

Plant Guide  
*Woodland  
Park  
Zoological  
Gardens*

*Washington Park Arboretum Bulletin* Volume 58:3 • \$5

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## Woodland Park Zoological Gardens

*This publication is dedicated to the outstanding gardeners, both professional and volunteer, who have transformed Woodland Park Zoo into a botanical as well as a zoological garden.*

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Woodland Park Zoological Society was founded in 1965 to assist the zoo with volunteers and financial support. A wide range of programs and activities has been undertaken that benefit Woodland Park Zoological Gardens. Today, the Society is the zoo's partner organization in marshalling public support for this nationally acclaimed attraction.

Woodland Park Zoo is committed to the goals of conservation, education, research, and recreation. It has received international acclaim for its naturalistic exhibits, species conservation efforts, and portrayal of major ecosystems from around the world.

For more information on zoo horticulture, visit the Elisabeth C. Miller Library, University of Washington Center for Urban Horticulture, 3501 NE 41st St., Seattle, WA 98195.

#### *Partners in Horticulture & Conservation*

The publishers of this guide are Washington Park Arboretum (a fund-raising arm of the University of Washington) in partnership with Woodland Park Zoological Society, Woodland Park Zoo's support organization.

The idea for this issue came from discussions with Sue Maloney Nicol, zoo horticulturist, a member of the editorial board of the *Washington Park Arboretum Bulletin*. The Washington Park Arboretum, Woodland Park Zoological Gardens, and Seattle Aquarium are the three public living museums of the Seattle Department of Parks and Recreation.

#### **How can I support the zoo's horticulture program?**

Donations to Woodland Park Zoological Society's Horticulture Fund are designated for all plant-related activities. Money in this fund helps support conservation projects as well as buying special rare plants, reference books, plant labels, and much more. Send donations to the Woodland Park Zoological Society Horticulture Fund, 601 N. 59th St., Seattle, WA 98103-5858.

# Welcome to the Garden of Animals... and Plants

Welcome to our garden. The Arboretum Foundation and Woodland Park Zoo have produced this guidebook as an issue of *Washington Park Arboretum Bulletin*, to explore the unique way the zoo has merged the plant and animal kingdoms into award-winning naturalistic exhibits.

The zoo exhibits create landscape habitats within animal displays instead of using concrete cages. This is the result of a type of urban horticulture, which started at Woodland Park Zoo in the late 1970s. At that time, the first naturalistic exhibits were designed by Jones and Jones, landscape architects. Since then, you have been able to experience savanna, tropical rain forest, and taiga without leaving Seattle's Woodland Park.

Use this guidebook as you tour the zoo. You will see how Seattle's mild climate allows zoo gardeners to use a wide variety of plant species to *emulate* exotic wildlife habitats. The Gorilla exhibit, for example, is created entirely outdoors using temperate plants that mimic a tropical rain forest.

Other exhibits, such as the Northern Trail, re-create the plant communities of south-central Alaska accurate to almost the last species.

Enter through the gates of Woodland Park Zoo into a unique green garden. Stately old trees planted during the early days of the twentieth century still tower over state-of-the-art exhibits. Quiet spots for picnicking are nestled amongst landscapes that immerse you in exotic natural worlds.

Let this plant guide accompany you on walks through the zoo to learn about the plant life among the animals. Come often to the zoo: You will be transported to regions of the earth where you can learn about the world's plants and animals without ever leaving Seattle.

*David Towne, Director*

*Sue Nicol, Grounds and Facilities Supervisor*

*Woodland Park Zoo*

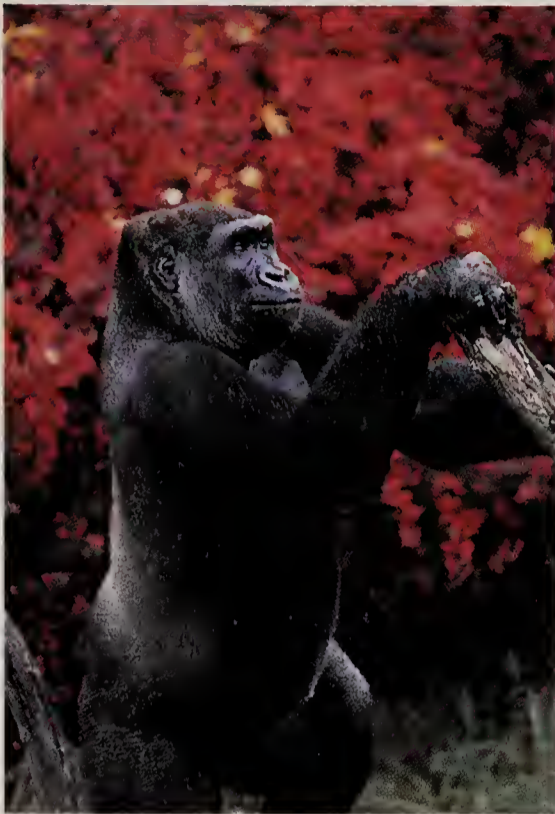


*Woodland Park  
Zoological Gardens  
Seattle, Washington*

# Plant Guide

## Woodland Park Zoological Gardens

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This guidebook is an issue of the *Washington Park Arboretum Bulletin*, published in cooperation with Woodland Park Zoological Gardens and Woodland Park Zoological Society.

**COVER:** Two siamangs swing through the Trail of Vines, in the Tropical Asia zone. Tree is *Liriodendron tulipifera*. Gerry Ellis.

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The Washington Park Arboretum is administered cooperatively between the University of Washington, its Center for Urban Horticulture (CUH), and the City of Seattle Department of Parks and Recreation. The programs and plant collections are a responsibility of CUH. The Arboretum Foundation is a non-profit organization that was chartered to further WPA development, projects, and programs through volunteer service and fund raising.

The Arboretum Foundation mission is to ensure stewardship for the Washington Park Arboretum, a Pacific Northwest treasure, and to provide horticultural leadership for the region. This stewardship requires effective leadership, stable funding, and broad public support.

The Washington Park Arboretum is a living plant museum emphasizing trees and shrubs hardy in the maritime Pacific Northwest. Plant collections are selected and arranged to display their beauty and function in urban landscapes, to demonstrate their natural ecology and diversity, and to conserve important species and cultivated varieties for the future. The Arboretum serves the public, students at all levels, naturalists, gardeners, and nursery and land-



TOP: Flaming red *Berberis thunbergii* 'Atropurpurea' is a backdrop to the gorilla. Carol Beach. MIDDLE: Peeking through the *Pinus densiflora* is a red panda. Woodland Park Zoo. BOTTOM: Vines against artificial buttress tree in the Trail of Vines. David Selk.

# Crossing the Zoo Boundary

by David Hancocks

When I became director of Woodland Park Zoo in the early 1970s, I noticed that Parks maintenance crews, like itinerant barbers, descended each month with clippers, mowers, and rakes to give everything a crew cut: They came, they clipped, they quit. Zoo keepers tended the few plants that survived, usually inside certain animal enclosures. This situation was not aesthetically appealing. Philosophically, it was unacceptable.



A young gorilla in one of the original zoo exhibits: a concrete cage. *Woodland Park Zoo.*

We wanted to create exhibits in which simulated wild landscapes flowed across boundaries of the animal enclosures, so that both zoo visitors and zoo animals shared the same type of environment. The term for this design technique, “landscape immersion,” was coined by landscape architect Grant Jones, senior partner of Jones & Jones, Seattle, and is now universally used. To achieve this, we had to develop expertise in plant maintenance beyond that which we had.

Historically, zoos have presented their animal collections in taxonomic groupings, segregated by genus or species. This is an artifact of the eighteenth and nineteenth century way of looking at nature; it is why zoo visitors traditionally had to go to one part of the zoo to view all the bears, then to other parts separately to see pachyderms, monkeys, birds, reptiles, and so on. Taxonomy is the most convenient way to maintain a living collection but is of no value in depicting animals in their habitats.

The other type of zoo layout is done occasionally, in which animals are arranged according to their continents of origin: zoogeo-



The lowland gorillas of the Tropical Rain Forest are surrounded by plants that simulate their original environment. *Gerry Ellis.*

graphic zoning. Toronto Zoo is the largest modern example. Again, such displays tell nothing about the natural homes of animals. In such a zoo’s South America zone, for example, you might find llamas, which are mountain animals, living with tapirs, which are forest dwellers, living with mara, which are plains animals. This arrangement doesn’t make sense.

The inadequacy of arranging animals by continent is revealed as soon as plants are added to the exhibit. Traditionally, zoos have only presented plants as decorative backdrops, inconsequential to animals. But to tell visitors something about animals other than what they look like — especially to tell some-

thing about behaviors and habitats — zoo plants must become as important as animals.

Faced with an exhibit containing South American llamas, tapirs, and maras, a zoo would need to decide what plants can represent their homes.

*“Traditionally, zoos have only presented plants as decorative backdrops, inconsequential to animals.”*



Should species be used from mountain, plains, or forest? As long as zoos persist in focusing on nothing but animals, they avoid this dilemma and thus fail to see its inadequacies.

The names we give to things dictate what we expect of them. In zoological gardens, for example, we confine activities to matters zoological. So, when I went before the Seattle City Council in the mid-1970s to request funding for horticulturists, several Council members found it incomprehensible. One of them asked, “Why do you want horticulturists? You’re a zoo!”

Several other zoos have had gardeners on staff for many years. In Europe, especially, there is a long tradition of presenting immaculate, colorful flower beds as part of the zoological gardens. But Seattle wanted to be among the first where horticulturists played an integral role in shaping the landscape—where as much attention was devoted to plants as to animals in creating naturalistic replicas of wild habitats for both people and animals. After a lot of lobbying we got our first horticulturist. Fortuitously, we started with one of the world’s best, Sue Maloney Nicol.

Grant Jones is as much a poet as a landscape architect. He not only coined the term “landscape immersion,” he also introduced me to the concept behind it. I once asked Grant if we could lay out Woodland Park Zoo to display all animals in their natural surroundings—pine forests, grasslands, and so on; in effect, if we could display animals along with flora representing their native climates. “Ah,” he said. “You mean bioclimatic zoning!” “Oh,” I said. “Do I?”

Jones & Jones prepared a long-range plan for Woodland Park Zoo in 1974. The plan called for the zoo to develop bioclimatic zones to demonstrate the relationship between climate and living matter. This new way of creat-

ing a zoo had never before been attempted.

At Woodland Park, the bioclimatic zones selected for replication are the ones you see today: savanna, tropical rain forest, temperate forest, steppe, taiga, and temperate forest montane—a very wide range. Ideally, we would have limited the scope, especially to conform to local climatic conditions. However, we had to fit the concept around the existing collection of animals, most of which came from tropical rain forests.

Grant Jones and I toured the Puget Sound region looking for plants with the appropriate look and character for tropical rainforest exhibits. “Simulators,” he called them. We scoured Washington Park Arboretum, parks, private gardens, roadsides, and vacant lots. This yielded a gratifyingly diverse number of species that would grow in Seattle yet resemble foreign plants we wanted to represent.

At first, however, the creation of naturalistic landscapes in Woodland Park Zoo almost back-fired. People were not used to seeing wild landscapes there. When visitors wrote to the City Council complaining that the zoo was looking unkempt, I was afraid that funding for our horticulturists was in jeopardy. We had to install signs saying, “These Are Not Weeds!” Fortunately, enough Seattle residents under-

stood and liked the change.

Woodland Park Zoo now has many and various simulated habitats that allow visitors to gain a better understanding of the natural environments in which the

*“Zoo horticulture is still a new profession, mainly confined to institutions in North America.”*



animals evolved and thrive. In addition, however, we recently have become aware of the need for natural history institutions, such as zoological and botanical gardens, to become more directly and actively involved in conservation. This creates an abundance of serious problems.

Zoos, for example, are set up principally for exhibition. Conservation centers, however, require lots of spaces for holding optimum numbers of pairs or groups, and these are just not available in a zoo. Some zoos are making good progress in breeding and conserving some endangered species; there are about 70

species survival programs in a coordinated effort nationwide. But the species receiving attention are, almost without exception, the charismatic animals such as large predators that are more important to zoos than to

*“Plants and animals are interdependent, a fact rarely revealed in zoological or botanical gardens...”*



nature. In the wild, it is typically the little things such as insects and arthropods that have the greatest biomass, that are most important, and run the world. Zoos, however, typically ignore these small life forms, as they do botanical life forms.

Plants and animals are interdependent, a fact rarely revealed in zoological or botanical gardens, which highlights the widespread need to understand this basic phenomenon and its vital importance. Plants and animals are also being lost at an accelerating rate, often by linked extinctions in which one species disappears because a plant or animal important to its survival has gone.

One thing zoos can do about the threat of extinction is to upgrade the status of their horticultural efforts: Every zoo should have a curator of botany. This would greatly help the more accurate development of habitat exhibits. Another obvious endeavor would be for zoos, despite the limiting factor of their name, to become involved in plant conservation, if at no other level than education and the dissemination of knowledge. This is where we run into a fundamental dilemma.

Today, many zoos are pursuing landscape immersion exhibits and replicating the images of natural habitats with simulator plants or, sadly, with concrete and plastic trees. To go beyond this step and do what zoos should be doing with animals, anyway—accurately interpreting the plants, their evolutionary tactics, and the role plants play within their ecosystems—means growing and maintaining authentic species. For most of the world's zoos that is simply impossible. Even Seattle, with its mild and wonderful growing climate, cannot sustain enough diversity to do that.

The best way to conserve species would be to develop a center or “garden” to not only show the beauty of nature but to interpret its

complexity to ever increasingly urbanized audiences. Such a center would reveal the importance of ecosystems and the connections between all living things and, most importantly, explain how we all can do something about conserving nature. This requires inventing something different from a zoo or an arboretum — a Garden of Ecology.

It would not be sensible, however, for such a garden to try to maintain living things from all over the world. It is true that exotic animals and plants from all of the planet's biomes are represented in zoos and botanical gardens nationwide, in climate-conditioned buildings. The expense, however, is enormous and is not, I believe, justifiable. There is a simpler, more useful approach.

The best solution is for gardens of ecology to focus on regional interpretations; for Seattle, that would mean Cascadia. In such a garden, native plants and animals could be maintained and displayed together, with minimal cost and maximum effectiveness. Here, the total richness of natural ecosystems could be interpreted fully. Visitors would better understand the diversity and complexity of the world around them. Conservation messages would be brought home, direct and meaningful.

Zoo horticulture is still a new profession, mainly confined to institutions in North America. It has grown well during its short life and brought immeasurable benefits to zoos. Perhaps its greatest and most enduring contribution, however, will be the following: By introducing horticulture into the zoo the basic flaw in the zoo concept is revealed and brings into our field of vision the possibility for the next evolutionary leap by zoological gardens — their transformation into ecological gardens.

*“...the next evolutionary leap by zoological gardens—their transformation into ecological gardens.”*



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David Hancocks is former director of Woodland Park Zoo. He currently is executive director of Arizona-Sonora Desert Museum, a living museum in Tucson, Arizona.

