# SEEDBANKS AND VEGETATION OF DISTURBED URBAN SOILS

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## ABSTRACT

The composition of urban seedbanks differed considerably from that of the established vegetation. Annuals were more abundant in the seedbank than in the vegetation, while perennials were more abundant in the vegetation. Many species were present in the seedpools and not in the vegetation, and the converse was also true. Seed dispersal and/or longevity was demonstrated by the presence of ten species, not growing in the vegetation, that emerged from the seedbanks of five or more of the six sites.

In the vegetation, as in the seedbanks, introduced rather than native plants were the most common, including: bluegrass (Poa pratensis), dandelion (Taraxacum officinale), plantain (Plantago spp.), clover (Trifolium spp.), knotweeds (Polygonum spp.), and various mustards (Cruciferae). The proportion of native species varied with the degree of disturbance of the site. More native species were present in the less disturbed areas. Accessibility of seed to the sites apparently varied, although access was difficult to measure. It is clear that seedbanks are a significant factor in the early development of urban vegetation and that the resulting vegetation reduces erosion and helps to create suitable habitat for closed turf species and for taller herbs and woody plants.

## INTRODUCTION

Within every city, many plants are growing that are not remnants of the native vegetation nor were they planted by city residents. From whence do they come?

Dispersal of weedy species into urban sites occurs both by natural means, such as wind and animals, and by human activity, e.g., contaminated lawn seed and the movement of soil and debris from one place to another. Many species in the weedy families, the grasses, sunflowers, plantains, spurges, legumes, smartweeds, mustards, pinks and goosefoots continue to thrive in cities, since seeds of species in these families are readily disseminated and persist in seedbanks.

Seeds may be stored in the soil in a dormant or conditionally dormant (i.e., capable of germinating only under a limited range of conditions--Baskin and Baskin, 1985) state for periods of several months to many years (Darlington and Steinbauer, 1961; Roberts, 1981). Seeds vary greatly in viability as well as in their ability to disperse from one site to another. Most urban sites are subjected to frequent disturbance of greater or lesser degree. Seed may remain

from earlier vegetation or may be blown in, or carried in, by animals. The seedbank in the soil is often an important source of propagules from which plants may develop to begin the process of revegetation. On a broader scale, seedbanks provide an indication of vegetational history as well as of the ability of seeds to reach a particular site.

This study was designed to: 1) assess the viable seed content of urban soils that had been subjected to different degrees of disturbance; 2) compare the vegetation growing on a site with the seedbank in the soil beneath, and 3) determine in what ways urban seedbanks may differ from those of agricultural or forested areas.

## METHODS

Six sites were chosen on the east side of Milwaukee: two in the right-of-way of the Chicago Northwestern Railroad, east of the Milwaukee River (RR I and RR II), one a privately-owned vacant lot that was mowed infrequently (WL), another, a well-kept and regularly mowed urban lawn in Shorewood (JAN); the fifth, a vacant lot remaining after the Lake Freeway was abandoned (JCC); and the sixth, a large filled area (GLC) that has been subjected to a variety of industrial and commercial uses (Table 1).

Table 1. Site descriptions and disturbance characteristics.

| Disturbance Rank | Site | Nature of Disturbance |
|---|---|---|
| 1. | GLC | Filled marsh used to store coke and limestone and later broken concrete. Heavy machinery used here. |
| 2. | JCC | Clearing for freeway construction followed by abandonment. Heavily trampled, with litter and some broken concrete. |
| 3. | JAN | Regular lawn care, mowing and fertilization. |
| 4. | WL | Sporadic (once or twice a season) mowing of old lawn on corner lot. |
| 5. | RRII | Adjacent to railroad tracks - open area bisected by path. |
| 6. | RRI | Relatively undisturbed for 30-50 years, open overstory of bur, red, and swamp white oak. |

The seedbank of each site was sampled by taking ten soil plugs using a stratified random design. An initial set of samples was obtained in fall of 1981. Loose debris was removed from the soil surface, and a soil corer was used to obtain a plug of surface soil (to approximately 5 cm depth) with a volume of approximately 25 $cm^3$. Individual samples were placed in plastic bags and stored

at 4° C over the winter. In April 1982, ten additional samples were obtained from each site, using the same procedures, and these samples were stored for 30 days at 4° C.

