

**FINAL 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 – 5.7.3.21**

**Description of activity**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Location | Nature Reserve „Ludaško jezero“ | Nature  Park ‘’Palić’’ | Special Nature Reserve ‘’Selevenjske pustare’’/  forest | Landscape of Outstanding Features „Subotička peščara“/forest |
| I report | | | | |
| 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% |
| No of soil sampling | 25 | 17 | 14/15\* | 15/14\*\* |
| No of identified weed species seed | 52 | 45 | 41 | 39 |
| No of identified invasive weed sp. seed | 9 | 11 | 12 | 8 |
| II report | | | | |
| Time of activity | 16.10.2018  7-15h | 31.10.2018  7-15h | 11.10.2018  7-15h | 18.10.2018  7-15h |
| Weather condition  Temperature/humidy | 13,5◦C/88% | 12,5◦C/93% | 14,6◦C/89% | 13,8◦C/86% |
| No of soil sampling | 25 | 17 | 14/15\* | 15/14\*\* |
| No of identified weed species seed | 28 | 19 | 32 | 23 |
| No of identified invasive weed species seed | 10 | 6 | 7 | 6 |
| III report | | | | |
| Time of activity | 13.06.2019  7-15h | 23.05.2019  7-15h | 17.04.2019.  7-15h | 18.04.2019  7-15h |
| Weather condition  Temperature/humidy | 33°C/49% | 16°C/74% | 16°C/48% | 20°C/36% |
| No of soil sampling | 25 | 17 | 14/15\* | 15/14\*\* |
| No of identified weed species seed | 31 | 21 | 22 | 38 |
| No of identified invasive weed species seed | 7 | 5 | 9 | 8 |

\*No of soil sampling at Special Nature Reserve ‘’Selevenjske pustare’’ and ‘’Selevenske forest’’

\*\* No of soil sampling at Landscape of Outstanding Features „Subotička peščara“ and ’’Subotička forest’’

Coordinates of all locality are in the tables 36-39 at the end of the report.

**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 at four locations, 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. Second report shows soil sampling at the end of the first vegetation season, and third one soil sampling at the beginning of second vegetation.

**3. Results**

**Nature Reserve ‘’Ludaško jezero’’**

I report

At the location of Nature Reserve ‘’Ludaško jezero’’ 52 weed species were identified: *Amaranthus retroflexus, Polygonum aviculare, Portulaca oleracea, Senecio vulgaris, Setaria italica, Chenpodium hybridum, Setaria glauca, Brassica hirta,Dianthus pontederae,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, Chenpodium album, Taraxacum officinale, Poa trivialis, Sinapis alba, Salvia officinalis, Daucus carota , Veronica hederifolia, Matricaria chamomilla, Euphorbia helioscopia, Crataegus sp., Celtis occidentialis, 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 repens* (table 1)*.*

II report

At the same location, on the end of the first season 28 weed species were identified: *Amaranthus retroflexus, Stellaria media, Setaria italica, Chenopodium hybridum, Trifolium repens, Polygonum aviculare, Datura stramonium, Chenopodium album, Portulace oleracea, Asclepias syriaca, Melilotus officinalis, Daucus carota, Senecio vulgaris, Solanum nigrum, Urtica dioica, Erigeron canadensis, Bromus mollis, Lolioum multiflorum, Ambrosia artemisiifolia, Euphorbia helioscopia, Matricaria discoidea, Raphanus raphanistrum, Canabis sativa, Phragmites communis, Colendula officinalis, Sonchus arvensis, Echinochloa crus-galli* and *Ailanthus altissima* (table 2)*.*

III report

At the beginning of vegetation 2019, at the locality Nature Reserve ‘’Ludaško jezero’’, 31 weed species were identified: *Amaranthus retroflexus, Polygonum aviculare, Portulaca oleracea ,Senecio vulgaris , Setaria italica, Chenpodium hybridum, Setaria glauca, Solanum nigrum, Datura stramonium, Raphanus raphanistrum, Stellaria media, Echinochloa crus-galli, Bromus molis, Chenpodium album, Taraxacum officinale, Sinapis alba, Daucus carota, Veronica hederifolia, Euphorbia helioscopia, Crataegus sp.,Celtis occidentialis, Polygonum lapathifolium, Hibiscus trionum, Rumex crispus, Ambrosia artemisiifolia, Phacelia campanularia, Calistega sp., Lepidium draba, Torilis arvensis, Geranium disectum* and *Ranunculus sp*. (table 3).

Table 1: Determined weed seeds at Special at Nature Reserve „Ludaško jezero“, spring, 2018



SUM- the total number of weed seeds in 25 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m2

Table 2: Determined weed seeds at Special at Nature Reserve „Ludaško jezero“, autumn, 2018



SUM- the total number of weed seeds in 25 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m2

Table 3: Determined weed seeds at Special at Nature Reserve „Ludaško jezero“, spring, 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| *Amaranthus retroflexus* | 16 | 0 | 0 | 7 | 5 | 1 | 30 | 0 | 1 | 0 | 2 | 3 | 0 | 12 | 0 | 0 | 162 | 16 | 6 | 5 | 1 | 2 | 23 | 20 | 2 | 314 | 25042.94 |
| *Ambrosia artemisiifolia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 239.26 |
| *Bromus molis* | 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 | 1 | 79.75 |
| *Calistega sp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Celtis occidentialis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 1116.56 |
| *Chenpodium album* | 3 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 4 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 25 | 1993.87 |
| *Chenpodium hybridum* | 0 | 4 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 25 | 1993.87 |
| *Crataegus* sp. | 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 | 1 | 79.75 |
| *Datura stramonium* | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 159.51 |
| *Daucus carota* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 79.75 |
| *Echinochloa crus-galli* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 159.51 |
| *Euphorbia helioscopia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Geranium disectum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 8 | 638.04 |
| *Hibiscus trionum* | 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 | 1 | 79.75 |
| *Lepidium draba* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 79.75 |
| *Phacelia campanularia* | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 10 | 797.55 |
| *Polygonum aviculare* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 1754.60 |
| *Polygonum lapathifolium* | 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 |
| *Portulaca oleracea* | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 8 | 638.04 |
| *Ranunculus sp.* | 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 | 2 | 159.51 |
| *Raphanus raphanistrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Rumex crispus* | 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 |
| *Senecio vulgaris* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 11 | 0 | 24 | 1914.11 |
| *Setaria glauca* | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 | 558.28 |
| *Setaria italica* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 9 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 58 | 4625.77 |
| *Sinapis alba* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 79.75 |
| *Solanum nigrum* | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 5 | 398.77 |
| *Stellaria media* | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 1 | 0 | 10 | 0 | 0 | 0 | 0 | 26 | 2073.62 |
| *Taraxacum officinale* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 51 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 54 | 4306.75 |
| *Torilis arvensis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 159.51 |
| *Veronica hederifolia* | 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 | 1 | 79.75 |

