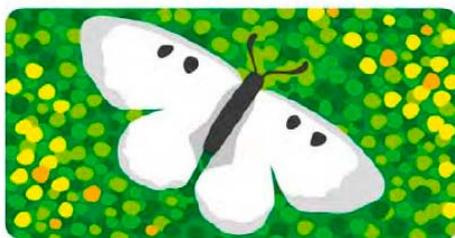




Species-rich LIFE  
LIFE10/NAT/FI000048

**Luonnonhoito-LIFE**



**Species-rich LIFE**

# **Annex to Monitoring Report (Action E6)**

## **Preliminary Results of Monitoring**

Kaisa Junninen

Katja Raatikainen



## 1. Background

This report includes preliminary results of Species-rich LIFE project action E6, General monitoring of restoration success, and complements the earlier report (Annex 149) as requested by the Commission. Actions included here are C1 Restoration of herb-rich forests and C3 Restoration of semi-natural grasslands.

## 2. Results from monitoring of restoration in herb-rich forests (Action C1)

A more detailed long-term monitoring of tree layer, vascular plants and bryophytes was implemented on six herb-rich forest restoration sites to provide information on the effects of Spruce (*Picea abies*) removal on the valuable plant species and various ecological variables. Monitoring data was collected both before and after Spruce removal.

Pre-treatment inventories were carried out in 2012 in all sites, except Kaakkosuo-Kivijärvi (26) where it was completed in 2014. Post-treatment inventories took place in the second growing season after the restoration actions and varied between 2014-2017, depending on the year of restoration. In Kaakkosuo-Kivijärvi, however, only the pre-treatment inventory could be completed within the timescale of the project. These six sites belong to the permanent monitoring network of PWF and will be monitored in every five years in the future.

The number of living spruce trees naturally decreased on average by 50% on the Spruce removal sites, whereas the number of pine and broad-leaved trees did not change (table 1). Some of the tree saplings were destroyed in the restoration actions (and spruce saplings were removed), but their number is expected to increase in the future. On the control sites, the living trees were measured only before the restoration (and will be measured every five years from now on) because their number was expected to stay unchanged for this first monitoring period.

Table 1. Number of living trees (with a minimum diameter 10 cm) and tree saplings before (“pre”) and after (“post”) Spruce removal on restored (“treated”) and control sites on the second growing season after the restoration actions. On the untreated control sites, the post-treatment number of living trees was expected to be the same as before treatment and it was not measured (“-”). In Kaakkosuo-Kivijärvi the first post-treatment monitoring will take place in 2018.

		Ison Kaitasen...		Kaakkosuo-Kivijärvi		Kolin...		Laivonsaari		Läpiän...		Stensböle	
		pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
Spruce	treated	17	6	16	-	25	8	28	15	3	3	14	4
	control	20	-	22	-	36	-	29	-	4	-	13	-
Pine	treated	0	0	0	-	0	0	3	3	0	0	2	2
	control	0	-	0	-	0	-	2	-	6	-	0	-
Broad-leaved trees	treated	40	43	9	-	1	1	18	18	8	8	14	14
	control	25	-	1	-	5	-	20	-	7	-	5	-
Saplings	treated	4	0	7	-	11	7	99	42	45	50	2	2

	control	4	-	1	-	7	-	109	-	27	-	14	-
--	---------	---	---	---	---	---	---	-----	---	----	---	----	---

The number of vascular plant species increased on all but one site (table 2), but as the numbers increased also on the control sites, we cannot conclude that the change was due to restoration. The number of bryophyte species increased on some sites and decreased on others. The longer-term effects of restoration are likely to differ from these preliminary results.

Table 2. Number of species of vascular plants and bryophytes before (“pre”) and after (“post”) Spruce removal on restored (“treated”) and control sites on the second growing season after restoration. In Kaakkosuo-Kivijärvi the first post-treatment monitoring will take place in 2018.

		Ison Kaitasen...		Kaakkosuo-Kivijärvi		Kolin...		Laivonsaari		Läpiän...		Stensböle	
		pre	post	pre	post	pre	post	pre	post	pre	post	pre	post
Vascular plants	treated	19	27	20	-	12	15	18	16	15	29	27	32
	control	23	30	27	-	12	10	11	14	22	30	20	23
Bryophytes	treated	21	20	22	-	11	9	16	20	14	11	7	9
	control	23	21	20	-	12	16	9	16	12	8	8	12

Two growing seasons is a very short time period to detect any changes in a forest ecosystem, and therefore the data have not been statistically analyzed yet. More detailed analyses will be performed and the results will be published in a scientific article when the data from 5-year monitoring period are complete.

