City Diversity (2023) Volume 4 Issue 1, *14 pages*.
doi: 10.54517/cd.v2i2.1943

ORIGINAL RESEARCH ARTICLE

Rural vegetation characteristics and biodiversity conservation strategies in the Yangtze river delta urban agglomeration

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ABSTRACT

The integrated green development of the Yangtze River Delta is a long-term major strategy. The rural ecological status is the basis for the healthy development of the Yangtze River Delta urban agglomeration. This study focuses on the expansion of demand for rural vegetation biodiversity conservation and ecosystem service functions in the Yangtze River Delta urban agglomeration. A total of 256 plant communities in 28 villages were investigated, and the composition of family, genera and species and life forms were analyzed respectively; through clustering, 47 community types and 8 vegetation types were divided, and the composition and distribution characteristics of plant community were analyzed; and then it analyzed the species biodiversity and compared the characteristics of rural transformation in the Yangtze River Delta with the vegetation characteristics of urban areas and natural areas. Finally, specific countermeasures for biodiversity conservation and reconstruction of the Yangtze River Delta rural vegetation was proposed in terms of species protection, habitat maintenance, plant community conservation, and ecological aesthetics guidance.

Keywords: landscape architecture; Yangtze river delta; rural area; biodiversity; plant community; ecological aesthetics

1. Introduction

The integrated green development of the Yangtze River Delta is a major strategy of China. The Yangtze River Delta urban agglomeration with Shanghai as the center is one of the five major urban agglomerations in the world, which integrates the society. Economics. Ecology. A comprehensive high-quality green development urban agglomeration integrating humanities; rural areas between urban agglomerations in the Yangtze River Delta are significantly affected by urbanization, serving urban agglomerations in terms of spatial structure and function. Compared with other cities, the relationship between urban and rural areas in the Yangtze River Delta urban agglomeration is closer. In the ecosystem, urban and rural areas have formed the effect of intertwined sharing and complementary resonance. The rural natural ecosystem has become the guarantee of urban ecological quality. Provide ecosystem services and balance the important buffer and resilience space of ecological environment problems caused by rapid urban development.

ARTICLE INFO
Received: September 4, 2023 | Accepted: October 11, 2023 | Available online: October 27, 2023

CITATION
Xie C, Xia Y, Yin C, et al. Rural vegetation characteristics and biodiversity conservation strategies in the Yangtze river delta urban agglomeration. City Diversity 2023; 4(1): 14 pages.

Among them, rural vegetation is the core element and main index of rural ecosystem, and rural vegetation has relatively strong natural attributes. A good natural ecological base has played an important ecological service function. However, in the process of rapid urbanization in the Yangtze River Delta, the rural habitat has been greatly impacted, resulting in the change and loss of the original rural habitat. The degradation of rural vegetation, affected by urban culture, has led to the reduction of rural naturality and serious damage to the rural natural ecosystem.

Rural vegetation usually does not have the unique value of natural reserves in China, nor does it have the stress pressure of urban sensitive areas, such as the local communities in front of and behind houses. Rural habitats in Riverside ditches usually do not have protection value in the conventional sense, but such habitats are exactly rural semi natural habitats formed in the long-term symbiosis between human and nature, reflecting the characteristics of human and nature coexistence under mild or moderate human interference. The ecosystem has high stability and toughness, and is an important ecological infrastructure to maintain the ecological health of regional urban agglomerations.

There are mainly two views on the impact of urbanization on urban and rural plant diversity. One view is that when extending from the central urban area to rural areas, the change curve of plant diversity is an unbalanced unimodal curve, and the species richness of the central urban area and rural areas is smaller than that of the suburban areas [1-3]. The second view is that when extending from the central urban area to rural areas, the species richness of native plants tends to increase gradually, but if alien plants are included, the plant richness of urban areas is higher than that of suburban and rural areas [4-6]. In addition, the edge effect of species richness between different habitats will also be affected by urbanization. For example, studies such as vallet show that the species richness at the edge of forest land is significantly higher than that in the central region, but the species richness at the edge of forest land in urban areas is significantly lower than that in rural areas [7].

In terms of rural vegetation conservation, developed countries such as Europe and North America have taken it as one of the urban and rural sustainable development strategies since the 1970s. Britain formed the "village law" very early, and formulated the London nature conservation guidelines and strategic planning in 1984; japan has been committed to the near natural afforestation mode and the protection and construction of near natural habitats under the promotion of Miyazaki since the 1970s; in 1990, Dusseldorf, Germany, formulated the rural biological habitat protection plan; Australia has long paid attention to the impact of the degree of artificial interference on the residual native vegetation, and proposed the patch protection strategy of the residual native vegetation in Perth City [1, 8-9].

Vegetation protection in China is mainly concentrated in urban areas and natural areas, including vegetation protection and restoration of urban sensitive habitats [10], protection of weed communities in urban difficult habitats [11], plant protection and management in natural reserves [12-13], research on urban natural heritage [14], etc. In terms of rural vegetation, it is mainly the classification of township green space system. Rural greening mode design. Liu binyi proposed the necessity of establishing rural greening landscape classification [15]; jin Zhaosen and others classified the green space in villages and towns [16-17]; li Hui et al. Studied the urban-rural integration of human settlements green space classification system [18]; renbinbin et al. Proposed the natural plant allocation mode in rural areas of Southern Jiangsu [19]; chen Xin gave the design principles and recommended tree species of rural River plant landscape [20].

