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ECOLOGICAL FUNCTIONS AND ENVIRONMENTAL BENEFITS OF RESERVOIR RIPARIAN ZONE

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Reservoir riparian zone is a special type of land use and a typical area of ecological vulnerability, which plays a key role in creation of environmental benefits, transportation of material energy and in the formation of the structure of groups, etc. Due to the special hydrologic rhythm of the reservoir, habitats of species are faced with the dual tasks of ecological degradation and high-quality water purification. In order to deal with these environmental problems, the key to the implementation and application of ecological restoration measures is to understand the regularity of vegetation succession and the management measures of adjacent forestland. The riparian zone is a hot spot of various nutrient processes and plays a disproportionate role in the development of ecological benefits. Hydrology is the key factor affecting the habitats' formation of reservoir riparian zone. Comprehend the geochemical process of soil in reservoir riparian zone and the transport and interception mechanism of nutrient elements can effectively reduce the damage to water body caused by non-point source pollution. In this paper, we reviewed the definition, classification and function of reservoir riparian zone, discussed the key role of vegetation in sphere of habitats' restoration and reconstruction in reservoir riparian zone and the role of arbor forest species in the production of ecological benefits. This issue is especially relevant for China, a country with a large number of reservoirs. The purpose of this study is to provide comprehensive information on the the habitats' characteristics and provide theoretical ideas for managing the ecological component of the environment. At present, the monitoring means of reservoir riparian zone are insufficient, and we are still concentrated in the macroscopic and mesoscale scale, while the microscopic scale needs to be further deepened. In the process of studying the riparian, we should pay enough attention to the investigation of the formation cause, geological environment and other factors, fully study the reservoir riparian zone from a unified organic and integral ecological point of view, pay attention to the rational use of high-tech means, and conduct reasonable monitoring with dynamic research means.

Key words: *buffer zone; vegetation succession; arboreal forestland; soil properties; geochemical process.*

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Introduction. Reservoir riparian zone is the dry and wet area where the land is periodically submerged by water flooding or exposed surface due to water storage or flood discharge, which is an important buffer area between water area and terrestrial. Due to constant water erosion, the region has ecological vulnerability, and the ecological environment changes dramatically, forming a unique energy exchange, material cycle and dynamic ecological pattern. Plants in the reservoir riparian zone play a function of corridor, filter and barrier to the material flow, energy flow, information flow and biological flow between the amphibious ecosystems (Millar et al., 2007; Seavy et al., 2009; Zhang & Peng, 2002). China has more than 90,000 reservoirs, which have become an important storage unit of inland hydrological system. Reservoir riparian zone plays an important role in national production and ecological benefits. However, it cannot be ignored that the construction of the reservoir also brings a series of ecological and environmental problems. E.g. the Three Gorges Reservoir (TGR) is the largest water conservancy project in human history. Since impounding in 2003, the fragility, marginality and transition of the ecosystem in the riparian zone easily lead to soil erosion, sediment deposition, land and water cross pollution, habitat degradation, and a sharp drop in biodiversity (Cheng et al., 2010; Sun et al., 2010). Therefore, this study summarized the importance of vegetation succession, arbor forest ecological function and geochemical process in reservoir riparian zone, the purpose of this study is to arouse people's full understanding of the necessity, urgency and complexity of the ecological environment problems in the riparian zone, which is of great practical significance to solve the ecological environment problems in the riparian zone of the reservoir.

