Securing Sustainable Dendromass Production with Poplar Plantations in European Rural Areas

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Deliverable

D1.6 Biodiversity monitoring:

Methodology and preliminary results

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Contributing partners:	IKEA Industry (providing basic data on field localisation)
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1.0	31.03.2020	Rastislav Lasák, Katharina Amsel	Final version

List of Abbreviations

Abbreviation	Denotation
D4EU	Dendromass4Europe
WP	Work package
SRC	Short rotation coppice – fast-growing poplar trees plantation

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1 Role and relevance of the deliverable within the project

The main role of this deliverable in the middle of the project is to inform other project partners about biodiversity value of areas of SRC localities. Presented data enriched by recommendations for site managers can lead to increasing biodiversity value of these areas which can have positive effect to nature and to communication with environmental authorities and public.

2 Responsibilities

DAPHNE Institute of Applied Ecology is responsible for gathering and evaluation of data needed for assessment of impact SRC localities on biodiversity.

3 Task, problem definition and research objectives

Fast-growing trees are more competitive over native plants and therefore they have led to increasing concerns regarding their adverse effects on biodiversity. The real assessment of impacts on biodiversity needs to be elaborated. The data from biodiversity may provide baseline for this assessment. In some cases the assessment needs to be done before any SRC plantation may be established as it is requested by environmental authorities.

Also the availability of specific information about the effect of D4EU's SRC plantations on biodiversity is essential for communication strategies, because in most cases the new, visible activities in the landscapes, that are yet unknown to local residents, are commonly rejected by the public.

To gather and evaluate appropriate data is the main goal of the project task T 1.3 - Environmental impact assessment and monitoring.

As it is not possible to cover all aspects of biodiversity, the representative species groups – plants, birds, amphibians, butterflies and beetles – were chosen as main objectives of research. Additional research objectives were specimens that can be easily determined in the field like mammals, reptiles or insects. They were minimally classified at the taxonomic order level.

4 Theoretical background, scope and limitations

The status of the biodiversity is the key factor needed for understanding the impact on the nature. It can be evaluated on landscape level or on species level. In the scope of the present project, the species level is used because it offers detailed information needed for such dynamic ecosystem like fast-growing tree species' plantations.

Data collection is done by regular monitoring of important parts of biodiversity in SRC localities. Monitoring all SRC localities for all species groups is limited by expert and time capacities. All localities are surveyed by **Inventory monitoring,** covering plants and selected, easily determined specimens of different species groups. **Reference monitoring** for birds, amphibians, beetles and butterflies is done on selected representative localities with reference control samples outside SRC localities.

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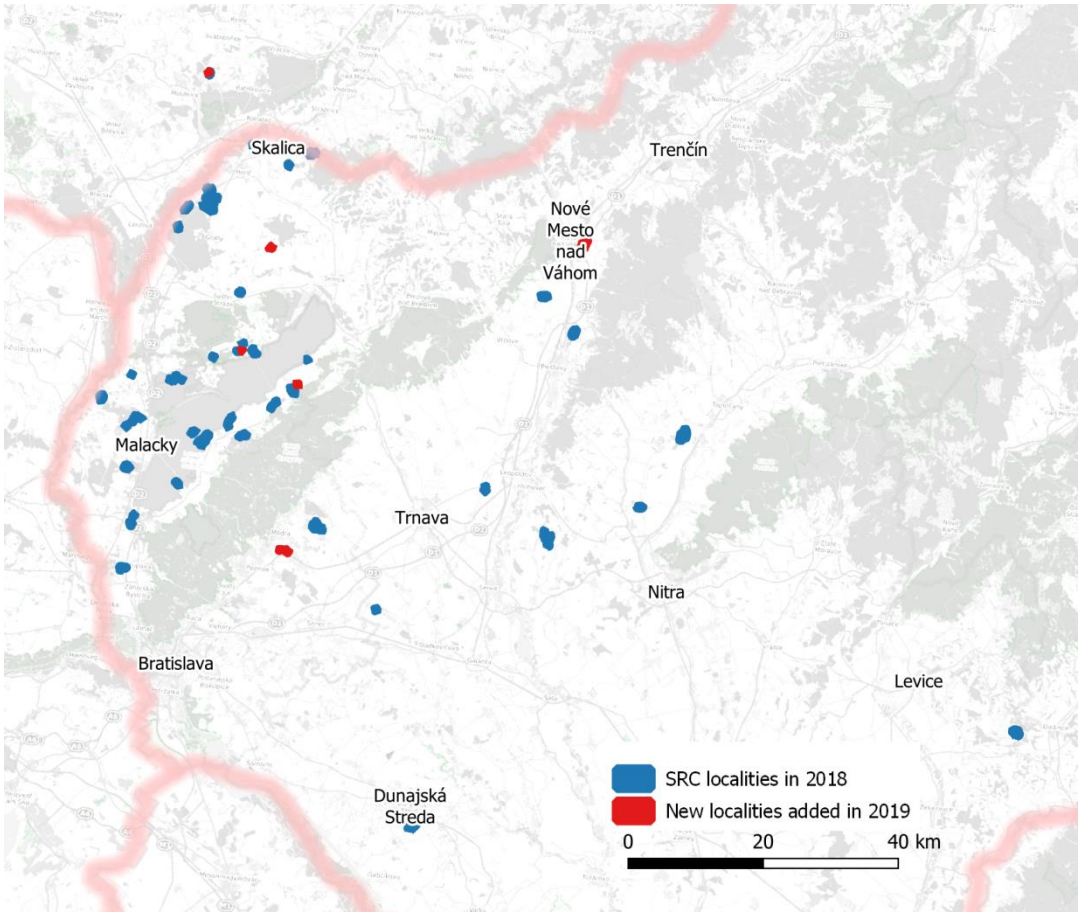
5 Research design and methods

By **Inventory monitoring** information on the overall status of biodiversity is gathered on 74 SRC localities in the season 2018 and on 84 localities in 2019 (See map 5.1). Monitoring uses the method of repeating biotope mapping, described in Catalogue of biotopes of Slovakia (Stanová 2002), where the presence of all **vascular plant** species is recorded passing through transect over whole area of **every SRC locality**. For each plant species, the abundance in Tansley scale (1 = less than 1%, 2 = over 1% and less than 50%, 3 = over 50%) is also recorded. On the same transect the recordings of presence of specimens of additional species groups; mainly **mammals, reptiles, insects** and **molluscs** are collected. Data from inventory monitoring is entered in a specific MS Access database system.



Map 5.1: SRC localities of Inventory monitoring. 73 in season 2018 and 10 added in 2019.

The main purpose of **reference monitoring** is to find out the differences between SRC localities and their surrounding reference biotopes, allowing assessing the status of biodiversity in the area. It is done for 4 animal species groups: **birds, amphibians, butterflies** and **beetles**. For each of the animal species groups, the representative SRC localities were selected on the basis of occurrence of neighbouring biotopes, of the type of prior land use before plantation and of the suitability for a particular species group (See maps 5.2 – 5.5). For each selected SRC locality at least one transect within the area of SRC and at least one transect per neighbouring biotope were defined as reference or control samples. The geographical position of transects is recorded by GPS. Data is entered in spreadsheets and then imported into the information system which is based on MS Access and was developed

