

Application Research on Flower Borders in Urban Renewal Driven by Dual-engine of Cultural Translation and Competition Practice

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Abstract The flower border is a distinctive landscape element that integrates ecological, artistic, and cultural functions in garden landscapes, playing an increasingly important role in urban renewal and cultural inheritance. Based on the theory of cultural landscape gene translation and practical experience in flower border competitions, this article constructs a technical framework consisting of three stages: “cultural decoding, technical translation and practical implementation”. A themed flower border case in Henan Province verifies the practicability of the three-tier translation model encompassing symbolic, ecological and emotional dimensions, and systematically summarizes the organization mechanism, evaluation standards, plant configuration principles, and spatial design techniques of flower border competitions. Furthermore, this study proposes the application approaches of flower borders in urban renewal, including strategies such as cultural gene implantation, long-term plant community construction, and promotion of refined construction techniques. The results show that the dual-engine model of cultural translation and competition practice can not only address prominent drawbacks of traditional flower borders that focus on visual appeal at the expense of cultural depth and prefer short-term effects to long-term sustainability, but also provide replicable and cost-effective technical solutions for the landscape upgrading of existing urban spaces, thus providing a new perspective for academic innovation and practical promotion of flower border design.

Keywords Flower border design, Cultural landscape gene, Translation model, Competition practice, Urban renewal

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As a landscape form that integrates natural ecology and artificial art, flower borders have expanded from traditional ornamental functions to diverse ecological, cultural, and social values^[1]. Against the backdrop of China’s urban development shifting from incremental construction to stock urban renewal, small-scale and refined landscape enhancement projects will become the dominant trend of future urban renewal practices. Therefore, flower borders, boasting the advantages of flexible space, outstanding effects, and controllable costs, will become an important landscape form for optimizing urban stock space landscapes. Traditional flower border design often focuses on the effect of plant combination, deficient cultural connotation and weak long-term ecological sustainability remain prominent defects, making it difficult to meet people’s dual needs for cultural identity and ecological quality^[2]. The theory of cultural landscape gene translation provides theoretical support for the cultural expression of flower borders. It extracts iconic regional cultural elements, abstract cultural connotations are transformed into perceptible landscape elements, achieving the unity of cultural inheritance and landscape aesthetics^[3]. In recent years, flower border competitions have become an important way of technological innovation and practical promotion, not only promoting plant variety innovation, optimizing construction techniques, and improving evaluation standards,

but also accumulating a large amount of practical experience that can be directly applied to urban renewal^[4]. Integrating cultural landscape gene translation with flower border competitions can not only enhance the academic depth and cultural value of flower border design, but also strengthen the implementation and operability of urban renewal projects.

Taking the flower border practice in Henan Province as the research object, this paper focuses on three issues: first, attempting to construct a scientifically feasible cultural landscape gene translation system; second, extracting the technological innovation points and evaluation criteria of competitive flower borders; third, exploring the efficient application pathways of flower border technologies in urban renewal. This study aims to provide theoretical support and operational paradigms for the cultural expression, technological optimization, and practical promotion of flower border design, thereby facilitating the high-quality development of urban landscapes.

1 Cultural translation theory and practice of flower border design

1.1 Construction of cultural landscape gene translation model

To resolve three core dilemmas of conventional flower borders, the separation between culture and form, the disjunction between tech-

nology and innovation, and the contradiction between short-term effects and long-term sustainability, a three-level translation model of Symbol—Ecology—Emotion is constructed (Fig.1) to achieve the complete transformation of cultural genes from abstract to concrete, and from theory to practice.

Symbol layer translation: Based on the theory of cultural semiotics, prototype symbols are extracted from regional culture, establishing a translation chain of cultural prototypes—abstract symbols—landscape elements. Natural forms, artificial symbols, and folk elements can all serve as sources of symbols, which can be transformed into landscape visual vocabulary through paving design, ornamental structures, plant clusters, and other forms^[5].

