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慢下来：
贵州省六盘水明湖湿地公园

Slow Down:
Minghu Wetland Park in Liupanshui, Guizhou

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摘要 ……

通过一系列再生设计技术，特别是减缓雨水径流的措施，一条渠化混凝土河流及一片环境恶化的城市边缘地区已经转变为一个闻名遐迩的湿地公园。作为全市生态基础建设的重要组成部分，该公园将提供多重生态系统服务，包括雨水管理、水体净化、原生栖息地恢复，并将创造一个供集会及审美享受的宝贵的公共空间。

关键词 ……

市政项目；湿地；修复；净化；雨洪；公共空间

Abstract ...

Through a series of regenerative design techniques, particularly measures to slow down the flow of stormwater, a channelized concrete river and a deteriorated peri-urban site have been transformed into a nationally celebrated wetland park that functions as a major part of the city-wide ecological infrastructure planned to provide multiple ecosystem services, including stormwater management, water cleansing, and recovery of native habitats, as well as a creation of a cherished public space for gathering and aesthetic enjoyment.

Key words ...

Municipal Commitment; Wetland; Restoration; Purification; Stormwater; Public Space

项目地址：贵州省六盘水市
项目面积：90hm^2
项目委托：六盘水市政府
景观设计：土人设计
首席设计师：俞孔坚
项目负责人：栾博、黄刚
设计团队：闫斌、单美娜、郑军彦、凡新、李世征、拜真、安建飞、陈琳、游宏凯、曹业奇、邓彰、杨晔、李悦、刘德华、白洁、任轶珍、刘拓、宋旭、张小峰、曹军营、张晋丰
设计时间：2009年12月~2010年12月
建成时间：2013年12月
所获奖项：2013年中国环境艺术设计金奖

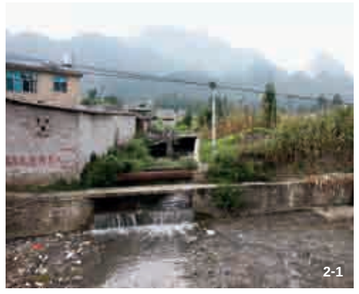
Location: Liupanshui, Guizhou Province
Area (size): 90 hm^2
Client: Liupanshui Municipal Government
Landscape Architecture: Turenscape
Chief Designer: Kongjian Yu
Project Leaders: Bo Luan, Gang Huang
Project Team: Bin Yan, Meina Shan, Junyan Zheng, Xin Fan, Shizheng Li, Zhen Bai, Jianfei An, Lin Chen, Hongkai You, Yeqi Cao, Zhang Deng, Ye Yang, Yue Li, Dehua Liu, Jie Bai, Yizhen Ren, Tuo Liu, Xu Song, Xiaofeng Zhang, Junying Cao, Jinfeng Zhang
Design Period: December, 2009 ~ December, 2010
Completion Time: December, 2013
Award: Gold Prize for 2013 Chinese Environment Design

1. 向北眺望公园全景，展示出项目蜿蜒曲折的特点。
2. 建造之前，场地是一片破败不堪的城市边缘地带，污水和垃圾被未经许可地倾倒于此，使之成为一片污浊之地。
1. This panorama, looking towards north, shows the sinuous design of the built project.
2. The site was a peri-urban derelict landscape, a deteriorating environment with illegal dumping of raw sewage and solid waste.

