LONG-RANGE PHYSICAL DEVELOPMENT PLAN

Karen Anderson / Woodland Park Zoo

"…helping to create a sustainable future for wildlife."

WOODLAND PARK ZOO

LONG-RANGE PHYSICAL DEVELOPMENT PLAN

Development Guidelines, Non-Exhibit Recommendations and Exhibit Scenarios

Prepared by:

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115 North Third Street, Philadelphia, PA 19106

Library of Congress

Catalog Card Number 2004099387

Adopted by Seattle City Council Resolution #30701

WOODLAND PARK ZOO

Woodland Park Zoo saves animals and their habitats
through conservation leadership and engaging experiences,
inspiring people to learn, care and act.

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SPECIAL ACKNOWLEDGEMENTS

Jones & Jones, Architects and Landscape Architects Ltd., authors of the 1976 "Woodland Park Zoo Long-Range Plan, Development Guidelines and Exhibit Scenarios," has graciously allowed the reprinting of significant portions of their work in this document.

Illustrations included from the 1976 Long-Range Plan were created by either Dean Rocky Barrick, Jon Charles Coe or John Swanson.

Reviewers of this document included all three primary authors of the 1976 Long-Range Plan.
Grant R. Jones
Jon Charles Coe
Dr. Dennis R. Paulson

Ric Brewer / Woodland Park Zoo

View to northeast

The future is not some place we are going to, but one we are creating. The paths to it are not found but made, and the making of those pathways changes both the maker and the destination.

– Dr. Peter Ellyard, Commission for the Future

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PREFACE

For three-quarters of the last century, Woodland Park Zoo had no long-range plan. It developed haphazardly through disjointed incrementalism based on fitful allocations of funding, usually in response to a crisis. In 1976, the zoo's first long-range plan was prepared by Jones & Jones. In the preface, Grant Jones acknowledged the significant shift the plan represented, writing, "Inevitably, an ecological approach to zoo design must be commonplace. But traditionally, zoos have developed as menageries for entertainment…"

For more than 25 years, we have worked to organize our exhibits around ecological themes with plants and animals arranged by natural association. As a result, our zoo emerged as a leader in creating naturalistic exhibits. However, like nature, zoos are dynamic and must continually improve themselves or risk decline. Our zoo must evolve to respond to our growing understanding of wildlife and the increasing need for species preservation. This plan reaffirms our commitment by providing for new conservation facilities and exhibits that enhance our ability to provide the highest quality of animal care and continue to contribute to the survival of wildlife.

In this new century, our primary focus will remain on programs and facilities that support the goals of education, conservation, research and recreation, and help to keep the zoo fresh and interesting for visitors. In the updated plan, new facilities will offer interactive learning opportunities that expand the zoo's ability to educate, inform and inspire action to help save species and habitats. An emphasis will also be placed on development of indoor exhibits, activities and gathering places that help make the zoo a year-round community resource.

The plan also provides for additional amenities such as restrooms, food service and parking to meet the needs of a growing visitor population. Increased onsite parking will help to address a long-standing problem with overflow parking in the surrounding neighborhood. The resulting plan carefully balances the needs of the zoo and zoo visitors over the next twenty years with those of our neighbors.

Importantly, the plan also helps to enhance our financial ability to sustain zoo operations and provide stewardship of this important community resource by developing facilities that create new revenue streams and can be used throughout the year.

We believe that this updated long-range physical development plan reflects a continuing dialogue with nature and with the community that uses the zoo for recreation, respite, education and inspiration. This plan offers a logical, but flexible, framework to guide future development so that the essence of Woodland Park Zoo will be preserved and future generations can experience the value, beauty and interdependence that nature embodies.

Deborah B. Jensen, Ph. D., President and CEO
Woodland Park Zoo

Dave Towne, Former Executive Director/CEO
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AUTHOR'S NOTE

In 1976 Woodland Park Zoo's Long-Range Plan reflected a new approach to zoo design, which continues to inspire zoos around the world and which has brought Woodland Park Zoo international prominence and respect. This naturalistic approach is appreciated locally as well. Surveys show the zoo is one of the most popular and loved public institutions in the Puget Sound region (1995 Marketing Study). The purpose of this Long-Range Plan Update is to guide the zoo's evolution to still higher levels.

While this Long-Range Physical Development Plan (LRPDP) continues to advance the state-of-the-art in exhibition and animal care, the revolution for the next 20 years will be in how people use these exhibits as well as the rest of the zoo. The care and presentation of zoo animals and plants will remain important and the overall quality of the visitor experience will reflect the same level of planning and design. The updated plan will show how the zoo can address the diverse physical and psychological needs of its visitors with the same depth of concern it has shown for its animals. This will be accomplished in several ways. Development of additional restrooms and food services, together with improvements to wayfinding and circulation, will provide a more pleasant visit. Improved arrival and parking will enhance both ends of the guest's visit and improve conditions for zoo neighbors. An integrated system of learning areas linked to the new Discovery Village will help to make the subtly implicit messages of immersion exhibits explicit and more important. Improved staff and volunteer facilities and service circulation will make the work of volunteers and staff both more productive and more enjoyable.

Recent advances in animal husbandry such as behavioral enrichment and operant conditioning will allow zoo animals to become more active and visible, displaying a wider range of exciting natural behaviors within beautiful habitat settings. New communication programs will allow both staff and visitors to interact with associated field workers around the world. Education programs will reach a far more diverse audience, both at the zoo and throughout the community. These are but a few examples of what Zoo Commission II meant in 1995 when it stated that Woodland Park Zoo is evolving from defining "what zoos should look like" to "how zoos should be used … " (Operations Committee Conclusions and Recommendations, December 5, 1995, Volume II, Technical Appendix).

This Long-Range Physical Development Plan is essentially a physical development roadmap. Other related documents will address the strategic, governance, education, conservation and other essential programs which, together with these plans and visions, will allow Woodland Park Zoo access to new levels of accomplishment and innovation unimaginable during the drafting of the 1976 Long-Range Plan.

New physical developments include completion of long-needed new facilities for bears and tigers. A major redefinition of the primary pathway loop (shortening it by 20%) will be anchored by three major visitor hubs: the South Plaza, East Plaza and West Plaza. Moving around the zoo will be easier and more comfortable. Secondary visitor hubs in each zoo quadrant will provide guests with a comfortable balance between adventure and relaxation.

"Discovery Village" will be a prototype of a plant/animal/people-friendly learning environment providing visitors with a window to the zoo's role in animal care and conservation, and an interactive learning environment for people of all ages.

Later phases will include outstanding new exhibits, such as the Desert Exhibit, a unique environment, especially during Seattle's winters, and the Asian Highlands, the long-awaited companion to the zoo's Northern Trail, considered by many as their favorite part of the zoo. Asian Highlands could include such legendary species as giant panda and brown snub-nosed monkey in a mist-shrouded Chinese valley. The nearby Australasia exhibit could feature colorful lorikeet flocks, a canopy visit to arboreal tree kangaroos, and a red desert encounter with kangaroos and wallabies by a billabong.

The African Savanna, now reaching the landscape maturity envisioned by its designers, will be given a new liveliness. The present Savanna pathway will have a new destination, the Safari Lodge, where nose-to-nose encounters with savanna animals such as lion, leopard and patas monkey will be highlights. The trail will end with a real splash at the new Hippo River exhibit where these bulky giants can be seen,

graceful as mermaids, underwater in their true natural environment. New off-exhibit holding facilities for giraffe and other hoofstock will make servicing the Savanna far more efficient and less disruptive to visitors.

The zoo's public area, presently anchored by an urban meadow with its amphitheater-like green, will be juxtaposed with a flexible program space and zoo offices reflecting new, sustainable building standards. A historic carousel will be an added visitor attraction. A new garden path, part of the zoo loop path dedicated to beautiful botanical displays, will integrate the new West Entry (consolidating the present west and north entries) with the North Meadow and new West Plaza area. The West Plaza and surrounding attractions of Discovery Village, Desert Exhibit, Tropical Rain Forest, Day and Night Exhibits, and Rain Forest Food Pavilion will create a "winter zoo." These improvements will rebalance the zoo's "center of gravity," which has become overcrowded on the east side with the last generation of new developments. Satellite visitor nodes are also important. The popular Pony Ring and Amphitheater (animal demonstrations) will be relocated to the zoo's under-utilized southeast quadrant.