SUM- the total number of weed seeds in 25 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m2

The seeds of invasive weeds at the location of Nature Reserve ‘’Ludaško jezero’’ were identified and showed in table 4,5 and 6.

I report

Table 4: Determined invasive weed seeds at Special at Nature Reserve „Ludaško jezero“, spring, 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 542 | 43.226,99 |
| *Ambrosia artemisiifolia* | 2 | 159,51 |
| *Celtis occidentialis* | 6 | 478,53 |
| *Datura stramonium* | 40 | 3.190,18 |
| *Echinochloa crus-galli* | 5 | 398,77 |
| *Iva xanthifolia* | 1 | 79,75 |
| *Lolium multiflorum* | 4 | 319,02 |
| *Portulaca oleracea* | 483 | 38.521,47 |
| *Setaria italica* | 21 | 1.674,85 |

SUM- the total number of invasive weed seeds in 25 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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 occidentialis* (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).

II report

Table 5: Determined invasive weed seeds at Special at Nature Reserve „Ludaško jezero“, autumn, 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 169 | 13.478,53 |
| *Setaria italica* | 17 | 1.355,83 |
| *Datura stramonium* | 12 | 957,06 |
| *Portulaca oleracea* | 69 | 5.503,07 |
| *Asclepias syriaca* | 2 | 159,51 |
| *Lolium multiflorum* | 7 | 558,28 |
| *Ambrosia artemisiifolia* | 8 | 638,04 |
| *Matricaria discoidea* | 6 | 478,53 |
| *Echinochloa crus-galli* | 2 | 159,51 |
| *Ailanthus altissima* | 3 | 239,26 |

SUM- the total number of invasive weed seeds in 25 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

The average number of weeds seed per m², at the location Special at Nature Reserve „Ludasko jezero“ , in the soil profil 0-10 cm is in the range of 79,75 to 13.478,53 seeds per m2 respectively. The weed seed bank contain several dominant species in all samples. Like in the spring, again *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 (13.478,53 seeds per m2), followed by *Portulaca oleracea* (5.503,07 seeds per m2), *Setaria italica* (1.355,83 seeds per m2), *Datura stramonium* (957,06 seeds per m2), *Ambrosia artemisiifolia* (638,04 seeds per m2), *Lolium multiflorum* (558,28 seeds per m2), *Matricaria discoidea* (478,53 seeds per m2), *Ailanthus altissima* (239,26 seeds per m2), *Echinochloa crus-galli* and *Asclepias syriaca* (159,51 seeds per m2).

III report

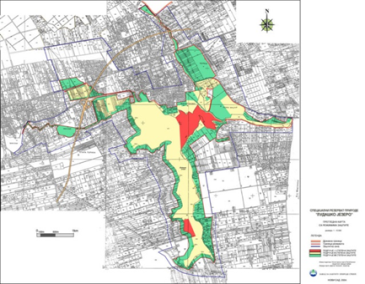
Table 6: Determined invasive weed seeds at Special at Nature Reserve „Ludaško jezero“, spring 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 314 | 2.5042,94 |
| *Ambrosia artemisiifolia* | 3 | 239,26 |
| *Celtis occidentialis* | 14 | 1.116,56 |
| *Datura stramonium* | 2 | 159,51 |
| *Echinochloa crus-galli* | 2 | 159,51 |
| *Portulaca oleracea* | 8 | 638,04 |
| *Setaria italica* | 58 | 4.625,77 |

SUM- the total number of invasive weed seeds in 25 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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 159,51 to 25042,94 seeds per m2 respectively. The weed seed bank contain several dominant species in all samples. *Amaranthus retroflexus* and *Setaria italica* 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 (25042,94 seeds per m2), followed by *Setaria italica* (4625,77 seeds per m2), *Celtis occidentialis* (1116,56 seeds per m2), *Prtulaca oleracea* (638,04 seeds per m2) and other.

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Map 1 – Special Nature Reserve „Ludasko jezero

|  |  |
| --- | --- |
| 20190613_093327.jpg | |
| 20190613_100802.jpg | 20190613_090654.jpg |
| 20190613_085018.jpg | 20190613_085009.jpg |
| Picture 1-5: Sampling of soil atSpecial at Nature Reserve „Ludaško jezero“, spring, 2019 | |

**Nature Park „Palić“**

I report

In spring 2018, seeds of 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, Matricaria discoidea, Portulaca oleracea,Veronica persica, 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 7).

II report

In autumn 2018, at the location of Nature Park „Palić“, 19 weed species were identified: *Chenopodium album, Amaranthus retroflexus, Portulaca oleracea, Celtis occidentalis, Veronica hederifolia, Polygonum aviculare, Robinia pseudoacacia, Bromus molis, Medicago polymorpha, Datura stramonium, Sambucus nigra, Asclepias syriaca, Matricaria chamomilla, Polygonum lapathifolim, Daucus carota, Canabis sativa, Phacelia tanacetifolia, Carduus acanthoides* and *Crataegus monogyna* (table 8).

