

BIODIVERSITY SENSITIVE LANDSCAPE DESIGN APPROACHES for CITIES

Kentler İçin Biyoçeşitliliğe Duyarlı Peyzaj Tasarım Yaklaşımları

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ÖZ

Kentler, artan nüfusla birlikte hızla genişlemekte ve çeşitli çevresel etkilere yol açmaktadır. Ancak, şehirlerin biyolojik çeşitliliği koruma ve geliştirme potansiyeli genellikle göz ardı edilmektedir. Kentsel alanlarda biyoçeşitliliğin korunması ve desteklenmesi sadece doğal ekosistemlerin sağlığı için değil, aynı zamanda kent sakinlerinin refahı ve yaşam kalitesi için de gereklidir. Bu nedenle, kentlerde biyoçeşitliliğe duyarlı peyzaj tasarımı, peyzaj tasarımında önemli bir odak noktası haline gelmiştir. Bu çalışmada, "One Central Greenway", "Superbloom", "Red Ribbon Park" ve "Rwanda Institute for Conservation Agriculture (RICA)" olmak üzere dört peyzaj tasarım projesi, biyoçeşitliliğe duyarlı peyzaj tasarım kriterlerine odaklanılarak analiz edilmiştir. Her bir proje, yerli bitki ve habitat özelliklerinin kullanımı, tür ve bitki katmanlarının çeşitliliği, su kaynakları, doğal kaynaklar, ekolojik koridorlar, sürdürülebilir bakım uygulamaları, kamu eğitimi ve farkındalığı gibi temel kriterlerle değerlendirilmiştir. Bu çalışmanın peyzaj mimarlığı disiplininin daha sürdürülebilir çözümler üretmesine ve farklı bölgelerden bir araya getirilen karşılaştırmalarla literatüre katkı sağlaması öngörülmektedir.

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ABSTRACT

Cities are rapidly expanding with the increasing population, leading to various environmental impacts. However, the potential of cities to conserve and enhance biodiversity is often overlooked. Conserving and supporting biodiversity in urban areas is not only essential for the health of natural ecosystems but also for the well-being and quality of life for city residents. Therefore, biodiversity-sensitive landscape design in cities has become a significant focus in landscape design. In this research, four landscape design projects, "One Central Greenway", "Superbloom", "Red Ribbon Park" and "Rwanda Institute for Conservation Agriculture (RICA)", were analyzed with a focus on biodiversity sensitive landscape design criteria. Each project was evaluated on key criteria such as the use of native plant and habitat features, diversity of species and plant layers, water resources, natural resources, ecological corridors, sustainable maintenance practices, public education and awareness. It is anticipated that this study will facilitate the development of more sustainable solutions within landscape architecture, while also contributing to the existing literature by offering comparisons drawn from a range of geographical regions.

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1. INTRODUCTION

Urbanization encompasses both the expansion of urban areas and the increasing density of existing urban settlements worldwide. In addition to temperature variations, floods and droughts, urbanization presents a challenge for our cities and thus for the geographical concentrations where approximately 60% of the world's population will reside in the near future ([Haase, 2021](#)). These problems give rise to alterations in the structure and functionality of urban ecosystems, which consequently impact the social benefits and ecosystem services they provide. It has vital importance on protection and maintenance of urban ecosystems, particularly those comprising natural elements, in order to ensure the health and well-being of urban communities ([Semerdzhieva & Borisova, 2021](#)).

The classification of areas as "urban" by governmental agencies is usually based on population size, population density, the economic base, the level of service, or a combination of these factors ([IPCC, 2023](#)). As two-thirds of the world's population is projected to live in urban areas by 2050, it is argued that urban biodiversity will play an instrumental role in halting global biodiversity loss ([Müller & Werner, 2010](#)). At this point, it is important to adopt biodiversity-sensitive landscape design approaches in cities. Cities have a rich biodiversity with parks and gardens created for the communities, as well as habitats included in idle areas. These landscapes create a complex mosaic of different habitat types, creating unique urban communities ([Kattwinkel et al., 2011](#)).

Biodiversity or biological diversity refers to the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. It includes diversity within species, between species and within ecosystems ([IPCC, 2023](#)). The number of species and the density of biodiversity in a city varies according to its geographical location, climate, topography and geological conditions. The biodiversity found in a city is a subset of the species pool in the wider environment, so the context of a city's location can have a significant impact on its biodiversity ([Norton et al., 2016](#)). On the one hand, increasing population densities and land use patterns in cities put pressure on ecosystems. An ecosystem is a functional unit composed of living organisms, their abiotic environment, and the interactions within and between them. The boundaries of ecosystems can change over time. Ecosystems are contained within each other and can range in size from very small to the entire biosphere. In the present era, most ecosystems

either contain humans as key organisms or are affected by human activities in their environment.

With rising standards of living in cities and increasing awareness of urban communities, there is a need for higher requirements for quality of life. Considering that ecosystem services are among the most prominent elements of these requirements, proper management is an important issue against the occurrence of environmental problems. Legal steps should also be taken to mobilize all levels of urban governments for the proper management of ecosystem services, especially in terms of biodiversity in the city. There are European strategic documents, projects and initiatives (European Biodiversity Strategies, European Climate Action and the Green Deal, etc.) that work together to establish legal bases for improving the sustainability and resilience of cities, including nature restoration in cities. As an example of this work, regarding the implementation of the Biodiversity Strategy for 2030, the European Commission recommends the expansion of protected areas and Natura 2000 sites, the creation of ecological corridors, investment in green and blue infrastructure, green plans for cities with more than 20,000 inhabitants ([European Commission, 2013](#)).