### 3. Results from monitoring of semi-natural grassland restoration sites (Action C3)

#### Vascular plants

Sites were monitored before restoration and management actions and 1-3 years after. Data was gathered of tree stand and field layer structure, and vascular plants. The standard protocol for monitoring traditional rural biotopes by PWF was used to allow comparability with previous inventories. Measured variables were vascular plant species of field and tree layer, including species abundance and coverage percent. In addition, several environmental variables were measured, for example the proportion of eaten vegetation on the plot, the average height of the vegetation and the proportion of bare soil. All monitoring visits also included a general inspection of the site, photographing from the corners of the monitoring plot and recording of all threatened species, as well as, other species of special importance for the management of the site.

Monitoring was done in 0,25 ha plots, having 15 vegetation plots (1 x 1 m) inside each monitoring plot. On each site, 1-2 study plots were founded. The method was the same as standardly used in Finland for monitoring semi-natural grassland restoration. Thus, the data from the Speciesrich LIFE monitoring sites can be compared with the larger national data set, which makes it possible to make stronger

analyses and recommendations for future management actions. As the monitoring period during the project was very short, the monitoring will be repeated after the project as a part of PWF work to evaluate the effects in the long run. If the results indicate the need to change the management, these actions can be implemented immediately.

Detailed monitoring of semi-natural grassland restoration was conducted on 9 project sites, two project sites had 2 subsites (table 3). In one site (Telkkämäki) the monitoring was done once, but due to the detailed management actions the second monitoring round was not conducted yet. In remaining three sites, the monitoring sampling was started, but no restoration measures could be carried out, precluding monitoring of these sites. This is due to the deletion in finding a suitable farmer for starting the grazing and at one site due to the exclusion of the site from the grassland management as the values of grove species in the area were so high.

Vegetation height showed very positive development after the restoration and first years of management (table 3). In average the height was over 50 % lower in the end of the project than before. This shows a good start in a recovery of the semi-natural grasslands and it also shows that the grazing pressure is mainly adequate. In few sites grazing pressure could be stronger and this will be considered in the next grazing periods. Restoration reduced the coverage of trees and bushes approximately by 33 %. Openness and lightness of the sites were thus significantly improved, allowing grassland species to spread. Some of the monitoring plots were already located in an open area, so no clearing was needed.

Even if, the monitoring period was very short, already some preliminary changes in vegetation and plant species can be seen (table 3). Diversity of species increased in most of the sites, which appeared as an increasing number of plant species and in the change of the dominant species. Particularly, this was seen in the coastal meadows previously heavily dominated by *Phragmites australis*, as the coverage of reed decreased significantly. Average increase in the number of vascular plant species at the monitoring plots after the restoration and grazing was +19 %. It is much too early to report the changes in grassland indicator species, but already in some site the increase is evident. However, in those sites where the grazing pressure during the first years has been very high and the changes in vegetation structure very strong, the first years of monitoring may show a temporary decrease generally in the number of species and in grassland indicators. This is mainly due to the difficulties in identification and finding of all the eaten leaves and stems of the species. As the situation stabilizes, also the plant species will change their appearance to miniature plants, and the identification becomes easier.

Conclusions from the preliminary results site by site and examples of the indicators under monitoring are presented on the table 4. Some examples from the visual monitoring of the semi-natural grassland plots are presented on the figure 1.

As the time period for detailed monitoring was short during the project, in most of the sites, largest changes in the site structure and species is still to come. But, already many positive changes can be seen. Management actions will be continued after the project as were planned in most of the sites. In those sites, where the vegetation is still high, management actions are strengthened by increasing the grazing pressure or by making additional actions, such as moving. Long-term monitoring on the changes will be essential for determining the correct management actions, for example the ideal number of grazing animals. Detailed monitoring will be continued by PWP after the project.

Table 3. Summary of the main results of detailed monitoring of vascular plants in semi-natural grasslands.