III report

In spring 2019, seed from 21 weed species was foud: *Lolium multiflorum, Amaranthus retroflexus, Celtis occidentalis, Stelaria media, Gallium aparine, Solanum nigrum, Setaria italica, Polygonum aviculare, Chenopodium album, Setaria viridis, Euphorbia heliscopia, Avena spp., Achillea millefolium, Robinia pseudoacacia, Hedera helix, Daucus carota, Cirsium arvense,Anthemis arvensis, Matricaria chamomilla, Alopecurus myosuroides* and *Setaria viridis* (table 9).

Table 7: Determined weed seeds at Nature Park „Palic“, spring, 2018



SUM- the total number of weed seeds in 17 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m2

Table 8: Determined weed seeds at Nature Park „Palic“, autumn, 2018



SUM- the total number of weed seeds in 17 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m²

Table 9: Determined weed seeds at Nature Park „Palic“, spring, 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| *Lolium multiflorum* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159,51 |
| *Amaranthus retroflexus* | 3 | 2 | 2 | 8 | 0 | 0 | 0 | 0 | 13 | 12 | 6 | 1 | 0 | 6 | 0 | 2 | 1 | 56 | 4466,26 |
| *Celtis occidentalis* | 0 | 3 | 7 | 0 | 3 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 1435,58 |
| *Stellaria media* | 12 | 2 | 0 | 17 | 5 | 0 | 0 | 1 | 0 | 15 | 0 | 1 | 2 | 1 | 0 | 1 | 7 | 64 | 5104,29 |
| *Gallium aparine* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 79,75 |
| *Solanum nigrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 239,26 |
| *Setaria italica* | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159,51 |
| *Polygonum aviculare* | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 3 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 13 | 1036,81 |
| *Chenopodium album* | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159,51 |
| *Setaria viridis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 79,75 |
| *Euphorbia heliscopia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 79,75 |
| *Avena spp* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 159,51 |
| *Achillea millefolium* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 319,02 |
| *Robinia pseudoacacia* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 79,75 |
| *Hedera helix* | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159,51 |
| *Daucus carota* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 159,51 |
| *Cirsium arvense* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 5 | 398,77 |
| *Anthemis arvensis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 239,26 |
| *Matricaria chamomilla* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 5 | 398,77 |
| *Alopecurus myosuroides* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 398,77 |
| *Setaria viridis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 6 | 0 | 11 | 877,30 |

SUM- the total number of weed seeds in 17 soil samples at 0-10 depth

no m2 - the total number of weed seeds in all soil samples expressed per m²

The seeds of invasive weeds at the location Nature Park „Palic were identified and showed in table 10, 11 and 12.

I report

Table 10. Determined invasive weed seeds at Nature Park „Palić“, spring, 2018

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 37 | 2.950,92 |
| *Asclepias syriaca* | 15 | 1.196,32 |
| *Celtis occidentalis* | 69 | 5.503,07 |
| *Datura stramonium* | 36 | 2.871,17 |
| *Galinsoga parviflora* | 2 | 159,51 |
| *Lolium multiflorum* | 14 | 1.116,56 |
| *Matricaria discoidea* | 13 | 1.036,81 |
| *Portulacae olaraceae* | 11 | 877,30 |
| *Setaria italica* | 19 | 1.515,34 |
| *Veronica persica* | 2 | 159,51 |
| *Vicia articulata* | 2 | 159,51 |

SUM- the total number of invasive weed seeds in 17 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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.

II report

Table 11. Determined invasive weed seeds at Nature Park „Palić“, autumn, 2018

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 69 | 5.503,07 |
| *Portulacae olaraceae* | 20 | 1.595,09 |
| *Celtis occidentalis* | 23 | 1.834,36 |
| *Robinia pseudoacacia* | 1 | 79,75 |
| *Asclepias syriaca* | 1 | 79,75 |
| *Phacelia tanacetifolia* | 25 | 1.993,87 |

SUM- the total number of invasive weed seeds in 17 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

The average number of invasive weeds at the location Nature Park „Palić“in the soil profil 0-10 cm is in the range of 79,75 to 5503,07 seeds per m2 respectively. The weed seed bank contains several dominant invasive weed species in all samples. *Amaranthus retroflexus* and *Celtis occidentalis* were one of the most numerous at the locality, like in spring 2018. *Amaranthus retroflexus* is the weed species with the highest number of selected seed from the samples (5503,07 seeds per m2), followed by *Celtis occidentalis* (1834,36 seeds per m2), *Phacelia tanacetifolia* (1993,87 seeds per m2), *Portulacae olaraceae* (1595,09 seeds per m2), *Asclepias syriaca* and *Robinia pseudoacacia* with 79,75 seeds per m2 .

III report

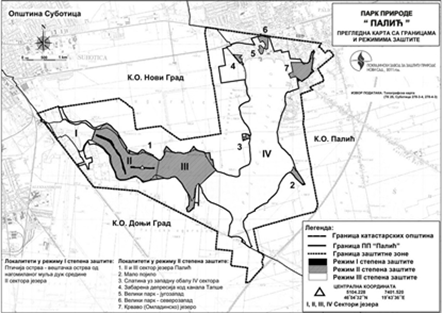
Table 12. Determined invasive weed seeds at Nature Park „Palić“, spring, 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Lolium multiflorum* | 2 | 159,51 |
| *Amaranthus retroflexus* | 56 | 4.466,26 |
| *Celtis occidentalis* | 18 | 1.435,58 |
| *Setaria italica* | 2 | 159,51 |
| *Robinia pseudoacacia* | 1 | 79,75 |

SUM- the total number of invasive weed seeds in 17 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

The average number of invasive weeds at the location Nature Park „Palić“in the soil profil 0-10 cm is in the range of 79,75 to 1435,58 seeds per m2 respectively. The weed seed bank contains several dominant invasive weed species in all samples. *Amaranthus retroflexus* and *Celtis occidentalis* was one of the most numerous at the locality, like in autumn, 2018. *Amaranthus retroflexus* is the weed species with the highest number of selected seed from the samples (143 4466,26 seeds per m2), followed by *Celtis occidentalis,* *Lolium multiflorum* and *Setaria viridis.*



Map 2 – Nature Park „Palić“

|  |  |
| --- | --- |
| 20190523_092925.jpg | 20190523_095749.jpg |
| 20190523_101002.jpg | 20190523_101005.jpg |

Picture 6-9: Sampling of soil atSpecial at Nature Park „Palić“, spring 2019

**Special Nature Reserve „Selevenjske pustare“**

I report

In spring 2018, at the location of Special Nature Reserve „Selevenjske pustare“, seeds for 41 weed species were identified: *Amaranthus retroflexus, Polygonum aviculare, Capsella bursa- pastoris, Setaria italica, Setaria viridis, Datura stramonium, Rubus caesius, Rannunculus repens, Lolium multiflorum, Iris* spp*., Polygonum convolvulus, Lolium perene, Oxalis pes-capras, Bulbocodium* spp. *, Raphanus raphanistrum*, *Centaurea cyanus, Portulacae olaracea, 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 13).