In this century, it is not right to think of nature in cities as a destination of parks and trails. The natural environment must become the foundation of our neighborhoods, our growth, and our transportation network ([MKSK, 2021](#)).

Landscape architects plan, design and manage natural and human environments, applying aesthetic and scientific principles to address ecological sustainability, the quality and health of landscapes, collective memory, heritage and culture, and territorial justice. They deal with interactions between natural and cultural ecosystems, including climate change adaptation and mitigation, ecosystem stability, socio-economic development and community well-being, coordinating other disciplines where necessary, to create places that anticipate social and economic prosperity ([IFLA World, 2020](#)). Since the mid-20th century, industrial pollution has become a threat to urban life, turning environmental problems into crises. Accordingly, the aesthetic priorities of landscape architects have been replaced by positive sciences ([Derinboğaz, 2022](#)). With the adoption of ecological design by landscape architecture in cities, landscape designs have been provided with a flexible, process-oriented perspective that can respond to changing conditions ([Erdem Kaya, 2022](#)).

The aim of this study is to contribute to the design of more sustainable cities by presenting biodiversity-sensitive landscape design examples from different locations around the world,

and to provide alternatives for climate change adaptation and mitigation solutions. At the same time, it aims to raise awareness both within the discipline and for urban societies by providing biodiversity-sensitive design approaches that can be considered in urban landscape design, thanks to the parameters selected in the study process.

2. MATERIAL AND METHOD

2.1. Material

In order to develop biodiversity sensitive landscape design approaches in cities, it is necessary to examine projects that have been researched and implemented according to different conditions. For this purpose, One Central Greenway in the United States of America, Superbloom in the United Kingdom, Red Ribbon Park in China and Rwanda Institute for Conservation Agriculture in Rwanda, each in different continents, were analyzed ([Figure 1](#)).



Figure 1. Locations of the projects.

Şekil 1. Projelerin konumları.

2.2. Method

In the first phase of the study, as shown in the method flow chart ([Figure 2](#)), many theses, books, articles, congresses and symposium proceedings in national and international publications in the fields related to the research topic, especially the concepts of city, biodiversity and landscape design, were scanned. As a result of the literature review, it is

observed that the relationship between the city and biodiversity is shaped within landscape design according to the needs of its location.

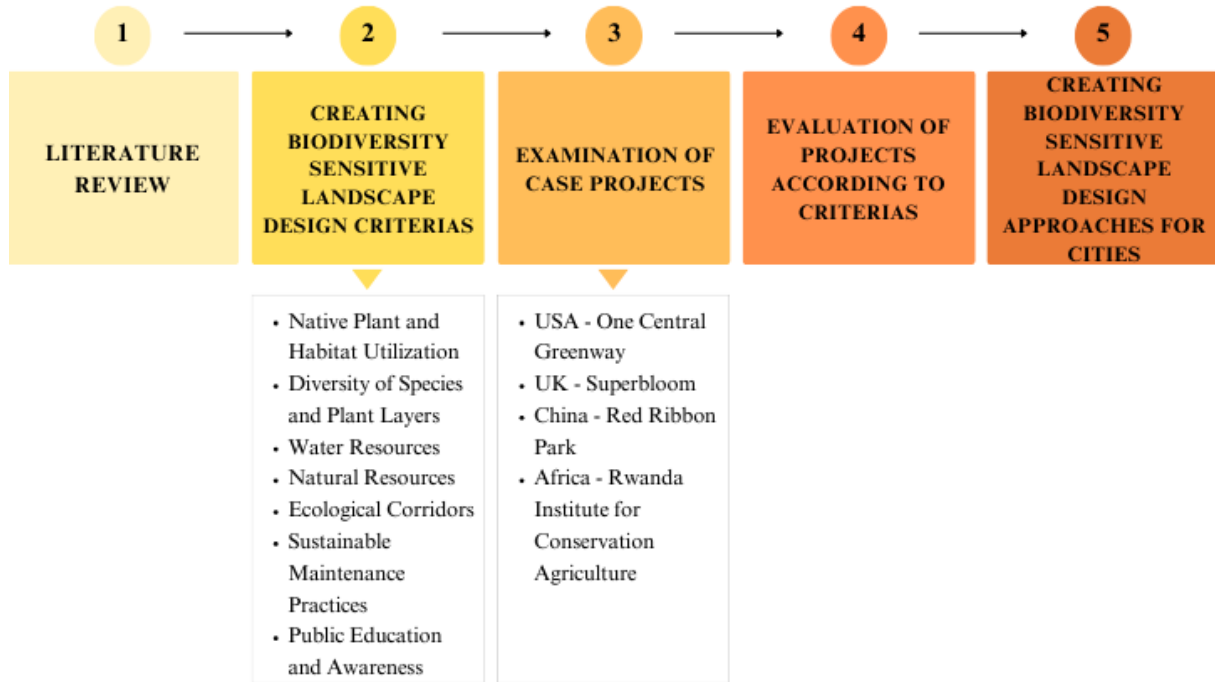


Figure 2. Method flow chart.

Şekil 2. Yöntem akış şeması.

The second step is to create biodiversity sensitive landscape design criteria based on the information obtained as a result of the research. These criterias are native plant and habitat utilization, diversity of species and plant layers, water resources, natural resources, ecological corridors, sustainable maintenance practices and public education and awareness.

In the third phase of the study, this led us to examine case projects involving research, analysis and design processes under various conditions in different locations around the world. One Central Greenway in Ohio, United States of America, Superbloom in London, United Kingdom, Red Ribbon Park in Qinhuangdao, China and Rwanda Institute for Conservation Agriculture in Bugesera, Rwanda were identified and analyzed as case projects where climate, geography and cultural conditions are quite different from each other.

