



## MANAGEMENT OF HERBACEOUS VEGETATION IN HISTORIC GARDENS – THE NORTH LANDSCAPE GARDEN OF WILANÓW PALACE

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### Summary

Herbaceous vegetation is a critical component of the multi-layered arrangement in historic gardens, enhancing its harmony and natural balance. Despite its numerous advantages, such as limiting weed growth, inhibiting soil degradation, and increasing biodiversity, it remains one of the most neglected components of historic gardens. The objective of this article was to present practical guidelines for the management of herbaceous vegetation in the North Landscape Garden of Wilanów Palace made for the Museum of King Jan III's Palace at Wilanów between 2017 and 2018. Analytical studies and design works were conducted for an area of 5.3 ha. Following the principles of conservation with respect to spatial forms and landscape features with simultaneous reference to the composition of natural plant communities and preservation of the existing natural qualities, a list of 106 dominant and coexisting plant species was proposed. Herbaceous vegetation covered in total 39% of the park's area. The identified species indicated a habitat of subcontinental oak-hornbeam forest (*Tilio-Carpinetum calamagrostietosum*) and willow-poplar marsh (*Salici-Populetum*). In addition, compositional guidelines and recommendations for implementation, care and use were specified. The correct management of herbaceous vegetation in a historic garden requires a well-thought-out design and implementation process that accounts for cultural values and habitat conditions.

### Keywords

Wilanów • historic garden • landscape garden • herb layer • herbaceous vegetation

### 1. Introduction

Herbaceous vegetation is a vital component of the multi-layered arrangement in historic gardens, enhancing its harmonious composition and natural balance. It provides an excellent background for buildings, groups of trees and shrubs, observation points and landscape niches [Majdecki 1993]. It limits or even eliminates the growth of weeds (except perennial weeds such as *Cirsium arvense*, *Elymus repens*) and creates a specific “living mulch”. Growing herbaceous plants also has important economic aspects (lower care requirements and lower costs of the maintenance of green areas) and functional

aspects (a psychological barrier preventing the destruction of plants). Herbaceous vegetation also significantly improves environmental conditions in historic gardens, especially for local trees and shrubs. First, it inhibits soil degradation by preventing erosion. Herbaceous plants also keep soil warmer, limiting its drying and improving water retention. Carefully selected herbaceous plants increase biodiversity and play a key role in phytoremediation [Zimny 1967]. This particularly concerns mature ecosystems, which are rich in species and have a high ability to self-regulate. It is also worth emphasizing the great biocoenotic importance of herbaceous vegetation as a habitat for insects and a foraging site for avifauna [Fornal-Pieniak 2015].

Despite its numerous advantages, herbaceous vegetation remains one of the most neglected components of historic gardens. During the investment process, it is often eliminated and replaced by mulch, lawns or, at best, ground cover plants. This risk also concerns the North Landscape Garden of Wilanów Palace, which has been undergoing a gradual restoration since 2009. As a result, the topsoil has been replaced in some parts and, in addition, has been severely degraded using heavy equipment (Fig. 1). It has become necessary to restore the former herbaceous vegetation, which contributed to the authenticity of the site.



Photo: W. Holnicki, Museum of King Jan III's Palace at Wilanów (inv. no. C31662)

Fig. 1. Restoration works at the North Landscape Garden, 2010.

The primary purpose of the presented study was to prepare practical guidelines for the management of the herbaceous vegetation in the North Landscape Garden, including a catalogue of recommended plant species, as well as guidelines for implementation, care, and further use. The paper has other additional objectives:

- 1) to examine the history of the park, with particular emphasis on the most important compositional changes and restoration works,
- 2) to specify the physiographic and habitat conditions such as topography, microclimate, soils and natural potential vegetation,
- 3) to describe the existing herbaceous vegetation layer, its seasonal fluctuation and habitats. The aim of this study is to present the results of a project conducted for the Museum of King Jan III's Palace at Wilanów between 2017 and 2018.

