DROUGHT-READY LANDSCAPES: DESIGNING WITH RESILIENT PLANTS

PEISAJE ADAPTATE SECETEI: PROIECTAREA CU PLANTE REZILIENTE

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Abstract.
This applied landscape-design case study examines a temporary drought-oriented garden built for West Side Flower Fest 2024 in Bucharest. The student team moved from interpreting the competition brief and developing the concept to planting and technical plans, three days of on-site implementation, and final presentation. The garden combined a framed view, bench and stepping stones with layered ornamental vegetation. During implementation, the team added Salvia nemorosa when Lavandula angustifolia 'Sevtopolis' did not provide the expected floral effect, preserving the intended purple rhythm. The plant palette combined taxa with different degrees of adaptation to limited water availability. The case illustrates compositional planning, technical coordination and adaptive decision-making in a full-scale student project. Transfer to other small urban spaces requires adapting plant selection, establishment care and maintenance to local conditions. As a temporary exhibition garden, it was not designed for long-term performance monitoring.
Key words: case study, water-wise planting, adaptive implementation, urban garden, ornamental vegetation

Rezumat.
Acest studiu de caz de proiectare peisagistică aplicată analizează o grădină temporară adaptată condițiilor de secetă, realizată pentru West Side Flower Fest 2024, la București. Echipa de studenți a parcurs etapele de la interpretarea temei de concurs și dezvoltarea conceptului până la planurile de plantare și detalierea tehnică, implementarea pe parcursul a trei zile și prezentarea finală. Grădina a combinat un cadru vizual, o banchetă și pași de piatră cu vegetație ornamentală stratificată. În timpul implementării, echipa a introdus Salvia nemorosa atunci când Lavandula angustifolia 'Sevtopolis' nu a oferit efectul floral așteptat, păstrând totodată ritmul cromatic violet. Paleta vegetală a reunit taxoni cu grade diferite de adaptare la disponibilitatea redusă a apei. Studiul ilustrează planificarea compozițională, coordonarea tehnică și luarea deciziilor adaptative într-un proiect studențesc realizat la scară reală. Transferul

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către alte spații urbane de mici dimensiuni necesită adaptarea selecției vegetale, a îngrijirii în faza de instalare și a întreținerii la condițiile locale. Fiind o grădină expozițională temporară, proiectul nu a fost conceput pentru monitorizarea performanței pe termen lung.
Cuvinte cheie: studiu de caz, plantare cu consum redus de apă, implementare adaptivă, grădină urbană, vegetație ornamentală

INTRODUCTION

Urban planting increasingly has to reconcile the demand for attractive green space with periods of limited water availability. Drought affects growth, flowering and visual quality in taxon-specific ways [Toscano et al., 2019]. Consequently, the expression 'drought tolerant' should not be treated as a permanent attribute independent of plant age, rooting volume, soil, exposure or maintenance.

Water-wise landscape design seeks to reduce unnecessary irrigation through coordinated decisions about spatial layout, plant selection, soil preparation, irrigation and maintenance. Efficiency cannot be attributed to the planting palette alone; it depends on the relationship between plant demand and management [St. Hilaire et al., 2008]. For ornamental planting, survival alone is insufficient: plants must also retain an acceptable visual role under the intended water regime [Toscano et al., 2019].

Applied case studies show how design principles translate into full-scale construction. Temporary show gardens make design logic, material constraints and adaptive implementation decisions visible, linking academic design exercises with built landscape experience.

The present case concerns a student garden for the second edition of West Side Flower Fest, held in Drumul Taberei Park, Sector 6, Bucharest, on 31 May–2 June 2024 [Primăria Sectorului 6, 2024]. The official theme was 'Inovații în peisagistică pentru utilizarea apei cu înțelepciune' (Landscape innovations for wise water use), and the team addressed 'Grădini fără irigații: design de secetă' (Gardens without irrigation: drought design) [Proiectare 6 and ADPDU Sector 6, 2024]. The category provided a framework for reducing irrigation through thoughtful plant selection, composition, and implementation.