In the third stage, the research, analysis, design and implementation processes of the projects were evaluated and criteria were established. With these, landscape design approaches sensitive to biodiversity in cities were categorized and evaluated in the last phase.

3. RESULTS

3.1. Biodiversity Sensitive Landscape Design

Cities are rapidly expanding with the increasing population, leading to various environmental impacts. However, the potential of cities to conserve and enhance biodiversity is often overlooked ([Müller & Werner, 2010](#)). Conserving and supporting biodiversity in urban areas is not only essential for the health of natural ecosystems but also for the well-being and quality of life for city residents ([Alvey, 2006](#)). Therefore, biodiversity-sensitive landscape design in cities has become a significant focus in landscape design.

Efforts to conserve and enhance biodiversity in urban areas have identified some principles that should be considered in urban landscape design. These principles include the preservation of habitats for local plant and animal species, the establishment of connectivity among green spaces, and the restoration of natural ecosystems ([Ahern, 1999](#)). Furthermore, the participation and collaboration of the community are essential for the sustainable management of urban biodiversity.

Biodiversity sensitive landscape design plays an important role in protecting nature and promoting diversity in urban environments. According to criterias established by the author, the basis of this design is the balanced combination of various elements and the creation of suitable habitats for nature ([Table 1](#)). The use of native plant species and the preservation of natural habitats make a major contribution to increasing biodiversity. The use of different plant species and cover layers increases the diversity of the ecosystem by supporting the life of various species. Proper management of water resources and planning of ponding areas, rivers, coastal zones etc. also increase biodiversity, while ecological corridors connect different habitats, allowing species to move and preserving genetic diversity. Sustainable maintenance practices include using methods that support biodiversity during regular maintenance of the landscape, while educating and raising public awareness about biodiversity is also important. These approaches play a critical role in urban landscape design to protect and promote biodiversity.

Table 1. Biodiversity sensitive landscape design criterias.

Tablo 1. *Biyçeşitliliğe duyarlı peyzaj tasarım kriterleri.*

Biodiversity Sensitive Landscape Design Criterias	
Native Plant and Habitat Utilization	Selection of native plants
	Conservation of natural habitats
Diversity of Species and Plant Layers	Utilizing different plant species
	Incorporating different layers of vegetation such as trees, shrubs, grasses, and ground covers
Water Resources	Water conservation and management
	Water features and natural filtration systems
Natural Resources	Utilization of local materials
	Recycled and renewable resources
Ecological Corridors	Natural land corridors
	Architectural design practices
Sustainable Maintenance Practices	Composting and recycling materials
	Low maintenance design
Public Education and Awareness	Community engagement
	Educational programs

3.2. Case Study Projects

3.2.1. One Central Greenway

In early 2021, Urban Land Institute (ULI) Columbus and the Mid-Ohio Regional Planning Commission (MORPC) invited five local design firms to collaborate with them on the design of five major waterways in Central Ohio. The objective was to create a waterway system that would be in keeping with the natural character of the region and become a focal point for urban prosperity. The concept is to integrate the city's five waterways into an interconnected green system with a view to promoting the growth of the region in a healthy way. The Olentangy River, situated at the midpoint of Central Ohio's five major waterways, serves as a backbone in this extensive green system because of its location and connectivity to the region's population, urban infrastructure, and other amenities ([RAPID 5, 2022](#)).

The Olentangy River Corridor's One Central Greenway project by local firm MKSK addresses the region's primary ecological and equity issues. It recognizes the potential for neighborhoods to connect to the river through greenways, blueways, parks, trails, routes, green streets, and community-serving elements. The goal is to create a network that provides access for all, brings the community together, provides recreational space, and significantly protects and enhances the ecology and habitats around the river ([MKSK, 2021](#)).

A call for further study by MKSK, the designer of the project, emphasized the importance of the landscape architect's perspective and the steps that need to be taken to protect and preserve biodiversity ([Landezine, 2023](#)): "We believe climate change and loss of biodiversity is real. We are in an era of major, global environmental disruption. There are two principal

problems: climate change and loss of global biodiversity. How we got here, and how we solve these problems is immensely complex, but MKSK is committed to leading, through planning and design, the change our world needs, discovering new solutions and building new ways of working. Landscape architects and planners, the two disciplines that lie at the intersection of construction and ecology, are uniquely positioned, and in our opinion obligated, to advance critical thinking to solve these growing challenges. MKSK is committed to elevating the way that landscape architects and planners integrate best and emerging practices to create innovative solutions.”.

One Central Greenway consists of 5 questions, 5 pillars, 5 actions, and 15 pulse points (Table 2). The questions shape the way the project is approached. The pillars categorize the concepts that define the project. The actions describe the basic steps the community can take to achieve these defined goals. The pulse points show how the project will be implemented at the end of this entire process.

Table 2. Five questions, pillars and actions in the project (MKSK, 2023).

Tablo 2. Projedeki beş soru, adım ve eylemler (MKSK, 2023).



It is estimated that the recent floods, droughts and rising temperatures that the city has recently experienced due to climate change will cause biodiversity loss and mass migration in the region by 2050. In addition, population growth in the city is causing rural landscapes to lose their value and forested and agricultural lands to turn into paved surfaces. One Central

Greenway responds to the increasing flood risk, wildlife migration and the need for a breath of fresh air against the heat island effect in the city with the right infrastructure (MKSK, 2021).

The river running through the neighborhood is in need of improvement due to increased development and pedestrian traffic, eroding plant communities, and water quality suffering from sediment and chemical deposition from high runoff. Canopy cover in the river corridor has been fragmented, and dense development has reduced the area of buffer zones designed to protect habitat.

