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Study on Restoration Practice of Degraded Ecological Functions of Yitong River Wetland

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Abstract: As an important watershed ecological carrier in Changchun city, Yitong River wetland performs the main tasks such as water cleaning, water source regulation and storage, and maintaining all life. Due to urban sprawl, manmade reengineering, urban non-point source pollution, and the like, the wetlands have lost their ecological foundation, gone through intense habitat division, and continuous erosion of their function. The restoration efforts still have a lot of problems now. Following the restorations at Yitong River Wetland, it will be possible to identify the problems that wetlands have faced so as to make practical improvements for future restoration. The restoration of the ecological base, applying suitable technology, and long-term administration & management, plus joint administration. The goal is the gradual restoration of the ecological service capability of the wetland and to provide a reference for the administration of urban rivers and lakes in northern China.

Keywords: Yitong river wetland; Ecological function degradation; Ecological restoration

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1. Introduction

The Yitong River wetland is one of the important city wetland ecosystems located in the Songhua River basin. It plays a significant role in the ecological civilization construction in Chang'an City, and it holds obvious ecological as well as social values. In recent times, because of intense city growth, there has been so much human interference to a point that there's no water flowing between all the places, and the internal stuff just keeps building up, then we end up with a bunch of not-so-good biology there. Right now, there are limitations put forth because of basic ecology, lack of tech adaptation, as well as inadequate management/protect mechanisms. Given this background, it carries out studies on the practice of restorations and searches for scientifically reasonable, acceptable ways of optimization of administration.

2. Core connotation and practical background of restoration for degraded ecological functions of Yitong River Wetland

Restoration of deteriorated Ecological function in the Ytong River Wetland cannot be just planting the vegetation and purifying the water. Instead, this should be treated as part of some larger system that will allow the wetland to return its water-related features, ability to clean water, and be an environment where plants and animals live and thrive. Build a harmonious ecosystem for both people and nature to grow together. Also, take into account the flood control and water

regulation of the city, as well as the ecological service function [1]. It is also one of Songhua River's main tributaries, which is the hometown of Changchun city, and was one of the most important places for keeping the area water safety and living variety. Due to long-term effects of urban growth and the channels being made straighter by rivers (river channelization) and continuous input of pollution from non-point sources, the wetland's habitat fragments increased drastically, along with a decrease in hydrological regulation & storage capacity. Native aquatic plant cover is now less than 20% of what it used to be. Ecological function keeps deteriorating; it will not be safe for the watersheds anymore. It is going to lose some of its capability regarding urban climates, as well as what it can do for the landscape. Therefore, it has turned out that targeted restoration works are inescapable approaches in solving ecological dilemmas in the Yitong River basin, as well as implementing plans for protecting cities from ecological damage.

3. Practical challenges in the restoration of degraded ecological functions of Yitong River Wetland

Yitong River Wetland's reconstruction has so much stuff to think of. The basics of what can be made are being restricted. The long-term wetland disintegration, coupled with the creation of hard shorelines, prevents us from just restoring it by doing some work. It's the only way we can connect the waters and land again. Some river sections have too many accumulated pollutants carried by river sediments, which greatly reduces the survival probability of the built-up water plants and undermines the stability of the plant community. Restoration tech shows weak local fit. Most of them take conventional ones as a whole; there is hardly anyone taking special treatment of things that are specific to this river, like the city's scattered pollution or mixed flows of sewage and rainwater called CSOs. Exogenous purifications cannot go well with fostering native microbiotic colonies, causing repeated disappointments in the success rate. Also, we need the system of rules and regulations, as well as continuous service and operation, and so forth. But there is no unified quality inspection standard for restoration projects, and the department's collaboration and administration mechanism is incomplete. Post-project monitoring data is discontinuous. It fails to make dynamic evaluations on the results and continuous improvements, making it hard for us to maintain the results after they have been completed.

4. Optimization paths for the restoration practice of degraded ecological functions of Yitong River Wetland

4.1. Restore the ecological base and consolidate the ecological security barrier

Focusing on the core problems of wetland division, inadequate hydrological association, and sediment dirtiness for Yitong River Wetland, focusing on enhancing the ecological defense line of the wetland by means of systematic improvement of the ecological ground, it is carried out as follows: Restoration of riverbanks and hydrologic linkages first. Built-up areas' hardened revetments are reconstructed ecologically section-wise by using porous ecological brick and an emergent plants buffer zone combination. Suburban river stretches, natural earthy bank inclines are reclaimed. Wetland patches separated from roads and dikes will be reconnected with adjustable ecological overflow weirs and newly constructed water level management devices. In that way, the water depth of the wetlands would stay at around 30-120 cm, so those plants native to those waters could grow normally [2].