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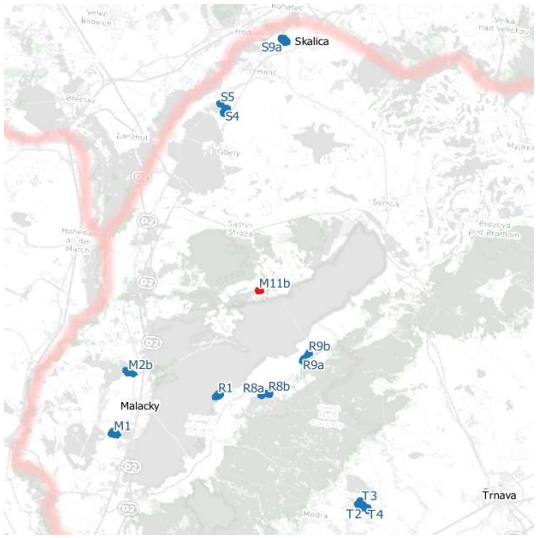
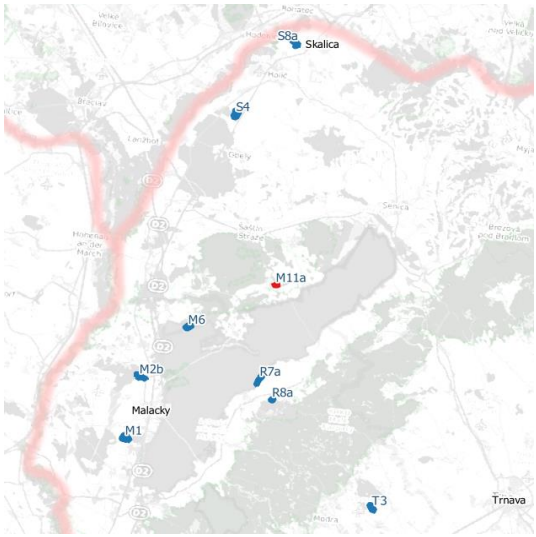
specifically for the task. Each record consists of information on the visit (locality ID, transect ID, date, mapper name) and of basic information on species occurrence (taxon name, character of occurrence, abundance).

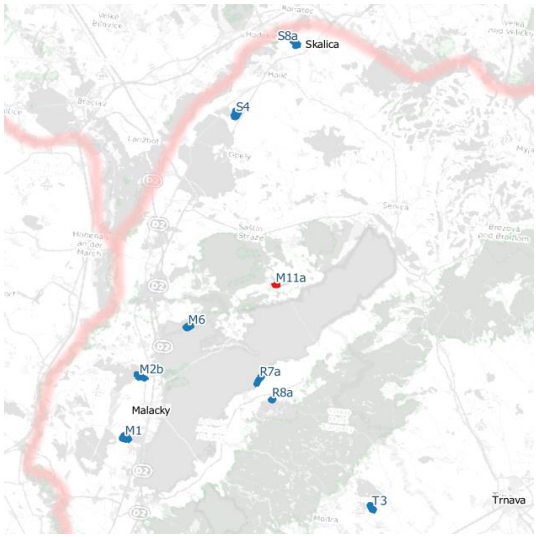


Map 5.2: SRC localities for reference monitoring of bird species (14 localities in 2018, 1 added in 2019)

Map 5.3: SRC localities for reference monitoring of amphibians (8 localities in 2018, 1 added in 2019)



Map 5.4: SRC localities for reference monitoring of butterflies (8 localities in 2018, 1 added in 2019)



Map 5.5: SRC localities for reference monitoring of beetles (8 localities in 2018, 1 added in 2019)

Each species group has its own methodology for data gathering:

Birds – All selected SRC localities (map 5.2) were visited at least 3 times per year: one visit in the winter season from December till February, and two visits in nesting season from April till June. Each SRC locality was monitored by passing defined transect within the area of SRC locality and within the neighbour biotope as reference control sample. All visual and acoustic activities of bird species were recorded. In some cases, bird species in surrounding biotopes were recorded which can potentially occur in SRC localities.

Amphibians – Each selected locality (map 5.3) was visited minimally 3 times per year, two visits in period March-June, and one during July-September. Minimal length of both transects (within the SRC field and in reference control biotope) is 400 m and the width is approx. 5 m. Passing the way of

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defined transects all visual and acoustic activities of amphibian species were recorded. Each transect was visited in day and also in night time.

To cover more amphibian species traps and sound recorders were installed in the last season. Traps were 15 m long foil barriers with a plastic tub at the end. Caught individuals were recorded and freed.

Installed sound recorders were helpful for capturing of nocturnal activities of amphibians within SRC localities as well as activities of amphibians in peripheral biotopes. Recorded sounds were analysed with the help of Audacity software. (https://www.audacityteam.org).

Figure 5.1: Example of trap for amphibian species in locality S8a

Figure 5.2: Sound recorder

Butterflies – Each selected locality (map 5.4) was visited 3 times within period from April till September. Transect within the area of SRC locality and also in reference control neighbouring biotope were passing by zigzag method observing activities of butterfly species. Individual specimens were caught by entomological net and after determination and recording they were freed.

Beetles – Each selected locality (map 5.5) was visited 4 times within the period from April till October. For monitoring were used standardized inventarisation rules according Ministry of Environment, Land and Parks, Victoria, BC, Canada, 1998.

Terrestric species were hunted with a sweep net (perimeter 35 cm), with beating nets (100 cm), by using leaf litter sieves and by catching individuals.

Ground traps were used for epigeic species of beetles (see schematic image of a trap). 10 traps were placed, one every 10 m of the transect. They were checked 2-3 days after installation.

Endangered, protected and easily determined species are immediately freed after determination. Other species are determined in laboratory with a help of microscope.

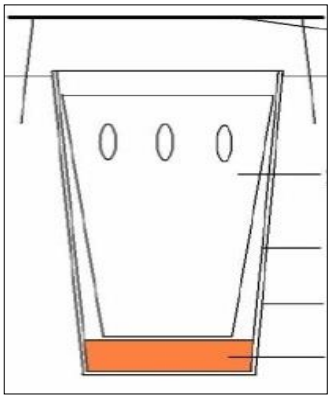

Figure 5.3: Beetle trap schema

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6 Results

All data from last two seasons collected in the field is stored in the information system created for this purpose. Part of this data is published on the webpage http://daphne.sk/d4eu/mon2019.php to be visible for project partners and experts.

Following tables show overview of collected data from last two seasons:

inventory mapping	# localities		# visits		transects km		# species records		# species	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
plant species records	74	84	76	87	114	126	2492	3141	310	341
animal species records	74	81	76	87	101	0*	715	280	102	42

*together with plants mapping

re monitoring	# localities		# visits		transects km		# species records		# species	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
birds	14	15	26	32	99	145	966	1010	100	95
amphibians	8	9	34	111	86	148	157	284	9	8
beetles	8	9	32	36	27	30	978	1326	202	228
butterflies	8	9	54	62	28	31	380	431	37	41

In the following, the data overview is given for each of the different species groups divided into their specific sections.

6.1 Birds (*Aves*)

In total 109 different bird species were recorded in the period of two seasons. 40 of them were from SRC localities, 70 from control transect biotopes and 103 species were found in surrounding biotopes. The higher number of species in areas out of SRC localities is because these areas covered different types of biotopes (fields, shrubs, grasslands and ruderal).

Figure 6.1.1 shows the number of bird species in SRC localities and their reference controls of different biotopes (number of birds with nesting activities are in pale color). In some cases the number of bird species is higher in SRC localities than in control arable fields.

The next figure 6.1.2 displays the same number of bird species but it zooms to the records from SRC localities only. It shows that birds were recorded in all localities, except R8a which is surrounded by natural biotopes, and birds with nesting activities were recorded on most of the SRC places.