目标和挑战

六盘水是一个建立于20世纪60年代中期的工业城市，以凉爽的高原气候而著称。城市被石灰岩山丘环抱，水城河穿城而过。城市人口密集，在60km^{2}的土地上，居住了约60万的人口。作为改善环境的重要举措之一，市政府委托景观设计师制定一个整体方案，以解决城市诸多严峻问题，其中包括：1）水污染：作为建于冷战时期并发展起来的重工业城市之一，六盘水以煤炭、钢铁和水泥行业作为主导产业。因此，长久以来，民众忍受着空气和水污染带来的恶果。数十年来，由工业烟囱排放的污浊空气中的沉降物散落在周边的山坡上，并随夹杂着农田化肥的山地径流以及城市各地污水的雨水径流被一同汇入河流；2）洪水和暴雨泛滥：由于坐落在山谷之中，该城市在雨季容易受到洪水和暴雨的侵袭，而由于当地为多孔石灰岩地质条件，旱季又易遭受干旱；3）修复母亲河：20世纪70年代，为了解决泛滥和洪水问题，水城河被渠化。渠化的河道满载着来自上游的雨水径流，引发了下游更为严重的洪水问题。从此，原本蜿蜒曲折的母亲河变成了死气沉沉的、丑陋的混凝土沟渠，其拦截洪水及环境修复的功能也丧失殆尽；4）创建公共空间：城市人口的激增导致了休闲和绿色空间的不足。曾经为城市带来过诸多福祉的水系统已经变成城市中废弃的后院、垃圾场和危险重重的城市阴暗面。因此，在人口密集的社区中，为居民创建一条可到达修复过的绿色空间的人行通道极其必要。

这一方案意在减缓来自山坡的径流流速，建造一个以水为基础的生态基础设施来对雨水进行储存和治理，使水成为重建健康生态系统的活化剂，提供自然和文化服务，从而令这个工业城市变为宜居之所。



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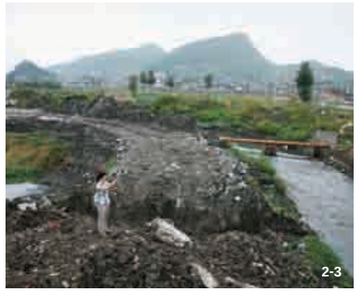

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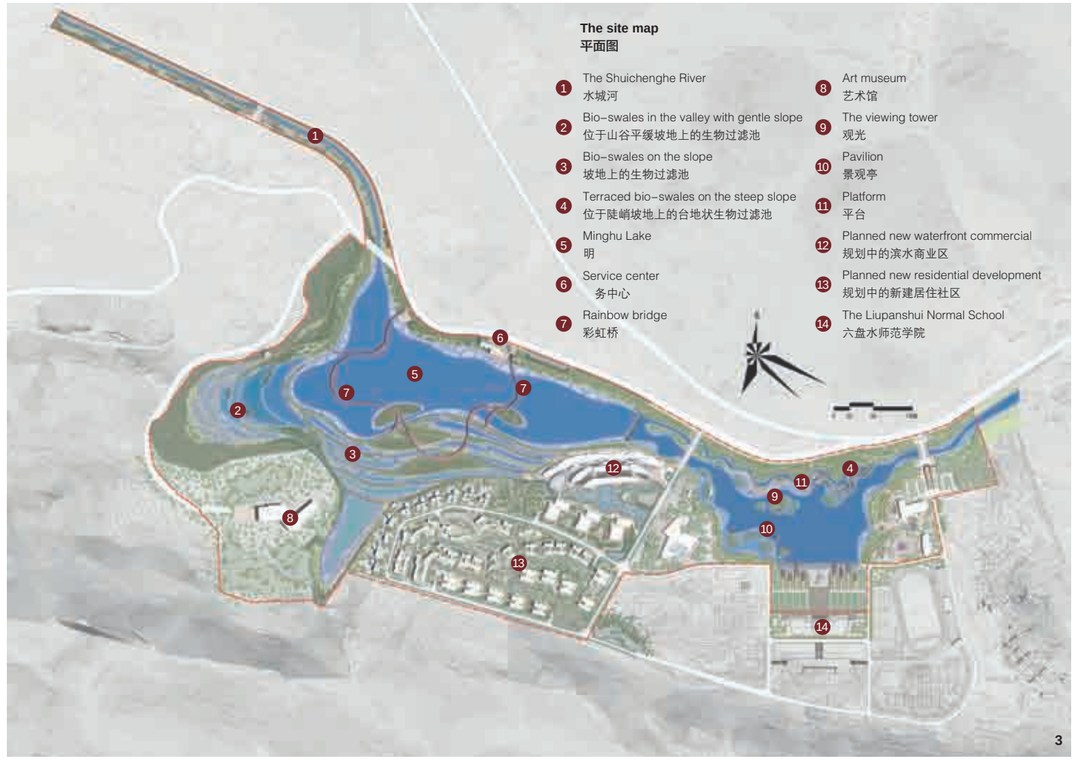