To increase ecological resilience along the Olentangy River, the goal is to reconnect the gaps in the ecosystem to create a green corridor. This will help protect and enhance biodiversity around the river, improve water quality, maintain tree cover along the river, and improve the function of the buffer zone between development and the river (Figure 3).

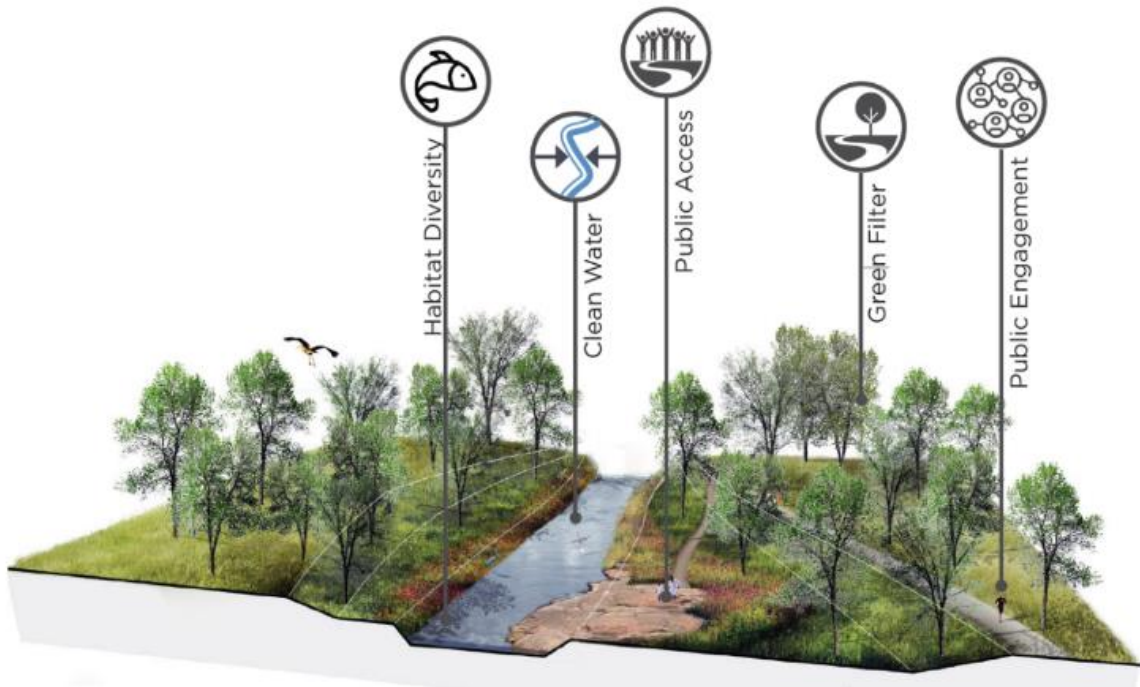


Figure 3. Green corridor structure along the river (MKSK, 2021).

Şekil 3. Nehir boyunca yeşil koridor yapısı (MKSK, 2021).

At the end of the analysis, planning and design process, 15 pulse points were identified according to the structural, social and ecological relationship established with the river and the city. At these points, an integrity where the city and society can breathe has been created by considering the habitats that need to be protected along the river and functioning with the recreational activities that the region needs.

3.2.2. Superbloom

Superbloom was designed by Historic Royal Palaces (HRP), the charity that maintains the Tower of London in the United Kingdom. The project was implemented on 1.7 acres of the Tower of London's moat, transforming the area into a festival of color between June and September 2022 to counter London's gray and chilly demeanor. Grant Associates landscape design company and Nigel Dunnett, Professor of Planting Design and Urban Horticulture at the University of Sheffield, worked together on the project. The design aims to bring a natural and colorful look to the Tower of London, while providing a much-needed resource for pollination and seed-eating birds. In the summer of 2021, tests at the site showed that even the small number of flower species in the moat has strong potential to increase biodiversity ([Dunnett, 2024](#)).

In addition to its colorful appearance, Superbloom has become an attraction that emphasizes the value and importance of nature in the collective memory of society. Against the backdrop of ancient stone walls and towers, visitors have the opportunity to experience vibrant hues of color, plant and animal species ([Figure 4](#)).



Figure 4. Project plan ([Landezine, 2024](#)).

Şekil 4. Proje planı ([Landezine, 2024](#)).

A number of technical challenges were encountered on site during the implementation of the project. The soil in the moat was not suitable for planting, and the Tower of London is a historic building, which made the project difficult to implement due to strict archaeological regulations. The microclimates in different parts of the moat affected the germination and flowering time of the seeds. These different conditions required special approaches to design on a scale closer to the site. More than 20 million seeds of different species were placed along the moat to create a natural and dynamic flower field. Ecological research has supported the aim of increasing biodiversity and supporting native species in the London area ([Landezine, 2024](#)).

The seed mixtures created to be applied to the site include many familiar wildflowers such as *Papaver rhoeas*, *Centaurea cyanus*, *Achillea millefolium*. However, depending on the purpose of the design and the surrounding elements, there are areas where they are applied intensively. For example, *Centaurea cyanus* is included in all seed mixes. Because when in full bloom, its bright blue color refers to the formerly water-filled moat of the Tower of London ([Grant Associates, 2022](#)). The full plant list is listed in the table below ([Table 3](#)).

Nigel Dunnett, Professor of Planting Design and Urban Horticulture at the University of Sheffield, said of the project (2024): “We hope that the effect of being surrounded by a sea of colourful, sparkling and vibrant flowers will release feelings of pure liberated joy in visitors to the Superbloom – it will be such a powerful, emotional and celebratory experience. We’ve undertaken a lot of testing and trials to ensure that we deliver dramatic and beautiful impressionistic blends of colours, a long and continuous sequence of flowering, and a wonderful place for pollinating insects.”

