

FORMS OF APPLICATION OF GRASS–HERBACEOUS PLANT COMMUNITIES IN URBAN ENVIRONMENTS

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Abstract

Grass–herbaceous mixtures represent an important component of contemporary urban environments, contributing to ecological stability, aesthetic quality, and the overall resilience of cities. As urban areas increasingly face the impacts of climate change, the urban heat island effect, biodiversity loss, and growing maintenance demands for public spaces, the use of meadow-like vegetation as a designed landscape element is gaining particular importance. Grass–herbaceous plant communities provide a sustainable alternative to traditionally intensively mown lawns and offer a wide range of ecological, social, and economic benefits. This paper focuses on the forms of application of grass–herbaceous mixtures in urban environments, drawing on experiences and current trends observed in Slovak and Czech cities. It examines different types of plantings, including meadow mixtures for extensive areas, park lawns, specialized mixtures for dry or highly exposed sites, and plantings that combine aesthetic value with ecological function. The study analyzes the role of these vegetation elements in urbanized environments, particularly their contribution to supporting biodiversity, improving urban microclimates, enhancing rainwater retention, and reducing maintenance requirements. The findings highlight the potential of grass–herbaceous communities as multifunctional elements that can improve both the ecological performance and visual quality of urban landscapes.

Key words: urban greenery; grass–herbaceous plant communities; biodiversity; urban microclimate; sustainable urban landscape

Introduction

Urban green infrastructure constitutes a significant component of the urban environment, with the capacity to support biodiversity, deliver ecosystem services, and enhance the quality of life of urban residents. In the context of accelerating global urbanization, cities are assuming an increasingly important role in nature conservation and the maintenance of ecological balance. Consequently, urbanized environments are no longer perceived solely as drivers of environmental degradation but are increasingly understood as spaces with the potential to actively contribute to biodiversity conservation and the provision of ecosystem functions.

Despite this potential, the ability of cities to fulfil these functions is substantially constrained by the loss of green spaces due to redevelopment and urban densification (Trémeau et al., 2024; Haaland and van den Bosch, 2015; Vinczeová, Tóth, 2025; Hus, Pástorová, 2025; Tóth, Slobodníková, 2025), as well as by conventional approaches to urban green space management that often fail to incorporate ecological principles and the need to promote biodiversity (Aronson et al., 2017; Manninen, 2010; Norton et al., 2019). A typical manifestation of such management is the maintenance of green areas in the form of intensively mown lawns primarily intended for recreational use. These intensively managed lawns are characterized by frequent mowing, low vegetation height, and a homogenized structure, and they dominate both public and private green spaces in temperate-zone cities (Norton et al., 2019).

The extent of intensively managed lawns is considerable. In Swedish cities, they cover approximately 22.5% of the urban area, representing nearly a twofold increase compared to the situation 50 years ago (Hedblom et al., 2017), while similar proportions have been recorded in the United Kingdom (25%; Evans et al., 2009) and the United States (23%; Robbins and Birkenholtz, 2003). This trend highlights the dominance of intensively managed lawns in urban environments, which may be at odds with the objectives of biodiversity conservation and sustainable green space management. At the same time, remnant semi-natural grasslands within urban areas are increasingly fragmented and isolated, negatively affecting their ecological stability and functionality (Gilbert, 1989; Manninen, 2010).

Given these challenges, there is a growing emphasis on the need to transform urban green space management towards more ecologically functional approaches. One promising strategy is the establishment of meadow vegetation, which can be defined as extensively managed grasslands with low mowing frequency and typically containing a significant proportion of flowering forbs. Such stands can mitigate the negative impacts of intensive green space management, and their characteristics can

be achieved primarily through a reduction in mowing frequency, allowing existing plant communities to increase in height and in the proportion of flowering species (Leblanc-Gagné, Brice, Pellerin, 2025; Norton et al., 2019). In urban environments, various types of meadow (grass–herbaceous) communities can be integrated into landscape architectural design, combining ecological, aesthetic, and recreational functions while enhancing the attractiveness of urban spaces (Hus, Saková, 2025; Rózová, Pástorová, Kuczman, 2023; Bellérová and Hus, 2025).

A wide spectrum of grass–herbaceous communities is applied in urban settings, differing in species composition depending on site conditions, spatial function, and the desired aesthetic effect. In intensively used areas, species-poor, stable mixtures with a higher proportion of grasses are often employed to ensure resilience to disturbance and rapid regeneration. In contrast, more extensively managed areas—such as parks, residential green spaces, and urban fringe zones—frequently utilize species-rich flowering meadows with a high proportion of forbs, which support biodiversity and seasonal vegetation dynamics. A specific category includes mixtures designed for extreme site conditions, such as dry and shallow soils on green roofs or slopes, where xerothermic species adapted to water scarcity predominate. Contemporary landscape architectural practice also increasingly incorporates mixtures with a higher proportion of annual species to achieve a rapid aesthetic effect or to facilitate successional processes. The variability of these communities allows for flexible responses to diverse urban conditions while effectively integrating ecological, functional, and visual requirements (Hus, Saková, 2025).

