

# SUSTAINABLE GRASSLAND MANAGEMENT IN HISTORIC GARDENS

## METHODOLOGY AND BASICS

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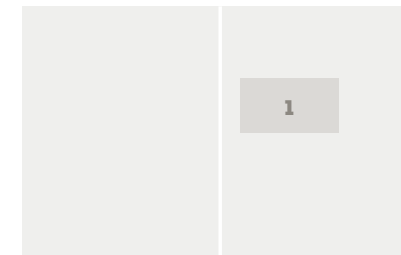
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### INTRODUCTION AND CONTEXT

The possibilities for research and restoration of the often damaged and fragmented historic gardens in Hungary were relatively limited in the past, but thanks to the funds provided by the European Union, more than 20 gardens were reconstructed between 2007 and 2013.<sup>1</sup> Since then 18 further sites had the chance for partial restoration (covering at least the surroundings of the mansions) in the framework of the National Mansion and Castle Programme.<sup>2</sup> Historic gardens have an outstanding importance in terms of heritage conservation, tourism potential and the promotion of historic garden heritage for the public. However, as a result of the restorations carried out, the extent of the areas requiring long-term maintenance has increased, which can be a challenge for the garden managers. (Figure 1.) Nowadays, the role of our landscape gardens has changed significantly, and because

of this, their long-term management requires adequate preparation established on a scientific basis. The restoration process requires the integration of several different approaches from different disciplines. This complexity of approaches, appears accordingly in the case of garden management, so first we have to find the suitable framework for sustainable management and maintenance. In order to achieve this, we must synthesise the accumulated knowledge of the current management regime, which is the most important part of this complex duty. Based on previously published experiences, the main task of conservation is clearly the restoration of the spatial layout. This means that garden areas that have been neglected and afforested over the last decades, must be cleared of the overgrowth, thereby revealing the visual structure of the gardens.<sup>3</sup> From practical point of view, and also regarding the fundamental concept that regards gardens as living, plant-based creations,

<sup>1</sup> [https://www.palyazat.gov.hu/tamogatott\\_projektkereso](https://www.palyazat.gov.hu/tamogatott_projektkereso) (2021.01.20.) EU-2007-2013, KEOP-3.1.3/2F/09. and KEOP-3.1.3/2F/09-11  
<sup>2</sup> <http://nkvp.hu/> (2021.01.20.) NKVP=National Mansion and Castle Programme  
<sup>3</sup> Szikra É. (2000) *A tájképi kertek rekonstrukciós, helyreállítási lehetőségei és módszerei* in (Edited by) Galavics, G. (2000) *Historic Gardens in and Around Hungary Studies on Research and Restorations*. Budapest. pp. 116-126.



**Fig. 1:** Park of the Festetics Mansion before<sup>5</sup> and after the restoration<sup>6</sup>



it is obvious that constant management and maintenance is essential in the conservation of the garden heritage.<sup>4</sup>

Based on the experience of daily practice, and Hungarian literature on green space management and maintenance,<sup>7</sup> it is clear that the conservation of the garden heritage is currently based on horticultural approach and technologies. Works of this kind, regardless of their intensity, usually appear in the management budget as a surplus expenditure. Following the restoration works, garden areas that have to be maintained expand, thus the resources for maintenance tasks need to be increased as well. This fact puts the management in a difficult situation, because with a usually tight budget, when maintenance work cannot be carried out as necessary, the heritage assets might again deteriorate and the restoration work go to waste. Solving this problem is a huge practical challenge. In order to develop a widely applicable solution, a proper scientific

basis can be very useful. Therefore, the authors' collaborative research is aimed to find landscape solutions for heritage protection by sustainable maintenance. This article introduces the basic methodology of the topic.

In order to examine the methods of the so-called sustainable conservation management of historic gardens, which is the aim of the research, it is necessary to analyse the basic materials of the study. Due to the variety of historic garden styles and the different management requirements related, the research is limited to English gardens located in the historical territory of Hungary. One of the reasons for the specific focus of the study is the typology of Hungarian historic gardens. The majority of our historic gardens are remains of English style gardens, so the results will be widely applicable to develop practical solutions. Another important reason is the main concept of English gardens: these aim to create idealised landscapes, where humanity

<sup>4</sup> ICOMOS (1982) *Florence Charter, Florence*. Article 1.

<sup>5</sup> Google Earth satellite imagery, 2021 (2021.01.20.)

<sup>6</sup> Google Earth satellite imagery, 2009 (2021.01.20.)

