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**LIFE project LIFE CCM DE/15/000138
LIFE Peat Restore**

«Reduction of CO₂ emissions by restoring degraded peatlands in Northern European Lowland»

**State of the project sites and consequences for project
implementation – results of field surveys.
Documentation. A3**

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Prepared by: dr. Leonas Jarašius, dr. Jūratė Sendžikaitė, Nerijus Zableckis, Žydrūnas Sinkevičius

LIFE15 CCM/DE/000138

**LIFE project «Reduction of CO₂ emissions by restoring degraded peatlands in Northern European
Lowland»**

Introduction

Hydrotechnical plans for restoration of hydrological regime in damaged peatlands have been accomplished for all Lithuanian sites. These plans consist of precise surface height modeling, location and type of hydrotechnical constructions. In addition, all the necessary Nature management plans have been prepared and approved. Nature management plans for the Amalva and Plinkšiai sites have been already prepared before the Peat restore project, whereas Nature management plans for Pūsčia and Sachara have been prepared and approved within the frames of the project. All necessary field studies (including inventories of habitat of EU importance, investigation of flora and fauna, etc.) have been carried out in all project sites. Nature management plan provides an overview of the physical geographical features and land use history of project site, describes biological features (habitats, plant, animal species, etc.), contains an assessment of the current ecological status of the site, indicates potential threats, etc. The plan contains goals and objectives for improvement or even restoration of the site's ecological conditions (stopping negative effects from drainage, restoring hydrological regime and open landscape in the site, reducing fragmentation of habitats, improving vegetation structure, to create favorable conditions for the typical species of mires flora, fauna and fungi, etc.). The document includes detailed action plan for restoration and maintenance of bog habitats, prioritization of all actions, as well as responsibilities of the involved parties, cost estimate and potential sources of funding.



Initial meeting and discussion about the nature management plan with the specialists of Gražutė Regional P, Pūsčia site LT04.



40 years of spontaneous revegetation created mosaic vegetation cover in abandoned parts of Sachara LT03 peat mining fields.

Conservation status and threats to the project sites

Amalva LT01

Draining of the southern part of Amalva was carried out already in the beginning of 20th century and continued during the soviet period. As a result, fen and transitional mire habitats were lost. The area has very uneven surface differing from one part to another by 1 meter or more. Transformation of hydrology of the area has started in the beginning of 20th century. The biggest impact was made in 1951 and later in 60s–80s, first the northern part was drained, later the reclamation was implemented in southern part (Peat Restore project area). Drainage network was established in fens suitable for agriculture and also in the part of raised bog. Currently only habitats of 7120 *Degraded raised bogs still capable of natural regeneration* can be found in the project site. Geological survey revealed that peat extraction in this peatbog is not suitable,

therefore it was decided to use the area for agriculture purposes. Thus, the unrestored part, which covers 215 ha in the southern part of the bog, has been selected as LIFE Peat Restore project site. The area belongs to the wetland complex of Žuvintas Biosphere Reserve, which has a status of SCI LTALY0005 „Žuvintas Lake and Bukta forest“ and SPA LTALYB003 „Žuvintas, Žaltytis and Amalvas bog“ as well.

Plinkšiai LT02

Plinkšiai peatland is part of SPA Biosphere polygon “Plinkšiai forest and its’ surroundings” (LTMAZB001). However, permission for peat extraction for the Plinkšiai peatland was issued in 2002 before setting the Natura 2000, therefore, the site has 2 contradicting targets: nature conservation vs intensive usage, and this impedes any further activities in the site, for the time being. The site is represented by EU habitats, typical for heavily impacted peatlands: 7120 *Degraded raised bogs still capable of natural regeneration* and 7150 *Depressions on peat substrates of the Rhynchosporion*. The area is partially drained by ditches (total length is 22 km). Peat layer was removed in the eastern part of the site (8 ha) leaving up to 1–2 meters peat on the bottom.

Sachara LT03

Peat mining started in 1941 and closed in 1981. Habitats of 7120 *Degraded raised bogs still capable of natural regeneration*, 7140 *Transitional and quaking bogs* and 91D0* *Bog Woodlands* are characteristic to Sachara peatland. Ditches (total length is of 37 km) caused a strong drainage of the area. Low water level caused the intensified growth of trees and shrubs. As a result, the site is in the constant fire risk. Almost 40 years the territory is abandoned, part of the wetland is naturalized by spontaneous revegetation.

