CitiesWithNature

COP17 YEREVAN ARMENIA

Taking action for nature 9th SUMMIT

ICLEI Local Governments for Sustainability

CITIES IN HARMONY WITH NATURE

城市与自然共生

中国城市生物多样性保护实践

CASE STUDIES OF URBAN BIODIVERSITY CONSERVATION IN CHINA



2026

FOREWORD

CITIES IN HARMONY WITH NATURE: CASE STUDIES OF URBAN BIODIVERSITY CONSERVATION IN CHINA

Cities are not only centres of human civilisation and development, but also homes for a rich diversity of life. They should be places where people and nature can thrive together. From urban park networks connecting mountains, rivers and coastlines, to riverine wetlands that conserve water and restore habitats for wildlife; from infrastructure projects carefully designed to preserve ancient trees and mature forests, to ecological corridors integrated into buildings and public spaces to facilitate the movement of wildlife—an increasing number of cities are rethinking and redefining their relationship with nature, moving from separation towards integration and coexistence. This is not only a proactive response to the Kunming–Montreal Global Biodiversity Framework, but also a shared direction for cities around the world as they pursue sustainable development and seek to build a harmonious relationship between people and nature.

In 2026, the Seventeenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP17) will be held in Armenia. As a global network committed to advancing the engagement of local and regional governments in sustainable development, ICLEI will continue to serve as a bridge connecting cities, regional governments and the international community, helping translate global biodiversity goals into action at the local and urban levels. Through the CitiesWithNature platform and initiatives such as Biodiversity Charming Cities, ICLEI works to connect cities, communities, experts and partners around the world, facilitate knowledge sharing, exchange experiences and foster joint action. These efforts aim to help cities better integrate the value of nature and biodiversity into urban planning and development, while providing an international platform to showcase the achievements and innovative solutions of Chinese cities in advancing ecological civilisation.

In recent years, Chinese cities have actively explored locally tailored approaches to biodiversity conservation and developed a growing body of practical experience in areas such as urban ecological space, nature education, ecological restoration, green infrastructure and public engagement. These experiences offer valuable and potentially replicable insights for urban biodiversity governance around the world. This case study collection brings together a selection of representative examples from Chinese cities, highlighting their commitments, actions and progress in advancing the vision of "Cities in Harmony with Nature." From public nature education to green infrastructure development, and from cross-departmental collaboration to long-term ecological monitoring and governance mechanisms, Chinese cities are integrating biodiversity conservation into urban development through diverse and practical approaches, helping to shape a more harmonious relationship between people and nature.

We hope that these experiences from Chinese cities will serve as a starting point for dialogue and inspiration, offering useful lessons for cities around the world and encouraging greater cooperation, knowledge exchange and innovation on urban biodiversity. Making cities part of nature, and making nature a source of strength for urban development, is an important pathway towards the sustainable future we share.

前言

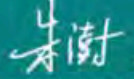
城市与自然共生：中国城市生物多样性保护实践

城市，既是人类文明繁荣发展的重要载体，也是万物共生的家园，更应成为人与自然和谐共生的重要空间。从贯通山海的城市公园网络，到兼具水源涵养与生物栖息功能的河流湿地；从为古树、密林主动让路的基建工程，到在城市建筑与公共空间中为野生动物保留的生态廊道——越来越多的城市正在重新审视和定义与自然的关系，从与自然对立走向融合与共生。这不仅是对《昆明—蒙特利尔全球生物多样性框架》的积极响应，也是全球城市实现可持续发展、建设人与自然和谐共生城市的共同方向。

2026年，《生物多样性公约》第十七次缔约方大会（COP17）将在亚美尼亚举行。作为长期致力于推动地方政府参与全球可持续发展进程的国际城市网络，宜可城（ICLEI）将继续发挥连接全球城市、区域政府与国际社会的桥梁作用，推动全球生物多样性目标在地方和城市层面的落实。通过"自然城市（CitiesWithNature）"平台以及"生物多样性魅力城市（Biodiversity Charming Cities）"等倡议，宜可城致力于连接全球城市、社区、专家及合作伙伴，促进知识共享、经验交流与联合行动，帮助城市将自然和生物多样性的价值更好地融入城市规划与发展，同时为展示中国城市生态文明建设的实践成果与创新解决方案提供国际交流平台。

近年来，中国城市积极探索具有地方特色的生物多样性保护路径，在城市生态空间建设、自然教育、生态修复、绿色基础设施以及公众参与等领域形成了一批具有实践价值的经验，为全球城市生物多样性治理提供了可借鉴、可推广的中国实践。本案例集精选中国城市的代表性案例，集中呈现其围绕"城市与自然共生"这一理念所作出的承诺、采取的行动以及取得的阶段性成果。从公众自然教育到绿色基础设施建设，从跨部门协同到长期生态监测与治理机制完善，中国城市正以多样化的实践探索，将生物多样性保护融入城市发展进程，描绘人与自然和谐共生的城市图景。

我们期待，这些来自中国城市的实践能够成为交流与启发的起点，为更多城市提供有益借鉴，并推动全球城市在生物多样性保护领域加强合作、分享知识、共同创新。让城市成为自然的一部分，让自然成为城市发展的力量，正是我们共同迈向可持续未来的重要路径。



SHU ZHU

宜可城—地方可持续发展协会东亚秘书处主任兼中国首席代表

ICLEI East Asia Reginal Director and China Representative



滹沱河秋景。图片由石家庄市提供
Autumn scenery of the Hutuo River. Photo provided by Shijiazhuang

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BAISHAN CITY, JILIN PROVINCE
吉林省白山市



Conservation of Key Breeding and Habitat Areas for the Scaly-sided Merganser
中华秋沙鸭主要繁育栖息地保护

关键词

中华秋沙鸭；濒危生物栖息地；繁育保护；候鸟迁徙；东亚森林生态系统

KEYWORDS

Scaly-sided Merganser; endangered species habitat; breeding conservation; migratory birds; East Asian forest ecosystem

案例名片

白山市地处长白山腹心地带，山水林田湖等自然要素齐备，是国际公认的地球同一纬度带原始状况保持最好、生物物种最多的自然生物圈和物种基因库，也是世界濒危物种中华秋沙鸭在全球的主要繁育栖息地，具有极高生态价值。项目从常态化迁徙监测、栖息地保护区设立、开展人工巢穴安装等方面开展系统性种群保护，破解繁育栖息地丧失、巢穴不足等严重制约种群繁衍的问题，系统构建“监测研究—栖息地保护—科学救助—社区共管”四位一体保护体系，为濒危迁徙鸟类保护提供借鉴经验。

CASE PROFILE

Located in the heart of the Changbai Mountains, Baishan City is endowed with diverse natural elements, including mountains, rivers, forests, farmlands, and lakes. It is internationally recognized as a natural biosphere and species gene bank with the best-preserved pristine ecosystems and the richest biodiversity among areas at the same latitude on Earth. It also serves as one of the world's most important breeding and habitat areas for the endangered Scaly-sided Merganser, possessing extremely high ecological value. The project has implemented systematic population conservation measures, including routine migration monitoring, the establishment of habitat protection zones, and the installation of artificial nesting boxes. These efforts have addressed critical constraints on population reproduction, such as habitat loss and insufficient nesting sites. Through the integrated conservation framework of "monitoring and research—habitat protection—scientific rescue—community co-management," Baishan City has established a comprehensive protection system and provided valuable experience for the conservation of endangered migratory birds.

背景与问题

中华秋沙鸭是东北亚最濒危的水禽之一，被列为IUCN濒危(EN)动物。受土地利用变化及人为活动的影响，栖息地面积锐减，全球现存栖息地仅为十九世纪末历史范围的十分之一，长白山西坡及小兴安山脉等地是中华秋沙鸭的集中繁殖地。由于中华秋沙鸭只在原始林和三、四十年以上的次生林上的树洞中完成产卵和孵化过程，一旦森林系统受到采伐等影响，其生存繁育将受到巨大的挑战。

行动与措施

开展物种迁徙范围研究

为精准削减人类行为扰动，限制开发建设活动侵占中华秋沙鸭栖息地，白山市自2011年起连续开展中华秋沙鸭种群监测与迁徙研究。通过持续调查监测，2019年在中华秋沙鸭繁殖地建成1000米保护围栏；截至2025年，已在抚松县识别确认其栖息地1500余公顷，为后续种群保护提供科学依据。

设立栖息地节点保护区

针对中华秋沙鸭迁徙繁育特点，设立长白山联合国"人与生物圈"自然保留地，成立吉林头道松花江上游国家级自然保护区，颁布专项管理条例，明令禁止漂流旅游、人工挖沙等人为干扰活动。建成野生动物救助站4个，构建"发现—救护—康复—放归"闭环机制。

开展人工巢箱布设与"安心驻巢"行动

为解决中华秋沙鸭天然繁殖巢锐减、2013年野外调查仅存3处的困境，在吉林省重点科技攻关计划支持下，长白山科学研究院动物研究所针对中华秋沙鸭天然树洞巢空间构造、巢址选择偏好与完整繁殖行为规律等方面开展专项研究，参照天然树洞特征研制仿生人工巢箱。

BACKGROUND AND CHALLENGES

The Scaly-sided Merganser is one of the most endangered waterfowl species in Northeast Asia and is classified as Endangered (EN) on the IUCN Red List. Due to land-use changes and human disturbances, its habitat area has declined dramatically. The global habitat range currently accounts for only one-tenth of its historical range at the end of the 19th century. The western slope of the Changbai Mountains and the Lesser Khingan Mountains are among the major breeding areas for the Scaly-sided Merganser. Because the Scaly-sided Merganser relies on tree cavities in primary forests and secondary forests that are more than 30–40 years old for egg-laying and incubation, any disturbance to forest ecosystems, such as logging activities, poses significant challenges to its survival and reproduction.

ACTIONS AND MEASURES

CONDUCTING RESEARCH ON SPECIES MIGRATION RANGE

To accurately reduce human-induced disturbances and prevent development and construction activities from encroaching on the habitat of the Scaly-sided Merganser, Baishan City has continuously carried out population monitoring and migration research on the species since 2011. Through long-term surveys and monitoring, a 1,000-meter protective fence was constructed at the breeding site of the Scaly-sided Merganser in 2019. By 2025, more than 1,500 hectares of habitat areas have been identified and confirmed in Fusong County, providing scientific support for subsequent population conservation efforts.

ESTABLISHING PROTECTED AREAS AT KEY HABITAT SITES

In response to the migratory and breeding characteristics of the Scaly-sided Merganser, the Changbai Mountain UNESCO Man and the Biosphere Reserve was designated, and the Jilin Toudao Songhua River Upper Reaches National Nature Reserve was established. Special management regulations were issued to explicitly prohibit human disturbance activities, including rafting tourism and artificial sand excavation. Four wildlife rescue stations were established, creating a closed-loop mechanism covering "discovery—rescue—rehabilitation—release."

IMPLEMENTING ARTIFICIAL NEST BOX INSTALLATION AND THE "SAFE NESTING" INITIATIVE

To address the severe decline in natural breeding nests of the Scaly-sided Merganser, with only three natural nests identified during field surveys in 2013, the Institute of Animal Research of the Changbai Mountain Research Institute conducted specialized studies with support from the Key Science and Technology Research Program of Jilin Province. The study focused on the spatial structure of natural tree cavities used by the Scaly-sided Merganser, their nest-site preferences, and complete breeding behavior patterns. Based on the characteristics of natural tree cavities, researchers developed biomimetic artificial nest

2018年起，以长白山区为重点范围，启动“中华秋沙鸭安心驻巢行动”，系统推进人工巢箱布设工作。截至2024年，已累计布设人工巢近百个，有效缓解了繁殖巢址不足的问题。

划分管护责任区域，实行精细化管理

全区共划定146个管护责任区，配备专职管护人员485名，成立联合巡逻小组，定期对秋沙鸭人工巢箱、繁殖河段、觅食水域实行常态化巡护，并在秋沙鸭栖息地周边关键路口、河道沿线设置警示标识，提示往来群众严禁进入栖息地周围河道和林地，严禁在秋沙鸭活动区域内非法捕鱼，保障秋沙鸭安全栖息与充足食源。

开展生物多样性保护宣传

面向林区群众和游客普及中华秋沙鸭保护知识，组建中华秋沙鸭志愿服务团队，开展中华秋沙鸭科普、巡护等工作。

boxes. Since 2018, with the Changbai Mountain region as the primary focus area, the "Safe Nesting Initiative for the Scaly-sided Merganser" has been launched to systematically promote the installation of artificial nest boxes. By 2024, nearly 100 artificial nests have been installed, effectively alleviating the shortage of suitable breeding sites.