Ecological layer translation: By exploring regional ecological patterns, traditional ecological models are translated into planting strategies for modern flower borders. Following the principle of prioritizing local areas and ensuring long-term stability, a three-layer plant community structure consisting of evergreen skeleton, seasonal flowers, and ornamental grasses is constructed to balance ecological adaptability with landscape sustainability. Based on specific site conditions, techniques like soil improvement and resource recycling are adopted to achieve synergy between natural ecological processes and cultural themes^[5].

Emotional layer translation: Grounded in

the Relph place theory of emotional geography, emotional resonance is triggered through spatial creation. Based on the theme requirements, design techniques such as color sequence, spatial openness and enclosure, and artistic conception shaping are employed to translate the cultural values, corporate philosophies, and collective memory into perceptible place spirits, ultimately fulfilling the dual goals of cultural identity and emotional delivery^[6].

1.2 Multidimensional implementation path of cultural translation

1.2.1 Innovation in spatial narrative. A spatial narrative approach based on the triple mapping of “geography—painting—philosophy” is adopted to enrich the dimensions of cultural expression. In the geographical dimension, natural geographical features can be restored through paving texture and terrain shaping. For example, in this study, the π -shaped paving accurately traces the course of the Yellow River, and the linear textures of the stone slabs simulate the dynamic flow of water. In the painting dimension, the composition principles of traditional painting, specifically the Three Distances (*san yuan*), are adopted to construct a three-dimensional landscape hierarchy with plants arranged in a staggered manner. In the philosophical dimension, traditional garden-making ideologies are integrated: the inscribed landscape stones and the cultivation of artistic conception realize the aesthetic pursuit of “wrought by human hands yet appearing natural”.

1.2.2 Innovative application of plant materials. The new plant varieties, as the core, promote the innovation and upgrading of plant materials. The four-season Camellia series varieties fill the gap in the traditional flowering period of camellias, and hybrid varieties such as *Magnolia* Red Smiling Star blossom for three seasons. Their ecological adaptability to both cold and heat, combined with lasting ornamental value, provides technical support for the long-term sustainability of flower borders. Furthermore, the full-chain transformation model spanning scientific research outcomes, competition exhibitions and market promotion accelerates the industry-wide application of these new varieties^[7].

1.2.3 Technology integration innovation. Integrating digital design with ecological principles enhances both the precision and sustainability of flower border creation. Landscape simulation software, such as Lumion, is employed to resolve spatial scale conflicts in compact areas, signifi-

cantly improving spatial utilization compared to traditional designs. To address the problem of soil salinization, a remediation technique combining the gravel desalination layers with leaf molds and peat soil amendment is used to reduce the pH value of the site from 8.2 to 6.8, which is suitable for plant growth needs. In addition, shredded garden waste is utilized as mulch to suppress weed growth and maintenance costs^[8].

1.3 Verification of a cultural themed flower border

This study takes the themed flower border of *In Celebration of the National Day: Embracing the Magnificent Rivers and Mountains* as the example. Operating within a limited space of merely 50 m², this project achieves the integration of cultural translation and technological innovation by centering on the cultural thread of the Yellow River (Fig.2). The spatial layout adopts a one axis three zone structure. The Yellow River Culture Axis simulates the course of the river with winding paving, connecting three distinct areas: the River Impression Area, the Mountain Landscape Area, and the Celebration Flower Terrace. Regarding plant configuration, *Ligustrum sinense* Silver Queen and rosemary serve as the evergreen structural framework; Hydrangeas and floribunda roses provide seasonal floral displays, while dwarf fountain grasses (*Pennisetum alopecuroides* Little Bunny) and *Tulbaghia violacea* form the groundcover layer. These are complemented by novel cultivars such as the four-season camellia and *Magnolia* Red Smiling Star, creating a landscape with year-round visual interest and distinct seasonal changes. In terms of cultural expression, elements such as the π -shaped paving representing the Yellow River, illuminated miniature installations inspired by *A Thousand Li of Rivers and Mountains*, and landscape stones inscribed with the phrase “Great beauty arises from inner” are employed, all of which facilitate a profound integration of Yellow River culture, traditional landscape aesthetics, and the National Day theme, ultimately achieving multiple goals of cultural inheritance, ecological optimization, and brand promotion.