Major expansion is also recommended for zoo operational and off-exhibit animal breeding and care areas, with concentrated service centers at the periphery of each quadrant. Service and maintenance operations, like visitor amenities, will now be brought to the same level of excellence the zoo has achieved in animal exhibition.

It has been said that more good has been done for animals by zoos in the last 25 years than in the previous three thousand-year-old history of zoos. Nowhere is this better demonstrated than at Woodland Park Zoo. And while this central work will continue to expand, the next 20 years will see even greater success in making the zoo and its mission ever more fun, meaningful, and important to citizens of the Pacific Northwest and their guests, who support Woodland Park Zoo so well.

Jon Coe

FOREWORD

PURPOSE OF THE PLAN

This Long-Range Physical Development Plan is intended to amend the zoo's original 1976 Long-Range Plan. The plan provides overall guidance for the physical development of the zoo over the next twenty years, building on the zoo's past achievements to guide the next generation of the zoo's evolution. The resulting plan improves infrastructure to meet the changing needs of the zoo and the community that uses the zoo, while keeping the zoo's unique character, design philosophy and ecological emphasis.

CHANGES SINCE 1976

Much has changed since the original plan was adopted. Zoos have evolved to play an increasingly important role in the preservation of wildlife around the world, and the education of future generations about the importance of conservation. Animal care standards and techniques continue to change as more knowledge is gained, requiring improvements in programs and facilities. Our growing understanding about the families and community members who visit the zoo has identified a need to increase opportunities for active involvement of the whole family and to make corresponding improvements in programs and facilities. Though the number of zoo staff and volunteers has increased significantly since 1976, permanent facilities to house them have been put off for years as more critical improvements for animals have taken priority. And as visitation has grown, the need to provide parking onsite to reduce the zoo's impact on nearby neighbors has become more acute.

Along with the region, the zoo has experienced tremendous growth since 1976. At that time, the zoo was entirely supported by the City through the Parks and Recreation Department, and served fewer than 600,000 visitors annually. Today, the zoo's annual attendance is more than one million, and the zoo is a regional conservation, education and recreation facility with a national reputation. The zoo has seen a corresponding increase in the staff and volunteers required to serve the needs of both zoo animals and visitors, with staff growing to almost 250 and volunteers to nearly 700, more than double the 1976 numbers. The updated plan provides for the visitor and employee facilities necessary to accommodate this growth.

Additionally, passage of the 20-year management agreement between the City and the Zoo Society has changed the way the zoo must operate. As a nonprofit organization that is no longer a part of city government, the zoo must find new revenue sources to meet rising costs and support zoo operations, while maintaining a commitment to keep general admissions affordable. And the end of the dual-management system at the zoo has given new urgency to efforts to bring most zoo operations staff together in one location, facilitating the collaboration and interaction necessary to run the zoo efficiently and effectively.

RELATIONSHIP TO THE 1976 LONG-RANGE PLAN

Despite these significant changes, much of the previous plan remains perfectly appropriate, including guidelines for immersion exhibits and animal viewing, plantings and site development. Indeed, a large number of paragraphs from the 1976 plan are transposed verbatim to the present volume. Other areas of the original plan are kept in spirit, yet updated in fact. For example, the singular exhibition theme of social biology—the keeping of social species in large, naturally sized social groups—does not fully encompass the zoo's collection nor its foreseeable emphasis. Therefore, the broader theme of natural behavior has been added to more accurately reflect the zoo's current and future emphasis.

The ecological and social emphasis of this plan still remains as the essential stimulus for the dialogue with nature envisioned by the 1976 Long-Range Plan. The broad concepts of bioclimate and sociobiology should continue to shape the overall experience of Woodland Park Zoo. Certain areas of the original plan have served their purpose and are no longer needed. These subjects include the extensive site analysis, establishment of bioclimatic simulation areas, and exhibit scenarios for exhibits now completed or long ago deleted.

New areas of emphasis have emerged, as older problems have been resolved. The greatest need of the original Long-Range Plan was to establish humane homes for zoo animals while immersing zoo visitors in

representations of the animals' habitats to give them a more compelling, memorable experience of animals in a naturalistic context. While a few older animal exhibits remain (principally associated with the old Feline House), most of the issues of first order urgency have been resolved with such success that the zoo has won four Best Exhibit Awards and one Significant Achievement Award for exhibits from the American Zoo and Aquarium Association. The zoo must now re-balance itself to better serve its more than one million annual visitors. This endeavor will require major investments in parking, visitor services, activities, education and special events.

The zoo also requires services ranging from utility infrastructure and separated roads, to maintenance and exhibit shops, veterinary facilities and greenhouses, more extensive than those mentioned in the 1976 LRP. Also, Woodland Park Zoo's commitment to the propagation and maintenance of endangered species, including its active participation in national and international breeding registries and Species Survival Plans, creates heavy demands for facilities and staff unforeseen in the original plan. Finally, while conservation education was important in the original plan, it has evolved into an even more important area of the zoo's mission than what was envisioned in 1976.

All of these changes mandate a shift within the zoo, as the Zoo Commission II report accurately foresaw in 1995:

> "The Commission concludes that the zoo today is at a critical turning point in its evolution. Although the focus of the zoo's past decade has correctly been on the successful upgrading and replacement of unacceptable facilities by world-class exhibits — i.e., on what zoos should look like — the Commission believes that the future focus of the zoo should be centered on how zoos are used — i.e., their role in serving the community and wildlife conservation. Moreover, the zoo is now in a position to be just as much a world-class pioneer over the next decade — through meaningful and innovative programs appealing to all ages throughout the region — as it has been with exhibit design during the past…"

The updated Long-Range Plan that follows provides a logical, flexible framework to guide future development so that these challenges will be met and the essence of Woodland Park Zoo will be preserved and enhanced.

USE OF THIS DOCUMENT

The Long-Range Physical Development Plan is a flexible document intentionally framed to allow for change and modification. It establishes ground rules to insure that such changes will not contradict the established themes, design applications, techniques and concepts, but rather will serve as refinements of the whole.

INTRODUCTION

The plan represents an effort to achieve a harmonious balance by creating naturalistic exhibits for animals while simultaneously addressing needs for visitor services, infrastructure and educational support. The updated plan re-states the essential design values articulated in the 1976 plan. With respect to design, four ideals are consciously interwoven: (1) realism, (2) landscape (habitat) immersion, (3) cultural resonance and (4) behavioral enrichment. Similarly, the physical development plan is designed to support the zoo's continuing goals of education, conservation, recreation and scientific study.

The following organizational principles, thematic emphases and historical descriptions are excerpted from the zoo's original 1976 plan, except where indicated. These provide the philosophical and conceptual framework for the physical development outlined in later portions of this document.

Excerpted from the 1976 Long-Range Plan (LRP) except where indicated by "[ ]" s

OBJECTIVES

By The Zoo Action Task Force, April 1975

The Woodland Park Zoological Garden should be a Life Science Institution demonstrating the value and beauty as well as behavioral and physical adaptations of animal life. As such, primary emphasis should be placed on fostering public understanding of the history of animal life and its relationship to ecologica1 systems.

Visiting the zoo and gaining this understanding should be an enjoyable experience. Recreational opportunities should be provided for the refreshment of body and mind and consistent with these purposes of the zoo. The zoo should promote the conservation of wildlife through care and propagation of selected species and through enhancement of public awareness of human impact on animals and their environments. The zoo should conduct and encourage research which promotes the above educational and conservation purposes, and which supports the welfare of its animals.

… Woodland Park Zoo should display a representative cross section of the world's animal life, including wildlife of the Pacific Northwest.

[The key objectives of the LRPDP are to reaffirm the 1976 LRP, but to adapt it to:

- Improve the zoo's animal health, conservation and maintenance facilities and provide new exhibits.
- Provide facilities for social gathering, recreation and interactive learning for visitors of all ages, with a focus on programs that inspire conservation.
- Enhance the financial ability to sustain zoo operations and provide stewardship of the zoo by developing facilities that create new revenue streams and can be used year-round.
- Improve the visitor experience, particularly for families with young children and during the zoo's off-peak times in late fall, winter, and spring.
- Reduce the neighborhood traffic impact and increase visitor convenience by providing sufficient onsite parking capacity to accommodate current and projected zoo attendance.
- Provide onsite workspace fore zoo staff that enhances efficiency, productivity and collaboration.]