IMPLEMENTING REFINED MANAGEMENT THROUGH CLEARLY DEFINED CONSERVATION RESPONSIBILITIES

A total of 146 management and conservation responsibility zones were designated across the entire region, with 485 dedicated conservation personnel assigned. Joint patrol teams have been established to conduct routine patrols of artificial nest boxes, breeding river sections, and foraging waters used by Scaly-sided Mergansers. Warning signs were also installed at key intersections and along riverbanks surrounding Scaly-sided merganser habitats, reminding local residents and visitors that entry into rivers and forest areas around the habitats is strictly prohibited, and that illegal fishing is forbidden in areas where Scaly-sided mergansers are active. These measures help ensure safe habitats and adequate food resources for the Scaly-sided Merganser.

PROMOTING BIODIVERSITY CONSERVATION AWARENESS

Conservation knowledge about the Scaly-sided Merganser was promoted among local forest communities and tourists. Volunteer service teams dedicated to the protection of the Scaly-sided Merganser were established to conduct science outreach activities, patrols, and other conservation initiatives.

▼ *吉林头道松花江上游自然保护区*
Jilin Toudao Songhua River Upper Reaches Nature Reserve



成效与价值

经过持续保护，中华秋沙鸭种群实现恢复性增长，种群总量由2018年不足300只恢复至2025年600余只。繁殖幼鸟数量从2019年的49只增长至2024年的92只，来访数量从2012的50余对上升至104对。2025年，抚松镇西江河段单日最高观测到200余只中华秋沙鸭。野生动物救助站已累积救助中华秋沙鸭、白鹤、雕鸮、赤狐等野生动物超过63只。

ACHIEVEMENTS AND VALUE

Through continuous conservation efforts, the Scaly-sided Merganser population has achieved restorative growth. The total population increased from fewer than 300 individuals in 2018 to more than 600 individuals in 2025. The number of successfully fledged juveniles increased from 49 in 2019 to 92 in 2024. The number of visiting pairs increased from more than 50 pairs in 2012 to 104. In 2025, more than 200 Scaly-sided Mergansers were observed at a single monitoring point on the Xijiang River section in Fusong County on the same day. Wildlife rescue stations have cumulatively rescued more than 63 wild animals, including the Scaly-sided Merganser, Siberian Crane, Eurasian Eagle-Owl, and Red Fox.

经验与启示

连续14年开展种群迁徙监测，精准识别中华秋沙鸭重要且集中分布的繁殖栖息地与种群数量减少的关键制约因素。通过设立保护区、开展巢穴专项研究、划分管护责任区等方式，实现由粗放管理向精准保护的转变。

EXPERIENCES AND INSIGHTS

Through 14 consecutive years of population migration monitoring, Baishan City has accurately identified key breeding habitats where the Scaly-sided Merganser is highly concentrated, as well as the critical factors restricting its population growth. By establishing protected areas, conducting specialized nest research, and ddesignating management and conservation responsibility zones, Baishan City has achieved a transition from extensive management to targeted and precise conservation.

河流中的中华秋沙鸭 ▼
Scaly-sided Mergansers in a River





CHINA-SINGAPORE TIANJIN ECO-CITY, TIANJIN MUNICIPALITY
天津市中新天津生态城

Innovative Practices in Ecological Restoration and Biodiversity Conservation on Saline-Alkali Lands

滨海盐碱地生态修复与生物多样性保护创新实践

关键词

国际合作；滨海城市建设；湿地保护与修复；候鸟保护；智慧监测；全民共建共享

案例名片

中新天津生态城（以下简称“生态城”）是为应对气候危机，推动绿色低碳转型，由中国、新加坡两国政府合作开发的示范项目，旨在建设一个“资源节约、环境友好、社会和谐”的生态城市标杆。项目遵从滨海盐碱地生态基底条件，协调城市经济发展与生态保护的关系，将生物多样性保护融入城市规划建设全过程，经过十八年系统治理，从盐碱荒滩、废弃盐田和污染水面蜕变为高质量生态空间，为全球滨海城市生态修复与生物多样性保护提供了可复制、可推广的实践样本。

KEYWORDS

International cooperation, coastal city development, wetland conservation and restoration, migratory bird conservation, smart monitoring, community-wide participation and shared benefits.

CASE PROFILE

The China-Singapore Tianjin Eco-City (hereinafter referred to as the "Eco-City") is a demonstration project jointly developed by the governments of China and Singapore to address the climate crisis and promote a green, low-carbon transition. It aims to establish a benchmark for an "ecological city that conserves resources, is environmentally friendly, and fosters social harmony." The project respects the ecological conditions of the coastal saline-alkali land, balances urban economic development with ecological conservation, and integrates biodiversity conservation into the entire process of urban planning and construction. After 18 years of systematic management, it has transformed from saline-alkali wasteland, abandoned salt fields, and polluted water bodies into a high-quality ecological space, providing a replicable and scalable model for ecological restoration and biodiversity conservation in coastal cities worldwide.



静湖（前污水库）
Jinghu Lake (Former Sewage Reservoir)

背景与问题

生态城位于渤海湾西岸的围海造陆和滨海盐碱地区域，土壤贫瘠，土壤含盐量高达4‰-7‰，植被存活率极低。生态城拥有36公里海岸线和198平方公里海域面积，是渤海湾重要的生态节点，也是东亚－澳大利西亚候鸟迁徙路线上的关键节点。由于人工围垦和养殖开发、水环境恶劣，区域内存在积存40年的污水库和诸多废弃盐田，底泥污染严重，水体黑臭，基本丧失自净能力；这也导致自然岸线丧失、陆海生态连通性不足，栖息地破碎化，严重影响候鸟的迁徙、繁衍和生存。

BACKGROUND AND CHALLENGES

The Eco-City is located in a reclaimed land and coastal saline-alkali area on the western shore of the Bohai Bay. The soil is barren, with a salt content as high as 4‰–7‰, resulting in an extremely low vegetation survival rate. With 36 kilometers of coastline and 198 square kilometers of marine area, the Eco-City serves as a vital ecological hub in the Bohai Bay and a key stopover along the East Asia–Australasia migratory bird flyway. Due to land reclamation, aquaculture development, and poor water quality, the area contains a sewage reservoir that has accumulated waste for 40 years and numerous abandoned salt fields. Sediment pollution is severe, the water is black and foul-smelling, and the water body has essentially lost its self-purification capacity. These issues have led to the loss of natural shorelines, habitat fragmentation, and insufficient ecological connectivity between land and sea, severely impacting the migration, reproduction, and survival of migratory birds.

行动与措施

生态规划引领城市建设

依托中新合作优势，通过基于自然的解决方案，将生物多样性保护融入城市规划建设全过程，在生态城建设之初，将生物多样性保护纳入城市建设顶层设计，建立跨部门协作机制，以生物多样性调查数据为规划基础，构建生态城市指标体系，将湿地、岸线保护作为核心目标，加强滨海岸线资源保护，保留入海口大面积生态湿地，严控周边建设开发，严格保护候鸟迁徙通道和觅食区域。

设定目标保护物种

将遗鸥作为生态修复的目标物种，围绕以遗鸥为重点的水生鸟类开展食物来源、栖息地状况、种群数量及分布的调查监测与数据分析，划定540公顷遗鸥生态保育区，推动天津滨海国家海洋公园建立等保护措施。

ACTIONS AND MEASURES

ECOLOGICAL PLANNING AS A GUIDE FOR URBAN DEVELOPMENT

Leveraging the strengths of China-Singapore cooperation and utilizing nature-based solutions, biodiversity conservation was integrated into the entire process of urban planning and construction. From the very beginning of the eco-city's development, biodiversity conservation was incorporated into the overarching urban development framework; cross-departmental collaboration mechanisms were established, biodiversity survey data were used as the foundation for planning, and an eco-city indicator system was developed. This system prioritized wetlands and shoreline protection as core objectives, strengthened the protection of coastal resources, preserved large areas of ecological wetlands at estuaries, strictly controlled surrounding construction and development, and rigorously protected migratory bird flyways and foraging areas.

SETTING TARGET SPECIES FOR CONSERVATION

With the Relict Gull (*Ichthyaetus relictus*) designated as a target species for ecological restoration, surveys, monitoring, and data analysis were conducted on the food sources, habitat conditions, population size, and distribution of aquatic birds—with a focus on the Relict Gull. A 540-hectare Relict Gull Ecological Conservation Area was established, and conservation measures—including the promotion of the establishment of the Tianjin Coastal National Marine Park—were implemented.

开展全域湿地保护及修复

在完整保留原始湿地的基础上，针对历史遗留的环境问题，彻底将215万立方米污水和385万立方米的污染底泥完成彻底根治和资源化利用，实施河、湖、滩、海连通工程，完成180平方公里水系连通，清除入侵物种互花米草，恢复滩涂原生生态。并连续多年开展增殖放流活动，实现了潮间带生物、海洋生物、渔业资源的自然恢复。

实施岸线修复

沿海建成总长度达15公里、总面积189公顷的绿色长廊，实现海防安全、生态保护、滨海休闲的功能。

系统性生物多样性调查

在生态城建设前、中、后三个阶段，开展全周期生物多样性本底调查，尤其针对遗鸥、大天鹅、小天鹅等重点保护鸟类进行声纹监测，为生态城建设及后续生境优化提供科学依据。

自然教育与公众参与

打造国家海洋博物馆、南堤滨海步道公园生物多样性体验地，开发教育课程与体验活动，面向公众推出“赏花地图”与“观鸟地图”，鼓励公众了解身边的自然。

CARRYING OUT COMPREHENSIVE WETLAND CONSERVATION AND RESTORATION

While fully preserving the original wetlands, The project thoroughly remediated and recycled 2.15 million cubic meters of sewage and 3.85 million cubic meters of contaminated sediment to address historical environmental issues. Projects were implemented to connect rivers, lakes, tidal flats, and the sea, completing the interconnection of 180 square kilometers of waterways, eradicating the invasive specy-smooth cordgrass (*Spartina alterniflora* Loisel.), and restoring the native ecology of the tidal flats. In addition, fish restocking activities were carried out for many consecutive years, achieving the natural recovery of intertidal and marine organisms as well as fishery resources.

IMPLEMENTATION OF SHORELINE RESTORATION

A green corridor with a total length of 15 kilometers and a total area of 189 hectares was established along the coast, serving the purposes of coastal defense, ecological conservation, and coastal recreation.

SYSTEMATIC BIODIVERSITY SURVEYS

During the pre-construction, construction, and post-construction phases of the Eco-City project, full-cycle baseline biodiversity surveys were conducted, with a particular focus on acoustic monitoring of key protected bird species such as the Relict Gull, Whooper Swan (*Cygnus cygnus*), and TTundra Swan (*Cygnus columbianus*), to provide a scientific basis for the Eco-City's construction and subsequent habitat optimization.

NATURE EDUCATION AND PUBLIC ENGAGEMENT

Biodiversity experience sites were established at the National Maritime Museum and the Nandi Coastal Promenade Park; educational curricula and experiential activities were developed; and "flower-viewing maps" and "bird-watching maps" were launched for the public to encourage them to learn about the nature around them.



推动生态价值转化

发展海洋文旅产业，实施天津市生态产品价值核算试点，发布核算标准，挖掘生态产品清单，推动生态价值转化。

PROMOTING THE CONVERSION OF ECOLOGICAL VALUE

The project boosted the marine culture and tourism industry, implemented the Tianjin's pilot program for the valuation of ecological products, published valuation standards, and compiled a list of ecological products—all of which helped translate ecological gains into tangible economic benefits.



▲ 国家一级保护鸟类遗鸥
The Relict Gull (Ichthyaetus relictus)

成效与价值

生态城通过系统治理，实现了生态环境的根本性逆转，建成区绿化覆盖率达50%，入海断面水质从劣V类跃升至III类标准。耐盐碱乡土植被形成的植物群落，为昆虫、两栖类和鸟类构建了完整的食物网。截至2025年，共记录植物305种，其中国家二级保护植物1种。鸟类从建设之初的106种提升至214种，成为大杓鹬、白琵鹭、东方白鹳等国家重点保护鸟类在东亚—澳大利亚迁徙路线上重要的停歇地。

实现生物多样性保护全民参与，形成"生态+文旅"的新业态，吸引绿色高端企业入驻，生态产品价值不断增加，污染底泥治理资源化技术成为示范性标杆，应用于多个生态治理项目。

ACHIEVEMENTS AND VALUE

Through systematic management, the Eco-City has achieved a fundamental reversal of its ecological environment. The greening coverage rate in the built-up area has reached 50 percent, and water quality at the estuary outfall has improved from inferior than Class V to Class III standards. Plant communities formed by salt- and alkali-tolerant native vegetation have established a complete food web for insects, amphibians, and birds. As of 2025, a total of 305 plant species have been recorded, including one species listed as a Class II nationally protected plant. The number of bird species has increased from 106 at the start of construction to 214, making the area an important stopover site along the East Asia–Australasia flyway for nationally key-protected birds such as the Far Eastern Curlew (*Numenius madagascariensis*), the Eurasian Spoonbill (*Platalea leucorodia*), and the Oriental Stork (*Ciconia boyciana*).

