

PROVINCIAL SECRETARIAT FOR URBAN PLANNING
AND ENVIRONMENTAL PROTECTION
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Based on the contract, Services of analyzing deposited seed (seed bank) of invasive species in soil and nature protected area for project "PROTECT" (HUSRB / 1602/12/0132 - 5.7.3.), which was concluded on 30.3.2018., in Novi Sad between: PROVINCIAL SECRETARIAT FOR URBAN PLANNING AND ENVIRONMENTAL PROTECTION, represented by project manager Nemanja Erceg, on the one hand, as a client, and the Faculty of Agriculture Novi Sad in Novi Sad, Trg Dositeja Obradovića 8, represented by the Prof. dr Nedeljko Tica, dean. We send you the report on conducted scientific - research activities for the first three months of the contract period.

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I REPORT

SERVICES OF ANALYZING DEPOSITED SEED (SEED BANK) OF INVASIVE SPECIES IN SOIL IN NATURE PROTECTED AREA FOR PROJECT "PROTECT"

REFERENCE NUMBER: HUSRB/1602/12/0132 – 5.7.3.

1. Description of activity

Location	Nature Reserve „Ludaško jezero“	Nature Park “Palić”	Special Nature Reserve “Selevenjske pustare”/forest	Landscape of Outstanding Features „Subotička peščara“/forest
Time of activity	17.05.2018. 7-15h	23.05.2018. 7-15h	29.05.2018/30.05.2018. 7-15h	29.05.2018/30.05.2018. 7-15h
Weather condition Temperature/humidy	17°C/18%	21,7°C/34%	22,3°C/81% 21,8°C/78%	22,3°C/81% 21,8°C/78%
N° of soil sampling	25	17	14/15	15/14
N° of identified seed	52	45	41	39
N° of identified invasive seed	9	11	12	8

2. Description of methodology

Soil sampling was carried out in locations of four protected areas in north of Serbia Landscape of Outstanding Features “Subotička peščara”, Nature Park “Palić”, Nature Reserve “Ludaško jezero” and Special Nature Reserve “Selevenjske pustare”. The depth at which samples were taken in each location was 0-10 cm. The sampling of soil was done in XX-XX, with a probe of the same volume. In the laboratory conditions, soil samples were sieved through sieves of various diameters. After that weed seeds separated in the sample from plant and other material and the identification of seeds was carried out. Identifying the seeds and determining their quantity was carried out with microscopes and determiners.

In first report shows soil sampling at the beginning of the first vegetation season.

3. Results

Weed seed banks contribute to the spread of both annual (Steinmann and Klingebiel, 2004) and perennial weed species (Blumenthal and Jordan, 2001), which affects the spread of the weed community in general over the years. What has to be taken into account in the study of weed seed banks in soil is that they are only a part of a complex and dynamic system consisting of soil (Otto et al., 2007), plants, animals and microorganisms (Chee-Sanford et al., 2006). The main biological characteristics of weeds which enable their viability are high seed production, a high potential for vegetative propagation, and the potential for rapid expansion and adaptation to adverse ecological conditions (Konstantinović et al., 2012). Seeds can be dispersed mechanically by wind, water, animals or cultivation machinery, all of which contribute to the regular replenishment of weed seed banks. The most significant factor for the appearance of a new seed into the weed seed bank is the time when the seeds are released by the dominant weed species within the local plant communities (Konstantinović et al., 2008). In addition, weed density is limited due to the risk of soil compression during wet winter seasons. All of these factors can have an impact on the appearance of weeds and on the composition of seed banks (Anderson et al., 1998; Clements et al., 1996; Le'ge`re et al., 2005; Smith and Gross 2006). Annual fluctuation of outside factors significantly influences weed seedbanks (Harbuck et al., 2009). Understanding the nature of seedbanks is a necessary prerequisite for studying plant population dynamics, or for setting up programs of weed control (Ambrosio et al., 2004).

Nature Reserve "Ludaško jezero"

At the location of Nature Reserve "Ludaško jezero" studied 52 weed species were identified: *Amaranthus retroflexus*, *Polygonum aviculare*, *Portulaca oleracea*, *Senecio vulgaris*, *Setaria italica*, *Chenopodium hybridum*, *Setaria glauca*, *Brassica hirta*, *Dianthus ponederae*, *Trifolium repens*, *Solanum nigrum*, *Datura stramonium*, *Raphanus raphanistrum*, *Silene vulgaris*, *Centaurea cyanus*, *Stellaria media*, *Sambucus nigra*, *Echinochloa crus-galli*, *Iva xanthifolia*, *Bromus molis*, *Stachys anuua*, *Chenopodium album*, *Taraxacum officinale*, *Poa trivialis*, *Sinapis alba*, *Salvia officinalis*, *Daucus carota*, *Veronica hederifolia*, *Matricaria chamomilla*, *Euphorbia helioscopia*, *Crataegus sp.*, *Celtis occidentalis*, *Polygonum persicaria*, *Delphinium consolida*, *Polygonum lapathifolium*, *Hibiscus trionum*, *Rumex crispus*, *Avena fatua*, *Ambrosia artemisiifolia*, *Carex hirta*, *Convolvulus arvensis*, *Rubus caesius*, *Hordeum murinum*, *Festuca pratensis*, *Sonchus arvensis*, *Sinapis arvensis*, *Lolium multiflorum*, *Carduus acanthoides*, *Capsella bursa-pastoris*, *Canabis sativa*, *Phacelia campanularia* and *Ajuga reptans* (table 1).