DESIGN POLICY

… Future developments at the zoo will be based upon the Social Biology [and Natural Behavior] Exhibition Theme and the [Natural Habitat and] Bioclimatic Zone Presentation Theme. To satisfy these requirements, several specific design principles will be incorporated into the development of the comprehensive plan for the zoo.

All new habitat reconstructions will be designed to give as natural an appearance as possible in order to visually replicate the animals' native environment …

The animal collections within these exhibits will reflect an emphasis on social groupings through representing natural-sized groups as much as possible. Thus, areas given to animals will invariably be larger than in the traditional zoo concept, with fewer species represented but with a larger number of individuals.

To benefit public viewing of the animals, all attempts will be made to avoid visual barriers, with viewing areas chosen for the most sympathetic appreciation of the habitat experience. All attempts will be made to create situations where the exhibition of the animals can be achieved through a landscape solution, thereby eliminating "exhibition houses" unless essential.

Because of the desire to emphasize the ecological aspects of the zoo site, all recreational activities which are not related to the zoo experience, or are of an energetically active nature, will be …[well separated from animal exhibits.] However, at the perimeter of the site, the environmental zones will all be designed to reflect Northwest landscapes and will be integrated to benefit the surrounding community by contributing towards its passive recreational needs.

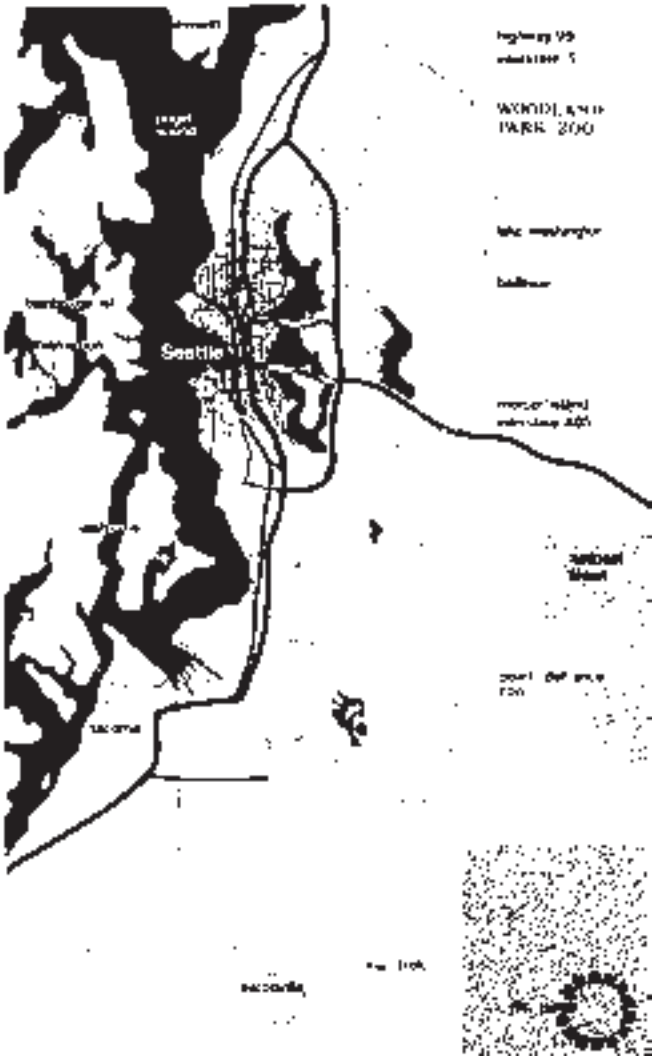
These design principles are not intended to be exclusive but are presented as an indication of the essential goals for the zoo as regards the visitor experience. The general intention is to move away from the traditional concept of exhibiting animals as mere objects. All planning and design work will attempt to produce a final result in which the visitor will have a total environmental experience, viewing wild animals as a living part of a naturalistic habitat.

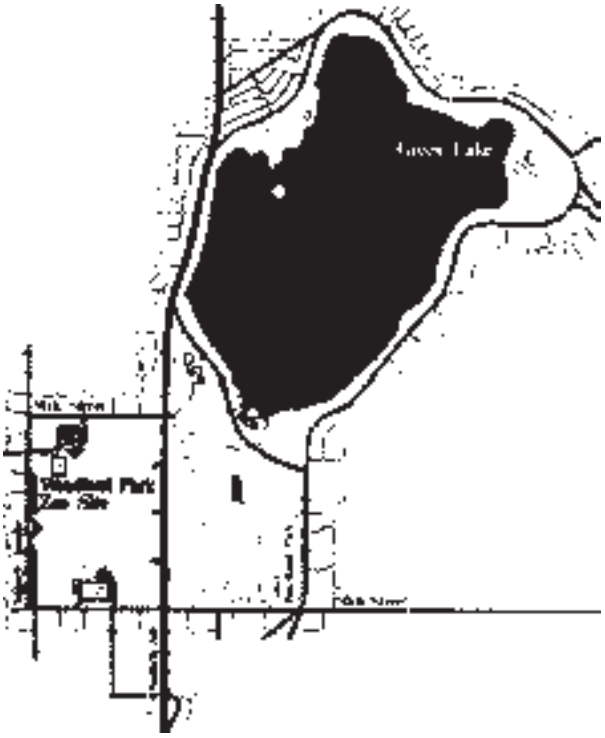
[The Seattle Design Commission participated in the development of the Design Policies listed above. Through the years, the Commission has also reviewed all major zoo projects. The early and continued involvement of the Design Commission will continue to be an important part of the design process.]

SITE LOCATION

Excerpted from the 1976 LRP except where indicated by "[ ]"s

Seattle's Woodland Park Zoo was established ... [in 1899] on Phinney Ridge in the northwest sector of the city. Ninety acres in size, the ample site is diverse in topography and aspect, having well-established vegetation communities throughout and buffering its four sides. It is sharply bounded on the east by a primary state highway, Aurora Avenue, and on the west by a secondary arterial, Phinney Avenue. Southern and northern boundaries interface … with the residential community. The site provides a rich spatial and botanical framework for future exhibit development.





HISTORY OF WOODLAND PARK ZOO

Excerpted from the 1976 LRP except where indicated by "[ ]"s

In l899 the City of Seattle purchased Phinney's Woodland Park estate for $100,000 and created a furor. Vigorous protests insisted that the price was too high, and that the park was too far out of town. But the wisdom of the City Council's decision has proven to be of ever increasing value.

Guy Phinney was English by birth and invested $40,000 in his estate to develop a traditional English park. He built a large house and laid out a formal rose garden, constructed a pump house to bring water from Green Lake to his gardens, erected an impressive stone entrance on 50th Avenue, and installed an electric trolley line along Fremont Avenue for his private street car. The aristocratic tradition also demanded a deer park and by 1893, when Phinney died, a small herd had been established in the park.

The first zoo in Seattle was a small collection of animals owned by the Lake Washington Cable Railway and maintained in Leschi Park. Their animals were given to the City soon after they purchased Woodland Park, and it is interesting to note that Carkeek Park's first use was as a vegetable garden for the zoo animals.

The City fathers engaged the famous Massachusetts landscape architectural firm of the Olmsted Brothers to create a public park out of Guy Phinney's estate. The choice was apt since [the work of the Olmsted Office], which included Central Park in New York City, was an inspired outgrowth of the English landscape tradition.

They retained the formal gardens of the Phinney estate, laid out new pathways, and created several great spaces with animal quarters on the periphery, after the fashion of the day. Lower Woodland was left as an informal woods, but in 1930 City Engineer W.B. Barkuff developed a plan to bisect Woodland Park with a six-lane highway. Councilman George Hill, who had earlier taken City Engineer R.H. Thompson on a tour of Europe to "cure him of the habit of putting roads through parks," formed a coalition to defeat the highway plan and proposed an alternate route following the contours of the land. Despite a public referendum vote against the plan, Aurora Avenue was constructed and the park was divided.

Since that time Woodland Park Zoo has remained in "Upper" Woodland Park. During the Depression several WPA projects were built, including a commissary, beaver ponds and monkey island. In 1949, under the direction of Ed Johnson, the bear and feline grottos were designed. He also proposed a children's zoo at that time, but not until 20 years and five unsuccessful Park Bonds later, plus a controversy over theme design, was the first unit of the children's zoo opened in 1967.