## 2. Materials and methods

The research methods included field work and study work conducted in two phases (analysis and design). The analytical phase consisted in the general description of the park and the herbaceous vegetation growing there, including the identification of the specific physiographic and habitat conditions, and the analysis of the most important natural and compositional conditions. Data on plants were gathered during the general inventory conducted on 1 May 2017 (spring survey), 24 July 2017 (summer survey), and 2 October 2017 (autumn survey). Spatial and eco physiographic data were acquired from the geospatial information systems of the Museum of King Jan III's Palace in Wilanów, Mazowieckie Province, and the Central Office of Geodesy and Cartography. The second phase of the conceptual study consisted in developing the guidelines for the management of the herbaceous vegetation based on the conclusions from the conducted analyses, scientific publications, and plant catalogues [Grabowska and Kubala 2005, Grabowska and Kubala 2006, Kłosowski and Kłosowski 2015, Lange 1996, Łukasiewicz 2003, Witkowska-Żuk 2013, Wójciak 2007]. Binomial names of plants were acquired from an international botanical resources: the International Plant Names Index, World Flora Online, Plants of the World Online (the Royal Botanic Gardens, Kew), and the Global Biodiversity Information Facility.

## 3. Results

### 3.1. History of the North Landscape Garden

The North Landscape Garden of the Palace in Wilanów was established in 1799–1820, founded by Stanisław Kostka Potocki as a part of the great project of ordering, expanding and re-composition of the residence following the English landscape garden style. The composition of the green areas and buildings was co-designed by the architect Chrystian Piotr Aigner and head gardener Karol Barthel [Fijałkowski 2014].

The works started in 1799 with ordering and transformation of the area between the village of Wilanów and Wilanów lake. Next, earthworks led to formation of a dyke and artificial island in the northern part of the park. They were joined by the Roman Bridge (1809) serving as a keystone of the composition. Its central location was highlighted by view corridors: eastern one facing Wilanów Lake, Sobieski Canal and Morysin palace (1811), northern one facing the island and the Raszyn Battle Monument commemo-

rating Captain Ksawery Burski (1809, Fig. 2), western one facing Sobieski Triumphal Arch formed as an artificial ruin (1810) and the southern one facing the Northern Bay and Chinese Gazebo (1806, Fig. 3). All buildings were joined by a walking path called “wilderness” along the shore of Wilanów Lake north toward the said island and further south to the Orangery (1820) with its Corinthian portico [Polanowska 2009].

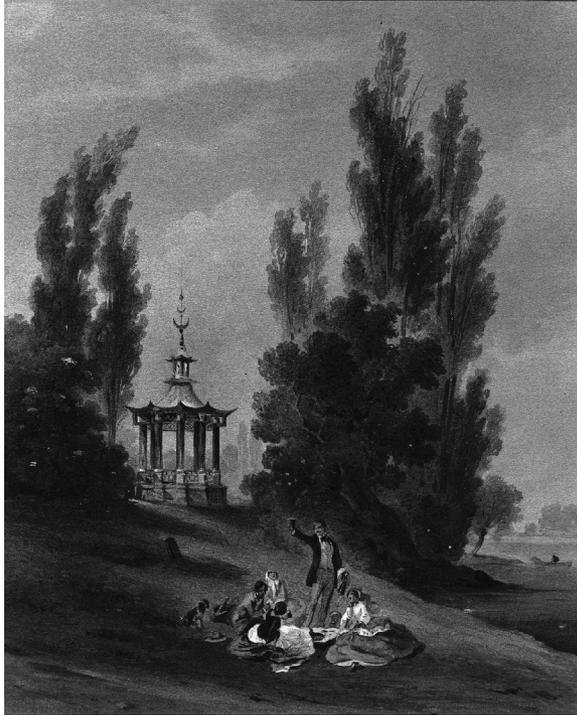


Source: Collection of the Institute of Art of the Polish Academy of Sciences in Warsaw (inv. no. 24723). Photo: H. Poddębski

