes, AM experiments with three taxa three populations each taxa set up.	AM experiments with two taxa were started promptly but one late in 2017. Slow growth rate in micropropagation hindered the start with <i>Salix pyrolifolia</i> . Cuttings used successfully.
	Sub-task 3.2 (Actions C.8 and C.5): Nine new populations of three threatened native plant taxa reintroduced to sites from where they have disappeared	Yes, nine populations representing six different threatened plant taxa were reintroduced during the project.	Lack of start material from some very rare species prevented their incorporation in the reintroduction scheme in a way described in the management plan and alternative species had to be used.
Main task 4: Compile instructions for ex-situ plant protection methodology. Organise exhibitions and seminars for dissemination.	Actions E.1, E.2 and F.2: Ex-situ conservation handbooks published. Seminars and exhibitions organised.	Yes, achieved according to the plan. Vascular plants and bryophyte (as manuscript in end of the project) handbooks published as printed and pdf version. Several seminars and one circulated exhibition held.	Project dissemination was very successful and ex-situ conservation is now largely accepted as part of the conservation toolbox.
	Sub-task 4.1 (Action E.1) Instruction booklet based the results achieved in implementation of different ex-situ plant conservation methods.	Yes, the "Ex-situ conservationist's toolbox" (in Finnish "Etäsuojelijan opas") published both printed and a pdf version	The book is a thorough description of ex-situ conservation methods used in ESCAPE together with examples taxa in ex-situ conservation. As

		distributed for free to stakeholders and conservationists.	it is in Finnish it will reach e.g. conservation practitioners and garden personnel.
	Sub-task 4.2 (Action E.1, E.2, Actions C.1-C.9, D.1-D.4): Information and instructions (two instruction booklets, progress reports, project brochures, web-based information packages) will be made available for species conservation authorities and other stakeholders.	Yes, similarly, a manuscript of conservationist toolbox on bryophytes soon to be published. Project reporting has been carried out promptly.	Communication with the scientific community and conservation professionals seemed to be successful and there is wide interest on project results especially from policy development point of view.
	Sub-task 4.3 (Actions E.1 – E.5): Information and educational materials (project brochures, exhibitions, printed guide book, other publications and a workshop for school children with web-based background materials) will be made available for general public.	Yes, all dissemination was carried out as planned.	As the project gained plenty of general interest, a large number of interviews in newspapers and magazines also added to the communication of the project value to the public.

5.4 Analysis of long-term benefits

Environmental long-term benefits of the project are mainly mediated through securing the genetic diversity of endangered plants. The role of these plants in the context of an ecosystem depends on taxa – some of them may be essential keystone species for a larger group of other plants, animals, fungi and micro-organisms. Having these taxa readily available for re-introduction may essentially reduce the time lag in restoration of ecosystem functions.

Regarding Natura 2000 habitat types, such as seashore meadows, are directly affected by the project since many of the restoration and assisted migration experiments were carried out on those. Specific habitat types visited: 1) Vegetated sea cliffs of the Atlantic and Baltic coasts (type code: 1230) *Ononis arvensis* and *Centaureum pulchellum* seeds collected, 2) Boreal Baltic sandy beaches with perennial vegetation (type code: 1640): several typical species collected such as *Salsola kali*, *Elymus farctus*, *Ammophila arenaria*, *Festuca polesica*, *Carex arenaria* and *Polygonum oxyspermum*, 3) Embryonic shifting dunes (type code 2110), typical species *Honckenya peploides* collected, and from 4) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (type code 2120) collected namesake species *Ammophila arenaria*.

Several Natura 2000 species were not only in ex-situ conservation but also subject for assisted migration and reintroduction experiments. The former may well create a new tool for the future toolbox in ensuring the biodiversity of seashore meadow. So-called directive species/taxa that have been either target of ex-situ conservation were *Pulsatilla patens*, *Agrimonia pilosa*, *Cypripedium calceolus*, *Calypso bulbosa*, and *Saxifraga hirculus* or in addition to that in-situ conserved either by AM or reintroductions (*Artemisia campestris* ssp. *bottnica*, *Puccinellia phryganodes*).

Regarding environmental policies assisted migration is now viewed as a new tool that can be utilized in adaptation to climate change. Current legislation is very restrictive, but enables this

at least at the experimental level. In the future assisted migration in a “chaperoned” form i.e. between botanic gardens and research stations is likely to take place at the EU level. In the future, this methodology will be discussed when planning the national biodiversity strategy (last time renewed in 2013) and policy development in general. The international biodiversity protection strategies have been as motivation to bring up the need of ex-situ conservation in many discussions in seminars and meetings with species conservation authorities and the decision-makers along the ESCAPE project run. These motivating background strategies include EU's Biodiversity action plan, EU2020 Biodiversity strategy, the Convention on Biodiversity (Article 9) and the Global Strategy for Plant Conservation.

Information about ex-situ conservation has increased during the ESCAPE which was indicated by the result of the web-based survey carried out in the beginning and at the end of the project (Annex FR Action D.5.1).

One very important step in post-ESCAPE development would be the adoption of new business model based on commercialization and mainstreaming of ex-situ conservation. This would require that implementation of either Global or European Strategy for Plant Conservation would be financed by authorities or EU programmes as well as setting up monitoring system. Commercial operators willing to offer their services would be readily available as well as instructions and guidelines on how to proceed with ex-situ conservation in practice.

The focal species in ESCAPE will remain in the gene-bank with time to time renewed accessions. Also, the plant material will be increasingly used in reintroduction programmes. Ex-situ conservation will in long-term expand to cover larger European areas such as the Baltic Region and other Nordic countries.

Major threats for the focal species are changes in land-use i.e. the loss of suitable habitats. Climate change will also alter the biotic and abiotic environment and often in a way that is very difficult to foresee. In order to ensure the survival of plant species diversity, all conservation measures should be in full use and the targets of the Global Plant Conservation Strategy should be met. National governments are responsible for these actions but, as the problems are global, international actors such as the EU can markedly help in the process by political pressure and financing of conservation programmes.