2 Practice innovation and evaluation system of flower border competition

2.1 Competition organization mechanism and implementation process

The Flower Border Competition is jointly

promoted by the organizer, corporate co-organizers, and government departments. The organizer is responsible for overall coordination and expert evaluations; the corporate co-organizers provide plant materials, auxiliary materials, and construction equipment, and formulate material supply catalogs and configuration recommendations in advance; government departments coordinate venue resources and logistical support. The competition adopts an assessment model combining theoretical knowledge and practical skills, comprising three main modules: a professional knowledge examination (25%), practical design (30%), and practical construction (45%). The professional knowledge examination focuses on basic theories and plant recognition; the practical design requires the completion of planting plans, hand drawn elevations, and planting lists within 4.5 h, with the proportion of annual and biennial flowers not exceeding 20%; the practical construction requires the completion of flower border construction on the designated plot within 8 h, with no more than 50% of the total materials provided. The competition works strive for a balance between “immediate visual impact during the event and long-term retention afterwards”, so the works are permanently preserved after the competition, serving as ready-made landscape samples for urban renewal.

2.2 Scientific and comprehensive evaluation criteria system

The evaluation framework covers three dimensions: scheme design, construction effect, and horticultural sculpture (Table 1), highlighting the core orientation toward “theme alignment, plant dominance, ecological sustainability, and artistic innovation”. For scheme design, the assessment focuses on the originality of the concept, the standardization of drawings, and rationality of plant configuration. It is required that the coverage area of plants should account for no less than 70%, and that the perennial herbaceous flowers constitute at least 60% of the planting. Regarding the construction effect, the assessment emphasizes the practical realization of the theme, terrain grading, material application, and overall landscape effect, with particular attention paid to harmonious coordination of plant form, color and texture. As an optional competitive category, horticultural sculpture prioritizes ecological value, innovation, and artistic appeal, encouraging the resource utilization of waste.

The final score is determined through expert evaluation. To ensure objectivity and fairness, the highest and lowest scores are excluded from the final calculation.

2.3 Practical and innovative characteristics of competition works

2.3.1 Diversified expression of themes. The 46 competitive entries collected in this study

are classified into four major thematic types: Regional Natural Landscapes (such as Taihang Mountains and Yellow River wetlands), Historical and Cultural Heritage (such as regional historical memory symbols), Corporate Culture (such as sustainable development concepts), and Natural Experience (such as immersive natural spaces), providing rich templates for cultural implantation in urban renewal^[9]. The thematic expression emphasizes that plant elements must account for no less than 70%, thereby avoiding excessive reliance on non plant materials and achieving an organic unity between cultural connotations and landscape forms.

2.3.2 Refinement of spatial layout. The plan design employs a combination of clump and mass planting, which utilize irregular curves to simulate the edges of natural communities, creating a dynamic interplay between solid and void spaces through the variation in planting density. The facade design strictly follows the principle of “low in front and high in back”, with low-growing flowers defining the boundary in the foreground, medium height plants forming the main body in the middle, and tall shrubs or ornamental grasses serving as the background in the rear, enhancing the three-dimensional