II report

In autumn 2018, at the locality of Special Nature Reserve „Selevenjske pustare“ seeds for 32 weed species were identified: *Vicia cracca, Chenopodium hybridum, Portulaca oleracea, Polygonum aviculare, Lepidium draba, Setaria italica, Poa trivialis, Matricaria inodora, Raphanus raphanistrum, Datura stramonium, Canabis sativa, Amaranthus retrofelxus, Daucus carota, Sonchus oleraceus, Chenopodium album, Centaurea adleriana, Amrbosia artemisiifolia, Bromus molis, Medicago polymorpha, Veronica hederifolia, Solanum nigrum, Melilothus officinalis, Celtis occidentalis, Sambucus nigra, Stellaria media, Robinia pseudoacacia, Mysotis arvensis, Lithosperum officinale, Bilderdykia convolvulus, Urtica dioica, Dianthus sp.* and *Silene alba* (table 14)*.*

III report

In spring 2019, seeds for 22 weed species were identified*: Polygonum aviculare, Amaranthus retroflexus, Setaria italica, Datura stramonium, Iris spp., Bulbocodium spp., Raphanus raphanistrum, Portulacae olaraceae, Stellaria media, Ambrosia artemisiifolia, Veronica hederifolia, Robinia pseudoacacia, Veronica persica, Celtis occidentalis, Chenopodium album, Bromus molis, Asclepias syriaca, Matricaria chamomilla, Solanum nigrum, Canabis sativa, Polygonum persicaria* and *Echinochloa crus-galli* (table 15).

Table 13. Determined weed seeds at Special Nature Reserve „Selevenjske pustare“, spring 2018

F-forest

SUM- the total number of weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of weed seeds in all soil samples expressed per m2

Table 14: Determined weed seeds at Special Nature Reserve „Selevenjske pustare“, autumn, 2018



F-forest

SUM- the total number of weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of weed seeds in all soil samples expressed per m2

Table 15. Determined weed seeds at Special Nature Reserve „Selevenjske pustare“, spring 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Weed seeds | Number of soil sampling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SUM | NO m2 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 1F | 2F | 3F | 4F | 5F | 6F | 7F | 8F | 9F | 10F | 11F | 12F | 13F | 14F | 15F |
| *Polygonum aviculare* | 5 | 32 | 0 | 46 | 0 | 0 | 0 | 12 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 102 | 8134.97 |
| *Amaranthus retroflexus* | 1 | 0 | 3 | 3 | 1 | 0 | 0 | 5 | 36 | 30 | 41 | 7 | 5 | 33 | 2 | 1 | 6 | 0 | 6 | 2 | 4 | 6 | 6 | 2 | 3 | 14 | 0 | 22 | 0 | 239 | 19061.35 |
| *Setaria italica* | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 22 | 1754.60 |
| *Datura stramonium* | 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 | 0 | 1 | 79.75 |
| *Iris spp.* | 1 | 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 | 0 | 0 | 4 | 319.02 |
| *Bulbocodium spp* | 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 | 0 | 1 | 79.75 |
| *Raphanus raphanistrum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 398.77 |
| *Portulacae olaraceae* | 2 | 0 | 4 | 2 | 1 | 0 | 0 | 0 | 10 | 4 | 7 | 0 | 4 | 0 | 0 | 2 | 0 | 2 | 9 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 54 | 4306.75 |
| *Stellaria media* | 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 | 10 | 0 | 12 | 957.06 |
| *Ambrosia artemisiifolia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 1276.07 |
| *Veronica hederifolia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 8 | 638.04 |
| *Robinia pseudoacacia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 7 | 558.28 |
| *Veronica persica* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 239.26 |
| *Celtis occidentalis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 1 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 15 | 1196.32 |
| *Chenopodium album* | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 558.28 |
| *Bromus molis* | 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 | 0 | 1 | 79.75 |
| *Asclepias syriaca* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 319.02 |
| *Matricaria chamomilla* | 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 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Solanum nigrum* | 0 | 1 | 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 | 2 | 159.51 |
| *Canabis sativa* | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 638.04 |
| *Polygonum persicaria* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 558.28 |
| *Echinochloa crus-galli* | 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 | 0 | 1 | 79.75 |

The seeds of invasive weeds at the location Special Nature Reserve „Selevenjske pustare“ were identified and showed in table 16, 17 and 18.

I report

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 16).

Table 16: Determined invasive weed seeds at Special Nature Reserve „Selevenjske pustare“, spring, 2018

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 249 | 19.858,90 |
| *Ambrosia artemisiifolia* | 1 | 79,75 |
| *Asclepias syriaca* | 1 | 79,75 |
| *Celtis occidentalis* | 8 | 638,04 |
| *Datura stramonium* | 3 | 239,26 |
| *Fraxinus pennsylvanica* | 1 | 79,75 |
| *Lolium multiflorum* | 7 | 558,28 |
| *Matricaria discoidea* | 19 | 1.515,34 |
| *Portulacae olaraceae* | 110 | 8.773,01 |
| *Robinia pseudoacacia* | 14 | 1.116,56 |
| *Setaria italica* | 15 | 1.196,32 |
| *Veronica persica* | 4 | 319,02 |

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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 16).