<sup>7</sup> Kiácz, Gy., Szendrői, J. (1980), *A zöldfelületek fenntartása*, Budapest.

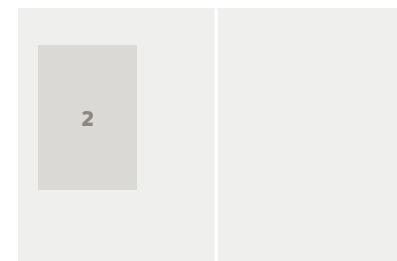
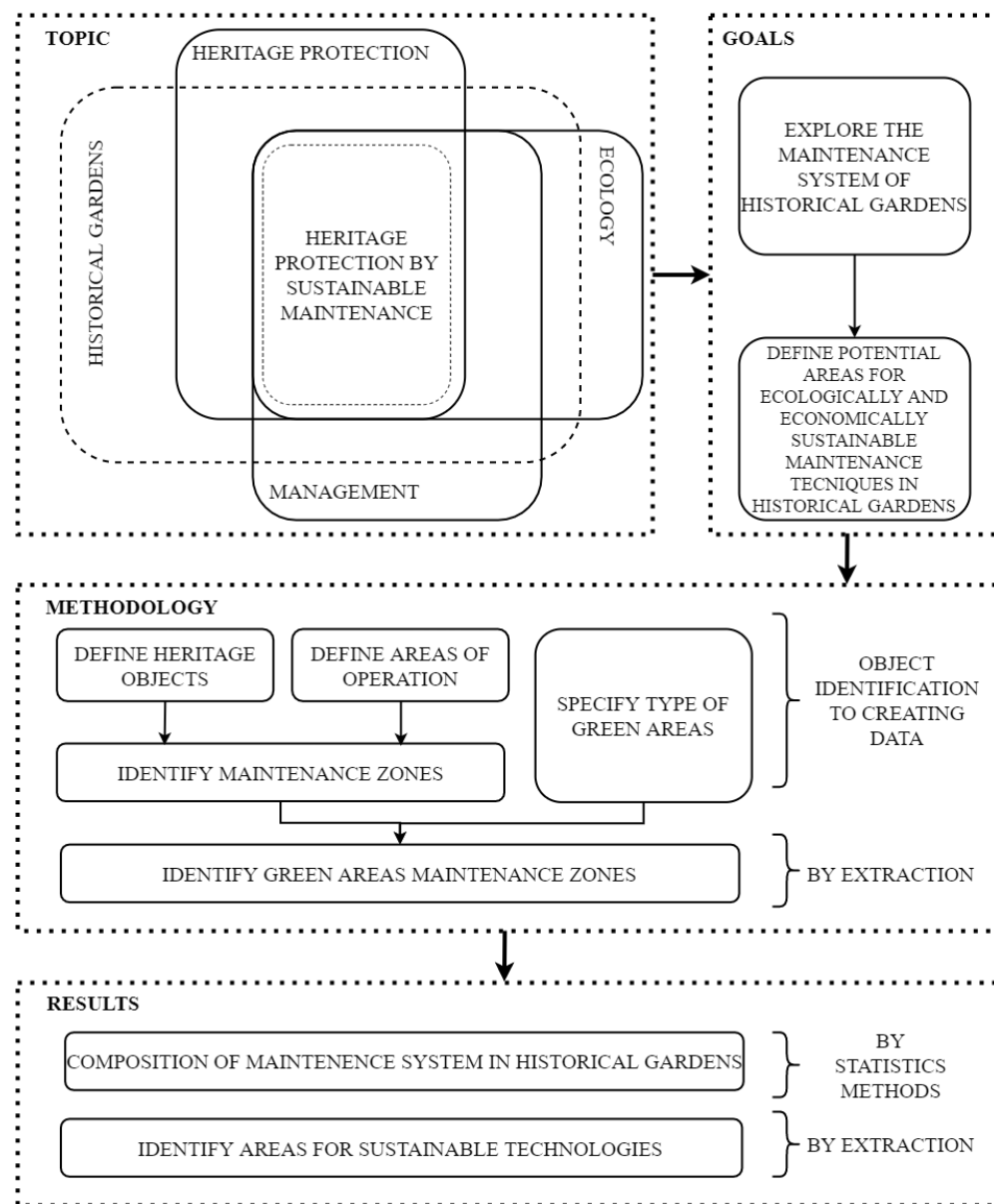


Fig. 2: Methodology

Which are the parts of a garden where sustainable technologies can be applied?