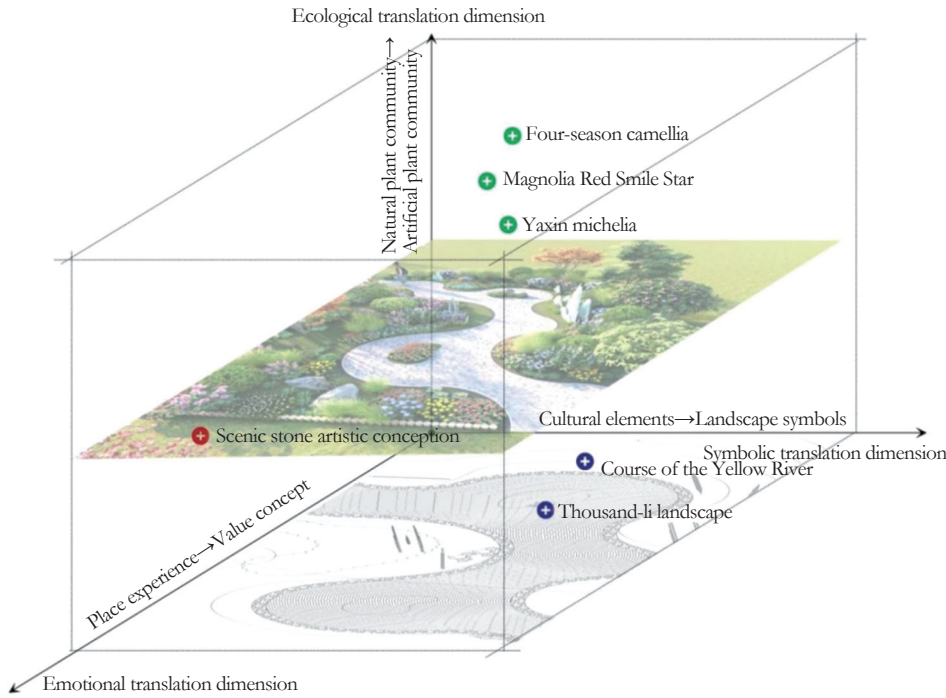


Fig.1 Three-tier translation model of cultural landscape genes

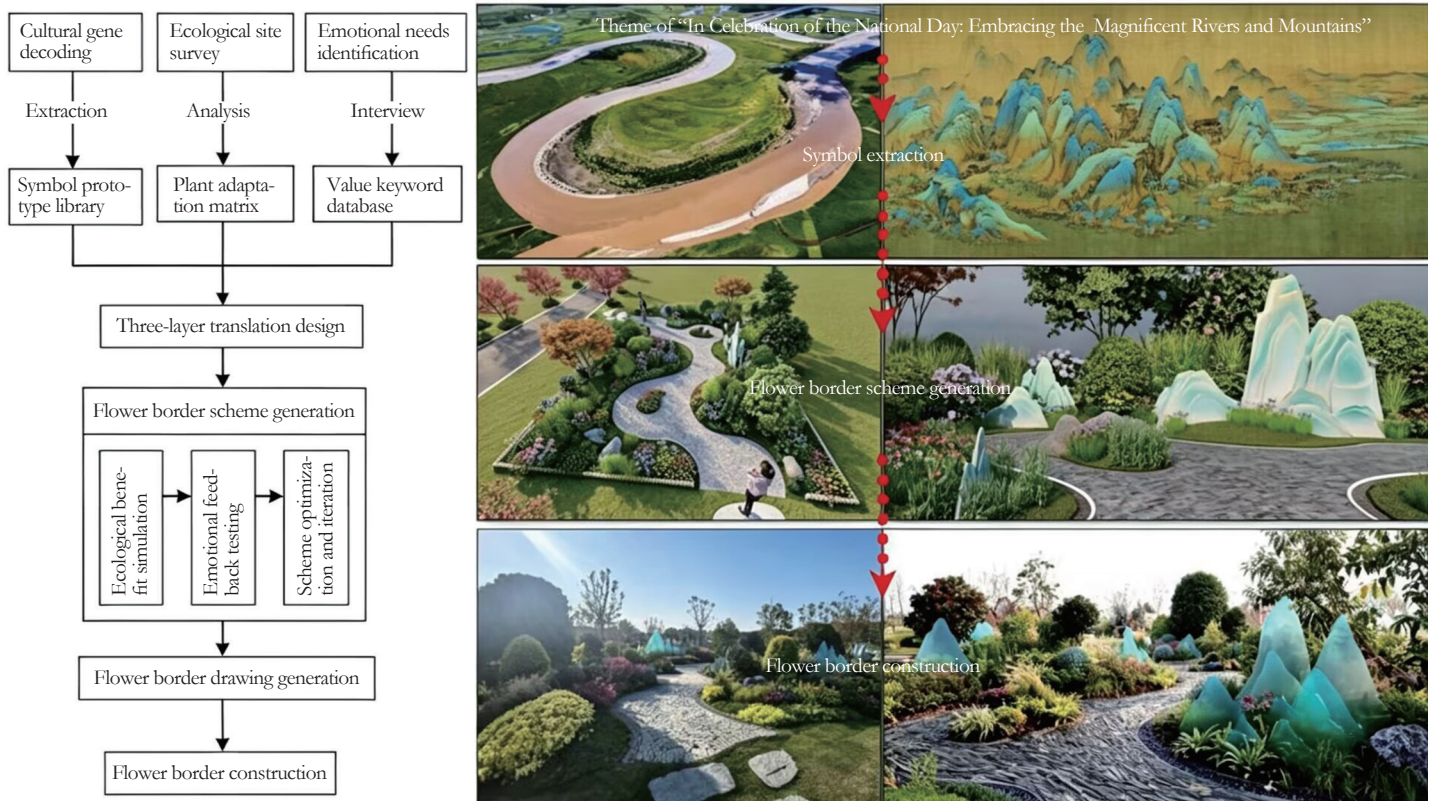


Fig.2 Cultural landscape gene translation

and spatial depth of the landscape. For instance, work No. 11 features staggered clusters of *Coreopsis*, while work No. 45 uses petunias to create a visual focal point, complemented by ornamental grasses that generate a sense of virtual space. Both designs exemplify a natural and fluid layout.

2.3.3 Rationalization of plant selection. Plant selection balances immediate visual impact for the competition with long-term sustainability. The dominant families are Asteraceae (30.4%) and Poaceae (11.8%). Perennial herbs account for 58%, shrubs for 17%, and biennial plants are controlled at 22%, which is close to the optimal standard of 20%. A total of 48 plant species adapted to the local climate are recommended, including *Cortaderia selloana*, *Hylotelephium erythrostictum*, *Heuchera micrantha*, and *Euonymus alatus Compactus* (Table 2). This strategy, characterized by the dominance of specific plant families and distinct regional features, not only ensures immediate landscape effect but also reduces long-term maintenance costs^[7].

3 Application path of flower borders in urban renewal

3.1 Organization model innovation: competition-driven renewal practice

Integrating flower border competition mechanisms into urban renewal projects has established an implementation model characterized by government guidance, corporate participation and public interaction. By hosting themed flower border competitions to extensively solicit creative proposals, this approach attracts professional expertise to the renovation of existing spaces. Moreover, the incorporation of public voting and feedback mechanisms enhances residents'

identification with and participation in urban renewal. The excellent entries generated by the competition can be directly transformed into landscape projects for urban pocket parks, community green spaces, and road nodes, achieving a highly efficient renewal model driven by competitions to promote construction and elevate quality^[10].

3.2 Technology application strategy: accurately matching urban renewal needs

3.2.1 Cultural implantation strategy. To meet the demand for cultural inheritance in urban renewal, a three-step approach of "prototype extraction, symbol transformation, and scene creation" is adopted. In the renovation of old communities, regional historical memory symbols are extracted and transformed into paving patterns or plant clusters. In the renewal of historical districts, traditional garden-making philosophies are borrowed to create cultural artistic conception through the combination of landscape stones, plants, and small installations. In the creation of festive landscapes, thematic colored flowers and cultural installations are used to convey collective emotions and the spirit of the times^[6].