Materials and method

The aim of this paper is to identify and analyze landscape architectural projects in urbanized environments in which grass–herbaceous communities constitute a significant compositional and functional element. Emphasis was placed on projects employing various types of grass–herbaceous vegetation in terms of species composition, structural arrangement, and management regimes. The selection included realized projects from the Slovak Republic and the Czech Republic to illustrate the diversity of approaches to the application of meadow vegetation in different types of urbanized environments. The analyzed examples included implemented projects from public spaces, parks, residential areas, and other urban sites in which grass–herbaceous communities were used as ecological, aesthetic, or spatial-forming elements. Attention was also paid to the mode of application of grass–herbaceous communities, distinguishing between the transformation of existing green spaces and their planned integration into new designs. The analysis focused on vegetation type, species composition, the proportion of grasses and forbs, spatial arrangement, site function, and management regime, particularly mowing frequency and maintenance intensity. The selected projects were examined and compared according to these characteristics to identify differences in the design and maintenance of grass–herbaceous communities in urban environments. The aim was not to provide a complete overview of all realizations, but to demonstrate the range of their application and their potential to support the ecological, aesthetic, and recreational functions of urban green spaces. For the purposes of this paper, the analyzed examples were also classified according to the principal types of grass–herbaceous vegetation used in urban environments. The classification considered vegetation composition, establishment method, visual effect, ecological potential, maintenance intensity, and the mode of application in existing green spaces or new designs. This typological framework served as a supporting basis for the comparison of the selected examples.

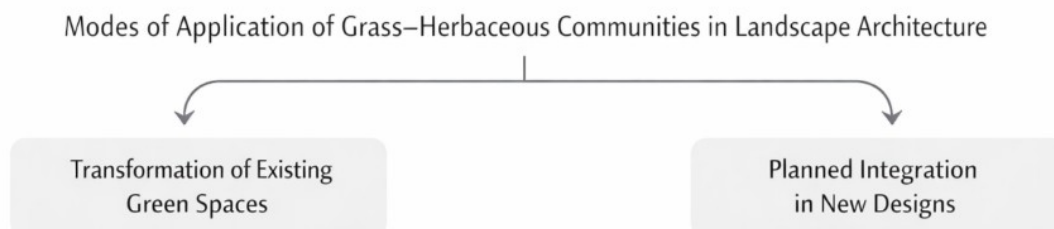


Fig. 1: Modes of Application of Grass–Herbaceous Communities in Landscape Architecture (author: Pástorová, 2026).

Tab. 1: Typology of grass–herbaceous vegetation used in urban environments and selected characteristics relevant to their application in landscape architecture.

Type of vegetation	Main composition	Visual effect	Ecological potential	Maintenance intensity
Annual mixtures	flowering Annual species, often with ornamental flowering effect	high	medium	high
Perennial mixtures	meadow Perennial meadow species, often including grasses and forbs	high	high	low–medium
Perennial mixtures with an annual species	Perennial mixtures with a proportion of annual species	high	high	medium–high
Grass-free / lawns	flowering Low-growing mowing-tolerant species	medium	medium	medium
Managed spontaneous vegetation	Existing or spontaneously developing vegetation regulated by mowing	low–medium	high	low
Designed communities combined systems	plant / Combination of sowing, perennial planting, and designed vegetation structure	high	high	medium–high

Results

The analyzed examples demonstrated that the application of grass–herbaceous communities in urban environments takes different forms depending not only on-site conditions, spatial context, functional requirements, and management regime, but also on the mode of their application within landscape architectural practice. In this respect, the selected projects could be divided into two principal categories: the transformation of existing green spaces and the planned integration of grass–herbaceous communities into new designs. Within these categories, the examples illustrated different approaches to the use of meadow vegetation, ranging from the conversion of intensively managed green areas to newly designed grass–herbaceous compositions incorporated into broader urban and landscape architectural concepts. Together, these projects demonstrate the broad range of possibilities for the application of grass–herbaceous communities in contemporary urban green space design.

• Transformation of Existing Green Spaces

This category included projects in which grass–herbaceous communities were introduced into already existing green structures or urban spaces to diversify vegetation composition, enhance ecological value, and modify the visual character of the site, with meadow vegetation applied as part of the regeneration, reinterpretation, or ecological transformation of previously established green areas; selected implementations comprised those designed or initiated by a site green space manager or a landscape architect, as well as cases where such communities occur naturally on the site and are maintained through appropriately set management practices.