This paper describes a methodology in development, which can be a basis to find answers to these questions. The methodology will be presented through a site analysis and the evaluation of the research approach. The site which has been chosen for this study is the park of Andrassy Mansion in Betliar, Slovakia. The park remained in a good state of repair, although further reconstructions are needed. With its current spatial layout it is suitable for introducing our methodology.

#### METHODOLOGY AND CURRENT RESULTS

In order to develop the methodology (Figure 2.), first of all it is necessary to define the elements and definitions of the topic, i.e.: What do we mean by sustainable management in heritage conservation? What methods can be used to explore it?

In the research, by the term management we mean a general, complex system that operates the whole site the garden is part of. And by the term maintenance, we mean the professional tasks, the applied technologies and processes to take care of the garden.

Whether talking about a classical horticultural or a comprehensive sustainable management (which became more significant in the days of urbanisation, and climate change),<sup>10</sup> the need for management of gardens is essential, based on their duality: on the one hand it is a man-made object, on the other hand it is a natural and living creation.<sup>11</sup> The management of historic gardens adds

a new layer to this principle, whereby garden management is important not only because of the function, recreation or representation, but is also essential in the preservation of historic values, ergo in fact conservation management is the basic form of management in historic gardens.<sup>12</sup> As explained earlier in the introduction, there is a need for increased sustainable management activity due to recently executed restoration works, which require more financial resources than what are realistically available in practice. If we think about the gardens' former role, we can easily formulate the answer, why it is so challenging to get enough resources for maintenance today. The gardens were once the ornamental gardens of families with a prosperous manorial background. As an ornamental garden, the maintenance was a general expense that could be covered by the economic prosperity of the same manor or the financial background of the family.<sup>13</sup> It is also important that the technology and manpower of the maintenance was also partially available by the agricultural staff of the manor.<sup>14</sup> Nowadays, this economic integrity of the manors and such financial background is lost. Thereby, the maintenance of the gardens is a societal responsibility, given by their historic significance. The need for proper financing of garden management without adequate resources requires us to find sustainable solutions. Therefore, we need to explore how can we understand sustainability in the context of garden management and maintenance. For this part of the study, the identification and presentation of the three pillars of sustainability proved to be the right choice.

- <sup>10</sup> Báthoryné Nagy, I., Gergely, A., Bálint, K. (2019) Fenntartható és klímadaptív városi gyepfenntartás Veszprém közterületein (2016-18) és annak hatása a gyeppek diverzítására, in (Edited by) Fazekas, I., Lázár, I. (2019) Tájak működése és arculata, pp. 337-342.
- <sup>11</sup> Ormos, I., (1955) A kerttervezés története és gyakorlata, Budapest. pp. 25-26.
- <sup>12</sup> (Edited by) Watkins, J. Wright, T. (2007) The Management & Maintenance of Historic Parks, Gardens & Landscapes - The English Heritage Handbook, London. pp. 249-304.
- <sup>13</sup> Takács, K. (2017) Uradalmi kertészetek a 19. századi Magyarországon, doctoral dissertation, Budapest. pp. 84-85.
- <sup>14</sup> Bálint, K. (2020) A gyömrői Teleki-kastély parkjának története a kezelés tükrében in (Edited by) Fodor, M., Bodor, P. (2020) SZIENTIFIC meeting for young researchers, pp. 81-92., Alföldy, G. (2015) A dégi Fesztetics-kastélypark, Budapest. p. 66.

and nature can co-exist in harmony.<sup>8</sup> English landscape gardens seem to us to be optimal models for investigating the issue of sustainable garden management, since the idealised landscape of the 19<sup>th</sup> century can be characterised by proximity to nature, once based on naturally applied, nowadays so-called, ecological principles, to which the human activity is added. Moreover, besides the economical and ecological aspects, the artistic factor of the gardens is a further main element as a result of social need. These components of sustainability clearly appear in the ideology of designed landscapes. After defining the material of the research, we had to study the restoration processes. As mentioned earlier, conclusions can be drawn from experiences of

restoration practices. One of the most significant goals is the restoration of the spatial layout: to define and restore the ratio of historical grasslands and woodlands, and the original composition transforming the neglected site.<sup>9</sup> That is why the research focuses on gardens with recently restored spatial layout or with the spatial layout well preserved. After reviewing the relevant research materials, and in order to define the garden's sustainable management regime, we had to develop a methodology first. We had to define where to start the work in order to find answers to the following questions: What can be considered as heritage feature in a garden? How can we define the levels of maintenance intensity required for different parts of a garden?