The city has achieved public participation in biodiversity conservation, fostered a new "ecology + cultural tourism" industry model, attracted high-end green enterprises to the area, continuously increased the value of ecological products, and established resource recovery technologies for treating polluted sediment as a model of best practice, which has been applied to multiple ecological restoration projects.

经验与启示

滨海盐碱地城市普遍面临土壤贫瘠、水环境恶劣、生态脆弱等共性难题。基于国际合作，中新天津生态城通过将生物多样性保护纳入城市规划顶层设计，以生态城市指标体系为刚性约束，以候鸟保护为保护目标，实现高强度城市开发与高水平生态保护的有效平衡。

EXPERIENCES AND INSIGHTS

Coastal cities with saline-alkali land generally face common challenges such as poor soil quality, poor water quality, and ecological fragility. Through international cooperation, the China-Singapore Tianjin Eco-City has achieved an effective balance between high-intensity urban development and high-level ecological conservation by incorporating biodiversity conservation into the overarching design of its urban planning, using an ecological city indicator system as a binding constraint, and setting migratory bird conservation as its primary objective.

◀ 国家一级保护鸟类遗鸥在生态城越冬栖息
The Relict Gull (Ichthyaetus relictus) overwinters in the Eco-City

SHIJIAZHUANG CITY, HEBEI PROVINCE
河北省石家庄市

"Hutuo River Ecological Corridor Restoration": A Collaborative Practice of River Ecological Restoration and Biodiversity Recovery

"滹沱河廊道修复": 河道生态修复与生物多样性恢复协同实践



关键词

基于自然的解决方案；乡土物种恢复；河流生态修复；东亚—澳大利西亚候鸟迁徙廊道

案例名片

滹沱河是石家庄的母亲河，其湿地系统是东亚—澳大利西亚候鸟迁徙路线上的关键节点。面对长期断流、生态功能丧失的严峻挑战，石家庄市开展系统性生态修复工程。通过保障生态基流、重建自然岸线、恢复乡土植被、营造多样生境，干涸的"母亲河"重现生机，成为贯穿城市的生态绿廊。如今，在滹沱河迁徙停留的鸟类已有224种，生态修复成效显著，为北方资源型缺水城市提供了协同推进生态修复与生物多样性保护的"石家庄方案"。

KEYWORDS

Nature-based Solutions (NbS), native species restoration, river ecological restoration, East Asian–Australasian Flyway

CASE PROFILE

The Hutuo River is the mother river of Shijiazhuang, and its wetland system serves as a key node along the East Asian–Australasian Flyway. Facing severe challenges including long-term river flow cessation and ecological function degradation, Shijiazhuang City has implemented a systematic ecological restoration project. Through measures including securing ecological base flow, restoring natural riverbanks, recovering native vegetation, and creating diverse habitats, the dried-up "mother river" has regained vitality and become an ecological green corridor running through the city. Today, 224 bird species have been recorded along the Hutuo River migration route, demonstrating significant ecological restoration outcomes. The project provides the "Shijiazhuang Approach" for resource-constrained northern cities to advance ecological restoration and biodiversity conservation in a coordinated manner.



◀ 乡土植物回归
Recovery of Native Vegetation

背景与问题

滹沱河作为石家庄主要生态廊道，既是区域水源涵养基底，亦是候鸟迁徙路线的关键中途停歇地，对维持生物多样性至关重要。然而，由于快速城镇化和工业发展超采地下水等原因，河水断流，流域生态空间破碎化，物种丰富度下降，水源涵养、栖息地支持等生态系统服务功能显著衰退，威胁了城市生态安全与可持续发展根基。

BACKGROUND AND CHALLENGES

As a major ecological corridor of Shijiazhuang, the Hutuo River serves both as the regional foundation for water conservation and as a key stopover site along the migratory route of birds, playing a vital role in maintaining biodiversity. However, due to factors including rapid urbanization, industrial development, and excessive groundwater extraction, the river experienced flow cessation, ecological space fragmentation, and declining species richness. Ecosystem services such as water conservation and habitat support significantly deteriorated, threatening urban ecological security and the foundation for sustainable development.

行动与措施

统筹水源调度，保障生态基流

针对滹沱河（石家庄段）数十年断流症结，城市构建多水源联合调度体系，统筹南水北调引江水、水库水及深度再生水，优先保障生态基流；2021年城市段干流实现全线贯通，系统缓解了流域水资源供需矛盾，为生态修复奠定了基础。

ACTIONS AND MEASURES

COORDINATING WATER RESOURCE ALLOCATION TO SECURE ECOLOGICAL BASE FLOW

To address decades of river flow cessation in the Hutuo River (Shijiazhuang section), the city established a multi-source water allocation system that integrates water diverted from the Yangtze River via the South-to-North Water Diversion Project, reservoir water, and highly treated reclaimed water, with priority given to maintaining ecological base flow. In 2021, continuous flow was restored throughout the main channel of the urban section, effectively alleviating water resource supply–demand pressures across the basin and laying the foundation for ecological restoration.

推进截留治乱，实现清源净流

系统推进流域截污治污工程，封堵非法排污口14个，完成127个傍河村环境整治，改扩建污水处理厂9座，同步建设人工湿地净化系统，有效削减入河污染负荷。干流水质稳定保持地表水III类标准，为河道生态复苏与候鸟栖息提供了优良水环境保障。

重塑生境形态，恢复自然岸线

通过营造深潭、浅滩、生态岛等多样化微生境，重构河流生态空间异质性，为不同水禽提供栖息条件。在此过程中，特意保留崖沙燕筑巢所需沙岛，并安排专人巡护，最大限度减少人为干扰。

坚持乡土优先，促进物种回归

坚持"乡土优先、近自然修复"理念，规模化恢复芦苇、香蒲等乡土水生植物群落，配植合欢、刺槐、金银花等食源蜜源植物，构建水陆交错、复层结构的立体植被系统，为鸟类及昆虫提供栖息与觅食条件。基于历史鱼类本底调查实施土著鱼类增殖放流，逐步恢复鱼类群落结构与生态功能。建立生物完整性指数监测体系，动态评估恢复成效。青头潜鸭、中华秋沙鸭、水雉、白鹭等野生鸟类持续到此停歇、繁衍，实现本土物种自然回归，流域生物多样性持续提升。

REDUCING POLLUTION AND RESTORING CLEAN WATER FLOWS

The city systematically advanced watershed pollution control and treatment efforts, including the closure of 14 illegal discharge outlets, environmental improvement in 127 riverside villages, and the expansion and upgrading of 9 wastewater treatment plants. Artificial wetland purification systems were also developed in parallel to effectively reduce pollutant loads entering the river. As a result, the main channel maintained stable water quality meeting China's Class III surface water quality standards, providing a favorable aquatic environment for river ecosystem recovery and migratory bird habitats.

RESHAPING HABITAT STRUCTURE AND RESTORING NATURAL RIVERBANKS

By creating diverse microhabitats such as deep pools, shallow shoals, and ecological islands, the project reconstructed the spatial heterogeneity of the river ecosystem and provided suitable habitats for different waterbird species. During this process, sand islands required for the nesting of Sand Martins (*Riparia riparia*) were intentionally preserved, and dedicated personnel were assigned for patrol and protection to minimize human disturbance.

PRIORITIZING NATIVE SPECIES TO PROMOTE SPECIES RECOVERY

Adhering to the principles of "native species priority and near-natural restoration," the project extensively restored native aquatic plant communities, including reeds and cattails, while introducing nectar and food plants such as silk trees, black locusts, and honeysuckle to establish a multi-layered vegetation system across aquatic and terrestrial habitats, thereby providing suitable habitats and foraging conditions for birds and insects. Based on historical baseline fish surveys, native fish restocking programs were implemented to gradually restore fish community structures and ecological functions. A Biological Integrity Index monitoring system was also established to dynamically evaluate restoration outcomes. In response to these efforts, wild birds–including Baer's Pochard, Scaly-sided Merganser, Pheasant-tailed Jacana, and egrets–were continuously recorded stopping over and breeding in the area, demonstrating the natural return of native species and the continuous enhancement of biodiversity across the watershed.

崖沙燕在滹沱河岸的沙崖上筑巢繁衍
Sand Martins Nesting and Breeding on Sandy Cliffs along the Hutuo River Bank



推进智慧赋能，实现精准管控

构建"天空地"一体化监测网络与"监测-评估-模拟-决策"数字化闭环管理链条，驱动流域治理从经验主导转向科学精准，提升生态响应效率与治理精准度。

LEVERAGING SMART TECHNOLOGIES TO ACHIEVE PRECISE MANAGEMENT

An integrated "sky-air-ground" monitoring network and a digital closed-loop management chain of "monitoring-assessment-simulation-decision-making" were established to drive watershed management from experience-based approaches toward science-based and precise management, improving ecological response efficiency and management accuracy.

成效与价值

水生态健康持续向好

水源保障与截污治污协同推进，扭转了河道断流与水质恶化态势。2021年滹沱河水流全线贯通，断流数十年的"母亲河"重获新生；水质改善至III类，水环境承载力与生态自净能力显著增强。

促进物种回归，丰富生物多样

滹沱河流域鸟类栖息种类达224种，较生态修复前增加近40种，特别是2025年春季候鸟迁徙季以来，在滹沱河市区段停歇的大天鹅、小天鹅数量达1500多只，旗舰物种黑鹳种群数量大幅增长，湿地鸟类生态群落结构不断完善，生物多样性丰富度创历史新高。

推动拥河发展，共享生态成果

百公里滨水绿道串联城市与自然，成为市民骑行、漫步、健身的活力空间；八大精品湖区与亲水平台，让观鸟、摄影、亲子游憩融入日常。城区段19公里滨水生态长廊融入城市，年均接待市民游客超百万人次。"滹沱河经济带"吸引文旅、科创、会展等绿色产业集聚，生态优势加速向发展优势转化。

经验与启示

滹沱河（石家庄段）实践表明，缺水型河流生态修复需以统筹多元水源、保障生态基流，以"近自然、可持续"的方式进行修复。通过乡土植物群落重建，构建自维持、低维护的植被系统；以微生境营造为手段，构建深潭、浅滩、生态岛等微生境，恢复河流形态多样性与生态空间异质性，为低成本且长期成效稳定的自然演替过程创造条件，从而为不同物种提供觅食、停歇和繁殖的场所，促进生物多样性的恢复和提升。该实践还实现了生态改善与市民福祉协同提升，为北方资源型缺水城市探索出"近自然修复—生态服务供给—社会共建共享"的协同治理范式。

ACHIEVEMENTS AND VALUE

CONTINUOUS IMPROVEMENT OF AQUATIC ECOSYSTEM HEALTH

The coordinated efforts in securing water resources and implementing pollution interception and treatment have reversed the trends of river flow cessation and water quality degradation. In 2021, continuous flow was restored throughout the Hutuo River, bringing the "mother river", which had experienced decades of flow cessation, back to life. Water quality has improved to meet Class III standards under China's national surface water quality classification system, significantly enhancing the river's environmental carrying capacity and ecological self-purification capacity.