II report

The seeds of invasive weeds at the location of Special Nature Reserve „Selevenjske pustare“ were identified*: Portulaca oleracea, Setaria italica, Datura stramonium, Amaranthus retrofelxus, Amrbosia artemisiifolia, Celtis occidentalis* and *Robinia pseudoacacia* (table 17)*.*

Table 17: Determined invasive weed seeds at Special Nature Reserve „Selevenjske pustare“, autumn, 2018

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Portulacae olaraceae* | 72 | 5.742,33 |
| *Setaria italica* | 16 | 1.276,07 |
| *Datura stramonium* | 2 | 159,51 |
| *Amaranthus retroflexus* | 201 | 16.030,67 |
| *Ambrosia artemisiifolia* | 2 | 159,51 |
| *Celtis occidentalis* | 18 | 1.435,58 |
| *Robinia pseudoacacia* | 7 | 558,28 |

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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 79,75 to 16.030,67 seeds per m2 respectively. The weed seed bank contains several dominant invasive weed species in all samples. Again, *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 (16.030,67 seeds per m2), followed by *Portulaca oleracea* (5.742,33 seeds per m2), *Celtis occidentalis* (1.435,58 seeds per m2), *Setaria italica* (1.276,07 seeds per m2), *Robinia pseudoacacia* (558,28 seeds per m2), *Datura stramonium* and *Ambrosia artemisiifolia* (159,51 seeds per m2), (table 17).

III report

The seeds of invasive weeds at the location of Special Nature Reserve „Selevenjske pustare“ were identified*: Portulaca oleracea, Setaria italica, Datura stramonium, Amaranthus retrofelxus, Asclepias syriaca, Amrbosia artemisiifolia, Veronica persica, Celtis occidentalis* and *Robinia pseudoacacia* (table 18)*.*

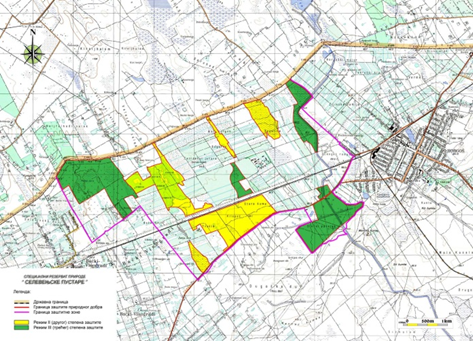
Table 18. Determined invasive weed seeds at Special Nature Reserve „Selevenjske pustare“, spring, 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 239 | 1.9061,35 |
| *Ambrosia artemisiifolia* | 16 | 1.276,07 |
| *Asclepias syriaca* | 4 | 319,02 |
| *Celtis occidentalis* | 15 | 1.196,32 |
| *Datura stramonium* | 1 | 79,75 |
| *Portulacae olaraceae* | 54 | 4.306,75 |
| *Robinia pseudoacacia* | 7 | 558,28 |
| *Setaria italica* | 22 | 1.754,60 |
| *Veronica persica* | 3 | 239,26 |

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

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 79,75 to 19.061,35 seeds per m2 respectively. The weed seed bank contains several dominant invasive weed species in all samples. Again, *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 (19.061,35 seeds per m2), followed by *Portulaca oleracea* (4.306,75 seeds per m2) and other invasive species, (table 18).

****

Map 3 - Special Nature Reserve „Selevenjske pustare“

|  |  |
| --- | --- |
| **IMG-43b70881df996eff96662c3df91394c6-V.jpg** | **IMG-f0f3c8e918f84de2152b71ef3958aa6c-V.jpg** |
| **IMG-5b27b9e03e6999230f18c0cb232fea57-V.jpg** | **IMG-c403008952ba04331c3778f92ac31890-V.jpg** |

Picture 10-13: Sampling of soil atSpecial Nature Reserve „Selevenjske pustare“, spring 2019

**Landscape of Outstanding Features „Subotička peščara“**

I report

In the spring 2018, at locality Landscape of Outstanding Features „Subotička peščara“ seeds of 39 weed species were identified:*Portulaca oleracea, Polygonum aviculare, Papaver rhoes, Polygonum persicaria, Amaranthus retroflexus, Polygonum convolvulus, Echinochloa crus-galli, Avena fatua, Setaria glauca, Raphanus raphanistrum, Melilotus officinalis, Capsella bursa-pastoris, Setaria italica, Solanum nigrum, Lolium perene, Poa trivialis, Stellaria media, Sambucus nigra, Celtis occidentialis, Chenpodium hybridum, Carduus acanthoides, Festuca pratensis, Verbascum thapsus, Calendula officinalis, Robinia pseudoacacia, Erodium ciconium, Bromus molis, Taraxacum officinale, Asclepias syriaca, Veronica hederifolia, Brassica nigra, Populus alba, Dianthus pontederae, Rubus caesius, Cathamus tinctorius, Crategus sp., Urtica dioica, Daucus carota* and *Senecio vulgaris* (table 19)*.*

II report

In the autumn 2018, at locality Landscape of Outstanding Features „Subotička peščara“ seeds of 23 weed species were identified: *Amaranthus retroflexus, Portulaca oleracea, Polygonum aviculare, Rapahanus raphanistrum, Setaria italica, Delphinium consolida, Chenopodium album, Chenopodium hybridum, Polygonum lapathifolium, Ambrosia artemisiifolia, Celtis occidentale, Sambucus nigra, Medicago polymorpha, Bromus spp., Canabis sativa, Trifolium repens, Iva xantihifolia, Calendula officinalis, Veronica hederifolia, Lolium multiflorum, Robinia pseudoacacia, Salvia officinalis* and *Rumex crispus* (table 20)*.*

III report

In the spring 2019, at locality Landscape of Outstanding Features „Subotička peščara“ seeds of 38 weed species were founded: *Portulaca oleracea*, *Polygonum aviculare, Papaver rhoes, Polygonum persicaria, Amaranthus retroflexus, Polygonum convolvulus, Echinochloa crus-galli, Setaria italica, Solanum nigrum, Lolium perenne, Stellaria media, Celtis occidentialis, Robinia pseudoacacia , Bromus molis spp., Taraxacum officinale, Asclepias syriaca, Veronica hederifolia, Rubus caesius , Crategus spp., Urtica dioica, Daucus carota, Senecio vulgaris, Canabis sativa, Lolium multiflorum, Iris spp., Sisimbrium sp., Medicago sativa, Medicago minima, Ambrosia artemisiifolia, Setaria glauca., Medicago polymorpha, Lithosperum officinale, Conyza canaden, Lepidium draba, Hibiscus trionum, Bulbocodium spp., Rumex crispus* and *Lychnis spp*. (table 21).