Table 1: Determined weed seeds at Special at Nature Reserve „Ludaško jezero“

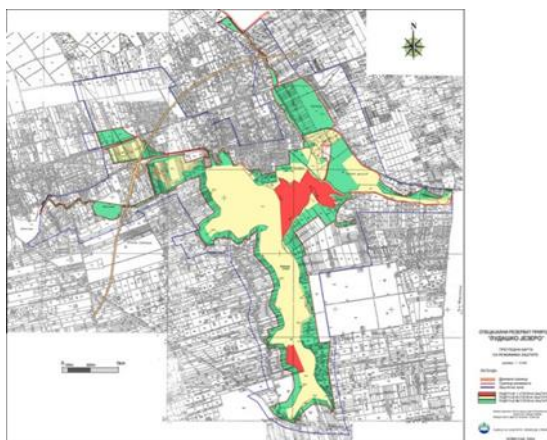
Weed seeds	Number of soil sampling																									SUM	no m2
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25		
<i>Amaranthus retroflexus</i>	8	4	2	73	113	0	9	66	42	7	7	70	11	19	7	9	29	38	4	4	8	1	2	7	2	542	43226,99
<i>Polygonum aviculare</i>	1	0	28	0	0	13	6	0	3	0	15	1	0	5	3	0	4	0	5	2	2	4	1	1	1	95	7576,69
<i>Portulaca oleracea</i>	1	4	5	33	154	2	2	8	36	9	81	2	23	20	33	2	16	35	0	4	7	1	0	4	1	483	38521,47
<i>Senecio vulgaris</i>	3	0	0	0	0	0	0	24	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	6220,86
<i>Setaria italica</i>	5	0	0	0	1	0	0	0	1	0	0	8	0	0	0	1	2	0	0	0	2	1	0	0	0	21	1674,85
<i>Chenopodium hybridum</i>	0	2	0	48	39	0	0	2	11	3	0	0	0	0	0	0	71	0	0	0	1	0	0	0	0	177	14116,56
<i>Setaria glauca</i>	0	2	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	16	1276,07
<i>Brassica hirta</i>	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51
<i>Dianthus pontederiae</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4	319,02
<i>Trifolium repens</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75
<i>Solanum nigrum</i>	0	0	2	8	4	0	0	0	1	0	0	8	1	0	8	0	0	0	0	0	0	0	0	0	0	32	2552,15
<i>Datura stramonium</i>	0	0	1	6	2	0	1	2	4	0	1	4	0	7	0	0	11	0	0	0	0	0	1	0	0	40	3190,18
<i>Raphanus raphanistrum</i>	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51
<i>Silene vulgaris</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	4	319,02	
<i>Centaurea cyanus</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75
<i>Stellaria media</i>	0	0	0	1	2	0	0	9	0	0	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	16	1276,07
<i>Sambucus nigra</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	159,51
<i>Echinochloa crus-galli</i>	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	5	398,77
<i>Iva xanthifolia</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75
<i>Bromus malis</i>	0	0	0	1	0	0	2	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	1	0	9	717,79	
<i>Stachys anua</i>	0	0	0	1	0	0	0	3	1	0	6	0	2	0	1	0	0	0	0	0	0	0	0	0	0	14	1116,56
<i>Chenopodium album</i>	0	0	0	0	30	1	0	8	0	8	3	0	4	0	11	0	0	15	0	1	0	0	0	2	0	83	6619,63
<i>Taraxacum officinale</i>	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	0	0	0	7	0	0	0	0	0	0	11	877,30
<i>Poa trivialis</i>	0	0	0	0	0	0	1	1	0	0	3	0	0	0	0	0	2	1	1	0	0	0	0	0	9	717,79	
<i>Sinapis alba</i>	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Salvia officinalis</i>	0	0	0	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	319,02	
<i>Daucus carota</i>	0	0	0	0	0	0	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	1754,60	
<i>Veronica hederifolia</i>	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	8	638,04	
<i>Matricaria chamomilla</i>	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	70	5582,82	
<i>Euphorbia helioscopia</i>	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	2	0	0	0	0	6	478,53	
<i>Crataegus L.</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Celtis occidentalis</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	0	0	6	478,53	
<i>Polygonum persicaria</i>	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	3	0	0	0	0	9	717,79	
<i>Delphinium consolida</i>	0	0	0	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	0	0	0	0	0	9	717,79	
<i>Polygonum lapathifolium</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	7	558,28	
<i>Hibiscus trionum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Rumex crispus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	3	239,26	
<i>Avena fatua</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4	319,02	
<i>Ambrosia artemisiifolia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	159,51	
<i>Carex hirta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	79,75	
<i>Convolvulus arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	4	319,02	
<i>Rubus caesius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	79,75	
<i>Hordeum murinum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	398,77	
<i>Festuca pratensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	7	558,28	
<i>Sonchus arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	4	319,02	
<i>Sinapis arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	159,51	
<i>Lolium multiflorum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	319,02	
<i>Carduus acanthoides</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	4	319,02	
<i>Capsella bursa-pastoris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	79,75	
<i>Canabis sativa</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	0	6	478,53	
<i>Phacelia campanularia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	239,26	
<i>Ajuga reptans</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	239,26	