The definition of riparian zone is still controversial. In the generalized, it is considered that the regions directly affected by water area are the scope of the riparian zone. While in the narrow sense, it is considered as the boundary range between water area and land area, mainly referring to the area affected by river water flow. As the cognition deepens, people gradually realize that the riparian zone, as a complete ecosystem, has unique community structure and energy flow characteristics. Therefore, the energy flow, material flow and water cycle of the riparian zone should be comprehensively considered as a whole ecosystem (Altier et al., 2000; Whigham, 1999; Minshall et al., 2007). The riparian zone as a small nature feature, and systematically elaborated on how to carry out conservation activities for the small ecological feature areas with important ecological benefits represented by the riparian zone (education, inventory, protect, sustainably manage, restore, and create) is vividly described (Hughe et al., 2003, 2005). Reservoir riparian zone as a special form of riparian zone is of great significance to soil and water conservation, water quality improvement, ecological benefits and social benefits (Liu et al., 2011; Zhang et al., 2019). Different from the riparian zone formed by floodplains and valleys in open areas, reservoir riparian zone is more stable, generally will not change with the occurrence of natural disasters such as deluge (Gregory et al., 1991). However, it is also subject to periodic fluctuation of precipitation, hydrology and human management frequently, which results in vegetation succession and lateral migration of nutrients, sedimentary materials and particulate matter in the reservoir riparian zone habitat. The hydrologic factor is the key factor that restricts the material energy flow in the reservoir riparian zone. The full understanding of the hydrologic environment is the premise to comprehend the process of biochemical, sediment deposition and pollutant migration in the riparian zone (Woolway et al., 2020). The habitat and plant succession regularity of the special riparian zone formed in the backwater area of the Missouri River reservoir into the estuary are studied (Volke et al., 2019). the temporal variation characteristic of two adjacent reservoir riparian zone which one is a drinking water reservoir (water level change is more than 6 m) and the other one is a natural lakes (water level change is less than 1 meter) are analyzed [23] (Furey et al., 2004). The results show that the two reservoir riparian zone with different hydrological characteristics have obvious differences in species abundance, photosynthetic active radiation (*PAR*), nutrients, sediment, organic matter. The study of riparian zone mainly depends on which scale to discuss. Due to the complex riverbank conditions, hydrological environment, tourism, agricultural production, animal husbandry, and alluvial water flow, the intricacy and fragmented environment of the riparian zone is formed (Pal et al., 2020), which result in the difficulty to summarize and expound the ecological law of this area. Therefore, according to the different geological characteristics, soil characteristics, hydrological environment and other characteristics, different classification methods have been applied to the riparian zone, but these methods are still not sufficient to fundamentally understand the riparian zone (Wang et al., 2005; Zhang et al., 2005; Su et al., 2005). Researchers (Cheng et al., 2010) proposed that the classification of the riparian zone should be combined with the research scale (regional scale, landscape scale), cause of formation (artificial or natural), time dynamics and the driving factors of the development of the riparian zone. Such as hydrological characteristics, climate, geomorphic conditions (geomorphic sites, geological basement conditions, geomorphic extrinsic dynamic conditions) and artificial activities influences make it possible to conduct dynamic, qualitative and quantitative studies on the evolution and functional changes of riparian zones. Hence, in the process of studying the riparian zone, we should pay more attention to investigate the formation of the riparian zone and geological environment and other factors, use dynamic research methods for reasonable monitoring.