- <sup>8</sup> Buttlar, A. (1989) *Der Landschaftsgarten Gartenkunst des Klassizismus un der Romantik*, Köln. pp. 20-23.
- <sup>9</sup> Alföldy, G. (2013) *Történeti kertek a változás közelében in Műemlékvédelem LVII./6.* pp. 385-399.

The societal pillar of sustainability is clearly justified by the historic value of the gardens, based on the Florence Charter, "A historic garden is an architectural and horticultural composition of interest to the public from the historical or artistic point of view."<sup>15</sup> Accordingly, maintenance is also essential from a societal point of view, so preservative management and maintenance of these values, in an authentic way, became one of the priorities of the research. The economic aspect of sustainability refers to maintenance technologies with less demand on resources, and can be profitable by nature-friendly agricultural practices or sustainable forestry methods.<sup>16</sup> This can have a beneficial effect on the management regime from the aspects of finance, or tourism. It is important to note, that the parks were never, even at their heydays, been self-sustaining, ergo this cannot be expected nowadays.<sup>17</sup> Finally, the aspect of ecological sustainability can be measured mainly by the results of low-maintenance techniques, which are applied on the semi-natural habitats.<sup>18</sup>

The above detailed basic context will define the primary research questions for the case study site analysis, which tries to analyse and identify the current maintenance structure of the parks in order to detect potential areas where alternative solutions, which are both economically and ecologically sustainable, can be applied, while preserving the heritage value. To formulate answers to these questions, we have collected data through field surveys and map analyses. The base map, on which the quantitative elements can be identified, was created using measurable orthophotos,<sup>19</sup> which include the canopy level, and an official land registry map, which displays the boundary of the case study site.

In order to describe the maintenance structure of the site, first it is necessary to identify the objects of historical interest, the functional or operational

units, and their environment. These components are identified as shown in Table 1, whether talking about buildings and their surrounding areas, pleasure grounds, walkways, garden structures, other structures, sports grounds, office or accommodation buildings.

Subsequently, also according to Table 1, each garden areas and features are classified into three categories according to their maintenance level required: Intensive Maintenance Category 1 was given to the representative areas of high priority, which include the surroundings of the mansion, the pleasure ground with its flower beds, and other flowerbeds in its vicinity. Additional historic objects, service facilities, walkways (irrespective of the type of paving) and their surroundings are classified into Intensive Maintenance Category 2, and finally the remaining green areas are classified into Extensive Maintenance Category. The definition of the surrounding environment of each object was based on two criteria: firstly, by adapting the historical layout of the garden. Secondly, by easy-to-define boundaries which do not require any special preparation before the actual work starts. In the study, if there are no other features, the surrounding area means the single width of a mower tractor (1.25 m) along walkways and garden structures, and the double width of a mower tractor (2.5 m) around the buildings. Differentiated maintenance within these contours is relevant for visitors and park users. Both professional experience and related research have shown that today's park visitors appreciate extensive, nature-friendly solutions much more, if there are visible signs of maintenance. This way, extensive surfaces do not give the impression of neglect.<sup>20</sup>

Some elements, namely the buildings and the water system, have not been examined in this study due to their special maintenance needs.

**15** ICOMOS (1982) *Florence Charter, Florence*. Article 1.

**16** (Edited by) Kozák, L. (2012) *Természetvédelmi élőhelykezelés. Mezőgazda Kiadó, Budapest*. pp. 92-225.

**17** Takács, K. (2017) *Uradalmi kertészetek a 19. századi Magyarországon, doctoral dissertation, Budapest*. pp. 84-85.

**18** (Edited by) Kozák, L. (2012) *Természetvédelmi élőhelykezelés. Mezőgazda Kiadó, Budapest*. pp. 92-225.

**19** <https://www.geoportal.sk/>, (2020) *Orthophoto*

**20** Konijnendijk, C. (2012) *Between fascination and fear - The impacts of urban wilderness on human health and wellbeing in Socialmedicinsk tidskrift 3/2012* pp. 289-295.



