

Planting Design of Beijing Olympic Forest Park

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ABSTRACT

Beijing Olympic Forest Park, which occupies about 680 hectares, sustains a healthy ecosystem in Beijing by maintaining regional ecological systems and improving urban ecology.

Key Words: Landscape Architecture, Olympic Forest Park, Planning and Design, Planting System, Ecosystem

I. Project Background

The Olympic Forest Park is situated in northern Beijing at the end of the city's central axis that runs through the Forbidden City. It is the largest landscape project for 2008 Beijing Olympic Games, "The Axis to Nature."

II. Planting Concept: Ecology, Design and Technology

The Olympic Forest Park is a landscape that achieves a transition from urban characteristics to rivers and forested hills by careful selection and placement of plant species. The Fifth Ring Road separates the Forest Park into two parts. The area south of the ring road, nearest the city and the Olympic venues, is for sports, leisure and entertainment. The area north of the ring road, along a riparian corridor, is an ecological protection and restoration zone.

Trees selected for use in the park are primarily native species that are hardy in the climate of Beijing, are resistant to disease, and possess beautiful formal characteristics. Two strategies are used for establishing forests of these trees. One strategy is to establish groves of canopy trees of various species including broadleaf and coniferous trees. These are located in areas that do not require intensive maintenance and can provide places for leisure and entertainment activities.

The second strategy is to establish a layer of shrubs massed beneath the mixed-species canopy trees. The tree-shrub forest amplifies distinctive landscape features of the park and will enrich the appreciation and knowledge of ecological plant communities in the city. Trees and shrubs are carefully combined to create various seasonal landscapes: spring landscape, summer landscape, autumn landscape, winter landscape, spring and autumn landscape, summer and autumn landscape, and four season landscape. These seasonal landscapes are created in order to heighten appreciation of botanical characteristics such as color, fragrance, form, and structure. In early spring, plants are in full bloom; in the mid-summer, green plants make people feel cool and fresh; in the mid-autumn, the scattered scarlet of *Rhus typhina* and *Cotinus coggygria* contrast with the dominant yellows and oranges of the other trees; in the winter, dark green pines and cypresses offer solemn resistance to the cold.

It is essential in this design to build sustainable, vertically-layered, and mixed-species matrices of plants. Three vertically-layered matrices, which increase ecological benefits to the forest community, are planted: trees, shrubs and grasses; trees and grasses; and trees and shrub. Scientific proportions are established between trees and shrubs and between coniferous and deciduous trees. The recommended proportion of trees to shrubs in Beijing area is 7:3 and that between coniferous and deciduous trees is 6:4. In order to define different landscape features such as mountain slopes or open meadow, these proportions are adjusted. For instance, the