PROMOTING SPECIES RECOVERY AND ENHANCING BIODIVERSITY

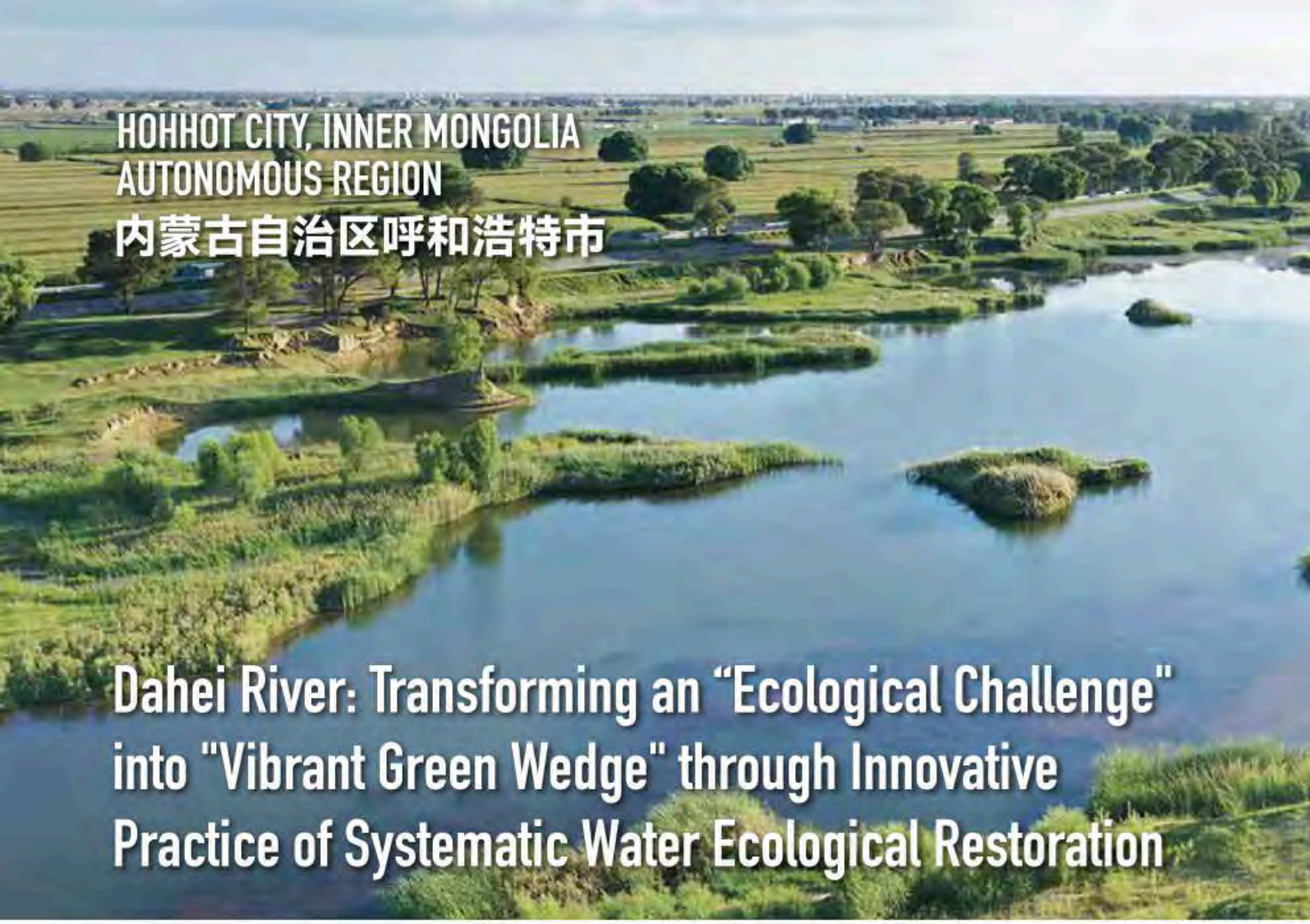
The Hutuo River Basin now supports 224 bird species, nearly 40 more than before ecological restoration. Since the spring 2025 migratory season, more than 1,500 Whooper Swans and Tundra Swans have been recorded stopping over along the urban section of the Hutuo River. The population of the flagship species, the Black Stork, has increased significantly, while the ecological community structure of wetland birds has continued to improve, reaching the highest level of biodiversity richness ever recorded.

PROMOTING RIVER-ORIENTED URBAN DEVELOPMENT AND SHARING ECOLOGICAL BENEFITS

A 100-kilometer riverside greenway now connects urban areas with natural landscapes, providing vibrant spaces for residents to cycle, walk, and exercise. Eight distinctive lake areas and waterfront platforms have integrated birdwatching, photography, and family recreation into everyday life. The 19-kilometer riverside ecological corridor in the urban section has become an integral part of the city, attracting more than one million residents and visitors annually. The "Hutuo River Economic Belt" has attracted the clustering of green industries, including cultural tourism, science and technology innovation, and exhibitions, accelerating the transformation of ecological advantages into development advantages.

EXPERIENCES AND INSIGHTS

The practice of the Hutuo River (*Shijiazhuang section*) demonstrates that ecological restoration of water-deficient rivers requires coordinated management of multiple water sources, maintenance of ecological base flow, and a "near-natural and sustainable" restoration approach. By rebuilding native plant communities, a self-sustaining and low-maintenance vegetation system has been established. Through micro-habitat creation, including deep pools, shallow shoals, and ecological islands, the project has restored river morphological diversity and ecological spatial heterogeneity, creating favorable conditions for low-cost and long-term stable natural succession. These efforts provide different species with habitats for foraging, stopover, and breeding, thereby promoting biodiversity recovery and enhancement. The practice has also achieved coordinated improvements in ecological conditions and public well-being, providing a collaborative governance model of "near-natural restoration–ecological service provision–social co-construction and shared benefits" for resource-constrained and water-deficient cities in northern China.



HOHHOT CITY, INNER MONGOLIA AUTONOMOUS REGION
内蒙古自治区呼和浩特市

Dahei River: Transforming an "Ecological Challenge" into "Vibrant Green Wedge" through Innovative Practice of Systematic Water Ecological Restoration

大黑河：从“生态痛点”到“活力绿楔”的系统性水生态修复创新实践

关键词

黄河流域；基于自然的解决方法（NbS）；候鸟迁徙廊道；干旱半干旱地区水生态系统生态修复

KEYWORDS

Yellow River Basin; Nature-based Solutions; Migratory Bird Flyway; Ecological Restoration of Water Ecosystems in the arid and semi-arid region.

案例名片

呼和浩特市作为西北干旱半干旱地区城市，针对大黑河（玉泉区段）曾有的生态退化问题，以自然恢复为主、人工修复为辅，既实现生态价值释放，也将生态优势转化为城市发展绿色增量，为干旱半干旱地区生态保护提供可参考的实践样本。

CASE PROFILE

As a city located in the arid and semi-arid regions of Northwest China, Hohhot has addressed the ecological degradation that once affected the Dahei River (Yuquan District) by prioritizing natural recovery and supplementing it with artificial restoration. This approach not only unlocks ecological value but also transforms ecological advantages into green growth for urban development, providing a practical model for ecological conservation in arid and semi-arid regions.

背景与问题

呼和浩特地处黄河重点生态区，但由于自然降水不足、土壤贫瘠、生态系统敏感脆弱，加之早期

BACKGROUND AND CHALLENGES

Hohhot is located within a key ecological zone of the Yellow River. However, due to insufficient natural precipitation, poor soil quality, and a sensitive and fragile ecosystem-compounded by issues such



▲

大黑河修复前后对比图

Before-and-after comparison of the Dahei River restoration.

采砂、污水直排，垃圾侵占滩涂等问题，导致生态衰退，生态系统服务功能急剧下降，严重威胁黄河流域生态完整性与区域可持续发展。

as early-stage sand mining, direct discharge of wastewater, and the encroachment of waste on riverbanks-ecological degradation has occurred, leading to a sharp decline in ecosystem services. This poses a serious threat to the ecological integrity of the Yellow River basin and the region's sustainable development.

行动与措施

ACTIONS AND MEASURES

恢复河道自然行洪能力

清除8.62公里河道河底污染物，同步拆除违法建筑、清理各类垃圾，恢复河道自然行洪能力。

RESTORING THE RIVER'S NATURAL FLOOD-CARRYING CAPACITY

Remove pollutants from the riverbed along an 8.62-kilometer stretch of the river, while simultaneously demolishing illegal structures and clearing all types of debris to restore the river's natural flood-carrying capacity.

构建补水体系

利用再生水技术对河道进行稳定补水，并沿河建设城市"海绵体"，对周边径流进行收集、过滤、净化，实现年径流控制率90%的目标。

ESTABLISHING WATER REPLENISHMENT SYSTEM

Utilize reclaimed water technology to provide a steady supply of water to river channels, and construct urban "sponge structures" along the rivers to collect, filter, and purify surrounding surface runoff, thereby achieving an annual runoff control rate of 90%.

植被恢复与生境重建

基于自然的解决方案，恢复湿地滩涂与自然驳岸，营造草原—湿地乡土植物群落，保留

VEGETATION RESTORATION AND HABITAT RECONSTRUCTION

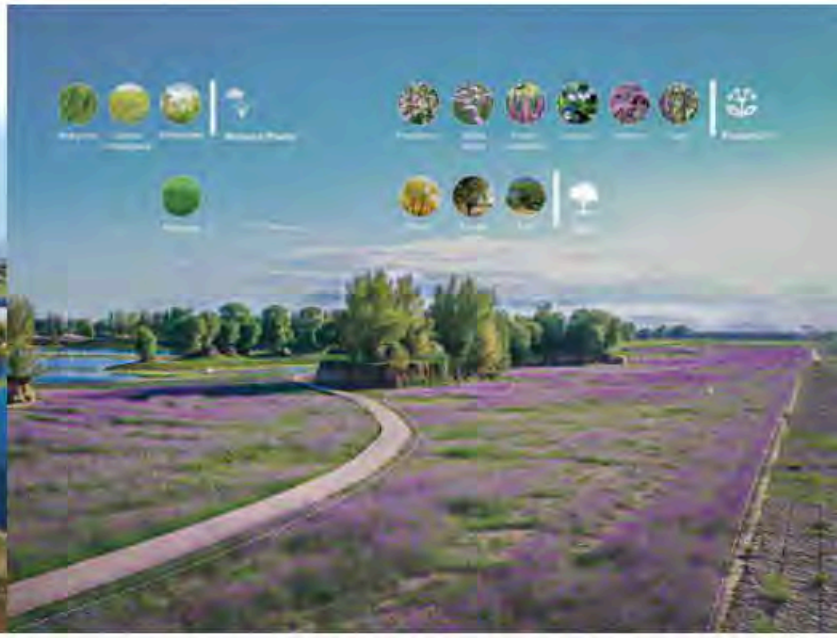
Implement nature-based solutions to restore wetlands, tidal flats, and natural riverbanks; establish native grassland-wetland plant communities; preserve

水中岛屿等生态“踏脚石”，沿河划定低人为干扰的生态封闭保育区。尤其对采砂区域进行针对性修复，将采砂形成的坑塘联通成完整水面，与上下游河道连通，并采用土壤改良技术提升土壤肥力，营造以苦草为主的水下植物群落，水中原有岛屿被完整保留，沿岛基底布设块石生态护脚，稳固岛体水土，使之成为水鸟栖息与繁殖的场所。

ecological "stepping stones" such as islands in the water; and designate ecologically enclosed conservation zones along the river with minimal human disturbance. In particular, targeted restoration efforts are carried out in sand-dredging areas. Pits and ponds formed by sand extraction are connected to create a continuous water surface linked to the upstream and downstream river channels. Soil improvement techniques are employed to enhance soil fertility, and submerged plant communities dominated by ***Vallisneria natans*** are established. Existing islands in the water are fully preserved, and ecological boulder revetments are installed along their bases to stabilize the islands and prevent soil erosion, transforming them into habitats for waterbirds to nest and breed.



▲ 大黑河千岛湖候鸟分布示意图
Schematic Diagram of Migratory Bird Distribution at Dahei River Thousand-Island Lake



▲ 植物营造与游憩体验提升
Planting Design and Recreation Enhancement

景观提升与自然教育

沿河道修建总长6300余米的观光木栈道，配套观景平台、防护栏与科普解说牌，实现生态保护与游憩体验的有机融合。

生物多样性友好管理

划设鸟类核心保护区，实行严格的分区管控，控制人流进入。针对冬季鸟类越冬需求，安排专人巡护监测，及时救助受伤、受困野生鸟类，确保栖息地安全无干扰。

为巩固生态修复成果，建立“天空地”一体化监测管护体系，常态化开展生物多样性与水质监测；建立鸟类监测站点，发动志愿者进行鸟类监测与数据记录。

在资金方面引入生态修复专项债，探索“生态修复＋文旅运营”的市场化融资模式，吸引社会资本参与后期管护与运营。

LANDSCAPE ENHANCEMENT AND NATURE EDUCATION

Construct over 6,300 meters of wooden sightseeing boardwalks along the river, complete with viewing platforms, guardrails, and interpretive signs, to achieve a harmonious integration of ecological conservation and recreational experiences.

BIODIVERSITY-FRIENDLY MANAGEMENT

Designate core bird conservation areas, implement strict zoned management, and control visitor access. To meet the needs of wintering birds, assign dedicated personnel to conduct patrols and monitoring, promptly rescue injured or trapped wild birds, and ensure that habitats remain safe and free from disturbance.

To consolidate the achievements of ecological restoration, establish an integrated "air-ground-space" monitoring and management system, and conduct routine biodiversity and water quality monitoring; establish bird monitoring stations and mobilize volunteers to conduct bird monitoring and data recording.

In terms of funding, introduce special bonds for ecological restoration and explore a market-oriented financing model combining "ecological restoration and cultural and tourism operations" to attract private capital to participate in post-project maintenance and operations.