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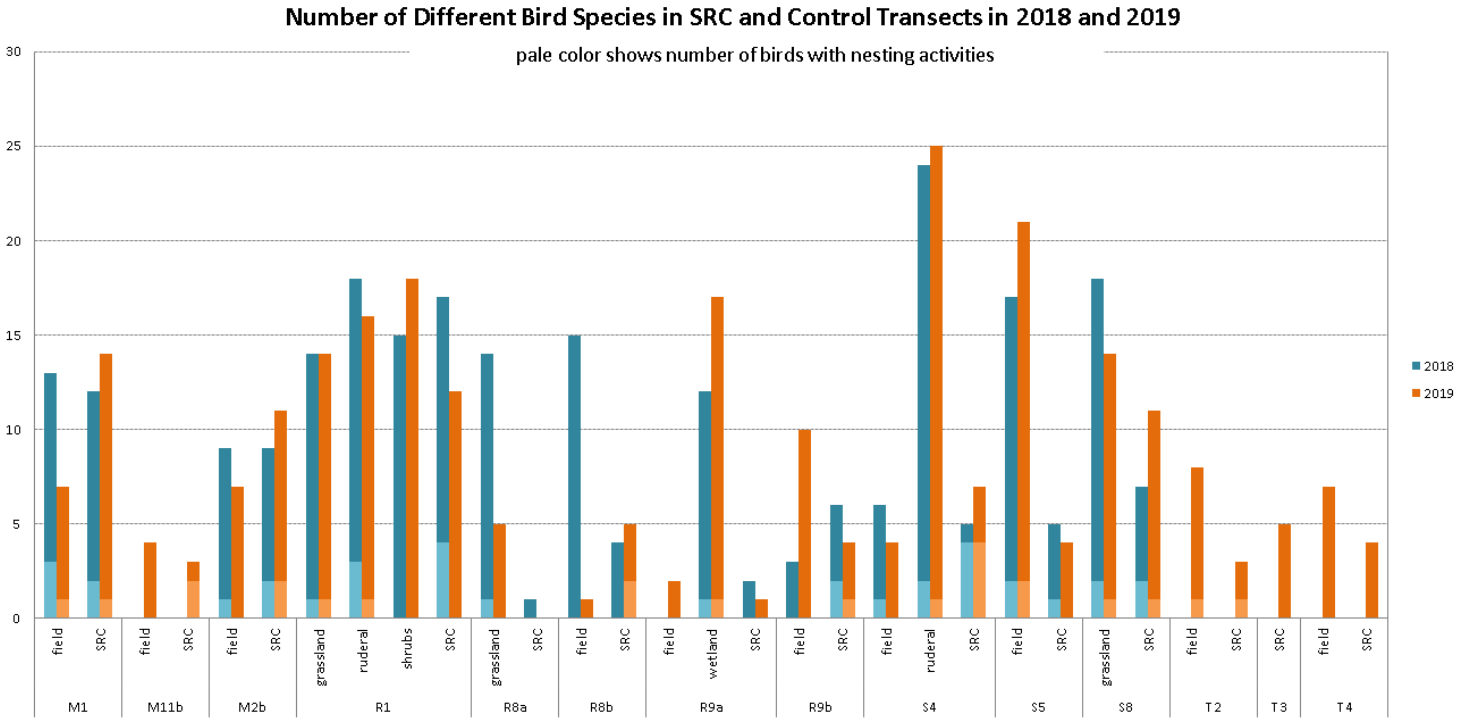

Figure 6.1.1: Number of bird species in SRC localities and their reference control biotopes.

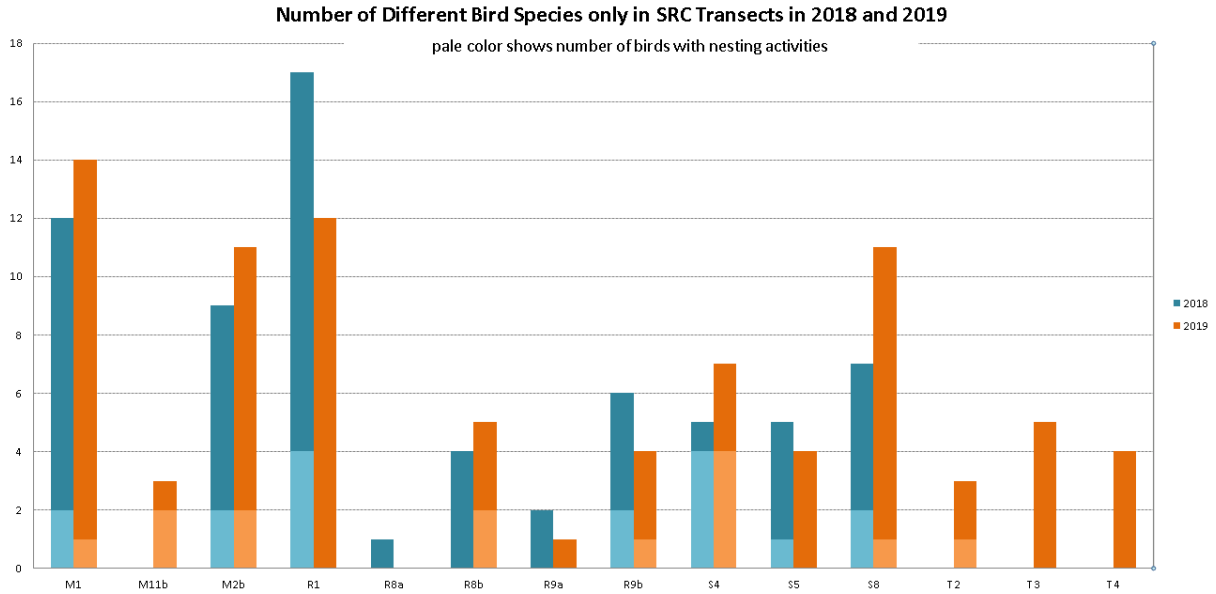

Figure 6.1.2: Number of bird species in SRC localities only.

The number of recorded characteristics of occurrence is demonstrated in figure 6.1.3 with the respective number of bird species in SRC localities and in reference control areas. A similar value of probable and proved nesting characteristics in both control and SRC localities indicates the value of SRC localities. Probable and proved nesting activities were observed for 7 bird species (***Alauda arvensis, Carduelis cannabina, Lanius collurio, Lullula arborea, Motacilla flava, Passer montanus*** and ***Phasianus colchicus***).

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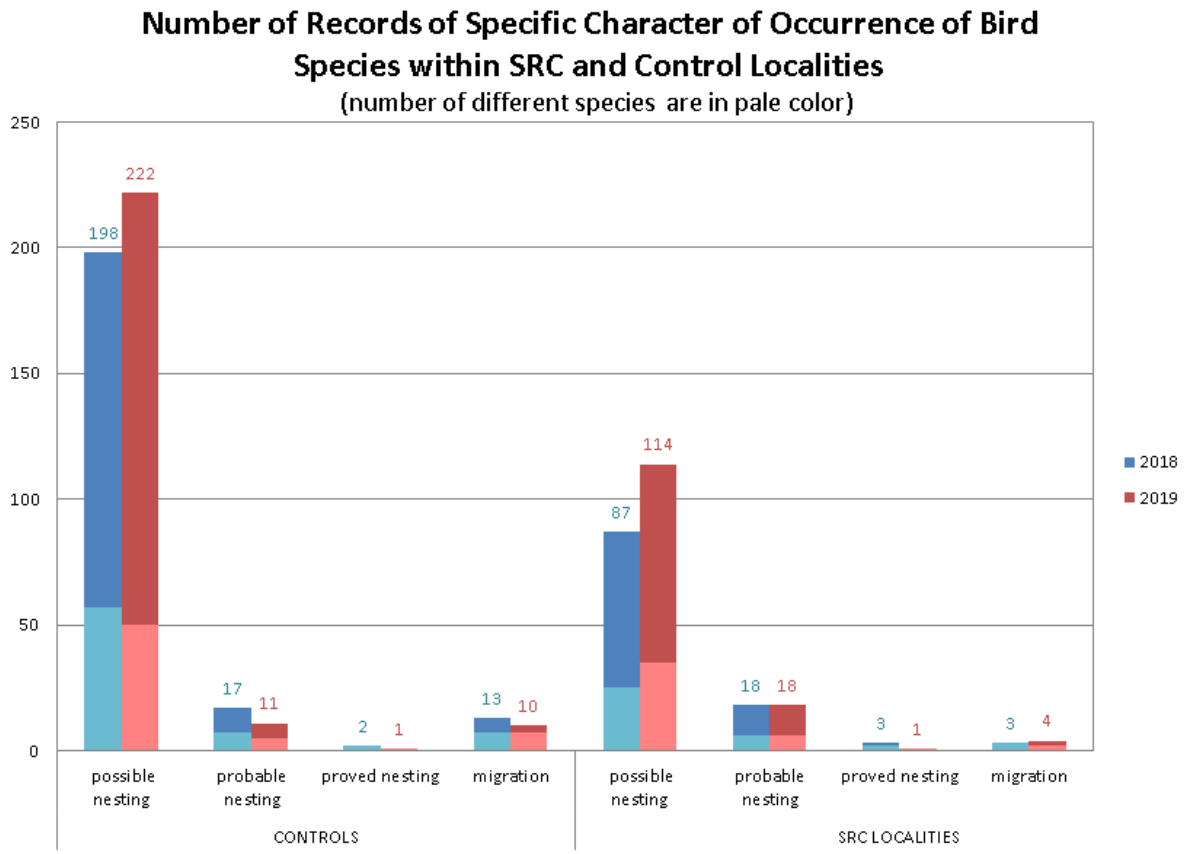