The aim of this study was to examine the garden as an applied example of drought-oriented design, explain its development and implementation, evaluate the plant palette in relation to reduced-water planting, and identify adaptive decisions relevant to other urban spaces.

MATERIAL AND METHOD

The student team from the Faculty of Horticulture, 'Ion Ionescu de la Brad' Iași University of Life Sciences, considered the urban context and the competition brief. The initial research focused on drought-tolerant gardens and urban planting. The brief specified a 30 m², temporary, demountable garden with concealed containers, contemplative seating and an explanatory poster. It required low-maintenance planting, native or locally naturalised plants and the exclusion of invasive and allergenic species

[Proiectare 6 and ADPDU Sector 6, 2024]. As the competition requested solutions for Bucharest, the planting strategy also considered warm summer conditions and limited water availability.

Concept development produced an East Asian-influenced setting for relaxation and contemplation. Sketches related the timber frame, bench, stepping stones and sinuous planting masses. The 'window of lost time' connected the framed view with past, present and future. Plant selection combined anticipated drought tolerance with perennial structure, purple and yellow flowers, fine grass foliage, differing habits and seasonal interest.

The competition was launched on 26 February 2024, with team registration scheduled for 15 March and final project submission for 15 April. This calendar established the formal framework for concept development, landscape design and technical preparation. The required documentation included the concept and execution memorandum, estimated material quantities and costs, a presentation poster containing the 2D plan, planting legend and mood board, sections, 3D representations and execution details [Proiectare 6 and ADPDU Sector 6, 2024]. Within this framework, the team prepared the planting plan, visualisations and frame drawings, calculated material requirements and developed the technical documentation needed for implementation. The proposed garden measured 4.00 × 7.00 m (28 m²), slightly below the nominal 30 m² area established by the competition brief. This adjustment resulted from the modular dimensions of the Euro-pallet base the students selected as a practical, demountable solution that supported the installation while protecting the existing lawn.

The competition set the official on-site installation period as 27–30 May 2024. Within this timeframe, the student team completed the garden implementation over three days. On day 1, the team positioned and stabilised the Euro-pallet platform, built the decorative frame and covered the working surface with a geosynthetic sheet. On day 2, the team painted the frame dark mahogany, completed the stepping-stone path using 8–16 mm marble aggregate, and centred and fixed the bench. On day 3, the team positioned the larger container plants first to establish the composition's main structure, followed by the herbaceous vegetation; a Japanese maple completed the focal planting. When *Lavandula angustifolia* 'Sevtopolis' did not provide the anticipated floral effect, the team introduced *Salvia nemorosa* to reinforce the intended purple rhythm. Coconut fabric concealed the plant containers, while decorative lighting completed the installation. The team then presented the finished garden at West Side Flower Fest, held from 31 May to 2 June 2024, along with a project poster explaining its concept.

RESULTS AND DISCUSSIONS

From brief to design concept

The garden translated the water-wise brief into a compact setting for contemplation. The bench and stepping stones organised circulation and provided a place for rest, while the timber frame directed attention towards the planted background. Curvilinear plant masses softened the rectangular platform. The 'window of lost time' functioned as a focal element and visual filter, creating depth within a small footprint (Figure 1). The brief allowed a nominal 30 m² garden, while the students developed a 4.00 × 7.00 m composition (28 m²). The slight reduction resulted from the modular dimensions of the Euro-pallet base the team chose, a practical demountable solution that kept the installation within the permitted footprint.

