



# ***Ruderal vegetation on the ruins of Polish cities (1949) – excerpts\****

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Nowhere else in the world did the last war cause such extensive destruction as in Poland. Entire cities or city districts were reduced to rubble, and in many places it is difficult to tell where the streets or squares used to be. The tree vegetation in cities was either completely obliterated or severely damaged.

During the German occupation of Warsaw, and after the war in many other Polish cities, I conducted observations of the flora of the ruins resulting from the war.

Abandoned, deserted streets and squares came to be covered with the kind of ruderal vegetation that had previously only been found on the outskirts of cities. Quite abundant flora appeared between the stones of the roads, pavement slabs, and stones of the cobbled streets and squares. Noteworthy species included: cotton thistle (*Onopordon acanthium* L.), creeping thistle (*Cirsium arvense* Sc.) black-bindweed (*Polygonum convolvulus* L.), common knotgrass (*P. aviculare* L.), narrow-leaf pepperwort (*Lepidium ruderale* L.), common silverweed and silver cinquefoil (*Potentilla anserina* L. et *P. argentea* L.), meadow and red fescue (*Festuca pratensis* Huds. et *F. rubra* L.), yarrow (*Achillea millefolium* L.), couch grass (*Agriopyrum repens* P.B.), common bent (*Agrostis vulgaris* With.), tufted hairgrass (*Aira caespitosa* L.), meadow foxtail (*Alopecurus pratensis* L.), pale madwort (*Alyssum calycinum* L.), redroot pigweed (*Amarantus retroflexus* L.), common bugloss (*Anchusa officinalis* L.), corn chamomile (*Anthemis arvensis* L.), loose silkybent (*Agrostis spica venti* L.), sand rock-cress (*Arabis arenosa* Scop.), thyme-leaf sandwort (*Arenaria serpyllifolia* L.), common and field mugwort (*Artemisia vulgaris* L., *A. campestris* L.), wall barley (*Hordeum murinum* L.), cock's-foot (*Dactylis glomerata* L.), small tumbleweed mustard (*Sisymbrium Loeselli* L.) and many other species that had not been there before.

\* Originally published as "Roślinność ruderalna na gruzach miast polskich", in: *Sprawozdania z posiedzeń Wydziału IV Nauk biologicznych*, Year XLII, 1949, pp. 49-60; here, it is reprinted in fragments; see also Mateusz Salwa's article in this issue.

Curiously, one could also come across cornflower (*Centaurea cyanus* L.), common corn-cockle (*Agrostemma githago* L.), yellow mignonette (*Reseda lutea* L.) and great mullein (*Verbascum thapsus* L.).

If stones and paving slabs were an obstacle to the density of ruderal vegetation, the same plants were found in dense clusters in the wells around street trees. However, there was a difference in the composition, as most often one species occupied the entire surface of the well, such as *Lepidium ruderales*, *Polygonum aviculare* or *Sisymbrium*. Sometimes two or three species competed with each other.

It is interesting to note that trees such as white poplar (*Populus alba* L.), black poplar (*P. nigra* L.), aspen (*P. tremula* L.), silver birch (*Betula verrucosa* Ehrh.), white willow (*Salix alba* L.), and black locust (*Robinia pseudacacia* L.) began to appear on cobbled streets, whose light seeds, thanks to their plumes or wings, were carried by the wind and germinated even in such unfavourable conditions.

The above herbaceous and woody vegetation alike, growing between stones, slabs or in cracks in the asphalt, established their root systems in the soil. The microclimatic conditions of highly heated slabs, stones or asphalt did not hinder plant development, as evidenced by the growth of trees, exceeding 1 m for some species. Height differences were only visible in places where the soil layer was dry, and individual specimens there were shorter and less branched.

The rubble from burned or demolished houses is not a very favourable habitat for plant growth. Sometimes it consists of large blocks of masonry, in which case it is completely devoid of vegetation; occasionally, individual specimens appear in the crevices and depressions where there is some pulverized lime mortar and dust. However, the height of such plants is negligible compared to the specimens of the same species growing in a thick layer of fine rubble or in the debris that covers the sites of former gardens, courtyards, streets and squares with a relatively thin layer.

Fine rubble, consisting of fragments of bricks, lime mortar and clay in those places where stoves and kitchens used to be, provides quite favourable conditions for trees, ruderal vegetation and even certain ornamental or useful plants. The thicker the layer of fine rubble, the richer the vegetation cover.

Rubble in any form is a substrate poor in minerals, because apart from calcium contained in plaster, occasional potassium in the sites of erstwhile fires or aluminosilicates, hardly any other minerals are available. Dust deposited by wind and rainwater on the surface of the rubble and in depressions, composed of clay, humus and soot, gradually improves the properties of the rubble as a substrate for plants with low living requirements.

The microclimatic conditions of the rubble fields are similar to those of deserts, being characterized by major temperature fluctuations during the day. The sun strongly heats up the rubble masses not covered by vegetation, especially their sun-exposed slopes; at night, as a result of re-radiation, the temperatures of the rubble

fields decrease considerably. Strongly heated during the day, the already permeable rubble dries out. However, microclimatic conditions vary even within the scree; they are different on the northern and the southern slopes, and different in depressions; bricks heat up differently than concrete. As a result of the peculiar thermal conditions, representatives of dry habitat fauna have appeared here and there on the rubble, such as blue- or red-winged rattle grasshoppers or tiger beetles. My attention was also drawn to certain different species of the membrane-winged (*Hymenoptera*) and butterflies (*Lepidoptera*). Undoubtedly, the fauna of the rubble sites differs from that of the surrounding areas, but as far as I know, no one has taken any particular notice. Goldfinches visit the rubble sites in great numbers, probably because of the larger amount of thistles and cotton thistles, whose seeds they eagerly shell.