Figure 6.1.3: Number of records of character of occurrence of bird species in SRC and Control localities.

6.2 Amphibians (*Amphibia*)

In SRC localities, in their reference control neighbor biotopes and in the periphery, all 8 amphibian species were recorded which can potentially occur in this region. Six of these species were observed directly in the area of SRC localities: *Bufo bufo,* ***Bufo viridis, Hyla arborea, Pelobates fuscus****, Pelophylax esculentus,* ***Rana dalmatina***. All of them are species of national importance, and four, in bold, are of European importance. Table 6.2.1 shows the number of identified species and the number of recorded individuals (in brackets) in all monitored localities, in their reference control biotopes and in the periphery:

	2019			2018		
Locality	**in Control**	**in Periphery**	**in SRC**	**in Control**	**in Periphery**	**in SRC**
M1	1 (3)	3 (1012)	7 (1089)	0	3 (1018)	2 (4)
M2b	1 (1)	4 (78)	4 (40)	4 (5)	5 (666)	3 (51)
M3a	0 (0)	1 (3)	2 (9)	0	5 (38)	4 (84)
R13	1 (1)	3 (2026)	0 (0)	-	-	-
R5	0 (0)	1 (3)	1 (1)	0	1 (1000)	2 (5)
S1	0 (0)	4 (722)	2 (3)	0	1 (3)	1 (1)
S4	0 (0)	1 (3008)	3 (156)	0	0	3 (8)
S8a	0 (0)	3 (2010)	2 (3)	1 (1)	3 (22)	0
T1	0 (0)	2 (4011)	0 (0)	0	1 (1000)	0

Table 6.2.1: Number of amphibian species and individuals, in brackets, in season 2018 and 2019.

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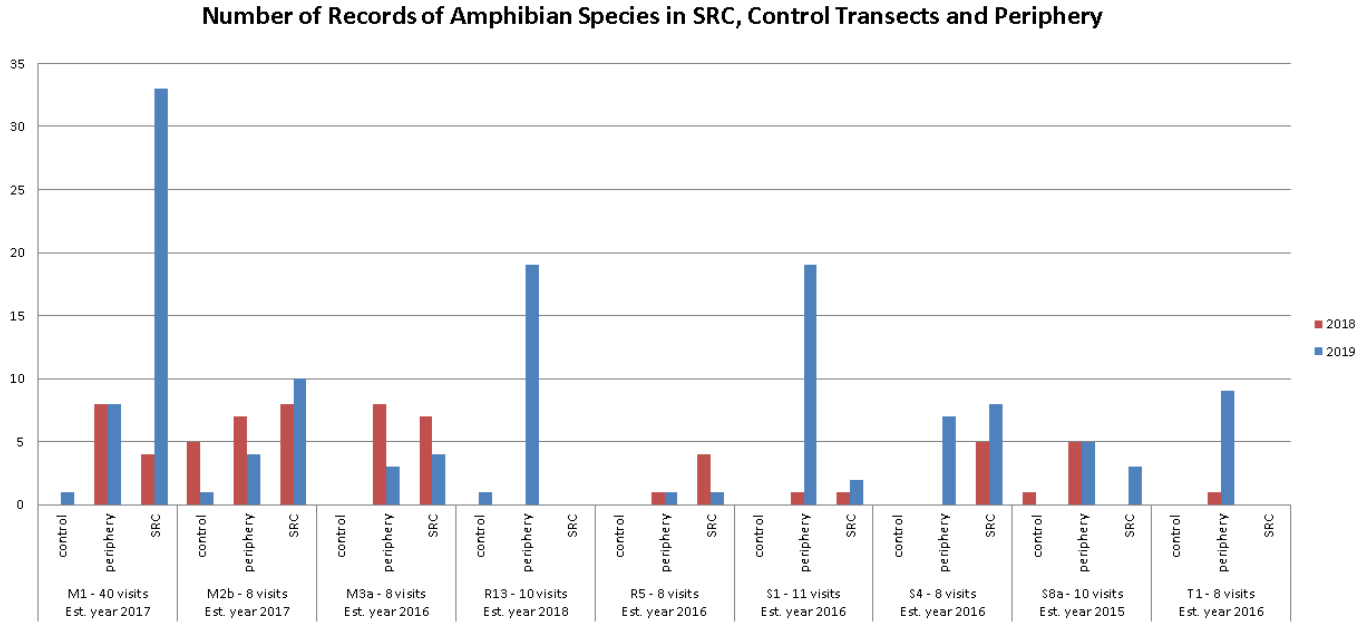

Figure 6.2.1: Number of records of amphibian species in SRC localities, their reference controls and perifery.

From the above table and figure 6.2.1 it is evident that presence of amphibian species in SRC localities dominates over their reference samples. Only one exception is locality R13 which was monitored only in season 2019 and it was densely overgrown by vegetation which made impossible visual observation and installation of the trap. Locality T13 is also without any amphibian species, but they are missing also in reference control area. This locality is a good example of not suitable biotope for amphibian species, because neighbor water channel is very often without water and soil is too hard to be used as shelter. Localities rich in amphibians very often contain some water pond or wetland depressions.

In the figure 6.2.1 is also visible, that season 2019 was more suitable for amphibian species than the season 2018.

6.3 Butterflies (*Lepidoptera*)

In the last two seasons, in total 41 butterfly species were recorded in SRC localities and in their reference control biotopes. 39 of them were observed also in SRC localities and 3 species only in SRC localities. Most of the butterflies adopt the SRC localities as a habitat for their entire life cycle. This means that their feeding plants occur in these areas and that all their life cycle stages can be observed here. One of these species, the large copper (*Lycaena dispar*), is a species of European importance.

Table 6.3.1 shows the numbers of identified species and of recorded individuals (in brackets) in all monitored localities and in their reference control biotopes.

The following figures 6.3.1 and 6.3.2 are graphical interpretations of the table 6.3.1 with additional visualization of the amount of species spending their whole lifecycle in the respective locality.

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	2018				2019			
Locality	**field**	**grassland**	**shrubs**	**SRC**	**field**	**grassland**	**shrubs**	**SRC**
M1	6 (6)			10 (16)	6 (22)			23 (72)
M11a	-	-	-	-		21 (77)		20 (51)
M2b	4 (5)			11 (24)	4 (5)			14 (49)
M6		26 (105)		16 (35)		26 (138)		16 (60)
R7a		26 (114)		26 (40)		27 (100)		20 (88)
R8a		32 (139)		20 (37)		32 (160)		20 (81)
S4	6 (8)		16 (50)	22 (51)	6 (12)		16 (75)	32 (240)
S8a	4 (4)	29 (92)	15 (27)	22 (34)	4 (5)	30 (183)	15 (41)	12 (36)
T3	7 (8)		29 (87)	23 (29)	7 (14)		29 (121)	23 (56)

Table 6.3.1: Number of butterfly species in season 2018 and 2019.

