

Research on Highly Artificial River Ecological Restoration

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Abstract

With the expansion of the city's incremental development to the intensive and high-efficiency connotation development based on the stock, the urban ecological environment, especially the highly artificial river pollution control, the improvement of the ecological environment and the improvement of the landscape have become the focus of the ecological protection and renovation of urban rivers. For this reason, highly artificial river ecological restoration and ecological landscape restoration are important components of the construction of new urbanization and beautiful human settlements. This paper analyzes and summarizes the spatial natural shape reconstruction of urban rivers, the restoration of the river water ecological environment and the riverbank ecological restoration technology, which provides a reference for the design and implementation of the urban river ecological environment protection and related projects.

Keywords

Highly artificial; urban rivers; ecological restoration.

1. Introduction

The construction of a new type of urbanization is an important strategy for sustainable economic and social development in the new era. Cities are also developing from incremental expansion-oriented development to stock-oriented intensive and high-efficiency connotative development. Rivers play an important role in improving the urban ecological environment, enhancing cultural characteristics, regulating the urban microclimate, building a beautiful living environment, and promoting regional economic growth in the process of new urbanization [1]. "Urban double repair" is an effective means to solve the problem of unbalanced economic, social, and ecological development in the process of urban development. It uses the concept of re-ecology to restore and upgrade the urban natural environment, protect and restore the urban rivers and surrounding ecological environment and natural landscapes. Play the role of river regulation to improve the quality of urban ecological environment. Urban rivers are an important part of the ecosystem. Researchers have carried out more theoretical research and technical applications of river ecological restoration, mainly focusing on river landscape improvement and river bank ecological restoration, providing technology, management, system construction, and system for river ecological restoration Construction and other experience [2]. Urban river ecological restoration mainly focuses on river space restoration, water ecological restoration and river bank ecological restoration. Many studies have

conducted theoretical research and practice on the improvement of urban river ecological environment quality and landscape enhancement from the perspective of landscape ecology. Based on a large number of previous studies and case practices, this article summarizes the key technologies and characteristics of river spatial morphology, water system, and river bank ecological restoration, and provides references for related scientific research and engineering projects.

2. Reconstruction and restoration of river space

2.1. Optimizing and restoring the natural form of the river

In the process of urban development and construction, the natural river channel is cut and straightened and divided into several water area units through water conservancy projects, which affects the continuity of the longitudinal ecosystem and changes the shape, length curvature, cross-sectional area, shape, and vertical slope of the river channel. The radius and number of river bends and the shape of the riverbank.

Restoring the ecological continuity of the river, building a diverse topographic structure with deep pools, sandbars, rapids and slow currents, so that the ecological environment is gradually restored. Restore the wetland area, restore the self-purification capacity of the water body, expand the floodplain area of the river, restore the natural pulse hydrological periodic changes of the river, and strengthen the lateral hydrological and horizontal connectivity between the main stream and the side tributaries and the floodplain [3]. The water flows into the main river channel of the deep shallows in the dry season, and the excess water overflows into the floodplain area during the flood season, which improves the river channel's flood-carrying capacity.

2.2. Optimize the shape of the river bed and water flow

The focus of restoring the riverbed morphology is to restore its vertical natural meandering, and to maximize the diversity of riverbed morphology on the basis of meeting the flood discharge and ecological habitat reconstruction of the river, thereby increasing its landscape heterogeneity. Among them, the continuity of the riverbed can be repaired into a continuous and vibrant water body by digging the river channel, connecting the water body with interrupted flow, and expanding the water surface. It adopts naturalization methods to restore its natural form, and designs different types of water bodies, including river courses, lakes, streams, water purification ponds, etc. In particular, for the restoration of lateral topographic features, it is necessary to design the river section and water depth. Deep pools and shallows form different river cross-sectional features, which can provide habitats for different organisms. For the control of cross-section and water depth along the river, different geomorphic features are constructed by alternating depths and shallows. Deep pools and shallows form different river cross-sectional features, providing habitats for different organisms. Make full use of the hydrogeological characteristics of the river, set up deep pools in geological depressions, and design deeper water levels at drops and river turns. In addition, for different river courses, the design of bank protection on both sides of the river bed shall be carried out layered and segmented repairs in accordance with the requirements of ecological restoration and ecological landscape construction goals, so as to achieve the main river bed overflow in the dry season and flood in the flood season. The multi-level design increases the river beach area while providing more habitats for aquatic organisms, ensuring the ecological function and improving the landscape effect.