The 1968 Forward Thrust Bond Issue provided $4.5 million for a list of specific zoo improvements. They were to be developed in accordance with a "comprehensive plan," and since no such plan existed, the city hired architect G.R. Bartholick to develop long-range proposals. His ... plan called for the extension of the zoo into Lower Woodland Park using a 700-foot zoological conservatory over Aurora Avenue to reunite the park. Paradoxically a public initiative defeated this innovative proposal in November 1974.

Mayor Uhlman then appointed a zoo advisory committee to establish guidelines for a new direction, and in the late spring of 1975 work began on a new plan under the direction of David Hancocks as design coordinator. Jones & Jones was hired that fall, and approval for their comprehensive plan was given by the City Council early in 1976. [The 1976 Long-Range Plan was the zoo's first master plan. It established new circulation, landscaping and land use criteria organized around an ecological approach to zoo design.] Forward Thrust development was at last ready to begin. First on-site work started in the summer of 1976 with

a schedule calling for completion by the end of 1979. [During that time the African Savanna, Gorilla Exhibit, Primate Islands, and North American Marsh and Swamp exhibits were created.

The 1985 Zoo Bond Issue provided $31.5 million and private donations in response to the “Save Our Elephants” campaign and the efforts of the Woodland Park Zoological Society raised an additional $10 million from private donations to match the bond and to build additional elements of the 1976 Long-Range Plan. The Asian Elephant Forest exhibit, Tropical Rain Forest exhibit, Education Center, ZooStore, Animal Health Facility, Northern Trail exhibit and Trail of Vines exhibit were constructed between 1987 and 1996.

On March 1, 2002, the City of Seattle, acting through its Department of Parks and Recreation, entered into an Operations and Management Agreement for the zoo with Woodland Park Zoological Society.

In addition to assuming the responsibility for operations and management, Woodland Park Zoological Society raised private donations to fund the African Village opened in 2001, African Wild Dog exhibit opened in 2002, and Jaguar Cove opened in 2003.]

LONG-RANGE PHYSICAL DEVELOPMENT PLAN

Woodland Park Zoo

Northern Trail (Taiga, Tundra, Montane Zones), Woodland Park Zoo

LONG-RANGE PHYSICAL DEVELOPMENT PLAN

EXHIBITION THEME: SOCIAL BIOLOGY AND NATURAL BEHAVIOR

The following is excerpted from the 1976 LRP except where indicated by "[ ]"s

A zoo has to be more than a natural history museum, for it is concerned with live animals, and its unique aspect is its potential for exhibiting animal behavior. It is therefore essential to give the animals all necessary opportunities to engage in natural behavior, to the benefit of the animal and the zoo visitor.

As a coherent theme for the exhibition of wild animals and their behavior, the zoo has decided to [emphasize Natural Behavior and] Social Biology, which has its roots in the sciences of ecology and ethology.

Ecology has made tremendous contributions to our general awareness of wildlife and wild habitats, and ethology is revealing new insights into human and animal behavior.

Social biology studies the social aspects of behavior. It requires a new way of looking at animals, not just as isolated individuals but as members of a complex society in which both the animal and its group has to learn to adapt and survive …

In this way the visitor will be able to observe not only the form, color … size [and natural activity] of the animal, but also the interactive behavior and communications naturally elicited by social species when they have opportunity to share the companionship of their own kind.

It is also hoped that, by using the world of social animals as a mirror, the zoo visitor will be able to more easily reflect upon some of the problems and some of the benefits that come from living together; for humans, too, are a social species.

PRESENTATION THEME: BIOCLIMATIC ZONES AND NATURAL HABITAT

Excerpted from the 1976 LRP except where indicated by "[ ]"s

The traditional zoo concept of directing visitors to one part of the site to see all the birds, then to another building to see all the cats, and yet another area of the zoo for all the bears, or primates, or marsupials, goes against the grain of nature.

Wild animals live in a dynamic ecological relationship, and, although the zoo is only a substitute, it should attempt to reflect this complex order. Animals are generally confined within certain parts of the world by the combined effects of climate and vegetation.

Thus we find that animals living in the deserts of New Mexico, for example, are often very similar in form and behavior to desert animals from Egypt; similarly monkeys living in Asian forests have evolved in much the same way as monkeys found in African forest regions.

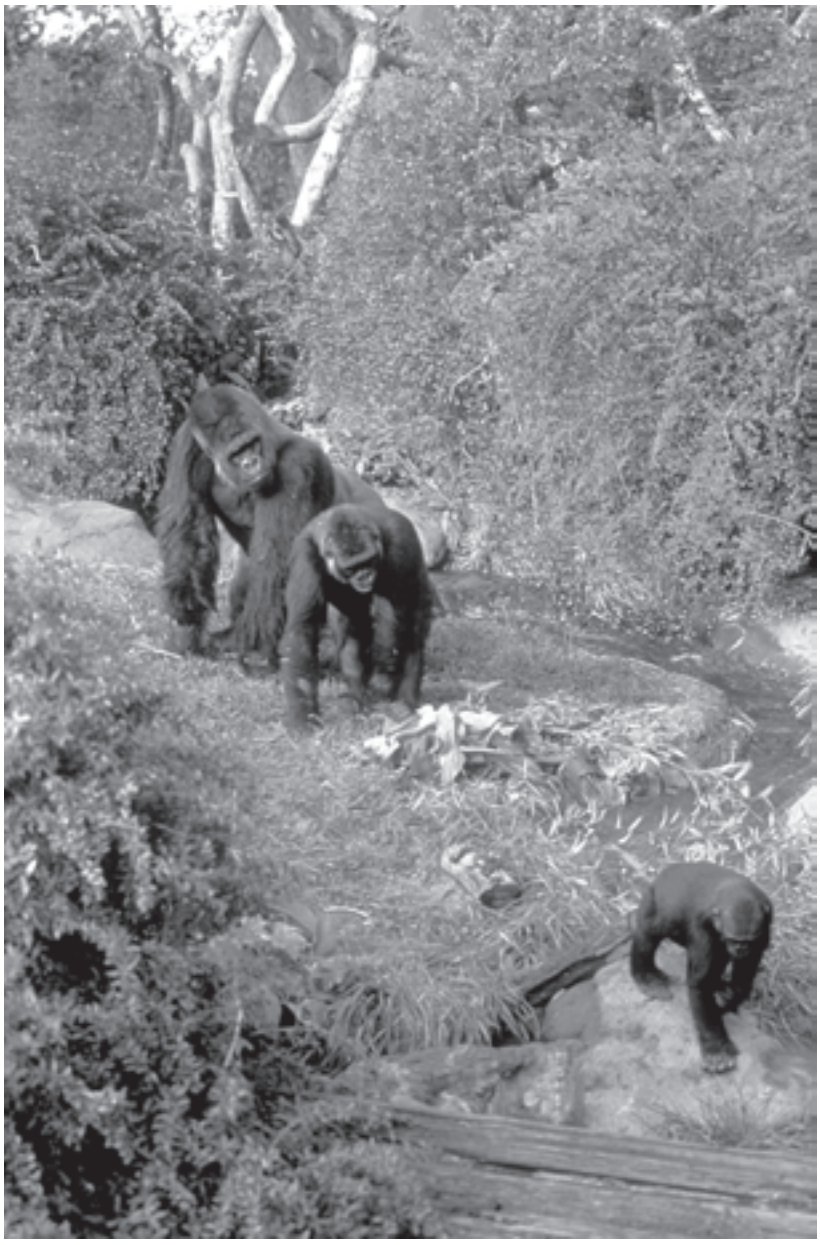


Photo by Ian Dewar

Tropical Rain Forest, Woodland Park Zoo

The divisions around the world created by climate and vegetation are the basis for the new plan concept for Woodland Park Zoo. Instead of dividing the zoo into different continents, or "zoogeographic" areas, a thorough analysis has been made to discover which bioclimates can be replicated, and where these should be located on the zoo site.

Seattle is fortunate in having a climate in which many different types of vegetation from a large number of the world's bioclimates can be grown, and in which many animal species from these zones can adapt to our weather patterns with minimal shelter requirements.

The concept plan therefore places major emphasis on natural vegetation and de-emphasizes large buildings whenever possible.

It is the intention of this presentation concept that visitors to the zoo will enjoy a total environmental experience and an opportunity to rediscover the beauty and value of natural fauna and flora in an urban oasis.