**Fig. 2.** Willibald Richter, Wilanów, a tomb in the park, ca. 1850

The spatial design of the North Landscape Garden was developed and transformed by further owners of Wilanów. Between 1855 and 1856 the Pump House was erected on the shore of Wilanów Lake, designed by the Polish-Italian architect Enrico Marconi. Inside, there were devices which used a system of underground waterworks installations to supply water to fountains in different parts of the garden in Wilanów. The system was designed by the engineer from Berlin, Theodor Schramke [Fijałkowski 2014]. In 1858 August Potocki brought a column with a figure of an eagle from the Ernst March's Thonwaaren Fabrik, Charlottenburg in Berlin to set it in the south-western part of the park (Fig. 4). In the 20th century, the park was regularly flooded, with the most dramatic occurrences in 1924 and 1934. The year of 1926 marked the end

of construction works of Zawadowski Rigde, which limited markedly flooding from Vistula and Wilanów Lake.



Source: Collection of the Institute of Art of the Polish Academy of Sciences in Warsaw (inv. no. 24722). Photo: H. Poddębski

**Fig. 3.** Willibald Richter, Wilanów, park, chinese gazebo, ca. 1850

In 1940–1944 the entire composition was ruined during the war. Many monumental trees and buildings were damaged or destroyed, including the Orangery, the Chinese Gazebo, the eagle column, the triumphal arch. With no maintenance works at green areas, the park and water shores turned wild [Fijałkowski 1973]. After World War II the park, managed by the National Museum in Warsaw, was an object of a comprehensive revalorisation supervised by Gerard Ciołek. Training and enhancement works were held at the shore of Wilanów Lake, and the routes inside the park were rebuilt. However, the works were hampered by floods, including one with very high water in 1947. Further conservatory works were implemented in 1960–1964 with renovation of all buildings, deepening of the North Bay and its connection to re-purified lake waters [Fijałkowski 1973]. From mid-1970s until the 21st century, contamination of Wilanów Lake grew dramatically due to draining of precipitation and industrial wastewater to Służewiecki Stream, some of it containing compounds of nitrogen, phosphorus and heavy metals,

chlorides, petroleum derivatives and dyes), leading also to eutrophication of the stream. Nevertheless, the Museum tried to remove waste from the water regularly, to successively exchange the paling enhancing the shores and to cut plants in their proximity.



Source: Collection of the National Digital Archives of Poland (inv. no. 3/2/0/-/8956/1)

Fig. 4. Warsaw. Column with the Polish eagle in the Wilanów Palace Garden, 1940

In 2009–2011, revalorisation works were implemented in the southern part of the park, designed by Zbigniew Myczkowski and Jerzy Wowczak. After the flood of 2010, embankments along Vistula near Wilanów and Konstancin were enhanced and heightened, reducing water flooding. Since then, only minor floods were recorded in the park, related to intensive precipitation, and increased flow of water from Służewiecki Stream to Wilanów Lake.

### 3.2. Physiographic and habitat conditions

The North Landscape Garden of Wilanów Palace covers an area of 5.3 ha. It is characterised by diversified landforms. The escarpment running through its centre divides the park into upper and lower areas. The upper area is flat and stretches along the north-south axis on the western border of the park. The lower area slopes at different gradients towards the north and east to the water bodies surrounding it. A wide and gentle bank

is in the southern part, with a narrow and steep one in the northern part of the park. Additionally, in the eastern part there is a man-made dyke that separates Wilanów Lake from North Bay. The difference in elevation between the highest and the lowest point of the park is approx. 6.5 m. The park is in the continental climate zone and influenced by the urban microclimate of Warsaw. A specific and unfavourable local feature is the low average total annual precipitation, ranging from 500 to 550 mm [Kozłowska-Szczęśna et al. 1996]. The park is formed on alluvial soil made of loose sands and marsh-alluvial silts in the coastal zone. Although on soil maps it is classified as forest soil, it has an exceptionally low content of humus (1–2%) and nutrients, as well as an acidic reaction (pH 5.0–6.0). Moreover, it is highly permeable and thus characterised by low ability to retain water, which means that it may be periodically or permanently too dry, depending on rainfall during the growing season [Lisowska et al. 1993]. The potential natural vegetation for the area (Fig. 5) under study includes subcontinental oak-hornbeam forest communities *Tilio-Carpinetum calamagrostietosum* (upper and lower areas of the park), as well as willow-poplar marsh *Salici-Populetum* and riverside wicker *Salici Triandro-viminalis* (Northern Dike, coastal zone of Wilanów Lake and North Bay). The vegetation landscape is characteristic of old parks, with remnants of tree stands and natural features [Lisowska et al. 1993].