All technology created in ESCAPE will be published and principles of the majority of protocols developed during the project are already known to the science-based conservationist community. International networks, such as ENSCONET and EBGC (see above) have produced ex-situ conservation protocols and will update them in the future. Hence, the contribution of ESCAPE parties in these updates will play part in disseminating the results to other countries and for the international community as a whole.

Long-term economic benefits are based, first, on the economic potential of the genetic diversity and, second, on the business opportunities that stem from the new business model that can be built on integrated plant conservation. This will in part yield better regional development and socio-economic welfare since the best business opportunities are located in non-urban areas. Crop wild relatives in ex-situ collections are the ones that are already globally utilized and are considered to be very important for food security.

The ESCAPE beneficiaries UH and UO will continue to maintain the wild plant ex-situ collections in the future and provide material to new Life+ or other projects that are willing to utilize this source.

Both transferability and cooperation aspects are relevant for post-ESCAPE development. Ex-situ conservation methods developed are readily available for the use all around the EU. In many cases similar methods can be applied to closely related species. Cooperation in regional solutions for ex-situ conservation instead of national ones is already being drafted. In the future, all conservation should be based on biomes, habitats and populations rather than

national borders. EU is a key operator in the political front and can utilize the lessons learned from Life+ projects such as ESCAPE.

Best practices developed in ESCAPE are, first, fine-tuned ex-situ methods, second, integrative conservation approach (in and ex situ) and, third, administrative processes in Finnish environmental administration. EU funding was instrumental to most parts of ESCAPE and, especially more innovative and experimental parts, such as ex-situ conservation of bryophytes and assisted migration would hardly been tested without the funding.

In the future, the long-term impact of ESCAPE can and will be simply measured by the ex-situ conservation status of Finnish threatened native plant species. Also, the number of populations collected should be included in long-term monitoring. The information on accessions in Finnish collections will be stored, not only in the Kotka database in the Finnish museum of Natural History, but in the international Plant Search database maintained by Botanic Gardens Conservation International (BGCI). The latter is utilized for tracking the global situation in ex-situ conservation and, hence, allows e.g. European-wise comparisons.

6. Comments on the financial report

6.1. Summary of Costs Incurred

The following Table 6. contains the incurred project costs compared to the original budgeted costs in GA. Comments and comparisons explains the discrepancies between these two budgets (noting the allowed flexibility of 30,000€ and 10% as indicated in Article 15.2 of the Common Provisions) on each of the cost categories.

Table 6. Comparison of the original ESCAPE project budget to the incurred costs in each of the cost categories.

PROJECT COSTS INCURRED			
Cost category	Budget according to the grant agreement*	Costs incurred within the project duration	%**
1. Personnel	1 570 450 €	1 608 516.06 €	102.42
2. Travel	104 155 €	83 949.24 €	80.60
3. External assistance	18 300 € ²⁾	10 060.78 €	54.98
4. Durables: total <u>non-depreciated</u> cost			
- Infrastructure sub-tot.	0 €	0 €	0
- Equipment sub-tot.	25 200 € ¹⁾	12 533.18 €	49.73
- Prototypes sub-tot.	0 €	0 €	0
5. Consumables	24 284 €	19 937.61 €	82.10
6. Other costs	117 280 €	144 375.67 €	123.10
7. Overheads	129 200 €	131 556.08 €	101.82
TOTAL	1 988 869 €	2 010 928.62	101.11

Comments on the project costs incurred:

- 1) Total budget for Equipment in GA was 25 200€. Of this budgeted sum, 50% is eligible in EU, thus the sum of the EU contribution is 12 600 €. The actual incurred Equipment cost was 49,73 % when calculated on the original total costs. Of the EU eligible costs, the incurred 50% 12 533,18 € is 99,47 %.
- 2) The original budget for External assistance in GA included 4 000€ for External audit. This cost was included in Other costs in the Financial statement of the Coordinating beneficiary UH (see also table 4 below). The original cost for the external audit in ESCAPE budget in GA was estimated as 4 000€, the incurred cost, however, exceeding this clearly (12 355,20€). The external audit company of UH was changed in competitive bidding, which may partly explain the difference in the estimated cost level in 2011 when the project proposal was prepared.

6.2. Accounting system

The accounting systems of ESCAPE beneficiaries are described and the approval systems described below individually for each of the beneficiaries:

Coordinating beneficiary University of Helsinki, UH

UH has electronic invoice handling and archiving systems. Once an invoice is saved/scanned into the system, a routing process for approval begins, based on the unique cost codes of the project. Invoices are certified by authorized persons (project managers or head of units). When invoices are approved they are routed for payment and archived with all relevant documentation. All personnel are instructed to give suppliers ESCAPE-reference to the project.

Accounting system: SAP.

Time recording system: SoleTM

Project codes: 401307, 79785104, 6303643

Associate beneficiaries:**University of Oulu, UO**

In UO, the ESCAPE project number has been 24000584. In addition to this, there are additional end-numbers because of two reasons:

- 1) The ESCAPE project has been moved two times into different (coded cost) units because of the structural changes in UO organization during ESCAPE project (First, Department of Biology was divided into Ecology unit and Genetics and Physiology unit. Later, these two units were combined as one Ecology and genetics unit).
- 2) There are separate end-numbers for income and expenditure. Book-keeping and financial reporting is taking place at the level of project number.

Metsähallitus, MH

Accounting system: The accounting system used at MH earlier was Web-Meritt 3.13.

Accounting system and the code identifying the project costs was 7154. Since December 2015 after SAP accounting system was introduced, the code identifying the expenses related to the ESCAPE LIFE project in the accounting systems is 4007154. The coding of the project invoices in the accounting system includes also a specific code for each project action (= määräA) and project site (= määräB).

The electronic Basware Invoice Processing system IP 5.1.5 is used for the electronic processing of purchase invoices. The system, suitable for receiving electronic invoices and invoices on paper scanned into the system, includes the electronic processing, verification, allocation and approval of invoices and their transfer into the accounting system. The

Basware Invoice Processing system comprises several applications used for performing various tasks at the various stages of invoice processing.

Invoice approval

In ESCAPE LIFE all costs are electronically approved by the Regional Directors, or by the closest superior of the employee in case of working time registration (accounting system AKS) and travel expenses (M2). For all the other costs the accounting information including the correct project codes are inserted and checked by the project's financial secretary to the analytical accounting system IP Thin Client. Each cost is further checked by the person responsible for the purchase or project action in question. Only after these steps are the costs forwarded for approval.