Pūsčia LT04

Pūsčia peatland (100.6 ha) has a status of Telmological Reserve, which was established in 2010 on abandoned for 20 years’ peat mining area. In 2006, Pūsčia peatland was appointed as pSCI (LTZAR0030). Currently, the site is abandoned for more than 30 years. Habitats of 7120 *Degraded raised bogs still capable of natural regeneration* (7120) dominate in the Pūsčia Telmological Reserve. In some areas 7150 *Depressions on peat substrates of the Rhynchosporion*, 91D0 *Bog woodlands* and 7140 *Transitional and quaking bogs* occur. A dense network of drainage ditches (total length approximately 35 km) leads to unfavorable hydrological conditions. Initial restoration attempts (in 2000) had a marginal effect so far. The central part of the peatland is overgrown by woody vegetation or covered by bare peat.

Aukštumala LT05

The project (10 ha) is located within the actively mined Aukštumala peatland. The project site is a part of Nemunas Delta Regional Park, which is protected by the Convention on Wetlands of International Importance (Ramsar territory) and is a NATURA 2000 site (SPA LTSLUB001 and SCI LTSIU0013). Peat mining is finished in the project site more than 10 years ago. About 0.3-1.0 m thick peat layer remained in this part of peat extraction field. Slight spontaneous revegetation is observed in some plots. The site is negatively influenced by the wide collective ditches, which surrounds the area. Moreover, active peat mining in the adjusting territories has a negative impact on hydrological conditions as well. Therefore, high water level fluctuations are evident in the site.

Review of field studies

Field surveys includes GEST type mapping, hydrological monitoring, chemical analysis of peat samples (pH, C/N ratio), measurements of peat layer depth and vegetation cover monitoring in research plots. The methodology and results of these surveys were presented in previous deliverables – Action A.2. GEST Analysis Report; Action A.3. First GEST GHG balance scenarios; and Action D.1. 2nd Monitoring protocol. For the basic results summarized table, which includes the area of every GEST type, water level fluctuation values, chemical parameters (pH, C/N ratio) and peat depth (Table 1, Annexes 6–10). According to GEST type mapping (performed in 2017) 20 GEST types were inventoried in all project sites. Currently about 284 ha (63 %) of all project area can be considered as forested GEST units. The rest area (168 ha) is assigned as open peatlands, however majority (137 ha) of these open GEST units are considered as severally damaged. Both forested and severely damaged open peatland GEST types emit considerably large amounts of GHG gasses. Hydrological monitoring results obtained in 2017–2018 show that water level fluctuations and mean water level values are unfavorable for the normal peatland conservation status in all project sites (with few exceptions). The results of vegetation cover analysis show that drainage resulted in the disappearance of typical bog species almost in all study plots. This was particularly evident in the study plots equipped nearby wide drainage ditches.

Table 1. Summarized results of field surveys on GEST type mapping, hydrological monitoring, peat chemistry (pH, C/N ratio) and peat depth

| Site (WGS Coordinates) | GEST-Type | Area (ha) | Water level, cm (Average, min, max) | C/N ratio | pH | Peat depth, m |
|--|---|--------------|--|--------------|---------------|------------------|
| Amalva LT01 54.495783, 23.544817 | Very moist bog heath | 2,03 | 4+ | 42,1 | 2,44 | 7 |
| | Wet peat moss lawn with pine trees | 20,60 | -22; -60; -2,1 | 39,7 | 2,95 | 7 |
| | Moderately moist bog heath | 3,60 | 2+ | | 2,44 | 7 |
| | Open water/ditches | 2,00 | - | - | - | - |
| | Moderately moist oligotrophic forests and shrubberies | 89,3 | -55; -107; -23 | 49,7 | 2,8-3,7 | 6-7 |
| | Moderately moist eutrophic forests and shrubberies | 1,1 | 2- | - | - | 1,5-3 |
| | Dry eutrophic forests and shrubberies | 89,5 | 2- | 46,2 | 3,18 | 1,5-3 |
| Sachara LT03 55.942547, 25.492139 | Bare peat (moist) | 8,78 | -51; -104; 10 | 66,2 | 2,67- 2,72 | 0,5-2 |
| | Wet peat moss lawn with pine trees | 10,43 | 4+ | 65,2 | 2,82 | 0,5-1,5 |
| | Peat moss lawn on former peat-cut off | 3,78 | 4+ | 65,2 | 2,82 | 0,5-1,2 |