# Travel the African Savanna

by David Selk

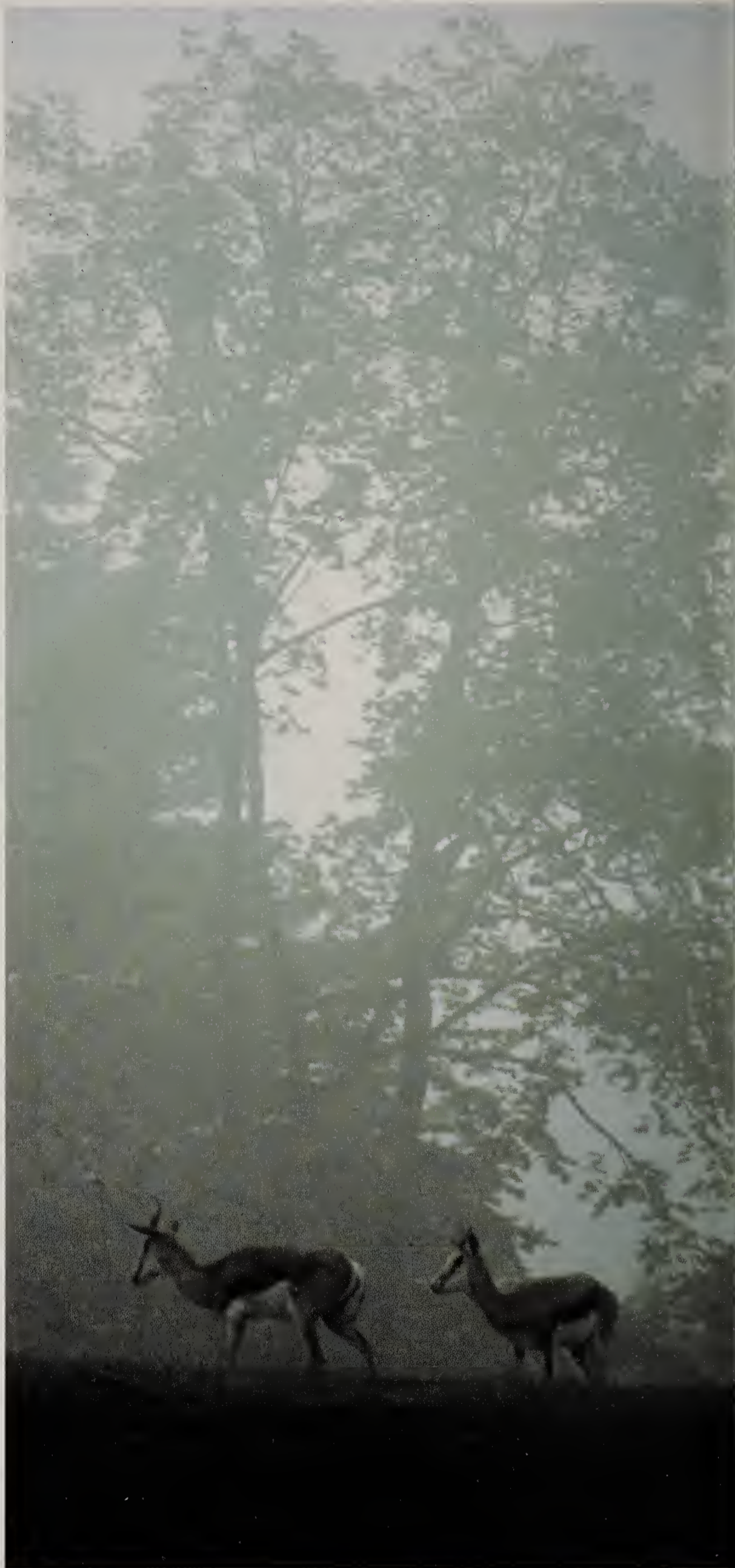
You are walking down a dusty path of red soil, surrounded by dry grasses and thorny bushes. You come to a refreshing water hole, and up rise two huge heads. Hippo! You raise your eyes to look past them and just ahead are herds of zebra, giraffe, and springbok. To the left, weaver birds in a grove of thorn trees busily create pendulous homes from dried grass. From off to your right comes the roar of a lion answered by another. Welcome to Africa?

Welcome to Woodland Park Zoo's African Savanna. Most people will never be able to travel to Africa and see these animals in their native habitat, but here in Seattle you can come as close as you can get to experience the thrill of that part of the world.

Some may think of a savanna as a flat, treeless grassland. That is certainly true, but it is also more complex than that.

Savannas have vast stretches of open grassland, and on the edges are many types of deciduous, semi-deciduous, and evergreen woodlands; scrubby bushlands; grasslands; and combinations of all of these. There are even wetlands. The plant communities mix various degrees of density and height, depending mostly on rainfall.

The zoo's savanna emphasizes animals. To see them in their habitat, however, the savanna habitat needs plants. Although most African savanna plants cannot be grown outdoors in Seattle because of Northwest winters, the zoo has planted trees, shrubs, and grasses to simulate the look and feel of such plants. As you go, you will learn about the savanna habitat and the fascinating adaptations plants have developed to flourish there.



# Touring the Savanna

Start at the public pathway around the savanna. It runs between two of the plant communities—the open grassland, where you will view many of the animals, and the scattered woodland edge. The individual plants discussed appear many times along the savanna path, and you will find many of them on the map.

## Plants Challenged by Water

Many challenges face plants on the African savanna, and they have many strategies to cope with these challenges. Water is one of the critical limiting factors in that climate. Months can pass with no rain and very high temperatures.

Plants have many adaptations to prevent water loss, and savanna plants incorporate most of them. One common adaptation is to develop a thick and waxy or leathery cuticle, which minimizes water loss through the leaf surface. You can see this demonstrated throughout the savanna in broad-leaved evergreen plants such as thorny elaeagnus (*Elaeagnus pungens*) and silk-tassel bush (*Garrya elliptica*). Wintergreen barberry (*Berberis julianae*) also has a thick cuticle as well as thorns that serve as added protection against browsing. Good examples of thorny elaeagnus are at the hippo viewpoints. The silk-tassel bush is south of the giraffe house, and the wintergreen barberry can be seen near the west patas monkey viewpoint.

Another way to reduce water loss is by reflecting the strong equatorial sun. Plants do this by developing leaves with light coloration. In African forest margin areas you can find native olives (*Olea* spp.) that have dull gray-green leaves with an almost white underside. On the zoo's savanna you will see good simulations of this with Russian olive (*Elaeagnus angustifolia*), which is near the lion overlook across from the Patas monkeys, and with autumn elaeagnus (*E. umbellata*) in the area behind the Jimi Hendrix Memorial.

## Prickly Situations

During times of drought, most of the savanna's water is stored in plants, so herbivores will be trying to get at all that water and nutritious food. Plants have developed ways to



Giraffes of the savanna eat hay from bags in a dead tree, which allows them to eat at the normal level without damaging existing trees. OPPOSITE PAGE: Springboks in the elms. *Woodland Park Zoo.*

minimize being eaten; one way is to modify branches into thorns. This is very common in African savannas, and probably the best-known examples are the acacias. At least thirteen species of acacia trees and several small bushy species are found in Serengeti National Park alone.

Acacia thorns often stick out farther than their small leaves. On the zoo's savanna the black locust (*Robinia pseudoacacia*) substitutes for acacia. Even its scientific name gives a hint as to how similar the locust is to acacias. Both are large woody members of the Pea family (Leguminosae) and have thorns, a pod for fruit, and compound leaves, which reduce surface area and water loss through the leaves.

## Fire for Plant Health

The locust trees are scattered throughout the savanna, but the best and most interesting example dominates the lion exhibit and can be



LEFT: Black locust are used here to simulate African acacias. Toxic trees such as these can only be used in an exhibit of carnivorous animals such as the lions. Sue Nicol. ABOVE: Dried grass goes into the weaver bird's nest. Woodland Park Zoo. BELOW: Another acacia simulator, *Phellodendron amurense*, frames the view across the hippo pond to the savanna.

seen from many parts of the zoo. The large center section that has died gives it a very natural, authentic look and is purposely kept as it is. Notice the thick, corky bark on this tree. This represents a way to withstand fires that periodically race through savannas. Inside the rail at the hippo viewpoints are more examples of fire resistance. These trees (*Phellodendron amurense*) have glossy compound leaves and a thick, corky bark.

Periodic fire plays a very important role in the vitality of many plant communities, and this is especially true in grasslands such as the savanna. Fire keeps woody plants from encroaching into the open grasslands and releases vital nutrients back into the soil. It also rids the ground layer of old dried grass allowing light to penetrate to the new shoots.

### Plants Defend Themselves from Animals

Several other examples of both compound leaves and thorns grow on the savanna. As you are standing at the Patas monkey viewpoint, notice the tree with the large compound leaves and very spiny trunk and branches. This is a Japanese angelica tree (*Aralia elata*), which is



a good example of defense with spines, even on the leaf stalk.

Other examples of thorny trees are the hawthorns. You will notice two dominant species as you walk around the savanna; they can be seen together on the path just south of the giraffe barn and are easily distinguished by their habit. The Carriere hawthorn (*Crataegus × lavalleyi* 'Carrierei') is more upright, usually with a single trunk and large, leathery, dark green leaves. The cockspur thorn (*Crataegus crus-galli*) is a wide-spreading, multi-stemmed tree with glossy green leaves and vicious three-inch thorns.

Shrubs also need protection from browsing, and a good representation of this is the



Zebras graze on pasture grasses planted to simulate savanna grasslands. Russian olive is in the background. Woodland Park Zoo.

Spanish broom (*Genista hispanica*). See it just west of the patas monkey viewpoint. This reduced leaf size also shows an adaptation to limit water loss. The leaves are so small that most of the photosynthesis is done through the green stems.

### Water!

Water isn't always in short supply on the African savanna. Rivers and lakes can be found scattered throughout, and there you will sometimes find hipopotamus. The northeast corner of the savanna has seasonal wet areas and a permanent pool where hippo and African waterfowl are found. The large compound leaves and exotic look of staghorn sumac (*Rhus typhina*) along the east side of the savanna give a lush feel to this area. East of the hippo viewpoints are water-loving plants to enhance this feeling of a cool, wet spot in the often dry savanna.

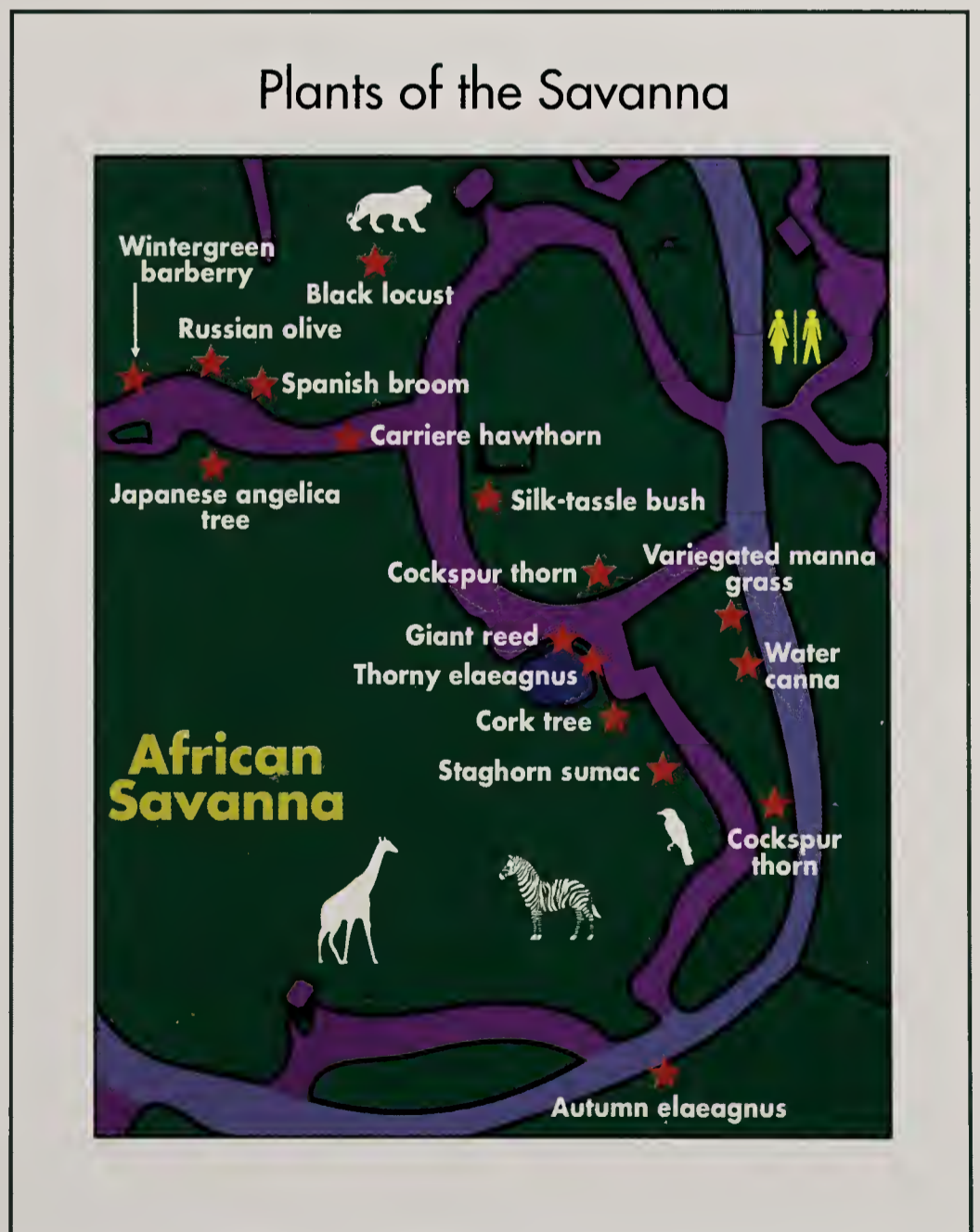
One water-loving plant is a clump of the tall bamboo-looking giant reed, *Arundo donax*. This grass can get up to eighteen feet tall, and in parts of the world where it is common, its stems are used for fence material and musical

instruments. Another is water canna, *Thalia dealbata*, which can grow to ten feet and blooms with pale blue flowers in summer. Also look at the manna grass (*Glycera maxima* 'Variegata'), a creeping perennial grass that has striking green- and cream-striped foliage.

As you walk through the African Savanna exhibit, enjoy the amazing wildlife you see. They represent a significant ecosystem in a spectacular part of the world. But take the time to experience all this exhibit has to offer. The glare from the summer sun off the dry grasses might make you squint. Listen to the zebra calling and the lions roaring. Stop and feel the thick leaves of the thorny elaeagnus and the formidable thorns of the hawthorn. As you walk the paths, notice the smell of the red dust from the dry soil. When you look across the wide grassland at the herds, monkeys, birds, or lions, you are not just looking at wild savanna animals and plants that simulate their native flora—you are in Africa.