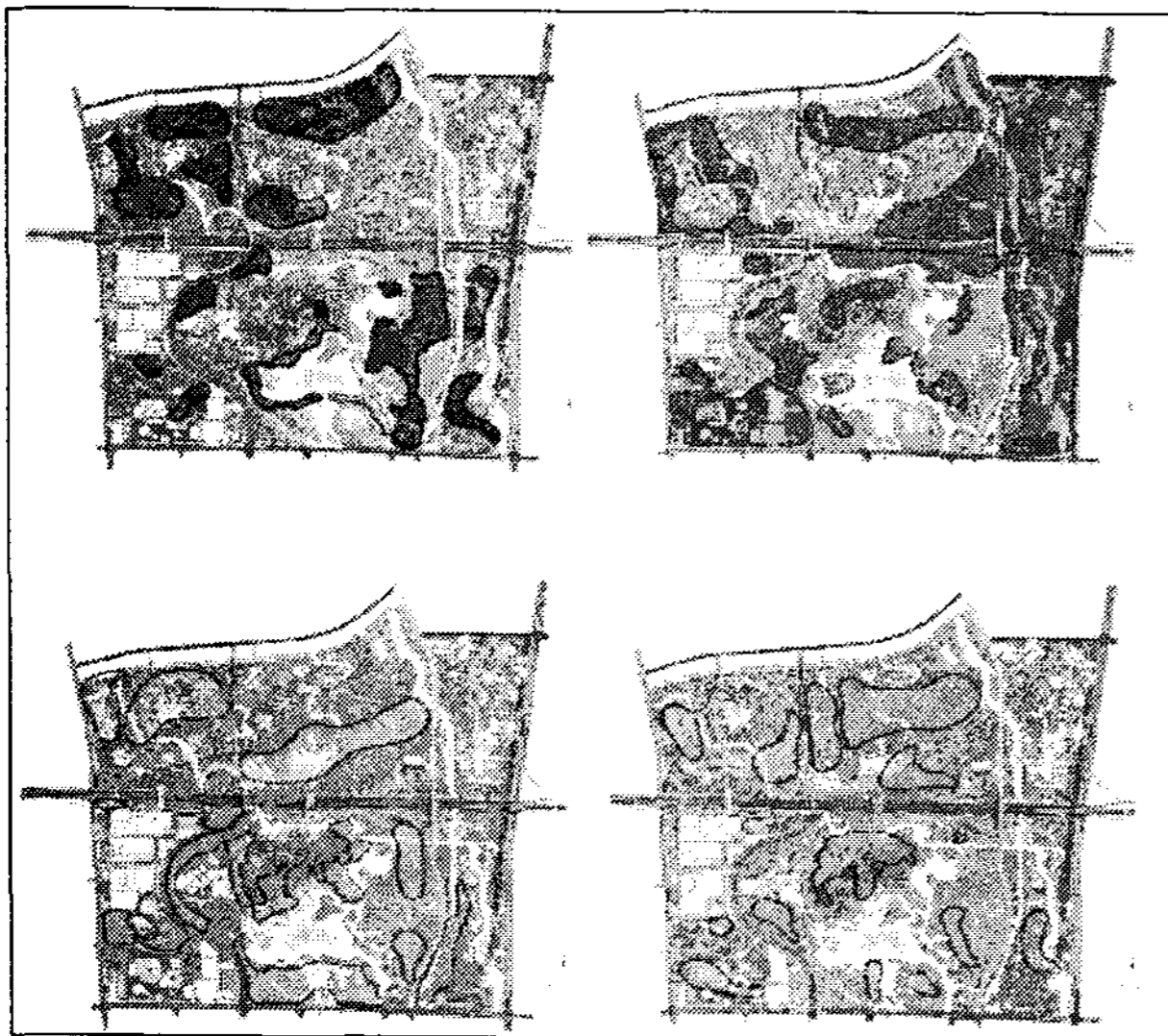


Figure 1. Plants in Different Seasons

proportion between coniferous and deciduous trees on the back of the mountain and on the mountain ridge is increased to 4:6 and, in some areas, as high as 1:1. In areas where the effect of flowering shrubs should be highlighted, the proportion between trees and shrubs is increase to 6:4.

Beijing's Plan for Transplanting Nursery Stock in 2004 was consulted in order to select plant species with sufficient stock to complete the landscape. The availability of good nursery stock was the result of advance planning to secure adequate numbers and quality of plants to complete the extensive planting required to construct the park.

The quantity of trees in the plan for Forest Park is also important for the ecological attributes of avian habitat, reduction of urban heat island effect, and the exchange of oxygen and carbon dioxide, among others. The forest planting expands the leaf area index(LAI), a key indicator of ecological health, of the Olympic site. In addition, the percent of canopy cover easily exceeds the twenty-five percent canopy coverage recognized as a threshold that yields significant ecological benefits.

III. Design Subdivisions: Northern and Southern Areas

The southern area of the Olympic Forest Park, adjacent to the Olympic venues, will be open to the public in 2008. The short interval between planting and the opening of the park makes it essential to protect existing large specimens or esta-

blished groves as well as procure new plants of sufficient size to structure the landscape immediately. Many trees in the areas of the lake and mountain landscape construction were dug and transplanted with their full crowns intact to add immediate scale to the landscape and to save costs.

The northern area of the park, north of the Fifth Ring Road, includes Wali Park and Jade Park-two existing planted areas which are incorporated into the Olympic Forest Park. The plants in these two parks are mature and their own ecosystem has largely been established. Dense forests, sparse forests and isolated specimen trees add considerable landscape effect and provide habitat for wildlife. In order to establish a luxuriant forest, new large specimens were added to these existing trees.

The design integrates the inherited landscapes with the new design objectives of the Olympic Forest Park in order to improve both the ecology and the formal design character of the landscape.

1. Plant Communities of the Southern Area of the Park

The plant communities in the Park's southern area were divided into three landscape types: dense forest, lawn with sparse trees, and wetland.