In terms of vegetation research in the Yangtze River Delta, it mainly focuses on the structural characteristics of rural vegetation. For example, Da Liangjun and others carried out a survey of rural vegetation in Shanghai and explored the construction scheme of near natural communities according to the habitat characteristics [21]; liu Yaliang con-

ducted an investigation on different greening in the new rural area and found that there are more deciduous trees and evergreen shrubs in the public greening of the new rural area in the Yangtze River Delta, and the plant species diversity and nativity of courtyard greening are insufficient [22]; wu Qiong's investigation of rural greening in Zhoushan found that there are rich varieties of fruit trees and ornamental plants [23]; wu Hao and others found that artificial greening measures can lead to changes in herb diversity more than land use changes in Northern Zhejiang [24]; li Xiang's research shows that the plant diversity in the intensive agricultural landscape area in the suburbs will decline as a whole with time, especially in the agricultural habitat, but not in the semi natural habitat [25].

These studies have a certain guiding role for rural vegetation conservation and biodiversity protection in the Yangtze River Delta, but most of them are conducted from a certain goal or several aspects to study rural public greening. There are many studies on regional vegetation such as agricultural landscape. However, the inlay of landscape patches in rural settlements is complex, and vegetation patches are scattered around the building. Water's edge. Among different habitat types such as hard pavement, a unique rural vegetation distribution pattern has been formed. The existing research on the characteristics of plant communities in different habitat patches in rural settlements is less, and the influence mechanism of different habitat types and rural degree on the characteristics of rural plant communities is not clear.

Therefore, the characteristics of rural vegetation in the Yangtze River Delta urban agglomeration are comprehensively investigated and analyzed, and compared with the relevant urban vegetation in the region, and the composition of rural vegetation in the Yangtze River Delta is proposed. Diversity status. The evolution characteristics not only provide countermeasures for the conservation of native vegetation and the restoration and construction of urban wilderness in the Yangtze River Delta, but also provide reference for the protection of biodiversity and the improvement of ecosystem services in the process of urbanization in other regions of China.

2. Sample plot for rural vegetation research of urban agglomeration in Yangtze River Delta

The Yangtze River Delta mainly includes Shanghai. In Zhejiang, Jiangsu and other regions, the terrain mainly includes the mountains and hills in the West. Among the plain water network in the middle and the coastal beaches in the East, the rural settlements in the plain water network area can best represent the rural characteristics of the water towns in the south of the Yangtze River. Therefore, five villages in Northern Zhejiang were selected. A total of 28 plain water network rural settlements in 11 villages in southern Jiangsu and 12 villages in Shanghai were studied. The villages studied are divided into two categories according to the degree of agriculture in the countryside:one is the villages with high rural nature dominated by agriculture (16); the other is low rural villages (12) dominated by industry and service industry. The location distribution of villages is shown in **Figure 1**.

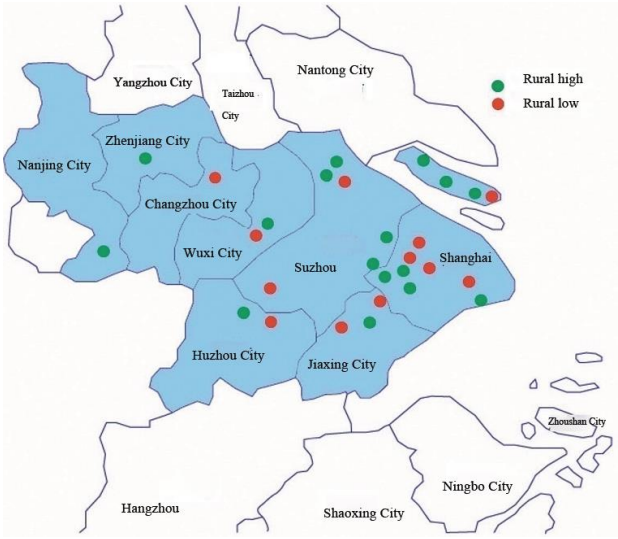

Figure 1. Distribution of villages surveyed.

3. research methods

3.1. Habitat classification and investigation methods of plant communities

Habitat types usually have a great impact on plant diversity. According to the characteristics of the relationship between vegetation patches and rural landscape [19, 22], the waterside of rural settlements in the Yangtze River Delta was investigated. Around the building. Vegetation communities in

four different habitats: green forest land and roadside. The waterside habitat can be divided into two types: natural and hard revetment surrounding. The surrounding habitat of the building can be divided into the back of the house according to the location of the vegetation in the house. There are three kinds of habitats on the front and side. The green forest land is divided into landscape forest and economic forest according to its function and maintenance differences. The economic forest in this paper refers to the small forest land such as trees and fruit trees scattered in the village with special economic value, excluding the large-scale productive economic forest.

Because the patches in different habitats in rural areas are inlaid complex, the distribution of plant communities is scattered, and the patch shape and area vary greatly, therefore, the "Farui school" investigation method [26] is adopted to investigate the plant communities according to the plant patches and other landscape patches (buildings). Courtyard. Road. River course. Farmland, etc.), determine the boundary of the investigated community, and set the herb community for 1m × 1m quadrat, and the quadrat with an area of 50~400m_2 for tree and shrub communities. A total of 285 plant communities in 28 villages and 4 types of habitats were investigated.

3.2. community classification analysis

This study is based on the relative dominance value of species, with reference to the classification standard of "vegetation in China", combined with the appearance of the community. Structure characteristics, classify the community.