David Selk is a horticulturist on the zoo staff.

*The African Savanna won the 1991 Exhibit Award presented by the American Zoo and Aquarium Association.*



# Experience the Tropical Rain Forest

by David Selk

Tropical forests cover only six percent of the earth's land surface yet hold two-thirds of all plant species. They have more diversity of species and more complex relationships than any other bioclimatic zone on earth.



UPPER LEFT: *Paphiopedilum barbatum*, an endangered orchid. LOWER LEFT: Ring-tailed lemur eats haws from a hawthorn. *Karen Anderson*. UPPER RIGHT: Poison dart frogs deposit their eggs in water stored in bromeliad rosettes. *Woodland Park Zoo*. LOWER RIGHT: *Neoregelia*, a bromeliad, holds water and is a life-support system for birds, reptiles, amphibians, insects, and mammals. *Karen Anderson*.



UPPER LEFT: Epiphytes grow on the branches of an artificial tree in the rainforest canopy. *Karen Anderson*. UPPER RIGHT: The Canopy exhibit is a free-flight aviary. *Thunbergia grandiflora* grows near staghorn fern. *Carol Beach*. MIDDLE LEFT: Children enjoy opening day of the Tropical Rain Forest. Asian ferns are planted on the wall behind them. *Carol Beach*. LOWER RIGHT: Wrinkled hornbills are cavity nesters. Here a female examines the cavity of an artificial tree. *Ian Dewar*. BOTTOM: Live plants and animals intermingle with an artificial stilt-root palm and an artificial tree of the forest floor. *Karen Anderson*.



Dark areas indicate the world's tropical rainforest zones.

All of the significant rain forests have equatorial climates, which is the key to their diversity. They sustain relatively constant temperatures and high rainfall throughout the year, due to ocean currents and prevailing winds. Being on the equator, they are not subject to devastating climatic shifts, such as glaciation, and in some regions have evolved unimpeded for more than seventy million years.

The earth's three major tropical rain forests are spread over three continents: Africa, Asia, and South/Central America. In Africa, a large rain forest is centered on the Zaire River basin and continues west through Cameroon to Liberia. In southeast Asia, rain forests extend from the northeast coast of Australia through Indonesia, Malaysia and the Philippines, and into Thailand. The largest rainforest region is known as the neotropics: the Amazon Basin of South America, reaching north through Central America to eastern Mexico and parts of the West Indies.

## Enter the Tropics

**I**t's hot in here!" You will hear this often as children enter the vestibule of the Tropical Rain Forest exhibit at Woodland Park Zoo. Yes, it is hot... and humid...and there's water dripping all over. It feels, well, tropical.

### The Entry Vestibule

The entry vestibule has no animals in it, but here you can acclimate to the warmth and humidity of the exhibit. More importantly, the vestibule introduces the rich diversity of tropical plants and the prominent role they play in our everyday lives. Many tropical plants are used by native peoples for medicinal purposes; important medicines used by Western society also have their origins in tropical species. The potential is enormous for further uses of these plants, from food to pharmaceuticals, but each day the likelihood diminishes as tropical rain forests are destroyed and rich ethnobotanical knowledge about their uses are lost.

Immediately to your left is a shiny-leafed

coffee tree (*Coffea arabica*). To your right, leaning over the pond, is a small tree with large, leathery, simple twelve-inch leaves. This is cacao (*Theobroma cacao*) whose fermented and roasted seeds are the source of chocolate. Below the cacao is a vine with small heart-shaped leaves growing on the large trunk of a fallen tree — pepper (*Piper nigrum*), which yields black pepper from the unripe fruit. Behind and to the left of the pepper are the large leaves of the banana (*Musa* spp.), which originated in the Old World tropics. Other plants in the vestibule important to humans are papaya (*Papaya carica*), vanilla (*Vanilla planifolia*, the fruit of an orchid), and tapioca (*Manihot esculenta*).

Overhead, notice branches that have plants growing on them, known as epiphytes. Though epiphytes grow on other plants, they do not take nourishment from them. Most of the epiphytes in this area are of two families. The ones with stiff leaves coming from a center rosette are bromeliads. The others with shinier leaves are orchids. In the tropics, many other plants have taken to the trees, including numerous ferns, pitcher plants, and rhododendrons.

### The Exhibit

Next, go through the doors to the main exhibit. Tropical rain forests support organisms growing in many microhabitats. This results in complex, floristic diversity and a distinct layering of the forest. The different forest layers blend into each other but are often conveniently referred to as forest floor, understory, and canopy. The Tropical Rain Forest exhibit is exactly this way.

#### *Start on the Forest Floor*

Enter the main exhibit on the forest floor. Very little light penetrates to the forest floor, so plant life is sporadic. What you will see are scattered woody and herbaceous plants as well as trunks of trees extending far up into the canopy.

Immediately to your left is an artificial strangler fig (*Ficus* sp.), which houses the leaf-cutter ant exhibit. Strangler figs often start as epiphytes and then extend their roots to the ground as they grow. They eventually encircle the host tree, choking it off to light and new growth—hence the name “strangler.” Live strangler figs of the species *Ficus aurea* can be

found in the entry vestibule where they are still well-behaved. Strangler figs are commonly found in rain forests, and their fruit is relished by any number of animal species, such as the toucans, who then act as important “seed dispersers.”

At this level, the first two exhibits are separated by an artificial tree representing *Ceiba pentandra*. It has many large flanges extending from the trunks, known as buttress roots, which are vital to the tree’s ability to stand up. Because of the high level of biological activity, tropical soils never have the chance to build up in depth or nutrition. Buttresses allow the tree to extend its roots farther, thus having access to more food as well as support in the dense, shallow soil.

Another way plants overcome the problem of low light is to attach to tall straight trunks and climb to light as vines do. Woody vines, known as lianas, are abundant in the tropics, and you will see them throughout this building. In lowland rain forests, one in six species are climbers. Philodendron is a well-known example, and most of these exhibits have them taking advantage of tree trunks.

Climbing the back wall of the Sunbittern exhibit is a vine with spotted, heart-shaped leaves, *Piper crocatum*. Behind you, hanging down from the window top of the Ocelot exhibit, are the aerial roots of the curtain vine, *Cissus sicyoides*.

An important timber tree of neotropical forests grows in the center of the Ocelot exhibit. Mahogany (*Swietenia mahagoni*) is native to the West Indies. Recognize it by the pinnately compound leaves, arranged along a central axis like a feather. This species has largely been replaced as a source of timber by *Swietenia macrophylla*, which is much more widespread in lowland tropical America. Because of its timber value, mahogany has been completely harvested from large parts of its natural range.

Further along on the left, find an exhibit situated between the plush-crested jays and the emerald tree boas. In the future this exhibit will display many plant/insect coadaptations, but currently it is dedicated to orchids.

Orchids comprise the largest plant family (Orchidaceae) on the planet, with at least 25,000 species. Most of them are epiphytes and have developed incredible adaptations.

Certain orchids go so far as to have flowers that mimic female insect species in order to trick the male to pollinate it. Others, such as some species of *Dracula*, mimic fungi that attract gnats, which then serve as pollinators. Many tropical orchids have evolved to attract very specific pollinators; for example, a single bee species. In turn, that species of bee depends on the specific orchid species to provide food. These strategies have led to fantastic diversity, yet such adaptations also make them vulnerable when their habitat is disturbed. If either one is destroyed, the other also disappears. This is known as “linked extinction.”

### *Move to the Understory*

At the boardwalk, you enter the understory. At this level of the rain forest, the larger trees start branching out and more light penetrates. Here, branches and tree trunks are not only highways for animals but a great place for plants to grow as well. Also, you will see more epiphytes, such as many of the bromeliads. In the tropics, there is enough rain and humidity that if a plant has a thickened cuticle, as bromeliads do, it can do very well by attaching itself to a tree branch.

The Bromeliad family, with more than two thousand species, has a long history of coevolution with animals in the tropics. For an example, look at the poison dart frog display. The frogs climb trees and deposit their eggs in the water stored in bromeliad rosettes; there the eggs hatch and tadpoles mature. But the frogs are not alone in their use of these plants. Entire mini-ecosystems exist here, supporting spiders, insects, mollusks, and even crabs. Since bromeliads hold water in their cups, they are seen as arboreal water holes visited by lizards, snakes, mice, and monkeys. Predators hide to prey on the creatures who stop to drink. Near the top of the boardwalk, the tanager display is a lush example of a bromeliad community that covers branches. Look into the rosettes and watch the tanagers come for a drink from time to time.

### *Reach the Rainforest Canopy*

Next, go through the glass doors and enter the world of the rainforest canopy of Southeast Asia. Here you are on a boardwalk at tree-top level. Many plants and animals spend their

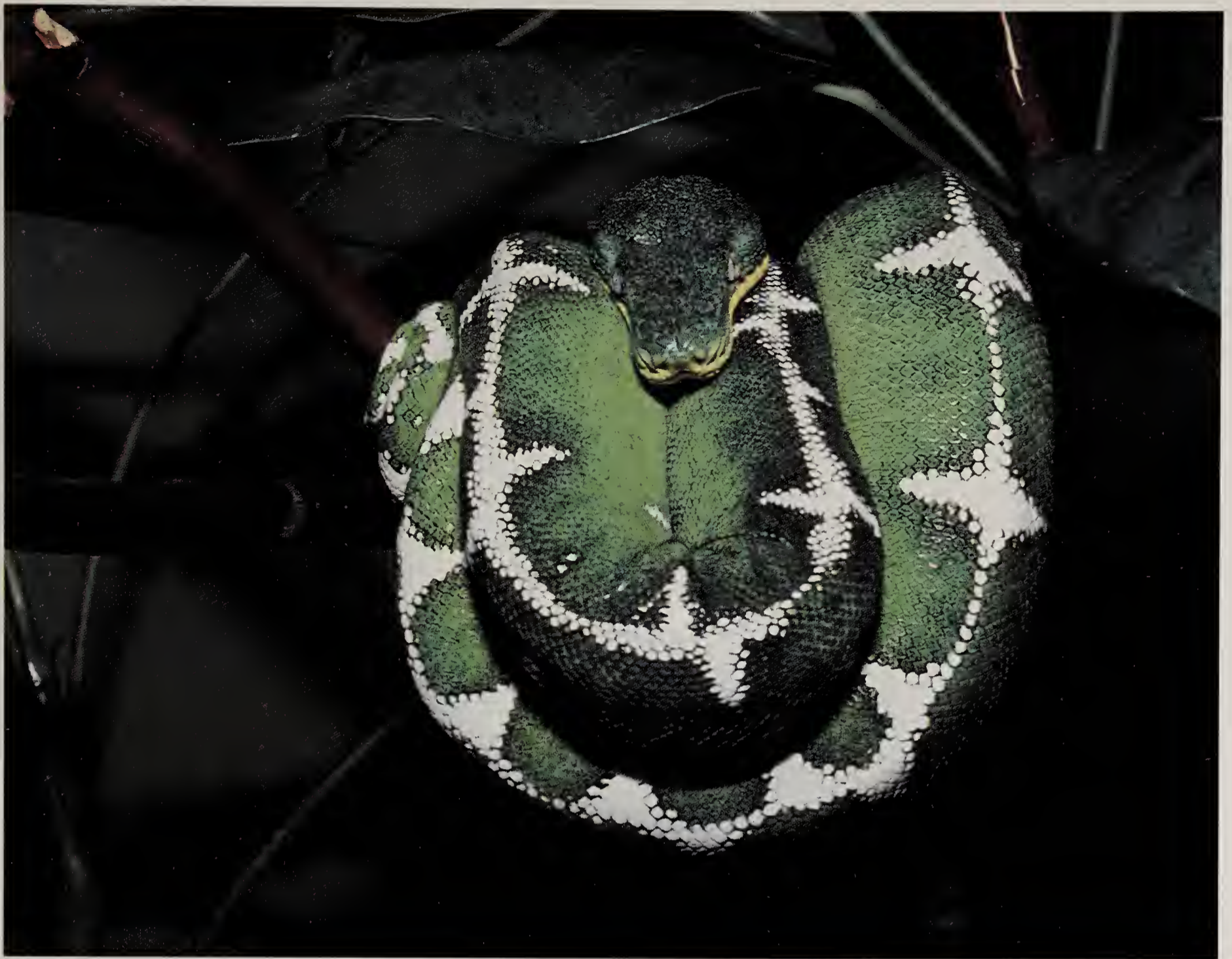
entire lives up here. The eleven bird species in this exhibit represent birds native to the rain forests of Southeast Asia. Included are fairy bluebird, lesser green broadbill, gold crested mynah, red-billed leiothrix, Victoria crowned pigeons, and others.

Notice at this level that the trees have spread out to take advantage of high light levels, and many vines and epiphytes have found their way up here for the same reason. For example, take a look at the heart-shaped leaves of the large *Hibiscus tiliaceus* leaning over your head from the left. Often, leaves of tropical plants such as this one are leathery with a thick cuticle. Here in the rain forest there is so much water and humidity that thick cuticles help prevent bacteria and fungi from invading the plant tissue. This leaf is also a good example of how plants shed excess water. The leaf margin is smooth and not jagged, so droplets don't accumulate on the edges. Instead, moisture goes directly to the exaggerated drip tip where water is easily shed.

Look up on the planted walls, where you will see a never-ending variety of forms, colors, and textures. In places, you will notice sections of cane-like stalks with long, pointed leaves, such as those growing in front of the windows to your left. These are members of the Ginger family (*Zingiberaceae*). Several genera of ginger have many commercial uses including spices, condiments, dyes, perfumes, and medicines. Included in this collection is the common cooking ginger (*Zingiber officinale*) from southeast Asia, cardamom (*Elettaria cardamomum*) from India, and red ginger (*Alpinia purpurata*), native to the Pacific Islands and common to US flower shops.

On the large tree arching over the center of the boardwalk are some very unusual examples of ferns. Ferns are part of a highly diverse group of plants in the tropics.

One interesting genus of fern has wide, leathery fronds that often branch to look like the antlers of a deer. They are known as staghorn ferns (*Platycerium* spp.), all of which are epiphytes. Staghorn ferns have two types of fronds, sterile ones that are roundish and serve to hold the plant to the tree, and fertile ones that usually branch and give these ferns their name. Look on the underside of the frond, and find dense, brown patches. These are the sporangia, the reproductive part of the



Leaves of philodendron, which is native to the neotropics, camouflage an emerald tree boa in the Tropical Rain Forest's understory. *Woodland Park Zoo.*

fern. Around the planted wall are located many genera of ferns, such as *Adiantum*, *Pellaea*, and *Blechnum*, that have counterparts such as maidenhair fern and deer fern in the Northwest.

Walk to the center of the boardwalk. Several species represented here in the Asian canopy are on the endangered species list. Look straight up at the large tree branch extending over your head for an epiphyte with a stout stem enveloped by the base of closely spaced, opposite-laying leaves that are hanging down towards you. This is the endangered *Vanda coerulea*, a beautiful blue-flowering orchid from Burma and Thailand.