Table 19: Determined weed seeds at Landscape of Outstanding Features „Subotička peščara“, spring, 2018



F-forest

SUM- the total number of weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of weed seeds in all soil samples expressed per m2

Table 20: Determined weed seeds at Landscape of Outstanding Features „Subotička peščara“, autumn, 2018



F-forest

SUM- the total number of weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of weed seeds in all soil samples expressed per m2

Table 21: Determined weed seeds at Landscape of Outstanding Features „Subotička peščara“, spring 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| *Portulaca oleracea* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 239.26 |
| *Polygonum aviculare* | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1036.81 |
| *Papaver rhoes* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 239.26 |
| *Polygonum persicaria* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Amaranthus retroflexus* | 8 | 56 | 6 | 13 | 28 | 10 | 30 | 4 | 14 | 3 | 0 | 15 | 0 | 2 | 10 | 9 | 21 | 8 | 5 | 19 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 4 | 28 | 299 | 23846.63 |
| *Polygonum convolvulus* | 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 | 0 | 1 | 79.75 |
| *Echinochloa crus-galli* | 0 | 0 | 2 | 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 | 3 | 239.26 |
| *Setaria italica* | 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 | 0 | 4 | 4 | 319.02 |
| *Solanum nigrum* | 0 | 0 | 0 | 0 | 0 | 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 |
| *Lolium perenne* | 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 | 0 | 1 | 79.75 |
| *Stellaria media* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Celtis occidentialis* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 1 | 1 | 15 | 1196.32 |
| *Robinia pseudoacacia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 8 | 638.04 |
| *Bromus molis spp.* | 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 | 0 | 1 | 79.75 |
| *Taraxacum officinale* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 478.53 |
| *Asclepias syriaca* | 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 | 0 | 0 | 2 | 159.51 |
| *Veronica hederifolia* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 398.77 |
| *Rubus caesius* | 0 | 0 | 0 | 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 | 1 | 79.75 |
| *Crategus spp.* | 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 | 0 | 1 | 79.75 |
| *Urtica dioica* | 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 | 0 | 0 | 0 | 1 | 79.75 |
| *Daucus carota* | 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 | 0 | 0 | 0 | 1 | 79.75 |
| *Senecio vulgaris* | 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 | 0 | 2 | 2 | 159.51 |
| *Canabis sativa* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 717.79 |
| *Lolium multiflorum* | 0 | 0 | 5 | 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 | 5 | 398.77 |
| *Iris spp.* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 6 | 478.53 |
| *Sisimbrium sp.* | 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 | 0 | 0 | 0 | 0 | 2 | 159.51 |
| *Medicago sativa* | 1 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 638.04 |
| *Medicago minima* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 2791.41 |
| *Ambrosia artemisiifolia* | 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 | 0 | 0 | 1 | 79.75 |
| *Setaria spp.* | 0 | 0 | 0 | 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 | 3 | 239.26 |
| *Medicago polymorpha* | 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 | 2 | 0 | 3 | 239.26 |
| *Lithosperum officinale* | 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 | 1 | 0 | 0 | 2 | 159.51 |
| *Conyza canaden.* | 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 | 0 | 1 | 79.75 |
| *Lepidium draba* | 0 | 0 | 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 | 1 | 79.75 |
| *Hibiscus trionum* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 12 | 957.06 |
| *Bulbocodium spp* | 0 | 0 | 0 | 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 | 1 | 79.75 |
| *Rumex crispus* | 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 | 0 | 0 | 0 | 0 | 1 | 79.75 |
| *Lychnis spp.* | 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 | 0 | 0 | 0 | 0 | 1 | 79.75 |

F-forest; SUM- the total number of weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of weed seeds in all soil samples expressed per m

I report

At the spring 2018 he seeds of invasive weeds at the location of Landscape of Outstanding Features „Subotička peščara“ were identified: *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Setaria italica*, *Celtis occidentialis*, *Robinia pseudoacacia, Erodium ciconium*, *Asclepias syriaca* (table 22)*.*

The average number of weeds at the location Landscape of Outstanding Features „Subotička peščara“ 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 22).

Table 22: Determined invasive weed seeds at Landscape of Outstanding Features „Subotička peščara“, spring 2018

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

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

II report

At the autumn 2018, 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 occidentialis*, *Robinia pseudoacacia, Erodium ciconium*, *Asclepias syriaca* (table 23)*.*

The average number of weeds at the location Landscape of Outstanding Features „Subotička peščara“ in the soil profil 0-10 cm is in the range of 79,75 to 17.785,28 seeds per m2 respectively. The weed seed bank contains several dominant invasive species in all samples. *Celtis occidentalis* and *Amaranthus retroflexus* 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 (17.785,28 seeds per m2), followed by *Celtis occidentalis* (3.269,94 seeds per m2), *Setaria italica* (2.631,90 seeds per m2), Portulaca oleracea (957,06 seeds per m2), *Ambrosia artemisiifolia* and *Iva xanthifolia* had same number of determinate weed seeds 159,51 seeds per m2 (table 23).

Table 23: Determined invasive weed seeds at Landscape of Outstanding Features „Subotička peščara“, autumn 2018

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 223 | 17.785,28 |
| *Celtis occidentialis* | 41 | 3.269,94 |
| *Setaria italica* | 33 | 2.631,90 |
| *Portulaca oleracea* | 12 | 957,06 |
| *Ambrosia artemisiifolia* | 2 | 159,51 |
| *Iva xanthifolia* | 2 | 159,51 |

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

III report

At the spring 2019, the seeds of invasive weeds at the location of Landscape of Outstanding Features „Subotička peščara“ were identified: *Amaranthus retroflexus, Ambrosia artemisiifolia, Asclepias syriaca, Celtis occidentialis, Echinochloa crus-galli, Portulaca oleracea, Robinia pseudoacacia, Setaria italica.*

The average number of weeds at the location Landscape of Outstanding Features „Subotička peščara“ in the soil profil 0-10 cm is in the range of 79,75 to 16.828,22 seeds per m2 respectively. The weed seed bank contains several dominant invasive species in all samples. *Amaranthus retroflexus* and *Celtis occidentalis* 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 (23.846,63 seeds per m2), followed by *Celtis occidentalis* (table 24).