The dense forest area is designed for the experience of

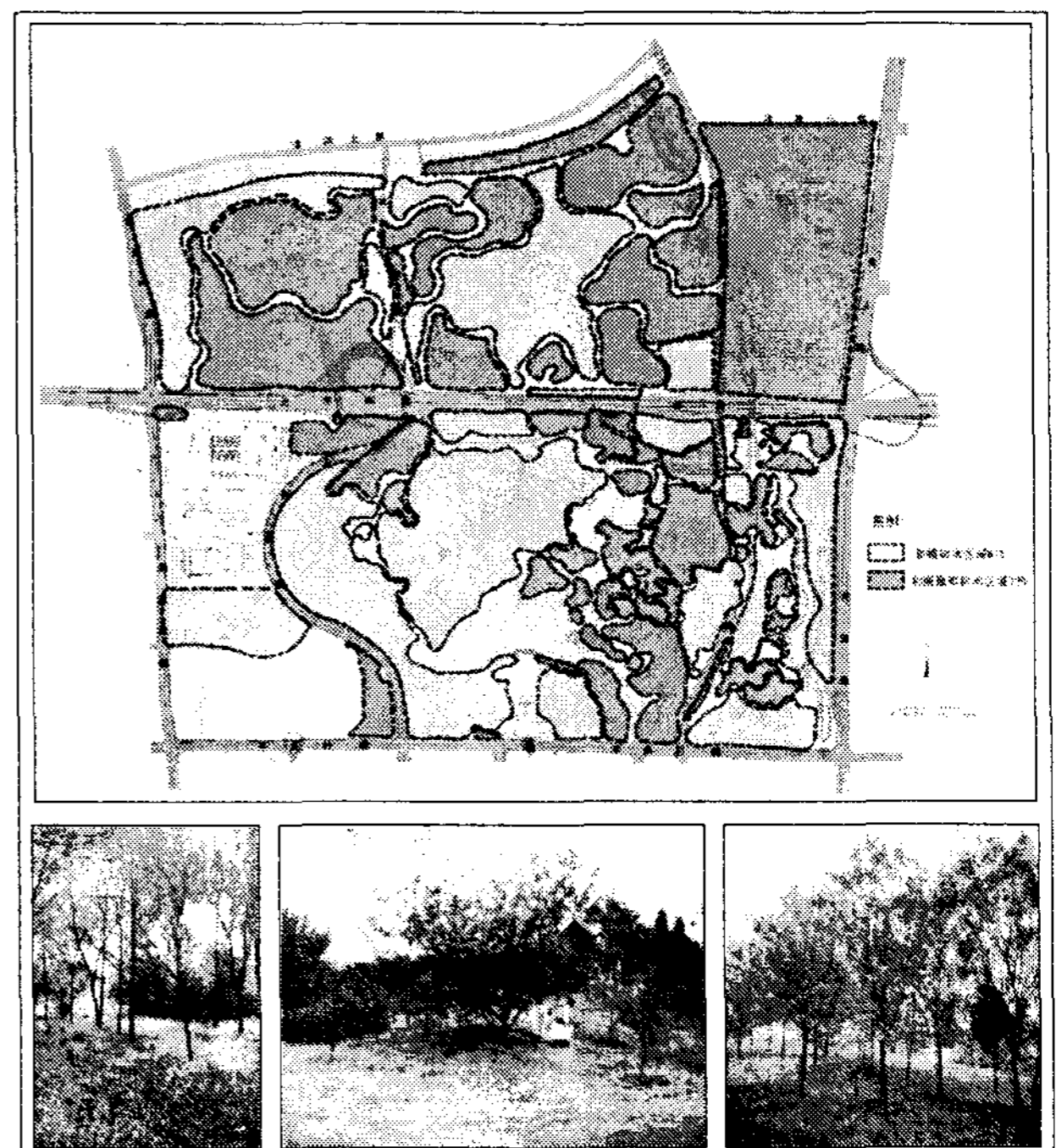


Figure 2. Using of Existing Plants and Pictures of the Site