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设计理念

六盘水明　湿地公园项目占地面积90hm^2，是景观设计师为该城市规划的综合生态基础设施中首要且重要的组成部分。

为了构建完整的生态基础设施，景观设计师需要同时关注水城河流域和城市两方面。首先，河流串联起现存的溪流、湿地和低洼地，形成一系列蓄水池和具有不同承载力的净化湿地，构成雨水管理和生态净化系统。这一方法不仅最大限度地减少了城市泛滥，而且增加了基流以维持非雨季时水流不断。第　，移除　化河流的混凝土河堤。重建的自然河岸使河岸生态恢复生机并最大化河流的自净能力。第三，建造包括人行道和自行车道的连续公共空间，增加河滨可达性。这些廊道既是城市休憩空间，也可提供生态　务。最后，项目将滨水区开发和河道整治结合在一起。六盘水的生态基础设施促进了城市重建工作，提升了土地价值，增添了城市活力。

3.　总平面图
4.　平缓坡地上的生物滞留池
5.　陡峭坡地上的台地状生物滞留池
3.　Master plan
4.　Bio-swales in the gentle slop
5.　Terraced bio-swales on the steep slope

作为六盘水生态基础设施的主要项目之一，明　湿地公园的具体设计方案包括：

（1）移除混凝土河堤，建造两个生态地带。其一供本地植被在泛洪区域生长，另一个为河岸挺水植物的生长创造条　。沿河建造曝气池以增加水体含氧量，从而促进富营养化的水体进行生物修复。

（2）建造台地湿地和蓄水池，以减少洪峰流量并调节季节性降雨。台地的灵感来源于当地农业耕作技术，通过吸收和储存雨水，使陡峭的坡地成为丰产的沃土。台地的方位、形式、深度都依据地质条　和水流分析而设定，并根据不同的水质和土壤环境种植自然植被（主要采用播种的方式）。这些台地状栖息地减缓了水流，水中过盛的营养物质成为微生物和植物快速生长的养分来源，从而加快了水体营养物质的净化。

（3）人行道和自行车道沿着水路铺设在绿色空间之中，在台地之间形成回路。设有大量座椅、凉亭和观光　的休息平台融入自然系统之中，便于所有人进入，提升了学习、娱乐和审美景观体验。方案中还包括一个环境解说系统以帮助游客理解这些地方的自然和文化含义。场地中最具标志性的建　物是一座暖色的彩虹桥，与当地频繁的凉爽湿润天气形成对比。这座彩虹桥连接了中心湿地（　）的三面，创造出令人难忘的散步及聚集场所。此处迅速成为了备受当地民众和远近游客喜爱的社交和休闲场所。

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以上景观技术的应用使衰退的水系统和城市周边的废弃地成功转变为高效能、低维护的城市形象典范。湿地公园通过巧妙地调蓄雨水、净化污水、修复原生栖息地以促进生物多样性，并吸引了众多的居民和游客前来。2013年被官方指定为“中国国家级湿地公园”。LAF

6.　生态修复后水城河上游河段的典型场景。原有的混凝土道被植被丰茂的溪流所替代，这些溪流减缓了来自山区的雨水径流。曾经了无生趣的河流如今已成为垂钓的乐园，两岸的步行道与自行车道吸引了不同的使用者。
7.　夏日，沿着山谷精心划分、相互连通的生物滞留池与水塘系统形成“绿色海绵”。雨水被吸收并储存，从而对水体中来自农田和城市非点源污染的污染物进行净化。
6.　This is a typical scene of the upper section of the ecologically restored Shuichenghe River. The previous concrete channel was replaced with a lushly vegetated stream that slows the storm water flow from the mountains. The former lifeless river is now a popular fishing place, while the pedestrian and cycling paths on both sides attract other users.
7.　In this summer scene, the carefully graded, interlocking bio-swales and pond system along the valley acts as a "green sponge". Storm-water is detained and retained to capture or transform the agricultural and urban non-point source pollutants.