Time recording and approval system

MH Parks & Wildlife Finland's standard time registry system (AKS) was used in the project. The AKS has been equipped during the project with mechanisms that enable the same references to be inserted as are used in the accounting systems and also a standard reporting template that enables easy printing of time sheet that includes all the necessary information. The printed time sheets are signed by the employee and his/her superior.

Instructions for project codes

In the beginning of the project financial guidelines were prepared and disseminated to the project crew of MH. The guidelines included clear instructions that a clear project reference ESCAPE LIFE (LIFE11 BIO/FI/917) be asked to every invoice and that in cases of missing reference a new invoice should be asked. In all systems of the MH the costs of the project were identified by the reference code '40007154'. For all costs bearing the reference '40007154' in IP, M2 or AKS also other data cells are obligatory for identifying the cost category ('KomKoh'), project action ('Amäärä') and project site ('Bmäärä') to which the cost item relates to.

VAT certificates.

The VAT certificate of MH has been submitted with earlier reports.

MH is entitled to recover VAT for expenses that arise from actions directly related to generating timber sales income. In practice the costs where VAT is recoverable include external assistance costs related to timber harvesting, such as subcontractors doing manual or mechanical harvesting or timber transportation. In ESCAPE LIFE, no such activities that generate timber sales income are included. All MH expenses have non-recoverable VAT included in the expenses reported on the financial statements.

Finnish Environment Institute, SYKE

Accounting system

In SYKE there has been several accounting systems during this project's ESCAPE lifetime (2012-2015).

The specific codes have been: XYL1022, P00648EUY01, 7020P-00648EUY01, 7020P-00648OMA01.

Different accounting systems have been: AdeEko+, Rainedance 1.1.2015 onwards, Kieku 10.2015 onwards.

Time recording systems have been: Taika, excel-worksheets 3-5/2014, Tauno 1.6.2014 onwards, Kieku 10.2015 onwards.

Invoice approval:

When the invoice is approved for payment, it should be checked that there is always a reference to the project in question. Also the person checking the item and correctness of invoice, should check this specific matter.

Note on exceptionally high daily rate DR values in UH Financial report

In the UH Financial table, the exceptionally high Daily rate DR levels in the following cases were caused by the system of assessing the DR. The exceptionally high DR values among UH personnel are caused by the following reasons: 1. the person's may have got a high pay rise contain the following cases: 2017 Havas-Matilainen. 2. The holiday pay may increase the DR: e.g. 2017 Hyvärinen, Talvitie and Tiiri, 2016 Hutri, 2013 Seikkula. 3. Small number of total working hours: 2013 Seikkula, 2016 Hutri. 4. Long holidays and other absences 2014 Liinamaa, Jovero, 2013, 2015, 2014-2016Tiiri Pakkanen. 5. No particular reason found for a high DR: 2017 Lindholm

6.3. Partnership arrangements

The coordinating beneficiary UH received the EU commission payments in autumn 2012 and after the Mid-term report acceptance in spring 2015. On the basis of the Associate beneficiaries' budgets and proportions (%) of the total budgeted costs, their share was paid as follows:

Partnership arrangements:

Coordinating beneficiary transfer pre-finances of the Commission to associated beneficiaries according to shares defined in the budget shortly after receiving the money. Co-Financier's (Ministry of the Environment) contribution was invoiced twice in 11/2015 and 11/2016.

1st pre-payment

- Metsähallitus 4.4.2013
- UO 4.4.2013
- SYKE 4.4.2013

2nd pre-payment

- Metsähallitus 3.11.2015
- UO 3.11.2015
- SYKE 3.11.2015

Financial reporting was done on the financial excel table in each of the Associate beneficiary organization, and delivered to the Coordinating beneficiary UH for the total financial report including the table of Consolidated costs compiled by UH.

6.4. Auditor's report/declaration

The ESCAPE project external audit was originally planned in GA both for Mid-term report and the Final report. As recommended by EU commission financial desk Päivi Rauma via monitor Milka Parviainen in autumn 2014 before the Mid-term report, no external audit was done in connection to the Mid-term report.

The external audit was ordered by ESCAPE Head of administration Tiina Ruokamo in spring 2017, the date set on 9.10.2017. The external audit was performed by an auditor company PwC Julkistarkastus Oy, P.O.Box 1015 (Itämerentori 2), FI-00101 Helsinki, www.pwc.fi which is the external auditor selected by University of Helsinki in competed bidding. All materials of all ESCAPE beneficiaries were given to the PwC Julkistarkastus Oy auditors before the set audit date 9.10.2017, and supplemented as requested during the audit. ESCAPE Head of Administration Tiina Ruokamo worked as a contact person between the auditors and ESCAPE project beneficiaries.

The Audit report is attached as Annex Audit report to the Final report.

6.5 Summary of costs per action

The Table 7. presents the allocation of costs incurred per action in ESCAPE project. Some discrepancies and changes which have affected the incurred costs as compared to the original budget in GA are explained below.

Table 7. The ESCAPE project cost per Action

Action no.	Short name of action	1. Personnel	2. Travel and subsistence	3. External assistance	4.b Equipment	6. Consumables	7. Other costs	TOTAL
A.1	Target species and site selection	40 959.48	0	0	0	0	0	40 959.48
A.2	Permits to collect seeds and plant tissue material	12 665.11	0	0	0	0	360	13 025.11
A.3	Elaboration of management plans for sites and actions involved in conservation	21 605.66	316.3	0	0	0	0	21 921.96
C.1	Collection of seeds and other plant material	201 629.86	26 738.21	49.95	0	0	546.79	228 964.81
C.2	Seed bank and development of feasible seed conservation protocols	195 406.35	1 416.29	0	12 533.18	3 607.25	124 305.21	336 397.30
C.3	Micropropagation and cryogenic preservation of threatened plant species	198 137.77	2 774.29	555.62	0	10 417.74	0	211 885.41
C.4	management of threatened species in outdoor collections	95 249.72	2 820.83	1 603.74	0	0	19.95	99 694.24
C.5	Development of ex-situ conservation scheme for threatened	50 380.35	6 437.77	0	0	2 693.49	20.11	59 531.71