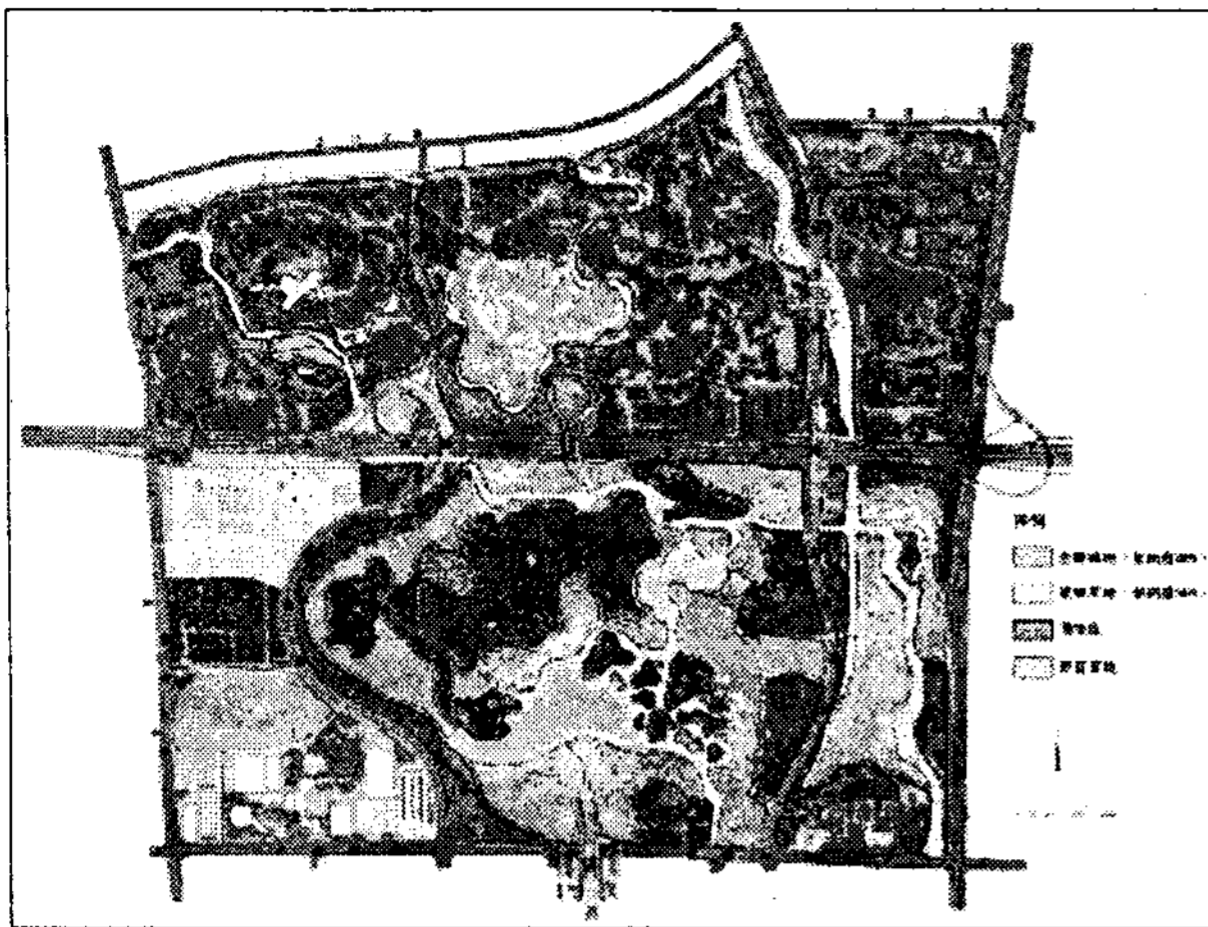


Figure 3. Diagram of Plant Space

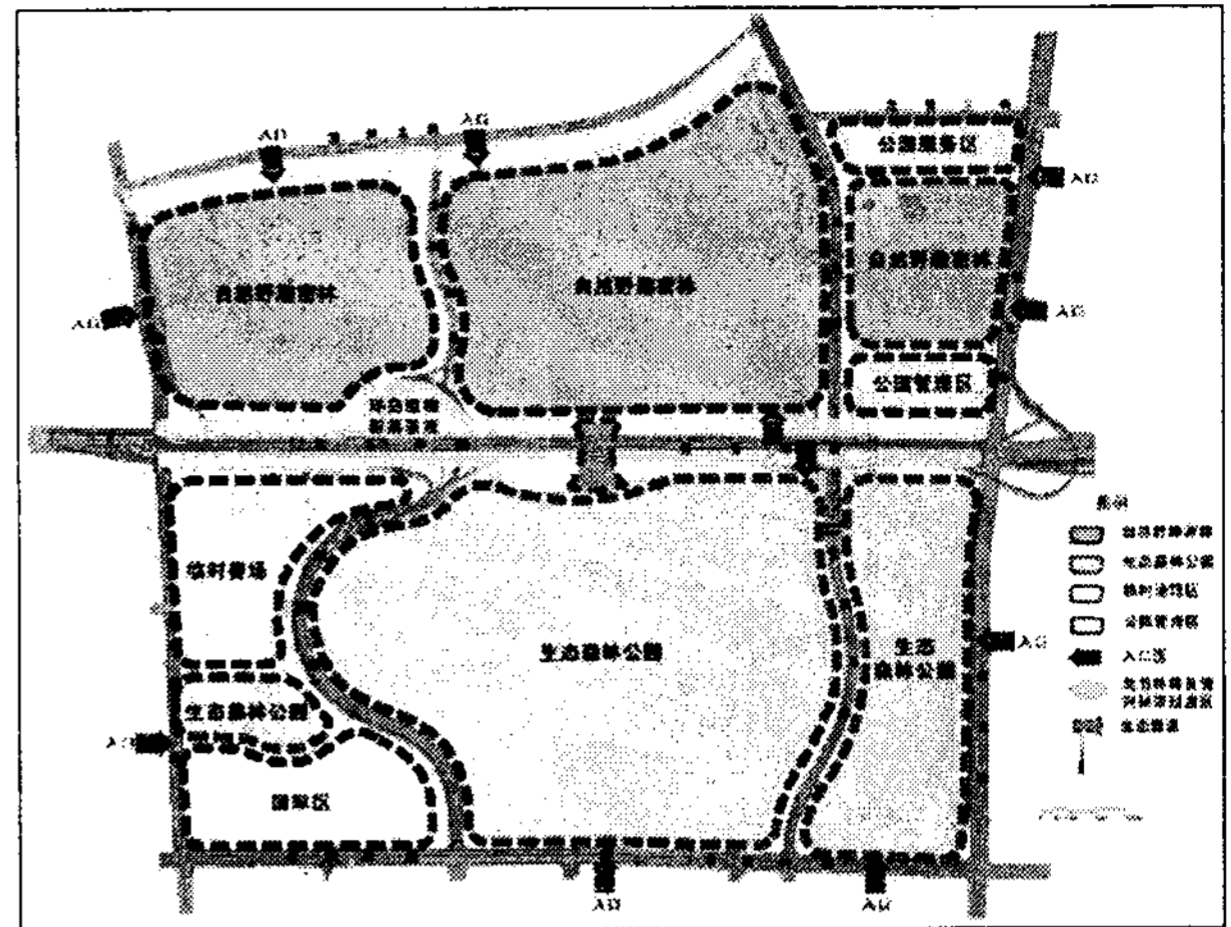


Figure 5. Functions of Forest Park