2.3. Shaping and Restoration of River Bank Line Shape

For the near-natural streamline shaping of the river bank shape, it should be as unified as possible with the current planned river center line, try to retain the original natural shape of

the river, emphasize the curvature of the landscape streamline, and maintain the original "deep pools, shoals, and streams", Rapids" and the natural trend of the main rivers. "Bend if you want to bend," such as the Liangshui River in Beijing, while respecting the current status of the river course, softened and improved the river bank to restore the natural shape of the river to the greatest possible extent, with appropriate curvature, combining wide and narrow, to reduce the shape of the river bank. The mechanical line types [4]. In the construction of the near-natural ecological restoration of the river bank, the river bank will be transformed in consideration of the nature of the surrounding land in the river basin, respecting the natural form of the water body, and making use of the design potential of the shoreline twists and river confluences and other landscape nodes for key reconstruction. To meet the requirements of flood control, increase the creation of hydrophilic spaces to allow people to participate.

3. River water ecological environment restoration

Based on the premise of following the basic laws of nature, guided by the principles of ecology, based on bioremediation, combined with physics, chemistry and various auxiliary engineering technical facilities, the river water ecological environment is protected and restored with the best effect and the lowest cost.

3.1. The river flood control and drainage

Give full play to the water system functions of natural accumulation, natural infiltration, and natural evolution of the river. Change the methods of mechanized and rapid treatment of pipes, canals, pumping stations and other facilities that are often used in traditional river governance, and remove water pollution through measures such as the absorption of rainwater by the river, the photosynthesis of river plants, and the enhancement of the permeability of the planting soil. Material, alleviate the flow rate of rainwater, based on the infiltration and storage function of the river, the precipitation pressure can be effectively adjusted through the permeable pavement of the green space and the adjustment of the reservoir. The flood storage area is set up in combination with the green isolation belt on the river bank, and measures such as rainwater collection pipes, groundwater drainage pipes, and main stream system diversion are used to combine artificial and natural systems for river drainage measures.

In the process of ecological treatment of rivers, most rivers are faced with problems such as insufficient flood discharge capacity and excessively mechanical treatment of flood discharge sections. In the process of ecological treatment of rivers, the construction technology of dam foundation grouting is used to repair, and the water flow is appropriately carried out. The diversion of the river is added to the tributary to prevent flooding. Construct a natural, structured, and biological bank protection project, and further protect the river bank slope through the construction of slope protection herb plants, ecological concrete slope protection and other garden projects.

3.2. The river water purification

Physical repair technology. Through dams, overflow weirs, sluices and other water body engineering construction facilities, the rainwater runoff system is artificially controlled, the algae in the water body are artificially removed, the dredging to remove the sediment of the river channel, and the water is diluted by various engineering methods to achieve the effect of purifying water quality. The water body structure is artificially treated, the water is tumbling and agitated to increase the oxygen in the water, and at the same time, the algae and other pollutants are artificially salvaged to remove pollutants in the water.

Chemical repair technology. In response to sudden water pollution, chemicals are used to promote nitrification and denitrification, and artificial oxygenation equipment is added to adsorb harmful substances in water bodies, and artificial scientific methods are used to quickly

and effectively control polluted water bodies and accelerate water body purification. However, in the specific implementation process, short-term remediation should be carried out according to local conditions such as the degree of river water pollution, pollution scope, and pollutant characteristics, and risk assessment of the side effects of chemical remediation technology should be carried out.

Bioremediation means. Through the purification function of the animals, plants and microorganisms in the water body that can purify the water body, it can filter and degrade the pollutants in the water, accelerate the circulation of the water body, and improve the metabolism ability of the aquatic organisms. Bioremediation technology can be divided into aquatic plant remediation, aquatic animal and microbial remediation according to the difference of the main body of the remediation. Among them, aquatic phytoremediation mainly uses the absorption, volatilization, filtration, and degradation of plants to remove organic and inorganic pollutants in water to achieve water purification. According to the characteristics of different river courses, aquatic plant restoration adopts diversified ecological treatment methods, mainly including artificial wetlands, artificial floating islands and other methods.