The seeds of invasive weeds at the location of Nature Reserve “Ludaško jezero” were identified: *Amaranthus retroflexus*, *Portulaca oleracea*, *Setaria italica*, *Datura stramonium*, *Echinochloa crus-galli*, *Iva xanthifolia*, *Celtis occidentalis*, *Ambrosia artemisiifolia* and *Lolium multiflorum* (Table 1).

Table 2: Determined invasive weed seeds at Special at Nature Reserve „Ludaško jezero“

Weed seeds	SUM	no m2
<i>Amaranthus retroflexus</i>	542	43226,99
<i>Ambrosia artemisiifolia</i>	2	159,51
<i>Celtis occidentalis</i>	6	478,53
<i>Datura stramonium</i>	40	3190,18
<i>Echinochloa crus-galli</i>	5	398,77
<i>Iva xanthifolia</i>	1	79,75
<i>Lolium multiflorum</i>	4	319,02
<i>Portulaca oleracea</i>	483	38521,47
<i>Setaria italica</i>	21	1674,85

The average number of weeds at the location Special at Nature Reserve „Ludasko jezero“ in the soil profil 0-10 cm is in the range of 79,75 to 43226,99 seeds per m² respectively. The weed seed bank contain several dominant species in all samples. *Amaranthus retroflexus* and *Portulaca oleracea* were one of the most numerous at the locality. *Amaranthus retroflexus* is the weed species with the highest number of selected seed from the samples (43226,99 seeds per m²), followed by *Portulaca oleracea* (38521,47 seeds per m²), *Datura stramonium* (3190,18 seeds per m²), *Setaria italica* (1674,85 seeds per m²), *Celtis occidentalis* (478,53 seeds per m²), *Echinochloa crus-galli* (398,77 seeds per m²), *Lolium multiflorum* (319,02 seeds per m²), *Ambrosia artemisiifolia* (159,51 seeds per m²) and *Iva xanthifolia* (79,75 seeds per m²).



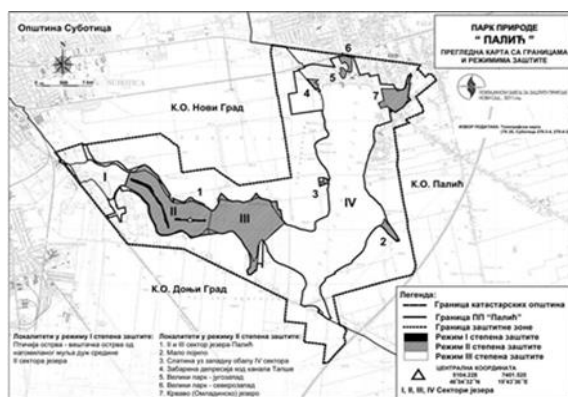
Map 1 – Special Nature Reserve „Ludasko jezero“



Picture 1-5: Sampling of soil at Special at Nature Reserve „Ludaško jezero“

Nature Park „Palić“

At the location of Nature Park „Palić“ studied 45 weed species were identified: *Lolium multiflorum*, *Taraxacum officinale*, *Bromus molis*, *Amaranthus retroflexus*, *Celtis occidentalis*, *Stellaria media*, *Galinsoga parviflora*, *Veronica hederifolia*, *Gallium aparine*, *Sambucus nigra*, *Solanum nigrum*, *Crategus L.*, *Silene alba*, *Vicia articulata*, *Setaria italica*, *Polygonum aviculare*, *Chenopodium album*, *Datura stramonium*, *Asclepias syriaca*, *Lolium rigidum*, *Rumex crispus*, *Canabis sativa*, *Convolvulus arvensis*, *Chenopodium hybridum*, *Aphanes arvensis*, *Polygonum convolvulus*, *Setaria viridis*, *Daucus carota*, *Myosotis arvensis*, *Euphorbia heliscopia*, *Stachys annua*, *Setaria viridis*, *Alopecurus myosuroides*, *Lepidium draba*, *Sonchus arvensis*, *Iris spp.*, *Raphanus raphanistrum*, *Cirsium arvense*, *Anthemis arvensis*, *Matricaria chamomilla*, *Agropyron repens* and *Chrysathenum spp* (table 3).



Map 2 – Nature Park „Palić“

The seeds of invasive weeds at the location of Nature Reserve “Ludaško jezero” were identified: *Lolium multiflorum*, *Amaranthus retroflexus*, *Celtis occidentalis*, *Galinsoga parviflora*, *Vicia articulata*, *Setaria italica*, *Datura stramonium*, *Asclepias syriaca*, *Matricaria discoidea*, *Portulacae olaraceae*, *Veronica persica* (Table 3).