Prior to planting in early May, all samples were thoroughly mixed and debris (rocks, sticks, garbage, etc.) was removed. Each sample was divided by weight into two equal replicates. A layer of sterilized sand, 2.5 cm thick, was placed in plastic trays and the seedbank soil samples were spread individually over that sterile base. Trays were placed in the greenhouse on 8 and 9 May 1982 and were watered regularly and exposed to natural light-dark cycles. Seed content of the soil was determined by counting and identifying the seedlings that developed (Chancellor, 1966; Priwer et. al., 1980; Univ. of GA, 1978). Where seedlings could not be identified, individuals were grown to maturity when possible. In early July, after two months in the greenhouse, the soil of each compartment was again mixed to expose underlying seeds if any, and samples were watered regularly until September, so that remaining viable seeds could germinate. Nomenclature follows Gleason (1974).

Vegetation at each site was examined in the autumn of 1981 and during the summer of 1982. In August 1982, vegetation was sampled using a stratified random design to determine plant composition and density.

Nutrient content, pH and texture of the soil were determined at each site. Five soil samples were taken at each site and were pooled to form a composite sample for analysis by the UWM State Soils Laboratory.

## RESULTS

The sites were relatively uniform in pH (7.3 to 7.9) while potassium and phosphorus content varied considerably, as did organic matter and soluble salts. Sites WL and JCC were high in clay, whereas RRI and RRII were sandy. Correlations between vegetation and soil characteristics proved tenuous at best, and differences between sites are much more likely a result of the timing and nature of disturbance, and of chance distribution of seed, rather than a result of soil characteristics.

The vegetation of all six sites was dominated by grasses or sedges and composites. The seedbank samples produced a greater number of species and individuals than were found growing on the sites (Table 4). Both annuals and biennials were more numerous as seedbank emergents than they were as parts of the vegetation (Table 2). The vegetation contained more perennials and woody plants than did the seedbank samples.

Grasses were the dominant plants in all sites, ranging from 50% to 99% of total plant density (Table 4). Introduced plants outnumbered native plants as might be anticipated (Table 3). Only one species, a woody plant, boxelder (Acer negundo), grew in all six locations, and most species appeared in only one of the six sites.

Table 2. Number of individuals of annual, biennial and perennial plants in urban vegetation plots and matching seedbanks.[1]

| SITES | | VEGETATION | SEEDBANK EMERGENTS |
|---|---|---|---|
| RRI | Annuals | 34 | 136 |
| | Biennials | 3 | 15 |
| | Perennials (woody & herbaceous) | 400 | 341 |
| RRII | Annuals | 247 | 196 |
| | Biennials | 4 | 57 |
| | Herbaceous Perennials | 534 | 341 |
| | Woody Plants | 41 | 5 |
| WL | Annuals | 7 | 135 |
| | Biennials | 3 | 1 |
| | Herbaceous Perennials | 911 | 386 |
| | Woody Plants | 2 | 2 |
| JAN | Annuals | 1 | 45 |
| | Biennials and Perennials | 645 | 118 |
| JCC | Annuals | 17 | 194 |
| | Biennials | 1 | 137 |
| | Herbaceous Perennials | 1089 | 714 |
| | Woody Plants | 12 | 9 |
| GLC | Annuals | 128 | 1327 |
| | Biennials | 41 | 212 |
| | Herbaceous Perennials | 652 | 134 |
| | Woody Plants | 1 | 1 |

[1]Vegetation samples consisted of 10 large quadrats (1963 $cm^2$ each) and 10 small quadrats (201 $cm^2$ each). The area sampled per site was 2.16 $m^2$. Seed pool samples were obtained in the fall of 1981 and spring of 1982, totalling 20 samples per site ($2.51 \times 10^{-4} m^3$ each plug and approximately $5.0 \times 10^{-3} m^3$ per site).

The plants that emerged from the seedbank were primarily grasses and composites and 79% were classified as weeds, i.e., plants of waste places or weeds of agricultural fields. Six taxa were present in all of the seedbanks. These included: *Poa pratensis*, *Panicum capillare*, *Taraxacum officinale*, *Plantago major*, *Melilotus* sp., *Lepidium* sp. *Oxalis* sp. was also present in all samples but it was difficult to determine how much was the result of greenhouse contamination and how much was in the seedbank. Possible greenhouse contaminants are not shown in Table 4. Unknown germinants were found in the seedbanks of all sites, since some plants could not be grown to maturity in the time available.