	bryophyte species							
C.6	Increasing population size of threatened plant species	76 309.34	12 129.29	198.39	0	794.87	0	89 431.89
C.7	Assisted migration of threatened plant species	50 547.17	3 828.34	0	0	78.64	646.23	55 656.01
C.8	Reintroduction of plant species	34 870.84	3 825.89	1 101.22	0	21.93	100.00	39 919.88
C.9	Habitat improvement	1 898.51	232	555.62	0	0	0	2 130.51
D.1	Monitoring the numbers of ex-situ conserved species in seed banks, cryopreservation and living collections	40 195.63	0	0	0	0	0	40 195.63
D.2	Monitoring the success of species reintroduction and assisted migration	49 788.28	0	0	0	0	0	49 788.28
D.3	Evaluation of bryophyte ex-situ methods developed	10 074.01	0	0	0	0	0	10 074.01
D.4	Evaluation of micropropagation and cryopreservation techniques	22 478.38	0	0	0	0	0	22 478.38
D.5	Monitoring the socio-economic impact and dissemination activities of the project	36 348.47	0	698.24	0	243.44	2 180.26	39 470.41
E.1	Communication of the value of ex-situ methods as species conservation tools to conservation professionals and lawmakers	70 813.25	711.18	2 807.49	0	0	3 239.40	77 571.32
E.2	Increasing public awareness of ex-situ plant conservation methods and public appreciation for plant conservation in Finland and Northern Europe	26 916.88	165.65	0	0	949.41	195.47	29 098.38
E.3	A children's comprehensive workshop on plant conservation	29 808.51	337.11	2 280	0	52.85	0	13 954.44
E.4	Project website, notice boards and social media	13 954.44	0	0	0	0	0	13 954.44
E.5	Layman's report of the project progress	20 425.64	0	0	0	0	350	20 775.64
F.1	ESCAPE project management and organisation plan	267 068.54	11 793.63	210.51	0	1 078.00	0	280 150.68
F.2	Networking with other LIFE and/or non-LIFE projects	40 983.86	10 328.11	0	0	0	77.00	51 388.97

F.3	After-LIFE Communication Plan	0	94.36	0	0	0	0	0
F.4	External audit	0	0	0	0	0	12 355.25	12 355.25
Over-heads		112 596.12	5 876.45	704.25	877.32	1 395.63	10 106.30	131 556.08
	TOTAL	1 721 129.3	89 825.69	10 765.03	13410.50	21 333.24	154 481.97 ²⁾	2 010 928.61

Comments on discrepancies between this table and the summary of costs per action set out in GA

Note that we have responded in this Revised Final report to the points requested for clarification in Responses letter Ref. Ares(2018)1095181 – 27/02/2018.

- 1) General comments: The main reasons for discrepancies between the costs per Action in GA and the costs incurred in ESCAPE project during the 5 years contain 1) costs not foreseen in project budget, 2) raising of price level in many cost categories during the years 2012-2017 and 3) distribution of e.g. working effort between Actions differently as compared to the GA.
- 2) Personnel costs: Major reason for differences in the original Actions' personnel costs (GA) and the incurred costs presented in Table 6 are caused by increase in salaries during the project years, but also as a consequence of the recruited personal's salary levels higher than expected. Additionally, between some Actions the working effort was focused differently, as some Actions (e.g. Action C.9) needed much less work than expected, and thus working hours were targeted to other actions requiring more labour (e.g. Action C.6). However, the overall distribution of personnel costs between the Actions follows rather well the original budget (see breakdown of costs for actions in GA). The discrepancies in personnel costs are explained as follows:
 - Action A.1: the higher personnel costs were caused mainly by the Beneficiary leader's high salary level and more hours targeted to this Action.
 - Action A.2: more working hours of the Project coordinator were targeted to this Action, thus increasing the personnel costs.
 - Actions C.1-C.3: more effort was targeted to these actions, but also the salary level of the staff was higher than expected.
 - Action C.4: less working hours than expected were targeted to this Action especially in early phases of the project. Additionally, the horticulturists' salary level was lower than expected.
 - Actions C.6-C.9: The actions C.7 and C.9 required less working effort than expected. The working effort was targeted to Actions C.6 and C.8 instead.
 - Actions D.3 and D.4: these actions appeared as more laborious than expected, thus requiring more working hours targeted to these monitoring activities.
 - Actions E.2 and E.3: planning, building, exhibiting and performing activities required more effort than expected, but the higher salary costs for motivated and enthusiastic staff was well justified by the successful results (see Actions E.2 and E.3 in Chapter 5.2.2).
 - Action F.1: majority of the personnel costs in this action consist of salary to fulltime Project coordinator, part of whose working effort was divided between many other actions, e.g. Action F.2, thus reducing the personnel costs on this Action.
- 3) Travel costs: Two major reasons caused the lower incurred total travel costs than expected in the original budget in GA. Most of the project meetings were arranged as video conferences thus reducing the need for travelling but also saving time. For instance, the meetings expected in the preparatory actions A.1-A.3 reduced the need

for travel money. The seed collecting and other field work was also organized so that many local volunteers and ESCAPE staff collecting in their close-by areas when possible lowered the costs. Additionally, when possible, public transport e.g. trains were used instead of driving private cars. Another reason for low total travel costs may have been also that relatively few international trips to e.g. platform meetings were realized.