| | | | | | | |
|---|--|-------|-------------------|---------------|---------------|---------|
| | areas | | | | | |
| | Wet small sedges reeds mostly with moss layer | 9,66 | 5+ | 74,2 | 3,04 | 0,7-1,3 |
| | Moist oligotrophic forests and shrubberies | 34,51 | -24;-54;- 14 | 65,9- 71,6 | 2,76- 2,8 | 0,7 |
| | Moderately moist oligotrophic forests and shrubberies | 19,44 | -35,-116; -1,9 | 34,8- 57,9 | 2,68- 3,18 | 0,3-2 |
| | Open water/ditches | 0,74 | | | | |
| Pūsčia LT04 55.680165, 26.101178 | Bare peat (moist) | 23,88 | -37; -87;+3 | 61,7- 77,4 | 2,67- 3,13 | 1,5-6 |
| | Wet meadows and forbs | 9,79 | -14;-41;+1 | 65,7- 66,7 | 2,9-3,8 | 4,5-6 |
| | Very moist meadow, forbs and small sedges, reeds | 0,42 | 5+ | 34 | 4,0-4,7 | 1,2-2 |
| | Moist bog heath | 6,37 | -30;-68;-2 | 32-35 | 2,93- 3,02 | 3,3-6 |
| | Wet peat moss lawn with pine trees | 0,19 | 4+ | 44,9 | 2,99 | 7 |
| | Wet tall reeds | 0,65 | 5+ | 26,2 | 5,86 | 1-1,5 |
| | Moist reeds and (forb) meadows | 4,22 | 3+ | 57,3- 98,0 | 3,17- 6,39 | 2-5 |
| | Open water/ditches | 5,58 | | | | |
| | Moderately moist mesotrophic and eutrophic forests and shrubberies | 20,41 | 2+ | 26-32,7 | 3,2- 3,97 | 0,1-2 |
| | Moist mesotrophic and eutrophic forests and shrubberies | 0,96 | 3+ | - | - | 1,5 |
| | Moderately moist oligotrophic forests and shrubberies | 11,47 | -40; -95, -14 | 37-48 | 3,08- 4,48 | 1,1-5 |
| | Moist oligotrophic forest and Shrubberies | 0,56 | 3+ | 34,8 | 2,93 | 6 |
| | | | | | | |
| Plinkšiai LT02 56.141796, 22.19389 | Bare peat (moist) | 0,89 | -11;-47;+1 | 111,6 | 2,55 | 1,5 |
| | Peat moss lawn on former peat-cut off areas (60%)/ Moderately moist oligotrophic forests | 50,49 | 4+;5+ | 58-66 | 2,72- 2,75 | 3,5-6 |

| | | | | | | |
|---|--|-------|--------------|-------|-----------|---------|
| | and shrubberies (40 %) | | | | | |
| | Moderately moist oligotrophic forests and shrubberies | 16,19 | -41;-71;-26 | 47-83 | 2,56-3,12 | 2,3-4,5 |
| Aukstumala LT05 55.391833, 21.431127 | Bare peat (dry) | 1,34 | -40;-97;-5 | 30,4 | 4,36 | 1,5 |
| | Moderately dry bog heath | 1,43 | - | 33,5 | 3,11 | 1,5 |
| | Moderately moist (forb) meadows | 0,86 | - | 24,8 | 4,42 | 1,5 |
| | Very moist meadows forbs and small sedges reeds | 3,82 | -11;-45;+3 | 24,3 | 4,62 | 1,5 |
| | Wet tall reeds | 4,67 | -13;-45;+6 | 29,1 | 5,31 | 1,5 |
| | Moderately moist mesotrophic/eutrophic forests and shrubberies | 0,44 | -91;-101;-75 | - | - | 1,5 |

In addition, the investigation of fauna was performed in Pūsčia, Plinkšiai and Sachara sites. For these studies two groups of invertebrates – butterflies and dragon flies as a good indicators of peatland damage status, were chosen. In Sachara site 16 (3 protected) species of dragon flies and 9 species of butterflies were found. In Pūsčia site 15 (1 protected) species of dragon flies and 14 (1 protected) species of butterflies were found. In Plinkšiai site 5 species of dragon flies and 4 species of butterflies were found. The results of these studies were included in Nature management plans.