**Table 1:** Classification of park elements

Component and/or garden area	Intensive Category I.	Intensive Category II.	Extensive Category	Unclassified
mansion				X
mansion's immediate environment (paved surfaces defined by the historical layout)	X			
pleasure ground (perennials, annuals, hedges, lawn and shrubs)	X			
other flowerbed (perennials, annuals, hedges, lawn and shrubs)	X			
walkways (solid pavement, gravel or without surfacing)		X		
lanes along walkways (in a width of a mower tractor)		X		
garden structures of historic value (e.g. ornamental pool, well etc.)		X		
immediate environment of garden structures of historic value (according to the historical structure, and in the double width of a mower tractor)		X		
other garden structures (storage, service buildings etc.)		X		
immediate environment of other garden structures (according to the use, and in the double width of a mower tractor)		X		
garden structures of historic value (pavilion, staffage buildings, waterfalls etc.)				X
immediate environment of buildings of historic value (according to the historical structure, and in the double width of a mower tractor)		X		
service buildings (office building, accommodation etc.)				X
immediate environment of operational buildings (according to the use, and in a double width of a mower tractor)		X		
grasslands			X	
tree shaded grasslands				
woodlands, with three levels of vegetation			X	
water system and it's equipments				X

By mapping and classifying the objects and their surrounding areas into management classes, the resulting areas can highlight the management composition of the garden. (Figure 3) This way, the components also became measurable. In the following sections, the study focuses on the green areas of the case study garden. Because of the principles described earlier, the research is mainly concerned with the spatial layout of the garden, which is defined by the woodlands and grasslands. Thus, once the management structure of the garden has been defined, it will be possible to find further answers to our research questions.

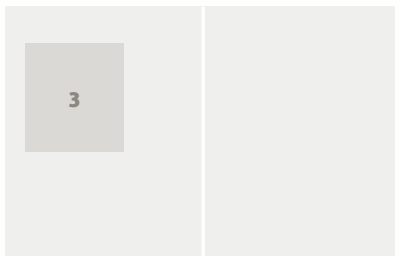
The next step is the classification of green areas into three categories: ornamental planting, grasslands, and woodlands with three levels of vegetation. (Table 2) This classification refers to the ground level surfaces, but later, the addition of a layer of trees will be necessary to complete the methodology. For example, in some cases historical tree

specimens may be located at extensive areas, and still require intensive care.

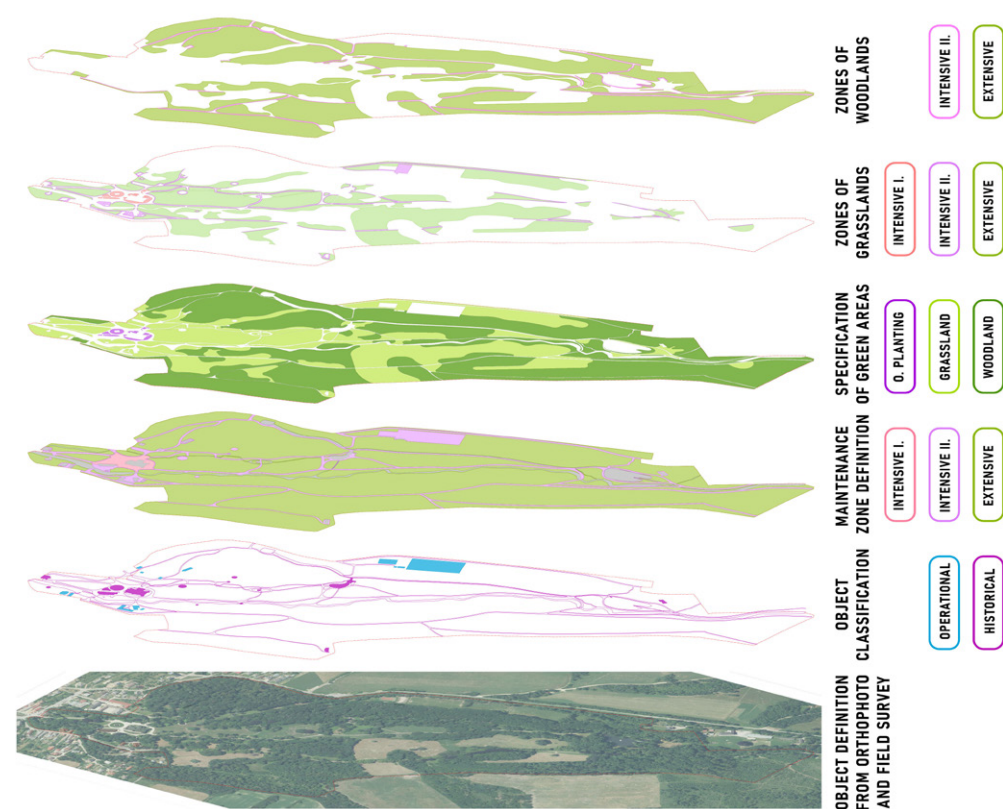
Conclusions can be drawn from the study by defining the different maintenance zones, examining the composition of the vegetation, and finally overlapping the vegetation and management zones. We can easily oversee the maintenance structure and the green areas of the whole site on the map, and draw the conclusion: a significant part of the garden can be managed extensively, while preserving the historic features.