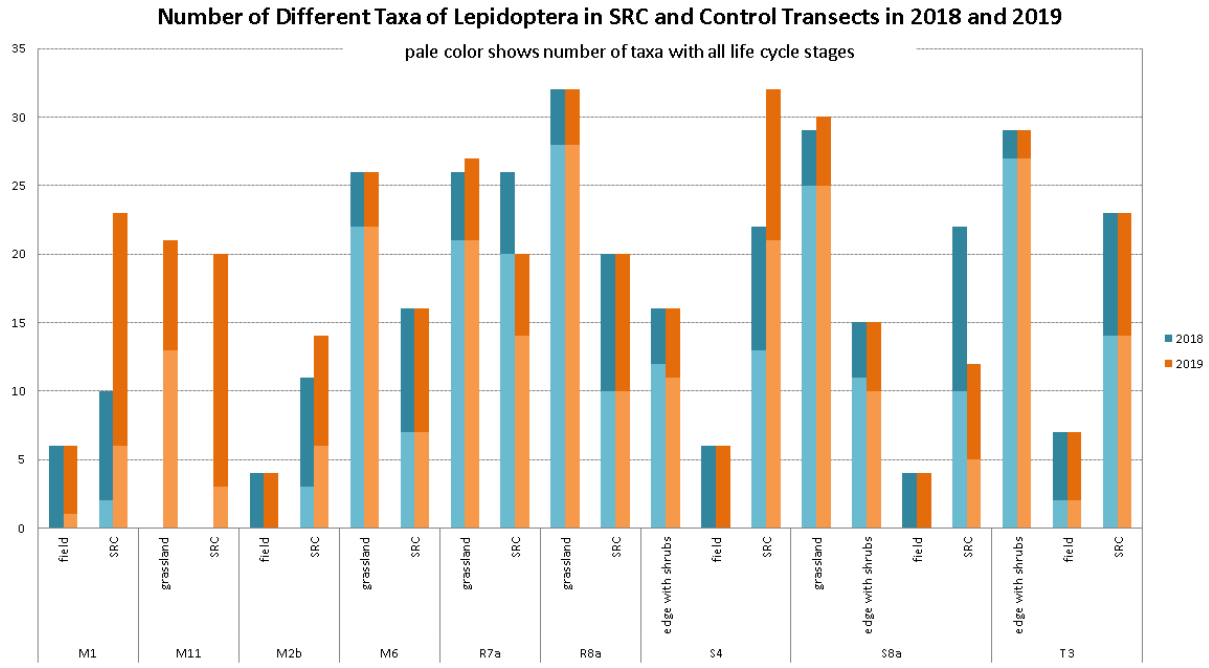

Figure 6.3.1: Number of butterfly species in all localities.

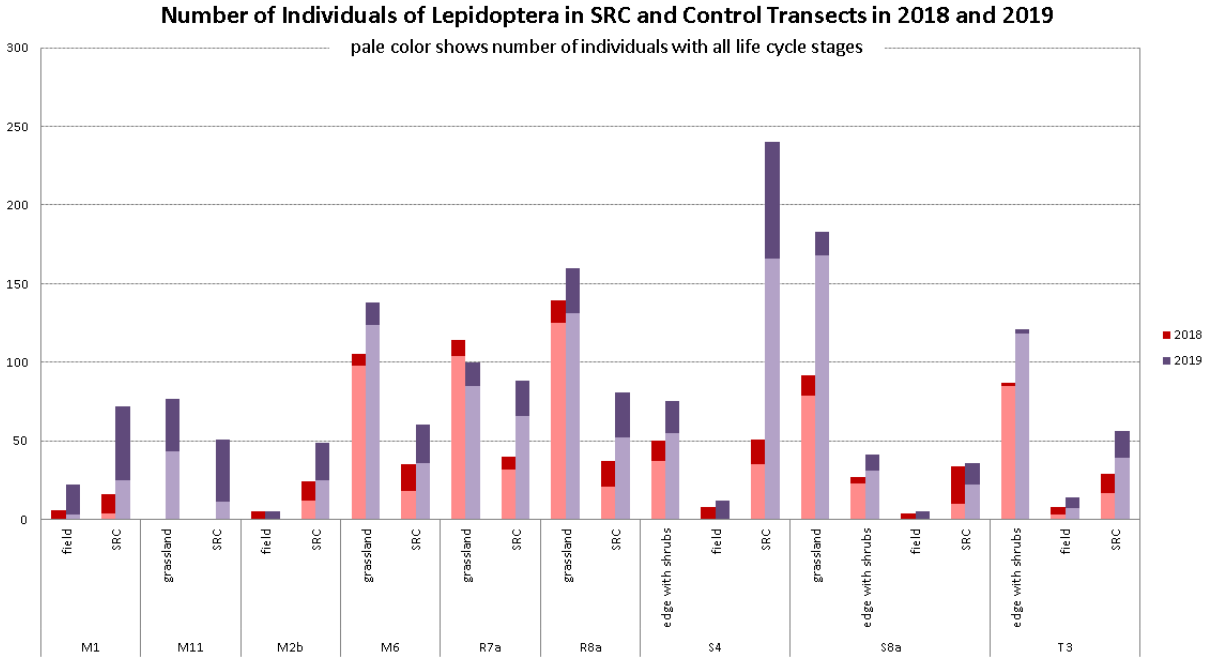

Figure 6.3.2: Number of individuals of butterfly species in all localities.

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Data in table 6.3.1 and their graphical interpretations explain that SRC localities are more suitable biotopes for butterfly species than arable fields, but are less suitable than natural biotopes like grassland or shrubs. The smallest amount of butterfly species observed in SRC localities (S8a) was probably caused by shading due to the dense canopy closure of the older poplar SRC stand.

6.4 Beetles (*Coleoptera*)

In the last two seasons, in total 228 species of beetles were recorded in SRC localities and in their reference control biotopes. 207 of them were observed in SRC and reference localities and 21 species only in SRC localities. Two of these species, *Meloe violaceus* and *Meloe proscarabaeus* are species of national importance. But they were recorded only in reference control grassland biotopes.

Table 6.4.1 shows the number of identified species and the number of recorded individuals (in brackets) in all monitored localities and in their control biotopes. The following figures 6.4.1 and 6.4.2 are graphical interpretations of the table 6.4.1.

	2018			2019		
Locality	**field**	**grassland**	**SRC**	**field**	**grassland**	**SRC**
M1	5 (50)		20 (150)	11 (52)		56 (292)
M11a	-	-	-		68 (309)	78 (364)
M2b	5 (45)		23 (214)	9 (46)		58 (308)
M6		146 (696)	96 (539)		153 (1209)	106 (598)
R7a		110 (629)	110 (536)		122 (595)	122 (481)
R8a		87 (399)	65 (196)		98 (365)	75 (219)
S4	14 (95)		57 (390)	17 (53)		123 (696)
S8a	6 (68)	94 (481)	54 (404)	11 (104)	107 (477)	70 (392)
T3	4 (50)		27 (283)	9 (65)		33 (194)

Figure 6.4.1: Number of coleoptera species in all localities.