Nature management. Status and progress

For the restoration of **Amalva peatland LT01** tree clearing and damming will be prepared in the whole site (215 ha). Nature management plan was approved before the project start in 2016 (<http://gamtotvarka.am.lt/plans/316.pdf>). Almost whole site is overgrown by forest. Approximately 215 ha of forest (birch, pine trees, shrubs) will be cut in order to increase the area of open peatland habitats and to reduce negative impact of tree evapotranspiration. Tree clearing will start before the implementation of the hydrological restoration actions. Forest management plan is in the process of approval, however 16 ha of young forest (dominated by birch trees) is already cleared, the rest of the territory will be cleared by the State Forestry Enterprise. Forest clearing will be prepared following the instructions provided in the Nature management plan, which foresee clear cuttings in the whole site and leaving some of the black alder and dwarf-forms of pine trees. In order to restore hydrological regime, 4 types of complex dams (total amount 37) will be installed. Valuable timber will be taken away from the bog. The branches of cut trees will be laid into the drainage ditches in order to restore damaged landscape of the bog and to create favourable conditions for establishment of *Sphagnum*. The site is surrounded by intensively farmed agricultural land; for this reason, the project aims to secure high water level inside the peatland. To ensure that neighbouring

farming lands will not be flooded 4 large complex dams with the pipes for the water outflow will be constructed on the edges of the site (Annex 1).

Restoration of **Plinkšiai peatland LT02** is under discussion. The European Commission (EC) confirmed that due to the complex and uncertain legal situation – valid peat excavation permission within a Natura 2000 site – the site could be omitted from the list of project sites. However, the clarification of costs of forest removal is still in process. Any savings under forest management (Action C.2) could be reallocated to the Plinkšiai peatland. The Nature management plan was approved before the project start in 2014 (<http://gamtotvarka.am.lt/plans/278.pdf>). For the restoration of the site, hydrological restoration measures will be implemented in the whole area. To increase the area of open peatland habitats and to reduce negative impact of tree evapotranspiration approx. 40 ha of forest (birch, pine trees, shrubs) will be cut. In addition, this action will help to conserve the population of black grouse, which is currently vulnerable (Annex 2).

For the restoration of **Sachara peatland LT03** approx. 100 dams and 3 embankments will be installed. To increase the area of open peatland habitats and to reduce negative impact of tree evapotranspiration 30 ha of young forest (pine trees, birch, and shrubs) will be cut. *Sphagnum* diaspores will be spread on the bear peat. Nature management plan (<http://gamtotvarka.am.lt/plans/336.pdf>) and hydrotechnical plan were prepared and approved in the frames of LIFE Peat Restore project. Hydrological restoration measures will be implemented in the whole project area (82 ha). Dams will be cascaded every 10–30 cm of surface inclination in perspective places for habitat restoration. Valuable timber will be taken away from the bog. The branches of cut trees will be laid into the drainage ditches in order to restore damaged landscape of the bog and to create favorable conditions for establishment of *Sphagnum* (Annex 3).