As Table 3 shows, only 1% of the total garden area belongs to the Intensive Maintenance Category 1, while functional areas, environments of secondary importance, historical and service areas represent only 10.3%. In contrast, extensive management zones cover 83.3% of the garden area. Looking at the zonal distribution of green areas shown in Table 4, we can see the dominance of built elements on both intensively managed areas. Only 0.4% of the total greenery of the managed areas belong





**Fig. 3:**  
Differentiating and mapping the green areas and maintenance zones



to Intensive Maintenance Category 1 and only 5.1% to the Intensive Maintenance Category 2, while 94.6% of green spaces require extensive management.

As soon as we move on to the issue of green area management, we can see that both of the intensively managed areas have halved, because these are directly related to pavements and buildings. The extensive area is stagnating or increasing in proportion, which is not surprising since the intensive areas are designated along built structures, for the sake of heritage preservation. After all, intensive green area management is necessary only at 5.5% of the whole site. From these results, we can formulate answer for one of the research questions (which is also the basis of the doctoral research), and we can describe the maintenance structure of the garden. Before we present the next analysis, we emphasise the principle that intensively managed areas require horticultural management to preserve their quality, while extensively

managed areas may be suitable for alternative types of techniques that promote economical and ecological sustainability.

Regarding the classification (Table 2) of green areas, in the park of Betliar only 0.4% are ornamental plantings, and 35.9% open grasslands and grasslands with solitaire trees or clumps. The majority of the garden is woodland with three levels of vegetation, with a ratio of 63.7%. Looking at the classifications and analyses, it is not surprising that, whether we talk about grasslands or woodlands, the extensive form of management appears in areas with the largest extents.

In the case of grasslands (Table 5.), ornamental plantings are included in the Intensive Grass Maintenance Category 1, since intensively maintained lawn plays a significant role in the composition, even if it covers only 1.1% of the grasslands. Because of their special needs and low ratio in the spatial layout, the categories of perennial and annual areas were not part of the study. Intensive

Grass Maintenance Category 2 applies to 7.8% of grasslands. These areas will require a horticultural approach in the further studies about techniques to apply. On extensive areas, alternative methods can be examined which, according to other international and national experiences, are ecologically and economically sustainable, such as correctly timed mowing or traditional grazing. Intensive Maintenance Category 1 does not apply to any woodlands. Due to their role as a belt, woodlands are usually not connected to any area with extra high maintenance needs. Only a relatively low ratio of 3.6% requires intensive approach, according to the methodology applied for the study. This means, that an extensive and sustainable management can be applied to 96.4% of the woodland areas. (Table 6) In order to provide economic sustainability and increase the resources for management, it is also worth to examine the potential application of sustainable forestry.

#### GRASSLANDS AND HISTORIC GARDENS

The next phase of the research is the analysis of management options for extensive areas, in the case of grasslands and woodlands. Priority will be given to grasslands, as the tasks related to their maintenance are more frequent, and can be scheduled on daily or weekly basis. Firstly, we must have a deeper understanding of the grassland's role as a garden feature. The lawn, as a compositional element, whether in contemporary or historical compositions, is intended to be the basic surface from which other elements emerge. Its character is influenced by a number of factors, including the location in the garden layout, and the soil, bedrock, microclimate and vegetation.<sup>21</sup> Since the design of landscape gardens predominantly utilised plant compositions and incorporated the local landscape characteristics, their

grassland areas mainly correspond to the native landscape character. This is confirmed by numerous previous research, which contain archival photographs, descriptions and oral histories about semi-natural grasslands, often in combination with a conscious economic use.<sup>22</sup> As both the theoretical background and research experiences have proved the applicability of semi-natural grasslands in historic context, their integration into the research of sustainable management is well-founded. Grassland types are not only distinguished by the results the research on management zones, but also by the basic literature.<sup>23</sup> Earlier, our research showed, that less than 10% of grassland appear in the form of intensively maintained areas of lawn, and more than 90% as extensively maintained grassland areas. The former is possible to maintain under a strict horticultural approach, while the latter allows greater flexibility in both the height of growth and diversity. Due to their large extent, these areas can retain their compositional role as a base surface.