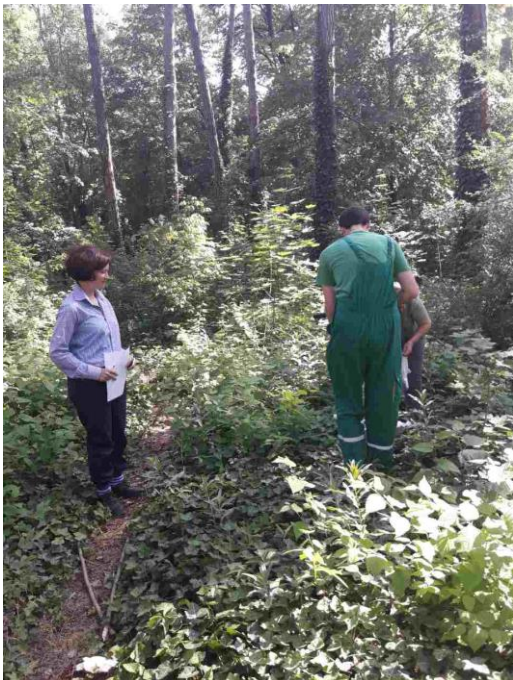
Table 3: Determined weed seeds at Nature Park „Palic“

Weed seeds	Number of soil sampling																	SUM	NO m2
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
<i>Lolium multiflorum</i>	11	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	14	1116,56
<i>Taraxacum officinale</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75
<i>Amaranthus retroflexus</i>	3	0	0	0	1	3	0	3	7	3	0	7	8	0	2	0	0	37	2950,92
<i>Bromus molis</i>	0	1	0	0	1	0	0	0	0	0	0	0	9	0	1	0	0	12	957,06
<i>Celtis occidentalis</i>	0	9	16	0	11	3	1	28	1	0	0	0	0	0	0	0	69	5503,07	
<i>Stelaria media</i>	0	10	4	0	0	0	0	1	0	0	0	9	2	0	4	0	0	30	2392,64
<i>Galinsoga parviflora</i>	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51
<i>Veronica hederifolia</i>	0	0	18	0	0	0	0	3	0	0	0	5	0	0	0	0	0	26	2073,62
<i>Gallium aparine</i>	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	478,53
<i>Sambucus nigra</i>	0	0	1	0	0	2	1	0	0	0	0	0	0	0	0	0	0	4	319,02
<i>Solanum nigrum</i>	0	0	1	0	0	0	2	0	0	5	1	0	1	0	0	0	0	10	797,55
<i>Crategus L.</i>	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	3	239,26
<i>Silene alba</i>	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51
<i>Vicia articulata</i>	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	159,51
<i>Setaria italica</i>	0	0	0	12	0	0	0	0	1	2	0	2	2	0	0	0	0	19	1515,34
<i>Polygonum aviculare</i>	0	0	0	0	6	4	3	1	0	1	0	5	2	2	0	0	1	25	1993,87
<i>Datura stramonium</i>	0	0	0	0	2	2	0	2	25	4	0	0	0	0	1	0	0	36	2871,17
<i>Chenopodium album</i>	0	0	0	0	0	2	0	0	0	1	0	0	0	1	2	1	0	7	558,28
<i>Asclepias syriaca</i>	0	0	0	0	0	1	2	12	0	0	0	0	0	0	0	0	0	15	1196,32
<i>Lolium rigidum</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2	159,51
<i>Rumex crispus</i>	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	319,02
<i>Canabis sativa</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	239,26
<i>Convolvulus arvensis</i>	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	159,51
<i>Chenopodium hybridum</i>	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	159,51
<i>Aphanes arvensis</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	79,75
<i>Polygonum convolvulus</i>	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0	0	0	4	319,02
<i>Setaria viridis</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75
<i>Daucus carota</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	79,75
<i>Matricaria discoidea</i>	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	9	0	13	1036,81
<i>Portulacae olaraceae</i>	3	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	5	11	877,30
<i>Myosotis arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	79,75
<i>Euphorbia heliscopia</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	79,75
<i>Stachys annua</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	159,51
<i>Raphanus raphanistrum</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	79,75
<i>Cirsium arvense</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	319,02
<i>Anthemis arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	6	0	14	1116,56
<i>Matricaria chamomilla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	239,26
<i>Agropyron repens</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	239,26
<i>Chrysathenum spp.</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	21	0	44	3509,20
<i>Iris spp.</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	239,26
<i>Lepidium draba</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	79,75
<i>Sonchus arvensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	79,75
<i>Alopecurus myosuroides</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	239,26
<i>Veronica persica</i>	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	159,51
<i>Setaria viridis</i>	0	0	0	0	0	0	0	0	0	0	0	2	0	0	12	0	0	14	1116,56

Table 4: Determined invasive weed seeds at Nature Park „Palić“

Weed seeds	SUM	no m2
<i>Amaranthus retroflexus</i>	37	2950,92
<i>Asclepias syriaca</i>	15	1196,32
<i>Celtis occidentalis</i>	69	5503,07
<i>Datura stramonium</i>	36	2871,17
<i>Galinsoga parviflora</i>	2	159,51
<i>Lolium multiflorum</i>	14	1116,56
<i>Matricaria discoidea</i>	13	1036,81
<i>Portulacae olaraceae</i>	11	877,30
<i>Setaria italica</i>	19	1515,34
<i>Veronica persica</i>	2	159,51
<i>Vicia articulata</i>	2	159,51