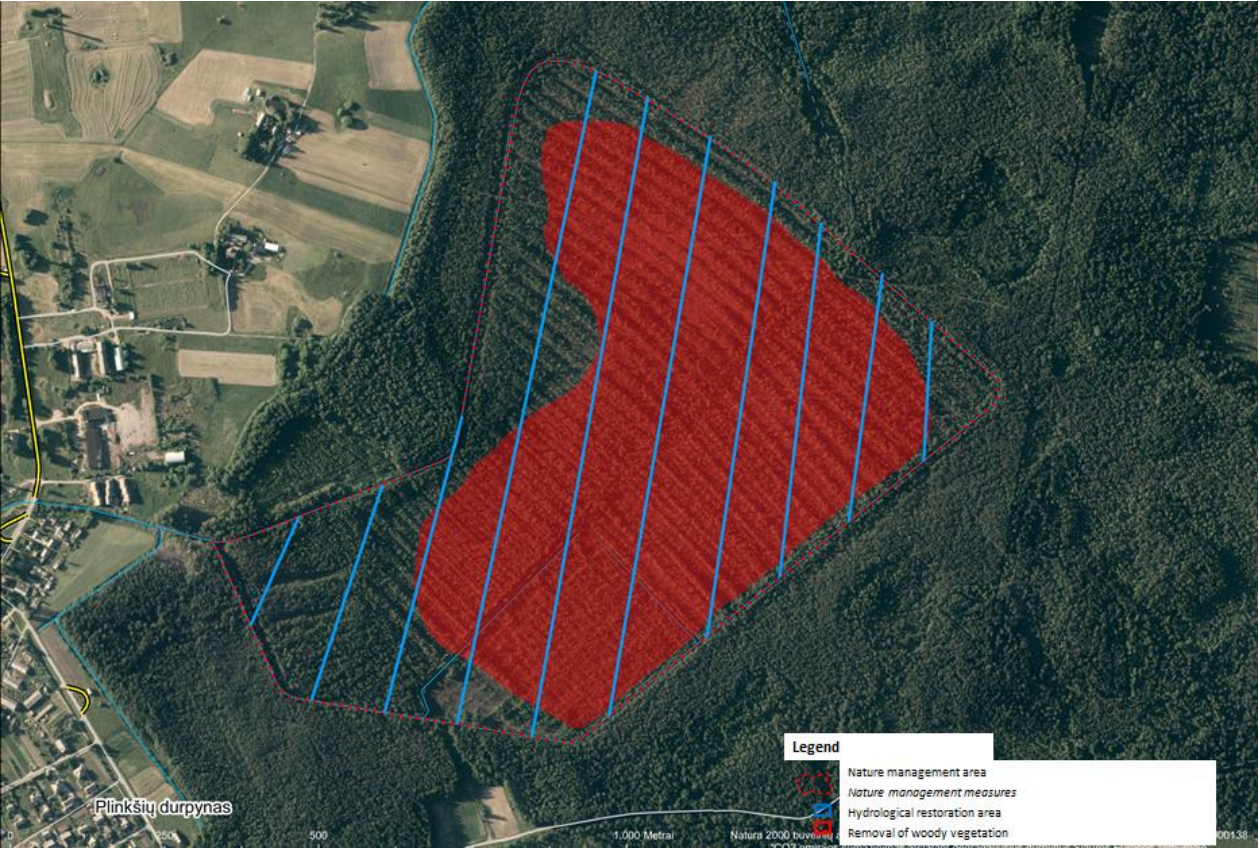
For the restoration of **Pūsčia peatland LT04** altogether 240 dams will be installed. In addition, to ensure stable water level approx. 10 protective embankments from peat and plastic will be constructed. To increase the area of open peatland habitats and to reduce negative impact of tree evapotranspiration altogether 30 ha of trees, mainly pine trees, birch and shrubs offshoots will be cut. *Sphagnum* diaspores will be spread in the bear peat habitats. A Nature management plan (<http://gamtotvarka.am.lt/plans/333.pdf>) and hydrotechnical plan were prepared and approved within the frames of the Peat Restore project. Hydrological restoration measures will be implemented in the whole project area (80,74 ha). Dams will be cascaded every 10–30 cm of surface inclination in perspective places for habitat restoration. Valuable timber will be taken away from the bog. The branches of cut trees will be laid into the drainage ditches in order to restore damaged landscape of the bog and to create favorable conditions for establishment of *Sphagnum* (Annex 4).

For the restoration of abandoned **Aukštumala cut-over peatland (Aukstumala LT05 site)**, *Sphagnum* spreading following the Canadian approach (Rochefort et al., 2003) will be performed. To ensure favorable hydrological conditions water will be supplied from the blocked ditches and shallow water pond. Experimental *Sphagnum* spreading field will be divided into smaller parts, which will be surrounded by the embankments (Annex 5).

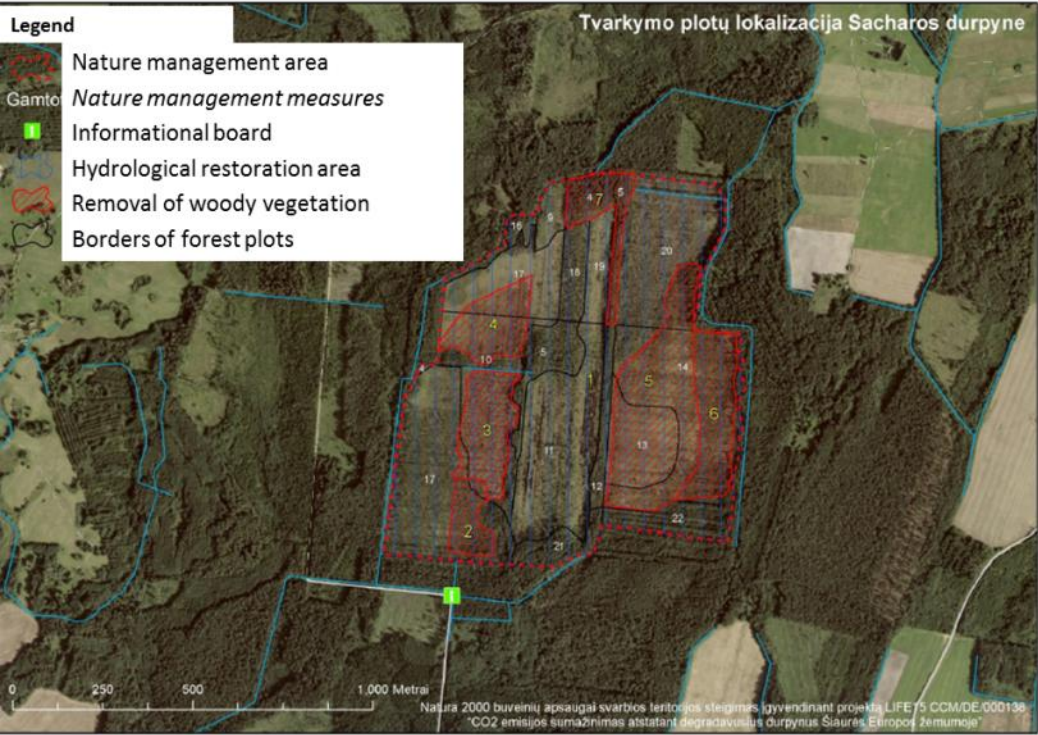
Annex 1. Nature management scheme in Amalva LT01 site