Despite the many challenges and obstacles encountered during the implementation of the project, Superbloom managed to attract more than 250,000 visitors during its exhibition period. In the process, it not only provided a visitor experience, but also raised awareness about the need to rethink green space design in cities in the face of climate change and biodiversity loss. The lessons learned throughout the design and implementation steps of the project will inform future design, emphasizing the importance of understanding microclimates, soil structure, water management and biodiversity sensitive design ([Landezine, 2024](#)). In addition, Historic Royal Palaces (HRP) has stated that the Superbloom project is an important starting point for the future landscape design of London’s green infrastructure ([Grant Associates, 2024](#)).

Table 3. Plant species and colors ([Historic Royal Palaces, 2023](#)).

Tablo 3. Kullanılan bitki türleri ve renkleri ([Historic Royal Palaces, 2023](#)).

Number	Plant Name (Latin)	Plant Name (English)	Color
1	<i>Achillea millefolium</i>	Yarrow	White
2	<i>Ammi majus</i>	Bishop's Flower	White
3	<i>Arctotis fastuosa</i> 'Zulu Prince'	Cape Daisy variety 'Zulu Prince'	White
4	<i>Glebionis segetum</i> 'Eastern Star'	Corn Marigold variety 'Eastern Star'	White
5	<i>Gypsophylla elegans</i>	Baby's Breath	White
6	<i>Leucanthemum vulgare</i>	Oxeye Daisy	White
7	<i>Malope trifida</i> 'Alba'	Mallow-wort variety 'Alba'	White
8	<i>Orlaya grandiflora</i>	Large Flowered Orlaya	White
9	<i>Rhodanthe chlorocephala</i> 'Pierrot'	Everlasting variety 'Pierrot'	White
10	<i>Anethum graveolens</i>	Dill	Yellow
11	<i>Bupleurum salicifolium</i>	Wild Anise	Yellow
12	<i>Coreopsis tinctoria</i> 'Tall'	Garden Tickseed variety 'Tall'	Yellow
13	<i>Galium verum</i>	Lady's Bedstraw	Yellow
14	<i>Helianthus</i> 'Summer Beauty'	Sunflower variety 'Summer Beauty'	Yellow
15	<i>Limnanthes douglasii</i>	Meadow-foam	Yellow
16	<i>Linaria vulgaris</i>	Common Toadflax	Yellow
17	<i>Rudbeckia hirta</i> 'My Joy'	Black-Eyed Susan variety 'My Joy'	Yellow
18	<i>Calendula officinalis</i> 'Indian Prince'	Pot Marigold variety 'Indian Prince'	Orange
19	<i>Dimorphotheca aurantiaca</i>	Namaqualand Daisy	Orange
20	<i>Eschscholzia californica</i> 'Mikado'	California Poppy variety 'Mikado'	Orange
21	<i>Atriplex hortensis</i> 'Rubra'	Garden Orache variety 'Rubra'	Red
22	<i>Linum grandiflorum</i>	Crimson Flax	Red
23	<i>Papaver rhoeas</i>	Common Poppy	Red
24	<i>Agrostemma githago</i>	Corncockle	Pink
25	<i>Centaurea americana</i> 'Aloha Rosa'	American Basketflower variety 'Aloha Rosa'	Pink
26	<i>Clarkia unguiculata</i> 'Appleblossom'	Clarkia variety 'Appleblossom'	Pink
27	<i>Cosmos bipinnatus</i> 'Gloria'	Mexican Aster variety 'Gloria'	Pink
28	<i>Linaria maroccana</i> 'Fairy Lights'	Toadflax variety 'Fairy Lights'	Pink
29	<i>Lychnis coronaria</i>	Rose Champion	Pink
30	<i>Silene armeria</i> 'Electra'	Sweet-William Catchfly variety 'Electra'	Pink
31	<i>Vaccaria hispanica</i> 'Pink Beauty'	Cowherb variety 'Pink Beauty'	Pink
32	<i>Viscaria oculata</i>	Rose Angel	Pink
33	<i>Gilia tricolor</i>	Bird's-Eyes	Purple
34	<i>Origanum vulgare</i>	Wild Marjoram	Purple
35	<i>Malva</i>	Mallow	Purple
36	<i>Salvia nemorosa</i>	Balkan Clary	Purple
37	<i>Centaurea cyanus</i> 'Blue Boy'	Cornflower variety 'Blue boy'	Blue
38	<i>Convolvulus tricolor</i> 'Blue Ensign'	Dwarf Morning Glory variety 'Blue Ensign'	Blue
39	<i>Echium vulgare</i> 'Blue Bledder'	Viper's-bugloss variety 'Blue Bledder'	Blue

3.2.3. Red Ribbon Park

Designed by Turenscape in 2005 and implemented in 2006 in Qinhuangdao, Hebei Province, China, Red Ribbon Park is a 20 hectare river corridor along the Tanghe River ([Turenscape, 2020](#)).

The analysis and research conducted prior to the design of the project revealed the strengths and weaknesses of the area (Figure 5). The ecological situation is a strength, because the area is covered with lush and diverse vegetation that supports biodiversity. However, the scattered and restrictive nature of this lush vegetation has created potential safety and accessibility issues. In addition, the abandoned settlement along the river, the development pressure on the area, and the recreational needs of the surrounding community have created a need for landscape planning and design around the river (Archdaily, 2013).