Perennial meadow mixtures

Brno- zahrada Vila Löw-Beer

Grass–herbaceous community – category: herbaceous lawn with a spring flowering effect of dandelions. The grasses are enriched with dicotyledonous herbs. The area is used throughout the year for recreation, with a higher mowing frequency.

Annual flowering mixtures

Lanškroun – a frequent example is the integration of summer-flowering seed mixtures (utilizing annual herbaceous species) within urban areas. A representative case is the application of annual meadow plantings along road infrastructure corridors, where spatial constraints limit the use of other types of vegetation; at the same time, this type of vegetative element exhibits a high level of visual attractiveness and user preference within the space.

• Planned Integration in New Designs

The second category included projects in which grass–herbaceous communities were incorporated as a deliberate part of newly designed or comprehensively conceived landscape architectural solutions. In these examples, meadow vegetation was not added secondarily to an already existing green structure but formed an integral component of the original spatial and compositional concept.



Fig. 2: Use of perennial grass–herbaceous communities in landscape architectural projects- grass-free/flowering lawns: Brno- zahrada Vila Löw-Beer, grass–herbaceous community (left) and Lanškroun – a frequent example is the integration of summer-flowering seed mixtures (right) (author: Hus, 2022).

Perennial meadow mixtures

Park Zdeňka Kopala in Litomyšl represents an example of the use of grass–herbaceous communities in a historic park environment, where they fulfil both ecological and compositional functions. Flowering meadows were designed with an emphasis on species diversity, seasonal vegetation dynamics, and harmonious integration into the existing vegetation structure while respecting spatial relationships and the character of the site. Regionally appropriate seed mixtures reflecting specific site conditions were used to establish stable and long-term sustainable plant communities. A characteristic feature of the project is the creation of a contrast between intensively maintained areas and more naturalistic parts of the park, thereby strengthening the visual legibility and spatial differentiation of the site. The project also highlights the potential for integrating ecologically oriented elements into a historically valuable park environment through extensive management and sensitive landscape architectural design.

Archaeopark Pavlov (Czech Republic), implemented in 2016, represents an example of the application of grass–forb communities under dry and heterogeneous site conditions. The total area of the site comprises approximately 6,042 m² of meadow vegetation and 1,127 m² of extensive green roof vegetation. Three basic types of seed mixtures were applied: (1) a mixture for dry habitats used on the roof with a shallow substrate, (2) a modified meadow mixture in the immediate vicinity of the building, combining grasses and forbs, and (3) a commercial grass mixture applied in the peripheral parts of the site (Knotek and Knotková, 2019).

As part of the subsequent management, overseeding was also carried out, including mixtures designed for dry conditions with a higher proportion of annual species. The project represents an example of an adaptive landscape architectural solution integrating grass–forb communities into an urban environment while taking into account the specific site conditions of the dry Pannonian region. It is characterized by the use of differentiated seed mixtures and by an emphasis on supporting biodiversity, aesthetic value, and ecological stability.

ZELOKVET Picnic Meadow represents an example of the use of grass–herbaceous communities within renaturalization-oriented approaches in urban environments, particularly in peripheral and transitional zones of cities. The design is based on the use of species-rich, predominantly autochthonous mixtures whose composition reflects site conditions and is informed by the phytocoenological analysis of the area. A characteristic feature of the project is the ecologically sensitive method of stand establishment, based on sowing on prepared surfaces or overseeding into existing lawns without the use of chemical agents. The grass–herbaceous stands are also combined with other vegetation elements, thereby creating a legible spatial structure based on the contrast between formal and more naturalistic parts of the site. The project highlights the potential of extensive meadow management in urban environments while maintaining both ecological functionality and visual acceptability for the public.



Fig. 3: Use of perennial grass–herbaceous communities in landscape architectural projects: Archeopark Pavlov (left) and Zdeněk Kopal Park (right) (author: Hus, 2024).

University meadow project – The BIO:VCEL:IN project, implemented on the campus of the Slovak University of Agriculture in Nitra, represents a comprehensive example of the application of grass–herbaceous communities in an urban environment on an area of approximately 1.5 ha. A total of 18 different meadow mixtures were used to verify their ecological, aesthetic, and operational potential. The design differentiates areas according to their function and intensity of use, combining permanent species-rich meadow communities, supplementary annual mixtures for rapid visual effect, and herbaceous lawns in communication corridors exposed to higher levels of use. The project is also characterized by its research and educational dimension, serving as an experimental and demonstration area for monitoring the influence of management and species composition on the development of meadow communities.