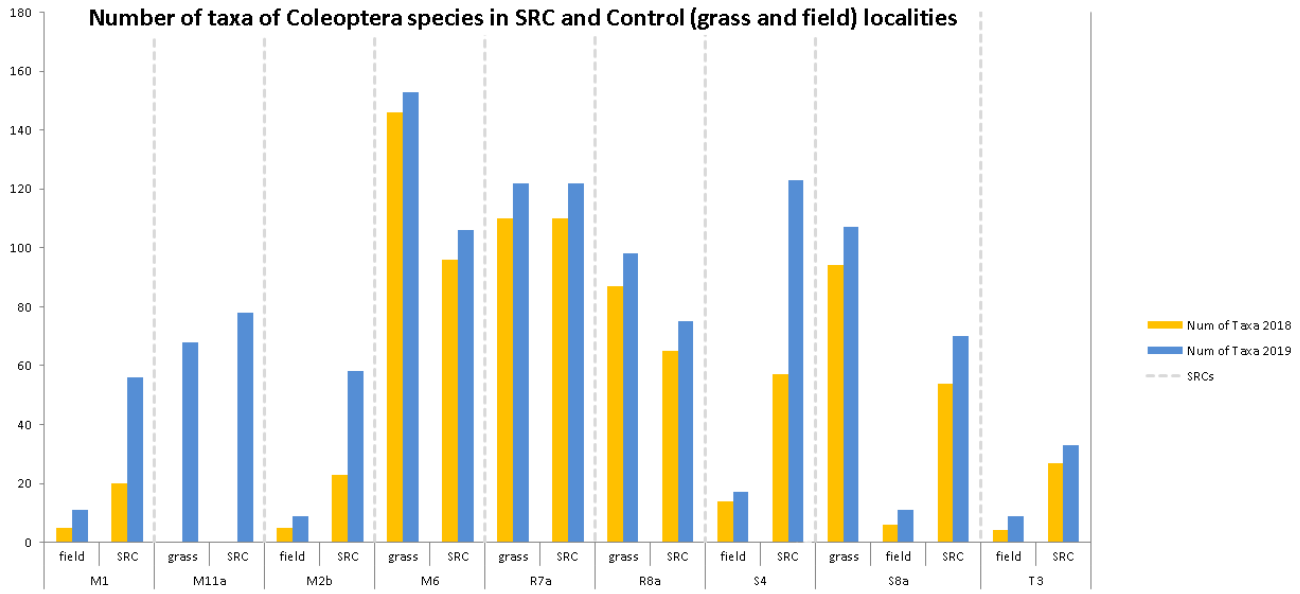

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Figure 6.4.1: Number of different coleoptera species in all localities.

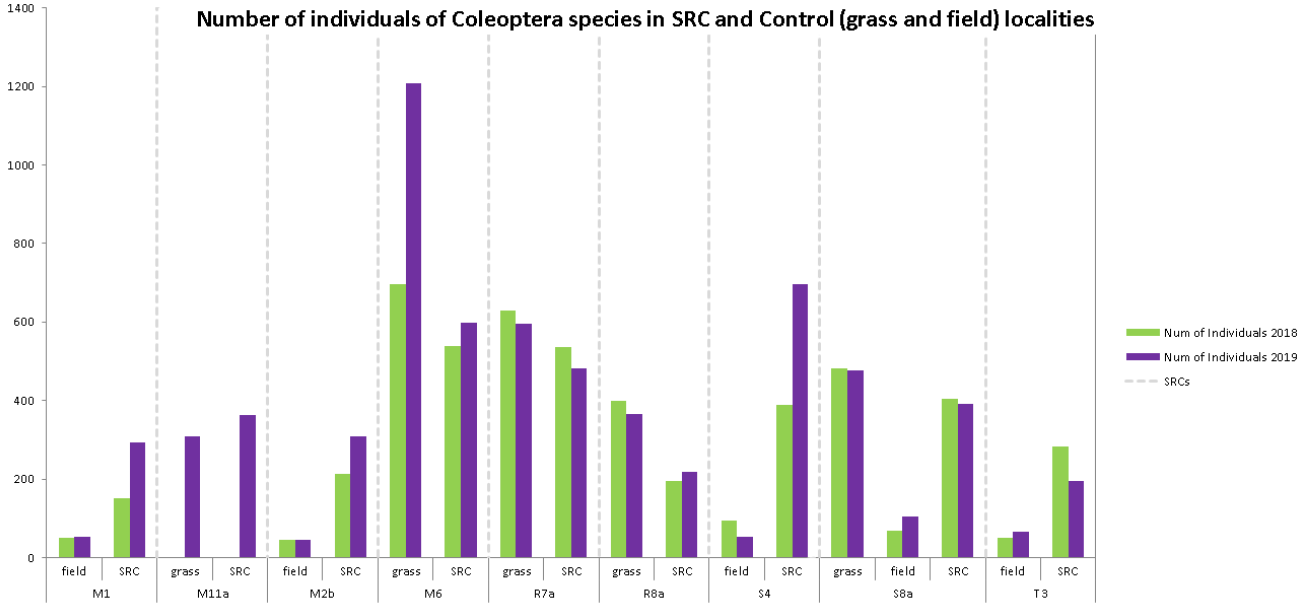
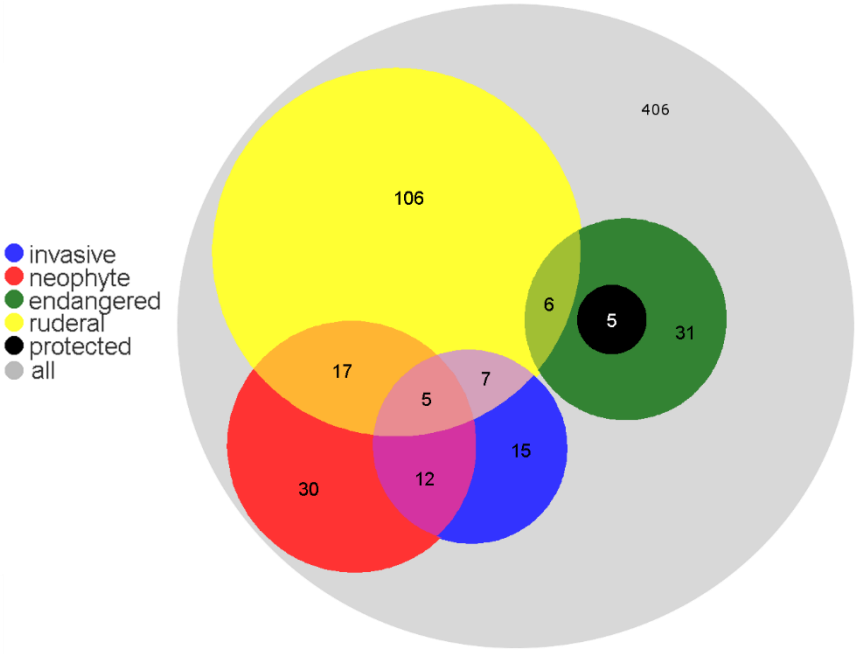


Figure 6.4.2: Number of individuals of coleoptera species in all localities.

From table 6.4.1 and subsequent figures is visible that SRC localities are more suitable biotopes for *Coleoptera* species than arable fields, but are less suitable than natural biotopes like grassland. Only one exception is in SRC locality M2b where there are higher numbers for SRC locality, because the respective control biotope has been degraded grassland.

6.5 Plants

The total number of identified plant species in all SRC localities in last two seasons was 406. All species were divided into groups according to their affinity to natural, semi-natural and artificial biotopes. The 6 main groups of plants were identified**: Invasive, neophyte, ruderal, endangered, protected** and **other** (Medvecká et al. 2012). The Venn diagram in figure 6.5.1 shows numbers and combinations of different plant species groups.



15 invasive, 30 neophytes and 106 ruderal plant species are considered as plants (114 in total) of artificial biotopes.

31 endangered, with 5 nationally protected plant species, and the rest 261 “other” species (292 in total) are representatives of natural and semi-natural biotopes.

Figure 6.5.1: Numbers of plant species in different species groups and their combinations

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The percentage of the abundance of different plant species is shown in figure 6.5.2 Data includes both seasons, 2018 and 2019, and all investigated SRC localities.