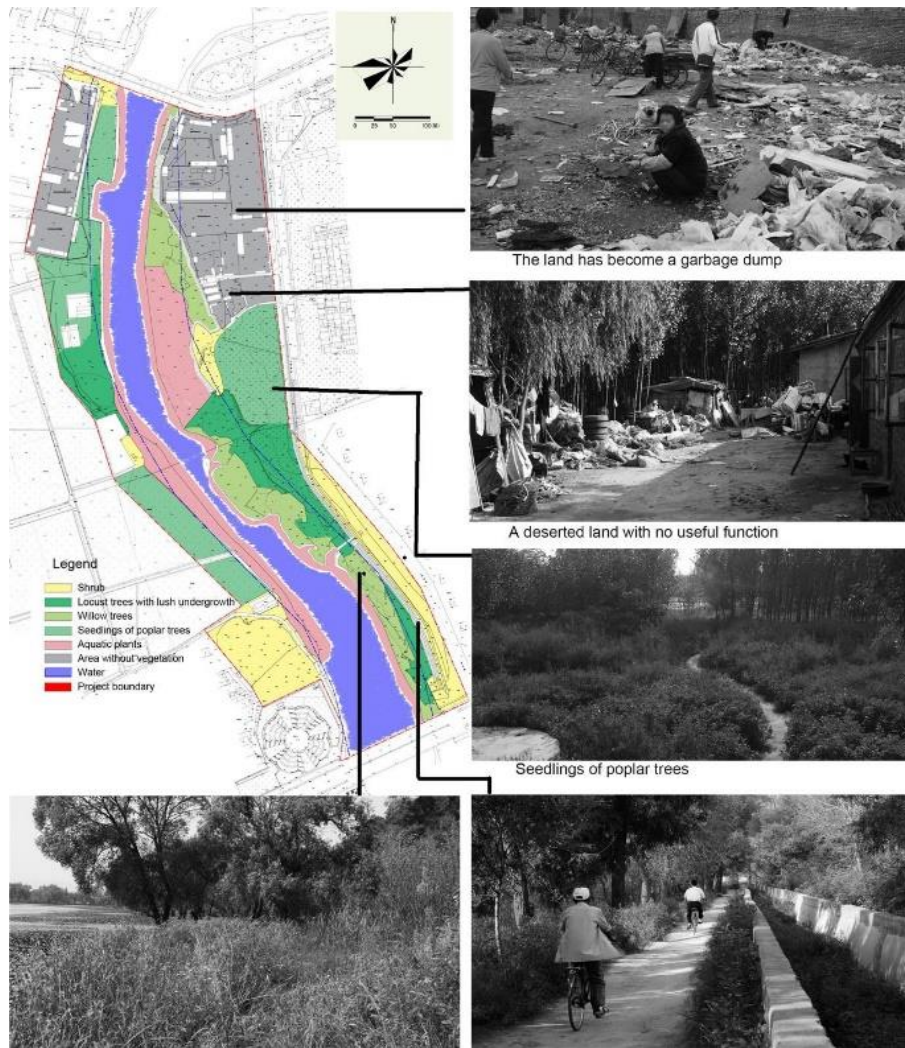


Figure 5. Planning and design process (Turenscape, 2020).

Şekil 5. Planlama ve tasarım süreci (Turenscape, 2020).

The biggest challenge in the Red Ribbon Park design process was figuring out how to preserve the area's natural habitats and biodiversity along the river, along with all the needs for intensive urban uses such as recreation and education. To get the most out of the area with the least amount of disturbance, a red ribbon was designed to run parallel to the dense green

vegetation and blue river. This ribbon runs along the riverbank for 500 meters. Boardwalks, lighting, seating and environmental interaction points are integrated according to the needs of the site, planned resting places and vegetation suitability. The red band varies from 60 cm in height and 30-150 cm in width. At some points, plant samples are grown in the openings left on the band. In the rest areas, four cloud-shaped pavilions have been installed to provide shelter from the weather, views, and opportunities for gathering. Flower gardens planted in abandoned areas that were once slums and garbage dumps serve as patches ([Divisare, 2012](#)).

The Red Ribbon Park project, which preserves as much of the natural river corridor as possible during the process of urbanization, demonstrates how design solutions can dramatically improve the landscape without intensive intervention ([ASLA, 2007](#)). For this reason, it was awarded the ASLA Design Honor Award in 2007, the International Architectural Award in 2008 and the Annual Honor Award for Excellence on the Waterfront in 2010 ([Turenscape, 2020](#)).

Stretching 500 meters, the bright red color of the ribbon illuminates the densely vegetated area, connects the four flower gardens planned to protect and maintain biodiversity, and provides a structural means of public access ([Figure 6](#)). The natural area around the river, the ecological processes and the habitat structure of the area are not disturbed, and the features needed by the community are incorporated into the design.



Figure 6. A photography of Red Ribbon ([Turenscape, 2020](#)).

Şekil 6. Red Ribbon'dan bir fotoğraf ([Turenscape, 2020](#)).

3.2.4. Rwanda Institute for Conservation Agriculture (RICA)

Rwanda is Africa's most densely populated country under the Sahara Desert, with more than 80% of the population living in rural areas. With rapid population growth expected to double by 2050, the country is projected to face challenges in producing enough food to feed its people. To strategize against this situation, the Rwanda Institute for Conservation Agriculture (RICA) campus in Bugesera ([Figure 7](#)), Rwanda has been redesigned in partnership with MASS Design Group. Designed in 2019, the construction of the project was completed in 2021 ([MASS Design Group, 2024](#)).



Figure 7. Aerial photo of area ([Baan, 2024](#)).

Şekil 7. Alanın havadan çekilmiş fotoğrafı ([Baan, 2024](#)).