Several species of tropical pitcher plant (*Nepenthes* spp.) are also endangered. To your left, one is climbing the trunk of the tree. Note its leathery leaves with elongated midrib curled into a tendril. Some of these tendrils will develop into water-holding pitchers that lure and entrap insects and occasionally small

vertebrates, which the plants digest to supplement their nutrition. Many tropical pitcher plants live only on single islands in Southeast Asia, so they are very vulnerable to extinction.

Tropical rain forests are extremely diverse and unendingly complex ecosystems. Because of this diversity, they are vitally important sources of foods, medicines, and other products that we use every day. Even more so they are indispensable sources of biodiversity—biological and cultural knowledge that needs to be retained. This exhibit gives you a taste of the richness tropical rain forests contribute to life on this planet.

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David Selk is a horticulturist on the zoo staff.

*The Tropical Rainforest received the 1993 Exhibit Award presented by the American Zoo and Aquarium Association.*

# Zoo Bamboo

by James Clever

The Woodland Park Zoo's bamboo collection is probably one of the largest in the Pacific Northwest. Over 40 species, both temperate and tropical, are grown in the exhibits and surrounding areas. Everyone knows that giant pandas love the fresh-cut canes, with their branches full of tasty leaves. At the zoo, other bamboo-eaters include red pandas, gorillas, orangutans, siamangs, macaques, and elephants.

In addition to a food source, bamboos play other important roles within the zoo's ecosystem. They help create natural and simulated habitats by screening off one exhibit from another; define access paths, roads, and maintenance work areas; and provide ornamental growth around many buildings.

Even though bamboo can be seen in many areas, the most impressive plantings can be viewed in three exhibits: the Elephant Forest, Trail of Vines, and the Tropical Rain Forest.

## Bamboos of the Tropical Rain Forest

In the Tropical Rain Forest exhibit, you will see only one tropical bamboo growing in the main building but a variety growing along the outdoor pathways. All of these plantings help give the feeling of being in a very special place.

Once you have walked through the entrance of the building, follow the rainforest trail to the canopy.

Near the exit, look for one of the most beautiful bamboo species, *Bambusa vulgaris*

'Vittata'. This Southeast Asian timber bamboo has bright yellow canes marked by broad to narrow green vertical stripes.

Just outside the canopy's west windows behind the *Bambusa vulgaris* 'Vittata' is a temperate bamboo, *Phyllostachys viridis* 'Robert Young', with bright yellow canes and green stripes; it gives the appearance of continuing the landscape from the exterior to the interior.

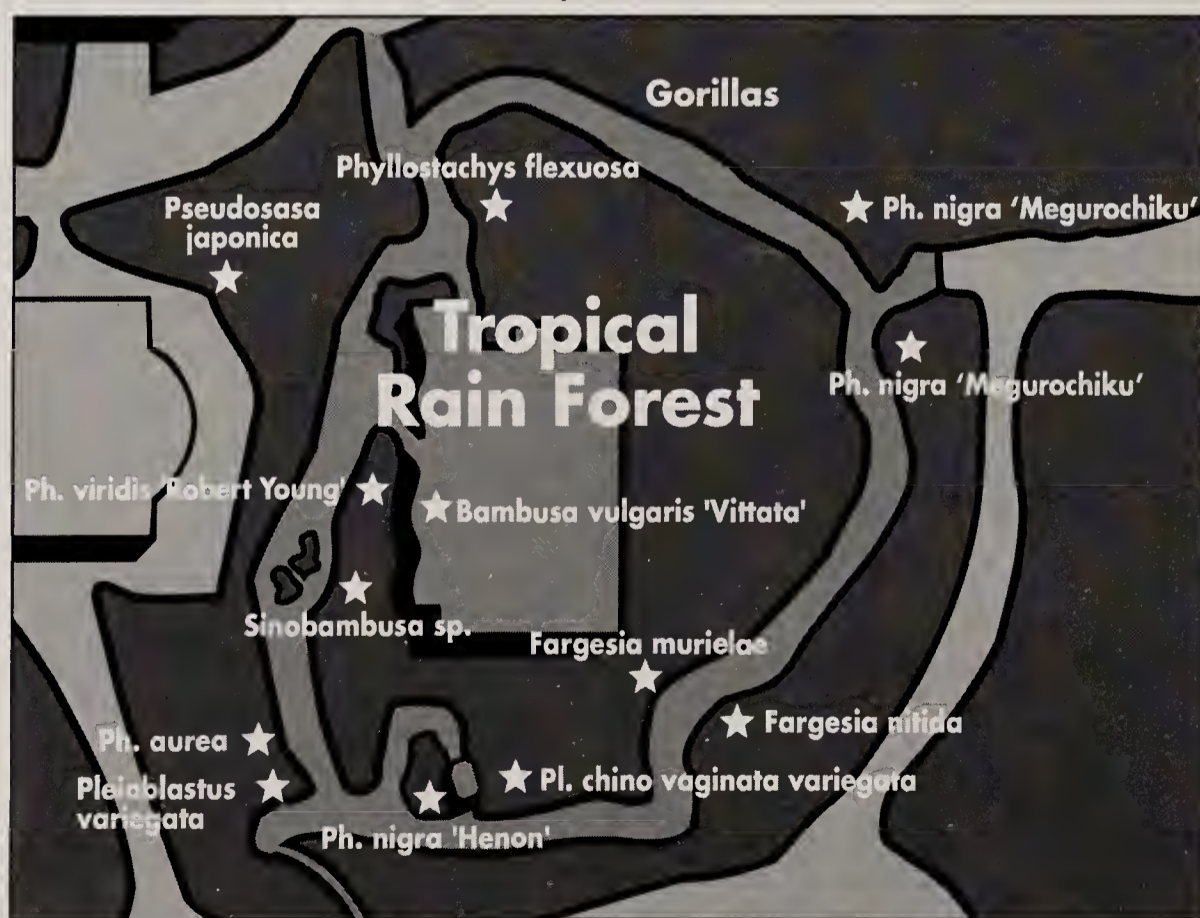
Exit the building. Stay to the left, and follow the path across the bridge. On the right, you will see golden bamboo (*Phyllostachys aurea*), which is common to the Northwest and to the rest of the US. The gold-toned canes with sev-

eral short internodes make excellent fishing pole handles.

Continue down the path, and on the right, next to the south De-Brazza viewpoint, is a small planting of *Pleioblastus variegata* (dwarf white stripe). This is the most desirable dwarf variegated bamboo and probably one of the most easily available of all bamboos. The leaves tend to keep their green and white stripes throughout the year.

Turn left with the path toward the Colobus exhibit to see the timber

Bamboos of the Tropical Rain Forest Exhibit



bamboo, *Phyllostachys nigra* 'Henon,' and another variegated dwarf bamboo, *Pleioblastus chino vaginata variegata*. Further along the path find two different types of hardy clumping bamboos on either side: left is umbrella bamboo (*Fargesia murielae*) and right is blue fountain bamboo (*Fargesia nitida*), which are the hardiest bamboos and good for planting in filtered shade. Umbrella bamboo grows above 10,000 feet in China where it is important food for the giant panda.

Further down the path approaching the gorilla exhibit, large plantings of *Phyllostachys nigra* 'Megurochiku' form a tunnel. This hardy timber bamboo can grow fifty feet tall with culms three and one-half inches in diameter.

## Bamboos of the Elephant Forest

A short distance before the entrance to the Elephant Forest, on the right, is the grove of yellow groove (*Phyllostachys aureosulcata*). This upright bamboo is hardy to -10 degrees F and can reach twenty-five to thirty feet with a maximum culm diameter of at least one and one-half inches. Young canes are dark green and have a distinct yellow stripe on alternative sides, extending from node to node. Occasionally, canes have a distinct zig-zag within the first couple of feet. This bamboo is native to temperate East Asia, as are all of the bamboos used at the zoo to simulate tropical exhibits.



ABOVE: The demonstration yard of the Elephant Forest. *David Selk.*  
 RIGHT: *Phyllostachys vivax*, a timber bamboo, and *Phyllostachys nigra* 'Henon' can be seen in the Elephant Forest. *James Clever.*

The growth habit of the bamboo is unique. All new growth comes from an underground network called a rhizome, either running or clumping. Running bamboo can send out rhizomes the equivalent to its height from the main plant or its current existing space in one season. Clumping bamboo spreads slowly, one to two inches per year forming tight clumps. Most bamboos at the zoo have running rhizomes. The diameter of culms (stems known as canes) can reach up to four inches in the Pacific Northwest climate.



Just inside the southern entrance to the Elephant Forest exhibit on the left and right you will also see a low-growing variegated running bamboo, *Pleioblastus variegatus*. Continue down the path on the right to another low-growing runner, *Sasaella masamuneana albostriata*, which is variegated with thick leaves and a cream-colored stripe. Behind it more *Phyllostachys aureosulcata* can be seen. On the small berm dividing the path, a clump of *Phyllostachys aurea flavescens-inversa* is located at the front forward area across from the *Sasaella masamuneana albostriata*. It is a golden bamboo with green-colored culms and a yellow groove, and can reach up to twenty-seven feet tall with a 1¼-inch diameter.

On the opposite side of the berm in front of the viewpoint rail is a generous planting of *Pleioblastus viridi-striatus*. During the spring when all the new leaves unfurl, this bamboo, which only reaches two to three feet, presents a lush color of golden yellow with green stripes.

Stay on the main path to the left. Many plantings of medake (*Pleioblastus simonii*) can be seen on either side all the way down to the bathing pool for the elephants. The grassy wild look helps to define the natural feel of the area. Medake, as it is called in Japan, reaches up to twenty feet high with 1-1/2 inch culms.

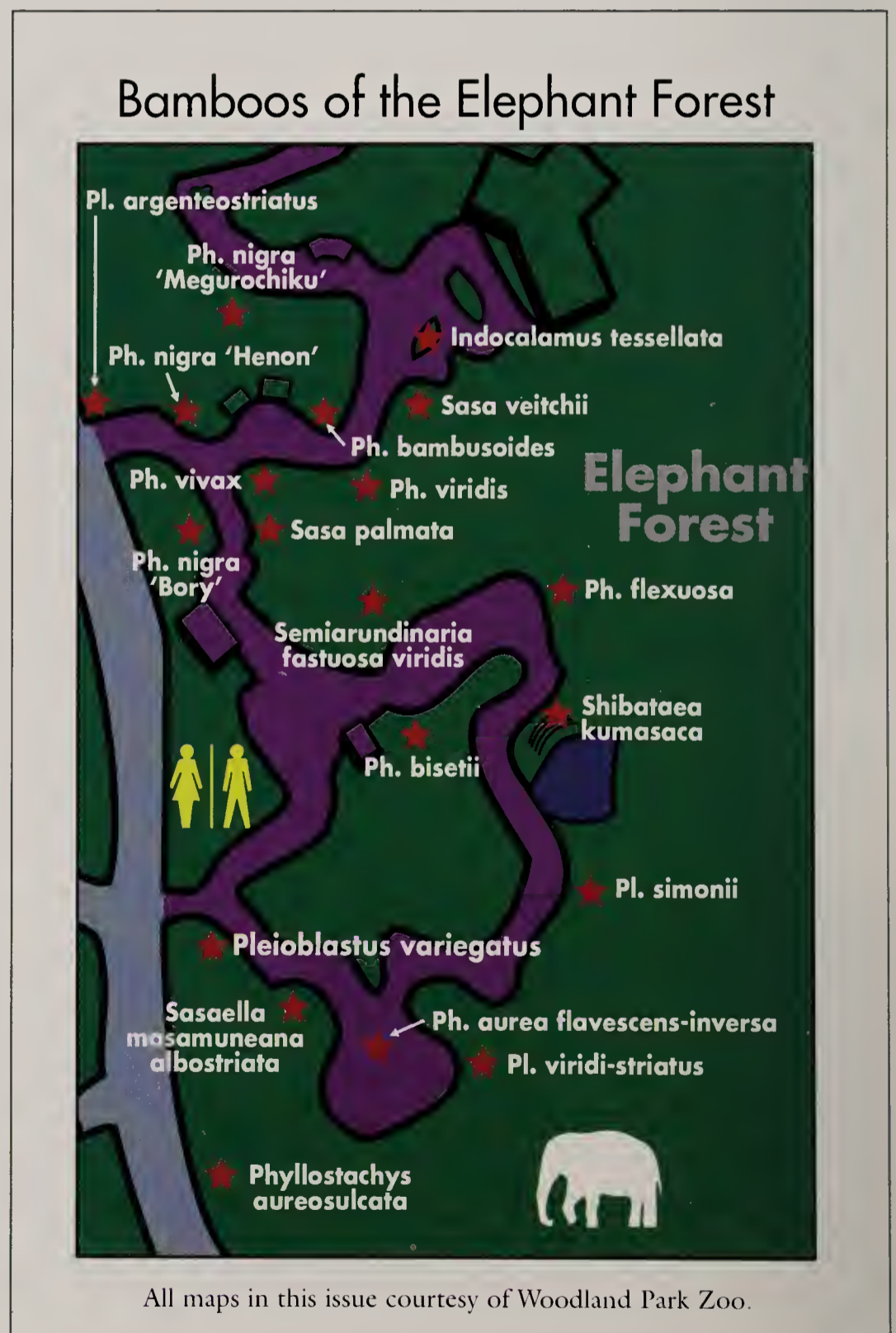
Behind the elephant bathing pool on the berm above the viewing area is a very un-bamboo-looking bamboo, *Shibataea kumasaca*. It has short, broad leaves that give it a unique shrubby appearance. The slender canes bear a multitude of these leaves with just as many canes from the root stock. *Shibataea kumasaca* is native to Japan.

Continue on the path as it gently slopes up, and on the right you will see a grove of *Phyllostachys flexuosa*. It grows to about twenty feet, creating a nice open feeling as the canes tend to come up a few inches apart. The cane sometimes has a slight ziz-zag and thus the name *flexuosa*.

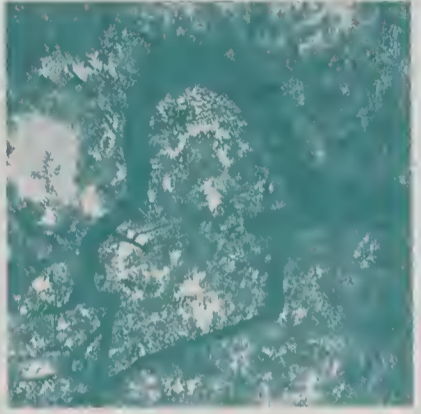
Pass the saddle shed on your right and the tack shed on your left. These are examples of domestic Thai architecture, using thatch for roofs and split

bamboo for siding. Because bamboo species each grow canes of different diameters, maturity determines cane size. There are hundreds of different uses for bamboo canes in Asian cultures. Just past these two buildings are the beginnings of many scattered plantings of *Semiarundinaria fastuosa viridis*, which is planted almost exclusively throughout the Thai logging camp work area. *Fastuosa* grows up to thirty feet high, and its 1½-inch-diameter canes are multibranched. Foliage covers it top to bottom, making it a favorite for hedges and screens in the zoo, as well as home gardens.