3.3. species diversity analysis

Four indicators are selected from the aspects of species richness and evenness to indicate the species diversity of the community:1) species richness and Gleason index represent the number of species in a community and the species richness per unit area; 2)Shannon Wiener index and Simpson index represent the comprehensive state of species richness and evenness of the community.

4. Analysis of rural vegetation characteristics in the Yangtze River Delta

4.1. species composition and comparative analysis of rural vegetation in the Yangtze River Delta

In the 285 sample plots of rural vegetation communities surveyed, a total of 269 species of seed plants belonging to 203 genera and 84 families were recorded (**Table 1**).

Families of investigated plants. Genus. According to the statistics of the number and proportion of species (**Table 2**), it is found that there are 5 large species families (number of species ≥ 11), 5 medium families (6-10 species), 36 rare species families (2-5 species) and 39 single species families. The five families are Compositae. Gramineae. Leguminous. Rosaceae and Cruciferae contain 65 genera and 89 species, accounting for 31.9% and 33.1% respectively. Relevant studies show that Lauraceae is a representative family in the Yangtze River Delta. Ulmaceae. Fagaceae. Honeysuckle family and Euphorbiaceae [27], but these families are rarely reflected in this rural survey, only Cinnamomum camphora of Lauraceae and beech of Ulmaceae are found. Park tree.

Table 1. Composition of genera and species of rural plant families in the Yangtze River Delta

Section	Genus/species	Section	Genus/species	Section	Genus/species
The composite family	21/25	Rhododendraceae	1/2	Bitter wood family	1/1
Gramineae	16/19	Chenopodiaceae	2/2	LANCO	1/1
Leguminous	11/17	Meliaceae	2/2	Clethraceae	1/1
Rosaceae	11/17	Aceraceae	1/2	Robiniaceae	1/1
Cruciferae	6/10	Lysimachiaceae	2/2	Portulaceae	1/1
Oleaceae	3/9	Rubiaceae	2/2	Ranunculaceae	1/1
Solanaceae	5/9	Caprifoliaceae	1/2	Cannaceae	1/1
Cucurbitaceae	5/8	Cyperaceae	2/2	Oleaceae	1/1
Liliaceae	5/7	Cornaceae	2/2	Daphneceae	1/1
Labiatae	6/7	Taxodiaceae	2/2	Trifoliaceae	1/1
Populaceae	1/4	Nymphaceae	2/2	Theaceae	1/1
Umbelliferae	4/5	Garciniaceae	1/2	Phytolacceae	1/1
Ulmaceae	4/5	Celastraceae	1/2	Pomegranate family	1/1
Euphorbiaceae	3/4	Acanthaceae	2/2	Persimmon family	1/1
Oleaceae	3/4	Berberidaceae	2/2	Rhamnaceae	1/1
Malvaceae	3/4	Rutaceae	1/2	Dioscoreaceae	1/1
Polygonaceae	2/4	Shikoniaceae	2/2	Pinaceae	1/1
Grapevine family	3/4	Palmae	2/2	Cycadaceae	1/1
Sangko	4/4	Oxalicaceae	1/2	Nonpathogenic Division	1/1
Caryophyllaceae	3/4	Paco	1/1	Wutong	1/1
Convolvulaceae	2/4	Primulaceae	1/1	Cactus family	1/1
Hamamelidaceae	3/3	Plantago Division	1/1	Campanulaceae	1/1
Ranunculaceae	1/3	Impatiens family	1/1	Commelinaceae	1/1
Araceae	3/3	Pittosporaceae	1/1	Ginkgo family	1/1
Amaranthaceae	2/3	Juglandaceae	1/1	Iridaceae	1/1
Scrophulariaceae	3/3	Saxifragaceae	1/1	Alismataceae	1/1
Magnoliaceae	1/2	Zingiberaceae	1/1	Lauraceae	1/1
Ileaceae	1/2	Crassulaceae	1/1	Jasmine family	1/1

Table 2. Rural plant families in the Yangtze River Delta. Genus. Quantity statistics of species

Category	Monotypic family (1 Species)	Oligodaceae (2-5 Species)	Medium family (6~10 Species)	Large species family (more than 11 Species)
Family (genus/species)	39(39/39)	36(76/10[1)]	5(24/40)	5(65/89)
Proportion in families, genera and species/%	45.9(19.1/14.5)	42.4(37.3/37.5)	5.9(11.8/14.9)	5.9(31.9/33.[1)]

Compared with the studies in surrounding urban areas [28], the number of large species families in rural areas is significantly less, among which there are four large species families in urban and rural areas, namely Rosaceae. The composite family. Leguminosae and Gramineae also contain similar species. However, cruciferous plants in rural areas contain more species than those in urban areas. In addition to artificially planted vegetables, these plants are mainly naturally distributed native herbs, such as cabbage. Shepherd's purse. Radish. Walk alone. Spinach. Some artificially planted vegetables,