Table 3. Number of species and individuals of introduced and native plants [1] in the vegetation of six urban sites.[2]

| ORIGIN OF SPECIES | Sites | | | | | |
|---|---|---|---|---|---|---|
| | RRI | RRII | WL | JAN | JCC | GLC |
| Europe | 15 | 10 | 10 | 2 | 11 | 16 |
| | (33) | (127) | (218) | - | (66) | (81) |
| Europe and Asia | 5 | 10 | 8 | 2 | 8 | 11 |
| | (11) | (9) | (105) | (4) | (64) | (23) |
| Escaped ornamental (Japan) | 1 | | 1 | | 2 | 1 |
| | (1) | | (1) | | | |
| North America | 29 | 26 | 7 | 3 | 10 | 13 |
| | (53) | (80) | (44) | | (963) | (155) |
| North America and Eurasia | 3 | 3 | 2 | 1 | 1 | 2 |
| | (288) | (440) | (56) | (641) | (22) | (532) |
| North America and Europe | 1 | 1 | 2 | | | 2 |
| | | | (499) | | | |
| Tropical America | 1 | 1 | | | | 1 |
| | | (2) | | | | (29) |
| Planted | | 1 | | | | |
| | | (15) | | | | |

[1] As classified by Gleason, 1974.

[2] The upper number refers to the number of species, and the lower number in () refers to the number of individuals sampled.

## DISCUSSION

Presumably, some seeds present in the soil did not germinate because of their need for some special germination condition. The number of these is thought to be small, but may include seeds of some of the plants growing on the sites that were not recorded from the seedbank samples. Identification of seedlings is often difficult. Many groups are impossible to distinguish in the seedling stage, and it is time consuming to grow certain plants to maturity so the seedbank/vegetation comparisons may be incomplete.

The findings of this urban seedbank study are comparable with those of studies from a variety of other habitats including agricultural fields, pastures,

and woodlots. Fifty species in the Milwaukee urban seedbanks were also found in seedbanks elsewhere in North America, Great Britain and Europe (Dowden, 1972; Haigh, 1980; Gilbert, 1983). The number of individual plants varies considerably from sample to sample; the Milwaukee sites produced from 1,751 to 26,062 seedlings/$m^2$ a range typical of studies reported in the literature (Roberts, 1981).

Most of the plants that emerged from the seedbank were weedy species normally found as colonizers of disturbed habitats and presumably easily dispersed. As expected, annual plants were far more abundant among the seedbank emergents than they were in the sites. Several of the sites had recently been badly disturbed and the seedbank samples failed to produce woody plant seedlings, although woody plants were growing on every site. Large seeds common to woody plants are susceptible to predation and are generally short-lived. In addition, many of the woody plants present in the sites had not yet reached sexual maturity.

Table 4. Species found and number of plants or seedlings at urban sites and in seedbanks 1981-82. V = Plants found in vegetation of sites. S = Seedlings grown from seedbanks. Species are arranged by family.[1,2]

| Species | RRI | | RRII | | WL | | JAN | | JCC | | GLC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Monocots** | V | S | V | S | V | S | V | S | V | S | V | S |
| Grasses - Poaceae | | | | | | | | | | | | |
| Poa pratensis | 287 | 144 | 438 | 99 | 42 | 30 | 641 | 95 | 0 | 21 | 486 | 7 |
| Poa spp. | 0 | 50 | 0 | 43 | 0 | 13 | 0 | 4 | 0 | 7 | 0 | 71 |
| Festuca rubra | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 1 | | 8 | 0 | 0 |
| Festuca sp. | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 8 | 0 | 0 | 0 | 0 |
| Setaria glauca | 0 | 0 | 39 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 14 | 56 |
| Setaria verticillata | x | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Muhlenbergia cuspidata | 0 | 1 | 0 | 5 | x | 0 | 0 | 0 | x | 2 | 0 | 2 |
| Lolium (temulentum or multiflorum) | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 |
| Phalaris arundinacea | 0 | 0 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Phleum pratense | 0 | 0 | 0 | 0 | 88 | 0 | 0 | 0 | x | 0 | x | 0 |
| Agropyron repens | x | 0 | x | 0 | 498 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hordeum jubatum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 0 |
| Bromus spp. | 0 | 0 | 149 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| Panicum capillare | 0 | 10 | 0 | 9 | 0 | 15 | 0 | 7 | 0 | 15 | 0 | 256 |
| Sporobolus (neglectus?) | 0 | 2 | 0 | 11 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 39 |
| Eragrostis (frankii or pilosa) | 0 | 12 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unknown grasses | 0 | 1 | 0 | 11 | 36 | 0 | 0 | 12 | 0 | 9 | 0 | 10 |