The restoration and reconstruction of vegetation is the key to ecological restoration of the reservoir riparian zone. Reservoir riparian zone is one of the most important wetland system by artificial control, the biodiversity was mainly affected by reservoir discharge water rhythm, has obvious periodicity. Therefore, it is of positive significance to understand the regulation of retrograde succession of vegetation and to select suitable and stress-resistant species to improve the species coverage and abundance and biodiversity in the reservoir riparian zone. The riparian zone was divided into five sections according to the relationship between vegetation and moisture, Toe Zone, Bank Zone, Overbank Zone, Transitional Zone and Upland Zone (Hoag et al., 2001). In a riparian zone, not all of these 5 sections will occur, but several will. Correspondingly, the vegetation distributed on different sections also showed different characteristics, and the gradient distribution trend of trees, shrubs, amphibians and emergent plants was also shown from land to water (Li et al., 2019). Hydrological condition is the core factor for the formation, change and succession of the riparian zone. Lakes act on the riparian zone through water impingements and other physical effects, creating different habitats of riparian zone. The propagules of different plants spread with the movement of hydrology. The fragmented riparian zone habitats formed different plant community structures and pioneer species. Similarly, the distribution of plant community after formation will act on the physical and chemical processes of hydrology in turn (Kardol et al., 2006; Gurnell et al., 2012; Nilsson et al., 2012). The relationship between plant community and hydrology and geomorphology is still the focus of many scholars. Researchers (Merritt et al., 2010) achieved good results in predicting the occurrence and development of riparian zones by establishing the response relationship between river flow and plant communities in different riparian zones. However, this method has limitations and its scope of application is very limited. The characteristics of plant communities in the natural flooded area and the non-natural flooded area in the Three Gorges Reservoir, and found that the plants in the non-natural flooded area showed strong ecological resilience are compared (Su et al., 2020). The variation trend of plant species in the Three Gorges Reservoir ravines riparian zone were systematically observed from 2008 to 2015 (Jian et al., 2018), and the results showed that the composition of plant species in the reservoir riparian zone was affected by the new hydrological environment, and determined that *Bermudagrass* or its community combination were the most suitable species for survival. The vegetation in riparian zone plays an important buffer role in the whole ecosystem, and is a crucial link in the ecosystem cycle. Many scholars believe that as long as the vegetation coverage and biomass of the riparian zone are improved, better ecological benefits can be achieved, and this is the most effective way to repair the riparian zone [98] (Zhang, 2007). Scholars have done a lot of research on the selection of suitable plants in the riparian zone in order to screen out the excellent plants with strong resistance to stress. Due to the distinct water environment in the riparian zone, adaptable plants in different gradient locations have different requirements. When the water level rises, plants are required to have good waterlogging resistance, while the water level drops, and then suitable plants are required to show good drought resistance (Guo et al., 2010). The elongation induction strategy of leaf blade of *Chloris gayana Kunth.* under different water flooding time and mode, and found that long-term water flooding is more beneficial to plant growth than repeated water flooding was studied in detail Striker et al., 2017). The changes of biomass, photosynthesis and other physiological and biochemical characteristics of *Alternanthera philoxeroides (Mart.) Griseb.* were studied (Luo et al., 2018) under different water flooding frequencies, and found that the photosynthesis, light protection mechanism and adaptation measures of – *A. philoxeroides* showed positive responses under high and low frequency water flooding events. Researchers (Albano et al., 2020) used remote sensing data to establish the response relationship between the trend of drought stress and the change of vegetation activity in Nevada state, providing a new research method for the large-scale monitoring study of the riparian zone. Through a large number of experiments and studies in China, some waterlogged trees and herbs have been identified. It mainly composed of woody plants such as *Taxodium distichum var. Imbricatum* (Nuttall) Croom, *Taxodium distichum* (L.) Rich., *Glyptostrobus pensilis* (Staunt.) Koch, *Sapium sebiferum* (L.) Roxb., *Pterocarya stenoptera* C. DC., *Quercus variabilis* Bl., *Salix variegata* Franch, *Salix rosthornii* Seemen and *Ficus tikoua* Bur., *Pinus Eliottii*, *Leucaena leucocephala* (Lam.) de Wit, *Nyssa aquatica* L., *Morus alba* L., *Myricaria laxiflora* (Franch.) P. Y. Zhang et Y. J. Zhang, *Distylium chinense* (Fr.) Diels and *Lycium* L. As well as herbaceous plants such as *Cynodon dactylon* (L.) Pers., *Hemarthria altissima* (Poir.) *Stapf et C. E. Hubb*., *A. philoxeroides, Cyperus rotundus* L., *Phragmites australis (*Cav.) Trin. Ex Steud., *Phalaris arundinacea* L., *Paspalum paspaloides* (Michx.) Scribn., *Festuca ovina* L., *Vetiveria zizanioides* (L.) Nash, *Holosteum umbellatum* Linn., *Acorus calamus* L., and *Polygonum hydropiper* L. (Lu et al., 2016). At present, many studies have been carried out on the ecological restoration strategies and methods of the riparian zone, but no consensus has been reached. It is clear that the understanding of plant community should be based on the restoration and maintenance of the riparian zone, so that the ecological environment of the riparian zone is in a healthy dynamic cycle, ensuring the sustainable operation of material flow, plant and animal habitat, and ecological and hydrological characteristics (Gornish et al., 2017).