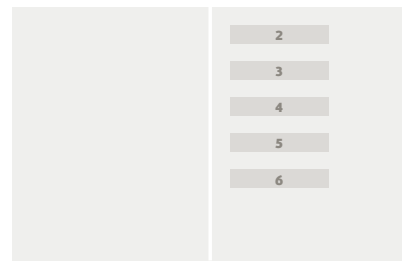
When looking at grasslands, it is important to know their significance in nature. Intact grasslands can only be found where there are no suitable conditions for a higher level of plant community in the habitat. Typical examples are habitats with a thin topsoil layer and sparse nutrients, such as those of lithophytes. Nevertheless, in the 19th century, grasslands covered a significant area of Hungary, almost 30%, as a result of human use as pastures or hayfields for livestock.<sup>24</sup> Due to this use of land, the biomass produced by the plants was not supporting the establishment of a higher level of plant community, but served as food for livestock. With the changes in agriculture, grasslands have been reduced enormously throughout Hungary, along with the natural grassland communities they include. Thus, the use of semi-natural grasslands is not only justified

<sup>21</sup> Ormos, I. (1955) *A kerttervezés története és gyakorlata*, Budapest. pp. 107-124.

<sup>22</sup> Jámbor, I. (2019) *Nebbi városligete*, Budapest, Alföldy, G. (2015) *A dégi Fesetics-kastélypark*, Budapest, Bálint, K. (2020) *A gyömrői Teleki-kastély parkjának története a kezelés tükrében in* (Edited by) Fodor, M., Bodor, P. (2020), *SZIENTIFIC MEETING FOR YOUNG RESEARCHERS*, pp. 81-92.

<sup>23</sup> Kíácz, Gy., Szendrői, J. (1980) *A zöldfelületek fenntartása*, Budapest. p. 61.

<sup>24</sup> (Edited by) Kozák, L. (2012) *Természetvédelmi élőhelykezelés. Mezőgazda Kiadó, Budapest*. pp. 92-94.



**Table 2:** Specification of green areas of the Andrassy Mansion Park in Betliar

**Table 3:** Maintenance zones of the whole site

**Table 4:** Maintenance zones of green areas

**Table 5:** Ornamental plantings (including lawn) and grasslands by management zones

**Table 6:** Woodlands with three levels of vegetation by management zones

by the design of gardens, but also by their ecological value. Horticultural and semi-natural grasslands also differ greatly in their composition: while traditional garden grasses are composed of monocotyledonous grass species in varying proportions depending on the seed mixture, semi-natural grass associations contain 20-40% of dicotyledonous plants. This makes their composition much more diverse, and it is known that greater diversity results in a more resilient plant community.<sup>25</sup>

To seize the benefits of semi-natural grasslands, we should pay attention to the establishment of a diverse grassland during the restoration process, by using specific planting technologies. This method basically uses seeds obtained from natural grass communities, *donor sites*, the properties of which fit to the gardens' habitats. This method can work by spreading seed-rich hay, collecting and dispersing seed, or even by collecting seed and using the collected material for cultivation.<sup>26</sup>

The traditional, horticultural approach in lawn management includes a number of tasks such as mowing, raking, cleaning, renovation, watering, fertilising, rolling, cutting, aeration, weed control, pest control and plant protection. The natural approach creates a more diverse and thus more stable community, that requires less intervention, both in terms of frequency and technology. The method is based on keeping the frequency of mowing low after the appropriate species have been planted, allowing perennial species to appear in the grassland. The perennials contribute to species richness and stability of the grassland by flowering and seed production.<sup>27</sup> By creating

semi-natural grasslands, the ecological value will increase and authentic agricultural technologies like grazing can be applied. It can be useful from management aspects through reducing the maintenance needs of the areas concerned. Moreover, it can have a positive impact on visitors of the site.

#### SUMMARY

In summary, we can see that the management of historic gardens is a complex task, which does not have a lot of scientific background in Hungary. To examine the topic, we had to start with the basics, and we had to choose a clear path to find answers to the most urgent questions. The daily practice had shown that the management of the spatial components, and within that the management of grasslands, is the greatest challenge in landscape gardens, which is why this became the main topic of the study. First of all, the research wanted to answer where we can find areas for alternative management. The methodology of the study was based on the different components of the garden, along with their surrounding areas. By classifying the elements and their surroundings we can define the management zones of the historic gardens in order to draw several conclusions. We can conclude that the presented methodology proved to be suitable to identify the management regime of historic gardens, which is fundamental to establish a scientific approach to garden management. The analysis shows that in the parks more than 90% of grasslands and woodlands are suitable for alternative management techniques.

**25** Báthoryné Nagy, I., Gergely, A., Bálint, K. (2019), *Fenntartható és klíma-adaptív városi gyepfenntartás Veszprém közterületein (2016-18) és annak hatása a gyeppek diverzitására*, in (Edited by) Fazekas, I., Lázár, I. (2019), *Tájak működése és arculata*, pp. 337-342.