Table 4. (Continued)

| Species | RRI | | RRII | | WL | | JAN | | JCC | | GLC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | S | V | S | V | S | V | S | V | S | V | S |
| Sedges - Cyperaceae | | | | | | | | | | | | |
| Carex prairea | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 954 | 0 | 0 | 0 |
| Carex spp. | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 1 | 0 | 12 | 0 | 0 |
| **Dicots** | | | | | | | | | | | | |
| Composites - Asteraceae | | | | | | | | | | | | |
| Taraxacum officinale | 0 | 14 | 1 | 15 | 102 | 57 | 4 | 16 | 4 | 260 | 9 | 32 |
| Sonchus oleraceus | 0 | 0 | 0 | 0 | 4 | 3 | 0 | 1 | 13 | 7 | x | 0 |
| Cichorium intybus | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 27 | 1 | x | 2 |
| Cirsium arvense | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 5 | 12 | 3 |
| Carduus nutans | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | x | 1 | 30 | 15 |
| Lactuca serriola | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 |
| Conyza canadensis | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 39 | 35 | 135 |
| Ambrosia artemisiifolia | 2 | 4 | 17 | 9 | 3 | 10 | 0 | 0 | 0 | 49 | 24 | 29 |
| Arctium minus | 1 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | x | 136 | 0 | 0 |
| Helianthus divaricatus | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 4 |
| Eupatorium rugosum | x | 20 | 15 | 40 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 1 |
| Chrysanthemum leucanthemum | 4 | 22 | x | 0 | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Aster sagittifolius | x | 67 | 0 | 121 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7? |
| Aster lowrieanus | 0 | 9 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Aster laevis | 13 | 0 | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Aster or Solidago spp. | 0 | 6 | 4 | 19 | x | 0 | 0 | 0 | 3 | 2 | 45 | 50 |
| Solidago canadensis and gigantea | 6 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4. (Continued)

| Species | RRI | | RRII | | WL | | JAN | | JCC | | GLC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | S | V | S | V | S | V | S | V | S | V | S |
| Solidago ulmifolia | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Achillea millefolium | x | 0 | 2 | 0 | 14 | 0 | 0 | 0 | 22 | 0 | 46 | 0 |
| Plantaginaceae | | | | | | | | | | | | |
| Plantago major and rugelii | 0 | 1 | 0 | 1 | 1 | 239 | 0 | 5 | 0 | 151 | x | 2 |
| Plantago lanceolata | 0 | 0 | 0 | 0 | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plantago indica | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 25 |
| Euphorbiaceae | | | | | | | | | | | | |
| Euphorbia maculata | 0 | 2 | 0 | 0 | 0 | 44 | 0 | 4 | 0 | 0 | 0 | 78 |
| Fabaceae | | | | | | | | | | | | |
| Medicago lupulina | 0 | 1 | x | 10 | x | 4 | 0 | 0 | x | 21 | x | 0 |
| Melilotus alba and officinalis | 1 | 4 | 10 | 35 | x | 2 | 0 | 1 | x | 2 | 7 | 74 |
| Trifolium repens | 0 | 0 | 0 | 0 | 115 | 9 | 0 | 0 | 0 | 8 | x | 1 |
| Polygonaceae | | | | | | | | | | | | |
| Rumex crispus | 0 | 0 | 0 | 0 | x | 0 | 0 | 0 | 1 | 22 | 0 | 0 |
| Polygonum persicaria | 0 | 0 | 0 | 0 | 0 | 12 | x | 1 | 0 | 1 | 0 | 0 |
| Polygonum aviculare | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 25 |
| Polygonum convolvulus | 0 | 1 | x | 3 | 0 | 0 | x | 0 | 0 | 0 | 0 | 0 |
| Brassicaceae | | | | | | | | | | | | |
| Capsella bursa-pastoris | 0 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 8 | 0 | 2 |
| Arabidopsis thaliana | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 57 |
| Lepidium (virginicum?) | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 3 | x | 0 | 0 | 3 |
| Sisymbrium altissimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| Unknown mustards | 0 | 0 | 0 | 3 | 0 | 4 | 0 | 2 | 0 | 4 | x | 2 |