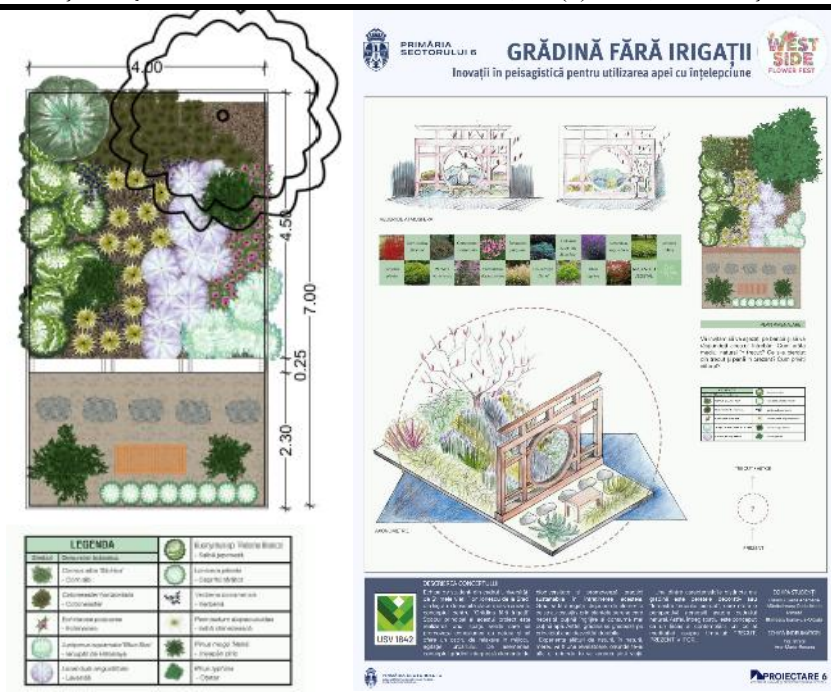

Fig. 1. Planting plan (left) and presentation poster showing timber-frame details, plant palette and axonometric view (right)

Spatial and planting composition

The planting concept relied on purple and yellow flowering accents, fine grass foliage, evergreen masses and woody structure (Figure 2). The red stems of *Cornus alba* 'Sibirica' extended the intended seasonal interest beyond flowering. The integration of seating, vegetation and contrasting forms is comparable to the compositional approach proposed for an Iași urban square [Cojocariu et al., 2023]. Research on public preferences has similarly found that flower-rich, water-wise schemes can be visually attractive [Nazemi Rafi et al., 2020], supporting ornamental quality as part of low-water landscape design.

Fig. 2. Front and oblique visualisations of the proposed composition

Plant palette and drought-oriented design

The project combined shrubs, conifers, herbaceous perennials and an ornamental grass, creating vertical layering and seasonal contrast. The palette brought together taxa with different degrees of adaptation to limited water availability, balancing drought-oriented planting with ornamental effect.

Plant selection for the competition used the commercial plant catalogues indicated by the organisers, including catalogues from partner companies and plant nurseries. Consequently, the botanical names recorded in the original project documentation followed the nomenclature used by the suppliers and reference catalogues available during project development. Such catalogues primarily serve horticultural production and procurement purposes and may retain widely used horticultural synonyms or earlier taxonomic combinations rather than immediately reflecting the latest accepted botanical nomenclature. The student team therefore used the names corresponding to the commercial references available during project development and implementation.

For the scientific manuscript, the botanical nomenclature was subsequently updated to reflect currently accepted taxonomic treatments. For fountain grass, the phylogenetic revision published by Chemisquy et al. [2010] supported the taxonomic unification of *Pennisetum* with *Cenchrus*. Accordingly, *Pennisetum alopecuroides*, the name used in the original planting documentation and still widely encountered in horticultural trade, is currently treated as a synonym of the accepted name *Cenchrus alopecuroides* [Chemisquy et al., 2010; Royal Botanic Gardens, Kew, n.d.]. Similarly, *Lonicera pileata*, as recorded in the project documentation, is currently treated as a synonym of *Lonicera ligustrina* var. *pileata* [Royal Botanic Gardens, Kew, n.d.]. The manuscript therefore uses the currently accepted nomenclature while retaining the original project names as synonyms where relevant, ensuring both scientific consistency and clear correspondence with the planting documentation.