**26** (Edited by) Török, P., Tóthmérész, B. (2015): *Ökológiai szemléletű gyeptelepítés elmélete és gyakorlata*, Budapest. pp. 69-77.

**27** Báthoryné Nagy, I., Gergely, A., Bálint, K. (2019), *Fenntartható és klíma-adaptív városi gyepfenntartás Veszprém közterületein (2016-18) és annak hatása a gyeppek diverzitására*, in (Edited by) Fazekas, I., Lázár, I. (2019), *Tájak működése és arculata*, pp. 337-342.

Area	Ornamental planting	Grasslands	Woodlands with three levels of vegetation
Green areas of the garden according to the cadastral map, and the current use.	Annuals, perennials, lawn, hedges, flowering shrubs etc.	Areas where grass maintenance techniques are currently applied.	Areas with woodland character, where trees, shrubs, and ground vegetation live together, and grass maintenance techniques can not be applied.
499 091 m <sup>2</sup>	1922 m <sup>2</sup> 0.4 %	179 300 m <sup>2</sup> 35.9 %	318 059 m <sup>2</sup> 63.7 %

Area	Int. maint. cat. 1.	Int. maint. cat. 2.	Ent. maint. cat.
Garden area according to the cadastral map, and the current use.	Areas with significant historic value: mansion environment, pleasure grounds and related elements.	Areas of historical elements around the park, and all other areas of regular use: walkways and their environment, service areas etc.	Other green areas where sustainable approaches can be examined.
566 411 m <sup>2</sup>	5663 m <sup>2</sup> 1.0 %	58 072 m <sup>2</sup> 10.3 %	472 040 m <sup>2</sup> 83.3 %

Area	Int. maint. cat. 1.	Int. maint. cat. 2.	Ent. maint. cat.
Green areas of the garden according to the cadastral map, and the current use.	Green areas of significant historic value: areas with annuals, perennials, lawn, hedges, flowering shrubs etc.	Green areas adjacent to historical elements around the park, and all other areas of regular use: lanes along walkways, immediate environments of historical and service buildings etc.	Other green areas where sustainable approaches can be examined.
499 091 m <sup>2</sup>	1923 m <sup>2</sup> 0.4 %	25 627 m <sup>2</sup> 5.1 %	472 040 m <sup>2</sup> 94.6 %

Area	Int. maint. cat. 1.	Int. maint. cat. 2.	Ent. maint. cat.
	Lawns in ornamental plant compositions.	Grass areas where the use or the historic feature requires continuous maintenance.	Actual grasslands where alternative techniques, and ecological approaches can be applied, without changing the historical layout.
181 223 m <sup>2</sup>	1922 m <sup>2</sup> 1.1 %	14 060 m <sup>2</sup> 7.8 %	165 444 m <sup>2</sup> 91.3 %

Area	Int. maint. cat. 1.	Int. maint. cat. 2.	Ent. maint. cat.
		Woodland edges which require management due to their usage, or historic value.	Actual woodlands where alternative techniques, forestry, and ecological approaches can be applied.
318 059 m <sup>2</sup>	–	11 445 m <sup>2</sup> 3.6 %	306 661 m <sup>2</sup> 96.4 %

The methodology can be a basis for future scientific research. Assessing the results of the work, we can conclude that further development of the methodology would be necessary. The integration of historic trees will form an additional layer. Once these are included, the next phase of the research will be the application of the research methodology on several other case study sites. The results are expected to vary to a certain extent, like the proportion of grasslands and three-layered vegetation, depending on the restoration level of the spatial structure. Some deviations can be expected in the ratio of the management zones, depending on the size of the parks.

The next planned phase of the research is the comparison of different techniques on the areas of extensively management

defined. In the case of grasslands, the main question is the applicability of sustainable, traditional grazing, and sustainable, well-timed mowing, while in the case of woodlands, that of nature-friendly forestry management, based on international experiences.<sup>28</sup> This part of the research will be based primarily on literature about grassland management and forestry, supplemented by interviews with farmers, foresters and green space managers who use similar technologies. Finally, these methods will be compared on the basis of their estimated man-hour requirements and the expected benefits of the semi-natural habitats as a result of maintenance technologies. ©

**28** (Edited by) Watkins, J. Wright, T. (2007) *The Management & Maintenance of Historic Parks, Gardens & Landscapes – The English Heritage Handbook*, London. pp. 249-304.