Table 4. (Continued)

| Species | RRI | | RRII | | WL | | JAN | | JCC | | GLC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | S | V | S | V | S | V | S | V | S | V | S |
| Amarathaceae | | | | | | | | | | | | |
| Amaranthus retroflexus | x | 16 | 4 | 63 | 0 | 2 | 0 | 3 | 0 | 0 | 29 | 55 |
| Solanaceae | | | | | | | | | | | | |
| Solanum dulcamara | x | 0 | x | 0 | 0 | 0 | 0 | 0 | 2 | 4 | x | 0 |
| Solanum nigrum | 0 | 2 | 0 | 0 | 0 | 5 | 0 | 1 | 0 | 3 | 0 | 0 |
| Portulacaceae | | | | | | | | | | | | |
| Portulaca oleracea | 0 | 0 | 0 | 1 | 0 | 11 | 0 | 3 | 0 | 0 | 0 | 4 |
| Chenopodiaceae | | | | | | | | | | | | |
| Chenopodium album | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 30 | 0 | 242 |
| Kochia scoparia | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | x | 90 |
| Caryophyllaceae | | | | | | | | | | | | |
| Stellaria media | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 2 |
| Silene cucubalus | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | x | 0 | 1 | 2 |
| Saponaria officinalis | 25 | 6 | 19 | 14 | 0 | 0 | 0 | 0 | 0 | 1 | x | 1 |
| Scrophulariaceae | | | | | | | | | | | | |
| Verbascum thapsus | 0 | 12 | 0 | 57 | 0 | 0 | 0 | 2 | 0 | 0 | x | 190 |
| Linaria vulgaris | 11 | 11 | 3 | 5 | 1 | 0 | 0 | 0 | 0 | 1 | 10 | 12 |
| Vitaceae | | | | | | | | | | | | |
| Vitus riparia | 1 | 0 | x | 0 | 0 | 1 | 0 | 0 | 0 | 0 | x | 0 |
| Parthenocissus (quinquefolia?) | 2 | 0 | 4 | 0 | x | 0 | 0 | 0 | x | 0 | 0 | 1 |
| Rosaceae | | | | | | | | | | | | |
| Potentilla recta | 13 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potentilla spp. | 0 | 54 | 0 | 11 | 0 | 1 | 0 | 0 | 0 | 10 | 0 | 144 |
| Prunus virginiana | 8 | 0 | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 4. (Continued)

| Species | RRI | | RRII | | WL | | JAN | | JCC | | GLC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V | S | V | S | V | S | V | S | V | S | V | S |
| Verbenaceae | | | | | | | | | | | | |
| Verbena bracteata | x | 77 | 0 | 28 | 0 | 0 | 0 | 0 | 0 | 21 | 4 | 1 |
| Onagraceae | | | | | | | | | | | | |
| Oenothera biennis | x | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| Apiaceae | | | | | | | | | | | | |
| Daucus carota | x | x | 0 | 0 | 0 | 0 | 0 | 0 | x | 0 | 3 | 2 |
| Rhamnaceae | | | | | | | | | | | | |
| Rhamnus catharticus | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 2 | 0 | 0 |
| Aceraceae | | | | | | | | | | | | |
| Acer negundo | 4 | 0 | 6 | 4 | 1 | 0 | x | 0 | 6 | 4 | x | 0 |
| Anacardiaceae | | | | | | | | | | | | |
| Rhus radicans | 4 | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oleaceae | | | | | | | | | | | | |
| Forsythia suspensa | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Convolvulaceae | | | | | | | | | | | | |
| Convolvulus arvensis | 0 | 0 | 28 | 0 | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Caprifoliaceae | | | | | | | | | | | | |
| Symphoricarpos albus | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

[1] Species represented at only one site in trace (1-3) amounts have been omitted.

[2] Symbol "x" indicates species observed to be growing on the site but not sampled.

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