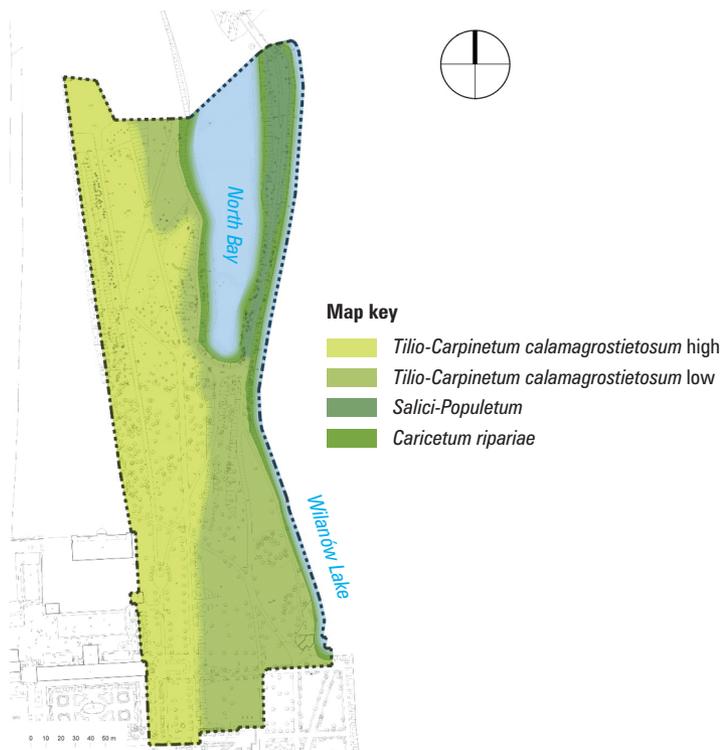


Fig. 5. The potential natural vegetation for the North Landscape Garden

### 3.3. General characteristics of herbaceous vegetation

The herbaceous vegetation in the North Landscape Garden covers a small area of approx. 9500 m<sup>2</sup> concentrated in the north-western part of the park and in the remains of the historic plant bed near the Pump House. Herbaceous vegetation covers in total 39% of the park's area (Fig. 6). The composition of plant species is mixed, i.e., they represent natural and anthropogenic communities.