such as Zhuge vegetables, may also escape and become wild again after being abandoned. For rural areas. Aquatic or biogenic plants. Vines are also the least among the three; in terms of the composition characteristics of plant species, the ratio of deciduous trees to evergreen trees in rural and urban areas of the Yangtze River Delta is about 4:1 and 2:1 respectively[29], and the proportion of deciduous trees in rural areas is larger than that of evergreen trees. It may be that deciduous trees are conducive to lighting and heating in cold and humid winter, and are more conducive to improving the comfort of the local living environment. There are many kinds of economic and practical arbors in rural areas, and affected by the environment and customs, most of them are naturally distributed species, and the species are relatively fixed; in urban areas, there are many foreign domesticated and cultivated trees, and only a few naturally distributed species, which makes the species richness of trees in urban areas much higher than that in rural and natural areas[30]. Affected by agricultural production and herbicide use, the species of aquatic plants in rural areas are far less than expected, and there are few naturally distributed species, most of which are economic plants[31–32], while there are more than 100 kinds of aquatic and hygrophytes widely distributed in the Yangtze River Delta, which significantly reduces the stability and ecological service function of the Yangtze River Delta aquatic ecosystem。This survey found that 20 species of arbor trees, 10 species of shrubs, 2 species of bamboos and 45 species of herbs are common ($f \geq 5\%$) in rural plant communities in the Yangtze River Delta (**Table 3**).

Table 3. Common plants and their occurrence frequency in villages in the Yangtze River Delta ($f \geq 5\%$)

Frequency /%	**Lifestyle**			
	Arbor (20)	**Shrubs and bamboos (12)**	**Herbs (45)**	
f>15	Cinnamomum camphora	Osmanthus fragrans	Erigeron canadensis	Galium spurium
	Diospyros kaki	Photinia serratifolia	Oxalis pes-caprae	Stellaria media
	Citrus reticulata		Setaria viridis	Cucurbita moschata
	Broussonetia papyrifera		Capsella bursa-pastoris	Glycine max
	Metasequoia glyptostroboides		Poa annua	Polypogon fugax
			Erigeron annuus	Humulus scandens
			Lamium amplexicaule	Mazus pumilus
			Alternanthera philoxeroides	
10≤f≤15	Zelkova serrata	Buxus sinica	Taraxacum mongolicum	Cucumis sativus
	Amygdalus persica		Veronica polita	Ranunculus japonicus
	Punica granatum		Vigna unguiculata	Hemisteptia lyrata
	Toona sinensis		Oxalis corymbosa	Myosoton aquaticum
	Cerasus yedoensis		Solanum melongena	Eleusine indica
			Bothriospermum zeylanicum	Parthenocissus tricuspidata
5≤f<10	Salix babylonica	Buxus megistophylla	Alopecurus aequalis	Vicia faba
	Eriobotrya japonica	Rhododendron simsii	Geranium wilfordii	Salvia plebeia
	Celtis sinensis	Fatsia japonica	Trifolium repens	Ophiopogon japonicus
	Triadica sebifera	Pittosporum tobira	Youngia japonica	Canna indica
	Acer palmatum	Ligustrum japonicum	Duchesnea indica	Commelina communis
	Pyrus sorotina	Camellia japonica	Capsicum annuum	Colocasia esculenta
	Ligustrum lucidum	Nerium oleander	Allium fistulosum	Vicia tetrasperma
	Melia azedarach	Phyllostachys sulphurea	Zizania latifolia	Lycopersicon esculentum
	Lagerstroemia indica	P. Iridescens	Ipomoea aquatica	
	Magnolia grandiflora			

The five most frequently used trees are Cinnamomum camphora. Persimmon tree.paper mulberry.Metasequoia and orange trees (f≥15%). Per-

simmon has the meaning of auspicious culture, good economic function and strong environmental adaptability. It is a typical local fruit tree in the Yangtze River Delta, mainly around the building and by the water; broussonetia papyrifera has strong spontaneity. Adaptability, behind the house. Water's edge. It can be seen everywhere on the roadside and is one of the representative native species; other tree species with high frequency mainly include fast-growing soil consolidation. The representative wood species and edible ornamental species are weeping willow. Zelkova schneideriana. Park tree. Peach tree. Pomegranate. Toona sinensis, etc. In addition, the relatively less used Sapium sebiferum and Melia azedarach deserve special attention. Sapium sebiferum has more than 1000 years of cultivation history, and Melia azedarach has been distributed in the middle and lower reaches of the Yangtze River for 5000 years. These two tree species have good landscape cultural and ecological values.

Herbs in rural areas can be mainly divided into artificially planted vegetables and crops and spontaneous herbs, and the species with high frequency are rich. Among the spontaneous herbs, Alternanthera philoxeroides. Pennisetum. Oxalis sorrel. Green bristlegrass. Annual fleabane. Bluegrass. The frequency of Humulus scandens was higher than 15%. Among them, invasive species need to be mainly controlled, such as Alternanthera philoxeroides (occurrence frequency 51.7%). Pennisetum (occurrence frequency 34.2%). Yinianpeng (with a frequency of 20.8%) and others have been flooded in rural areas.

4.2. analysis of rural vegetation community types in the Yangtze River Delta

Community type analysis

According to the classification standard of vegetation in China [33], the 256 communities surveyed are divided into evergreen deciduous broad-leaved mixed forests. Deciduous broad-leaved forest.broad-leaved evergreen forests.Deciduous coniferous forest.Coniferous and broad-leaved mixed forest. Bamboo forest.There are 8 vegetation types in herbaceous community and aquatic plant community. The herb community here refers to the terrestrial herb community.