The management of arboreal forest land in the reservoir riparian zone is conducive to the full play of ecological benefits. Arboreal land is an important ecological niche and link in the ecosystem of the riparian zone. Forestlands adjacent to the riparian zone have stronger and faster carbon fixation capacity than mountain forests, and are the most important biomes and ecological hotspots that are most directly close to the buffer zone (Junk et al., 2000; Dybala et al., 2012; Matzek et al., 2018). Many studies have focused on the ecological restoration function and waterlogging resistance of tree species in landward areas (Mao et al., 2016; Zhong et al., 2016), in order to screen out the tree species that can withstand water flooding and have stable root system, so as to improve the forest land area and enhance the ecological function of soil and water conservation and water purification in the riparian zone by planting suitable tree species in a large area (Carrick et al., 2018; Martínez-Arias et al., 2020). This concept is very popular in China and has achieved certain results. Many researchers believe that the core of ecological restoration in the riparian zone is to increase the proportion of tree species and give full play to the ecological benefits (Wright et al., 2017), especially the typical representative of mangrove construction, which is very common in the south of China. The relationship between canopy structure and basal area of forest land with different degradation types and soil physical and chemical properties, and found that tree canopy openness and basal area under different site conditions of the riparian zone could be used as important markers to evaluate soil quality was studied (Celentano et al., 2017). There is also a view that the ecological restoration of riparian zone should be mainly used to maintain its healthy and stable community structure (Greet et al., 2020). These two views represent active and deliberate repair strategies, respectively. The jury is still out on which approach is more effective. No matter which strategy is adopted, the ecosystem environment of the riparian zone is a complex organic integrity, and long-term hydrological environment changes have a profound impact on the plant community structure and suitable species. There is a close energy exchange between the riparian zone and adjacent waters and woodlands, the composition and root distribution of tree species in the forestland play a pioneering role in the stabilization of the riparian zone and the fixation of nutrient elements. Pollutants, nutrient elements and particulate matter from the land are firstly fixed by the forestland, acting as a barrier for the riparian zone (Newbold et al., 2010; Rieger et al., 2014). When plant nutrients are scarce, forestland can provide continuous nutrients for vegetation in the riparian zone through the release of nutrient elements such as root circulation (Bruce & Rutherfurd, 2001). This ecological balance is within a certain range. Once the ecological environment is destroyed, the forestland will lose its barrier function, and the riparian zone will bear the brunt, the environment will be in danger. The arbor woodlands have an important "marginal effect" on the ecological benefit play and material energy interception of the riparian zone (Oldén et al., 2019). At present, there are few researches on forest land evaluation, forest management status and measures of forestland adjacent to the riparian zone. Forest structure variables could explain the concentration of phosphorus in rivers, thus affecting water quality and river habitat was found (Souza et al., 2013). These authors also found higher ammonia levels in rivers where with less forest covered. Therefore, the study of the species structure of forest communities and the evaluation of forest management benefits can directly promote the ecological restoration and the play of benefits in the riparian zone, and further understand the relationship between forestland and the riparian zone (Coll et al., 2018).