3.2.2 Ecological optimization strategy. Long-term, low maintenance plant communities are constructed based on the ecological restoration needs of urban renewal. Native plants and independently developed novel plant varieties are prioritized to reduce maintenance costs. To address soil salinization and alkalization, a composite remediation technique combining salt-isolation layers with amended soil is employed to enhance plant survival rates. Furthermore, the strategic configuration of ground cover plants and ornamental grasses helps mitigate

surface runoff and improve soil water retention. Additionally, the planting of nectar-rich plants is encouraged to enhance on-site biodiversity^[5].

3.2.3 Spatial reshaping strategy. Differentiated flower border layout patterns are adopted for different update scenarios. Pocket parks adopt a "single axis, multiple nodes" layout, with a cultural axis linking various landscape nodes. Community green spaces emphasize immersive experiences, forming comfortable resting spaces through plant enclosure. The road nodes employ a three-dimensional hierarchical design, with low plants defining the boundaries and medium to high plants attracting visual attention, thereby enhancing the quality of the street landscape. In the regeneration of industrial heritage sites, soil remediation technology can be combined to construct flower borders that combine ecological restoration and landscape display functions^[11].

3.3 Long term management mechanism: ensuring the sustainability of updates

A long-term management system integrating design, construction and maintenance is established. During the design phase, plant configuration ratios are clearly defined, with perennial plants accounting for no less than 60% and annual/biennial plants strictly controlled below 20%. In the construction phase, ecological technical specifications are strictly followed to ensure the quality of soil amendment and terrain grading. In the maintenance phase, an IoT (Internet of Things) monitoring system is employed to track plant growth in real time, enabling precise irrigation and scientific pruning to reduce maintenance costs. Furthermore, interpretive signage is utilized to explain the ecological value and cultural connotations

Table 1 Comprehensive scoring standards for flower border competition

No.	First-level indicator	Second-level indicator	Scoring criteria	Score weight//%
1	Scheme design (30%)	Concept and expression	The work's concept extends the overarching theme, featuring a novel title and a well-structured design description.	15
		Drawing quality	CAD floor plans are standardized, hand-drawn elevation drawings maintain appropriate proportions, and annotations are accurate.	10
		Plant configuration	Plants exhibit good adaptability, the proportion of long-term varieties meets the standards, and the configuration ratios are reasonable.	5
2	Construction effect (45%)	Theme realization	The theme aligns with the design intent, with plants effectively expressing the thematic connotations.	10
		Site and materials	Terrain grading is reasonable, the combination of main and accompanying plants is coordinated, and the application of auxiliary materials is appropriate.	15
		Landscape quality	The overall effect is harmonious, the spatial structure features a well-balanced density, and the color and texture combinations are appropriate.	15
3	Horticultural sculpture (25%)	Civilized construction	The site is cleaned upon completion, and construction complies with regulatory standards.	5
		Concept and theme	The sculpture aligns with ecological concepts, featuring novel and unique creative concepts.	8
		Form and craftsmanship	The structure is sound, the imagery is complete, and the material weaving is ingenious.	8
		Artistic effect	The style is distinct, conforms to aesthetic principles, and possesses strong appeal.	9

Table 2 Recommended plants and configuration suggestions for flower borders in Henan province