The three main vegetation communities in the villages of the Yangtze River Delta are deciduous broad-leaved forests (occurrence frequency 33.6%). Evergreen broad-leaved forest (occurrence frequency 26.6%) and deciduous coniferous forest (occurrence frequency 11.7%) (**Figure 2**). The representative deciduous broad-leaved forest community is the park community. Persimmon and beech communities; typical evergreen broad-leaved forest communities include Cinnamomum camphora community. Orange community and osmanthus community; metasequoia glyptostroboides community and Taxodium ascendens community are representative deciduous coniferous forest communities. The types of plant communities in villages in the Yangtze River Delta conform to the vegetation characteristics of evergreen broad-leaved forest and evergreen deciduous broad-leaved mixed forest in the subtropical Eastern monsoon climate area.

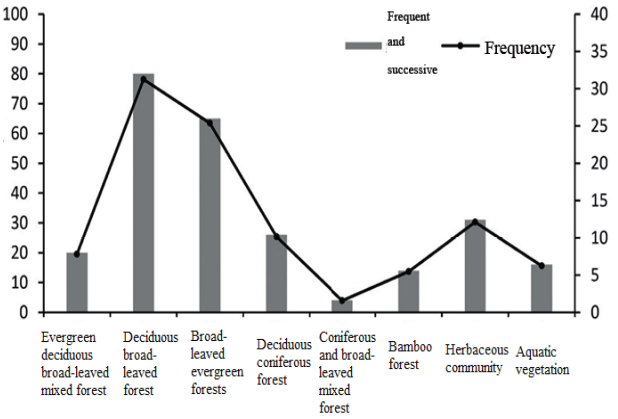

Figure 2. Number and proportion of communities in each vegetation type.

Compared with the community types in urban areas [26-28], the community types of Rural plants are similar, and the differences are mainly reflected in the dominant species. In villages, there are more communities with economic trees such as fruit trees as the dominant species, while in urban areas, ornamental trees are often selected as the dominant species. The frequency of coniferous and broad-leaved mixed forests and evergreen coniferous forests in villages is lower, while the fre-

quency of herb communities and aquatic vegetation communities in villages is higher.

Comparison of community types in different habitats

It can be seen from **Figure 3** that the most abundant community types are the habitat around the building and the waterside, which contain 7 types, followed by the roadside and green forest habitat, which contain 6 and 5 types respectively. Deciduous broad-leaved forest community is around the building. The most community types appear in waterside and roadside habitats, and there are more deciduous coniferous forests dominated by Metasequoia in roadside habitats (the frequency of occurrence is 20%). Evergreen broad-leaved forest community is the largest community type in green forest land. It is noteworthy that the proportion of aquatic plant communities in the waterside habitat is not high (11.4%), which may be caused by the serious hardening of the revetment.

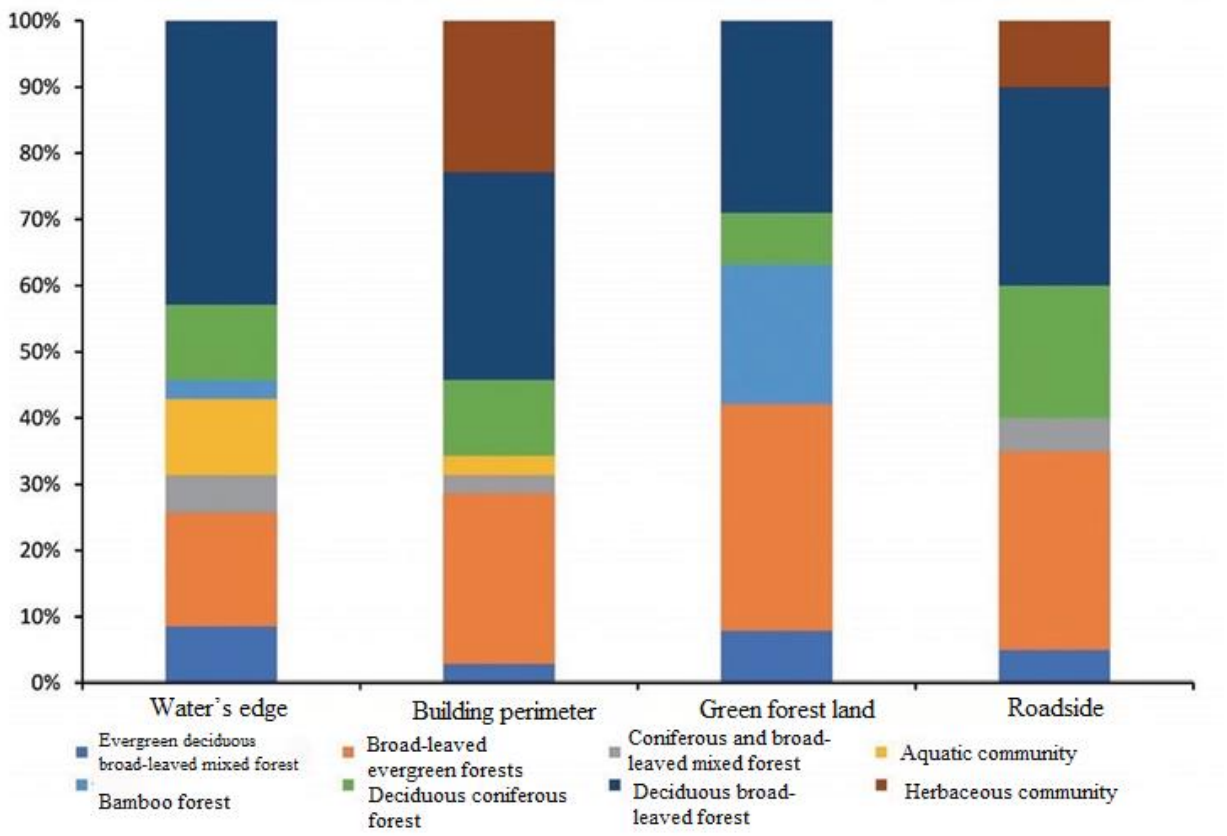

Figure 3. Comparison of the number and proportion of community types in different habitats.