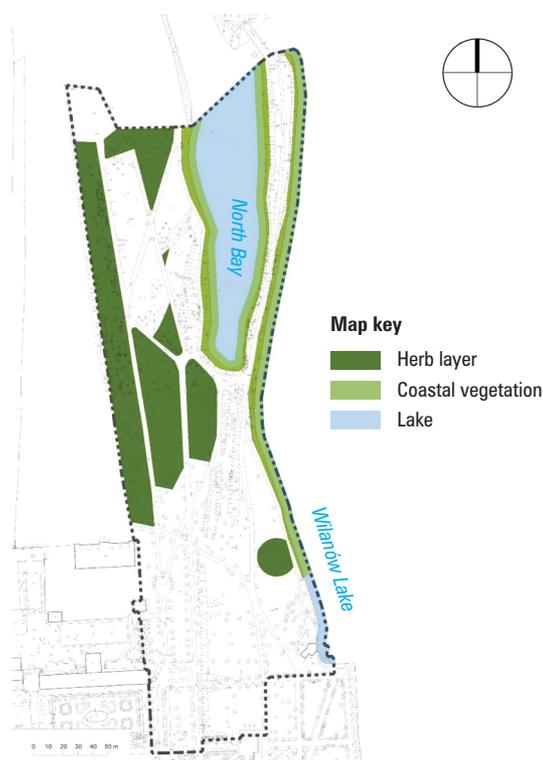


Fig. 6. The herbaceous vegetation in the North Landscape Garden

In the early spring (March) and spring (April–May), the following species stand out in the ground cover: *Anemone nemorosa* (Fig. 7), *Anemone ranunculoides*, *Corydalis solida*, *Crocus flavus*, *Crocus vernus* (Fig. 8), *Ficaria verna*, *Gagea lutea*, *Galanthus nivalis*, *Isopyrum thalictroides*, *Primula elatior*, *Ranunculus auricomus*, *Viola reichenbachiana*. There are also species characteristic of nitrophilic communities: *Alliaria petiolata*, *Chelidonium majus*, *Geum rivale*, *Glechoma hederacea*, *Lamium album*, *Lamium purpureum*, *Urtica dioica*. Other species include, e.g., *Cardaminopsis arenosa*, *Erodium cicutarium*, *Galium aparine*, *Hieracium pilosella*, *Veronica arvensis* and plants accidentally introduced from ornamental gardens surrounding the landscape park, e.g., *Convallaria majalis*, *Doronicum orientale*, *Hemerocallis ×hybrida*, *Iris* sp., *Myosotis*

*sylvatica*, *Ornithogalum nutans*. In the coastal zone, spring primarily brings the growth of rushes formed by *Carex riparia*, *Glyceria maxima* and *Phragmites australis*. After the leaves on trees and shrubs have fully developed, the geophytes go into dormancy, leaving bare ground.



Photo: Ł. Przybylak

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Fig. 7. *Anemone nemorosa* in the Wilanów North Landscape Garden



Photo: Ł. Przybylak

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Fig. 8. *Crocus vernus* and the view of the Pump House in the background

During the summer (June-August) the ground cover in the park is adorned with blooming flowers: *Achillea millefolium*, *Aegopodium podagraria*, *Ajuga reptans*, *Campanula rapunculoides*, *Epilobium hirsutum*, *Geranium sylvaticum*, *Hypericum perforatum*, *Impatiens parviflora*, *Lamium album*, *Lathyrus sylvestris*, *Lotus corniculatus*, *Plantago major*, *Prunella vulgaris*, *Ranunculus auricomus*, *Saponaria officinalis*,

*Solidago canadensis*, *Viola reichenbachiana*. Apart from them, the nitrophilic species remain ornamental because of their flowers, e.g., *Chelidonium majus*, *Geum urbanum*, or foliage, e.g., *Alliaria petiolata*, *Urtica dioica*. Summer is also the peak time for the growth of ferns, especially *Dryopteris filix mas*. Dense rushes are formed, for example, by *Carex riparia*, *Glyceria maxima*, *Nasturtium officinale*, *Phalaris arundinacea*, *Phragmites australis*, *Ranunculus lingua*, *Rumex hydrolapathum*, *Sium latifolium*, *Typha latifolia*.

Based on the identified species, the habitat was classified as subcontinental oak-hornbeam forest (*Tilio-Carpinetum calamagrostietosum*) and willow-poplar marsh (*Salici-Populetum*). These communities have an admixture of synanthropic and ornamental plant species, which, although present at a low frequency, indicate human interference. The species composition of the coastal zone vegetation indicated the eutrophic type of water and the presence of coastal sedge rush communities (*Caricetum ripariae*).

#### 3.4. Guidelines on the management of herbaceous vegetation

The list of herbaceous species for the North Landscape Garden was prepared with a strong focus on the principles of conservation with respect to spatial forms and landscape features, with simultaneous reference to the composition of natural plant communities and preservation of the existing natural qualities. The proposed species were assigned to specific areas according to the previously identified habitats. The list includes dominant species that should dominate the designed herbaceous vegetation, and coexisting species to be introduced as an admixture to enhance the diversity of the composition.