Fig. 4: Use of perennial grass–herbaceous communities with an admixture of annual species- ZELOKVET Picnic Meadow (left); University meadow project – The BIO:VCEL:IN (right) (author: Hus, 2025).

Discussion

The analyzed examples showed that grass–herbaceous communities cannot be understood as a uniform vegetation type, but rather as a diverse group of vegetation and design approaches whose suitability depends on site conditions, spatial context, intended function, and management regime (Norton et al., 2019; Bretzel et al., 2024). The selected projects illustrated different forms of application, ranging from species-rich meadow mixtures and grass–forb communities to renaturalization-oriented solutions and more complex designed compositions. This confirms that the use of meadow vegetation in urban environments requires site-specific and function-specific approaches rather than the application of a single universal model. An important aspect identified in the analyzed examples is the distinction between the transformation of existing green spaces and the

planned integration of grass–herbaceous communities into new designs. In the first case, meadow vegetation is introduced into already established green structures, often through the conversion of intensively managed lawns or through renaturalization-oriented interventions (Chollet et al., 2018; Bretzel et al., 2024). In the second case, grass–herbaceous communities form part of the original landscape architectural concept from the outset. This distinction influences not only the method of establishment, but also the compositional role of vegetation, the expected visual effect, and the subsequent management regime. The comparison further suggests that the successful establishment and long-term functioning of grass–herbaceous communities depend not only on vegetation type and species composition, but also on appropriate management, particularly mowing frequency and timing (Chollet et al., 2018). The analyzed examples indicate that extensive management may reduce maintenance requirements in comparison with conventional lawns; however, its success depends on its adaptation to the ecological conditions and intended function of the site (Bretzel et al., 2024; Norton et al., 2019). At the same time, the projects demonstrate that grass–herbaceous communities fulfil not only ecological functions, but also important compositional and aesthetic roles by introducing seasonal dynamics, colour variation, and spatial differentiation into urban green spaces (Marshall et al., 2023). From the perspective of landscape architectural practice, the analyzed examples highlight the potential of grass–herbaceous communities as a flexible design element that can contribute to biodiversity support, ecological stability, and the diversification of urban green-space structure (Norton et al., 2019; Marshall et al., 2023). Their successful application, however, requires a balanced consideration of ecological function, visual expression, and long-term management; public acceptance of near-natural management should also be considered (Lampinen et al., 2021).

Conclusion

Based on the analyzed examples, it can be concluded that the application of grass–herbaceous communities in urban green spaces takes different forms depending on site conditions, spatial context, functional requirements, management regime, and the mode of their application. The selected projects showed that these communities can be introduced either through the transformation of existing green spaces or through their planned integration into new designs, while differing in vegetation type, species composition, and maintenance requirements. At the same time, the comparison confirmed that meadow vegetation can fulfil ecological, aesthetic, and recreational functions and may represent an alternative to intensively managed lawns in suitable urban contexts. However, their successful establishment and long-term functioning depend on appropriate design, species selection, and subsequent management, particularly mowing regimes.

The analyzed examples thus point to the potential of grass–herbaceous communities as an important component of contemporary landscape architectural practice and sustainable urban green space management.

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Sohrn

Směsí trav a bylin představují důležitou součást současného městského prostředí a přispívají k ekologické stabilitě, estetické kvalitě a celkové odolnosti měst. Vzhledem k tomu, že městské oblasti čelí stále častěji dopadům klimatických změn, efektu městského tepelného ostrova, úbytku biologické rozmanitosti a rostoucím nárokům na údržbu veřejných prostranství, nabývá použití luční vegetace jako prvku krajinářského designu na významu. Společenstva trav a bylin představují udržitelnou alternativu k tradičně intenzivně sekaným trávníkům a nabízejí širokou škálu ekologických, sociálních a ekonomických přínosů. Tento článek se zaměřuje na formy využití travnatě-bylinných směsí v městském prostředí a čerpá ze zkušeností a aktuálních trendů pozorovaných ve slovenských a českých městech. Zkoumá různé typy výsadby, včetně lučních směsí pro rozsáhlé plochy, parkových trávníků, specializovaných směsí pro suchá nebo vysoce exponovaná stanoviště a výsadby, která kombinuje estetickou hodnotu s ekologickou funkcí. Studie analyzuje roli těchto vegetačních prvků v urbanizovaném prostředí, zejména jejich přínos k podpoře biodiverzity, zlepšení městského mikroklimatu, zvýšení retence dešťové vody a snížení nároků na údržbu. Zjištění zdůrazňují potenciál travnatě-bylinných společenstev jako multifunkčních prvků, které mohou zlepšit jak ekologickou výkonnost, tak vizuální kvalitu městské krajiny.

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