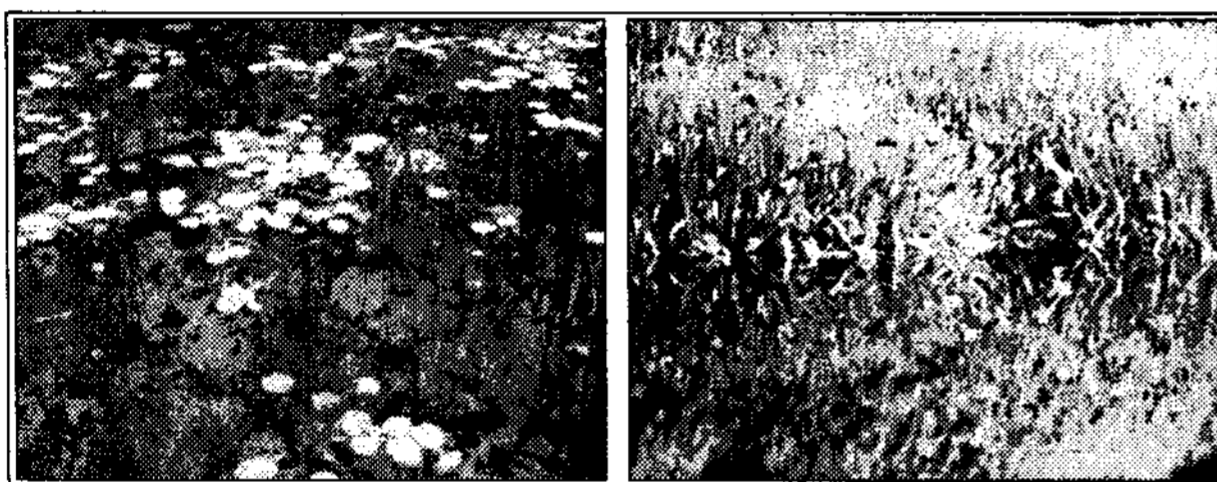


Figure 4. Reference Pictures of Wetland Plants

wildness and to accentuate the rustic landscape of mountains and forest.