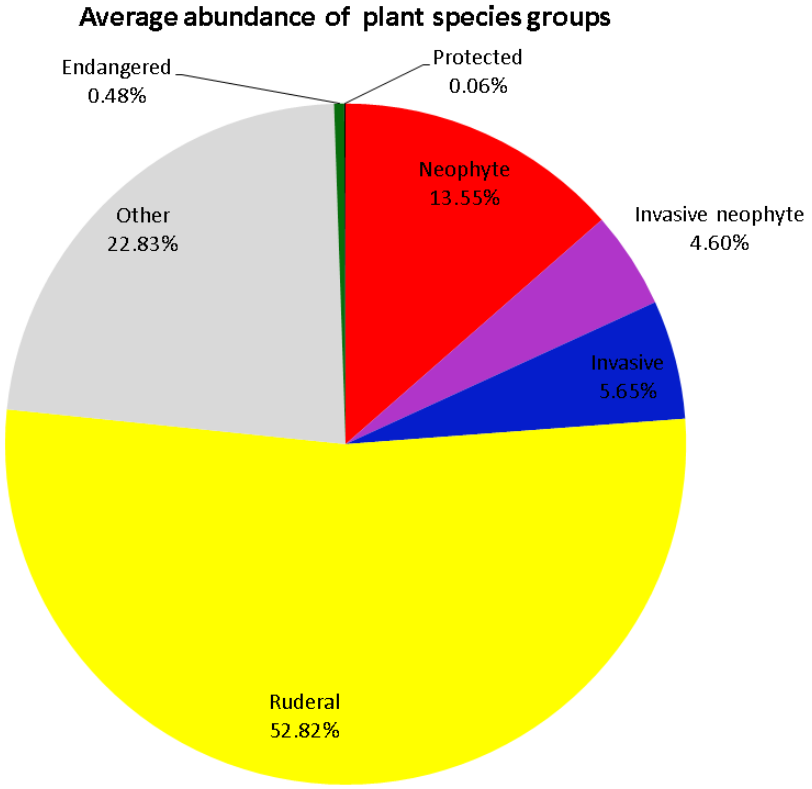

Figure 6.5.2: Abundance of plant species types in season 2018 and 2019.

From figures 6.5.1 and 6.5.2 is visible that although the number of "artificial" plant species (114) is much lower than number of "natural" plant species (292) the overall average abundance is in favor of "artificial" species.

The following bar charts show number of SRC localities with different percentages of "natural" species (species of natural and semi-natural biotopes) and "artificial" species (species of artificial biotopes).

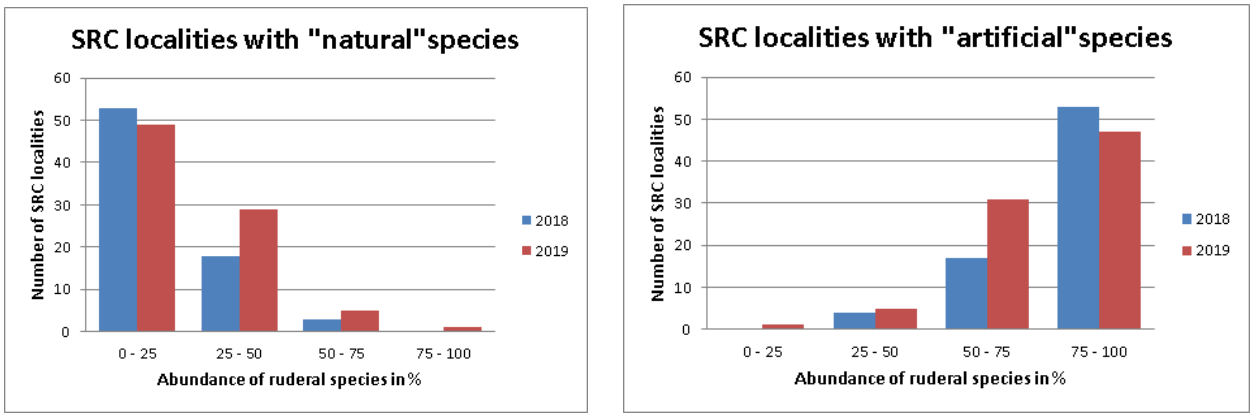

Figure 6.5.3: Number of SRC localities in different categories of abundace of „natural" and „artifcial" plant species

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Figure 6.5.4: Abundance of plant species group in all monitored SRC localities sorted by abundance of species of natural biotope

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The abundance of plant species groups in particular SRC localities (sorted by abundance of natural plant species) is displayed in figure 6.5.4. SRC localities with dominance of "natural plant species" occur mostly on the places which were originally natural biotopes like wetlands or sandy (psamophytic) biotopes – see localities at the top of the bar chart: WF1-4 (not planted in time of monitoring), R1, M13…

The figure 6.5.4 also visualizes the distribution of **endangered** and **invasive neophyte** plant species. These plants are important **indicators of the status of biodiversity**.

Endangered species were found in 46 SRC localities. An important occurrence of two endangered archaeophyte species *Ranunculus arvensis* and *Aphanes arvensis* in three SRC localities was recorded. Probably the disturbances made by disking as a main management measure in the SRC localities is accepted by or even beneficial for these species. Also psamophytic plant species like *Spergula morisonii* or *Teesdalia nudicabulis* are profiting from such type of management. Data for coming years of monitoring can explain if these species can survive vegetation seasons under shading due to dense canopy closure of SRC poplar stands.

SRC localities can serve as a habitat for rare species, but also as a place for invasive neophytes which can be a source for spreading of aliens.

6.6 Other species groups

In the last two seasons in all SRC localities 2175 individuals of different species groups were observed. Figure 6.6.1 presents the percentage of occurrences of these records and table 6.6.1 shows distribution of number of individuals of different species groups in particular SRC localities.

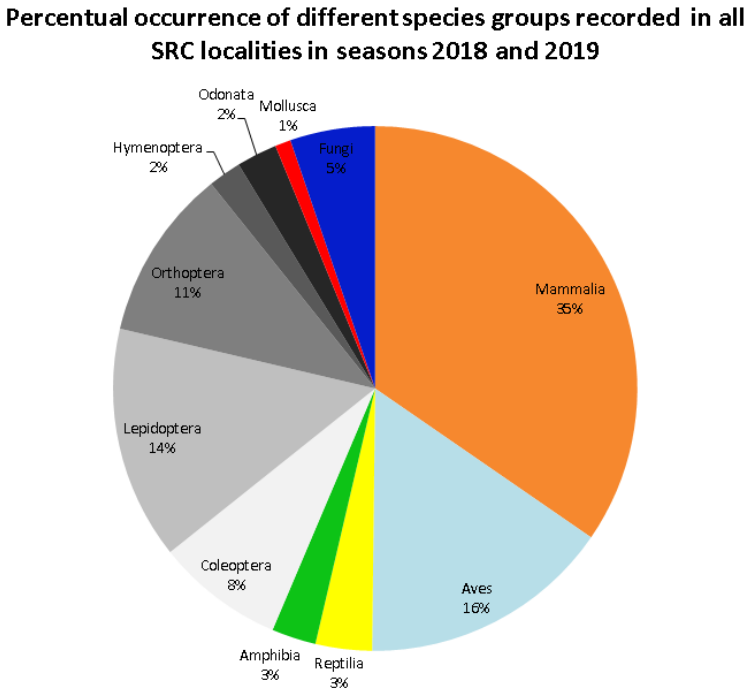

Figure 6.6.1: Percentage of occurrrence for different species groups in all SRC localities