SITE	Coverage (%) of trees or shrubs BEFORE	Coverage (%) of trees or shrubs AFTER	Change %	Vegetation height (cm) in field layer BEFORE	Vegetation height (cm) in field layer AFTER	Change %	Number of vascular plants in 0,25 ha plots BEFORE	Number of vascular plants in 0,25 ha plots AFTER	Change	Grassland positive indicator species BEFORE	Grassland positive indicator species AFTER	Change
Medvästö-Stormossen: Dävits wooded pasture	45	35	-22 %	38	20,5	-46 %	73	71	-2 species	2	2	0
Medvästö-Stormossen: Dävits coastal meadow	1	1	0 %	164	120	-27 %	23	30	+7 species	1	1	0
Meiko-Lapträsk: Vrångnässudden wooded pasture	90	95	6 %	22	10	-55 %	39	39	0	1	1	0
Mustavuoren lehto ja Östersundomin lintuvedet: coastal meadow	0	data only before		194			22			0		
Tammisaaren nat-alue: Dragsvikgården coastal meadow	0	data only before		194			26			1		
Stensböle mesic meadow	1	1	0 %	78	55	-30 %	52	54	+ 2 species	2	3	+1 species
Houtskarın lehdot wooded pasture	45	data only before		14			33			3		
Rekijokilaakso: Riihipuostankoski mesic meadow	18	3	-83 %	45	13	-71 %	79	76	-3 species	2	1	-1 species
Rekijokilaakso: Kokkapää mesic meadow	18	15	-17 %	65	24	-63 %	64	64	0	5	4	-1 species
Jurmo dry heath	30	0	-100 %	26	4	-85 %	15	30	+15 species	1	5	+4 species
Lapväärtin kosteikot: Härkmerifjärden coastal meadow	0	0	0 %	66	58	-12 %	5	10	+5 species	0	0	0
Luodon saaristo: Rönnskäret coastal meadow	0,5	1,5	200 %	29	19	-34 %	36	37	+1 species	8	7	-1 species
Tiilitehtaanmäki mesic meadow	1	1	0 %	56	29	-48 %	43	44	+1 species	1	2	+ 1 species
Perämeren saaret: Paskaletto, Tiuranen	excluded											
Telkkämäki slash and burn	70	data only before		6			25			0		
<b>Average</b>	<b>22,8</b>	<b>15,3</b>	<b>-33 %</b>	<b>71,2</b>	<b>35,3</b>	<b>-51 %</b>	<b>38,2</b>	<b>45,5</b>	<b>+19 %</b>	<b>1,8</b>	<b>2,6</b>	<b>+41 %</b>

Table 4. Conclusion and examples of the indicators site by site from the detailed monitoring of semi-natural grasslands.