成效与价值

经多年系统治理，大黑河玉泉区段水质根本改善，核心区植被覆盖度从不足30%跃升至85%以上；截至2025年，记录野生植物755种（含9种国家二级保护植物），兽类35种、鸟类218种（含国家一级保护10种、二级44种），黑鹳、白尾海雕、大天鹅、白琵鹭等珍禽频现。2025年秋季水鸟同步监测记录38种、19658只，为上年同期4倍，并新增呼和浩特鸟类记录——红胸黑雁。

修复项目显著提升了该区域的气候韧性，实现防洪调蓄、生态缓冲的功能，提升流域气候的适应性。同时，生态改善同步带动社会经济效益，提升民众幸福感，并为周边村民创造就业机会，为干旱区流域生态修复提供了可复制推广的样本。

ACHIEVEMENTS AND VALUE

After years of systematic management, water quality in the Yuquan section of the Dahei River has fundamentally improved, and vegetation coverage in the core area has jumped from less than 30% to over 85%; As of 2025, 755 species of wild plants (including 9 nationally Class II protected species), 35 species of mammals, and 218 species of birds (including 10 nationally Class I protected species and 44 Class II protected species) have been recorded, with rare birds such as the Black Stork, White-tailed Sea Eagle, Whooper Swan, and White Spoonbill frequently sighted. During the fall 2025 synchronous waterbird survey, 38 species and 19,658 individuals were recorded—four times the number recorded during the same period the previous year—and a new bird species was recorded in Hohhot: the Red-breasted Goose.

The restoration project has significantly enhanced the region's climate resilience, providing flood control and water storage capabilities as well as ecological buffering functions, thereby improving the watershed's adaptive capacity to climate change. At the same time, these ecological improvements have simultaneously generated socioeconomic benefits, enhanced the well-being of local residents, and created job opportunities for nearby villagers, providing a replicable and scalable model for ecological restoration in arid-region watersheds.

经验与启示

中国北方城市普遍面临生态水量匮乏的问题，呼和浩特通过再生水利用与控制地表径流等措施，有效解决大黑河水量不足的问题。呼和浩特以恢复自然水文过程与河流地貌形态为导向，系统修复滩涂漫滩结构，维持水系自然连通性与栖息地多样性。

对人类干扰的精细化管控，促进河道生境自然修复与生态系统自发演替，实现水系“再野化”恢复。

EXPERIENCES AND INSIGHTS

Cities in northern China generally face a shortage of water for ecological purposes. Hohhot has effectively addressed the water shortage in the Dahei River through measures such as reclaimed water utilization and surface runoff control. Guided by the goal of restoring natural hydrological processes and river mophology, Hohhot has systematically restored the structure of riverbanks and floodplains to maintain the natural connectivity of the water system and habitat diversity.

The refined control of human disturbances promotes the natural restoration of river habitats and the spontaneous succession of ecosystems, achieving the "rewilding" restoration of water systems.

大黑河航拍图 ▼
Aerial photo of the Dahei River





WUHAN CITY, HUBEI PROVINCE
湖北省武汉市

Baer's Pochard: Conservation and Wild Population Restoration of a Critically Endangered Waterbird in a Megacity

青头潜鸭：超大城市极危水鸟保护与野生种群恢复

关键词

青头潜鸭；极危物种；栖息地修复；人工巢台；OECMs；社区共管

案例名片

青头潜鸭是衡量湿地生态健康的关键指示物种。十年前，它们只在武汉越冬，如今超过全国五分之一的种群栖息在武汉。武汉市通过精准的生境修复、创新的人工巢台技术和广泛的社区共管，在特大中心城市，为全球极危物种打造了家园。

背景与问题

青头潜鸭被评为《IUCN红色名录》的极危物种（CR），全球种群曾不足千只。2014年由观鸟志愿者在黄陂府河湿地祁家湾首次发现青头潜鸭繁殖活动，经专家确认，武汉成为青头潜鸭全球最南繁殖地。然而，青头潜鸭的繁殖期与梅雨季节重合，强降水频繁淹没巢穴，天然巢址资源紧张，种内竞争激烈，加之养殖结构转型等人为干扰导致挺水植物消退、快速城市化导致栖息地萎缩等影响，青头潜鸭种群恢复面临多重压力。

KEYWORDS

Baer's Pochard; critically endangered species; habitat restoration; artificial nesting platforms; Other Effective Area-based Conservation Measures (OECMs); community co-management

CASE PROFILE

Baer's Pochard is a key indicator species for assessing wetland ecological health. Ten years ago, the species was only found wintering in Wuhan; today, more than one-fifth of the national population inhabits Wuhan. Through targeted habitat restoration, innovative artificial nesting platform technologies, and extensive community co-management, Wuhan City has created a habitat for a globally critically endangered species within a megacity.

BACKGROUND AND CHALLENGES

Baer's Pochard is classified as a Critically Endangered species by the IUCN, with its global population once numbering fewer than 1,000 individuals. In 2014, birdwatching volunteers first discovered breeding activities of Baer's Pochard in Qijiawan, Fuhe Wetland, Huangpi District. After confirmation by experts, Wuhan became the southernmost breeding area of Baer's Pochard in the world. However, the breeding season of Baer's Pochard overlaped with Wuhan's plum rain season, and heavy rainfall frequently floods nests. In addition, limited natural nesting sites and intense intraspecific competition further constrained breeding success. These pressures were compounded by human disturbances, including the decline of emergent aquatic vegetation caused by changes in aquaculture structures and habitat loss resulting from rapid urbanization. These together posed motiple threats to the recovery of the Baer's Pochard population.

行动与措施

划定保护范围，实施栖息地精准修复

武汉为保护青头潜鸭划设安全区，将豹澥湖、祁家湾列为重要栖息地并纳入基本生态控制线，禁止投放药物和饵料等高干扰活动，并通过退养还湿、恢复植被营造适宜生境，在自然保护区之外，建立了生物多样性保护的有效区域。

创新人工巢台技术，破解繁殖成活率瓶颈

青头潜鸭繁殖期为每年4月至7月，与武汉梅雨季节高度重合，它们通常在挺水植物丛中筑巢，雨季水位急涨极易淹毁鸟巢，这是繁殖的最大瓶颈。武汉基于NbS理念研发了“智慧人工巢台”，以多块塑料植草板拼装成稳固浮台，上铺淤泥并种茭白等水生植物，以模拟天然筑巢环境，竹竿穿过浮台孔洞插入水底，起固定和导向作用，水位上涨时浮台沿竹竿自动上升，水位下降时随之回落，从而确保巢台始终高于水面，有效抵御巢穴淹没威胁。2024年，巢台在豹澥湖虾塘首次试用即成功辅助繁殖，此后推广搭建近200处。

ACTIONS AND MEASURES

DESIGNATEING PROTECTED AREAS AND IMPLEMENTING TARGETED HABITAT RESTORATION

Wuhan has designated safe zones for the conservation of the Baer's Pochard, designated Baoxie Lake and Qijiawan as important habitats and incorporated them into the Basic Ecological Control Line. High-disturbance activities such as the release of chemicals and bait are prohibited. Through measures including wetland restoration by converting aquaculture ponds back into wetlands and vegetation restoration to create suitable habitats, Wuhan has established effective biodiversity conservation areas beyond the boundaries of nature reserves.

INNOVATING ARTIFICIAL NEST PLATFORM TECHNOLOGY TO OVERCOME THE BOTTLENECK OF BREEDING SUCCESS RATES

The breeding season of the Baer's Pochard lasts from April to July each year, which highly overlaps with Wuhan's plum rain season. The species typically builds nests among emergent aquatic vegetation, and rapidly rising water levels during the rainy season can easily flood and destroy nests, posing the greatest bottleneck to reproduction. Based on the Nature-based Solutions (NbS) concept, Wuhan developed a "smart artificial nest platform." The platform consists of multiple plastic grass-planting boards assembled into a stable floating structure, covered with mud and planted with aquatic vegetation such as wild rice stems to simulate natural nesting conditions. Bamboo poles are inserted through holes in the floating platform into the waterbed, serving as stabilizers and guides. As the water level rises, the floating platform automatically moves upward along the bamboo poles, and as the water level declines, it moves downward accordingly, ensuring that the nest platform remains above the water surface at all times and effectively reducing the risk of nest flooding. In 2024, the nest platforms were successfully used for assisted breeding during their first trial application at a shrimp pond in Baoxie Lake, and nearly 200 platforms have since been established and promoted.

志愿服务队队员在祁家湾栖息地搭建人工巢台 ▼
Volunteers Construct Artificial Nesting Platforms at Qijiawan Habitat





▲ 智慧人工巢台实景-青头潜鸭在孵卵
Smart Artificial Nest Platform – Baer's Pochard Incubating Eggs

动员社会参与，打造全民护鸟共同体

在政府主管部门支持下，联合科研单位、志愿者、养殖户组建青头潜鸭志愿服务队，对青头潜鸭分布区开展月度监测，每月安排专业调查志愿者采用样线法开展系统调查，持续收集种群数量、分布范围、季节性变化及与生境关联的数据。同时，以补贴方式委托当地养殖户担任巡护员，每日开展塘边巡护，开发线上表单实时记录生境状况与威胁信息，实现监测数据的即时共享与动态管理，同时依托乡土关系向周边村民宣传保护理念，劝阻干扰行为。面向社会组织观鸟比赛，激励参赛者深入调查并发现盗猎鸟网等潜在威胁，上报主管部门，增强公众参与保护的获得感与荣誉感。

MOBILIZING SOCIAL PARTICIPATION TO BUILD A COMMUNITY FOR BIRD CONSERVATION

With the support of government authorities, research institutions, volunteers, and aquaculture farmers jointly established the Baer's Pochard Volunteer Service Team. The team conducts monthly monitoring in areas where Baer's Pochards are distributed. Each month, professional survey volunteers carry out systematic surveys using the line transect method to continuously collect data on population size, distribution range, seasonal changes, and habitat associations. Meanwhile, local aquaculture farmers were commissioned as patrol officers through subsidy programs to conduct daily patrols around ponds. Online forms were developed to record habitat conditions and information on potential threats in real time, enabling immediate sharing and dynamic management of monitoring data. At the same time, relying on local community networks, conservation concepts were promoted among surrounding villagers, and disturbance activities were discouraged. Bird-watching competitions were organized for the public, encouraging participants to conduct in-depth surveys, identify potential threats such as illegal bird-catching nets, and report them to relevant authorities. These activities enhanced the public's sense of participation, achievement, and recognition in biodiversity conservation.

全周期保护与长效管理

搭建智慧湿地系统平台，构建监测网络，运用红外相机、视频识别等技术跟踪种群动态；清理违规网具、规范湿地活动；设立专项资金，开展繁殖生态研究，支撑科学管理，指导生境恢复。将保护纳入湿地规划，并推行责任机制，保障旗舰物种长效保护。

FULL-CYCLE CONSERVATION AND LONG-TERM MANAGEMENT

A smart wetland system platform was established to develop a monitoring network, using technologies such as infrared cameras and video recognition to track population dynamics. Illegal fishing nets were removed, and wetland activities were regulated. Special funds were established to support breeding ecology research, providing scientific support for management and guiding habitat restoration. Conservation efforts were incorporated into wetland planning, with responsibility mechanisms implemented to ensure the long-term protection of the flagship species.

成效与价值

武汉青头潜鸭经十年保护实现历史性突破，从零星过境到稳定定居，数量大幅增长。截至2025年，武汉观测种群已达540只，约占全国21%，成为全球重要分布区。人工巢台技术以"浮力自适应水位＋植物营造生境"的机制，精准破解了繁殖关键瓶颈，为青头潜鸭种群恢复提供了有力支撑。2025年监测显示，仅祁家湾示范点就发现30个繁殖巢穴、45只幼鸟顺利孵化。

豹澥湖和府河湿地的相关工作入选"OECMs中国潜力典型案例"，政府主管部门、科研机构、社会组织、街道社区及当地养殖户形成的多方协同保护机制日趋成熟，为青头潜鸭保护提供了持续稳定的社会支撑与治理保障。2022年《湿地公约》第十四次缔约方大会期间，青头潜鸭作为武汉湿地代表物种受到300余家媒体关注报道，《湿地公约》秘书长蒙巴曾表示，中国通过湿地保护改善了生态环境，武汉青头潜鸭保护正是这一贡献的缩影。

ACHIEVEMENTS AND VALUE

After a decade of conservation efforts, Wuhan's Baer's Pochard population has achieved a historic breakthrough, transitioning from sporadic passage records to stable settlement, with a significant increase in population size. By 2025, the monitored population in Wuhan has reached 540 individuals, accounting for approximately 21% of the national population and making Wuhan an important global distribution area for the species. The artificial nest platform technology, through the mechanism of "buoyancy-based adaptive water-level adjustment + habitat creation through vegetation restoration," has precisely addressed the key bottleneck in breeding and provided strong support for the recovery of the Baer's Pochard population. Monitoring in 2025 showed that the Qijiawan demonstration site alone recorded 30 breeding nests, with 45 chicks successfully hatched.