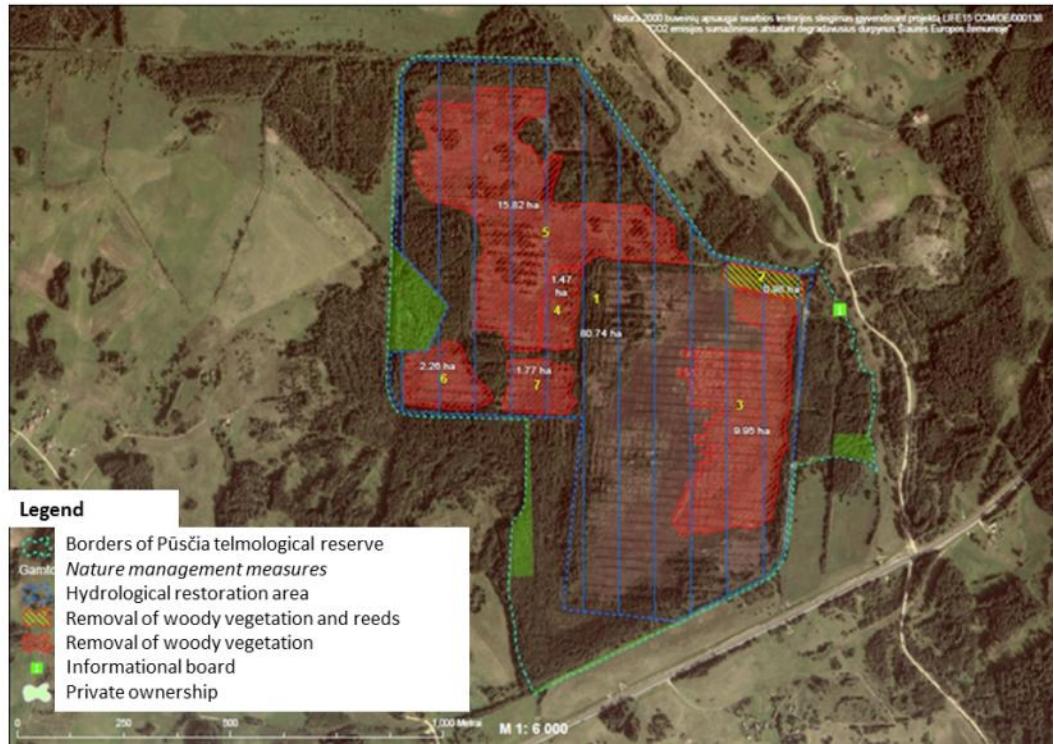
Annex 2. Nature management scheme in Plinkšiai LT02 site