Continue down the path until you reach a T. On the left is *Phyllostachys nigra* 'Bory'. This unique cultivar of black bamboo produces canes that can grow to fifty feet tall and three inches in diameter. Larger than the type (black bamboo), the young green canes develop scattered spots of brown to light black in a couple of years.



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*Bambusa vulgaris* 'Vittata' in the Tropical Rain Forest canopy. James Clever.

On the right of this junction is tropical-looking *Sasa palmata*; it will reach about seven feet in height. The Jungle path, which is small and non-wheel chair accessible, parallels the main path heading to the right through it. On your left find a grove of *Phyllostachys vivax*, probably the largest bamboo species that grows in the Northwest, both in diameter (four inches) and height (fifty feet plus). Just as you exit this short path, on your right is a small planting of *Phyllostachys viridis*, which can get up to forty-seven feet tall. The shoots are eaten by humans, primates, elephants, and many other animal species, and culms produce good quality wood.

Again on the main path, a large, long grove of *Phyllostachys nigra* 'Henon' extends from the main zoo loop to the viewpoint for the Tapir exhibit. This timber bamboo is native to southern China, reaching up to fifty feet high and 3½ inches thick.

Once at the Tapir exhibit, you can see two different bamboos. On your left, growing against the building, is a bamboo similar to 'Henon', called *Phyllostachys nigra* 'Megurochiku.' The difference is that 'Megurochiku' grooves turn black after the culm is a year or two old.

On the right side of the Tapir glass view-

point, a planting of *Phyllostachys bambusoides*, commonly called Japanese timber bamboo, is bravely trying to make a go of it at the zoo. It is one of the two most used bamboos in the East for its strong, large, long canes and edible shoots. In Japan, it reaches seventy feet tall and six inches in diameter; in the Northwest climate, expect about half of these dimensions if your microclimate is favorable.

Continue on the main path. Go right and follow it down the incline towards the elephant house, to see a five-foot-high planting of *Sasa veitchii*. This bamboo, distinctive for large green leaves with parchment-like fringe, is most notably used in Japanese gardens. On the planting berm on the elephant house side see the bamboo with the largest-sized leaves (up to two feet long), *Indocalamus tessellata*.

## Bamboos of the Trail of Vines

Loop around the planting space as you leave the elephant house, and go back up the hill on your right to the newest exhibit, the Trail of Vines. Look for the very prominent planting of *Phyllostachys dulcis* (forty feet tall, 2¾-inch-diameter culms). This attractive plant is noted for arching canes and shoots that are particularly free of any acrid taste. *Phyllostachys dulcis* is planted on the right side of the viewpoint for the macaque. On the left side of this viewpoint is a young planting of *Phyllostachys aureosulcata* 'Spectabilis', a very rare cousin to yellow groove, with all the same growth characteristics. This plant is vigorous, hardy, straight, sometimes has a few zig-zagging culms, and is upright twenty-five to thirty feet. The only difference that the 'Spectabilis' has is a yellow cane with a green vertical stripe on the internode. It is a very attractive plant.

Continue down the path and straight ahead to the Siamang exhibit, which contains an island. On it are plantings of *Phyllostachys aureosulcata* 'Alata' and arrow bamboo (*Pseudosasa japonica*), distributed to create a quick-growing and hopefully durable jungle for the siamangs. Because bamboo has an effective habit of binding the soil and stopping erosion, this should prove helpful on the small island. Arrow bamboo canes are thick and very erect, commonly used for the shafts of arrows

## Bamboos of the Trail of Vines



because of their strength, straight form, and light-weight features. The masses of dark green large leaves that are up to a foot long and 1½ inches wide form the semi-erect branches at the upper nodes. The culm sheaths (parchment-colored husk-like protective covering) are often as long as the internodes and are quite persistent. It is very common in the US, good for hedges and wind breaks.

Continue up the path. On the right behind and below the rocks, are plantings of the golden bamboo (*Phyllostachys aurea*). When full-grown, it will help mask the wire mesh enclosure; the lower few feet of the culms are solid.

Straight ahead, in a raised planting bed, is *Phyllostachys purpurata* 'Solidstem,' which can reach eighteen feet and have solid ¾-inch diameter culms.

In two separate raised planting island beds is the popular and common black bamboo (*Phyllostachys nigra*). The striking black canes reach thirty feet and are quite elegant in appearance. Cut canes are used in fine cabinet work. Both *Phyllostachys purpurata*, with a sol-

id stem, and *Phyllostachys nigra* are used in this area to screen off the exterior of the exhibit and cut down the sunlight that could reflect off the windows.

Opposite the indoor Orangutan exhibit is the Research Station. Note the walls covered by split bamboo poles. It shows that the cut canes can be useful and attractive as fencing or siding.

Walk past this area and move onto the outdoor orangutan exhibit area on your left. There, many plantings of *Pleioblastus simonii* are scattered throughout the forest floor. The wild, rough quality helps emulate a tropical forest, and with luck it will thrive under the attention of orangutan families.

In the background on the tops of the parapets (cliffs), see plantings of *Phyllostachys meyeri*, which are distributed here to create the effect of another level or plateau. The plantings help screen off the building's many skylights. When the plants attain some height, they will visually make the cliffs look larger.

Continue down the path at the end of the raised wooden walkway, and on the right you will see *Phyllostachys rubromarginata*. Its dark green canes have the internodes as long as sixteen or more inches and smooth nodes; they are a favorite of musical instrument and basket makers. In its native China, the shoots are prized for their taste.

On the planting island just ahead is *Pleioblastus viridi-striatus*, which gets up to three feet tall. New leaves are golden with green stripes. As you exit, on your left is a young grove of moso (*Phyllostachys heterocyclus pubescens*). Moso is the largest of the hardy bamboos at seventy-five feet with seven-inch diameter culms. In the Northwest, however, the largest moso reaches thirty feet in height.

James Clever is an amateur botanist and has been a member of the American Bamboo Society since 1986. He was president of The Pacific Northwest Chapter of the American Bamboo Society from 1990–1992. James owns Bamboo Gardener, a small business that specializes in hardy bamboo plants.

# On the Northern Trail

by Michael Pope

Imagine yourself in the interior of Alaska, slowly walking through a dense, white spruce forest, looking for trails of moose, bears, and wolves to follow. A movement through the trees has your heart pounding, and you immediately shout, "Bear!" Soon you sense another movement: Your stare is met by that of a wolf through the spruce trees, and you freeze in your tracks.



ABOVE: The grizzly yearling travels on the Northern Trail's braided stream. In the background are mountain goats as well as white spruce and paper birch. *L. K. Sammons.*



RIGHT: Forget-me-not, Alaska's state flower. ABOVE: The Taiga Interpretive Center building simulates a landslide. *L.K. Sammons*. Prickly rose (UPPER RIGHT) and yellow potentilla (LOWER RIGHT) are found throughout Alaska and in the Northern Trail exhibit. *Karen Anderson*. BOTTOM: White spruce frames the gray wolf. *Karen Anderson*.



The Northern Trail exhibits the flora and fauna of the Alaskan boreal forests. The Russian word for this region is taiga, meaning "land of little sticks." These vast, dense forests of spruce or pine stretch around the world at high northern latitudes. The zoo chose to simulate the dense white spruce forest of the interior of Alaska, starting north of the Alaska range near the world-renowned Denali National Park and Preserve, traveling south over the Alaska range, and ending along the coastal areas of the Kenai peninsula south of Anchorage.

The horticultural goal in planting the Northern Trail was to use species native to the taiga forests of Alaska, though simulator plants were also used where natives could not be obtained. The zoo wanted to be as correct as possible in representing the seven distinct plant communities of south-central Alaska.

The land of the midnight sun is an extremely harsh climate for plant growth. Limiting factors include a very short growing season (June 1 to August 15), extreme cold temperatures, a wide range of high and low annual temperatures, and low mean soil temperatures. However, during the growing season, sixteen to twenty-two hours of daily sunlight enable astonishing growth spurts, especially of perennial wildflowers and fruiting shrubs. These forests explode in the short growing season of the north!

Hiking the boreal forests of the north can bring great excitement. So can Woodland Park Zoo's exhibit of Alaska's natural habitats. Whet your appetite for the adventure of a lifetime—the Northern Trail.

## Starting the Northern Trail

### White Spruce Forest

You start the Northern Trail in a closed forest of white spruce (*Picea glauca*). Find clumps of paper birch (*Betula papyrifera*) in areas opened where trees have fallen. In summer, look for prickly rose (*Rosa acicularis*) and shrubby yellow-flowered cinquefoil (*Potentilla fruticosa*), two Rose family members that add soft, long-lasting flowers to the forest. In spring and summer, a colorful forest floor is painted by mountain cranberries (*Vaccinium vitis-idaea minus*) and low-bush blue-

berries (*Vaccinium* 'North Sky'), pink bunchberry (*Cornus canadensis*), white twinflower (*Linnaea borealis*), blue lupine (*Lupinus albi-caulis*), white foamflower (*Tiarella trifoliata*), and Alaska's state flower, blue forget-me-not (*Myosotis alpestris*). The abundance of berry-producing flowers and shrubs provides food to many migratory bird species and resident small mammals during the very active warmer months in the Alaskan taiga.

### Fire Succession

Round the bend to the first wolf viewpoint, and the white spruce forest opens to a grove of quaking aspen (*Populus tremuloides*). These slender trees with light-green bark have leaves that flutter in the breeze, hence the term "quaking." Quaking aspen is the tree that recolonizes spruce forests after wildfires. It is also the widest-ranging tree species in North America and thrives from Mexico to the Arctic. You can see evidence of wildfire if you stand at the wolf viewpoint.

In addition to the aspen planted here, the roots of fireweed (*Epilobium angustifolium*) were collected and sown into the ridge before you. In summer, spike-like racemes of rose-colored flowers give way to slender capsules that burst open. Cottony seeds float on the wind to disperse over wide areas and colonize newly cleared land. The gray wolves move freely on and around this ridge.

Soapberries (*Shepherdia canadensis*) are often found in these burned aspen stands as well as along stream courses in Alaska. They are a favorite food of bears and also used by native Athabaskan people in the Interior.

From the wolf viewpoints, also see more berry bushes along the opposite hillside. Saskatoon serviceberry (*Amelanchier alnifolia*) is another species that contributes to an abundant summertime food supply in Alaska.

### Black Spruce Forest

Move to the small mammal exhibits, and observe members of the unique black spruce (*Picea mariana*) forest community. Interestingly, if classified based on low annual rainfall, the interior north of the Alaska range could be considered a desert. But in many low-lying areas, especially those underlain by permafrost, there is enough standing water to call them true wetlands.

Black spruce forests support fascinating black spruce plant communities, which are represented here. Often slanted and always stunted, see the skinny black spruce which provide a deep green background for tamarack or eastern larch (*Larix laricina*). This is a deciduous conifer known for its splendor, because the needles cast yellow blazes across a dark green forest before dropping in the fall. Also notice the rich, thick carpet of moss and lichens that coats the forest floor.

Bog birch (*Betula glandulosa*) and scattered clumps of Labrador tea (*Ledum groenlandicum*) grow in association with yet another berry-producing shrub, crowberry (*Empetrum nigrum*). The presence of these species are good indicators of the wetness of these black spruce forests, which are often associated with permafrost conditions. Flat, low-lying areas and north-facing slopes are almost always underlain by permafrost north of the Alaska range.

### Permafrost Bank

The permafrost bank is located next to the Tundra Interpretive Center and in front of the snowy owl exhibit. The bank was also planted to represent the black spruce forest community. Mosses in this planting were collected from the Verlot area on the Darrington Ranger District, Mt. Baker-Snoqualmie National Forest, with permission from the US Forest Service. Feathermoss (*Hylocomium splendens*), sphagnum moss, and *Pleurizium schereberi* are all found both here in the Washington Cascade range and throughout Alaska. The taiga forest near Denali National Park and Preserve was one of the areas studied as the zoo attempted to recreate the natural habitat of the taiga forest. Denali is a magnificent place to see an actual moss-rich black spruce community.

### Shrub Tundra

Continue to the triangular bed just to your right of the entrance to the Tundra Interpretive Center building. Two dwarf Arctic birch (*Betula nana*) are planted here to represent part of the shrub tundra. Here, the zoo is displaying species common to a type of tundra community that is found in abundance in interior Alaska—not the kind of tundra that is associated with the mountainous regions.

Shrub tundra, unlike the low growth of dry

alpine tundra, consists of waist- to head-high shrubs including a variety of willow (*Salix*) species and many dwarf Arctic birch (*Betula nana*) and bog birch (*Betula glandulosa*). Bog birch and dwarf Arctic willow (*Salix purpurea* 'Nana') are planted all across the face of this building to represent shrub tundra.

### Dwarf-Willow Shrub Tundra

Turn north to view the habitat of the brown bears, and observe species representative of a dwarf-willow shrub tundra community, which is another type of tundra found in the North.

*Salix yezo-alpina* and *S. lindleyana*, although not native to interior Alaska, are two willow species that demonstrate the prostrate growth habit that is characteristic of at least eight species of willow native to Alaska. With thirty-eight species, the Willow family comprises almost one-third of all woody species in Alaska. Adding the Heath family (thirty species) and the Rose family (twenty-one species), these three families comprise about two-thirds of all woody species in Alaska. Of the twelve willow species in this exhibit, half are native to the Interior. The others were chosen for similar appearance and growth habit.

The terrain at this brown bear viewpoint also contain plants commonly eaten by the interior grizzly bear, which is one type of brown bear in Alaska. Another brown bear, the world-famous Kodiak bear, lives on the coast where an abundant salmon diet allows much larger growth than the mainly vegetarian interior grizzly.

From late spring to early summer, interior grizzly bears eat fermented berries left on the shrubs from the previous fall and fresh grass shoots like the clumps of polargrass (*Arctagrostis latifolia*) planted at this viewpoint.

In mid-summer, the bears shift their diet to include some of the starchy roots of the legume, *Hedysarum*, which grows in abundance along gravelly river and stream bars. At the viewpoint, look for *Hedysarum alpinum* with its gray-green, pinnately compound leaves. The bears' preference for this legume and others, such as blackish oxytrope (*Oxytropis campestris*), gives hikers in the North some bear warning signs to look out for. As the bears dig these legumes for their roots, they

leave the tundra and river bars with gouges and tears noticeable from some distance.

In the fall, the bears' attention turns to fresh berries. Soapberries (*Shepherdia canadensis*) seem to be the most preferred, so much so that, when the soapberries ripen in Denali National Park, certain stretches of the popular Toklat River are closed to hiking as a precaution to encounters with hungry berry-eating bears. Also at this viewpoint see other ripe patches of low-bush blueberries that signal to hikers that bear are nearby. They are represented in this collection by *Vaccinium* 'North Sky' and 'Top Hat' and mountain cranberries (*V. vitis-idaea minus*). These bear favorites allow the zoo to interpret for visitors changes in the mostly vegetarian diet of the interior grizzly, during the relatively short, snow-free season in the north. It also allows you to see some of the differences between the

two types of brown bears native to Alaska.