The conservation efforts at Baoxie Lake and Fuhe Wetland have been selected as "China's Potential Typical Cases of OECMs," attesting to a mature multi-stakeholder collaborative conservation mechanism involving government authorities, research institutions, social organizations, subdistrict communities, and local aquaculture farmers, which provides sustained social support and governance safeguards for Baer's Pochard conservation. During the 14th Meeting of the Conference of the Contracting Parties to the Ramsar Convention on Wetlands in 2022, the Baer's Pochard, as a representative wetland species of Wuhan, attracted coverage from more than 300 media outlets. Ms. Musonda Mumba, Secretary General of the Ramsar Convention, stated that China had improved its ecological environment through wetland conservation, and the conservation of the Baer's Pochard in Wuhan served as a microcosm of this contribution.

经验与启示

保护成效源于志愿者、在地社区与政府部门的紧密协同。形成"政府支持＋专业调查＋在地巡护"相结合的长期监测体系。监测内容涵盖种群数量、分布范围、季节性动态及与生境变化的关联关系，数据详实、连续性强，为保护决策提供了扎实的科学基础。在地养殖户深度参与不仅弥补了高频巡护的人力缺口，更依托乡土网络开展社区宣传与威胁预警，实现了保护工作的在地化与常态化。政府主管部门在监测委托、栖息地认定、保护范围划定及威胁处置等方面给予制度与资源支持，三方合力构建了可持续的协同保护格局。

基于详实的监测记录，精准识别青头潜鸭繁殖季巢穴淹没、天然巢址紧缺制约因素，保护工作从养殖户观察茭白无土生长的乡土经验中汲取灵感，联合中科院水生所开展人工巢台专项研究，通过设置不同生境梯度进行巢址偏好实验，科学模拟天然筑巢环境，有效提升繁殖成功率，实现保护资源的高效配置与精准投入。

EXPERIENCES AND INSIGHTS

The conservation outcomes have been driven by close collaboration among volunteers, local communities, and government authorities. A long-term monitoring system integrating "government support + professional surveys + local patrols" has been established. The monitoring has covered population size, distribution range, seasonal dynamics, and the relationship between population changes and habitat conditions. The comprehensive and continuous dataset have provided a solid scientific foundation for conservation decision-making. The deep involvement of local aquaculture farmers has not only helped address the shortage of personnel for frequent patrols but also leveraged local community networks to promote conservation awareness and provide early warnings of potential threats, enabling conservation efforts to become more locally embedded and routine. Government authorities have provided institutional and resource support in areas including commissioned monitoring, habitat designation, delineation of protected areas,and threat response. Through the joint efforts of these three parties, a sustainable collaborative conservation framework has been established.

Based on comprehensive monitoring records, the key constraints affecting Baer's Pochard breeding have been accurately identified, including nest flooding during the breeding season and the shortage of natural nesting sites. Conservation efforts have drawn inspiration from the local experience of aquaculture farmers in cultivating wild rice stems without soil and, together with the Institute of Hydrobiology of the Chinese Academy of Sciences, conduct specialized research on artificial nest platforms. By conducting nest-site preference experiments under different habitat gradients, researchers have scientifically simulated natural nesting environments, effectively improved breeding success rates, and achieved efficient allocation and targeted investment of conservation resources.



SHENGZHOU CITY, ZHEJIANG PROVINCE
浙江省嵊州市

“Intercropping Torreya and Medicinal Herbs”: Conservation and Sustainable Utilization of Important Ancient Tree Cultural Heritage Resources

“榧药共生”：重要古树文化遗产资源保护和可持续利用

关键词

全球重要农业文化遗产；榧药套种；基于自然的解决方案（NbS）；乡土物种保护

KEYWORDS

Globally Important Agricultural Heritage System; torreya-herb intercropping; Nature-based Solutions (NbS); native species conservation

案例名片

会稽山古香榧群是全球重要农业文化遗产，生态价值突出。然而，千年古树正面临保护投入不足、经济效益下滑等现实困境。近年来，香榧主业收益持续走低，农户无力承担高昂的养护成本，且可投入的人力日益紧缺。为此，嵊州市探索推行林下复合经营模式，在香榧林中套种玉竹、黄精等道地药材，既有效提高林下空间利用率，又切实带动农户增收。该模式将经济增益与古树保护紧密结合，既缓解了保护资金与人力压力，也促进了林下生态恢复和生物多样性提升，实现了遗产保护与可持续利用的协同共赢。

CASE PROFILE

The Ancient Torreya Forests of Kuaiji Mountain are recognized as a Globally Important Agricultural Heritage System, with outstanding ecological value. However, these thousand-year-old trees face practical challenges, including insufficient conservation investment and declining economic returns. In recent years, the income generated from the torreya industry has continued to decline, leaving farmers unable to bear the high costs of tree maintenance and increasingly scarce labor inputs. To address these challenges, Shengzhou City has explored and promoted an under-forest integrated management model by interplanting authentic medicinal herbs such as ***Polygonatum odoratum*** and ***Polygonatum sibiricum*** beneath torreya forests. This approach has not only effectively improved the utilization efficiency of understory spaces but also substantially increased farmers' incomes. By closely integrating economic benefits with ancient tree conservation, the model alleviates pressures on conservation funding and labor, while promoting understory ecological restoration and biodiversity enhancement, achieving synergistic outcomes between heritage conservation and sustainable utilization.



◀ 香榧林生态实景
Ecological Landscape of Torreya Forests

背景与问题

嵊州会稽山古香榧群是全球重要农业文化遗产，拥有近3万株百年以上古香榧树。然而，香榧产业发展面临多重挑战：一方面，市场供需矛盾突出，香榧生长周期长，农户增收渠道有限；另一方面，规模化种植和传统管理模式易造成林下空间闲置、水土流失和生物多样性下降。如何在保护古树资源的同时实现生态改善与农户增收，是香榧遗产活化发展的关键。

BACKGROUND AND CHALLENGES

As a Globally Important Agricultural Heritage System, the Ancient Torreya Forests of Kuaiji Mountain in Shengzhou City are home to nearly 30,000 ancient torreya trees over 100 years old. However, the development of the torreya industry faces multiple challenges. On the one hand, market supply and demand imbalances are prominent, and the long growth cycle of torreya trees limits opportunities for farmers to increase their incomes. On the other hand, large-scale cultivation and traditional management practices have resulted in underutilized understory spaces, soil erosion, and biodiversity decline. Balancing ancient tree conservation with ecological improvement and farmers' income growth remains a key challenge in revitalizing and sustainably developing the torreya heritage system.

行动与措施

基于需求，探索遗传资源保护与可持续利用模式

面对香榧产业发展与生态保护的双重压力，谷来镇围绕香榧古树资源保护和林下生态修复需求，通过入户调研、专家论证等方式，探索香榧林下复合种植模式。在尊重自然规律的基础上，筛选玉竹、黄精、芍药、何首乌等乡土药用植物作为伴生种，充分利用香榧林下空间适度种植，构建多物种共生的生态系统。林下植物能够适应弱光环境，其根系有助于改善土壤结构、涵养水源，并通过植被覆盖减少水土流失，在促进农业文化遗产保护的同时，维护区域生物多样性。

依托试点建设，推动社区参与和惠益共享

谷来镇以王院村为试点，带动周边村开展“香榧套种”实践，通过“企业＋村集体＋农户”的合作模式，将林下药材销售利润按比例分

ACTIONS AND MEASURES

EXPLORING MODELS FOR GENETIC RESOURCE CONSERVATION AND SUSTAINABLE UTILIZATION BASED ON LOCAL NEEDS

Facing the dual pressures of torreya industry development and ecological conservation, Gulai Town explored an under-forest intercropping model to address the conservation of ancient torreya trees and the restoration of understory ecosystems. Through household surveys and expert consultations, the town identified suitable approaches for integrated management of torreya forests. Based on natural ecological processes, native medicinal plants, including ***Polygonatum odoratum***, ***Polygonatum sibiricum***, ***Paeonia lactiflora*** and ***Fallopia multiflora*** were selected as companion species and moderately cultivated under torreya forests to make efficient use of understory spaces and establish a multi-species coexisting ecosystem. These understory plants were adapted to low-light conditions, and their root systems helped improve soil structure and water retention capacity. Meanwhile, vegetation coverage reduced soil erosion. By promoting the conservation of agricultural cultural heritage while maintaining regional biodiversity, this approach achieved coordinated benefits for ecological protection and sustainable utilization.

LEVERAGING PILOT PROJECTS TO PROMOTE COMMUNITY PARTICIPATION AND BENEFIT SHARING

Taking Wangyuan Village as a pilot site, Gulai Town promoted the "torreya intercropping" practice in surrounding villages. Through a cooperative model involving "enterprises + village collectives + farmers," profits from the sale of understory medicinal herbs were distributed proportionally among village

红给村集体与农户，同时政府给予套种补贴，使社区居民成为香榧保护的重要参与者和受益者。在促进林下资源可持续利用的同时，增强社区参与保护的动力，推动香榧遗传资源保护、生物多样性维护与地方绿色发展的有机结合。

collectives and farmers, while government subsidies were provided to support intercropping activities. This approach enables local communities to become important participants and beneficiaries in torreya conservation. While promoting the sustainable utilization of understory resources, the model also strengthened community motivation for conservation and facilitates the integration of torreya genetic resource conservation, biodiversity maintenance, and local green development.

强化科技支撑，完善保护利用体系

谷来镇与浙江大学、方正珍稀药材、国药集团、磐安中药材产业协会、中国平安保险等开展产学研合作，构建“林上摘果、林下种植”的榧药套种立体种植生态循环经济体系。依托科研力量，开展香榧林生态环境监测、林下药材适生性研究和绿色种植技术推广，筛选玉竹、黄精等适宜伴生植物，减少化肥使用，避免除草剂对土壤和林下生境的干扰，实现遗传资源保护、生物多样性维护与社区共享收益协同发展。

STRENGTHENING TECHNOLOGICAL SUPPORT AND IMPROVING THE CONSERVATION AND UTILIZATION FRAMEWORK

Gulai Town established industry-academia-research collaborations with Zhejiang University, Fangzheng Rare Medicinal Materials, Sinopharm Group, the Pan'an Chinese Medicinal Herb Industry Association, China Ping An Insurance, and other partners to develop a three-dimensional ecological circular economy model based on "fruit harvesting above the forest and medicinal herb cultivation beneath the forest" through torreya-medicinal herb intercropping. Leveraging scientific research capabilities, the project conducted ecological environment monitoring of torreya forests, studies on the suitability of understory medicinal plants, and the promotion of green cultivation technologies. Suitable companion plants, including ***Polygonatum odoratum*** and ***Polygonatum sibiricum***, were selected to reduce fertilizer use and avoid the disturbance caused by herbicides to soil and understory habitats. This approach promoted the coordinated development of genetic resource conservation, biodiversity conservation, and shared community benefits.

▼ 榧药套种融合示范基地实景
Demonstration Site of Torreya-Medicinal Herb Intercropping



成效与价值

ACHIEVEMENTS AND VALUE

古树种质资源保护成效

“榧药套种”模式有效缓解了古香榧树的保护压力。套种改善了古树根系生长环境，同时林下药材种植带来的持续经济回报，使农户更有动力长期管护古树，扭转了过去因养护成

ACHIEVEMENTS IN ANCIENT TREE GERMPLASM CONSERVATION

The "torreya-medicinal herb intercropping" model has effectively alleviated conservation pressures on ancient torreya trees. The intercropping system has improved the root growth environment of ancient trees, while the continuous economic returns generated from understory medicinal herb cultivation have increased farmers' motivation to engage in long-term tree management. This

本过高而弃管、弃采的局面，为千年古香榧种质资源的活态保存提供了可持续的内生动力。

生态价值成效

林下植被覆盖率显著提升，有效遏制了坡地水土流失；套种区域除草剂用量大幅下降，林下生物多样性得到切实保护，形成了古树与药草共生的立体生态景观，促进了林下生态系统的恢复与稳定。

社会经济价值成效

经济层面，该模式亩均年增收约6000元，惠及榧农500余户；社会层面，吸纳农村富余务工群体就业千余人次，有效带动低收入农户增收，并壮大了村集体经济，实现了遗产保护与社区发展的良性互动。

经验与启示

农业文化遗产保护不能停留于静态保存，而应在合理利用中实现活态传承。嵊州以"榧药套种"模式，将古香榧种质资源保护与林下生态利用有机结合，探索出一条生态保护与乡村发展的良性互动路径。这一模式对同类古树群落保护尤其具有借鉴价值，即，如何可持续地转化古树资源的经济价值，形成"投入—产出"的长效养护闭环。实践表明，通过制度创新和生态利用，让面临高保护价值、低经济回报困境的古树群落能够实现保护与发展的协同转化，为全球重要农业文化遗产的活化保护提供了可复制的嵊州样本。

has reversed the previous situation in which ancient trees were abandoned both maintenance and harvesting due to high maintenance costs, providing sustainable endogenous momentum for the living conservation of thousand-year-old torreya germplasm resources.