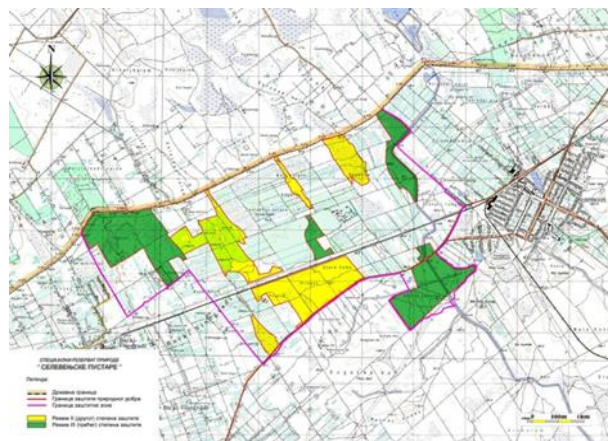
The average number of weeds at the location Nature Park „Palić“ in the soil profil 0-10 cm is in the range of 159,51 to 5503,07 seeds per m² respectively. The weed seed bank contains several dominant species in all samples. *Amaranthus retroflexus* and *Celtis occidentalis* were one of the most numerous at the locality. *Celtis occidentalis* is the weed species with the highest number of selected seed from the samples (5503,07 seeds per m²), followed by *Amaranthus retroflexus* (2950,92 seeds per m²), *Datura stramonium* (2871,17 seeds per m²), *Setaria italica* (1515,34 seeds per m²), *Asclepias syriaca* (1196,32 seeds per m²), *Lolium multiflorum* (1116,56 seeds per m²), *Matricaria discoidea* (1036,81 seeds per m²), *Portulacae olaraceae* (877,30 seeds per m²) and *Galinsoga parviflora*, *Veronica persica*, *Vicia articulata* had same number of determinate weed seeds, 159,51 seeds per m² (table 4).



Picture 6-9: Sampling of soil at Special at Nature Park „Palić“

Special Nature Reserve „Selevenjske pustare“

At the location of Special Nature Reserve „Selevenjske pustare“ studied 41 weed species were identified: *Amaranthus retroflexus*, *Polygonum aviculare*, *Capsella bursa-pastoris*, *Setaria italica*, *Setaria viridis*, *Datura stramonium*, *Rubus caesius*, *Ranunculus repens*, *Lolium multiflorum*, *Iris* spp., *Polygonum convolvulus*, *Lolium perene*, *Oxalis pes-capras*, *Bulbocodium* spp. , *Raphanus raphanistrum*, *Centaurea cyanus*, *Portulacae oleracea*, *Stellaria media*, *Ambrosia artemisifolia*, *Veronica hederifolia*, *Robinia pseudoacacia*, *Melilothus* spp., *Veronica persica*, *Lolium rigidum*, *Avena fatua*, *Celtis occidentalis*, *Chenopodium album*, *Urtica dioica*, *Bromus molis*, *Asclepias syriaca*, *Delphinium consolida*, *Daucus carota*, *Matricaria discoidea*, *Matricaria chamomilla*, *Brassica nigra*, *Verbascum* spp., *Rhinanthus* spp., *Senecio vulgaris*, *Fraxinus* L., *Chenopodium hybridum* and *Pinus nigra* (table 5).



Map 3 - Special Nature Reserve „Selevenjske pustare“

The seeds of invasive weeds at the location of Special Nature Reserve „Selevenjske pustare“ were identified: *Amaranthus retroflexus*, *Asclepias syriaca*, *Matricaria discoidea*, *Robinia pseudoacacia*, *Celtis occidentalis*, *Veronica persica*, *Setaria italica*, *Lolium multiflorum*, *Datura stramonium*, *Fraxinus pennsylvanica*, *Portulaca oleracea* and *Ambrosia artemisifolia* (table 6).