5. Analysis of species diversity of plant communities in villages in the Yangtze River Delta

In terms of species richness of plant communities (**Figure 4**), the facade of the building. The back of the building. Economic forest. The species richness of hard revetment and landscape forest decreased successively, which were 15.3 respectively. 13.6. 13.3. 11.9. 10.0. The species richness in six kinds of habitats decreased with the decrease of rural nature, especially in landscape forests.

In terms of Shannon Wiener index of plant community (**Figure 5**), the habitat with better performance is the front of the building and the natural revetment, and the Shannon Wiener index is 1.8 and 1.7 respectively. The worst performance is economic forest, with Shannon Wiener index of 1.3, which may be due to the prominent dominant species of economic forest. The Shannon Wiener index of plant community is on the front of the building. The economic forest and revetment habitat de-

creased with the reduction of rural nature, and it was on the back of the building. The performance is opposite in roadside and landscape forest habitats.

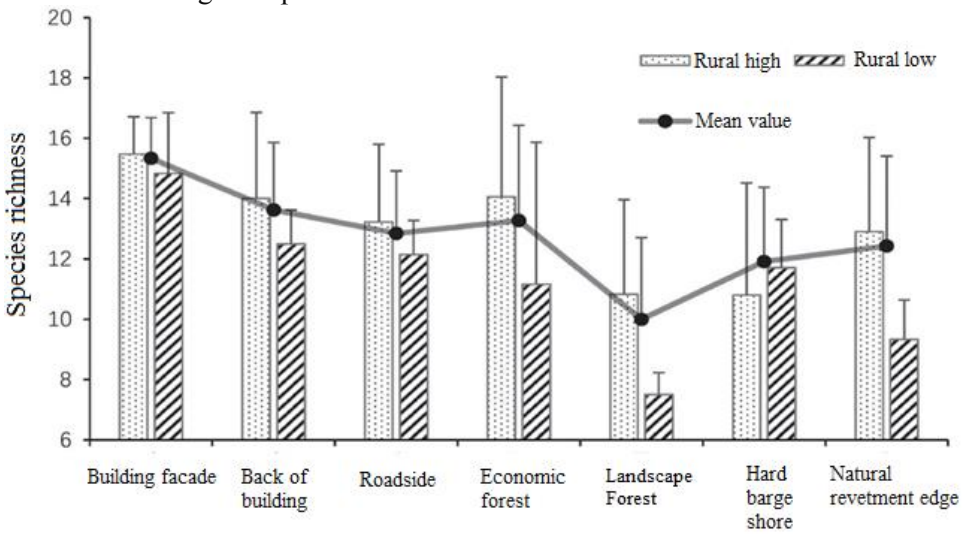

Figure 4. Analysis of species richness index of plant communities in different habitats.

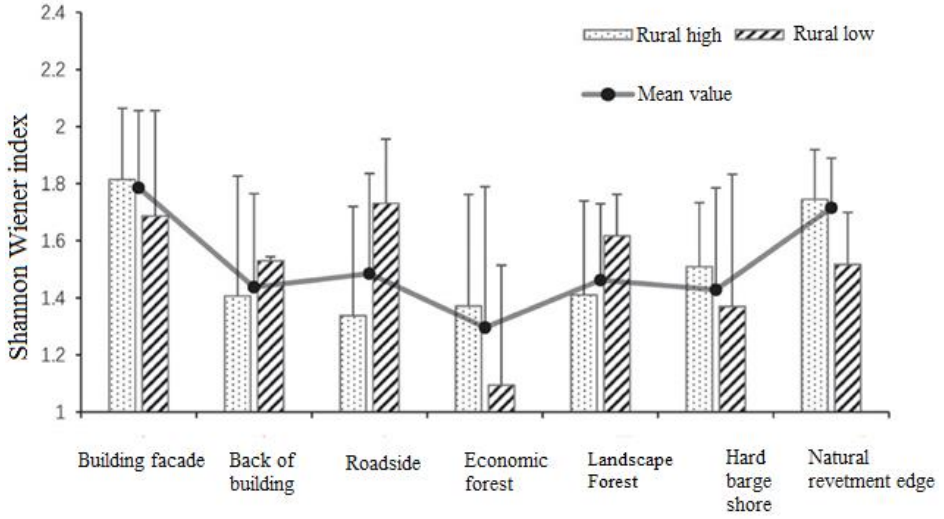

Figure 5. Shannon Wiener index analysis of plant communities in different habitats.

In terms of Simpson index of plant community (**Figure 6**), the habitat with better performance is the natural revetment. On the front of the building, the Simpson index is 0.74 and 0.72 respectively. The habitats with poor performance are economic forest and roadside, with Simpson index of 0.57 and 0.59 respectively. Simpson index of plant community is on the front of the building. Economic forest. The habitat along the revetment decreases with the decrease of rural nature, and it is on the back of the building. The performance is opposite in roadside and landscape forest habitats. Gleason index of plant community (**Figure 7**), surrounding the building. Water's edge. Roadside. The Gleason index of plant communities in green forest habitat decreased in turn. In roadside and waterside habitats, Gleason index increased with the increase of rural nature, but it was opposite in green forest habitat; it remains basically unchanged in the surrounding habitat of the building.