- 4) External assistance: In Action C.1, a sum 2 000 € was budgeted to payments for volunteer collections for the seed bank. This opportunity for a compensation for the collecting effort was not realized, as the volunteers did not want that compensation and it was thus used only once. The total costs in the External assistance lack the external audit costs, which were accounted on the Other costs.
- 5) Equipment: The total incurred budgeted Equipment costs are indicate in Table 7. However, eligible equipment costs are 50 % of the costs shown in Table 5, and in the Financial report of UH excel-table. The Equipments include the gear required in seed bank establishment in Action C.2, and this type of expence was budgeted only to Coordinating beneficiary UH.
- 6) Consumables: The incurred Consumable costs contain laboratory utensils and chemicals in Actions C.2, C.3 and C.5. The several repeated tests in cryopreservation and micropropagation methods caused higher need and thus increased costs of consumables. Chemicals and other laboratory materials were more or less divided between the cryopreservation Actions C.3 and C.5. Some Consumables costs were targeted also to field work tools but such needs were very minimal and the circulated and existing tools were used in most cases reducing the costs in Actions C.4, C.6, C.8 and C.9.
- 7) Other costs / UH: Coordinating beneficiary UH budgeted 103 280€ in rent of the seed bank facilities in Kumpula Botanic garden on the basis of information received from UH central administration in 2011 when making the LIFE+ proposal. The premises used to be in holdings of Senaattikiinteistöt Oy external estate company earlier. The rent was paid annually as internal invoicing on the basis of competitive bidding procedures in UH. Later, the premises were moved under University of Helsinki real estate division, which became known for ESCAPE project not before the preparations for the project Final report (see also comments on rent payments in e.g. ESCAPE Mid-term report). The rented premises for ESCAPE seed banking are the best and in practice only possible option for seedbank establishment and maintenance, thus we see these rental costs as eligible. Inquiries on potential establishment of the seed bank where considered, but the most important excluding reasoning was based on the long distance (150 km) to adequate facilities elsewhere.
The payment proofs and other clarifications on this matter are given in the Annex to the cover letter to the Revised Final report (nr. 15) as requested in the Responses letter Ref. Ares(2018)1095181 – 27/02/2018.
- 8) Other costs / other details: The costs of the External audit (see Action F.4) were originally targeted in External assistance but were moved to Other costs in the Final report.

6. Annexes

7.1 Administrative annexes

Partnership Agreements between ESCAPE project coordinating beneficiary UH and the three Associate Beneficiaries (UO, MH and SYKE) were included as Annexes to the ESCAPE Inception report on 31.5.2013.

7.2 Technical annexes

7.2.1. Keywords:

ex-situ conservation, threatened species, native plants, seed bank, botanical gardens, reintroduction, population increasing, assisted migration, gene bank, Action, activities, deliverables, ESCAPE, implementation, incurred costs, milestones, results, dissemination

7.2.2. List of abbreviations:

AM - assisted migration

ELY- centre - Centre for Economic Development, Transport and the Environment, local environmental authorities in Finland

LAP - Lapland

POP – North Bottnia (Pohjois-Pohjanmaa)

KES - Keski-Suomi

ESA – South Savo (Etelä-Savo)

HAM - Häme

KAI - Kainuu

POK – Northern Karelia (Pohjois-Karjala)

POS – North Savo (Pohjois-Savo)

VAR – Varsinais-Suomi

ESCAPE - Ex-situ Conservation of Finnish Native Plant Species

GA - grant agreement

DR – Daily rate (in financial tables)

HF - Hortus Fennicus section in Kumpula Botanical Garden

HE - Hortus Fennicus section in Kumpula Botanical Garden

IT staff - intelligence technology staff

LUOMUS – Finnish Museum of Natural History (Luonnontieteellinen museo LUOMUS in Finnish)

MH - associate beneficiary Metsähallitus

UH – coordinating beneficiary University of Helsinki

UO - associate beneficiary University of Oulu

UT - Botanical Garden, University of Turku

SYKE - associate beneficiary Finnish Environment Institute

7.3 Dissemination annexes

In addition to the dissemination annexes listed below, a list of all ESCAPE project dissemination documents annexed also to the previous reports is given as Annex FR Annex list.

7.3.1 Layman's report

ESCAPE project Layman's report was first published in English on project website www.luomus.fi/escape on 30.6.2017. The Finnish and Swedish versions were launched on the website later. All Layman's report versions are downloadable for free at the website. See Action E.5 above, see also Annexes FR Action E.5.1-E.5.3.

7.3.2 After-LIFE Communication plan – for LIFE+ Biodiversity and LIFE Environment Policy and Governance projects

An After-LIFE communication plan was published soon after the project ended. The After-LIFE communication plan was written in cooperation between all the project beneficiaries, and published on ESCAPE website www.luomus.fi/escape as a downloadable pdf-file (see also Annex FR Action F.3.1). Materials for the After-LIFE communication plan were collected along the project as reported in previous ESCAPE reports, too. The After-LIFE plan includes the plans for future continuation of ex-situ plant species conservation, its potential applications, use of project dissemination products, and further development and cooperation on the ex-situ conservation between the ESCAPE partners and other parties.

7.3.3 Other dissemination annexes

All the photographs produced during the project with photographers names, photo locations/storage sites, numbers of pictures and general contents are listed in the updated photograph list in Annex FR Action E.4.1. A selection of the high quality photos is attached as a folder Action E.4 Annex Photos. Photographs to the electronic version of ESCAPE Final report

Dissemination products including brochures, scientific articles, guidebooks, posters, press releases and articles in general media are listed in Annexes FR Action E.4.3 - E.4.5 and attached to the Final report as paper copies and pdf:s in Annex FR Action E.4.8.

Video trailer on the Action E.3 is attached in the electronic version in Final report with corrected opening pages as an annex Responses – video trailer. mp4, now including the LIFE and ESCAPE logos and also the LIFE-funding expressed literally as suggested by Mrs Anne Burrill in her response letter to the ESCAPE PR3.

Standard presentation compiled by Project leader Marko Hyvärinen illustrates the main actions and results of the project. This is included to the Final report as Annex Standard presentation Hyvärinen 2017

7.4 Final table of indicators

The Final table of indicators is annexed to this Final report. It contains the required numerical outcome of the ESCAPE project concrete conservation activities and dissemination products and events as appropriate. A corrected Outcome indicators Table with corrections requested in Response letter Ref. Ares(2018)1095181 – 27/02/2018 is annexed to the Revised Final report.

8. Financial report and annexes

The following documents required in the ESCAPE project Final report are annexed to this report. Please, note that the revised Financial documents are annexed to this Revised Final report, as requested in Response letter Ref. Ares(2018)1095181 – 27/02/2018

- Standard Payment Request and Beneficiary's Certificate
- "Consolidated Cost Statement for the Project"

- Financial Statement of the Individual Beneficiary completed for each project beneficiary (UH, UO, MH and SYKE). Signed originals are attached to the Final report and with scanned copies also to the electronic versions.
- Documents on information and clarifications requested in previous letters from the Commission, and not already submitted as response-files with the previous reports are

included in the Final report both as printed copies and in a folder Responses on the electronic copy.