Table 5: Determined weed seeds at Special Nature Reserve „Selevenjske pustare“

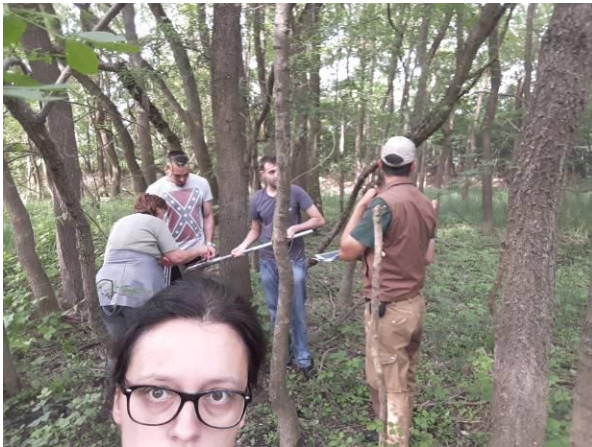
Weed seeds	Number of soil sampling																									SUM	NO m2				
	1	2	3	4	5	6	7	8	9	10	11	13	14	1F	2F	3F	4F	5F	6F	7F	8F	9F	10F	11F	12F			13F	14F	15F	
<i>Polygonum aviculare</i>	4	5	2	38	1	0	0	25	1	0	1	0	0	0	1	3	0	0	0	0	1	0	0	0	0	0	0	0	1	84	6699,39
<i>Amaranthus retroflexus</i>	1	3	4	4	0	0	3	3	70	67	0	10	4	2	1	7	0	0	11	13	0	2	2	3	0	10	9	20	249	19858,90	
<i>Capsella bursa-pastoris</i>	1	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	638,04	
<i>Setaria italica</i>	0	4	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	15	1196,32	
<i>Setaria viridis</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	0	4	0	0	0	0	10	797,55	
<i>Datura stramonium</i>	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	239,26	
<i>Rubus caesius</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Ranunculus repens</i>	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	319,02	
<i>Lolium multiflorum</i>	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0	0	0	0	7	558,28	
<i>Iris spp.</i>	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Polygonum convolvulus</i>	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Lolium perene</i>	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Oxalis pes-capras</i>	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	319,02	
<i>Bulbocodium spp.</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Raphanus raphanistrum</i>	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	398,77	
<i>Portulacae olaraceae</i>	0	0	0	0	0	0	2	0	9	0	0	20	0	0	0	20	0	1	21	7	1	7	0	3	0	0	11	8	110	8773,01	
<i>Stelaria media</i>	0	0	0	0	0	0	0	0	5	0	0	7	1	0	0	0	0	0	0	0	0	1	0	0	0	1	25	40	3190,18		
<i>Ambrosia artemisiifolia</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Veronica hederifolia</i>	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	16	1276,07	
<i>Robinia pseudoacacia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	5	0	4	0	0	1	14	1116,56		
<i>Melilotus spp.</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	10	0	1	0	0	0	1	0	17	1355,83		
<i>Veronica persica</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4	319,02	
<i>Centaurea cyanus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	239,26	
<i>Lolium rigidum</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Avena fatua</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	11	877,30	
<i>Celtis occidentalis</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	4	2	0	0	8	638,04		
<i>Chenopodium album</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	159,51	
<i>Urtica dioica</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	4	319,02	
<i>Bromus mollis</i>	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	319,02	
<i>Asclepias syriaca</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Delphinium consolida</i>	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	398,77	
<i>Daucus carota</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Matricaria discoidea</i>	0	0	0	0	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	1515,34	
<i>Matricaria chamomilla</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Brassica nigra</i>	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Verbascum spp.</i>	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Rhinanthus spp.</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Senecio vulgaris</i>	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	398,77	
<i>Fraxinus pennsylvanica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Chenopodium hybridum</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Pinus nigra</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	

F-forest

The average number of weeds at the location Special Nature Reserve „Selevenjske pustare“ in the soil profil 0-10 cm is in the range of 159,51 to 5503,07 seeds per m² respectively. The weed seed bank contains several dominant species in all samples. *Amaranthus retroflexus* and *Portulaca oleracea* were one of the most numerous at the locality. *Amaranthus retroflexus* is the weed species with the highest number of selected seed from the samples (19858,90 seeds per m²), followed by *Portulaca oleracea* (8773,01 seeds per m²), *Matricaria discoidea* (1515,34 seeds per m²), *Setaria italica* (1196,32 seeds per m²), *Robinia pseudoacacia* (1116,56 seeds per m²), *Celtis occidentalis* (638,04 seeds per m²), *Lolium multiflorum* (558,28 seeds per m²), *Veronica persica* (319,02 seeds per m²), *Datura stramonium* (239,26 seeds per m²), and *Ambrosia artemisiifolia*, *Asclepias syriaca*, *Fraxinus pennsylvanica* had same number of determinate weed seeds 79,75 seeds per m² (table 6).

Table 6: Determined invasive weed seeds at Special Nature Reserve „Selevenjske pustare“

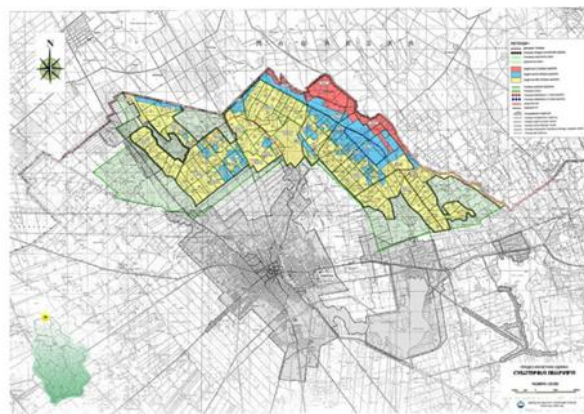
Weed seeds	SUM	no m2
<i>Amaranthus retroflexus</i>	249	19858,90
<i>Ambrosia artemisiifolia</i>	1	79,75
<i>Asclepias syriaca</i>	1	79,75
<i>Celtis occidentalis</i>	8	638,04
<i>Datura stramonium</i>	3	239,26
<i>Fraxinus pennsylvanica</i>	1	79,75
<i>Lolium multiflorum</i>	7	558,28
<i>Matricaria discoidea</i>	19	1515,34
<i>Portulacae oleraceae</i>	110	8773,01
<i>Robinia pseudoacacia</i>	14	1116,56
<i>Setaria italica</i>	15	1196,32
<i>Veronica persica</i>	4	319,02