EDUCATION

Excerpted from the 1976 LRP except where indicated by "[ ]"s

> [The purpose of education at Woodland Park Zoo is to inspire an understanding of nature and a commitment to conservation. The zoo should demonstrate] … the value and beauty as well as behavioral and physical adaptations of animal life. As such, primary emphasis should be placed on fostering public understanding of the history of animal life and its relationship to ecological systems.

CONSERVATION

Excerpted from the 1976 LRP except where indicated by "[ ]"s

> The zoo should promote the conservation of wildlife through care and propagation of selected species and through enhancement of public awareness of human impact on animals and their environments. [The zoo is essential habitat for many native animals especially migratory birds, butterflies and bats. Whenever possible, development of the zoo should consider its value to migratory and other native wildlife. The zoo should continue to breed threatened and endangered species in cooperation with other wildlife institutions.]

RESEARCH

Excerpted from the 1976 LRP except where indicated by "[ ]"s

> The zoo should conduct and encourage research which promotes the above educational and conservation purposes, and which supports the welfare of its animals.

RECREATION: FAMILY PARTICIPATION AND ENJOYMENT

Excerpted from the 1976 LRP except where indicated by "[ ]"s

> Visiting the zoo … should be an enjoyable experience. Recreational opportunities should be provided for the refreshment of body and mind and consistent with these purposes of the zoo.
>
> [Families visit zoos not only to see, enjoy and learn about animals and nature, but also for recreation. Zoos are expected to provide safe, entertaining experiences for families with children of all ages. To date, Woodland Park Zoo has played a leading role in the development of naturalistic exhibits that allow for high quality animal care as well as viewing experiences that help visitors understand the important interplay between animals and habitat. However, there continues to be a need for active areas at the zoo where families can interact and enjoy their own social activities. The proposed historic carousel, events center and Discovery Village are intended to provide children and families with new opportunities to enjoy interactive, hands-on experiences during their visit to the zoo. These features will not only enable the zoo to better meet the needs of visitors, they can also earn revenue to help support the zoo's programs.]

FINANCIAL STABILITY AND STEWARDSHIP

A combination of forces has led zoos across the country to seek new revenue opportunities to support day-to-day operations and mission-based conservation and education programs. Rising utility and employee benefit costs, new technologies, the higher cost of maintaining naturalistic exhibits instead of steel barred cages, and zoos' evolving leadership role in worldwide conservation and wildlife preservation have driven costs up at the same time that city funds available for zoos are shrinking. As public funding becomes a smaller proportion of the overall budget, Woodland Park Zoo must create new revenue streams to meet rising costs and support zoo operations and programs. To address these needs, the zoo should develop facilities that allow for the community's year-round use of the zoo for family activities, community gatherings, workshops, weddings and other events, providing new funds to ensure the zoo's financial success. The new revenue opportunities should allow the zoo to meet the dual goals of increasing the financial stability of the organization while also maintaining affordable general admission rates.

THE BIOCLIMATIC CONCEPT

Excerpted from 1976 LRP except where indicated by "[ ]"s

… animals are generally confined within certain parts of the world by the cause-and-effect relations of climate and vegetation. These create specialized habitats to which animals have adapted, ranging from tropical rain forests to dry deserts, from mountains to ocean shores, and from open prairies to hedgerows.

Because these habitats occur within different parts of the world, a thorough analysis has been made to define and locate them and to determine which bioclimatic zones can be replicated for the zoo.

Although many natural scientists have developed techniques to define world habitats, the subject has been dealt with most objectively by Holdridge (1972). He has devised a system for bioclimatic-zone classification using as his basis three parameters: 1) temperature; 2) precipitation; and 3) evapotranspiration.

Temperature

Temperature, one of the two important climate controls, varies in a regular and predictable manner with both latitude and altitude and is primarily responsible for the latitudinal and altitudinal climatic belts. An important difference, however, between its latitudinal and altitudinal variation involves seasonality. The seasonal range of temperature varies latitudinally, and because of this, tropical montane areas of equivalent mean annual temperature to high-latitude lowland areas may be quite different ecologically.

The oceans, with their great resistance to heating and cooling, act as ameliorating effects on temperature, so that continental climates show greater temperature variations, both annual and diurnal, than do maritime ones. The flow of currents in the ocean affects the temperatures in maritime areas, and the Japanese Current and Gulf Stream cause higher mean temperatures on the [west] coasts of North America and [Europe], while the Humboldt and Benguela Currents cause lower mean temperatures on the [west] coasts of southern South America and southern Africa.

Precipitation

Water continually evaporates from the earth's water bodies, travels through the atmosphere as water vapor, and eventually condenses out as fog or falls as precipitation. Thus the world air circulation is instrumental in determining patterns of precipitation. The fact that air can hold less moisture as it cools is significant in determining where the water returns to the substrate as it travels around the atmosphere. First of all, the equatorial belt is characterized by extreme and constant heating, the sun remaining overhead during the daytime throughout the year, and this causes the air there to rise. As it rises, its moisture condenses out and falls as rain. This produces the equatorial rainy belt. As the thermal equator moves north and south with the changing seasons, the belt of extreme rains accompanies it, so that some seasonality in rainfall is characteristic of even this belt. As this equatorial air falls back to earth, it is generally vectored toward the west, causing the trade-wind belt just above the equatorial region. These easterly winds are very moisture-laden as they flow across the eastern edges of the continents at these latitudes, and where they hit even low coastal plains the air rises because the land is hotter than the water, and the eastern shores of tropical regions are thus wet.

The seasonality of precipitation is controlled by the moving of the thermal equator and the changes of wind directions characteristic of annual (and shorter) cycles. This is especially

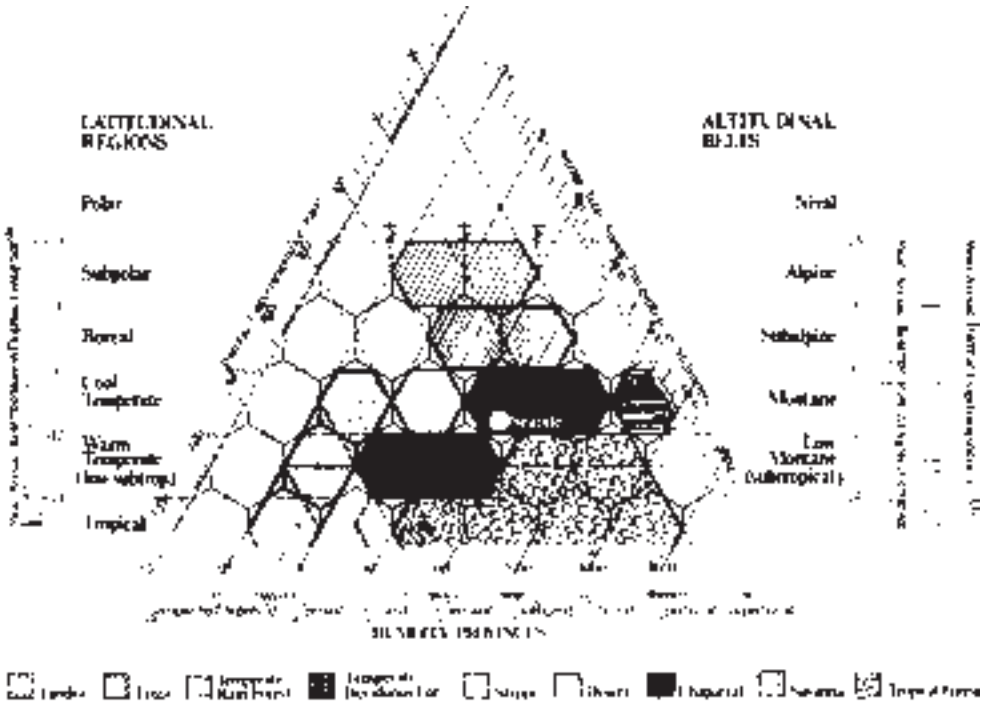
obvious in regions in which the wind flows from the ocean during some part of the year and from the interior during the other part. In low-latitude areas seasonality is entirely controlled by variation in precipitation, whereas with increased latitude both temperature and precipitation play a part, the former of increased importance with increase in latitude. Both the amount of precipitation and the time of the year it occurs are significant at higher latitudes, as for example whether the precipitation comes during the hot (growing) season or the cold (dormant) season. Both the amount of precipitation and its duration over the year (or conversely, the length of the dry season) interact to determine the climatic pattern in any area.