- Auditor's report presented as Annex Audit report using the standard reporting format

Full list of Annexes during the project

Below there is a list of annexes from six reports. The number of annexed materials including both required documentations and copies of project deliverables, dissemination materials and other products and/or documents containing specific information and results totals 129 (44 annexed to this Final report).

INCEPTION REPORT dated 31.5.2013

Partnership agreements:

- Annex 7.1.1.a University of Oulu UO Partnership agreement, with signatures (pdf)
- Annex 7.1.1.b University of Oulu UO, Partnership agreement Annex 6, with signatures (pdf)
- Annex 7.1.2. Metsähallitus MH, Partnership agreement & Annex 6, with signatures (pdf)
- Annex 7.1.3. Finnish Environment Institute SYKE, Partnership agreement & Annex 6, with signatures (pdf)

Deliverables

- Annex 7.2.1. Action A.1 Priority list of 100 native plants
- Annex 7.2.2. Action A.1 A set of criteria for AM published
- Annex 7.2.3. Action E.1 Printed brochure about the goals of the project
- Annex 7.2.4. Action E.1 Article about the launch of ESCAPE project

Other ESCAPE dissemination products

- Annex 7.3.1. Action C.1 •ESCAPE siemenkeruuohje (pdf). [in Finnish]. Seed collection instructions
- Annex 7.3.2. Action E.1 & C.5 ESCAPE: Uhanalaisten sammalten ex situ -suojelu Suomessa – *Bryobrotherella*
16: 37–43 (pdf) [In Finnish]

Output indicators. Definition. Other

- Annex 7.5.1. Draft of the ESCAPE poster (pdf)
- Annex 7.5.2. Programme of the ESCAPE stakeholder meeting 22-05-13 (pdf) [in Finnish]
- Annex 7.5.3. ESCAPE Priorisation explanations version 2.3 (pdf)
- Annex 7.5.4. Contribution of the Ministry of Environment. ESCAPE Pirjo Santasalo Co-Financier instructions.pdf [In Finnish]

PROGRESS REPORT 1 dated 31.1.2014

- Annex A.2.1. List of permits for collecting, habitat management and other activities of the ESCAPE project concerning the threatened and protected plant species and nature reserves in Finland
- Annex A.3.1. General management plan.
- Annex C.1.1. Kasvien ex situ -suojelua ESCAPE-hankkeessa: uuden siemenpankin ensimmäiset kasvit
- Annex C.2.1. List of the seeds stored in Kumpula Botanic garden seed bank in 2013
- Annex C.5.1. Localities of the action C.5 focal species *Meesia longiseta* visited in 2013
- Annex D.1.1. List of the plants in living plant collections in Kumpula Botanic garden, UH and Oulu Botanical Garden, UO in 2013 with a scale developed for plant vitality evaluation.

Annex D.5.1. A sample of answers from people visiting ESCAPE website and answering the questionnaire

Annex E.1.1. Lists of public presentations in media and printed and/or web publications of ESCAPE project produced during the report period 1.5.-31.12.2013.

Annex E.1.2. Brochure of ESCAPE

Annex E.1.3. Uhanalaisten kasvilajien etäsuojelun edistäminen Suomessa

Annex E.1.4. ESCAPE poster

Annex F.1.1. ESCAPE project meetings held in the report period 1.5.-31.12.2013

Deliverables

(Listed in chronological order of the deadline date)

30.6.2013 : **Action E.1** *Printed brochure* about the goals of the project (Annex E.1.2)

30.9.2013: **Action E.2** Web-based information package on ex-situ methods

(<http://uusiwww.luomus.fi/fi/tietoa-suomen-uhanaalaisten-kasvien-etasuojelumenetelmista>, see Action E.2, p. 14)

Dissemination materials

Seminars: listed in Annex E.1.1

Newspaper articles: listed in Annex E.1.1., an example Annex E.1.4

Articles for professionals in scientific journals: Annexes C.1.1. and E.1.3.

Presentations: listed in Annex E.1.1.

Radio broadcasts: listed in Annex E.1.1.

Mid-term report dated 6.2.2015

Mid-term report Annexes are listed below.

Annex MT A.1.2. – Assisted migration (AM) criteria

Annex MT A.1.3. – Prioritization explanations

Annex MT A.3.1. – Management plan

Annex MT C.1.1. – Seed collecting list

Annex MT C.1.2. – Article in Lutukka [in Finnish]

Annex MT C.4.1. – List of the plants in living plant collections in Kumpula Botanic garden, UH and Oulu Botanical Garden, UO by the end of November, 2014.

Annex MT C.4.2. – Milestone 30.6.2014

Annex MT C.7.1. – Milestone report 31.10.2014

Annex MT C.9.1. – The management activities implemented by 30.11.2014 on the localities of six ESCAPE focal taxa

Annex MT D.1.1. – List of the plants in living plant collections in Kumpula and Kaisaniemi Botanical gardens, UH and Oulu Botanical Garden, UO by 30.11.2014 with notes on their vitality

Annex MT D.5.1. – Invitations, programs and participation lists of the ESCAPE meetings arranged for stakeholders and ex-situ professionals 2012-2014.

Annex MT E.1.1. – ESCAPE brochure (en)

Annex MT E.1.2. – Suomen uhanalaisten kasvien ex situ -suojaus saa vauhtia LIFE-hankkeesta. [In Finnish] Lenninsiipi Maaliskuu 2013.

Annex MT E.1.3. – Milestone article

Annex MT E.1.4. – ESCAPE Dissemination plan

Annex MT E.1.5. – ESCAPE project activities in increasing the public awareness of ex-situ conservation and dissemination of the project results

Annex MT E.4.1. – List of the photographers of ESCAPE project with information on photograph numbers, topics and storage sites

Annex MT E.4.2. – ESCAPE poster

Progress report 2, dated 31.1.2016

Deliverables

In the Joint mission event in Helsinki on 29.9.2015 the commission technical officer Arnoud Heeres suggested changes on the original lists of Deliverable products and project Milestones. The updated and modified lists of ESCAPE Deliverable products and project milestones produced and achieved thus far, and those to be produced by the end of the project are compiled in Annex PR2 Chapter 5.6 with explanatory annotations.