At the second bear viewpoint, catch sight of the braided stream, a replica of the many braided streams and rivers found in interior Alaska. These streams are animal highways of the North. Not only is travel much easier than in a dense white spruce forest or in five-foot-high shrub-like tundra, but important food plants grow in abundance along these gravel stream bars. These include willows for moose and soapberries, blueberries, and legumes for bears. Notice how the bears move with ease and great curiosity as they travel up and down this stream.

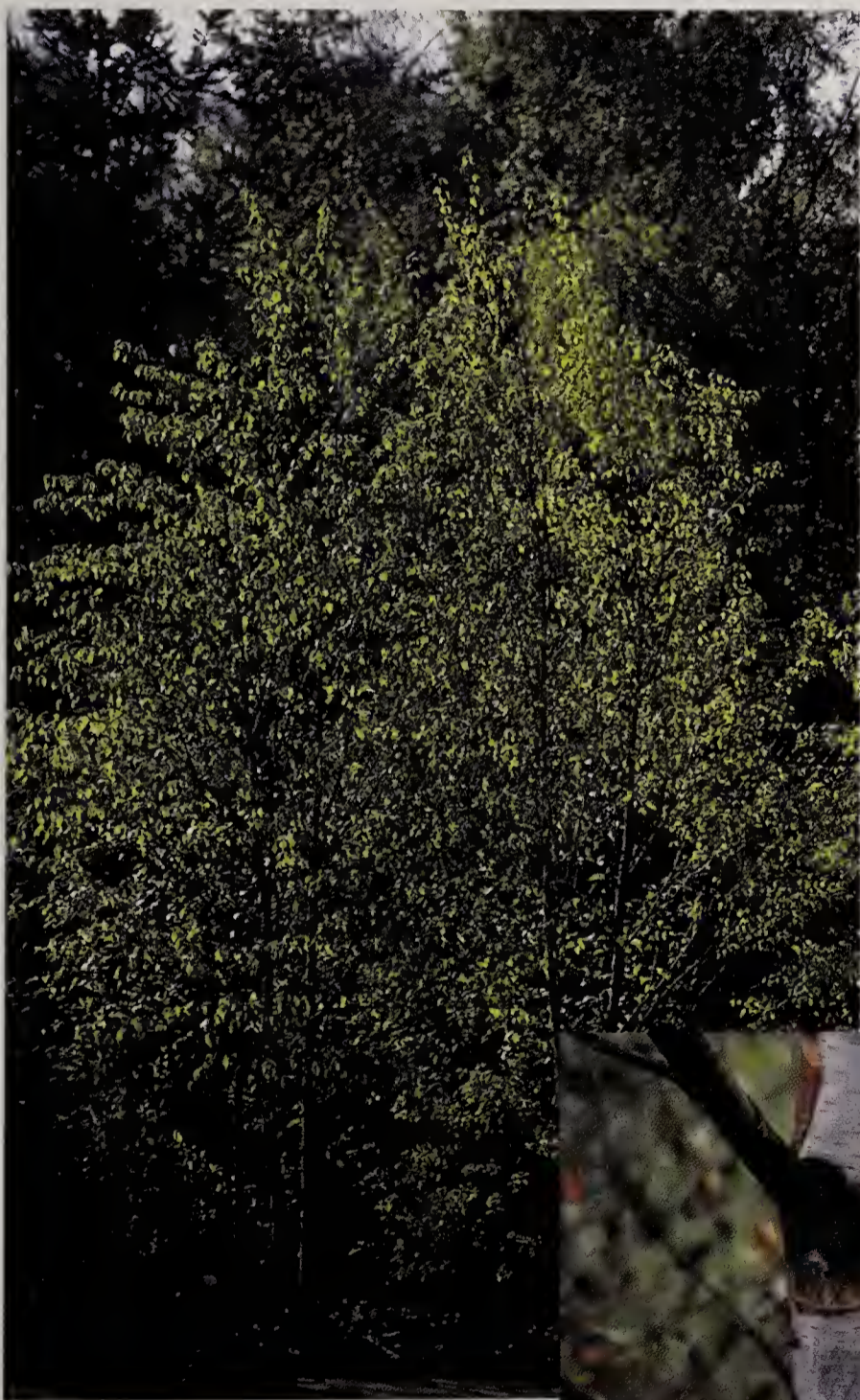
### Paper Birch/White Spruce/ Poplar Forest

Continue toward the Taiga Interpretive Center but facing away from it, and you will notice an increasing number of paper birch (*Betula papyrifera*). Large tracts of paper birch dominate the landscape on the south side of the Alaska range and into the paper birch/white spruce/poplar forests of the Upper Susitna valley. White spruce grows in patches, and large poplars or cottonwoods crowd the river and stream banks. Mountain alder (*Alnus crispa*) and tall willows grow in thickets in forest openings and colonize landslides.

Enter the Taiga building, "buried" under a simulated landslide. Here you can experience fabulous views of the brown bears and the underwater aerobics of the playful river otters. The otter habitat is planted with the willow *Salix scouleriana*, red-flowering dogwood (*Cornus sericea*), and other species common to coastal areas on the Kenai peninsula.

After leaving the Taiga building, notice the cliffs of the mountain goat exhibit. It is hard to tell, but they are actually carved out of concrete that was designed and

constructed to portray columnar basalt, a geologic phenomena that is found both in the Pacific Northwest and in Alaska. And all the lichens were painted by artists. These cliffs give visitors a realistic view into the rugged mountain homes of the regal mountain goats.



Paper birch. Karen Anderson.



## Coastal Forest

At the end of your journey down the Northern Trail, stop at the eagle viewing shelter. There lives the majestic symbol of the Alaskan wilderness and the national bird, the bald eagle. The mature bald eagle has the well-known white head and tail feathers, which they develop in their fourth or fifth year of life, while the immature bald eagle is mostly brown with a mottled white chest and belly.

This exhibit, like the river otter habitat, was planted with species common to the coastal areas of Alaska. Notice the slender, almost scraggly, Alaska yellow cedar (*Chamaecyparis nootkatensis*), which exhibits an unusual growth habit to deal with the heavy snow of coastal Alaska. The foliage of these trees hangs perpendicular to the ground. This adaptation, combined with springy branches that bend down until the snow sloughs or melts off,

allows this species to withstand the heavy wet snows of coastal Alaska. In the spring, look for shooting stars (*Dodecatheon pulchellum*) and wild iris (*Iris tenax*) along the stream. These wildflowers, along with ferns, sedges, and an abundance of willows and red-flowering dogwood, were planted to recreate the lush coastal forest of south-central Alaska.

Come again with friends and enjoy the Northern Trail. It is one of the finest exhibits in the world and gives you a glimpse into the taiga forests of Alaska.

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Michael Pope helped design, plant, and maintain the Northern Trail exhibit, first as a consultant and then as a member of the horticulture staff.

*The Northern Trail exhibit won the 1995 Exhibit Award presented by the American Zoo and Aquarium Association.*

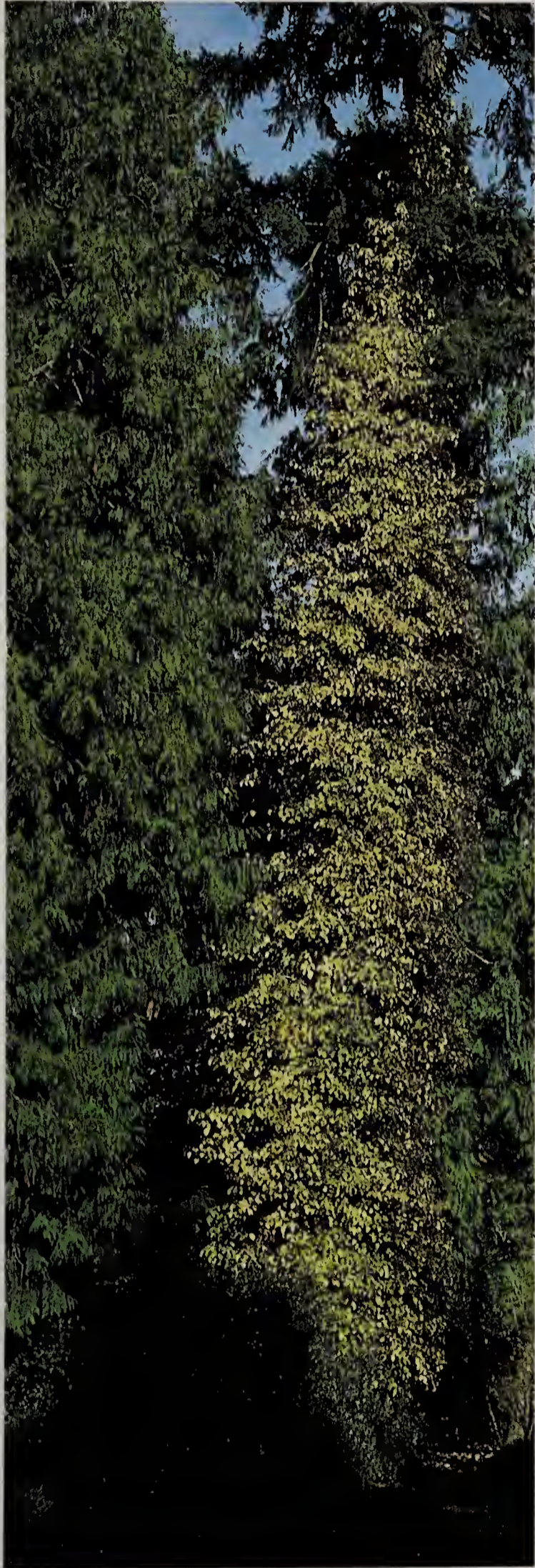
## Plant Communities of the Northern Trail



# Feigning Foreign Flora

## *Tropical Temperance for the Pacific Northwest*

by Daniel J. Hinkley



*Hydrangea anomala* × *petiolaris*, as seen in Washington Park Arboretum. Joy Spurr.

In the heart of Puget Sound, dominant masts of needled evergreens provide a familiar, though somewhat monotonous, signature to the landscape. Beneath them, gardeners frequently cultivate a rather limited array of ornamental understory shrubs. This assemblage of commonly used landscape exotics and natives reflects that which is home and familiar.

Though I am generally content with the landscape style that fits the region, some landscape situations validly call for exotic plant materials whose effect can transport the human participant to another time or place. The best justification for this approach is at Woodland Park Zoo. Throughout the exhibits, designers ingeniously use a wide palette of hardy ornamentals to produce vignettes that simulate raw nature.

The permanent residents react to the simulation of their original haunts with a corresponding naturalness in behavior that further enhances the visitors' experience. Plant shapes, leaf sizes, and landscape compositions unfamiliar to the eye are the most effective in evoking the emotions of separation from the Northwest environment. Within a short distance, visitors can successfully transition from Asia to Africa and South America. Using this acute understanding of form, shape, and ecology, you too can successfully fabricate the essence of the tropics.

### **Tropical Forest Simulators**

Though it is virtually impossible to reconstruct a living tropical forest in the Pacific Northwest, horticultural trompe l'oeuil is accomplished by paying attention to those common threads that link all equatorial woodlands—vines and lianas, large-leaved plants, and a diversity of flora. Tropical forests can be simulated by recognizing the vertical delineation that exists in nature—with life forms becoming more and more abundant as one rises higher into the trees.

### **Colorful, Tenacious Vines**

The easiest way to impart a tropical effect is by use of vines and lianas, dozens of which are suitable for the Pacific Northwest.





*Akebia quinata* is found in the Trail of Vines and in the Tropical Rain Forest exhibit near the gorillas. Joy Spurr

*Wisteria floribunda* and *W. sinensis* are two vines that will quickly rise into the crown of a sizable native or non-native tree. Deciduous pinnate foliage unfolds just as the long pendent racemes of fragrant purple flowers are produced. The flowers of *W. sinensis* open collectively on the vine, providing a shorter-lived but bolder floral effect than *W. floribunda*, whose flowers open consecutively over a longer period of time. Select host trees that are strong enough to accommodate these vines: physically, to support the added weight, and in vigor, to withstand the added stress of reduced light for photosynthesis.

Grape species are invaluable for coaxing up trees to provide extremely bold foliage with spectacular color in autumn. Best for this effect is the well-known *Vitis coignetiae*. With leaves expanding up to fifteen inches across and rich autumn tints, they add an aerial chain of color not unlike a flock of macaws in the distance. The fruit is generally considered inedible, being small and acrid.

*Vitis davidii*, from China, is the only grape species with thorny stems, providing a distinctive addition to the list of Northwest tropical simulators. The large, glossy green leaves are arranged along stems studded with succulent reddish spines; when back-lit by late evening sun, these spines provide a dazzling effect. It has proven to be somewhat tender above ground, however the vigor it possesses readily replaces wood lost during the winter. Unable to climb a limbless tree trunk, both grapes mentioned must be provided means of support to get them to the first limbs. In our garden, we suspended a rope in the Douglas-firs, which the grapes have now climbed. They are nearing the first branches from which they will be able to explore unaided the canopy of the Northwestern forest.

*Hydrangea petiolaris* var. *anomala* and *Schizophragma hydrangeoides* are two vines that also perform remarkably well at adding tropical flair to the Northwest. With vigorously upright stems hugging the main trunk of the tree, they will not swamp the outer canopy of their host, yet provide a summer showing of white flower clusters surrounded by white bracts.

*Akebia quinata*, on the other hand, does not share the polite demeanor of the aforementioned vines. The five-leaved akebia, with tiny clusters of black-purple stars in early spring, clambers through, over, and under any support, living or otherwise, that is provided. Aptly coined the "kudzu of the north," it convincingly portrays the vigor of tropical vines.

Any thought of marriage between vine and tree provokes an often-asked question of suitability and danger to the supporting plant. Although in the tropics, vines truly can conquer and kill, this process is unlikely to happen in the Pacific Northwest as long as the host is vigorous and large enough to house the intruder. This is not to say it is appropriate in all instances; case-by-case pairings should be well thought out.

### Large Leaves

Through film, fiction, and fact, inhabitants of the northern climes have come to associate immense leaves with the exotic. Adapting to the rigors of a fast-growing canopy and instantaneous shade, tropical plants produce large leaves to maximize the capture of electrons that pierce the upper canopy. Conveniently for the creator of a tropical exhibit or garden, tender tropical flora do not hold a monopoly on folial massiveness. Many hardy species exist in the Puget Sound area that perform remarkably well in this regard.

*Gunnera manicata* and *G. chilensis* (syn. *G. tinctoria*) produce Jurassically large clumps of surrealistic-sized leaves



Find gunnera at the entrance to the Elephant Forest. David Selk.

as well as three-foot cone-shaped inflorescences. These South American species perform exceptionally well for Northwest gardeners when ample moisture and protection from severe winter cold is provided. Simply cut the leaves at season's end and pile them over the crowns for sufficient protection. Though certainly adapted to full sun conditions, their massive rosettes are somewhat more appropriately sited in partial shade as an understory herb. *Gunnera manicata* possesses the larger leaves of the two, with long, nodding branches extending from its massive upright inflorescence. *G. chilensis* is relatively more compact and has a narrower flowering spike.