Potential Evapotranspiration

This parameter refers to the amount of water potentially evaporated from the environment and transpired by the vegetation at a given temperature under constantly optimal conditions of soil moisture and plant cover, i.e., climax vegetation. A simple formula for expressing potential evapotranspiration (PET) is: PET = mean annual temperature (degrees Centigrade) x 58.93, the PET expressed as mm rainfall. If rainfall and PET are equal, the PET/precipitation ratio is 1.0. Any region with a PET ratio greater than 1.0 can be considered dry, with a moisture deficit, and any region with this ratio less than 1.0 can be considered wet, with a moisture excess. The importance of this ratio is that it takes into account the interaction of temperature and precipitation in controlling soil moisture and humidity, of great importance to vegetation. For example, 250 mm of precipitation in the tropics would evaporate very rapidly with the high temperatures there, producing a very dry environment, whereas the same amount of precipitation in the Arctic would evaporate very slowly and produce a moderately wet environment.

Potential Bioclimatic Zones: Holdridge System and Others

As mentioned, Holdridge, (1972) has devised an objective system of classifying life zones, or bioclimatic zones. By construction of a triangle, using the three parameters of temperature, precipitation, and evapotranspiration as the three axes of the triangle, any spot on earth with climatic records can be placed in one of the Holdridge life zones. The life zone designations



are those of the “climatic association” characteristic of the zone, i.e., the normal climatic climax vegetation. This can be much modified by edaphic (non-climatic) factors so that many plant associations are possible within each life zone, but there should be only one type of climax vegetation.

The Holdridge system is of great value in being totally objective, although its utility has been tested and confirmed in tropical regions and only incompletely so in temperate regions. One of its values, however, lies in its two-dimensionality, so that any two sites can be plotted on it and compared.

Numerous other classification systems of life zones, or world vegetation zones, exist, of which Schimper and von Faber (1935), Odum (1971) and Walter (1973) have been examined in detail. There is major agreement among these systems, with differences reflecting the authors' attitudes toward the relative magnitudes of differences between plant associations and their significance. We have integrated these systems into the Holdridge model so that vegetation types can be looked at in terms of actual climatic variables. The following diagram integrates the bioclimatic zones chosen for replication at the zoo (see below) into the Holdridge system.

Simplification for the Zoo

The bioclimatic zones presented herein are of great importance in the evolution and distribution of plant communities and in turn of animal communities. However, birds and mammals, with their physiological homeostasis and well-developed dispersal powers, tend to range widely – larger species especially occur in a variety of plant associations. Because of this, the bioclimatic zonal system has been simplified for the purposes of animal exhibition at the zoo.

Ten bioclimates were selected for replication at the zoo: 1) Tropical Forest; 2) Savanna; 3) Desert; 4) Steppe; 5) Chaparral; 6) Temperate Deciduous Forest; 7) Temperature Rain Forest; 8) Taiga; 9) Tundra; and 10) Montane.

Biological Characteristics of the Bioclimatic Zones

TROPICAL FOREST

The trees are giants, reaching to 180' as emergents and over 100' as a continuous canopy. The vegetation is somewhat layered, with emergents, canopy, and understory trees and a less well-developed shrub and herb layer. In climax forest the understory is very open, easily permitting passage of large animals. The tree trunks are slender, but many of them have flaring buttress roots to increase their stability in the relatively shallow soil. The leaves of the canopy trees tend to be leathery and drought resistant, but the species within the canopy are much more subject to desiccation if removed from their very equable microclimate. Lianas and epiphytes are characteristic. The diversity of plant species is highest in this zone, with as many as hundreds of species of trees in a few acres in the best-developed forests. Palms are abundant in the New World, less so in Asia and virtually absent from African forests. Leaf cover is so extensive in this highly insolated zone that in many forests less than 1% of the available sunlight reaches the forest floor, and there are very few forest-floor herbs.

In the tropical deciduous forest the trees are lower (canopy 30-80') than in the evergreen ("rain") forest, and many or most of them are deciduous during the dry season, the degree of leaf-fall determined by the length of the drought period and the proximity of the trees to ground water. Some species, especially those of the understory, have small, hard leaves that are not dropped. This forest has a denser undergrowth than the evergreen forest, as there is much more light penetration. Lianas are less common, but drought-resistant epiphytes may be

abundant, especially cacti, orchids and bromeliads. The Australian forests in this zone are characterized for the most part by evergreen *Eucalyptus*; this genus is primarily evergreen and furnished the raw material for the evolution of trees in the tropical deciduous zone in Australia, thus the forest there has a very different aspect from those elsewhere in the zone.

Thousands of species of trees of many, many genera in many families occur in the Tropical Forest Zone. Characteristic of many of them are smooth, light-colored trunks, buttressed bases and leaves with elliptic shape, entire margins and an elongate tip; in fact the similarity in leaf type among so many distantly related groups is remarkable. Gymnosperms are virtually absent (except cycads), herbs are relatively rare, and monocots are especially prominent, including tree-like (Palmae, Cyclanthaceae, Musaceae, Zingiberaceae, Marantaceae) and epiphytic (Araceae, Bromeliaceae, Orchidaceae) ones. Some indication of the diversity is provided by a list of dicot families that are very diverse in the tropics, with hundreds of species in each: Piperaceae, Moraceae, Annonaceae, Lauraceae, Capparidaceae, Leguminosae (mimosa – and cassia-types), Meliaceae, Anacardiaceae, Sapindaceae, Sterculiaceae, Guttiferae, Myrtaceae, Melastomaceae, Araliaceae, Myrsinaceae, Sapotaceae, Bignoniaceae, Gesneriaceae, Acanthaceae and Rubiaceae. These families are entirely or largely restricted to the tropics.

This zone supports a very high diversity of animals as well. This diversity extends to the higher groups (families and orders) as well as to species, as there are more ways for animals to "make a living" in this zone than in any of the others, as the vegetation is so complex and food resources so varied. Most of the species are relatively "rare," that is, their population density is low, but the total abundance of all individuals of all species is as great as in any zone. Activity is year-round, although breeding is often seasonal, its cycle controlled by rainfall cycles. The diversity of large mammals is not as great as it is in more open habitats, where vegetation is not so dense as to preclude rapid locomotion. Arboreal types are prominent, and these include climbers (monkeys, prosimians, sloths, anteaters, pangolins, squirrels and procyonids), gliders (flying squirrels, anomalurids, flying lemur) and fliers (bats). Bats are very much more diverse in the tropical forests than elsewhere and are responsible for much of the increase in mammalian diversity toward the equator. Caviomorph rodents (agoutis, pacas and their relatives) and small deer and antelopes furnish food for the larger carnivores (jaguar, leopard and tiger). Birds are incredibly diverse, with several hundred species possible in a few acres of Amazonian forest. Many of the treetop species are large, conspicuous and brightly colored, but the great majority of the understory species are cryptically colored and most often detected by their calls. Typical groups of the tropical forest include guans, pheasants, pigeons, parrots, hummingbirds, hornbills, puffbirds, toucans, woodcreepers, ovenbirds, antbirds, cotingas, manakins, flycatchers, pittas, birds-of-paradise, babblers, bullbuls and tanagers.

SAVANNA

This zone encompasses basically grassland with scattered trees, the latter growing in situations in which their roots can penetrate into the water table, as through cracks in hardpan soils; where these situations are prevalent, this habitat grades into tropical deciduous forest or thorn forest. In most tropical grasslands, trees are present in varying densities; hence "savanna" rather than "steppe" for this zone. Many of the trees are the same as those of the nearby forests, but some are peculiar to the savanna. The diversity of plants is low, as they

must be fire-resistant. Seasonality is pronounced, with a flush of growth of the grasses and annual forbs at the beginning of the wet season.

With lowered diversity it becomes feasible to list characteristic genera. In this zone, in drier areas the grasses *Panicum*, *Pennisetum*, *Andropogon* and *Imperata* are important, and tree genera include *Prosopis*, *Acacia*, *Curatella*, *Byrsonima*, *Adansonia* and *Euphorbia*. In wetter savannas the grasses *Leersia*, *Oryza* and *Paspalum* dominate, and palms are the predominant tree form.