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Objectives and Challenges

Liupanshui, known for its cool plateau climate, is an industrial city built in mid 1960s in a valley surrounded by limestone hills, with the Shuichenghe River running through it. With an area of 60 square kilometers, the city is densely inhabited by a population of 0.6 million. As an element of a major campaign of environmental improvement the city government commissioned the landscape architect to develop a holistic strategy to address multiple serious problems including: 1) Water pollution: As one of the major heavy industrial cities built during the cold war period, Liupanshui has been dominated by coal, steel and cement industries. Consequently, the citizens have suffered with the results by air and water pollution for a long time. From the industrial chimneys, decades of air pollution deposits


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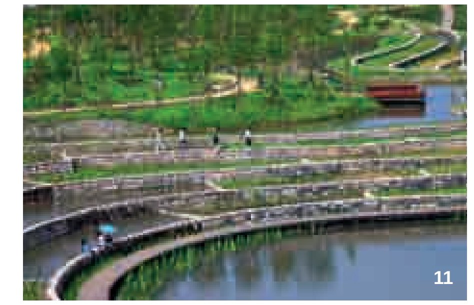
fell onto the surrounding slopes and washed into the river along with the stormwater that also carries the chemical fertilizer runoffs from the farm land on the slopes and sewage from the scattered settlements on the slope; 2) Flood and stormwater inundation: Situated in the valley, the city is subject to floods and stormwater inundation during the monsoon season, but also severe drought in the dry season due to the porous limestone geology; 3) Recovery of the mother river: Channelization of the Shuichenghe River was carried out in the 1970s as a solution to inundation and flooding. The channel transmitted the stormwater from upstream but caused even more severe flooding problems downstream. Hence, the former meandering mother river became an ugly concrete, lifeless ditch and its capacity for flood retention and environmental remediation was totally lost; 4) Creation of

8. 人行步道网络与生物滞留池相互交织，使游客可以近距离地体验自然。
9. 休息平台（这里也是可供孩子们玩耍的小型游乐平台）或被安设于生物滞留池之间，或延伸出滞留池。这一人造空间作为一种人工元素将“杂乱无章”的自然转变成公共空间。
10. 流经池塘与植被的水流流速被减缓，使得净化与滋养的过程能够发生。每一个独立的池塘能够持有足量的水以供植被生长，从而创造出四季皆受欢迎的栖息地。
11. 建造技术受到了当地人民在坡地上进行农耕活动的启发。
12. 游客们尽情享受着与生物滞留池中成片的自播繁衍野花和洁净水体的亲密接触。
13. 游客与当地居民都非常喜爱秋季公园中丰富的肌理与斑斓的色彩。

8. The network of pedestrian paths weaves between the bio-swales allowing visitors intimate contact with living nature.
9. The resting platforms (which in this case are also small play-platforms for children) are nestled between and extend over the bio-swales. These man-made spaces also act as artificial frames that transform "messy" nature into neatly ordered public space.
10. The rate of water flow through the ponds and vegetation is slowed to allow for filtration and nutrient uptake. The design makes individual ponds to retain sufficient water to sustain adaptive vegetation and create attractive habitats enjoyed by visitors in all seasons.
11. This technique is inspired by the local farming practice of field making for planting rice on slopes.
12. Visitors are excited at the intimate contact with the massive drifts of self-seeding flowers and the cleansed water in the bio-swale.
13. Tourists and locals alike enjoy the view of the richly textured and colored tapestry in fall.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public space: Recreation and green spaces are inadequate due to the population explosion in the city. The water system that was once a blessing to the city has become a deserted backyard, garbage dump and the dangerous backside of the city. Pedestrian access to a restored green space system is badly needed in such a densely populated community.