RICA aims to prevent future food problems by educating the next generation of farmers and agricultural workers about sustainable, healthy and safe food production. Titled “One Health,” the project’s research, analysis, and design process was multidisciplinary, resulting in a land use and master plan that prioritizes landscape, human, ecological, and animal health. One Health aims to capitalize on the productive aspects of ecological and agricultural relationships to achieve higher crop yields, increased biodiversity, waste management, healthier soils and water quality. Because RICA’s landscape architects favor sustainable methods in the design and construction process, they have created a plan that will produce a net zero carbon footprint using materials such as stone, soil, and vegetation that exist on the site itself and will be reused. It is estimated that RICA will be carbon positive by 2044, and it is argued that the project will serve as a model for sustainable development ([ASLA, 2020](#)).

Based on the data collected in the first phase of the project, an analysis of the flora and fauna of the study area was carried out with the participation of landscape architects, ecologists, local historians, veterinarians, doctors, agricultural academics and biologists. As a result of the analysis, it was determined that an area that makes up about a quarter of the study area is a very valuable intact savanna woodland. This led to the idea of combining the agricultural production and educational elements of the ‘One Health’ design in a restored ecosystem ([ASLA, 2020](#)).

In contrast to the damages of industrial agriculture, the importance of soil conservation and regeneration, biodiversity and natural processes are actively reunited on and under the soil surface ([Figure 8](#)).

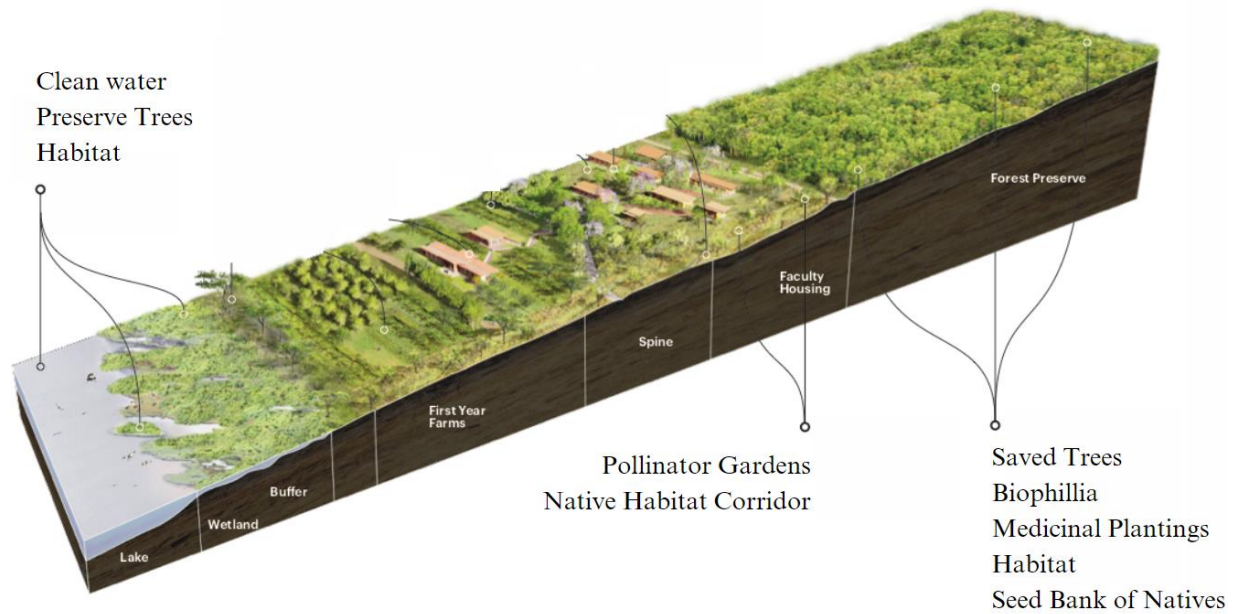


Figure 8. Section of the system ([Barcelona International Landscape Biennial, 2020](#)).

Şekil 8. Sistem kesiti ([Barcelona International Landscape Biennial, 2020](#)).

In the process of creating the master plan, landscape architects placed campus structures on 40 hectares of the 1400-hectare site, taking into account the slope, soil type, existing vegetation and circulation. Savannah forests that retain their characteristic features have been designated as protected areas. Buffer zones were created around them to ensure the health of the wetlands. Ecological corridors connect these woodlands to the wetlands, maintaining the relationship between habitats and allowing movement.

RICA’s masterplan includes landscaping, housing, academic spaces, stables, storage, processing space, stormwater systems, waste management systems and independent energy infrastructure. The separation of the farms and their immediate surroundings according to their

subject matter creates an appropriate distance between the modes of production in terms of biosecurity. Landscape design restores the habitats surrounding the farmland, protecting and sustaining biodiversity.

RICA contributes positively to 15 of the 17 UN SDGs through low-carbon natural materials, independent energy production and sustainable landscape design ([Arup, 2024](#)). Thanks to all these positive aspects of the project, it won ASLA's 2020 Professional Awards in the Analysis and Planning category ([MASS Design Group, 2024](#)).

4. CONCLUSION

Urban green areas are habitats that play an important role in the protection, maintenance and continuity of biodiversity resources, and in this context, they provide services for all life functions such as shelter, accommodation, rest, nutrition and reproduction for flora, fauna and other living species. For this reason, biodiversity-sensitive landscape design in cities is not only crucial for the ecological health of cities but also for improving the quality of life of city residents. Therefore, it is essential that efforts in urban planning and landscape architecture align with the goals of biodiversity conservation and enhancement.

Four landscape design projects, "One Central Greenway", "Superbloom", "Red Ribbon Park" and "Rwanda Institute for Conservation Agriculture (RICA)", were analyzed with a focus on biodiversity sensitive landscape design criteria ([Table 4](#)). Each project was assessed with key criteria such as native plant and habitat utilization, diversity of species and plant layers, water resources, natural resources, ecological corridors, sustainable maintenance practices, public education and awareness.