The composition and thickness of the rubble layer, and depending on whether the rubble only superficially or intermittently covers streets, courtyards and gardens, as well as the exposure and moisture content in the rubble itself, determine the location of the vegetation. This is primarily ruderal vegetation, normally found in rubbish dumps, courtyards, under fences, in squares, on embankments and railway tracks. It is accompanied by trees that have no special habitat requirements. Prevalent among the ruderal flora are plants with small seeds, equipped with flying apparatus, which the wind can easily carry over long distances. Smaller seeds without a flying apparatus can also be carried by strong winds into the city centre. (...)

There are also fruit trees and shrubs whose seeds have been spread by birds or humans, such as apple, pear, cherry and gooseberry trees.

The composition of woody vegetation in the rubble sites is quite diverse in individual Polish cities, which is determined by the species of trees and shrubs growing in the nearby forests, gardens, parks or river valleys. This explains why poplars, willows, black locusts and ornamental shrubs predominate on the ruins in some cities. The Silesian willow on the ruins of the Botanical Garden in Warsaw was transferred from the garden itself, the paper birch on the ruins of Ujazdów came from the Ujazdowski Park, while the red elderberry (*Sambucus racemosa* L.) on the ruins of the palace in Białowieża was brought by the birds from the park in Białowieża.

The herbaceous vegetation covering the rubble is relatively abundant. Its composition also depends on the surrounding flora. Next to the common species encountered on almost all ruins in Poland, there are plants that are seen only in certain cities and even species that have been observed for the first time among Polish flora. (...)

The flora of the ruins shows a link with urban cultivation, as evidenced by the ornamental plant species such as common marigold (*Calendula officinalis* L.), garden cosmos (*Cosmos bipinnatus* L.) and kochia (*Kochia scoparia* Schrad.). The latter species covered significant areas of the ghetto ruins in Warsaw, and I also encountered it on the rubble in Wrocław and Szczecin.

For several years, poppies, and sporadically sunflowers and tomatoes, could be observed sprouting, blooming and bearing fruit on the rubble in Warsaw. Tomatoes,

which under normal conditions are transplanted into the soil from frames, would sprout in the warmer areas of the rubble until 1947, not infrequently bearing tasty fruit.

The ruins of cities, Warsaw in particular, were invaded not only by the ruderal plants from the suburbs, but also by the vegetation brought from further afield, equipped with flying apparatus or even without it. In the centre of Warsaw, one can come across species brought from the banks of the Vistula River (...). (...)

Comparing—based on the literature—the vegetation of the rubble of Stalingrad, the coasts of England and France with the flora of our rubble, many common species may be identified. Growing everywhere, there are fireweed, goosefoot, bent spike-rush and, among trees, poplars, willows and others.

The vegetation of the rubble sites undergoes significant changes under specific conditions. The same plants change their size and appearance depending on their vertical elevation, exposure, the thickness of the rubble layer and the size of its fragments. In more favourable conditions, they grow into well-developed, tall plants, while in poorer habitats, they are small-sized and demonstrate meagre growth, often not exceeding 5 cm in height. This applies above all to goosefoot, amaranth, bent spike-rush and others, trees and shrubs included. In some species, the colour of the leaves and shoots changes to red even in summer. These are adaptations to the habitat conditions: cold nights cause a more intense red colouration, which protects them from the cold.

In the adverse conditions of the rubble fields, ruderal vegetation thrives thanks to the root systems which penetrate deep into the rubble if the layer is thick enough. The main root is particularly strong. In places where the rubble layer is thin, the taproot and lateral roots are much weaker. The less robust development of the root system and the entire plant is influenced not so much by the thickness of the rubble itself, but by the lack of moisture and excessive exposure, as rainwater escapes through the cracks deep into the rubble without benefiting the plants, while a thin layer of rubble dries out quickly.

When observing the root systems of both herbaceous and woody vegetation on rubble, I found out that the plants are greatly adaptable, thanks to which they can survive in the minimal living conditions offered by the rubble. Locally, the conditions for the rubble vegetation may vary for individuals of the same species, even within an area of 1 m<sup>2</sup>. This becomes evident upon inspecting the root system after the plants have been dug up. Some specimens have relatively long roots, while in others they are short or one-sided. Sometimes, the root system suddenly turns sideways just below the surface, or the roots go deep but are developed in a single plane. The length and shape of the root system are affected by the rubble itself, its composition and layout. Often, under a thin layer of rubble, there is a wall, over the surface of which plant roots creep, penetrating even the tiniest cracks, thus contributing to the erosion of the wall remnants. The ability of vegetation to adapt to the living

conditions on rubble sites is most evident in trees. Removal of the rubble in the Ujazdów area in Warsaw, where many trees had grown on the ruins—some reaching 6 m in height—revealed the root systems of those plants vegetation. The workers removing the rubble noticed the unusual nature of the root systems, which demonstrated extraordinary length. The roots had penetrated into the narrowest crevices, where they had to mould into a very specific form. They were fantastically bent and flattened ribbon-like, taking advantage of every crack in the wall, which did not always run horizontally. When such a root encountered a layer of fine rubble or soil on its way, it produced a mass of fine rootlets that sourced water and mineral salts in larger quantities, promoting stronger growth of the shoots and roots. (...)

In order to capture the fullest possible development cycle of vegetation on rubble sites, from the earliest stages to the formation of a woody shrub, a long period of time is needed and the changes must be recorded for at least one generation. However, rubble will not remain there for so long, the best example of which is Warsaw, where it disappears very quickly. Even if the rubble remained, the natural development cycle would be hindered and distorted by the humans who destroy vegetation by grazing goats, breaking trees and shrubs.

Translated by Szymon Nowak