Better for smaller settings are the ornamental rhubarbs found in the genus *Rheum*, with several species being superb in foliage and flower. *Rheum palmatum* var. *tanguticum* sends forth wrinkled reddish leaves in early spring that expand to boldly cut leaves with a reddish cast even when fully mature. The white flowers are produced on substantive six-foot panicles in mid-spring. Even more striking in foliage and flower is *R. palmatum* var. *atrosanguineum* with dark-toned leaves and red flowers that theatrically unfurl from rising globular buds of unparalleled anticipation.

Nurture the rhubarbs with adequate moisture and well-amended soils, and they will easily hold their own against a modestly sized *Gunnera*. The foliage of rhubarbs tends to be short-lived after flowering occurs, however. Rejuvenate the plants by cutting everything to the ground, then enjoy the fresh regrowth of foliage for the remaining months of summer.

Another herbaceous perennial that is well known among Northwest gardeners is *Crambe cordifolia*. Unlike the succulent, kale-like foliage of its cousin, *C. maritima*, this species produces quite large rounded leaves and a six-foot-high flowering stalk cloaked in fragrant, white, four-petaled flowers during June and July. Best in conditions of full sun, *C. cordifolia* provides remarkable contrast in the form and size of leaves and flowering stalk whether growing in the mixed border or fully herbaceous garden.

*Canna* delivers a tropical punch to any landscape in the Northwest. Oddly, however, it is used more on the US eastern seaboard where it dominates herbaceous borders from New England to Florida. In the Pacific North-

west, the banana-like leaves reach six feet or taller, and showy blossoms of orange, red, or yellow are produced above the foliage in late summer or early autumn. However, if banana foliage is the effect you hope to achieve, then why not the real McCoy? *Musa basjoo* is considered one of the hardiest species of banana that exists; with limited protection, it flourishes and flowers outdoors throughout the Pacific Northwest, ultimately spreading to become a multi-stemmed clump that rises to eight feet by summer's end. Mulch heavily as good insurance against damage to the root system during extremely cold winters.

### A Multiplicity of Flora

The immense number of different species inhabiting an equatorial forest is yet another hallmark of the tropics that can be exploited in its re-creation. Traveling northward or southward from the equator, species diversity is replaced by species density. At the extreme opposites are both poles, which support vast numbers of very few species. In the Puget Sound area, we have less diversity of native flora. However, a virtual mishmash of leaf types, colors, and textures can excite our visual nerves.

The doctrines of good landscape design espouse the use of repetitive themes of identical plants. When simulating the tropics, however, this would deflate the overall effect. While there are certainly large numbers of the same plant used in many of the plantings at Woodland Park Zoo, a deliberate attempt is made to reduce the appearance of order or pattern.

Having used Woodland Park Zoo for several years as a teaching site for plant identification classes, I have come to fully appreciate the accomplishments of the horticultural and design staff in brilliantly evoking and maintaining different floral regions of the world. With each visit, I leave with the experience of again having drunk from the cup of travel while sensing the profound impact that plants can play on the human emotions.

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Daniel Hinkley is the co-owner of Heronswood Nursery, Ltd., and the author of *Winter Ornamentals*. He lectures and teaches throughout the United States.

# Our Backyard to Your Backyard: Creating Wildlife Havens

by Cathy Miller  
photos by Karen Anderson

A canopy of green is ahead as you approach Woodland Park Zoo's South Entry Gate. Huge oaks and tall European beech—the beech of Robin Hood's Sherwood Forest—form a spreading canopy over zoo plantings.

On your left as you approach the entry booth are large boulders that appear to have been deposited by the last glacier. Among the boulders you recognize a tree with the peeling bark of paper birch. Quaking aspen also grows above a shrub layer of native rose, hardhack, salmonberry, and thimbleberry.

You also may notice the songs of native birds, who nest and feed in trees, shrubs, and ground covers throughout the zoo. The zoo is a haven for native wildlife that is not in cages. It has what they need—food, water, and layers of plant cover. To see more native flora and fauna visit “Our Backyard.”





Penstemon (left) and santolina. *Karen Anderson.*

## Welcome to Our Backyard

**F**ollow the paved path toward the old water tower at the zoo's far west boundary. On your left, as you leave the entry plaza, are serviceberry and Indian plum, both spring-blooming native plants that produce nectar and berries that are food for wildlife. There are also western red cedar, Douglas-fir, and western hemlock. These familiar native trees, along with shrubs and ground cover, provide natural cover for wildlife.

On your left, pass the monolith that marks the entry to the Temperate Forest exhibit and take a diversion by following the inviting gravel path that disappears into a nook among the shrubs. There you will find benches facing a stream planted with sword fern, deer fern, rhododendrons, and red-flowering currant. Older, non-native trees provide structure as well as beauty along the stream. This is the Talking Bench nook where bench voices speak very quietly when you sit down. A part of Seattle's project to put art in public places, the benches "speak" in poetic and narrative form with wildlife themes chosen by the artist.

As you sit, listen for the soft "whirr" of hummingbirds at the red-flowering currant, a spring nectar source for them. Female hummingbirds use spider silk to bind together

moss and lichen to make tiny nests on a tree branch. Chickadees also use moss for their nests. The moss on the rocks next to the stream may be just right for these small birds.

You begin to realize that there is more wildlife at the zoo than elephants and lions! Leave the bench nook and continue west on the paved pathway. Follow the wavy brick wall past the old Family Farm entry on your left and the new Tropical Rain Forest on your right. Our Backyard is just ahead.

You will recognize this garden when you see the trellis forming a canopy of clematis over the wrought-iron garden benches. An unobtrusive sign on your left confirms it. In Our Backyard there is no lawn; mowed lawn is a sterile monoculture having little benefit for wildlife. Instead of lawn there is ground cover as well as an herb and shrub layer. Water is available in a bird bath. Food is provided by many kinds of berry- and nectar-producing plants. Canopy is supplied by established trees in neighboring areas, much as the trees in your neighbors' yards might provide canopy for your yard. While the trees here are typical birch, maple, and sycamore, the neighbors who live in these yards are seriema, cranes, and red pandas.

The bed south of the garden's trellis takes sun, a good location for flowering plants that provide summer nectar for hummingbirds as well as butterflies and other insects. On the far

right are butterfly bush (*Buddleia davidii*), possibly the number one nectar plant for butterflies, and a white-flowering variety of spirea. Ground cover is sword fern, wild strawberry, rock rose, columbine, snowberry, and penstemon. Insects, which are pollinators as well as a source of protein for birds, are attracted to the summer blooms of penstemon, while snowberry provides white fruit that birds and mammals eat in fall and winter.

The plants in this bed have features that make them drought-tolerant. Many bloom early, and with their reproductive work done, are able to shut down in the typical Seattle summer drought. *Senecio greyi*, for example, is a low mound of silver-gray fuzzy leaves. The fuzziness is produced by tiny hairs that help slow down and direct the air that circulates over the leaves. This reduces moisture loss from the leaves, a good adaptation for times when moisture is scarce. *Santolina* is another low mound of silver-gray foliage, but more lacy than the senecio. Cornelian cherry, *Cornus mas*, blooms in early spring to attract insect pollinators, while red-hot poker (*Kniphofia*) in this bed blooms in summer, and its red flowers attract hummingbirds.

Behind the Our Backyard sign, planted on an island between the garden walkway and the main paths, is highbush cranberry (*Viburnum opulus*). This tall plant produces red berries in the fall, but you might still see the berries in the spring, since they have a bitter taste and birds seem to eat them only as a last resort. However, the berries do provide emergency food for wildlife in a harsh winter.

Growing under the highbush cranberry is Oregon grape, a good ground cover in shade. The dark blue berries are food for wildlife. Native Americans used Oregon grape to make dried berry cakes to last over the winter.

Several oaks grow north of the highbush cranberry. Plants can lose moisture through their leaves. But the leathery leaves of evergreen oaks such as deer oak (*Quercus sadlerana*) and huckleberry oak (*Q. vacciniifolia*) that grow here help retain moisture and reduce moisture loss, making them drought tolerant. The bark of oaks and other trees are home to a variety of insects. Watch for birds, such as nuthatches, creepers, and chickadees, that search for insects in the bark.

Along the north border of the garden is

pyracantha (firethorn), which you will recognize by bright orange summer berries that persist through the winter, as well as red huckleberry, sword fern, and lingonberry. Huckleberry or blueberry is a good wildlife plant. Many varieties are available to gardeners. Lingonberries are good ground cover and provide berries appreciated by humans as well as wildlife. Hardy *Fuchsia magellanica*, strawberry bush (*Arbutus unedo*), native dogwood (*Cornus nuttallii*), and blueberry provide structure in the garden understory. Other low-growing ground covers are barren strawberry (*Waldsteinia fragarioides*) and ajuga (*Ajuga reptans*), which has leaves tinted with purple and tiny blue summer flowers. In the background are vine maple (*Acer circinatum*), a springtime source of seed, and Indian plum (*Oemleria cerasiformis*), often called “the harbinger of spring” by hikers as well as gardeners because of its beautiful white flower sprays that are an early pollen source for wildlife.

Moss that you see is welcomed by animals who use it for nest and den lining. It is another ground cover that is thought to deter parasites in bird nests. Zoo gardeners periodically remove ground litter, but this debris provides necessary shelter for insects. The insects are important food for ground-feeding birds such as rufous-sided towhees and northern flickers.

Our Backyard is generally a quiet place at the zoo where you can enjoy the garden, rest, eat a peaceful lunch, and watch for visitors of the wildlife variety. Look up! You may see a bald eagle circling overhead.

Not only Our Backyard but the entire zoo is a valuable wildlife habitat. The zoo has food, water, and cover planted in layers throughout the grounds.

Just as the zoo provides wildlife habitat, any neighborhood can provide the features needed by wildlife. Start with *your* backyard.

To obtain a packet on backyard wildlife planting, call or write the Washington Department of Fish and Wildlife, 16018 Mill Creek Blvd., Mill Creek, WA 98012: (206) 775-1311. The packet provides information on plants and garden designs as well as bird feeders and bird nesting boxes.

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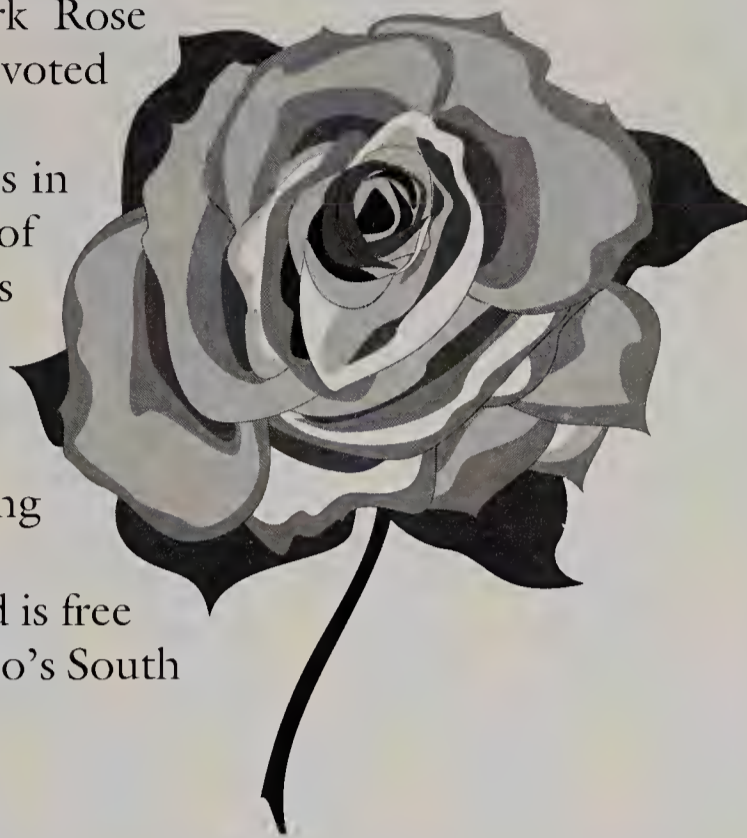
Cathy Miller is a volunteer and former staff member at the zoo.

# Woodland Park Rose Garden

A horticultural trip to Woodland Park wouldn't be complete without a stroll through Woodland Park Rose Garden near the main entrance. In 1995, it was voted the outstanding rose garden in the US.

The two and one-half acre formal garden lies in vivid contrast to the wild and natural plantings of the zoo. It opened to the public in 1924 and has been lovingly maintained by Robert Lasser for three decades. As one of 26 All American Rose Selection Test Gardens in the United States, almost 5000 roses can be seen at their peak during the first week of July.

The Rose Garden is open daily until dusk and is free of charge. It is across the parking lot from the zoo's South entry at 50th and Fremont Avenue North.



## Volunteer for Zoo Horticulture

*Plant lovers and dirt gardeners will find many opportunities to volunteer with WPZG's internationally acclaimed horticultural program.*

### Docents

Zoo docents are volunteers who present educational programs to the public on behalf of the zoo. Once a docent has completed a twelve-week training course, that person can choose a variety of activities to support the zoo. These women and men lead tours; take zoo programs to libraries, preschools, community centers, and nursing homes; participate in research projects; and support zoo special events.

Since 1966, docents at the zoo have been invaluable in communicating the message of wildlife conservation to thousands of children and adults each year. As a Woodland Park Zoo docent, you will have the opportunity to educate and inform the public, not only about Woodland Park Zoo's animals, plants, and world-class exhibits, but also about the vital role that Woodland Park Zoo and other zoos play in worldwide conservation of endangered species and habitats.

Docents make a service commitment to the zoo for two years, thirty hours/year minimum.

They often put in many more hours and stay many more years.

If you enjoy public contact and have a background in botany or horticulture, Woodland Park Zoo is interested in having you help form a small group of docents that specialize in plant-related programs and tours. To receive more information about the training class, contact the docent coordinator: (206) 684-4827.

### Gardener Aides

Gardener aides are the volunteers with the tan work shirts and volunteer patches. They assist the zoo horticultural staff in planting and cultivating flowers, trees, and shrubs, as well as with landscape maintenance. You must be at least 16 years old, available on weekday mornings for a minimum of three months under all weather conditions, and able to perform strenuous work. We also have a variety of other volunteer positions, including office aide/receptionist. Contact the volunteer coordinator for an information packet: (206) 684-4845.

# Enjoy the Outstanding Trees

*You will find interesting tree specimens along zoo pathways as well as in exhibits.*

by Arthur Lee Jacobson

photos by the author

To discuss a zoo without mentioning animals is like talking about restaurants while ignoring the subject of food. But the zoo is so refreshing in plant life that even if all of its colorful, howling animals were to suddenly disappear, gardeners and tree-watchers would still enjoy a worthwhile visit.