3.3. Pollution source prevention and control

Pollution control is a fundamental measure to improve river water quality. Ecological restoration of urban rivers is a systematic project that integrates water conservancy, environmental protection, land management, urban construction and other departments. In order to achieve the control of urban river pollution sources, comprehensive measures must be taken to intercept pollution and improve the water quality of the river network. While effective control of point and non-point sources of pollution, the internal pollution sources of the river must be treated. Speed up the construction of urban sewage collection pipe networks in residential areas, improve the quality of residents and environmental protection awareness, change the bad habit of dumping garbage into rivers, and incorporate all residents' domestic sewage discharge into the urban sewage pipe network. In order to prevent the emergence of eutrophication of river water bodies, measures such as pollution control, river dredging and water surface cleaning have been implemented to reduce the total amount of pollutants in urban rivers. In addition, effective use of river beaches, wetland systems, etc., improves the water quality of urban rivers through the self-purification capacity of the rivers.

The water quality of rechargeable urban rivers is poor, and the water bodies contain more pollutants and are relatively turbid. Therefore, setting up corresponding water conservancy infrastructure to gradually filter impurities in the water is a very necessary repair measure. Rolling dam is a low-height water-retaining structure, also known as overflow dam. Its main working principle is that when the water level does not exceed the height of the dam, the dam will intercept the flow of water and store water; When the water level exceeds the height of the dam, excess water will overflow from the top of the rolling dam. Setting up ecological rolling dams in rechargeable urban rivers can not only reduce flood disasters to a certain extent, but also play a role in blocking water and filtering sediment in the river, preventing sediment from being discharged downstream. And can provide a variety of living space for animals and plants, increase biodiversity.

4. Artificial riverbank ecological restoration

4.1. Ecological revetment

After urban rivers have undergone a high degree of artificial disturbance, in the process of ecological repair and restoration, it is necessary to rebuild and restore the ecological revetment, strengthen the embankment, and rationally arrange plants to provide habitat for organisms in the ecosystem and improve the ecological environment of the river. Common technical

measures for ecological revetment include live plant revetment, riprap revetment, gabion revetment, ecological concrete revetment, fence revetment, and composite stone revetment [5]. In particular, natural solid materials can effectively slow down the water and soil erosion of the revetment, and the physical, chemical, and biological synergistic effects of microorganisms and plants can effectively reduce the eutrophication in them.

Riparian slope protection and ecological restoration mainly involve riparian soil restoration and plant community design. Among them, soil remediation uses civil engineering methods and biochemical remediation techniques to remediate contaminated soil based on the soil environmental quality. In addition, the river bank is an important urban landscape construction point, and plant landscape design is particularly important. Ecological restoration plants absorb nutrients to filter rainwater and pollutants, reducing the pollution of runoff on both sides of the river directly into the main river and affecting the water quality of the river. The riverside lawn is designed with gentle slopes to improve hydrophilicity.

4.2. River bank humanistic landscape construction

The revetment corridor is an important part of the urban river landscape construction, which can enhance the necessity of landscape connection, maintain ecological integrity, and generate positive ecological benefits. Using the landscape patch-corridor-matrix theory to create a spillway ecological revetment space, it is important to determine the slope, matrix composition, length, continuity, and width of the revetment.

The human landscape of the river is of great significance to the comprehensive improvement of the quality of the river's ecological environment and even the construction of the urban landscape. The riverside landscape is often equipped with viewing buildings and structures to express the characteristics of the urban landscape and provide urban residents with a hydrophilic and water-friendly resting environment. The construction of humanistic landscape needs to tap the local humanistic characteristics of the city, and form a new landscape sequence through the arrangement and combination of scenes. Based on the urban cultural innovation, the riverbank humanistic landscape is developed into a city's iconic and representative classic case.

5. Conclusion

The restoration of urban river ecosystem and ecological landscape has become a concern in the construction of new urbanization and livable living environment in China. It mainly includes the construction of the spatial natural form of the river channel, safe flood control and drainage, river erosion and siltation, restoration of aquatic ecological habitat, ecological restoration of the river bank, pollution prevention and control, as well as the construction of urban and river ecological landscapes, cultural landscape construction and characteristic themed cultural construction. In advancing the construction of urban ecological space, the construction of urban river ecological landscape has always been in an important position in the safety of urban water resources and ecological health, and various measures have been taken to carry out river reconstruction, ecological restoration and ecological and cultural landscape construction according to local conditions, and to cooperate with smart cities and smart people. Housing construction coupling strengthens the maintenance and management of the healthy state of the river in the later stage, and realizes a win-win situation for the construction of a healthy urban ecological effect of a high-quality riverfront human settlement environment in the urbanization of the new city.

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