The strategy is to slow the flow of water from the hillside slopes and create a water-based ecological infrastructure that will retain and remediate the stormwater, and make water the active agent in regenerating a healthy ecosystem to provide natural and cultural services that transform the industrial city into a livable human habitat.

Design Strategies

The submitted Liupanshui Minghu Wetland Park project, 90 hectares in size, is the first phase and a major part of the comprehensive ecological infrastructure project planned for the city by the landscape architect.

For the overall ecological infrastructure, the landscape architect focused both on the Shuichenghe River drainage basin and the city. Firstly, existing streams, wetlands, and low-lying land are all integrated into a stormwater management and ecological purification system linked by the river, forming a series of water retention ponds and purification wetlands with different capacities. This approach not only minimizes urban flooding but also increases the base flow to sustain river water flow after the rainy season. Secondly, the concrete embankment of the channelized river was removed. A natural riverbank was restored to revitalize the riparian ecology and maximize the river's self-purification capacity. Thirdly, continuous public spaces were created to contain pedestrian and bicycle paths, increasing access to the riverfront. These corridors integrate the urban recreation and ecological spaces. Lastly, the project combines waterfront development and river restoration. The ecological infrastructure catalyzes urban renewal efforts in Liupanshui, significantly increases land values, and enhances urban vitality.

The specific design approaches that achieve these objectives are listed below.

(1) The concrete river embankment was removed to create two ecological zones. One encourages native vegetation to grow within the flood zone and the other establishes conditions for emergent vegetation in the riverbed. Aerating cascades were created along the river to add oxygen that fosters bio-remediation of the nutrient-rich water.

(2) Terraced wetlands and retention ponds were created to reduce peak water flow and regulate the seasonal rainwater. The terraces are inspired by the local farming techniques that catch and retain water and transform steep slopes into productive fields. Their positions, forms and depths were based on geographic information and a water flow analysis. Native vegetation was planted (mostly sown) to establish associations adapted to the various water and soil conditions. These terraced habitats slow the flow of water and speed nutrient removal from the water by microorganism and plant species that use excess nutrients as resources for rapid growth.

(3) Pedestrian paths and bicycle routes are overlaid on the green spaces along the waterways and form a circuit around and between the wetland terraces. Resting platforms with abundant seats, pavilions and a viewing tower are integrated into the designed natural system for universal access. This fosters learning, recreational and aesthetic landscape experiences. An environmental interpretation system was designed to help visitors understand the natural and cultural meaning of the places. Clearly, the most iconic built artifact is a warm-colored rainbow bridge, in contrast with the frequently cool and damp climate. This causeway connects three sides of the central wetland (lake), creating unforgettable walking and gathering places. These have quickly become favored social and recreational environments of the citizens and attract visitors from near and far.

Through these landscape techniques, the deteriorated water system and peri-urban wasteland has been successfully transformed into a high-performance and low maintenance municipal front yard. The wetland park beautifully regulates stormwater, cleans contaminated water, restores native habitats for biodiversity, and attracts residents and tourists. It was officially designated as a National Wetland Park in China in 2013. LAF

14. 流经一系列的生物过滤池和台地，水流最终汇集到中央区，成为可用游人嬉戏的、安全而洁净的水体。
15. 一座彩虹桥凌于湿地公园之上，使游客可以进入且畅游其中，忙碌的城市居民放慢他们的脚步，如同生物过滤池减缓了水流的“脚步”一般。
16. 彩虹桥成为一种文化景观的标志性元素，引发人们对城市周围广阔的喀斯特地貌的关注。彩虹桥成为对这一寻常自然景观的不寻常一面进行编排、体验、解说的文化线路。
14. Having been filtrated through a series of bio-swales and terraces, the water merges into the central lake and becomes safe and clean for people to play with.
15. A rainbow bridge flies above the wetland park. It serves as access into the designed wetland and as a linkage that invites the ever busy residents to "slow down" their pace just as the bio-swales slows down the water.
16. The rainbow bridge is an iconic cultural landscape element that focuses views toward the extensive karst landscape surrounding the city. The bridge provides a cultural route for ordering, experiencing and interpreting the otherwise ordinary natural landscape.

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