Plant name	Ornamental months	Flower/leaf color	Application location	Plant category
<i>Cortaderia selloana</i>	September–November	White flowers	Background	Ornamental grasses
<i>Agapanthus africanus</i>	June–August	Blue and white flowers	Mid-ground	Perennial herbs
<i>Plectranthus scutellarioides</i>	Year-round (foliage)	Purple-red, yellow-green, and variegated leaves	Foreground & border	Annual and biennial flowers
<i>Scaevola sericea</i>	May–October	White and light purple flowers	Mid-ground	Shrubs
<i>Impatiens walleriana</i> ‘Super Elfin’	May–October	Red, pink, white, and purple flowers	Foreground & border	Annual and biennial flowers
<i>Salvia farinacea</i> ‘Victoria Blue’	June–September	Deep blue flowers	Mid-ground	Perennial herbs
<i>Hylotelephium erythrostictum</i>	July–October	Pink and purplish-red flowers	Mid-ground	Perennial herbs
<i>Heuchera micrantha</i>	Year-round (foliage)	Purple, red, yellow-green, and orange leaves	Foreground & border	Perennial herbs
<i>Crossostephium chinense</i>	September–November	Yellow flowers and silvery-white leaves	Mid-ground	Perennial herbs
<i>Sedum lineare</i>	Apr–May (flower)	Yellow flowers and fresh green leaves	Foreground & border	Perennial herbs
<i>Weigela florida</i> ‘Red Prince’	May–June	Deep red flowers	Background	Shrubs
<i>Asparagus densiflorus</i> ‘Myers’	Year-round (foliage)	Emerald green leaves	Foreground & border	Perennial herbs
<i>Elacagnus pungens</i>	September–November (flower)	Silvery-white flowers and silvery-white leaf undersides	Background	Shrubs
<i>Ilex cornuta</i> ‘Golden Ham’	Year-round (foliage)	Golden-yellow leaves with green edges	Mid-ground	Shrubs
<i>Euonymus alatus</i> ‘Compactus’	Autumn (foliage)	Leaves turning red in autumn, light yellowish-green flowers	Background	Shrubs
<i>Celosia cristata</i>	June–October	Red, purple, and yellow flowers	Mid-ground	Annual and biennial flowers
<i>Duranta erecta</i>	May–October	Blue-purple flowers and yellow fruits	Mid-ground	Shrubs
<i>Lysimachia nummularia</i> ‘Aurea’	May–July (flower)	Yellow flowers and golden-yellow leaf edges	Foreground & border	Perennial herbs
<i>Sambucus nigra</i> ‘Aurea’	May–June (flower)	White flowers and golden-yellow leaves	Mid-ground	Shrubs
<i>Acorus gramineus</i> ‘Ogon’	Year-round (foliage)	Golden-yellow leaves	Foreground & border	Perennial herbs
<i>Chrysanthemum morifolium</i>	September–November	Diverse flower colors including red, yellow, white, and pink	Mid-ground	Perennial herbs
<i>Juncus effusus</i> ‘Blue Sword’	Year-round (foliage)	Blue-green leaves	Mid-ground	Ornamental grasses
<i>Ligustrum japonicum</i> ‘Variegatum’	Year-round (foliage)	Bright green leaves with golden edges	Mid-ground	Shrubs
<i>Eupatorium greggii</i>	July–September	Light purple flowers	Mid-ground	Perennial herbs
<i>Panicum virgatum</i>	July–October	Light purple flowers	Background	Ornamental grasses
<i>Verbena hybrida</i>	May–October	Pink, purple, white, and red flowers	Foreground & border	Perennial herbs
<i>Rosmarinus officinalis</i>	June–July (flower)	Light purple flowers and grayish-green leaves	Mid-ground	Shrubs
<i>Stachys byzantina</i>	May–June (flower)	Purplish-red flowers and leaves densely covered with silvery-white pubescence	Foreground & border	Perennial herbs
<i>Salvia leucantha</i>	August–October	Blue-purple flowers	Mid-ground	Perennial herbs
<i>Dianthus deltoides</i> ‘Compactus’	April–November	Pink and white flowers	Foreground & border	Perennial herbs
<i>Eupatorium fortunei</i>	July–September	Light purple flowers	Mid-ground	Perennial herbs
<i>Lythrum salicaria</i>	June–September	Purplish-red flowers	Mid-ground	Perennial herbs
<i>Dianella ensifolia</i>	March–August	Blue-purple flowers and blue-black fruit	Mid-ground	Perennial herbs
<i>Liriope spicata</i>	July–August (flower)	Light purple flowers and deep green leaves	Foreground & border	Perennial herbs
<i>Gaura lindheimeri</i>	May–September	White and pink flowers	Mid-ground	Perennial herbs
<i>Salvia guaranitica</i>	June–September	Deep blue flowers	Mid-ground	Perennial herbs
<i>Salvia officinalis</i>	June–August	Purple flowers and grayish-green leaves	Mid-ground	Perennial herbs
<i>Vitex agnus-castus</i>	June–August	Blue-purple flowers	Background	Shrubs
<i>Myrtus communis</i>	May–June (flower)	White flowers and fragrant green leaves	Mid-ground	Shrubs
<i>Ligustrum sinense</i>	May–June (flower)	White flowers and green leaves	Mid-ground	Shrubs
<i>Pennisetum alopecuroides</i> ‘Little Bunny’	June–October	White flowers (panicles) and green leaves	Foreground & border	Ornamental grasses
<i>Distylium buxifolium</i>	March–April (flower)	Mar-April (flowering)	Mid-ground	Shrubs
<i>Miscanthus sinensis</i> ‘Silver Tassel’	September–November	Silvery-white flowers	Background	Ornamental grasses
<i>Lagerstroemia indica</i> ‘Cherry Mocha’	June–September	Deep pink flowers and purplish-red leaves in spring	Background	Small arbor
<i>Iris ensata</i>	June–July	Purple flowers with patterns	Mid-ground	Perennial herbs
<i>Cordyline fruticosa</i>	Year-round (foliage)	Red, purple, and green leaves	Mid-ground	Shrubs
<i>Tulbaghia violacea</i>	May–August	Light purple flowers	Foreground & border	Perennial herbs
<i>Aster tataricus</i>	July–September	Blue-purple and white flowers	Mid-ground	Perennial herbs