The lawn and tree area provides people with a place for sunlight and shade. Tree species were chosen for avian habitat and the desirable pharmacological effects that many produce. For example, cypress produce volatile oils which are good for human beings. The fragrance of the chrysanthemum is good for children's intelligence and helps to ease tiredness after a day of work. Pine and clove are effective in the treatment of colds and tuberculosis.

The wetland area is designed for aesthetic appreciation and scientific education. The stratification of plants in different aquatic depths at the edges of water bodies establishes unique communities of wetland plants with elegant form and brilliant colors that attract butterflies.

2. Landscapes of the southern area of the park Detailed planting design was completed for six separate subdivisions of the southern area of the park(south of the Fifth Ring Road): south entrance, main lake, main mountain, eco-exercising area, fishing area, and forest art area.

The south entrance is the main threshold between the Olympic Forest Park and the main Olympic venues-the stadium, arena, and the support facilities. The approach to the entrance from the south is along the sixty-meter-wide central axis. At the entrance to the park, the linear axis gives way to a panoramic view of mountains, forests and water. The broad, gently-sloping lawn is flanked with open groves of transplanted pine, ginkgo and other canopy species with their massive crowns creating pools of shade and shadows.

The main lake is the largest water surface constructed in the Olympic projects. The lake is first viewed from the south entrance and it is this panoramic view that the plants along the lakeside are arranged to enhance. In Beijing as in many parts of the world, shrubs and flowers mainly bloom in spring. The mirror-like surface of the lake reflects the "April in the world" that is ablaze with flowers in bloom.

The peak of the main mountain is aligned with the central axis and is the centering focus of the Olympic Forest Park. The height of trees species increases from the bottom to the top of the mountain in order to amplify the verticality of the peak. Pines and cypresses embrace the summit scenic spot, named The Celestial World, and mark the intersection of land and sky.

Spring-flowering shrubs and perennials are planted between the lake and mountain to add colorful variety and textural gradation to the landscape. The trees on the mountain ridge are pagoda-shaped conifers that will form a "forest skyline" which extends along the top of the mountain.

The two side slopes of the mountain will be planted with trees and shrubs with a variety of leaf colors-from bright

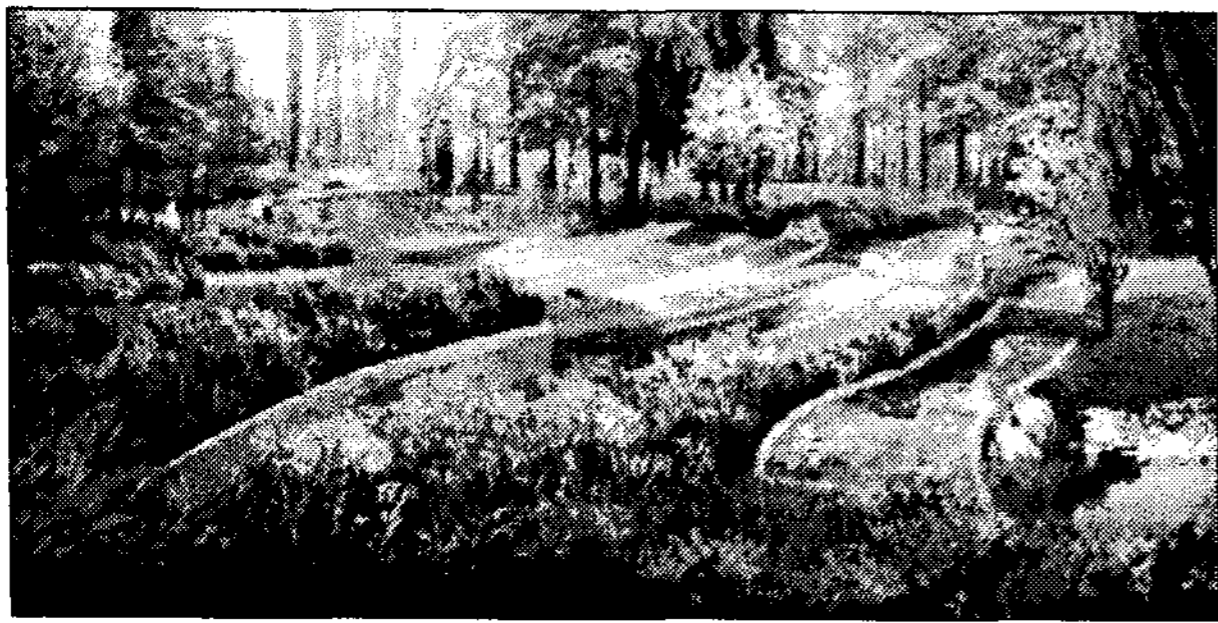


Figure 6. Perspective of Wetland

green to deep russet red. This chromatic range will intensify the summer landscape during the Olympic Games which will be held during the month of August. The two facing slopes will also frame the panoramic view of the lake when viewed from either the south entrance looking up toward the mountain or from atop the mountain peering down at the lake below.