1. The upper and lower areas of the park (subcontinental oak-hornbeam forest):
  - a. dominant species: *Actaea spicata*, *Aegopodium podagraria*, *Ajuga reptans*, *Anemone nemorosa*, *Anemone ranunculoides*, *Asarum europaeum*, *Asperula odorata*, *Calamagrostis arundinacea*, *Cardamine bulbifera*, *Carex digitata*, *Carex pilosa*, *Chaerophyllum temulum*, *Corydalis solida*, *Dactylis polygama*, *Ficaria verna*, *Gagea lutea*, *Galanthus nivalis*, *Galeobdolon luteum*, *Galium odoratum*, *Galium schultesii*, *Glechoma hederacea*, *Hepatica nobilis*, *Lathyrus vernus*, *Melampyrum nemorosum*, *Melica nutans*, *Mercurialis perennis*, *Mycelis muralis*, *Phyteuma spicatum*, *Poa nemoralis*, *Polygonatum multiflorum*, *Pulmonaria obscura*, *Ranunculus auricomus*, *Ranunculus cassubicus*, *Scrophularia nodosa*, *Stellaria holostea*, *Viola minor*, *Viola reichenbachiana*.
  - b. coexisting species: *Adoxa moschatellina*, *Campanula latifolia*, *Campanula rapunculoides*, *Campanula trachelium*, *Carex umbrosa*, *Convallaria majalis*, *Galium verum*, *Oxalis acetosella*, *Paris quadrifolia*, *Viola mirabilis*.
  - c. ferns: *Athyrium filix-femina*, *Dryopteris carthusiana*, *Dryopteris filix-mas*, *Phegopteris connectilis*, *Polypodium vulgare*.
  - d. climbers: *Calystegia sepium*, *Fallopia dumetorum*, *Humulus lupulus*, *Silene baccifera*.

## 2. Dyke (willow-poplar riparian forest):

- a. dominant species: *Aegopodium podagraria*, *Anthriscus sylvestris*, *Artemisia vulgaris*, *Astrantia major*, *Cirsium arvense*, *Equisetum arvense*, *Eupatorium cannabinum*, *Fallopia dumetorum*, *Galeopsis tetrahit*, *Galium aparine*, *Geum rivale*, *Glechoma hederacea*, *Lamium maculatum*, *Myosoton aquaticum*, *Phalaris arundinacea*, *Rubus caesius*, *Saponaria officinalis*, *Senecio fluviatilis*, *Stachys palustris*, *Symphytum officinale*, *Trollius europaeus*, *Urtica dioica*.
- b. ferns and horsetails: *Dryopteris cristata*, *Dryopteris filix-mas*, *Equisetum fluviatile*, *Equisetum palustre*, *Matteuccia struthiopteris*, *Osmunda regalis*, *Thelypteris palustris*.
- c. climbers, dominant species: *Calystegia sepium*, *Humulus lupulus* and coexisting species: *Fallopia dumetorum*, *Silene baccifera*.

## 3. Coastal zone – waterside vegetation:

- a. dominant species: *Alisma plantago-aquatica*, *Eleocharis palustris*, *Geranium sylvaticum*, *Glyceria maxima*, *Phragmites australis*, *Rumex hydrolapathum*, *Schoenoplectus tabernaemontani*, *Sium latifolium*, *Typha latifolia*.
- b. coexisting species: *Carex acutiformis*, *Carex disticha*, *Carex paniculata*, *Carex pseudocyperus*, *Carex riparia*, *Carex stricta*, *Carex vulpina*, *Cladium mariscus*, *Galium palustre*, *Iris pseudacorus*, *Lysimachia thyrsiflora*, *Phalaris arundinacea*, *Ranunculus lingua*, *Schoenoplectus lacustris*, *Typha angustifolia*.

### 3.5. Compositional guidelines

In landscape gardens, the character and features of the ground cover were closely related to the type of spatial components and the existing structure of the tree stand. For the North Landscape Garden of Wilanów Palace, five fundamental components were identified, for which the following compositional guidelines were defined:

1. Under the groups of trees and shrubs the layer of herbaceous vegetation should be poor in species and consist of loosely spaced clumps or patches with native species of medium or tall growth, providing only ground cover and a neutral background for trees and shrubs. The species composition should be randomly diversified (from single- to multi-species) but distinguished by durability and a uniform year-round display.
2. On flower beds and borders (under the canopy of trees and shrubs) the layer of herbaceous vegetation should be composed of native and introduced species, growing in clumps or patches of various heights and shapes. On the outer side of beds vegetation should go down in a cascade towards flowering plants and plants with ornamental foliage. Vegetation should be composed of two or more species and include plants that are perennial and ensure year-round display. Currently, the only existing bed in a relic form has been preserved in the south-eastern part of the park, near the Pump House.