SITE	Number of monitoring visits during the project	Actions at the monitoring plot	Example of the indicator	Conclusions
Medvästö-Stormossen: Däviets wooded pasture	3	Tree clearings and grazing by sheep and cattle	The average coverage of the negative indicators decreased: <i>Pteridium aquilinum</i> from 22 to 11 % (-50 %) and <i>Calamagrostis epigejos</i> from 4 to 2% (-50 %).	Good results of tree clearings and high grazing pressure, although the changes in the field layer species composition and abundance are not so big yet. However, negative indicator started to decrease already. Management actions continues as planned. Monitoring will be continued.
Medvästö-Stormossen: Däviets coastal meadow	3	Grazing by sheep and cattle	The average coverage of the negative indicator <i>Phragmites australis</i> decreased from 54 to 25 % (-54 %).	Good first results of grazing. This can be seen clearly in the decrease of <i>Phragmites australis</i> and in the diversification of vascular plant species. Management actions continues as planned. If needed, additional management is done by cutting the reed by a machine. Monitoring will be continued.
Meiko-Lapträsk: Vrångnässudden wooded pasture	3	Light clearing of shrubs and grazing by sheep	Forest species <i>Calamagrostis adundinacea</i> decreased by 91 %.	Good first results in vegetation height and in the decrease of forest species. Small increase in the coverage of <i>Corylus</i> after the restoration. No big changes in the species composition and abundance yet, but the monitoring period is too short. Grazing pressure and sprouting of <i>Corylus</i> is followed up and additional actions will be done if needed.
Mustavuoren lehto ja Östersundomin lintuvedet: Östersundom coastal meadow	1	No management	Only the data before restoration collected	Monitoring continues if management will began.
Tammisaaren nat-alue: Dragsvikgården coastal meadow	1	No management	Only the data before restoration collected.	Decision made of leaving the site without management as the species inventories showed that the values of grove forest were already so well developed.
Stensböle mesic meadow wooded pasture	3	Grazing by sheep and clensing of <i>Rubus idaeus</i>	The average coverage of the negative indicator <i>Rubus idaeus</i> decreased from 42 to 32 % (-23 %).	First results showed fairly good development in the vegetation height and in the coverage of negative indicators, even tough the changes are not very big yet. Grazing pressure could be increased if the effects on <i>Parnassia mnemosyne</i> population stays positive. Monitoring will be continued.
Houtskarın lehdot	1	No management	Only the data before restoration collected	Monitoring continues if management will began.
Rekijokilaakso: Riihipuostankoski mesic meadow	2	Tree clearings and grazing by sheep	The average coverage of the negative indicator <i>Aegopodium podagraria</i> decreased from 24 to 4 % (-81 %).	After major tree clearings and high grazing pressure at the first year, the site is currently under big changes. Vegetation structure will change considerably during the following years and grassland species will slowly return and replace forest and ruderal species. First signs of this can already be seen, despite a short period of monitoring. Management actions will continue as planned. Monitoring will be continued.
Rekijokilaakso: Kokkapää measic meadow	2	Light clearing of trees and grazing by cattle	The average coverage of the negative indicator <i>Anthriscus sylvestris</i> decreased from 16 to 4 % (-76 %).	High grazing pressure during the first years has already shown positive effects on this fairly nutrient rich site. Yet, it is too early to show changes in species composition, but the coverage of negative indicators has already decreased. Management actions continues as planned. Monitoring will be continued.
Jurmo dry heath	3	Burning and grazing by cattle	<i>Juniperus communis</i> , which earlier covered 30 % of the monitoring plot, was totally burned away. Number of positive grassland indicators increased from 1 to 5.	Three years is not enough to the vegetation recovery after thorough burning. But, slowly the grassland species is getting back to the site and already there are several grassland species more in the plot as there were before restoration. However, burning in the autumn may have been a bit too strong and deep, and it would be good to have spots were not all vegetation and ground layer would not be burned so intensively. So, mosaic burning with varing intensity is recommended as a good solution when restoring dry heaths. Management by grazing will be continued as planned. Monitoring will be continued.
Lapväärtin kosteikot: Härkmerifjärden coastal meadow	2	Grazing by cattle	Number of vascular plants in the monitoring plot increased from 5 to 10.	Already after a year from the beginning of the management, there can be seen a diversification in the plant species. But, the monitoring period is very short to detect major changes in species composition. Management by grazing will be continued as planned and grazing pressure is followed up. Monitoring will be continued.
Luodon saaristo: Rönnskäret coastal meadow	2	Grazing by cattle	The average coverage of the negative indicator <i>Phragmites australis</i> decreased by 29 %.	Already after a year from the beginning of the management, there can be seen a diversification of the dominant species. But, the monitoring period is very short to detect major changes in species composition. As management by grazing started two years after the first monitoring, tree seedlings and sprouts already came to the monitoring plot. These will be removed. Management by grazing will be continued as planned and grazing pressure is followed up. Monitoring will be continued.
Tiittehtaanmäki mesic meadow	3	Grazing by sheep	Coverage of positive indicator <i>Avenula pubescens</i> increased by 57 %. Coverage of negative indicator species decreased significantly: for example <i>Filipendula ulmaria</i> from 13 to 0,6 % (-96 %), <i>Anthriscus sylvestris</i> from 2,8 to 0,2 % (-92 %).	Positive effect of grazing can already been seen after 3 years of management in the increased coverage of positive indicators, as well as, in the decrease of negative indicators. Management by grazing will be continued as planned. Monitoring will be continued.
Perämeren saaret: Paskaletto, Tiuranen	0			No monitoring plot established.
Telkkämäki slash and burn	1	Burning	Only the data before restoration collected.	Burning was done in 2017. First year 2018 after burning is a year of cultivating traditional old rye variety at the burned area, and after that the area if taken for grazing. Monitoring will be continued after the first year of grazing.

Figure 1. Example photos from the detailed monitoring plots before and after the restoration A) Medvastö-Stormossen: Dåvits wooded pasture, B) Medvastö-Stormossen: Dåvits coastal meadow, C) Rekijoki, Riihipuostankoski mesic meadow D) Jurmo dry heath