The back slope of the mountain has a northerly aspect so species were selected that are winter hardy and will amplify the mountain scene. Trees such as linden, oak, mulberry and walnut are combined with conifers to create a mountainside atmosphere that can survive extreme winter conditions.

The wetland is a vital ecological water purification system as well as a rich visual environment of flowers and water. The wetland planting is divided into four plant zones: marsh, shallow water plants, submerged plants and mixed plant zones.

The marsh is located in the upper reaches of the water system. Primary communities of reed and cattail communities are augmented with primrose, iris, lotus, water hyacinth, arrowhead, loosestrife and other aquatic species.

The shallow-water plant zone is located at the northern part of the wetland where water flows slowly. Primary communities of salvinia and duckweed are augmented with associated plant species such as floating heart, water hyacinth and several species of lily.

The submerged plant zone is located in the ecological fish pond at the eastern side of the wetland. Species were selected that are used by fish and shrimp for food and shelter. Primary communities of potamogeton and vallisneria are augmented with associated plant species such as ditch crowfoot, hornwort and water moss. The mixed planting zone is located in the center of the wetland wildlife exhibition area. Several islands provide plants with generous and varied spaces

for growth. Plants are layered along the water's edge according to water depth zonations. Plants were also selected for their textural, aromatic and chromatic attributes and for the wildlife shelter and food source they provide.

Two eco-exercising areas are located in Olympic Forest Park—one on the west side and one on the east side. The western eco-exercising area is adjacent to residential neighborhoods and its facilities are coordinated with the entertainment need of the residents. A series of botanical park areas will provide seasonal interest. Yulan Magnolia Park, Peach Park, Peony Park and Crape Myrtle Park will concentrate species of flowers and shrubs with varieties and hybrids for scientific education and gathering places with beautiful plants.

The eastern eco-exercising area is located east of Beichen Road. This is an area where existing monocultural tree plantations, which are protected during construction of the park, will be supplemented with a buffer of conifers along the road and a variety of shrubs and perennials which will transform the monoculture plantations into colorful seasonal landscapes. The flood plain along the Yangshan Canal requires species that will thrive with periodic inundation of water. Wingnut, euonymus, dawn redwood, ash and willow were chosen because sufficient nursery stock was available for these species.

Wetland shrubs and perennials such as kerria, viburnum and lilac, enrich the landscape through layering and massing. The fishing area is adjacent to the main lake in an area that is renovated from the former Jade Park and which will be punctuated with several islands. The islands and nearby areas will be planted with collections of species that will dominate separate landscape areas. From north to south, these are the peach, crape myrtle, magnolia, lilac and crabapple. Along the western bank of the fishing area is a former residence which will remain. The area around the house will be planted with a grove of silk trees that will form a luxuriant shade garden.

The forest art exhibition is located on the former Wali Park which has many existing trees which are closely spaced and which provide a pleasant shade. The existing landscape is largely retained and only some shrubs and perennials are added to extend the planting pattern along the roadside. The forest art exhibition area is dedicated as a place for artists to work and to exhibit in an inspiring landscape. The area can also be used by tourists who can find shelter under the trees

in the popular summer and autumn camping seasons.

IV. Landscapes of the Northern Area of the Park

The northern area of the Olympic Forest Park is largely dedicated to an ecological nature reserve. It will become a regional source of seeds for native trees and a habitat patch that supports birds, small mammals, amphibians, reptiles and insects. Spaces for social activities are concentrated at the edges of the reserve. Large trees in this area have been preserved and they will be protected with groundcovers that will keep people from damaging their root and canopy structure. The ecological conditions at the construction area will be monitored for species that thrive without routine maintenance so as to identify species that can reduce long-term labor costs.