Table 24. Determined invasive weed seeds at Landscape of Outstanding Features „Subotička peščara“, spring 2019

|  |  |  |
| --- | --- | --- |
| Weed seeds | SUM | no m2 |
| *Amaranthus retroflexus* | 299 | 23.846,63 |
| *Ambrosia artemisiifolia* | 1 | 79,75 |
| *Asclepias syriaca* | 2 | 159,51 |
| *Celtis occidentialis* | 15 | 1.196,32 |
| *Echinochloa crus-galli* | 3 | 239,26 |
| *Portulaca oleracea* | 3 | 239,26 |
| *Robinia pseudoacacia* | 8 | 638,04 |
| *Setaria italica* | 4 | 319,02 |

SUM- the total number of invasive weed seeds in 29 soil samples at 0-10 depth

NO m2 - the total number of invasive weed seeds in all soil samples expressed per m2

** **

** **

Picture 14-17: Sampling of soil atLandscape of Outstanding Features „Subotička peščara“

|  |  |
| --- | --- |
|  | Map 4 - Landscape of Outstanding Features „Subotička peščara“ |

Table 25: Number of invasive weed seed per m2 for all 4 protected areas, from spring 2018 to spring 2019

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Invasive weed seeds** | **SNRLJ** | | | **NPP** | | | **SNRSP** | | | **LOFSP** | | |
| **S. 2018** | **A. 2018** | **S. 2019** | **S. 2018** | **A. 2018** | **S. 2019** | **S. 2018** | **A. 2018** | **S. 2019** | **S. 2018** | **A. 2018** | **S. 2019** |
| ***Amaranthus retroflexus*** | **43226.99** | **13.478,53** | **25042,94** | **2950.92** | **5.503,07** | **4466,26** | **19858.90** | **16.030,67** | **19061.35** | **13717.79** | **17.785,28** | **23.846.63** |
| *Ambrosia artemisiifolia* | 159.51 | 638,04 | 239,26 |  |  |  | 79.75 | 159,51 | 1276.07 |  | 159,51 | 79,75 |
| *Asclepias syriaca* |  | 159,51 |  | 1196.32 | 79,75 |  | 79.75 |  | 319.02 | 398.77 |  | 159.51 |
| ***Celtis occidentalis*** | **478.53** |  | **1116,56** | **5503.07** | **1.834,36** | **1435,58** | **638.04** | **1.435,58** | **1196.32** | **1196.32** | **3.269,94** | **1.196.32** |
| *Datura stramonium* | 3190.18 | 957,06 | 159,51 | 2871.17 |  |  | 239.26 | 159,51 | 79.785 |  |  |  |
| *Echinochloa crus-galli* | 398.77 | 159,51 | 159,51 |  |  |  |  |  |  | 79.75 |  | 239.26 |
| *Erodium ciconium* |  |  |  |  |  |  |  |  |  | 398.77 |  |  |
| *Galinsoga parviflora* |  |  |  | 159.51 |  |  |  |  |  |  |  |  |
| *Fraxinus pennsylvanica* |  |  |  |  |  |  | 79.75 |  |  |  |  |  |
| *Iva xanthifolia* | 79.75 |  |  |  |  |  |  |  |  |  | 159,51 |  |
| *Lolium multiflorum* | 319,02 | 558,28 |  | 1116.56 |  | 159,51 | 558.28 |  |  |  |  |  |
| *Matricaria discoidea* |  | 478,53 |  | 1036.81 |  |  | 1515.34 |  |  |  |  |  |
| ***Portulacae olaraceae*** | **38521.47** | **5.503,07** | **638,04** | **877.30** | **1.595,09** |  | **8773.01** | **5.742,33** | **4306,75** | **16828.22** | **957,06** | **239.26** |
| *Robinia pseudoacacia* |  |  |  |  | 79,75 | 79.75 | 1116.56 | 558,28 | 558.28 | 3828.22 |  | 638.04 |
| ***Setaria italica*** | **1674.85** | **1.355,83** | **4625,77** | **1515.34** |  | **159,51** | **1196.32** | **1.276,07** | **1754.6** | **1914.11** | **2.631,90** | **319.02** |
| *Veronica persica* |  |  |  | 159.51 |  |  | 319.02 |  | 239.26 |  |  |  |
| *Vicia articulata* |  |  |  | 159.51 |  |  |  |  |  |  |  |  |
| *Ailanthus altissima* |  | 239,26 |  |  |  |  |  |  |  |  |  |  |
| *Phacelia tanacetifolia* |  |  |  |  | 1.993,87 |  |  |  |  |  |  |  |

**S** - spring

**A -** autumn

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

**NPP** - Nature Park „Palić“

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

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

Table 36. Soil samplesGPScoordinates - Nature Reserve „Ludaško jezero“

|  |  |  |  |
| --- | --- | --- | --- |
| No of soil sampling | GPS coordinates | No of soil sampling | GPS coordinates |
| 1 | 46°5'47''  19°47'37'' | 14 | 46°5'47''  19°47'37'' |
| 2 | 46°6'21''  19°49'8'' | 15 | 46°6'19''  19°51'30'' |
| 3 | 46°5'47''  19°47'37'' | 16 | 46°6'37''  19°49'41'' |
| 4 | 46°5'15''  19°47'4'' | 17 | 46°6'10''  19°50'37'' |
| 5 | 46°5'47''  19°47'4'' | 18 | 46°6'19''  19°51'30'' |
| 6 | 46°6'20''  19°47'51'' | 19 | 46°6'46''  19°49'58'' |
| 7 | 46°5'47''  19°49'40'' | 20 | 46°6'50''  19°50'50'' |
| 8 | 46°6'04''  19°42'47'' | 21 | 46°6'59''  19°49'31'' |
| 9 | 46°5'34''  19°50'0'' | 22 | 46°6'34''  19°48'53'' |
| 10 | 46°5'18''  19°49'57'' | 23 | 46°6'59''  19°49'31'' |
| 11 | 46°5'18''  19°49'56'' | 24 | 46°5'3''  19°50'0'' |
| 12 | 46°5'37''  19°49'41'' | 25 | 46°4'1''  19°49'36'' |
| 13 | 46°6'30''  19°49'29'' |  | |