The combination of different plant life-forms, combining features of grassland and forest, provides an excellent environment for many species. This is the home of the largest mammals of the World, the many African ungulates and elephant, and the large carnivores that feed on them. The same environment on the other continents is less rich in animal life but still has some species modified for savanna existence. Ostriches, rheas and emus, for example, are ecological savanna/steppe equivalents in Africa, southern South America, and Australia, respectively. Australia has a variety of kangaroos as equivalents to the African ungulates, but South America has no such present-day fauna, most of its savanna animals being relatively small. The hoofed animals are important in regulating the height and diversity of the grassland plants, and each species of mammal has its own distinctive food habits and way of feeding. Only because of this can so many species coexist. The open substrate lends itself as a home to a wide variety of burrowing mammals, and their burrows in turn are habitats for other animals such as reptiles. In this and other open environments hawks, with their long-range vision, are very successful. As the savanna is a very seasonal environment, parts of it are much more suitable for animals at some times of the year than others, so many of the large mammals migrate in Africa, and the same is true for many of the birds in Australia, where rainfall is even more unpredictable.

DESERT

Scattered, well-spaced shrubs with numerous branches from the ground level and small, thick leaves are characteristic of this zone. Two other plant life forms also occur commonly: succulents that store water in their stems and quick-growing and–flowering annuals that sprout immediately after the infrequent heavy rains. Rainfall is always low but variable, from widely spread to seasonal to totally unpredictable. The soils are often highly alkaline because of the high evaporation rate and lack of run-off, and this further limits plant growth.

Characteristic members of the three plant life-forms of this zone include: (1) small-leaved shrubs—*Acacia, Prosopis*, *Cercidium*, *Larrea* and *Commiphora*; (2) succulents—*Opuntia* and other cacti, *Agave*, *Yucca*, *Aloe*, *Sanseviera*, *Crassula*, euphorbias and milkweeds; and (3) ephemeral annuals—grasses, *Mesembryanthemum* and members of the Polemoniaceae and Boraginaceae.

In this environment many of the animals possess special physiological and/or behavioral adaptations to allow them to exist with minimal water supply. Because of this, there is much convergence on certain life forms among the animals of the different deserts of the World. For example, medium-sized, long-legged, sandy-colored rats or rat-like animals with long tails occur in most of the major deserts, but they represent only distantly related groups—the kangaroo rats of North America, jerboas and gerbils of Africa and Asia, and dasyures of

Australia. Other examples include kit foxes of America and fennecs of Africa; and jackrabbits of North America, caviids of South America and small kangaroos of Australia. Most of the mammals are nocturnal, active at a time when humidity is higher and predation by birds is reduced, but ground squirrels can be active during the hottest part of the day. The predominant color of small animals in this environment is that of the substrate, whether light or dark sand, as they are much subject to predation by visually oriented predators in this open environment. Reptiles are well adapted to dry climates and are well represented in deserts.

STEPPE

This zone is widespread in the interiors of continents and characterized by the low stature of its plant species, composed of various grasses and forbs. It varies depending on rainfall from more open with shorter grass to very dense with tall grass. In the drier areas bunchgrasses predominate, with open space between the plants. This habitat is much subjected to grazing pressure from large mammals, and the grasses reproduce vegetatively to a large extent when this is the case. The spring is usually wet, with much flowering of the forbs, but many of the plants dry out by late summer, and brown is the prevailing color then. This habitat is also an edaphic climax where there is a high water table or much fire in wooded regions, and the edge between it and the deciduous forest or it and the taiga shifts depending on drainage patterns and fires.

The tall grasses of wetter areas include *Andropogon*, *Panicum*, *Sorghastrum* and *Spartina*, medium grasses of intermediate areas include *Andropogon*, *Stipa*, *Sporobolus*, *Agropyron*, *Koeleria* and *Oryzopsis*, and the short grasses of drier areas include *Buchloe*, *Bouteloua*, *Poa* and *Bromus*. Forbs of a wide variety of families are also present.

The colder grasslands, like the tropical savannas, support populations of large ungulates that move over the landscape in regular migrations, cropping grasses and forbs and moving on as the food resources become depleted. There are fewer herbivore species in this zone than in the savanna, and in particular fewer predators on them, the wolf and its smaller relatives, the coyote and jackals. As in the savanna, there is a variety of burrowing herbivores, some of them colonial, and carnivores that specialize on them. The diversity of steppe birds is much lower than that of the lower-latitude savannas, only a few hawks, shorebirds and ground passerines being typical in the northern hemisphere. This habitat in South America supports more species, most of them of tropical origin and thus similar to or identical with the savanna species of that continent.

CHAPARRAL

This vegetation may be composed of very densely packed shrubs, as in California, or of these shrubs and trees to 40-50’ canopy height, as in the original vegetation around the Mediterranean. Much of the latter has now been replaced by vegetation more like that in

California, and the California chaparral may be a fire climax rather than a true climatic climax. The vegetation is evergreen, with small, thick leaves (sclerophyllous).

Characteristic trees include evergreen oaks (*Quercus*), *Olea* and *Cupressus*; shrubs, which are much more diverse, include *Adenostoma*, *Arbutus*, *Arctostaphylos*, *Buxus*, *Cistus* and *Ceanothus*.

Because of the density of this vegetation type, most of its mammals and birds are small, and the majority are cryptic. Wrens, sparrows, babblers, small squirrels and rabbits, and mice are characteristic, although all of these groups are common in other zones as well.

TEMPERATE DECIDUOUS FOREST

These fairly tall forests are characterized by obligatory leaf-shedding during the cold season. The forest is multilayered, with 1-2 tree layers and a shrub and a herb layer. With the great amount of light penetration in early spring, there is an abundance of herbaceous species flowering at that time. Some of the tree species produce large edible nuts and characteristically drop great quantities of them ("mast") in certain years. Pines may form an edaphic climax in this zone, and the ecotones between it and the taiga and it and the steppe may be very wide.

This zone varies from single species to multi-species dominance. Common genera are *Acer*, *Fagus*, *Quercus*, *Carya*, *Juglans*, *Fraxinus*, *Populus* and *Salix*. There is a great diversity of shrubs, some of them evergreen, and many herbs of the Orchidaceae, Liliaceae, Ranunculaceae, Rosaceae, Saxifragaceae and other families.

This is the most seasonal, in terms of environmental changes, of the habitats discussed thus far, and there is pronounced seasonality in its fauna. Many of the mammals hibernate, and some of the bats and over half of the birds migrate toward the equator in fall and back in spring. Food storage is feasible because of the ease in storing substances at low temperatures, and this adaptation is important to some mammals of this zone, in particular squirrels, which harvest the nuts produced by trees of the beech and maple families. These forests support a moderately diverse assemblage of animals from large carnivores and their ungulate prey through a great variety of small rodents and birds.

TEMPERATE RAIN FOREST

The tallest forests in the world lie in this zone, on the Pacific coast of North America. The dominants are all conifers, but hardwoods play an important part during succession and are locally abundant. Some evergreen hardwoods occur in the understory, and the herb and shrub layers are well represented, as there is much more light penetration than in the tropical rain

forests. The humidity is high, maintained by rainfall and coastal fogs, so epiphytes are abundant, although they are mostly mosses and lichens, as at high altitudes in the tropics. The forests in this zone in Australia and New Zealand are lush and dense, with a much higher proportion of hardwoods and superficially much like tropical forests.

Large conifers dominate in North America: *Abies*, *Tsuga*, *Picea*, *Pseudotsuga*, *Thuja* and *Sequoia*. Understory trees include *Alnus* and *Acer*, and shrubs of the Ericaceae are prominent. The herbaceous understory includes many ferns (Polypodiaceae) and species of Saxifragaceae, Liliaceae, Orchidaceae and many other families. In Australia and New Zealand *Eucalyptus* and *Agathis* predominate.

The fauna of this zone is not characterized by any special attributes, as most of its species are the same as or related to species of other zones. Its faunal distinctiveness is enhanced because it is well represented in Australia and New Zealand, which have very distinctive faunas, but even there no particular types of adaptations are evident. The species of this zone in the Pacific Northwest are the same as or closely related to those of the taiga and the temperate deciduous forest of the same continent.

TAIGA

This high-latitude zone is characterized by extensive fairly dense stands of conifers, which reach sizes comparable to the trees of the temperate deciduous forest. They are often so dense that there is little understory vegetation, and the temperatures are low enough so litter accumulates faster than it is decomposed. Because of glacial scouring, ponds and lakes are extremely numerous in this zone.