The understanding of geochemical process of reservoir riparian zone is helpful to purify water quality. Due to the influence of tourism, artificial activities and agricultural production, various non-point source pollutants enter the riparian zone along with surface runoff, as an important ecological buffer zone and the last barrier, the fixation, migration and feedback effects of plants, soil and microbial communities in the ecosystem on all kinds of non-point source pollution will directly affect the water quality of the reservoir (Vidon et al., 2010). As a crucial part of the riparian zone, soil is the central medium of biological activities, providing material support for plants and regulates the availability of nutrients and water. In turn, vegetation cover, roots, litters, organics and the associated biotic community affect soil porosity and other properties that affect soil moisture, infiltration, groundwater storage and flow rate (Hudson, 1994; Lavelle et al., 2006; Brevik et al., 2015). Soil physical structure such as soil moisture content, density and porosity directly affect soil particle viscosity, capillary adsorption capacity and bulk density, etc., which are considered as important indexes to measure soil quality and soil productivity. Its chemical properties, such as soil pH value, organic matter, total nitrogen, available nitrogen, total phosphorus, available phosphorus, total potassium, available potassium, etc., directly affect soil fertility, and then, through affecting the growth of surface vegetation, ultimately affect the play of the ecosystem function of the riparian zone. For example, degraded riparian areas tend to have higher soil volume density (NRCS, 2010), which may decrease shortly after recovery as the effects of livestock trampling and heavy vehicles are eliminated. After the exclusion of livestock and replanting, increased vegetation coverage, accumulation of organic matter (such as leaves and twigs), and reduced bare land (Robertson & Rowling, 2000) lead to increased soil carbon content and improved soil structural stability (Bronick & Lal, 2005).Therefore, studying on the physical and chemical properties of soil in the riparian zone can better understand the process, structure and function of soil formation, and providing reference for the research on the relationship between soil and plants, the spatial pattern of vegetation, soil erosion, land use change and ecological process (Guo et al., 2007; Li et al., 2014; Yang et al., 2015). Due to the hydrologic rhythm of the riparian zone, the soil is in the repeated cycle of submergence and exposure the aerobic and anaerobic bacteria community will also change with the soil exposure, and the change of bacteria community will also react on the change of soil nutrient content. The influence of environmental factors at different spatial locations in the watershed on soil microbial processes is an important topic to study the cushioning effect of riparian zone. In addition, soil physical and chemical conditions and deposition processes regulate soil nutrient dynamics by affecting adsorption, desorption and nutrient transport processes (Bing et al., 2016; Fierer et al., 2015; Woodward et al., 2015). Changes in soil nutrient levels are driven by soil physical and chemical properties, which are themselves influenced by hydrology and human activities, including sediment size, pH, soil moisture, air temperature and vegetation. With the water level fluctuation, organic matter content in the riparian zone shows extremely strong spatial heterogeneity. On the one hand, organic matter in rivers accumulates in the riparian zone with water flow, and on the other hand, organic matter will be taken away with the decline of water level, which is mainly closely related to the soil properties of the riparian zone (Ye et al., 2019). The function of the soil ecosystem is closely related to the turnover of soil organic matter (SOM), a complex and interwoven series of biological processes that recycle biological residues (e.g. plant litter, dead organisms, etc.) into inorganic molecules. Environmental and climatic factors influence decomposition rates, soil biological activity, and ultimately soil circulation (Rodriguez-Iturbe et al., 2001; Parton et al., 1987). Soil water directly affects processes mediated by soil biotas (soil animals, bacteria, fungi, etc.) because the optimal decomposition rate can only be achieved within a narrow saturation range (Bell et al., 2008; Ju et al., 2006; Porporato et al., 2003). Due to the strong dependence of ecological processes on soil moisture, there is a linear and nonlinear interaction and feedback between hydrological processes and soil ecosystem functions (Curiel et al., 2007; Misson et al., 2005), rainfall and temperature fluctuations are the main external forcing factors of the climate-soil-vegetation system (Davidson et al., 2006; Gu et al., 2004). A second important external forcing factor on SOM and soil productivity is related to the quantity and quality of vegetation litter inputs (Dent et al., 2006; Manzoni et al., 2008). In particular, the C/N ratio (C/N) of added litters is a very sensitive parameter. The importance of newly deposited litters to soil activity has been demonstrated in a number of recent studies measuring carbon dioxide generation (Rasmussen et al., 2007; 2010). Doubling litter input could accelerate soil respiration in an unpredictable way was found (Crow et al., 2009). This unexpected increase is associated with an increase in nutrient availability in pore solutions, this finding that has implications for long-term soil nutrient balance because it suggests that increased plant productivity may deplete soil C reserves rather than promote carbon dioxide absorption. Litter input rates and their temporal patterns vary with changes in soil utilization. Therefore, C and N stocks, soil fertility, and DOM dynamics change in unpredictable ways (Batlle-Aguilar et al., 2011; Chantigny et al., 2003).