3. In large communities formed by trees and shrubs (woodlots, groves, and wild promenades) herbaceous vegetation should maintain a natural, forest-like, or semi-natural character, and be formed only by spontaneously regenerating/propagating native species. If it is necessary to emphasize the attractive look of a selected part of the park, planting ground cover or adding ornamental species is allowed. Vegetation should be maintained in the form of clumps, small patches, or large patches of medium to high growth. Multispecies vegetation should be perennial, semi-perennial or ephemeral, creating seasonal or year-round display.
4. Herbaceous vegetation around park buildings should be mixed, but poor in species, consisting of both native and introduced species. It should primarily provide a background for the buildings, emphasizing their attractive look in the landscape. One exception comprises structures for which vegetation is an integral element that determines their character, e.g., boulders and the Lapidarium by Wilanów Lake.
5. On the shores of Wilanów Lake and North Bay the waterside vegetation should be natural and consist of native species. Due to the high-water eutrophication and the risk of overgrowing of North Bay and Wilanów Lake, plant development should be constantly controlled.

### 3.6. Guidelines on implementation, care, and use

The ground vegetation in the park in typical arrangements does not achieve a complete closure throughout the growing season. It looks very attractive in the early spring, while in the summer its cover rate reaches 70 to 80% [Zimny 1967]. This is due to the seasonality of the ground vegetation and the disappearance of geophytes, which often leave the soil exposed. However, the cover of herbaceous vegetation should be increased by eliminating sodded areas.

Before starting the works on the herbaceous vegetation in the North Landscape Garden of Wilanów Palace, it is recommended to perform all the necessary treatments in the stand, including cutting down trees to improve the composition and health of the stand, planting new specimens, and crown reducing and pruning. Gradually, work should aim at thinning the crowns to allow for better light penetration, which will create conditions promoting the growth of herbaceous vegetation. Optimally, all construction and earth works should be completed, since they are usually associated with the destruction of herbaceous vegetation, which in the process of natural succession is quickly replaced by synanthropic plants. Through this, it will be possible to identify valuable species that should be preserved, but also undesirable species that should be removed.

Considering implementation, the most important postulate is to preserve the existing, mature layer of herbaceous vegetation, which will help maintain the ability of self-regulation and reduce the need for interventions during later care. Changes in the ground vegetation of the park should involve promoting selected species by sowing or planting them along with removing or destroying undesirable species. This work should be conducted in late spring and early autumn.

The first years of the development of the designed ground cover in the park require exceptional care in the planting and sowing of the desired species, to obtain maximum density as quickly as possible. Any gardening activities should be limited, including digging, raking leaves, and feeding with mineral fertilizers, because they can have harmful effects on the park ground cover and cause damage to above ground and underground organs. The propagation of undesirable species, and the development of synanthropic or nitrophilic vegetation, etc. should be controlled. Considering the use of the park, trampling should be limited because it reduces soil aeration, as well as walking and picking plants, since all these activities have a negative impact on the development of young seedlings.

#### 4. Conclusions

The correct formation of ground cover in a historic garden requires well-thought-out design and implementation accounting for historic and natural qualities. The best decorative effects and the benefits mentioned in the introduction will be possible only by the exploitation of the existing habitat conditions and selecting the appropriate plants, both in terms of natural environment and composition. This selection should be based on the species characteristics of the primary natural communities growing in the study area and be closely related to the type of spatial elements and the structure of the tree stand. These mature systems of herbaceous vegetation, although transformed by human impact, should be preserved, and strengthened by protecting selected desirable plant species.

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