Picture 10-13: Sampling of soil at Special Nature Reserve „Selevenjske pustare“

Landscape of Outstanding Features „Subotička peščara“

At the location of Landscape of Outstanding Features „Subotička peščara“ studied 39 weed species were identified: *Portulaca oleracea*, *Polygonum aviculare*, *Papaver rhoeas*, *Polygonum persicaria*, *Amaranthus retroflexus*, *Polygonum convolvulus*, *Echinochloa crus-galli*, *Avena fatua*, *Setaria glauca*, *Raphanus raphanistrum*, *Melilotus*, *Capsella bursa-pastoris*, *Setaria italica*, *Solanum nigrum*, *Lolium perenne*, *Poa trivialis*, *Stellaria media*, *Sambucus nigra*, *Celtis occidentalis*, *Chenopodium hybridum*, *Carduus acanthoides*, *Festuca pratensis*, *Verbascum thapsus*, *Calendula officinalis*, *Robinia pseudoacacia*, *Erodium ciconium*, *Bromus mollis*, *Taraxacum officinale*, *Asclepias syriaca*, *Veronica hederifolia*, *Brassica nigra*, *Populus alba*, *Dianthus pottederae*, *Rubus caesius*, *Caltha tinctorius*, *Crataegus L.*, *Urtica dioica*, *Daucus carota* and *Senecio vulgaris* (table 5).



Map 4 - Landscape of Outstanding Features „Subotička peščara“

The seeds of invasive weeds at the location of Landscape of Outstanding Features „Subotička peščara“ were identified: *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Setaria italica*, *Celtis occidentalis*, *Robinia pseudoacacia*, *Erodium ciconium*, *Asclepias syriaca* (table 6).

Table 5: Determined weed seeds at Landscape of Outstanding Features „Subotička peščara“

Weed seeds	Number of soil sampling																		SUM	NO m2											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1F	2F	3F			4F	5F	6F	7F	8F	11F	13F	14F	15F	16F	18F
<i>Portulaca oleracea</i>	25	0	21	5	5	38	0	12	1	33	18	0	19	12	6	0	0	0	0	1	0	0	0	0	0	9	0	4	2	211	16828,22
<i>Polygonum aviculare</i>	4	3	0	0	0	15	0	0	0	2	0	43	3	0	13	0	0	0	0	0	0	0	0	0	11	0	1	0	95	7576,69	
<i>Papaver rhoeas</i>	3	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	1116,56	
<i>Polygonum persicaria</i>	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	239,26	
<i>Amaranthus retroflexus</i>	0	1	12	33	4	1	0	6	3	0	18	0	15	5	2	3	0	0	4	10	1	5	0	36	7	4	0	2	172	13717,79	
<i>Polygonum convolvulus</i>	0	1	0	0	0	0	0	0	3	0	0	0	0	6	0	2	0	0	0	0	0	0	0	0	0	0	0	0	12	957,06	
<i>Echinochloa crus-galli</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Avena fatua</i>	0	0	3	0	0	2	0	0	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	957,06	
<i>Setaria glauca</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	4	319,02	
<i>Raphanus raphanistrum</i>	0	0	5	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	15	1196,32	
<i>Mellilotus officinalis</i>	0	0	0	3	0	0	0	4	0	4	9	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	1834,36	
<i>Capsella bursa-pastoris</i>	0	0	0	0	5	0	0	0	0	0	0	0	9	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1435,58	
<i>Setaria italica</i>	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	3	10	24	1914,11
<i>Solanum nigrum</i>	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Lolium perenne</i>	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	5	0	16	1276,07	
<i>Poa trivialis</i>	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	6	478,53	
<i>Stellaria media</i>	0	0	0	0	0	1	0	0	0	0	4	0	20	1	0	0	0	0	0	0	0	0	0	6	0	0	0	3	35	2791,41	
<i>Sambucus nigra</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	7	558,28	
<i>Celtis occidentalis</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	0	0	2	0	0	0	0	0	0	15	1196,32	
<i>Chenopodium hybridum</i>	0	0	0	0	0	0	0	2	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	8	638,04	
<i>Carduus acanthoides</i>	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	319,02	
<i>Festuca pratensis</i>	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	717,79	
<i>Verbascum thapsus</i>	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	478,53	
<i>Calendula officinalis</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Robinia pseudoacacia</i>	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	16	0	0	0	3	12	0	6	0	0	3	1	48	3828,22	
<i>Erodium ciconium</i>	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	398,77	
<i>Bromus mollis</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Taraxacum officinale</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10	797,55	
<i>Asclepias syriaca</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	2	0	0	0	0	0	0	5	398,77	
<i>Veronica hederifolia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	2	1	0	0	0	0	1	0	0	0	0	0	0	26	2073,62	
<i>Brassica nigra</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	159,51	
<i>Populus alba</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	79,75	
<i>Dianthus pottederae</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	239,26	
<i>Rubus caesius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	11	877,30	
<i>Cathamus tinctorius</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	319,02	
<i>Cratogeomys L.</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	8	638,04	
<i>Urtica dioica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	79,75	
<i>Daucus carota</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	159,51	
<i>Senecio vulgaris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	319,02	