Annex 3. Nature management scheme in Sachara LT03 site

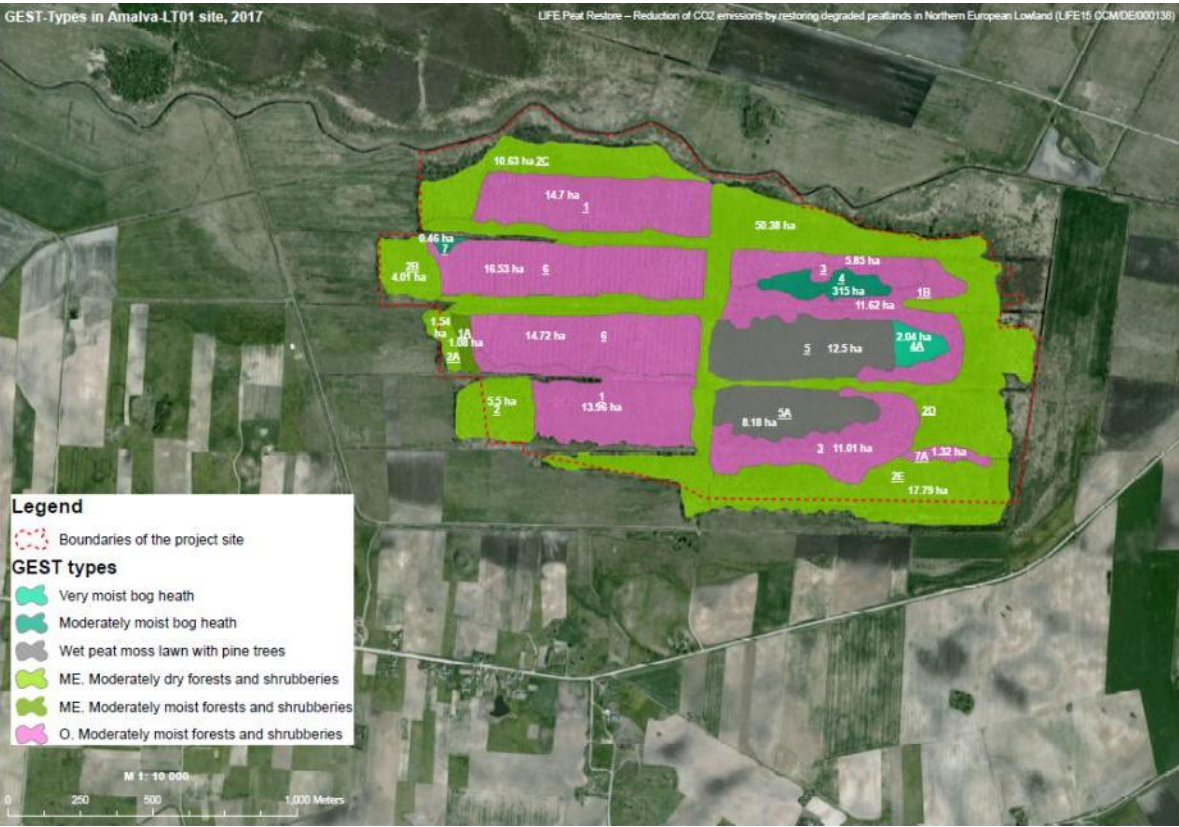


Annex 4. Nature management scheme in Pūsčia LT04 site

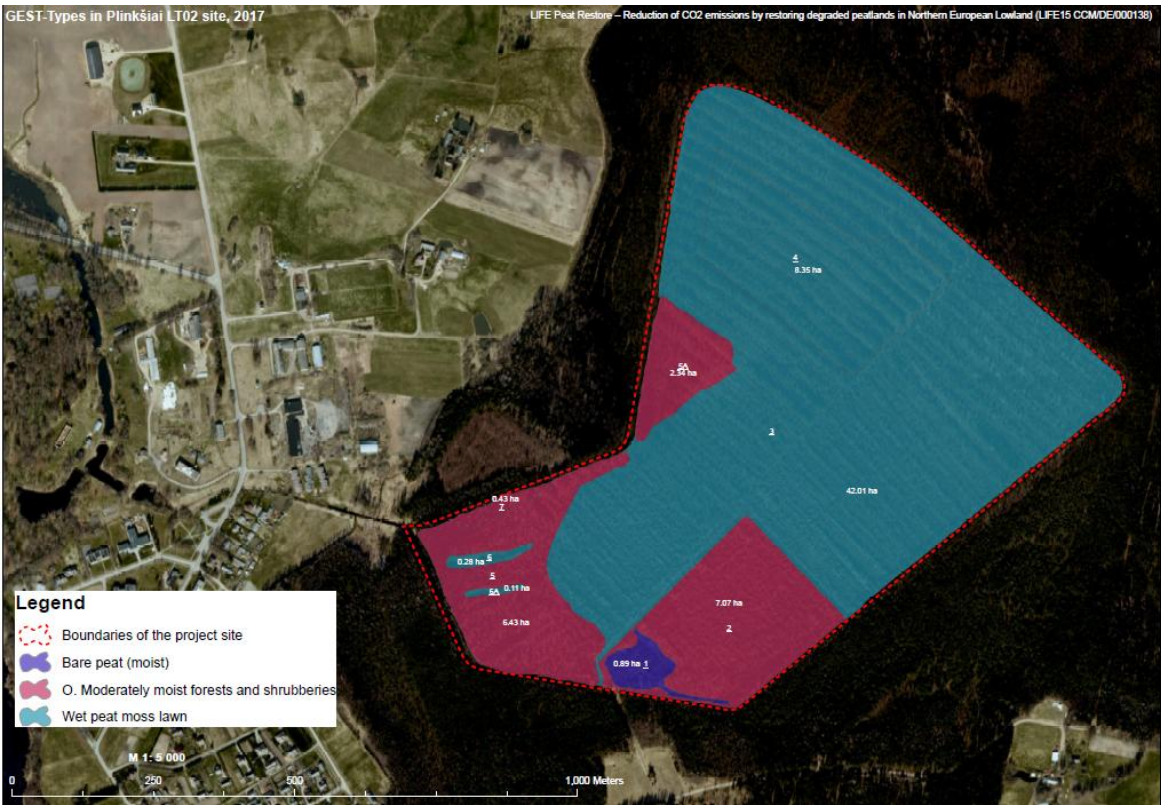


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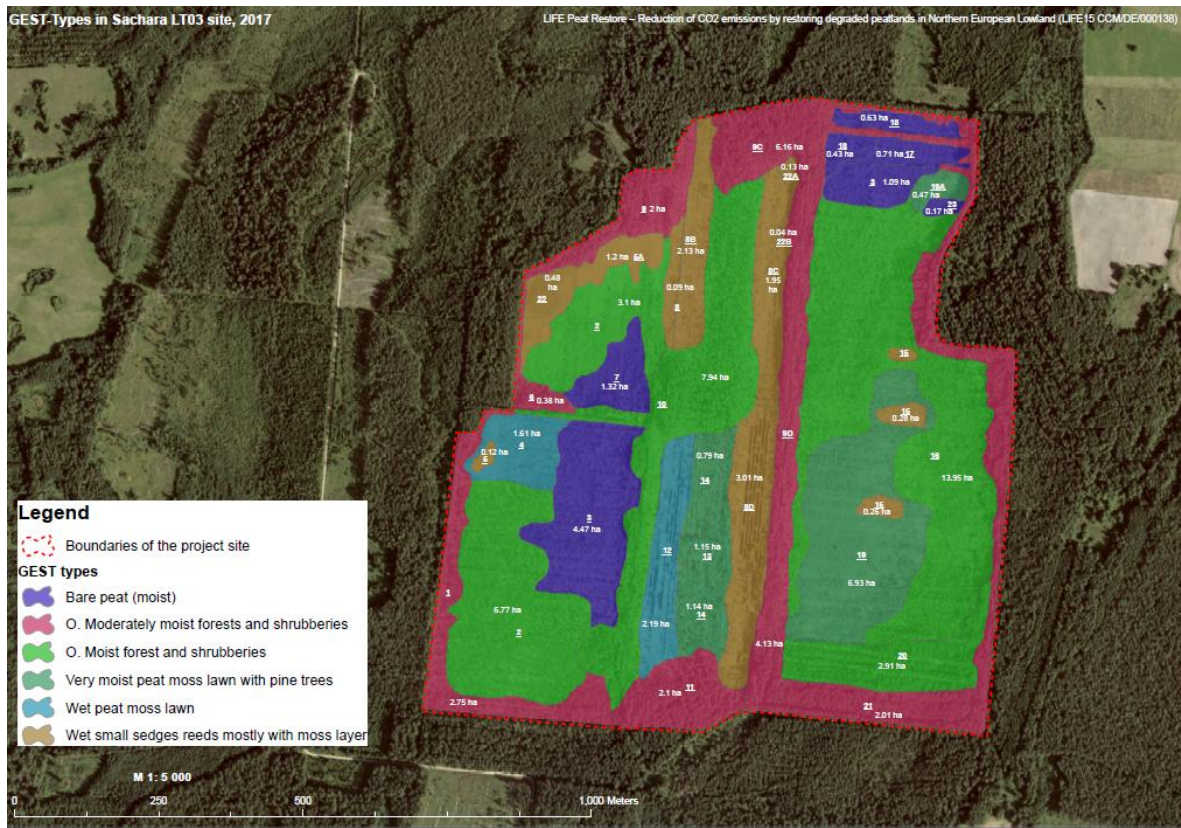
Annex 6. GEST types in Amalva LT01 site



Annex 7. GEST types in Plinkšiai LT02 site



Annex 8. GEST types in Sachara LT03 site



Annex 9. GEST types in Pūsčia LT04 site



Annex 10. GEST types in Aukštumala LT05 site