Secondly, we have the target treatment of polluted sediment. We do some part of the dredge in a part that has lots of yucky stuff, only a bit more than half a meter. This way, they wouldn't kill off all the living things near it. At the same time, put down a layer of the straw fiber stabilization so as to offer a place to stick with those original micro-organisms. And combining this thing called an In-situ passive clay that was also altered, like with other stuff, and also had nitrogen, phosphorus, and other things inside the clay that would immobilize it, which reduced the chance that they'd ever get released back into whatever water source.

With a base such as a gradient of native vegetation. Phragmites australis, Acorus calamus, Typha aorientalis, Vallisneria natans, and Myriophyllum submersum are all planted on either bank of the river and together make a vegetation barrier extending into the water from land. Artificial fish shelters, shoals, and deep pools are set up as well to give homes and eating spots for local fish and birds living in water. We want the place's home-making ability to get better little by little.

4.2. Adopt adaptive restoration technologies and improve practical performance

Considering most kinds of pollution in the Yitong River are the city's non-point source type pollutions and CSO pollution, we give up using common restorative models and set up our very own customized and responsive technical systems to make them more practical.

The first step we must take is to address pollution sources at their roots. We put the initial rainwater storage tanks and supporting ecological filters next to where the combined sewer overflows start. The combination processes, such as sediments and the constructed wetlands and biosystems, for overflowing and reducing pollutants like COD and Ammonia Nitrogen. We make straw filter strips and eco-ditches on farmland catchments. In the urban rivers section, permeable pavement and rain gardens are widely promoted to intercept nonpoint source pollution from the rainfall events and reduce inputs from pollution sources.

Secondly, optimizing water body restoration technology. Native strain capable of eliminating N & P will be selected and applied in the more polluted rivers. Worked with intermittent artificial aeration to increase dissolved oxygen in water, increasing the ability of microorganisms to purify, without introducing alien strains that cause ecological risks.

A mechanism of pilot verification and dynamic optimization. The typical river reaches of Nanxi Wetland are taken as a technical pilot. Water quality indexes, vegetation survival rate, and microbial community change are constantly observed for half a year. The layout density of the ecological floating bed and the working time of the aeration device, etc., are technical parameters adjusted by taking into account pilots' data. Replicable restorations tailored specifically towards what works in the actual context of the Yitong River (i.e., no blind adoption of some type of generalized model) have now been generated.

4.3. Build integrated management and collaborative governance for sustainable operation and maintenance

In view of the lack of management standards, poor coordination among different departments, and insufficient long-term operation and maintenance of Yitong River wetland restoration projects, it is necessary to create an established administration structure and cooperation governance structure to ensure that the results of reconstruction are preserved. Full-process standardized management codes are to be created for the projects that specify the quantity standards for the dredging of sediments, the allocation of vegetation, and monitoring the water quality and other key tasks. There are some must-accept indicators, such as doing the water quality test every week. Also, if the plant survives at least up to eighty percent, then I can get the project managed throughout each of its stages.

Set up a monthly meeting amongst departments dealing with the stuff about water and how it works, how life interacts with everything that's going on within nature, those in control over our towns, places to visit for fun, and so forth, so we can organize both the repair efforts and day-by-day activities. The introduction of professional institutions through the Government Procurement Service for conducting normal operation and maintenance work, such as invasive plant and animal removal, equipment maintenance, and routine monitoring of water. Meanwhile, we're going to have volunteers helping out with doing some of the patrols around the wetlands, as well as educating people on different things related to ecology, so that more people will be able to do this.

The Internet of Things device will be used for monitoring the ecological indicators in real-time. The restoration effectiveness is checked every three months, and then operations and maintenance plans are made according to it. It can also deal with problems like deterioration of plant cover, fluctuations of water standard, which is an essential part to keep it stable [3].

5. Conclusion

The study talked about how the Yitong River Wetland lost its ecology and talks about what is happening right now when I do restoration and create a mixed-up kind of restorative environment where I'm restoring nature, making new stuff, and working together with others. Ecological rehabilitation for city water bodies has to do with long-term systematic work, so just doing a simple project isn't going to fix it. Starting local eco-realities, then balancing those out with tech improvement as well as long-term upkeep tasks, better collaborative rules to keep building up our restorations, so the Yitong River's eco-service capacity can finally be recovered!

Disclosure statement

The author declares no conflict of interest.

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