The gently sloping terrain of the northern area is less diverse than the southern area which has lakes and mountains. Nevertheless, there are a variety of planting areas that are determined by function and microtopography. The species selected for this area are those that thrive in the northern China plain and which will provide a diverse and formally variable forest: willow, pine, poplar, elm, sophora, toon, oak, dogwood, tamarisk, dawn redwood, ash, euonymus, mulberry, wingnut and pear. Demonstration areas for several unique native plants are also provided. The trees include *Tilia Mongolia*, *Tilia mandshurica*, *Catalpa bungei*, *Ulmus macrocarpa*, *Quercus dentata*, *Phellodendron amurense* and various species of *Rhus*. The shrubs and perennials include *Deutzia parviflora*, *Syringa villosa*, *Berberis poiretii*, *Lespedeza floribunda*, *Cotoneaster multiflorus*, *Lonicera coerulea*, *Lonicera chrysantha*, *Lonicera maximowiczii*, *Spiraea salicifolia*, *Spiraea japonica*, *Spiraea bumalda* and several species of *Hydrangea*. The native grasses and groundcovers include carex, dogbane, fiddleheads, cinquefoil, mock strawberry, yarrow, thyme, skullcap, violet, ground ivy, clematis, foxglove, blackberry lily, morning glory and ivy glorybind.

Roadsides and waterside areas are planned as forest belt transition areas. Here, shrubs and perennials are vertically layered and set back in ascending heights in order to ecologically structure the forest edges.

Large trees are allocated along the Fifth Ring Road to provide visual enclosure and landscape continuity between the

northern and southern areas of the park. The two roads that pass through the east and west respectively are designed as landscape valleys flowing through the forest by integrating the existing trees with new nursery stock and regional terrain renovations.

The riparian shelterbelt along the Qinghe River is augmented by shrubs with pendulous habits. Species such as yellow rose barberry, winter jasmine, false spirea, beautyberry and forsythia send cascading branches falling over the riverbanks.

The area next to the residential neighborhood is small botanical garden for social activity. The eastern part of this area is planted with spring-flowering shrubs and perennials. The seeds of a specially-selected hybrids and varieties of the Chinese flowering crabapple will be imported from the USA by the Beijing Botanical Garden to form the basis for this landscape. Hybrids and varieties will include 'Red Splendor', 'Pink Spire', 'Blazing Color', 'Flame', 'Doug' and 'Diamond.' The western part of this area will be an autumn landscape that celebrates the color of fall foliage and will be planted with ginkgo, purpleblow maple, golden raintree, various species of prunus, honeysuckle, and viburnum.

The garden management office area in the southeastern corner is characterized by large trees which are transplanted from the lake and mountain construction areas. Specimens and clumps of trees, including some ginkgoes, are placed here to highlight the autumn landscape. Perennials are planted at the margin of the forest and under the trees so as to enrich the color and gradation. Plants with different characteristics are distributed to the various management buildings to assist in identifying each building and to construct a landscape with a variety of textures and colors.

V. The Significance of Plant Communities in the Olympic Forest Park

The Olympic Forest Park will be, upon its completion, the largest manmade landscape and park in Beijing-the "green lung" of China's capital city. The quantity of plants in the park contributes to the regional environment and ecological quality of Beijing. In fulfilling its role as a model ecological project, the Olympic Forest Park project has incorporated in its design a plant seed bank through which a rich diversity of native plant species can be propagated. This green land will be significant for its protection of native species and recon-

struction of native vegetation. The forests and lakes will provide habitat for small mammals, birds, fish, and other fauna. Ecological construction technologies and scientific maintenance regimes will be used in the park and the experience gained in the application of these in the park will advance the recovery of Beijing's ecological environment.

A green land as large as the Olympic Forest Park will be beneficial to the improvement of the urban heat island effect, dust detention, noise pollution, water conservancy and will increase the oxygen and oxygen anion content of the air. The selection of plants with high leaf area indices and high WUE can produce fresh oxygen for the city, absorb carbon dioxide and release anion. In addition, the proper selection of plants will consume ecological resources at low levels while maximizing ecological benefits.

Diverse terrains and landforms such as hilltops, sloping banks, valleys, lakes, and wetlands integrate ecological forests with other landscape types and play a key role in sheltering the city from wind and sand. They temper humidity and temperature, increase storm water detention and hold precious rainwater. The favorable effects of the park will undoubtedly spill over to the surrounding area and lay an ecological foundation for safeguarding the city's ecology and promoting sustainable development.

In addition to the ecological benefits, the forests in the

Park provide people with an enjoyable place to experience natural environments. The southern forest will be developed into a landscape with areas for visitors to witness and participate in a natural environment. The northern forest will be used for a model education center and will have limited access to visitors so that the human pressure on the ecology is reduced.

The Park will continue to transform Beijing's urban environment, improve the quality of life for Beijingers and positively influence the regional ecology for future generations.

Biographies

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