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	Chordata				Insecta						
Loc	Mammalia	Aves	Reptilia	Amphibia	Coleoptera	Hymenoptera	Lepidoptera	Odonata	Orthoptera	Mollusca	Fungi
M1	79	2	7		1				2	1	
M10	1	7			2	1	15		3		1
M11a	6	3			5	1	14		3		1
M11b	22	6			3		17				
M11bx		4					6		2		
M12	3	1			3		8		3		
M13	10	20			4	2	7			4	
M13x	1										
M13z							7	2	2		
M14	1	1					13		1		1
M2a	1	1			3	1	9		1		
M2b	43		3	50	2		7			1	5
M2b1							5		2	1	1
M3	1	1		1	2		3				
M3a	8	7	11		2	1	1		1		
M3b	5	2			1		2	1	2		
M4	7	3			4		2		2		1
M5a	2	2	1	1	1	1	6	1	1		10
M5b		3		1	7		4		3		11
M6	9	5	1		2	1	10		25		14
M7	5	3		1	1	3	16		9		2
M8	5	2	1		2		7		19		3
M9	14	4			1	5	1		2		
MF1	1						2				
MF3	2	1									
R1	21	7	1	4	6		3	1	2		5
R10	12	3	1		2	1	1		1		
R11a	22				1						1
R11b	10				1		1				
R12a	26	2			2		1		2		
R12b					1			1		2	
R13		10		1	1		2		1		
R2	4	2	1		23		3	1	2	1	1
R3	1	8	1		1	1	5	4		2	1
R4	3	4	1		1		1				43
R5		2	11								1
R6	7	4			1	6	1				1
R7a	8	3			2	1	2	2		2	
R7b		2	1		2	1					
R8a		3			1	1	2				
R8b		3			1	1	3				
R9a	2	4			5	1	1		3	1	
R9b	1	5			1		1	1			
S1	14	4	5		3				1		1

	Chordata				Insecta						
Loc	Mammalia	Aves	Reptilia	Amphibia	Coleoptera	Hymenoptera	Lepidoptera	Odonata	Orthoptera	Mollusca	Fungi
S10	20	1			1		3				
S11	3	52			3	1	9				
S12	4		1								1
S12b								1			
S13	19	1			2		4		1		
S14	1	1					1		3		1
S2	11	4	1		2		5	1	2	1	
S3a	33	6	1		2	1	1	2			
S3a1			1								
S3a2			1								
S3a3		4	2								
S3b	17	3	4		5	1			2		
S3c	8	3	1		2	1	1			1	
S3d	6		1		2						
S4	20	7	8		4	3	6				
S5	13	1	1		2						
S6	7	12	1		2				1	1	
S7	6	6	2		1		4	5			
S8	5										
S8a	15	1	4		2		3	2	2		
S8a2	1										
S8b	8	1			1					1	
S9a	1	4			2		2				
S9b	3	1			1						
T1	1	1			1				6		1
T10a	4	8			1	1	5	1	4		
T10b	8	3			1		6				
T11	51				1		3				
T12	6	8			5		6	15	11	1	
T12b							1	1			
T13	16	2									
T14	2	3					2				
T15							4				5
T2	6	20			1		6		2		1
T3	8	3			7	1	7		9		
T4	8	5			1	1			10		
T5	10	1			2		8	5	3	1	
T6	47	12			6	1	16		18		
T7a	1	9			2	2	1	1	1		
T7b	3	3			3	1	5				
T8	4	1			2		1		3		
T89	1	2					10	6	55		
T9	10	1			2	1	1				
WF1-4	2	2									

Table 6.5.1: Number of occurrences of individuals of different species groups in SRC localities in seasons 2018 and 2019

The most abundant species groups in SRC localities are mammals, insects and birds which were recorded in more than 70 SRC localities.

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Mammals are represented mostly by *Capreolus capreolus, Suus scrofa, Lepus europaeus* and *Microtus arvalis.* Activities of the European beaver (*Castor fiber*), a species of European importance, were recorded in two SRC localities.

The insects group is represented mostly by *Coleoptera*, *Lepidoptera* and *Orthoptera* species. In SRC localities with wetland character, the dragonfly species (*Odonata*) were recorded.

Lizards and snake species of the *Reptilia* group were recorded in 28 SRC localities indicating that they benefit from these biotopes. They are represented by species of European importance, *Lacerta agilis, Lacerta viridi* and *Coronella austriaca,* and one species of national importance, the grass snake (*Natrix natrix*). Some individuals of these species were killed by disking.

7 Risks, monitoring and evaluation

Main risk for continuation of the monitoring is lack of experts. For example the beginning of this season was threatened by capacity of butterfly experts and we had to work it out.

Another risk is weather conditions inappropriate for species of particular species group, as it was in season 2018 for amphibians.

According these preliminary results after two monitoring seasons and their evaluation we can assess impact of SRC localities on biodiversity.

Positive Impact on biodiversity:

- SRC localities established on the place of arable fields become an important refuge for different species groups and can increase the biodiversity value of the area.
- Micro-localities of SRC tree rows, which are not disked, can offer suitable shelters for plant and animal species within the SRC locality.
- SRC localities with one or two years old trees are good for most of the animal species group. For bird species the “memory of the site” is used.
- Disking disturbances can be supportive for psamophytic and annual species. Some of them are rare – *Aphanes arvensis*, *Ranunculus arvensis*, *Spergula morisonii*, *Teesdalia nudicaulis*.
- If some micro-localities of natural biotopes, like tree solitaires or water ponds, are present in a SRC locality, its biodiversity value is higher.

Negative Impact on biodiversity:

- SRC localities established on the place of grasslands, wetlands or other non-forest biotopes decrease original biodiversity value.
- SRC localities of 4 years old trees with dense canopy closure are sterile for almost all taxonomic groups but for beetles (*Carabidae*) and for some bird species.
- Open soil areas, after disking, offer pre-conditions for spreading of invasive species

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- Disking of the SRC areas destroys reproduction micro-localities of amphibian species and very often kills adult species from *Reptilia* and *Amphibia* species groups. Also disking very often destroys plants which are source of feeding for many butterfly species.

8 Deviations and next steps

In the next two seasons the inventory mapping and expert monitoring will continue on all SRC localities monitored in previous seasons and also new localities will be added.

Data from all seasons will be used for the evaluation of biodiversity in SRC localities, in the respective surrounding biotopes and for the analyses of differences among SRC localities. For example, regression analyses of biodiversity and tree canopy density and soil types are planned. Evaluated data will be a reference for the assessment of the impact of SRC localities on biodiversity and this will lead to recommendations for preserving or improving the biodiversity value of D4EU's SRCs.

9 Conclusion

On the basis of the present data, it can be shown that the project's (Dendromass4Europe) SRC have improved the conditions for biodiversity when planted on prior arable farmland. Disking, which is an important (non-chemical) weeding measure, can have supportive but also detrimental effects, depending on the respective plant or animal species and on the timing of the disking. Gaps or small edge-like habitats allowed in the SRC, can help improving the over-all value of the SRC for biodiversity, especially during phases of canopy closure.

9.1 Preliminary recommendations after two seasons

According to the assessed impacts on biodiversity, we can recommend activities for maintaining and/or increasing of biodiversity value in SRC localities

- Reducing of frequency and depth of disking can preserve many amphibian, reptile, butterfly and dragonfly species. At least avoiding the disking in the period of reproduction and developing of amphibian species can increase their population. Alternating disking by mulching can be less destructive.
- Preserving or creation of natural micro-biotopes like water ponds or shrubs or tree solitaires within the area of SRC locality increases biodiversity by expanding of natural shelters for species which also use biotope of SRC area.
- Placing new SRC localities near natural biotopes like brooks, wetlands, grasslands
- Establishing a mosaic of different tree age classes within one SRC locality can increase its biodiversity for several species
- Mulching/disking in appropriate time can eliminate spreading of invasive species.

Following the rules from suggested recommendations can have positive effects for the nature and for the overall communication of D4EU project objectives to the public.

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