Nitrogen and phosphorus are the main chemicals that cause eutrophication in water bodies, which has been a hot research topic. N in soil pollutants can not only be absorbed and retained by plants in the habitat of the riparian zone, but also generate N_2 to be discharged into the atmosphere through denitrification, which is an important way to eliminate N pollution (Wang et al., 2013). Phosphorus is mainly combined with solid phase such as large particles of soil in the form of adsorption (Daly et al., 2015; Zhang et al., 2012). The movement and distribution of nitrogen and phosphorus in different site types in the riparian zone directly determine the operation of the ecosystem (Lowrance et al., 2000; Groffman & Crawford, 2003). The proportional relationship between the organic contents, nitrogen and phosphorus in soil will also affect the accumulation and release of nutrient elements. Studies have shown that the phosphorus content in the riparian soil is closely related to the phosphorus content in the adjacent farmland soil. The nitrogen content of the soil, however, does not. This may be due to the rapid cycle of nitrogen in riparian soils and agricultural soils (Cavagnaro et al., 2006; Smith et al., 2012). Mineralization of organic matter releases ammonium, if it is not fixed by plants or microbes can be quickly converted to liquid nitrogen nitrate (Tinkler & Nye, 2000). The leaching and adsorption of phosphorus by plants is often mobilized by the nitrogen content in the soil, Nitrogen-based compounds released by plants promote phosphorus absorption (Walker et al., 2003; Roberts et al., 2019). Phosphate adsorption rate is closely related to soil particle content (Zhang et al., 2012). The soil property in the Chinese fir riparian zone of the Three Gorges Reservoir area and found that the soil nutrients showed significant spatial changes with the elevation gradient, and the organic contents, total nitrogen and total potassium were the highest in the middle area were studied (Wang et al., 2016). Landscape scale factors such as topographic index, slope, elevation, and land use type indirectly regulate the spatial variability of riparian soil denitrification by influencing the spatial distribution of soil texture, soil moisture content, and NO_3-N content (Wei et al., 2017). Researchers studied the physical and chemical properties of soil in the flooded and unflooded areas of the three Gorges Reservoir riparian zone, and found that water level rising can lead to a large loss of the content of available phosphorus, available nitrogen, available potassium, total nitrogen, total phosphorus and organic matter and a significant increase in pH of the soil (Shen et al., 2016).

Reservoir riparian zone is a special type of land use and a typical area of ecological vulnerability, which plays a pivotal role in ecological benefits, material energy transport and transport, community structure construction and so on. Previous studies have focused more on the process of nitrogen and phosphorus adsorption