F-forest

The average number of weeds at the location Landscape of Outstanding Features „Subotička pešćara“ in the soil profil 0-10 cm is in the range of 79,75 to 16828,22 seeds per m² respectively. The weed seed bank contains several dominant species in all samples. *Portulaca oleracea* and *Amaranthus retroflexus* were one of the most numerous at the locality. *Portulaca oleracea* is the weed species with the highest number of selected seed from the samples (16828,22 seeds per m²), followed by *Amaranthus retroflexus* (13717,79 seeds per m²), *Robinia pseudoacacia* (3828,22 seeds per m²), *Setaria italica* (1914,11 seeds per m²), *Celtis occidentialis* (1196,32 seeds per m²), *Echinochloa crus-galli* (79,75 seeds per m²), and *Asclepias syriaca*, *Erodium ciconium* had same number of determinate weed seeds 398,77 seeds per m² (table 8).

Table 8: Determined invasive weed seeds at Landscape of Outstanding Features „Subotička pešćara“

Weed seeds	SUM	no m2
<i>Amaranthus retroflexus</i>	172	13717,79
<i>Asclepias syriaca</i>	5	398,77
<i>Celtis occidentialis</i>	15	1196,32
<i>Echinochloa crus-galli</i>	1	79,75
<i>Erodium ciconium</i>	5	398,77
<i>Portulaca oleracea</i>	211	16828,22
<i>Robinia pseudoacacia</i>	48	3828,22
<i>Setaria italica</i>	24	1914,11

Analyzing deposited seed (seed bank) of invasive species in soil is made in the representative locations of four protected areas in the north of Serbia Landscape of Outstanding Features „Subotička peščara“, Nature Park „Palić“, Special Nature Reserve „Ludaško jezero“ and Special Nature Reserve „Selevenjske pustare“. In the table below (table 9) presents the determined seed invasive weeds tested at 4 protected areas. There was a very large number of weed seeds a few weed species. At all four protected location have determined the presence of 4 weed seeds a very large number (*Amaranthus retroflexus*, *Celtis occidentalis*, *Portulacae olaraceae*, *Setaria italica*). Other weed species were also determined in large numbers or not at each test location.

Table 9: Invasive seed of weeds at 4 protected areas

Invasive weed seeds	SNRLJ¹	NPP²	SNRSP³	LOFSP⁴
<i>Amaranthus retroflexus</i>	43226,99	2950,92	19858,90	13717,79
<i>Ambrosia artemisiifolia</i>	159,51	-	79,75	-
<i>Asclepias syriaca</i>	-	1196,32	79,75	398,77
<i>Celtis occidentalis</i>	478,53	5503,07	638,04	1196,32
<i>Datura stramonium</i>	3190,18	2871,17	239,26	-
<i>Echinochloa crus-galli</i>	398,77	-	-	79,75
<i>Erodium ciconium</i>	-	-	-	398,77
<i>Galinsoga parviflora</i>	-	159,51	-	-
<i>Fraxinus pennsylvanica</i>	-	-	79,75	-
<i>Iva xanthifolia</i>	79,75	-	-	-
<i>Lolium multiflorum</i>	-	1116,56	558,28	319,02
<i>Matricaria discoidea</i>	-	1036,81	1515,34	-
<i>Portulacae olaraceae</i>	38521,47	877,30	8773,01	16828,22
<i>Robinia pseudoacacia</i>	-	-	1116,56	3828,22
<i>Setaria italica</i>	1674,85	1515,34	1196,32	1914,11
<i>Veronica persica</i>	-	159,51	319,02	-
<i>Vicia articulata</i>	-	159,51	-	-

¹**SNRLJ** - Special Nature Reserve „Ludaško jezero“

²**NPP** - Nature Park „Palić“

³**SNRSP** - Special Nature Reserve „Selevenjske pustare“

⁴**LOFSP** - Landscape of Outstanding Features „Subotička peščara“



Picture 14-17: Sampling of soil at Landscape of Outstanding Features „Subotička pešćara“

4. Comments / conclusions

Analyzing deposited seed (seed bank) of invasive species in soil in nature protected area were conducted in the representative locations of four protected areas in the north of Serbia Landscape of Outstanding Features „Subotička peščara“, Nature Park „Palic“, Special Nature Reserve „Ludasko jezero“ and Special Nature Reserve „Selevenjske pustare“. At all four protected location is determined 17 different seeds of invasive weed species. *Amaranthus retroflexus* and *Portulaca oleracea* were determined on every location

Amaranthus retroflexus, *Celtis occidentalis*, *Portulaca oleracea* and *Setaria italic* were determined in very large numbers at each protected location, while a smaller number of seeds remain determined invasive weed species.

Ambrosia artemisiifolia was determined in large numbers at Special Nature Reserve „Ludaško jezero“ and Special Nature Reserve „Selevenjske pustare“.

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