Deliverable products on the reporting period 1.12.2014-31.12.2015:

Action E.2 Exhibition on plant ex-situ conservation, Deadline 30-12-2015. See Action E.2, and Annexes PR2 E.2.1, E.2.2 and E.2.3

Action E.2 Circulated exhibition in nature centres and museums, Deadline 30-12-2015 See Action E.2, and Annexes PR2 E.2.1, E.2.2 and E.2.3

Action E.2 printed guide book on the exhibition, Deadline 31-05-2015. See Annexes PR2 E.2.1, E.2.2 and E.2.3

Action E.3 A workshop for children aged 7-12, Deadline 31-12-2015. See Annex PR2 E.3.1

Dissemination materials

ESCAPE project dissemination materials from the reporting period 1.12.2014-31.12.2015 are concentrated in general public media in internet, interviews in radio and TV and in articles based on interviews of ESCAPE staff members and on reports on ESCAPE activities in the field. These are listed and copies presented with publication information in Annex PR2 E.1.1. Publications and presentations and in [ESCAPE on Media – Examples](#) blog-update compiled by acting Action leader Ville Korhonen (Action E.4). Unfortunately, the materials in web are in most cases not available as pdf or other printable forms, so they are listed and copied in the Annex PR2 E.1.1. Publications and presentations.

An ex-situ exhibition (Action E.2) was presented in Kaisaniemi Botanic Garden 16.6.-4.10.2015, thereafter started touring in ESCAPE associate beneficiaries premises in 2015-2017. The touring exhibition was first opened in UO Botanic garden on 16.11.2015. The exhibition planning and implementation with a photo gallery is presented in Annex PR2 E.2.1.

For future nature conservationists, decision makers and potential ex situ professionals, the school-kids of today, an interactive workshop “Hei -- me tehdään sitä!” was planned, rehearsed and presented in Kaisaniemi Botanical garden in 1.3.9.2015 as free-for-groups one school lesson (45 min) long performance for kids of 2nd-4th elementary school classes and their teachers in co-operation with environmental workshop group Ohjelmatoimisto Ruutikellari.

The background ideas, planning, preparation and performance with information on feedback received from the teachers are presented in Annex PR2 E.3.1.

ESCAPE Annex PR2 A.2.1. – Julia Vänni's BSc thesis

ESCAPE Annex PR2 C.1.1. – List and numbers of the plant taxa seeds and/or tissues of which have been collected for ex-situ collections in Kumpula botanical garden seed bank and cryopreservation and micropropagation collections in Oulu Botanical garden during the ESCAPE project.

ESCAPE Annex PR2 C.3.1. – Jonne Tolonen's MSc thesis

ESCAPE Annex PR2 C.4.1. – List of taxa and numbers of seedlings of native plant taxa added and grown in nursery for the outdoor collections of Kumpula Botanic Gardens in UH and in Oulu Botanic Garden, UO during the reporting period 1.12.2014-31.12.2015 in ESCAPE project.

ESCAPE Annex PR2 C.5.1. – Peetu Rytönen's student report

ESCAPE Annex PR2 – Deliverable and Milestone lists
ESCAPE Annex PR2 E.1.1. – Publications and presentations
ESCAPE Annex PR2 E.2.1. – ESCAPE ex-situ exhibition 2015: Description and a photo gallery
ESCAPE Annex PR2 – Guide book (fi)
ESCAPE Annex PR2 – Guide book (se)
ESCAPE Annex PR2 E.3.1. – Description of planning, preparation and performing the interactive workshop for children aged 7-12 with workshop manuscripts, practical implementation and products
ESCAPE Annex PR2 – ESCAPE meetings 2015
ESCAPE Annex PR2 – ESCAPE poster LUOMUS
ESCAPE Annex PR2 – Gantt chart
ESCAPE Annex PR2 – Impact
ESCAPE Annex PR2 – Responses
ESCAPE Annex PR2 – Updated ESCAPE organization

Progress report 3, dated 31.1.2017

List of Annexes (pdf files)

Annex PR3 Action A.2.1 – Milestone report: permit applications for 60 vascular plants
Annex PR3 Action C.2.1 Deliverable – Deliverable report published on ESCAPE website
Annex PR2 Action C.3.1 Deliverable – Deliverable: List: cryopreserved threatened native plant taxa.
Annex PR3 Action C.8.1. Deliverable – Deliverable: Science article on integration of ex- and in-situ, a pdfcopy
of the article Hyvärinen, M. 2016: Luonnon Tutkija 119 (4): 132-136.
Annex PR3 Action C.8.2. Thesis – Master's thesis by Koen Frans Verweij on Action C.8 target species
Annex PR3 Action C.9.1. – Lists of management activities: sites and species
Annex PR3 Action D.1.1 – Combination of lists covering all taxa in ESCAPE ex situ collections in Actions C.1, C.2, C.3, C.4 and C.6
Annex PR3 D.2.1 Deliverable – Evaluation report on taxon reintroductions and AM
Annual reports on ESCAPE field activities:
Annex PR3 Action D.2.2 AJ2013
Annex PR3 Action D.2.3 PK2014
Annex PR3 Action D.2.4 PK2015
Annex PR3 Action D.2.5 PK2016
Annex PR3 Action D.2.5 – Monitoring plots established in ESCAPE project
Annex PR3 Action D.4.1 Deliverable – Technical report on success of micropropagation (previously a milestone report)
Annex PR3 Action D.5.1 – Trainee reports on student training periods in ESCAPE project
Annex PR3 D.5.2 – Report on ESCAPE socio-economic impacts (Action D.5) and awareness and dissemination activities (Action E.1) on reporting period 1.1.-31.12.2016
Annex PR3 D.5.3 – Milestone – Monitoring report on socio-economic impact (until 31.12.2015)
Annex PR3 E.1. – Milestone Toolbox manuscript – Copy of the Ex-situ toolbox publication manuscript dated 15.12.2016
Annex PR3 E.1.1. –Deliverable: Article about project function and achievements, a pdf –copy of the article Havas-Matilainen, P. 2016: Sorbifolia 47 (2): 51-66.
Annex PR3 – Responses

Annex PR3 E.1.2 – Pdf-copy of a science article Ranta, P., Jokinen, A. & Laaka-Lindberg, S. 2016: Ecosphere 7(9):e01401

Annex PR3 Action E.2.1 – A pdf-printout of a video-presentation at the E.2 circulating exhibition at the Liminganlahti Nature center (MH) in 1.11.-30.11.2016

Annex PR3 Action E.3.1 – pp.112-117 – pdf-copy of an article on ex-situ conservation in teachers’ annual guidebook for school educational excursions by Puranen, K. 2016: Opettaja 3B/Retkiopas 2016: 112-117. NOTE: on an electronic report, this Annex contains the whole issue of the journal, please refer to the pages 112-117.