In general, the species diversity index of the plant community on the facade of rural buildings is the highest, and the species are the most abundant and evenly distributed. The main reason is that the facade of the building is most closely related to the life of residents, which needs to meet the landscape of residents. Practical and other needs, and there are many species planted. The high efficiency of land

use determines the high diversity of plant communities in the front habitat of the building; the performance of landscape forest in species abundance index is poor. The good uniformity may be caused by less species selection and regular and uniform planting methods during the construction of landscape forests; the plant communities on the back of the building and along the natural revetment perform well in species richness and uniformity, and the community stability is high. The main reason is that these two types of habitats are usually less disturbed by human beings. After a period of natural growth and succession, plants will form a relatively stable plant community with high species diversity; roadside and hard revetment have low scores on various indexes, showing poor diversity. Such habitats are significantly disturbed by human beings, and the soil condition is poor, which is not conducive to plant growth. The species richness of economic forest is higher, but the indicators related to evenness are lower. The possible reason is that there are fewer species in the forest, the dominant species are more obvious, but the species in the forest edge are relatively rich [34].

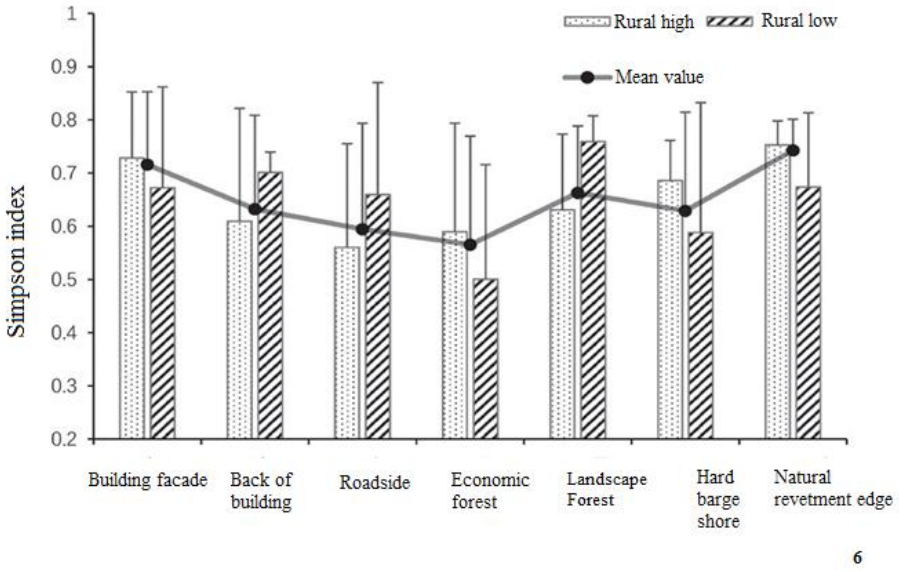

Figure 6. Simpson index analysis of plant communities in different habitats.

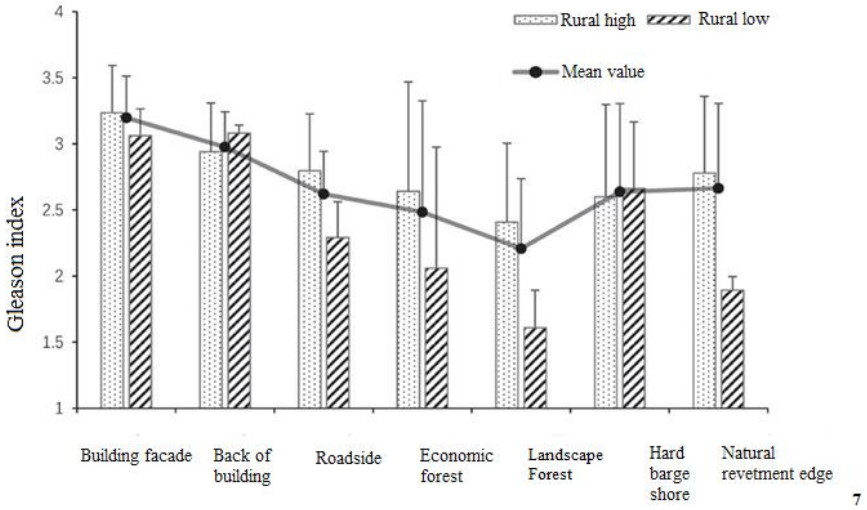

Figure 7. Gleason index analysis of plant communities in different habitats

6. strategies for biodiversity protection of rural vegetation in Yangtze River Delta Urban Agglomeration

The rural vegetation of the Yangtze River Delta urban agglomeration has the typical characteristics of urban-rural ecology and culture interweaving. The highly developed urban agglomeration not only drives the development of rural economy and industry, but also brings the influence of ecological environment and cultural value. Therefore, the status and change trend of rural biodiversity in the Yangtze River Delta urban agglomeration is undoubtedly the result of urban-rural interaction, with a dual structure of ecology and humanities. Therefore, the biodiversity conservation of rural vegetation in the Yangtze River Delta urban agglomeration includes the conservation and restoration of habitat (Habitat) and its vegetation. The ecological design of greening in the process of rural construction also includes the guidance of rural ecological culture and ecological aesthetics, which are sometimes more important than ecological conservation and ecological design technology.