ECOLOGICAL BENEFITS

The coverage of understory vegetation has significantly increased, effectively reducing soil erosion on slopes. The use of herbicides in intercropped areas has been substantially reduced, providing effective protection for understory biodiversity. The model has created a multi-layered ecological landscape where ancient trees and medicinal herbs coexist, promoting the restoration and stabilization of understory ecosystems.

SOCIOECONOMIC BENEFITS

Economically, the model generates an additional annual income of approximately RMB 6,000 per mu on average, benefiting more than 500 torreya-growing households. Socially, it has created over 1,000 employment opportunities for surplus rural labor, effectively increased the incomes of low-income farmers, and strengthened village collective economies. The approach has achieved positive interaction between heritage conservation and community development.

EXPERIENCES AND INSIGHTS

The conservation of agricultural cultural heritage should go beyond static preservation and achieve dynamic continuity through sustainable use. Shengzhou has integrated the conservation of ancient torreya germplasm resources with the sustainable utilization of understory spaces through the "torreya–medicinal herb intercropping" model, creating a pathway for synergistic development between ecological conservation and rural revitalization. This model provides valuable insights for the conservation of similar ancient tree communities, particularly by demonstrating how the economic value of ancient tree resources can be sustainably realized and how a long-term cycle can be established in which economic returns support conservation efforts. The practice demonstrates that, through institutional innovation and ecological utilization, ancient tree communities facing high conservation value but low economic returns can achieve coordinated conservation and development. It provides a replicable Shengzhou approach for the adaptive conservation and sustainable development of Globally Important Agricultural Heritage Systems.



香榧果实
Torreya Fruits

BAIYUN DISTRICT, GUIYANG CITY
贵阳市白云区

Changpoling State-owned Forest Farm: Intergenerational Succession in Afforestation and Forest Protection and Practices for Long-term Ecological Conservation of Urban Forests

长坡岭国有林场：代际接力造林护林与都市森林生态长效保护实践



贵阳长坡岭国有林场俯瞰图
Aerial View of the Guiyang Changpoling State-Owned Forest Farm

关键词

森林资源；生态修复；植树造林；林下经济；生态文化设施；生物多样性；自然课程教育；公众参与

KEYWORDS

Forest Resources; Ecological Restoration; Afforestation; Understory Economy; Ecological and Cultural Facilities; Biodiversity; Nature-Based Education; Public Participation

案例名片

贵阳市长坡岭国有林场始建于1914年，历经三代护林人百年接力造林护林，从2900亩荒山秃岭蜕变为1.26万亩城市"绿肺"，森林覆盖率达86.8%。林场依托城市环城林带核心区位，建成国家级森林公园和自然教育基地，探索出"生态修复—城林融合—惠民共享"的绿色发展路径，为生态脆弱区治理与城市森林资源可持续利用提供可复制样板。

CASE PROFILE

Established in 1914, the Guiyang city Changpoling State-owned Forest Farm has undergone a century-long relay of afforestation and forest conservation efforts by three generations of forest rangers. It has transformed from 2,900 mu of barren hills and bare ridges into a 12,600-mu "green lung" for the city, with a forest coverage rate of 86.8%. Leveraging its central location within the city's ring-shaped forest belt, the forest farm has established a national-level forest park anda nature education base. It has pioneered a green development path centered on "ecological restoration, urban-forest integration, and shared benefits," providing a replicable model for the management of ecologically fragile areas and the sustainable use of urban forest resources.

背景与问题

长坡岭国有林场所在区域石漠化严重、土层瘠薄、水土保持能力差，建场初期周边多为光秃秃的石头坡，原生植被严重退化，生态功能脆弱。同时，林场早期缺乏系统性人工造林与抚育，亟需通过人工干预恢复森林生态系统，并解决城市扩张中"城林对立"的空间矛盾。

BACKGROUND AND CHALLENGES

The area where the Changpoling state-owned Forest Farm is located suffered from severe rock desertification, thin soil layers, and poor soil and water conservation capacity. In the early days of the forest farm's establishment, the surrounding area consisted mostly of barren, rocky slopes; the native vegetation had severely degraded, and ecological functions were fragile. At the same time, the forest farm lacked systematic afforestation and tending in its early years, creating an urgent need to restore the forest ecosystem through human intervention and resolve the spatial conflict between urban expansion and forest preservation.

行动与措施

三代人接力荒山造林

自从1958年正式建场以来，三代护林人秉承吃苦耐劳精神植树造林，将林场面积从2900亩逐步扩大至1.26万亩。1997年建立省级森林公园，2001年升级为国家级森林公园，2009年界定为生态公益性林场，实现面积与权属的制度性保护。

森林资源系统管护

实施林区网格化管理，护林员以管护站为家，常年巡山护林，严防火灾及破坏行为；积极开展乡土珍稀苗木培育，为省市义务植树提供苗木保障。1998年借天然林保护工程试点契机，停止经济林生产，全面封山育林，严守生态底线。

ACTIONS AND MEASURES

THREE GENERATIONS OF FORESTERS AFFORESTING BARREN HILLS

Since the forest farm was officially established in 1958, three generations of forest rangers upheld a spirit of hard work and perseverance to plant trees, gradually expanding the forest farm's area from 2,900 mu to 12,600 mu. In 1997, it was designated as a provincial-level forest park; in 2001, it was upgraded to a national-level forest park; and in 2009, it was designated as an ecological public-welfare forest farm, ensuring institutional protection of both its area and ownership.

SYSTEMATIC MANAGEMENT AND PROTECTION OF FOREST RESOURCES

The forest area was managed through a grid-based system, with forest rangers making their management stations their home as they patrolled the mountains year-round to protect the forests and strictly prevent fires and acts of destruction. The forest farm actively cultivated rare native tree seedlings to ensure a steady supply for provincial and municipal tree-planting campaigns. In 1998, taking advantage of the pilot program for the Natural Forest Conservation Project, the forest farm ceased commercial forestry operations, implemented a comprehensive closure of the mountains for forest regeneration, and strictly upheld ecological safeguards.

自然教育与文化活动

通过建设国家自然教育学校、省级自然教育基地、开展自然教育与科普研学等活动。结合“世界环境日”等节点，开展多场亲子自然体验活动；推进“自然教育进校园”，研发“步履旧道，知行山川”等在地化课程。

累计投入超过1800万元完善自然教育设施，建成中德合作森林体验教育中心展馆，收藏生态科普书籍5000余册；建设总长约3公里自然教育径解说系统，设计“森小悠”等自然教育IP形象及多款文创产品，并出版发行《森小悠的绿色奇妙游：长坡岭万物情报局》科普读物1000册。

跨部门合作与公众参与

与本地教育、科研机构共同夯实“自然教育实践基地”和“生态研学基地”；通过主流媒体与新媒体宣传林场生态成效，开展环保志愿服务和义务植树活动，广泛吸引公众参与自然保护。

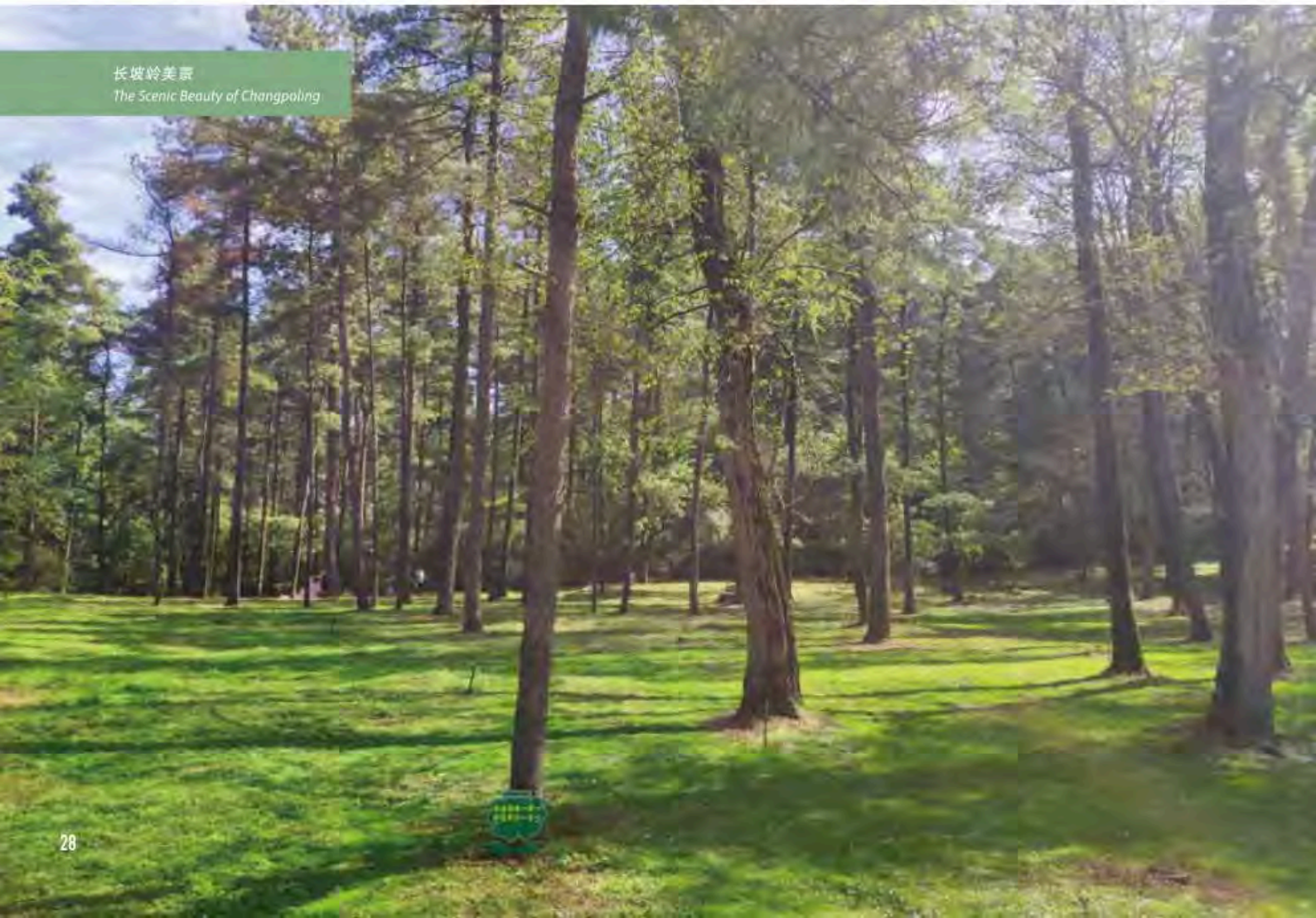
NATURE EDUCATION AND CULTURAL ACTIVITIES

Through the establishment of national nature education schools and provincial-level nature education bases, as well as the organization of nature education and science outreach field trips, the initiative has organized numerous parent-child nature experience activities in conjunction with events such as "World Environment Day." It has also promoted the "Nature Education in Schools" program and developed localized curricula such as "Walking the Old Trails, Understanding Mountains and Rivers."

A total of more than 18 million yuan has been invested to improve nature education facilities, including the completion of the Sino-German Cooperative Forest Experience Education Center exhibition hall, which houses a collection of over 5,000 books on ecological science. An interpretive system along a nature education trail totaling approximately 3 kilometers was subsequently built. Nature education IP characters such as "Sen Xiao You" and various cultural and creative products were designed, and 1,000 copies of the science outreach book "Sen Xiao You's Green Adventure: The Changpo Ridge Bureau of All Things" were published.

INTERDEPARTMENTAL COLLABORATION AND PUBLIC PARTICIPATION

The forest farm partnered with local educational and research institutions to strengthen a "Nature Education Practice Base" and an "Ecological Study-Travel Base." It publicized the forest farm's ecological achievements through mainstream and new media, organized environmental volunteer services and tree-planting campaigns, and widely engaged the public in nature conservation efforts.