Table 37. Soil samplesGPScoordinates - Nature Park ‘’Palić’’

|  |  |  |  |
| --- | --- | --- | --- |
| No of soil sampling | GPS coordinates | No of soil sampling | GPS coordinates |
| 1 | 46°05'912''  19°46’60’’ | 10 | 46°04'385''  19°46'141'' |
| 2 | 46°05'92''  19°45'60'' | 11 | 46°04'376''  19°46'119'' |
| 3 | 46°06'008''  19°45'46'' | 12 | 46°04'225''  19°44'267'' |
| 4 | 46°06'089''  19°45'37'' | 13 | 46°04'198''  19°44'258'' |
| 5 | 46°06'058''  19°45'272'' | 14 | 46°04'367''  19°43'602'' |
| 6 | 46°05'895''  19°44'912'' | 15 | 46°04'349''  19°43'517'' |
| 7 | 46°05'904''  19°44'978'' | 16 | 46°04'368''  19°43'555'' |
| 8 | 46°05'626''  19°45'105'' | 17 | 46°04'565''  19°42'371'' |
| 9 | 46°05'805''  19°44'975'' |  | |

Table 38. Soil samplesGPScoordinates - Special Nature Reserve ‘’Selevenjske pustare’’/ forest

|  |  |  |  |
| --- | --- | --- | --- |
| Soil sampling in ’Selevenjske pustare’’ | | Soil sampling in ``Selevenjske forest‚‚ | |
| No of soil sampling | GPS coordinates | No of soil sampling | GPS coordinates |
| 1 | N46 04 34.9  E19 42 23.8 | 1F | N46 08 20.0  E19 53 12.2 |
| 2 | N46 07 37.1 E19 53 58.0 | 2F | N46 08 21.1  E19 53 09.1 |
| 3 | N46 07 53.3 E19 54 21.2 | 3F | N46 08 30.7  E19 53 15.0 |
| 4 | N46 08 21.4 E19 55 10.8 | 4F | N46 08 37.7  E19 53 06.8 |
| 5 | N46 08 09.5 E19 55 55.8 | 5F | N46 08 39.4  E19 53 14.3 |
| 6 | N46 07 56.2 E19 56 12.4 | 6F | N46 08 39.6  E19 53 14.1 |
| 7 | N46 09 19.8 E19 55 47.0 | 7F | N46 08 44.4  E19 53 09.6 |
| 8 | N46 09 48.5 E19 55 36.5 | 8F | N46 08 41.7  E19 53 20.9 |
| 9 | N46 08 42.3 E19 54 22.5 | 9F | N46 08 53.9  E19 53 12.7 |
| 10 | N46 09 37.9 E19 54 17.2 | 10F | N46 08 34.1  E19 52 32.9 |
| 11 | N46 08 42.0 E19 54 22.5 | 11F | N46 08 44.1  E19 52 29.6 |
| 12 | N46 08 42.4 E19 52 06.3 | 12F | N46 08 46.2  E19 52 30.2 |
| 13 | N46 08 59.0 E19 52 03.7 | 13F | N46 08 50.4  E19 52 40.4 |
| 14 | N46 08 30.0 E19 51 39.3 | 14F | N46 08 52.8  E19 52 45.4 |
|  | | 15F | N46 08 55.4  E19 52 54.5 |

Table 39. Soil samplesGPScoordinates - Landscape of Outstanding Features „Subotička peščara“/forest

|  |  |  |  |
| --- | --- | --- | --- |
| Soil sampling in ``Subotička peščara‚‚ | | Soil sampling in ``Subotička forest‚‚ | |
| No of soil sampling | GPS coordinates | No of soil sampling | GPS coordinates |
| 1 | N46 08 50.8  E19 45 17.5 | 1F | N46 07 27.5  E19 47 00.4 |
| 2 | N46 09 20.9  E19 44 18.5 | 2F | N46 07 24.2  E19 46 12.5 |
| 3 | N46 09 19.4  E19 44 16.6 | 3F | N46 07 45.9  E19 45 50.2 |
| 4 | N46 09 27.4  E19 44 20.0 | 4F | N46 08 44.0  E19 44 52.9 |
| 5 | N46 09 49.2  E19 44 15.2 | 5F | N46 08 00.1  E19 44 24.2 |
| 6 | N46 09 52.3  E19 44 18.4 | 6F | N46 07 59.9  E19 44 14.8 |
| 7 | N46 09 52.7  E19 44 21.1 | 7F | N46 09 27.6  E19 43 10.9 |
| 8 | N46 09 46.7  E19 43 40.8 | 8F | N46 09 48.4  E19 42 53.1 |
| 9 | N46 09 52.7  E19 44 21.1 | 9F | N46 09 48.5  E19 42 53.1 |
| 10 | N46 09 59.4  E19 43 28.5 | 10F | N46 09 08.3  E19 39 00.0 |
| 11 | N46 09 57.5  E19 43 28.7 | 11F | N46 09 25.1  E19 38 18.6 |
| 12 | N46 09 54.6  E19 43 22.8 | 12F | N46 08 39.7  E19 37 28.8 |
| 13 | N46 10 18.0  E19 42 39.8 | 13F | N46 09 37.8  E19 36 23.3 |
| 14 | N46 10 06.3  E19 42 34.7 | 14F | N46 09 09.7  E19 34 58.0 |
| 15 | N46 10 06.2  E19 42 34.8 |  | |