More than 5000 trees (200 species) grow throughout exhibits and open spaces as though the goal is to ensure that the place live up to its name, Woodland Park. More than two-thousand young trees have been planted in recent years, a model of ecologically aware installation—high diversity, organic practices, and encouragement of exhibiting wildlife in more naturalistic exhibits. To those who recall the zoo as high and dry, open and sunny, and windswept with barren, sandy soil, this transformation into a lush, diverse forest is thrilling.



Shirotae cherry is north of the Trail of Adaptations.

Zoo trees, if viewed collectively, are a patchwork of different origins. Woodland Park once consisted of hundreds of acres packed with towering old-growth Douglas-firs. Guy Phinney, an Englishman who amassed a fortune by running a sawmill on Lake Washington, bought the tract and transformed it into an amazing estate. Phinney opened the 200-acre park to the public in 1889. His vision was vast, and he had the money to make his



This deodar cedar is at the south entrance to the zoo near the Education Center.

dreams come true. The nucleus of a zoo, rose garden, ballfields, and many other embellishments was created.

After Guy Phinney died, Seattle bought the land just before the turn of the century, and soon enough the Seattle Department of Parks and Recreation was busy planting. Virtually none of the old-growth Woodland Park natives still exist, except maybe a bigleaf maple over one-hundred years old remaining near Aurora Avenue North.

During the gradual redevelopment of the zoo, an important component has been the special effort to preserve trees. Some zoo species are on the Washington State Big-Tree list, meaning that a designated specimen is either taller or stouter in trunk or spreads its branches wider than any other like specimen known in Washington State. Numerous other trees, though not of surpassing size, offer color, shade, sculpted silhouettes and—in one word—life.

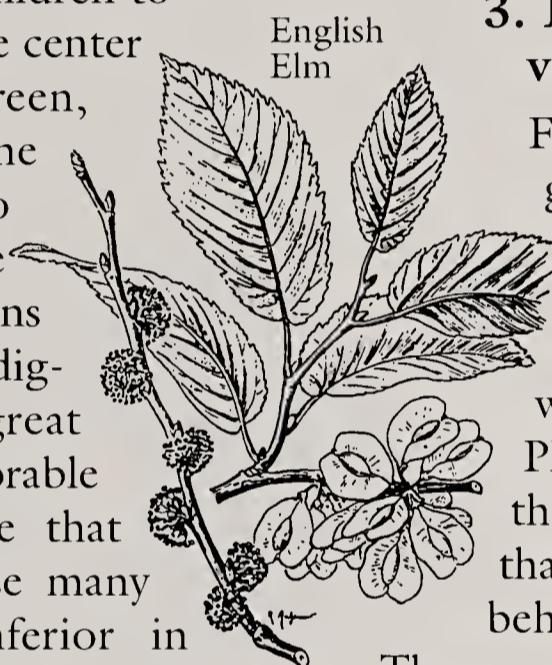
# Tour of Zoo Trees

Many zoo trees deserve to have their stories told. If I had to show an out-of-town tree lover just six of them, however, they would be the following:

## 1. Deodar Cedar (*Cedrus deodara*)

Of landmark stature at the south entrance near the Education Center, is an especially verdant and limby Deodar cedar, which bears sharp one- to two-inch needles. The lemon-sized cones disintegrate at maturity, thereby reserving energy for foliage. Notice its gently drooping aspect, like that of hemlock, yet how massive it is. The name Deodar is from Sanskrit, devadaru (deva, deity, and daru, timber), timber of the Gods.

Though this Himalayan native is common and thrives in Seattle, the zoo specimen is special. Stout, low limbs invite children to climb. It is sited so as to be the center of attention. Being evergreen, grand in size, and long-lived, the zoo's specimen is well suited to such an honored place. There is something about evergreens that arouses admiration. The dignity of age, as well as great breadth, only add to the favorable impression. We are fortunate that this tree is a Deodar, because many other species would be inferior in longevity, health, or safety.



## 2. Black Locust (*Robinia pseudoacacia*)

The lions, in both a geographic and romantic sense, are at the heart of Woodland Park Zoo in the savanna—the zoo's glory. It is fitting that the king of beasts should hold court in the midst of everyone else. Who can gaze upon the broad expanse of waving grasses without admiring the achievement here? Find the hippos in their pond and zebras on the plain, giving you a glimpse of another world: a bit of sunny Kenya in a Northern metropolis!

The landmark black locust trees in the lion exhibit are fine substitutes for African acacias, being in the same family and similar in appearance. These dark and rugged-trunked, craggy-limbed trees deck themselves in delicate, rich green foliage. From May into early July they are loaded with small but numerous fragrant white flowers beloved by bees.

In some respects, black locust is high on the “world's greatest hits” of treehood. Native to a small region in the central and eastern United States, it was widely cultivated beginning in 1635. Since then, black locust has naturalized in many places on earth, including the Pacific Northwest. A member of the Pea family, you will notice its long, dry pods in fall; this tree is able to thrive even in poor dry sites. Rapid growth and the ability to either reseed or spread by root suckers ensures that this species and its many cultivars will remain common.

## 3. English Elm (*Ulmus minor* var. *vulgaris*; syn. *U. procera*)

Fourteen English elms adorn the zoo grounds. They tower above and shade a spacious lawn south of the concert stage. Three envelop the Giraffe House, and five shade the west woodland playground at 59th and Phinney Avenue North. They are at their height of stately form, being at that ideal age where juvenility is far behind and senescence yet to come.

These are superb trees to gaze up into.

Elms have traditionally been valued more for their looks than for their timber or other properties. The Dutch elm disease more than chestnut blight brought home the urgency of planting diverse trees along streets and in landscapes, not relying too much on one kind. Now that this fatal scourge of elms is in Puyallup and Tacoma, we fear it won't be long before Seattle elms begin to be infected and die. The zoo specimens are reasonably well isolated, however, so don't hurry to write them off as doomed. They might live another one hundred years, although they will shed branches with increasing frequency, no matter what.

## 4. Bigleaf Magnolia (*Magnolia macrophylla*)

West of the gorilla-viewing shelter are plantings that suggest humid tropical jungles. These simulators are broad-leaved evergreens

including *Mahonia* 'Arthur Menzies', wax-myrtle (*Myrica californica*), and Portugal laurel (*Prunus lusitanica*). But the ultimate tropical motif in this area is supplied by the deciduous bigleaf magnolia, the zoo's largest; find smaller examples elsewhere (e.g., in the Pheasantry and Trail of Vines). The large leaves are magnificent, commonly two feet long, sometimes reaching more than three feet. From May into early July, it bears white flowers of celestial fragrance and immense size, eight to twenty inches wide. A native of the southeastern United States, this species grows in woodland there. It does very well in Seattle but becomes a bit sunburnt and wind-blasted if too exposed.

### 5. Empress Tree (*Paulownia tomentosa*)

More than fifty empress trees have been planted at the zoo, and many exuberantly add six to eight feet of growth yearly. The only mature specimen is north of the Trail of Adaptations (formerly the Feline House), flanked west by blue spruce, east by incense cedars. Native to China and Korea, this tree is stout; though smooth-barked, overall it suggests catalpa, with coarse heart-shaped leaves. The leaves are also reminiscent of those of the sunflower: late to flush, huge, dull green, fuzzy, and dropping without fall color. Sometime from March into May, before the leaves emerge, it bears spectacular terminal clusters of trumpet-shaped pale violet- to sky-blue flowers, sweetly scented. Both the flower buds and seed capsules are conspicuous.

*Paulownia* is a weed of sorts in parts of the eastern US, because it naturalizes conspicuously and copiously along interstates. In Seattle, however, it is restrained, though the powerful root system makes short work of paving. The wood is highly prized in Japan, where it is called Kiri. *Paulownia* was named for Anna Paulownia (1795-1865), daughter of Czar Paul I of Russia and hereditary princess of The Netherlands.

### 6. Chilean Fire Tree (*Embothrium coccineum*)

Explosive floral display from trees is the more glorious if borne by a species that would

be quite the ugly duckling except for its blossoms. Chilean fire tree is usually a spare, leggy, and small tree of graceless, irregularly upright form, with semi-evergreen foliage. If it did not bloom, no one would want it, but because of the blooms, it is irresistible: Anytime from mid-April into mid-June this little tree presents intense scarlet flowers. Being a hardy South American native, Chilean fire tree was planted with Antarctic beech (*Nothofagus antarctica*) across from the prairie dogs. Younger and thriftier specimens are near the bench in the Pheasantry.

In ideal sites, Chilean fire tree grows very fast, but it may be short-lived like pussy willow. It blooms when very young, and hummingbirds love the flowers. The tallest recorded specimen was sixty-five feet tall and the stoutest trunk, six feet around. Most are fifteen to fifty feet tall and slender.

Other trees at Woodland Park Zoo are, in their own way, equally worthy as the six just singled out. Several are champions for size, such as mountain ash (*Sorbus aucuparia*), sweet birch (*Betula lenta*), black cherry (*Prunus serotina*), Shirotae or Mt. Fuji cherry (*Prunus* 'Shirotae'), Sargent crab apple (*Malus sargentii*), and chinquapin oak (*Quercus muhlenbergii*) — all are on the Washington State Big Tree List.

A few tree specimens at the zoo are very rare in the Northwest region, such as *Kalopanax*, which is at the entrance to the Elephant Forest, and *Maackia*, in the Family Farm Habitat Discovery Loop. Several have been planted in combinations or quantities perhaps never seen before (e.g., find six hundred boreal spruces in the Northern Trail). At any given time of year, some species are show stoppers, with blossoms or bright fall color, or because of winter presence.

Seattle is truly fortunate to have a first rate zoo that also serves as a horticultural mecca. The whole world of plants and animals is brought together in one place.

*Sorbus  
aucuparia*




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Arthur Lee Jacobson is author of *Trees of Seattle*, *Purpleleaf Plums*, *Trees of Green Lake*, and *Landscape Trees of North America*.

# Conserving Plants and Animals

by John A. Wott

Often the consequences of human actions to nature are understood only after they are irreversible. That is why one of the main responsibilities of living museums, such as Woodland Park Zoological Gardens and The Washington Park Arboretum, is to help conserve plants and animals.

## Many Species Are Threatened

More than 30,000 species in the world are now threatened with extinction, according to the Global Biodiversity Assessment. A December 1995 report by the Nature Conservancy found that one-third of the 20,000 native American species of plants and animals are listed as "rare or imperiled." A high proportion of flowering plants and freshwater species head the list. "In many respects," says the document, "this is not a report card on how they're doing but how we're doing."

The Woodland Park Zoo has 60 species (both plants and animals) on the endangered list of the International Union of Conservation of Nature—18 are endangered plants, including 12 species of orchids and six species of pitcher plants. Washington Park Arboretum has 120 distinct plant types on the list. While many of these plants are from other areas of the world, specimens of bristlecone pine and Monterey pine are West Coast endangered species.

## How Living Museums Can Help

Museums were once for the rich or learned. For years, they merely collected objects, usually at the whim of a single curator. It was easi-

### Center for Wildlife Conservation

The CWC is a coalition of Northwest organizations dedicated to the preservation and enhancement of wildlife diversity, with an emphasis on native Northwest species of plants and animals, as well as habitats. For information: Center for Wildlife Conservation, 5500 Phinney Ave. N, Seattle, WA 98103.

est to display similar things together. Unfortunately, this does not work for displaying plants or animals in living collections.

It is not easy to modernize an older institution. As living collections of plants and animals age and die, they must be replaced in ways that reflect and protect their disappearing ecosystems. When living museums modernize, they must also become more accessible and useful to a large and diverse audience. Modern plant and animal exhibits must show how they are related to each other and to the habitats from which they originated.

## Conserving Together

Seattle's living museums have compatible conservation goals. Modern zoos frequently concentrate on conserving animal germ plasm, because male animals are difficult and expensive to maintain. Usually, participating zoos focus on specific animals.

Public botanical gardens concentrate on conserving specific plant collections. They can no longer afford to plant every species that can grow in that climate. For example, several of Washington Park Arboretum's collections—mountain ashes, pines, and hollies—are very large and expensive to maintain. In the future, both the zoo and the arboretum may also concentrate more on conserving local species.

The zoo as the keeper of wildlife and the arboretum as the keeper of the plants should start more conservation programs evolving around their collections. For example, native trees could be introduced back into Woodland Park Zoo or other city parks with help from the Arboretum in a program to preserve our native flora—a partnership of living museums.

All living museums must emphasize conservation through ecologically aware displays and an emphasis on maintaining diverse species. The future of both the natural and human-made world depends, in part, on living museums taking the lead.

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John A. Wott is director of arboreta, Washington Park Arboretum.

# ZooPlant Facts

*What is that plant with the purple berries?*

This is our most frequently asked plant question. In the fall and winter, the normally inconspicuous beautyberry (*Callicarpa* spp.) erupts in tiny purple fruit. Beautyberry, a native to eastern Asia, can be found next to the Trail of Adaptations (formerly the Feline House) and in the Tropical Rain Forest exhibit.

*How old are the oldest trees in the zoo?*

The City of Seattle purchased the zoo property in 1899 from the widow of Guy Phinney. Even then, many of the original native forest trees had already been removed from the property. None of today's zoo trees were alive at that time. However, much planting was done during the first decades of the twentieth century when the zoo was a popular city park. Probably the oldest zoo trees are its beeches, still found just north of the south entry towering over a popular picnic area.

*Are plants grown and fed to the animals?*

Two sources of zoo plants are fed to the animals. First, the zoo grows bamboo in what is called a "browse garden." The browse garden is not on public display, but is used by keepers as a source of food for certain plant-eaters, such as elephants. The second living plant source is the many trees and shrubs that are pruned by zoo gardeners. Only the edible, non-toxic prunings are hauled to the animals to eat.

*How can exotic species grow here?*

Plants from all over the world can grow outdoors in Seattle if they originate from habitats with similar rainfall, summer drought, seasonal changes in day length and temperature, and soil characteristics. Gardeners can grow more kinds of plants in Seattle's maritime climate (with mild winters and summers) than in many other parts of the United States.

*Where can I get favorite plants that I see at the zoo?*

Most can be found in local nurseries. Look for a label to obtain the correct name, and then ask at your local nursery.

*What is that plant with the giant leaves?*

Though several plant species at the zoo have large leaves, probably the most eye-catching is the gunnera found at the entrance to the Elephant Forest. Gunnera is native to Mexico and Central America, and it survives as a perennial in Seattle. The leaves can reach six feet across. Gunnera is grown in a swale at the zoo, because it seems to thrive in damp areas.

*How important are plants to wildlife?*

Plants are as important to wildlife survival as wildlife is to plant survival. In other words, all of life is interconnected. Animals need plants for food, shelter, and nesting material. Many plants need animals to pollinate them, and they must have that animal or insect partner to survive.

Beautyberry, *Callicarpa japonica*. Joy Spurr.

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*A zoological garden is a living museum of animals and plants.*

*An arboretum is a living museum of woody plants for education, conservation, research, and display.*

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