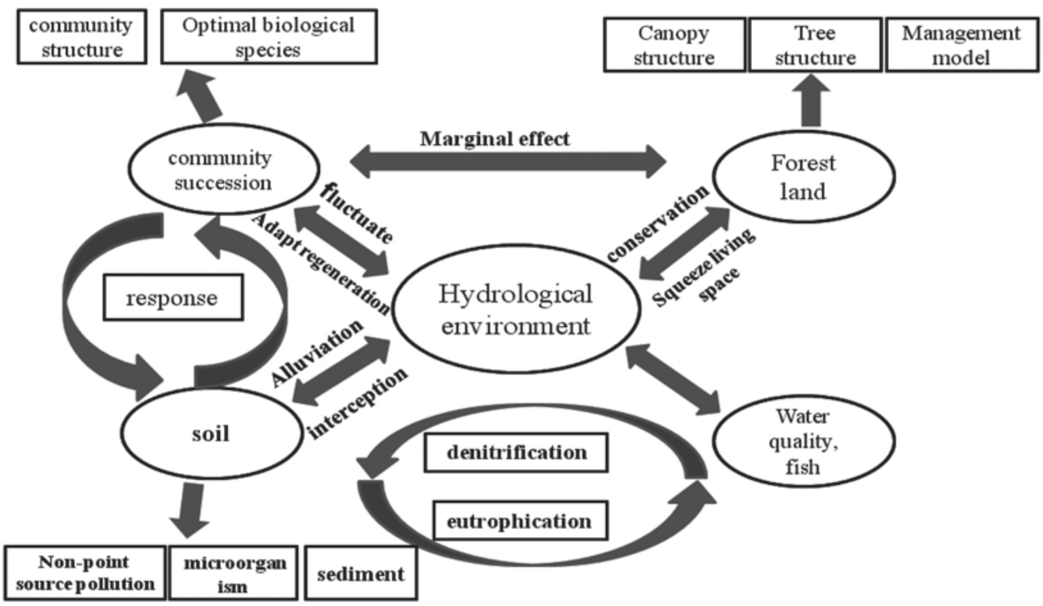

Fig. 1. The riparian zone ecosystem

and release, material deposition and riverbank erosion in the reservoir riparian zone as an important buffer area for water quality management (Mayer et al., 2007; Sabater et al., 2003; Vidon et al., 2019). At present, the research scale is mostly focused on the macroscopic or mesoscale, while the research on the microscopic process still needs to be deepened. Many researchers have realized that the riparian zone is an organic whole composed of multiple elements, and it is the key direction of the next research to understand and explore the comprehensive process of riparian zone with multi-scale and all-round research methods. It mainly includes the formation and evolution of reservoir riparian zone, the response regularity of the geochemical process and vegetation; To establish the interaction process and feedback relationship between plant - soil - microorganism as the main process of multidisciplinary fusion;

Understanding the impact of greenhouse gas emissions from reservoir riparian zones on climate change; A unified material energy cycle that takes the land-water area of the whole field as a whole; The implementation and application of new and high technology monitoring means represented by 3S technology and the establishment of continuous and stable monitoring platform.

Conclusions. This article combines many research results of riparian zones, describes the concept, classification and function of reservoir riparian zone respectively, and discusses the regulation of vegetation succession, the function and benefit of arbor forest, the process of earth geochemistry and migration and absorption of soil nutrients. On this basis, we look into the distance of the research prospect and point out the methods and emphases that should be paid attention to, which is of great theoretical value for understanding and evaluating the ecological value of reservoir riparian zone, and also provides reference for the regional ecological environment control of reservoir riparian zone.

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Екологічні функції та переваги щодо середовища існування у прибережній зоні водосховища

Прибережна зона водосховища є особливим типом землекористування і типовою зоною екологічної вразливості, яка відіграє ключову роль у створенні екологічних переваг, транспортуванні матеріальної енергії та у формуванні *структури угруповань тощо. Завдяки особливому гідрологічному ритму прибережної зони водосховища, оселищ існування видів постають перед подвійними викликами – екологічної деградації та якісного очищення води. Для того, щоб вирішити ці екологічні проблеми, ключем до впровадження та застосування заходів екологічного відновлення є розуміння закономірності сукцесії рослинності та заходів щодо управління прилеглим лісовим масивом. Прибережна зона є гарячою точкою різних процесів живлення та відіграє непропорційну роль у розвитку екологічних переваг. Гідрологія є ключовим фактором, що впливає на формування оселищ в прибережній зоні водосховища. Розуміння геохімічного процесу ґрунту у прибережній зоні водосховища, а саме механізму транспортування та перехоплення елементів живлення може ефективно зменшити пошкодження водного об'єкта, яке спричинене забрудненням із різних джерел. У цій роботі ми розглянули визначення, класифікацію та функції прибережної зони водосховища, обговорили ключову роль рослинності у сфері відновлення та реконструкції оселищ у прибережній зоні водосховища та роль деревних лісових рослин у продукуванні екологічних вигод. Це питання має особливу актуальність для Китаю – країни із значною кількістю водосховищ. Метою даного дослідження є надання вичерпної інформації щодо характеристик оселищ та надання теоретичних ідей щодо управління екологічною компонентою середовища. Наразі засобів моніторингу прибережної зони водосховища недостатньо, і ми все ще зосереджені у макро- та мезомасштабах, тоді як мікроскопічний масштаб потребує подальшого поглиблення. У процесі вивчення прибережної зони нам слід приділити достатню увагу дослідженню причини формування, геологічного середовища та інших факторів, повністю вивчити прибережну зону водойми з єдиної органічної та цілісної екологічної точки зору, звернути увагу на раціональне використання високотехнологічних засобів та проводити необхідний моніторинг за допомогою засобів динамічного дослідження.*

Ключові слова: *буферна зона, сукція рослинності, деревні лісові масиви, властивості грунту, геохімічний процес.*