We also checked horticultural cultivar names against current reference databases. RHS records Cheyenne Spirit as a hybrid *Echinacea* seed strain rather than assigning it exclusively to *E. purpurea*, while 'Lemon Beauty' is currently listed under *Lonicera ligustrina* [Royal Horticultural Society, n.d.]. These names were adjusted in the manuscript where necessary while preserving their correspondence with the plant material specified in the original project.

Table 1 summarises the compositional roles of the selected taxa together with the main considerations related to water availability and their potential transfer to permanent planting schemes, based on botanical and institutional horticultural records [Royal Botanic Gardens, Kew, n.d.; Royal Horticultural Society, n.d.; NC State Extension, n.d.].

Experimental studies provide useful context for the expected behaviour of several taxa under water deficit. In confined-root trials, *Echinacea purpurea* regained turgor after watering but showed reduced visual quality under deficit, while *Lavandula angustifolia* showed tolerance to moderate drought [Zollinger et

al., 2006]. Although these trials do not address the Cheyenne Spirit strain directly, they underline the importance of ornamental quality alongside survival. 'Sevtopolis' and 'Codreanca' lavender also survived water withholding, although growth was inhibited [Szekely-Varga et al., 2020]. Together, these findings support the project's reduced-water design direction and the value of establishment care during prolonged dry periods.

Table 1

Drought-oriented assessment of the project plant palette

Taxon/project label	Compositional role	Water and transfer conditions
Cornus alba 'Sibirica'	Woody structure; red stems	Best suited where soil moisture is retained; valued for woody structure and seasonal stem colour.
Cotoneaster horizontalis	Low, arching mass	Relatively tolerant after establishment; monitor local spread in permanent schemes.
Echinacea (Cheyenne Spirit seed strain)	Flowering accent	Hybrid identity; E. purpurea evidence is used only as general context for water response.
Juniperus squamata 'Blue Star'	Blue-grey evergreen mound	Reduced-water candidate; good drainage remains important.
Lavandula angustifolia 'Sevtopolis'	Purple flowers; aromatic foliage	Relatively tolerant; ornamental performance may decline under prolonged severe drought.
Lonicera ligustrina 'Lemon Beauty' (syn. *L. nitida*)	Variegated foliage	Suitable with establishment watering; benefits from protection in very exposed sites.
Lonicera ligustrina var. *pileata* (syn. *L. pileata*)	Low evergreen layer	Useful as a low evergreen layer; performs best where some soil moisture is available.
Verbena bonariensis	Tall, light floral layer	Relatively tolerant; consider local winter performance and self-seeding.
Cenchrus alopecuroides (syn. *Pennisetum alopecuroides*)	Fine foliage; movement	Tolerant after establishment; consider local winter performance and self-seeding.
Pinus mugo (project label 'Nana')	Compact evergreen mass	Suitable where root-zone and exposure are appropriate; confirm dwarf identity.
Rhus typhina	Woody silhouette	Tolerant of dry conditions; vigorous suckering should be considered in permanent schemes.
Salvia nemorosa	Purple floral rhythm	Reduced-water candidate in drained soil; establishment care supports flowering and visual quality.
Japanese maple	Focal canopy	Focal canopy element; confirm the exact taxon before assigning drought suitability.

For permanent planting, consider the growth behaviour of *Rhus typhina*, as the species can spread clonally [Wang et al., 2008]. *Cotoneaster horizontalis*, *Verbena bonariensis* and *Cenchrus alopecuroides* may likewise require consideration of their potential for self-seeding or spread under local conditions [NC State Extension, n.d.]. These aspects do not diminish their ornamental role in the temporary garden; rather, they show how an exhibition palette can adapt to local site conditions and long-term management requirements.

From design to implementation

Technical preparation connected the planting plan, frame drawings and material estimates with construction. The pallet platform, separator sheet, stepping stones, marble aggregate and fixed bench formed a temporary setting for the planting (Figure 3). These choices responded to the demountable exhibition requirement. During fabrication, the circular opening shown in the drawings became a polygonal opening (Figures 1, 5), while preserving its role as a visual filter.