Annex PR3 – Updated deliverable and Milestone lists.

Annex PR3 – Responses – Required responses to feedback on the previous reports

Annex PR3 – Responses (1) – Copy of an Excel-sheet with compiled and updated (31.12.2016) information on costs per Action required in PR2 feedback.

Annex PR3 – Responses (2) – Copy of an invoice KR355002398, with indication of ESCAPE reference

Annex PR3 – Video Action E.3 corrected version (NOTE: in “printed” copy of the report, the video saved on a DVD)

Final report, dated 30.11.2017

Annexes

1. Official annexed materials

In addition to Final report and Financial report tables and the Indicators table, a set of documents required to be shown in connection to Final report is included in a folder Responses Annexes. This folder contains copies of documents on ESCAPE staff members salary slips (15 persons, documents identified by persons’ surname), and copies of invoices on ESCAPE seed bank laboratory rent in UH. Furthermore, documents containing arguments on product/service selection in UH for larger purchases and the seed bank equipment are shown in Annex FR purchases and Seed bank purchases, respectively. None of these purchases actually exceed the price limit of necessary tender but were however documented as support to the decisions on such purchases.

Administrative issues

Annex FR Annexes

Annex Standard presentation (in Finnish)

Annex Audit report

Annex FR Administration – ESCAPE project organization and personnel

Annex FR Action Leader Instructions

Annex FR Action E.3.1 – Subcontracting agreement

Annex FR – Calendar 2012-2017

Annex FR Action A.2.1 – A sample of ex-situ activity permission applications

Annex FR Action A.2.2 – An example of ex-situ collection permissions 2. Dissemination products, deliverables and milestone reports

Deliverables

Annex FR Action C.2.2 - deliverable C.2

Deliverable C.5 ESCAPE – science article on bryophyte ex-situ conservation

Annex FR Action C.7.1. – Deliverable Science article on AM

Annex FR Action E.1.1 – Deliverable Ex-situ guidebook

Annex FR Action E.1.2 – Deliverable E.1 Bryophyte ex-situ guidebook (manuscript)

Annex FR Action E.1.4 – Deliverable Brochure on project results, Finnish version

Annex FR Action E.1.5 – Deliverable Brochure on project results, English version

Annex FR Action E.2.1 – Deliverable; ex-situ exhibition, Deliverable; touring exhibition

Annex FR Action E.5.1. – Deliverable; Layman´s report English version
Annex FR Action E.5.2. – Deliverable; Layman´s report Finnish version
Annex FR Action E.5.3. – Deliverable; Layman´s report Swedish version

Milestones

Annex FR Action C.6.1 – Milestone report Min of five taxa in population increase scheme
Action C.5 Milestone – Bryophyte ex situ conservation scheme

Other dissemination products

Annex FR Action A.1.1 – A model of the spreadsheet, pages 1-6 of total of 278 p. Complete table presented

only as an electronic copy

Annex FR Action C.2.1 – Germination protocols for valuable Finnish plants

Annex FR Action C.2.3 – Juho Jämsen's MSc thesis utilizing seed bank techniques

Annex FR Action D.3.1 – Bryophyte ex-situ monitoring methods

Annex FR Action C.6.2 – Monitoring data on taxa with population strengthening activities

Annex FR Action C.7.2 – Transplants of *Puccinellia phryganodes* and their monitoring in ESCAPE Life+ project 2014-2017

Annex FR Action C.8.1. – Monitoring data on nine reintroduced taxa

Annex FR Action C.8.2. – Monitoring data as graphs on five taxa reintroduced in ESCAPE project

Annex FR Action C.8.3. – Luhtaorvokki palautettiin Tampereelle, Lutukka vol. 30: 110 - 113 [in Finnish]

Annex FR Action C.9.1 – Management activities conducted at the ESCAPE reintroduction and population strengthening sites

Annex FR Action D.1.1 – All taxa in different ex-situ collections listed

Annex FR Action D.5.1 – Questionnaire results

Annex FR Action D.5.2 – Questionnaire forms in Finnish, Swedish, and English

Annex FR Action E.1.3 – Lenninsiipi: lajisuojelun verkkolehti. Maaliskuu 2013 [in Finnish]

Annex FR Action E.2.1 – ESCAPE-hanke, ESCAPE project posters

Annex FR Action E.4.1 – List of the photographers of ESCAPE project with information on photograph numbers, topics and storage sites

Annex FR Action E.4.2 – Photographic report on the locations of ESCAPE posters in project beneficiaries´ premises

Annex FR Action E.4.3 – ESCAPE dissemination: 2013-2017 hits by Meltwa

Annex FR Action E.4.4 – ESCAPE dissemination: 2013-2017 ESCAPE project Radio interviews and other hits

Annex FR Action E.4.5 – ESCAPE dissemination: 2013-2017 Press releases and own news in LUOMUS, UH

Annex FR Action E.4.6 – Examples of postings on ESCAPE social media sites: on botanic garden Facebook account, and on ESCAPE Luomus Facebook account

Annex FR Action E.4.7 – List of the photographers of ESCAPE project with information on photograph numbers, topics and storage sites Please, note: this Annex was accidentally attached twice in the Final report on 30.11.2017.

Annex FR Action E.4.8 – Paper copies of recent articles

Annex FR Action F.2.1 – Poster presentation

Annex FR Action F.2.2 – ESCAPE final seminar