Table 4. Evaluation of projects according to biodiversity sensitive landscape design criteria.

Tablo 4. Projelerin biyoçeşitliliğe duyarlı peyzaj tasarım kriterlerine göre değerlendirilmesi.

Projects	Biodiversity Sensitive Landscape Design Criterias						
	Native Plant and Habitat Utilization	Diversity of Species and Plant Layers	Water Resources	Natural Resources	Ecological Corridors	Sustainable Maintenance Practices	Public Education and Awareness
One Central Greenway	X	X	X	X	X		X
Superbloom	X	X					X
Red Ribbon Park	X			X	X	X	
RICA	X				X	X	

Each of the analyzed projects demonstrates a commitment to promoting and conserving biodiversity through various design strategies and initiatives. The One Central Greenway project, conducted in the state of Ohio, USA, by the design firm MKSK, aims to preserve the existing local ecosystem and enhance biodiversity. The project emphasizes the use of local plant species and has taken various measures to conserve water resources. Additionally, the project aims to raise awareness about biodiversity and ecosystem services within the community. The Superbloom project, carried out by Historic Royal Palaces (HRP) in the capital city of London, United Kingdom, emphasizes the utilization of local plant and habitat and incorporates various measures to conserve water resources. The application of plant species suitable for organic farming methods contributes to ecosystem health. Furthermore, the project aims to raise awareness about biodiversity and natural life by highlighting the value of the natural environment to visitors. The Red Ribbon Park project, designed by Turenscape in the city of Qinhuangdao, China, focuses on the utilization of local plant and habitat and facilitates species movement through ecological corridors connecting different habitats. Additionally, the project stands out for adopting sustainable maintenance practices and preserving the local ecosystem. The Rwanda Institute for Conservation Agriculture (RICA) project, implemented in the country of Rwanda in Africa, promotes the use of local plant and habitat and preserves species movement and genetic diversity through ecological corridors. Moreover, the project adopts sustainable maintenance practices and protects the local ecosystem.

The projects selected and analyzed from North America, Asia, Europe, and Africa demonstrate a variety of landscape design approaches that are influenced by the climatic characteristics and geographical locations of each country. In these countries, different landscape design approaches can be adopted in cities according to their unique conditions.

The climate of North America varies considerably across different regions. The Northeast and Northwest are temperate, the Southeast is tropical, and the Southwest is desert. Therefore, it is crucial to consider the impact of climate differences when designing biodiversity-sensitive landscapes in North America. In the Northeast and Northwest, the use of native plants and habitats can create landscapes that are resilient to seasonal changes. In contrast, in the Southeast and Southwest, water-saving plant choices and sustainable irrigation practices are preferable. In the United Kingdom, biodiversity-sensitive landscape design is crucial for the preservation of native plant species, wetlands, and the creation of connections between various habitats. Additionally, the implementation of sustainable water management practices, such as rainwater recycling systems, is widely encouraged. China's vast geographical areas encompass diverse

climate types, necessitating the adaptation of landscape design accordingly. When designing biodiversity-sensitive landscapes in China, practices such as plant selections suitable for seasonal changes, water-saving irrigation systems, and measures to prevent soil erosion stand out. The continent of Africa is characterized by tropical climates, although there are notable variations in climatic conditions across different regions. In landscape design that is sensitive to biodiversity in Africa, it is crucial to consider the potential impact of drought and water scarcity. This necessitates the incorporation of water-saving plant species, the use of local plant varieties, and drought-resistant landscape designs. Additionally, it is vital to educate and engage the public in the effort to conserve biodiversity in Africa.

Urban biodiversity not only contributes to the preservation of natural habitats but also shapes the ecological and cultural identity of cities ([Ignatieva, 2010](#)). In managing urban green spaces, consideration should be given not only to the ecological conditions of the urban environment but also to the historical development of green spaces and culturally significant plant species. In this context, the use of local plant species is an effective way to increase biodiversity in urban areas ([Başer, 2011](#)). Additionally, green infrastructure elements such as green roofs can provide habitats for rare and endangered species, thus enhancing biodiversity ([Baumann & Kasten, 2010](#)). Moreover, biodiversity-sensitive landscape design in urban areas requires a multidisciplinary approach. Collaboration and coordination among urban planners, landscape architects, biologists, and local communities are necessary. Additionally, effective policies and regulations are essential for the conservation and enhancement of biodiversity in urban areas.

To ensure appropriate approaches on biodiversity-sensitive landscape design in urban areas, firstly, heterogeneity should be achieved through the use of diverse elements and arrangements. This is achieved by balancing natural and artificial components to create different habitat types ([Alberti & Wang, 2022](#)). Additionally, it is crucial to strengthen connections between habitats. By establishing green corridors and other forms of green infrastructure, transitions between different habitats can be facilitated, thereby easing the migration and dispersal of species. The organization of transportation infrastructure also plays a significant role in biodiversity-sensitive landscape design. Roads, rail systems, and other transportation routes should not only avoid hindering the movement of species but also support it. Therefore, appropriate measures to preserve biodiversity should be taken into account when planning transportation infrastructure. Considering the historical heritage, local ecosystems, and their changes within the city is also important. Past events and long-term changes can

influence current biodiversity patterns and guide future conservation efforts. Therefore, understanding the context of the area's character in urban landscape design is essential. Lastly, increasing public awareness and participation is crucial. Biodiversity-sensitive landscape design should rely on the support and involvement of the community. Local residents should be educated and encouraged to participate actively in this process, fostering their engagement in biodiversity conservation efforts.

When these approaches are integrated, it becomes evident that biodiversity-sensitive landscape design in urban areas can be successfully implemented, thereby providing an invaluable opportunity for urban environments to support natural life.

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