Fig. 3. Implementation: unpainted platform and frame; path construction; arrival of the Japanese maple (left to right)

On the third day, the focus shifted from construction to planting composition. Larger plants established the main masses and sightlines; herbaceous plants refined colour and texture. The Japanese maple, described by the team as approximately 3.5 m tall, provided a focal canopy; because the team did not record its exact species and cultivar, it is referred to here generically. Coconut fabric visually concealed the container edges, while lamps added a final decorative layer. As the plants remained container-grown in a temporary exhibition installation, their water requirements should be interpreted differently from those of permanent in-ground planting [St. Hilaire et al., 2008].

Adaptive decisions during implementation

The clearest adaptation concerned the floral effect of *Lavandula angustifolia* ‘Sevtopolis’, which was less pronounced than anticipated at installation. The student team added *Salvia nemorosa* to reinforce the intended purple rhythm and

vertical texture (Figure 4). The intervention preserved the visual objective and illustrates the role of real-time compositional decisions during implementation.
Planting design benefits from installation flexibility. Adaptive implementation can preserve intended colour, height and texture while maintaining the overall concept. A comparable design case describes adjustments to unforeseen site conditions during execution [Istrate et al., 2023]. In the present project, the Salvia addition became a practical example of translating a design intention into a successful built composition.

Fig. 4. Completed planting: floral and foliage contrasts (left) and the view through the built frame (right)

Completed garden and applicability

The completed garden retained the frame, bench, mineral path and layered planting as a coherent ensemble (Figure 5). Its presentation and explanatory poster communicated the concept to visitors. The process also offered a practical design exercise, making relationships between concept, composition, users and scale concrete during construction. A landscape-teaching approach similarly emphasises these relationships [Trif, 2025].

The principles are readily transferable to small public spaces, institutional courtyards, park edges and temporary installations. A legible route, resting point, structural plants, and contrasting herbaceous layers can be adapted without literally reproducing the artistic frame. Permanent use would require adjustment to local climate, frost, soil depth and drainage, exposure, plant identity, compatible water demand and maintenance [St. Hilaire et al., 2008]. In Bucharest and other warm urban contexts, the low-water objective is strengthened by selecting plants suited to summer heat and periods of limited rainfall, with establishment irrigation where needed. Exhibition-specific elements such as container concealment and pallet construction can be redesigned for permanent installations.

Fig. 5. Completed garden: overall front view, with bench, polygonal frame, path and concealed containers (source: project documentation).

Because the garden was conceived as a temporary exhibition installation, the study focused on design, construction and adaptive implementation rather than long-term performance monitoring. Future applications could extend this work by assessing water use, microclimatic response, biodiversity and plant survival over time.

CONCLUSIONS

Drought-oriented landscape design can combine clear spatial organisation with ornamental diversity. The frame, path, bench and layered vegetation created a coherent composition within a compact exhibition footprint.

The plant palette combined taxa with different degrees of adaptation to limited water availability and complementary ornamental roles. For permanent schemes, site-specific evaluation of water needs, exposure and spread behaviour remains important.

Technical planning enabled the garden to be installed efficiently over three days. The Euro-pallet platform and concealed containers met the temporary, demountable exhibition requirements and demonstrated the value of modular construction.

Adding *Salvia nemorosa* when *Lavandula angustifolia* ‘Sevtopolis’ did not provide the expected floral effect demonstrated adaptive decision-making and preserved the intended purple rhythm of the composition.

The project offers principles that can be adapted to other small urban spaces, including warm urban contexts such as Bucharest, provided that species selection, establishment care and maintenance are adjusted to local conditions. Long-term monitoring would be valuable in future permanent applications.

From an educational perspective, the project connected concept development, technical detailing, full-scale construction and public presentation, offering students an integrated landscape-design exercise.

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