of the plants, thereby enhancing the educational function of the flower borders and promoting public participation in maintenance management^[8].

4 Conclusion

This study explores the application of

cultural landscape gene translation theory in flower border competition practices, constructs a technical framework of “cultural decoding, technical translation and practical implementation”, proposes a three-tier translation model comprising “symbol, ecology and emotion” in flower border design, and investigates the

application pathways in urban renewal. Cultural translation is the core means of enhancing the connotation of flower borders. From the triple dimensions of geography, painting, and philosophy, it can effectively transform regional culture from abstract concepts to landscape

(To be continued in P60)

as primary and secondary schools, vocational colleges, and universities, providing a replicable and implementable standardized paradigm for holistic education, mental health education, and characteristic campus construction throughout the entire school stage. In the industry scenario, its core logic of "professional technical practice and professional value popularization" can provide systematic practical solutions for the implementation of garden healthcare, forest rehabilitation, and horticultural therapy in diverse scenarios such as cultural tourism, rural areas, communities, and sports, promoting the popularization and high-quality development of the industry.

Future research can further optimize the quantitative evaluation system of natural healing effects, expand empirical research in multiple regions and types of scenarios, continuously iterate theoretical and practical models, and promote natural healing as an important

supporting force for promoting national health, ecological civilization construction, and educating people in the new era.

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entities, and solve the problem of insufficient expression of traditional flower border culture. The well-established organizational mechanism, scientific evaluation criteria, and rich practical experience of the flower border competitions provide replicable technical templates and operational paradigms for urban renewal. An established management mechanism driven by competition can achieve landscape enhancement, ecological optimization, and cultural inheritance in urban renewal. With the increasing emphasis on cultural connotations and ecological values in the industry, flower borders are bound to become an important carrier of urban renewal, which can provide strong support for the construction of livable, resilient, and urban spaces.

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