6.1. pay attention to and protect rural special. Sensitive habitat, protecting rural ecological base

Plant communities in some sensitive habitats in rural areas need special attention. Plant communities in such habitats are ecologically high and have important ecological and landscape cultural significance. Such as the back of the building. Natural revetment and other habitats are accompanied by human life and production in the village, which adapts to the moderate interference of human beings, animals, plants and water in the microenvironment. Soil and other environmental factors form a relatively stable food chain, food webs and trophic level and other ecological relations. The niche of various organisms reaches a dynamic balance, which has a self-evident function for maintaining regional biodiversity and ecosystem stability. However, such habitats and their organisms often do not have the unique value of natural reserves and cannot be classified into the protection level. In rural construction, these plant communities are facing the risk of destruction.

Through the investigation of biodiversity and ecosystem service functions, we should clarify the protection value of such habitats and their plant communities, protect them in the process of rural construction, fully retain and give full play to the functions of the original plant communities, and extract the corresponding ecological configuration mode of "Habitat plant communities". The combination mode of such plant communities can not only be applied to township greening and ecological restoration projects, it can also provide reference for urban greening and ecological conservation.

6.2. respect the relationship between plants and habitats, build communities dominated by native adaptive plants, and reflect the local landscape and culture

Summarize and summarize the spatial structure and species composition of adaptive plant communities in different habitats in rural areas, study the matching between plant living habits and habitat characteristics, and establish a reference system of plant communities in different habitats. When building and optimizing rural plant communities, select suitable plant species according to different habitat types, and pay attention to the rationality of space in plant collocation and planting. At the same time, fully protect and apply the plant groups that can represent the characteristics and culture of typical water towns in the Yangtze River Delta, and build the plant community landscape with regional cultural characteristics.

6.3. pay attention to the construction of ecological network, protect the ecological corridor of vegetation, improve the ecological function of green forest land, and optimize the planning and design standards

Pay attention to the protection and construction of plant communities in linear ecological corridors along rivers and roads in rural areas. Linear plant

communities account for a large proportion of villages in the Yangtze River Delta and play an ecological connection to rural ecosystems. Purification buffer. Biological migration and other important roles. At the same time, we should pay attention to the protection of the core vegetation patches in the villages to avoid the erosion of urbanization. Improve the ecological and local guidance of rural vegetation planning and design, and reduce the poor construction stability. Landscape forest with low ecological function.

6.4. develop evaluation indicators and design guidance suitable for rural biodiversity and ecosystem service functions

Rural habitats and vegetation have unique ecological and local cultural values, and play an important role in maintaining regional ecological balance and improving ecosystem service functions. Therefore, community stability (species composition) can be used in the evaluation of biodiversity and ecosystem service function of rural vegetation. Community structure. Renewal potential. Habitat stability, etc.). Typicality of community types (representative types and community composition of community development under local habitats). Community native culture (native plants. Composition of plant communities that coexist with rural human settlements for a long time). Diversity of ecosystem services (environmental protection and ecological health). Production function. Cultural function and leisure function, etc.)And other aspects. On this basis, according to different space types and habitat characteristics, formulate corresponding design guidelines, and recommend appropriate habitat and plant configuration design patterns.

6.5. ecological culture and ecological aesthetic guidance based on rural biodiversity conservation

Rural areas are considered to maintain a more harmonious relationship between man and nature after human industrialization and urbanization. It deduces the equal and symbiotic relationship between human beings and nature. Break through the dualistic world outlook of subject and object and build a systematic and holistic world outlook, guide people to re-examine the social values and ethics of ecosystem health, break the traditional aesthetics, advocate ecological aesthetics, and guide people to obtain aesthetic feeling through more understanding of rural ecological processes and ecological services in visual perception. Rural is the landscape scale that human beings, as organisms, are easy to perceive, such a scale of landscape is the key to linking human beings with ecological phenomena.

Ecological aesthetics integrates ecology and traditional aesthetic theory, emphasizing that ecological beauty comes from the interaction between man and nature. Due to the existence of multi-dimensional characteristics of ecological landscape, such as perception dimension, in addition to visual perception, there are also hearing and smell (birds singing and flowers smelling); there are seasonal changes in the time dimension. Wildlife flash, etc; spatial dimension, such as large-scale or micro ruler. The multi-dimensional characteristics of ecological landscape often exceed the scope of people's visual perception and are difficult to be fully recognized by people, which is the main reason for the conflict between traditional landscape aesthetics and ecological value. Ecological aesthetic experience is a way for people to establish contact with the environmental system. In this experience, people's perception process is directly related to the landscape morphology and characteristics. Ecological aesthetics is participatory, and the contradiction and conflict between human needs and ecosystem needs can be solved from the perspective of public participation in management. Ecological aesthetic value is usually reflected by the interaction between people and the natural environment. Rural areas are the result of the interaction between human beings and nature, the ecological landscape formed by it has natural ecological aesthetic value.

Therefore, in the protection of rural biodiver-

sity, it is particularly important to change people's traditional understanding:1) at the level of public guidance, guide and improve the public's ecological value. Attention to ecosystem health and biodiversity, aesthetic activities from the entity of beauty to the relationship between man and nature; 2)At the level of academic research and education, starting from the theories and methods of environmental psychology and biological evolution, this paper further analyzes the mechanism and types of Chinese people's preference for rural landscape, and integrates ecological integrity. Ecological health and biodiversity are included in the indicators of rural landscape aesthetics and ecological aesthetics.

Conflict of interest

The authors declare no conflict of interest.

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