长坡岭美景
The Scenic Beauty of Changpoling

成效与价值

生态成效

林场面积从2900亩扩大至1.26万亩，森林覆盖率攀升至86.8%，成功由秃石坡蜕变为稳定的生态系统，是涵养水源、净化空气、调节微气候的"森林氧吧"。338维管束植物、59种野生动物的丰富生物多样性，成为贵阳城市生态的核心物种基因库。

惠民成效

建设自然教育径，开展科普研学、森林体验等多元化活动，构建起覆盖全龄段的生态文明教育体系，是市民亲近自然、放松身心的"绿色客厅"，周末必去之地。林场依托优质森林资源盘活生态价值，推动生态资源向生态产品转化，让居民在家门口共享生态保护成果，有效提升群众生态获得感与幸福感；同时带动周边乡村自然休闲业态发展，探索生态保护与民生普惠协同共进的可持续发展模式。

示范推广价值

几代人持之以恒的植树造林与系统管护可使荒山变林海；城林融合的空间规划树立城市空间优化典范；从经济生产型林场向公益性、共享型森林公园转型，探索出生态保护与民生服务深度融合的可行路径。

经验与启示

一是生态修复是一项长期事业，需要持续保持投入、推进，将代际努力传递下去，终见成效；二是城市森林资源保护应与城市规划深度融合，让森林成为城市有机组成部分；三是生态成果须坚持惠及公众，取消门票、建设自然教育基地、开展科普活动等方式，将生态优势转化为市民可感可及的绿色福祉；四是生态保护的长效机制，依靠护林人代代接力的风险精神与公众广泛参与的生态自觉双向赋能，才能凝聚起持久的合力。

ACHIEVEMENTS AND VALUE

ECOLOGICAL ACHIEVEMENTS

The forest farm's area has expanded from 2,900 mu to 12,600 mu, with forest coverage rising to 86.8%. It has successfully transformed from barren, rocky slopes into a stable ecosystem, serving as a "forest oxygen bar" that conserves water sources, purifies the air, and regulates the microclimate. With a rich biodiversity of 338 species of vascular plants and 59 species of wildlife, it has become a core gene bank for Guiyang's urban ecology.

BENEFITS TO THE PUBLIC

By constructing nature education trails and organizing diverse activities such as science outreach, field studies, and forest experiences, the project has established an ecological education system catering to all age groups. It serves as a "green living room" where citizens can connect with nature and relax, making it a must-visit destination on weekends. Leveraging its high-quality forest resources, the forest farm is revitalizing ecological value and promoting the transformation of ecological resources into ecological products, enabling residents to share in the benefits of ecological conservation right on their doorstep and effectively enhancing the public's sense of fulfillment and well-being regarding the environment. At the same time, it is driving the development of nature-based leisure industries in surrounding rural areas and exploring a sustainable development model that fosters synergistic progress between ecological conservation and widespread improvements in people's livelihoods.

DEMONSTRATION AND PROMOTION VALUE

Through the persistent tree-planting efforts and systematic management carried out by several generations, barren mountains have been transformed into vast forests; spatial planning that integrates urban and forest areas has set a model for optimizing urban space; and the transition from economically oriented forestry operations to public-benefit, shared forest parks has charted a viable path for deeply integrating ecological conservation with public services.

EXPERIENCES AND INSIGHTS

First, ecological restoration is a long-term undertaking that requires sustained investment and consistent progress, passing on these intergenerational efforts to deliver tangible results over time. Second, the protection of urban forest resources should be deeply integrated with urban planning, making forests an organic part of the city. Third, ecological achievements must benefit the public; by eliminating admission fees, establishing nature education centers, and conducting science outreach activities, ecological advantages can be transformed into tangible green benefits for citizens. Fourth, a long-term mechanism for ecological conservation relies on the dual empowerment of the dedication and risk-taking spirit passed down through generations of forest rangers and the ecological consciousness fostered by broad public participation, which together generate lasting synergy.

LEISHAN COUNTY, QIANDONGNAN
MIAO AND DONG AUTONOMOUS PREFECTURE
黔东南苗族侗族自治州雷山县

A Transformative Approach to Bird Conservation That Balances Regulation and Guidance

管控与引导并重的鸟类保护转型实践



白腹在林中漫步
Silver Pheasant (Lophura nycthemera) strolls through the woods

关键词

鸟类迁飞通道保护；栖息地管控；多部门协同

案例名片

雷山县位于贵州省黔东南苗族侗族自治州，地处东亚-澳大利西亚鸟类迁飞通道关键节点，境内已记录鸟类238种，其中国家一级重点保护鸟类3种、国家二级重点保护鸟类39种，是红腹锦鸡等中国特有珍稀鸟类的核心分布区。面对山区非法捕猎多发、公众保护意识薄弱等威胁，雷山县构建机制保障、巡护管控、跨部门协同、宣传引导四位一体的保护体系，将鸟类栖息地与迁徙通道纳入常态化巡护监管，实现非法捕猎工具存量持续削减。同时依托丰富的鸟类资源发展生态旅游，为迁飞通道沿线地区的生物多样性保护与社区可持续发展提供了实践参考。

背景与问题

雷公山国家级自然保护区地处东亚—澳大利西亚候鸟迁飞通道上，区内共记录鸟类238种。近年来，区域野生鸟类保护仍面临诸多现实考验：野外偶有非法猎捕鸟类行为，部分村寨存在观赏、驯养野生鸟类及民间斗鸟等传统乡土活动，群众野生动物保护意识仍需持续提升；多部门协同联动巡护机制需进一步完善，野外巡查执法力量有待提升。

KEYWORDS

Protection of bird migration corridors; habitat management; interagency coordination.

CASE PROFILE

Leishan County is located in the Qiandongnan Miao and Dong Autonomous Prefecture of Guizhou Province. Situated at a key node along the East Asia–Australasia bird migration corridor, the county has recorded 238 bird species, including 3 species under Class I national protection and 39 species under Class II national protection. It serves as a core habitat for rare bird species endemic to China, such as the Golden Pheasant (*Chrysolophus pictus*). Faced with threats such as frequent illegal hunting in mountainous areas and weak public conservation awareness, Leishan County has established a four-pronged conservation system comprising institutional safeguards, patrol and monitoring, interdepartmental coordination, and public outreach. By incorporating bird habitats and migration corridors into routine patrol and monitoring, the county has achieved its goal of sustained reduction in the stock of illegal hunting tools. At the same time, it has leveraged its rich avian resources to develop ecotourism, providing a practical model for biodiversity conservation and sustainable community development along the migration corridor.

BACKGROUND AND CHALLENGES

The Leigongshan National Nature Reserve is located along the East Asia–Australasia migratory bird flyway, and a total of 238 bird species have been recorded within the reserve. In recent years, the conservation of wild birds in the region has continued to face numerous practical challenges: occasional incidents of illegal bird hunting still occur in the wild; some villages still engage in traditional local activities such as keeping wild birds for display or as pets, as well as folk bird-fighting; and public awareness of wildlife conservation still needs to be continuously improved. Furthermore, the multi-departmental coordinated patrol mechanism requires further refinement, and the capacity for field patrols and law enforcement needs to be enhanced.

鸟类巡护
Bird Patrol



行动与措施

开展鸟类调查

采用样点法、样线法、长焦距相机拍摄法等方法开展系统性鸟类调查，共记录到鸟类238种，隶属于16目59科，其中国家一级重点保护野生动物鸟类3种，国家二级重点保护鸟类39种。

建立常态化巡护管控机制

开展鸟类栖息地与迁徙通道巡护，设置21条固定巡护路线，针对重点区域开展夜间专项巡查，清除非法捕猎工具，并对受伤、迷途、被困野生鸟类开展收容救护工作。

构建多部门协同执法网络

联动林业、公安、市场监管等部门，聚焦捕猎、运输、销售、食用、展演等关键环节，开展全链条排查整治。对集贸市场、餐饮场所、花鸟市场等重点区域实行严格检查，依法清理非法鸟类交易场所。

深化公众参与和宣传教育

深入走进原住民村寨，面向广大公众开展野生动物保护相关法律法规、典型违法案例线下普法宣传；结合“爱鸟周”“国际生物多样性日”等重要节点，专项开展鸟类保护科普宣教活动，持续提升群众野生动物保护法治意识与生态保护自觉，引导全社会革除玩鸟、斗鸟等伤害野生鸟类的不良陋习。

发展观鸟生态旅游产业

依托丰富的鸟类资源和苗族文化特色，打造雷公山生态观鸟等文旅融合品牌，推出大型实景苗族歌舞诗剧等文化演艺产品，将生物多样性保护成果转化为旅游吸引力，带动周边社区增收。

ACTIONS AND MEASURES

CONDUCTING BIRD SURVEYS

Systematic bird surveys were carried out using methods such as the fixed-point method, transect method, and long-range camera photography. A total of 238 bird species were recorded, belonging to 16 orders and 59 families, including 3 species listed as Class I Nationally Protected Wild Birds and 39 species listed as Class II Nationally Protected Wild Birds.

ESTABLISHING A ROUTINE PATROL AND MONITORING MECHANISM

Patrols of bird habitats and migration corridors were conducted along 21 fixed patrol routes. Special nighttime patrols were carried out in key areas, illegal hunting devices were removed, and shelter and rescue services were provided for injured, lost, or trapped wild birds.

ESTABLISHING A MULTI-AGENCY LAW ENFORCEMENT NETWORK

Efforts were coordinated among forestry, public security, market regulation, and other departments to focus on key stages—including hunting, transportation, sales, consumption, and public displays—and comprehensive inspections and rectification measures were carried out across the entire supply chain. Strict inspections were conducted in key areas such as farmers' markets, restaurants, and bird and flower markets, and illegal bird trading venues were shut down in accordance with the law.

STRENGTHENING PUBLIC PARTICIPATION AND PUBLIC EDUCATION

The project delved deeply into indigenous villages and conduct community-based public awareness campaigns for the general public on laws and regulations related to wildlife conservation, as well as typical cases of violations. By capitalizing on key events such as "Bird Conservation Week" and "International Day for Biological Diversity," the place organized specialized science outreach activities focused on bird conservation. These efforts continuously enhanced the public's legal awareness of wildlife conservation and their commitment to ecological protection, while guiding society as a whole to eliminate harmful practices that harm wild birds, such as keeping birds as pets or pitting them against each other in fights.

DEVELOPING THE ECOTOURISM INDUSTRY CENTERED ON BIRDWATCHING

Leveraging abundant avian resources and the distinctive Miao cultural heritage, the county established integrated cultural and tourism brands such as the Leigong Mountain Ecological Birdwatching experience and launched cultural performance products like large-scale live-action Miao song-and-dance poetic dramas. This initiative transformed achievements in biodiversity conservation into tourism attractions, thereby boosting income for surrounding communities.

5·22国际生物多样性日开展鸟类放飞活动 ▶
Bird Release Event Held on International Day for Biological Diversity

成效与价值

鸟类保护工作系统推进，通过建立覆盖栖息地与迁飞通道的常态化巡护网络和多部门协同执法体系，实现非法捕猎工具存量持续削减，有效维护了雷公山亚热带森林生态系统的结构完整与动态平衡，为238种鸟类提供了安全的迁徙与栖息环境。

传统斗鸟、食鸟等陋习得到有效革除，公众爱鸟护鸟的自觉性显著提升。成功打造雷公山生态观鸟等文旅融合品牌，将生物多样性保护成果转化为旅游吸引力。2025年全县接待游客1345万人次，实现旅游综合收入143亿元，带动5万余人持续增收，实现了鸟类保护与原住民生计改善的良性互动。

经验与启示

针对鸟类保护中意识薄弱、斗鸟食鸟等传统陋习，该实践探索出一条执法与引导并重的转化路径：以执法为基，建立常态化巡护与多部门联动执法网络，对违法行为实行刚性约束；通过科普宣传、培育观鸟经济的方法，让原住民从保护中获得可持续收益，让保护行为产生可见的经济价值，激发内生动力，推动其从“猎鸟人”转变为“护鸟人”，实现从“被动禁止”到“主动守护”的转变，为同类地区提供了可借鉴的治理样本。

ACHIEVEMENTS AND VALUE

Through the systematic advancement of bird conservation efforts, including the establishment of a regular patrol network covering habitats and migration corridors, as well as a multi-agency collaborative law enforcement system, illegal hunting tools have seen a sustained reduction. This has effectively maintained the structural integrity and dynamic balance of the Leigongshan subtropical forest ecosystem, providing a safe migration and habitat environment for 238 bird species.

Outdated practices such as bird-fighting and the consumption of birds have been effectively eradicated, and the public's awareness of and commitment to loving and protecting birds has significantly increased. The county has successfully established cultural and tourism integration brands such as the Leigong Mountain Ecological Birdwatching experience, transforming achievements in biodiversity conservation into tourism attractions. In 2025, the county welcomed 13.45 million visitors, generated 14.3 billion yuan in comprehensive tourism revenue, and helped more than 50,000 people achieve sustained income growth, thereby creating a virtuous cycle between bird conservation and the improvement of local residents' livelihoods.

EXPERIENCES AND INSIGHTS

In response to low awareness of bird conservation and traditional harmful practices such as bird-fighting and bird poaching, this initiative has pioneered an approach that emphasizes both law enforcement and public education: Grounded in law enforcement, it establishes a network of routine patrols and multi-agency joint enforcement to impose strict constraints on illegal activities; and through public education and the development of a bird-watching economy, the initiative enables local residents to derive sustainable benefits from conservation efforts, transforming conservation actions into tangible economic value. This approach has fostered endogenous motivation, encouraging a shift from "bird hunters" to "bird protectors" and facilitating a transition from "passive prohibition" to "active protection," thereby providing a governance model that can be replicated in similar regions.



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