With increased latitude the plant diversity decreases greatly, and at any one site there are only a few species of trees in this zone. The Pinaceae includes most of the dominants (*Abies*, *Picea*, *Larix*, *Pinus*) but under many edaphic conditions broad-leafed trees may be abundant, in particular *Betula*, *Populus* and *Salix*. Ranunculaceae, Rosaceae and Saxifragaceae provide many of the herbaceous species.

This zone supports a low diversity of characteristic animals, many of them occurring throughout the world at high northern latitudes. Relatively large size, heavy insulation, hibernation and food storage are characteristic of many of the mammals, and most of the birds migrate out of this zone in the winter. Even in this relatively harsh climate, however, there are species of songbirds and small rodents that remain active all winter, and many predators (cats, foxes, wolves, mustelids, hawks and owls) are similarly active. Large browsing mammals are as common as in the temperate deciduous forest and rain forest farther south. Cyclic population oscillations characterize some species of both this zone and the next one.

TUNDRA

This is basically a two-dimensional habitat, like the steppe, but mosses and lichens are much more important components of the vegetation. In most areas the permafrost just below the ground surface traps the relatively small amounts of precipitation, so the landscape can be

very wet, but ridges may be extremely dry with no plants other than scattered lichens. Grasses and sedges and many forbs are abundant, and dwarf willows in many areas form beds of low shrubs. Alpine tundra, with no permafrost and a different photoperiod regime, is still much like arctic tundra, but in the tropics the same zone is very different, as it receives no snow and has little seasonal temperature variation. The plant physiognomy is still similar, with grasses and low chaparral, and above them a cold desert with widely spaced low herbs.

Lichens of many kinds (*Cladonia*, *Cetraria*, *Thamnolia*) and mosses (*Polytrichum*) are characteristic, as are sedges (*Carex*, *Eriophorum*) and grasses (*Poa*, *Elymus*). Dwarf species of *Salix* and *Betula* are shrublike to sprawling; otherwise only herbs are present. Common dicot genera include *Draba*, *Saxifraga*, *Dryas*, *Oxytropis* and *Pedicularis*.

This zone, with its very harsh climate and short growing season, supports a very low diversity of resident animals, but a surprisingly large number of birds, especially shorebirds, visit it in the summer to breed during the brief period of insect abundance. As in other open areas there are large herds of ungulates, but here the permafrost layer precludes burrowing in many areas. Hibernation is also impossible in high-arctic mammals, as temperatures are too low to sustain metabolism through the winter. Cold-blooded animals except insects and spiders are absent.

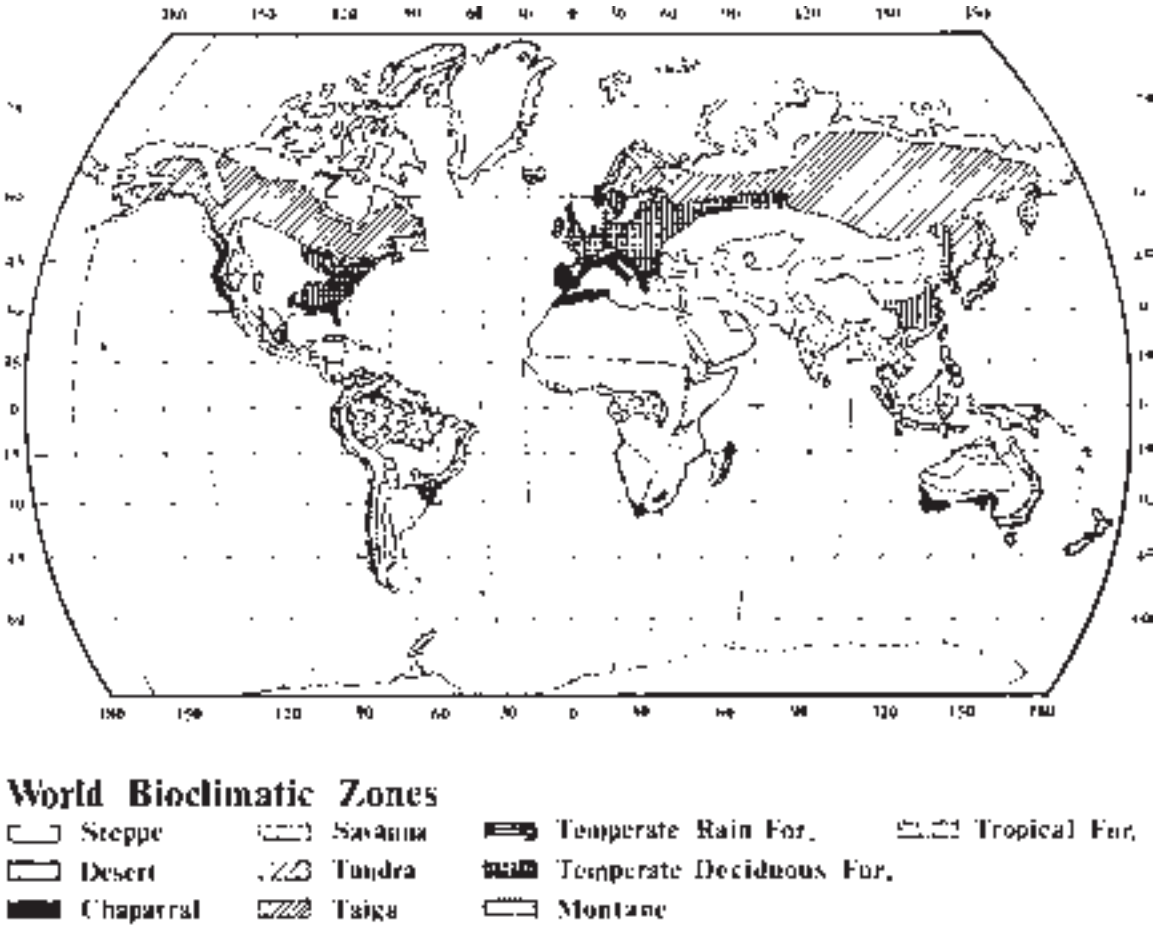
MONTANE

This zone is characterized by high relief and generally high altitudes. It contains elements of both taiga and tundra, its timberline much like the ecotone between those two zones. Many high-altitude areas are rugged and rocky, and talus slopes and scree fields are typical, but other areas are gentler and may lack rocks. Climate varies from equable at lower latitudes to extremely severe at high latitudes and altitudes. Precipitation varies considerably as well, depending on location of the mountain range.

Accordingly, a great variety of plants occur, in particular those with affinities to the flora of the taiga and tundra. In the temperate zone, conifers predominate in montane areas, often similar to related species of the taiga. Within and above the conifer zone, subalpine and alpine meadows and fell fields contain species of widely distributed northern genera such as *Phlox*, *Dryas*, *Lupinus*, *Oxytropis*, *Gentiana*, *Pedicularis* and others. However, the flora of equatorial montane areas is more often derived from the surrounding tropical lowlands, and the plants are thus quite different from ecologically equivalent plants in temperate montane areas.

As in the plants, the animals of the temperate-zone montane regions find their closest relatives in the arctic and subarctic, and adaptations for dealing with extreme temperature variations and long winters are emphasized. In addition, there is a premium on locomotory adaptations to traverse the rugged physiography. Ungulates are especially successful under these conditions, and there are many species of sheeps and goats at high altitudes. Pikas and marmots are widespread, and large birds of prey find the wind conditions ideal for soaring while hunting these same mammals. Again, in tropical montane regions the animals are derived from related species in the lowlands, and animals such as tapirs and leopards may ascend to considerable heights.

The map on the following page expresses the distribution of the major bioclimatic zones around the world. It has been adapted from the world map by Odum (1971) to fit our scheme for the zoo.



TRANSITIONS BETWEEN BIOCLIMATIC ZONES

In nature most habitats interdigitate into one another in a complex manner. In some cases the transition is sharp, the ecotone (intermediate habitat) narrow or nonexistent, but in other cases there is a gradual transition from one type of environment into another. The same is true with the larger-scale bioclimatic zones. As would be suspected from the Holdridge diagram, a given zone may contact and intergrade with a number of other zones, varying with temperature and precipitation. In some cases this is only a potential contact, as barriers (mountains, ocean) prevent contact in areas in which it might occur, i.e., areas of climatic intermediacy.

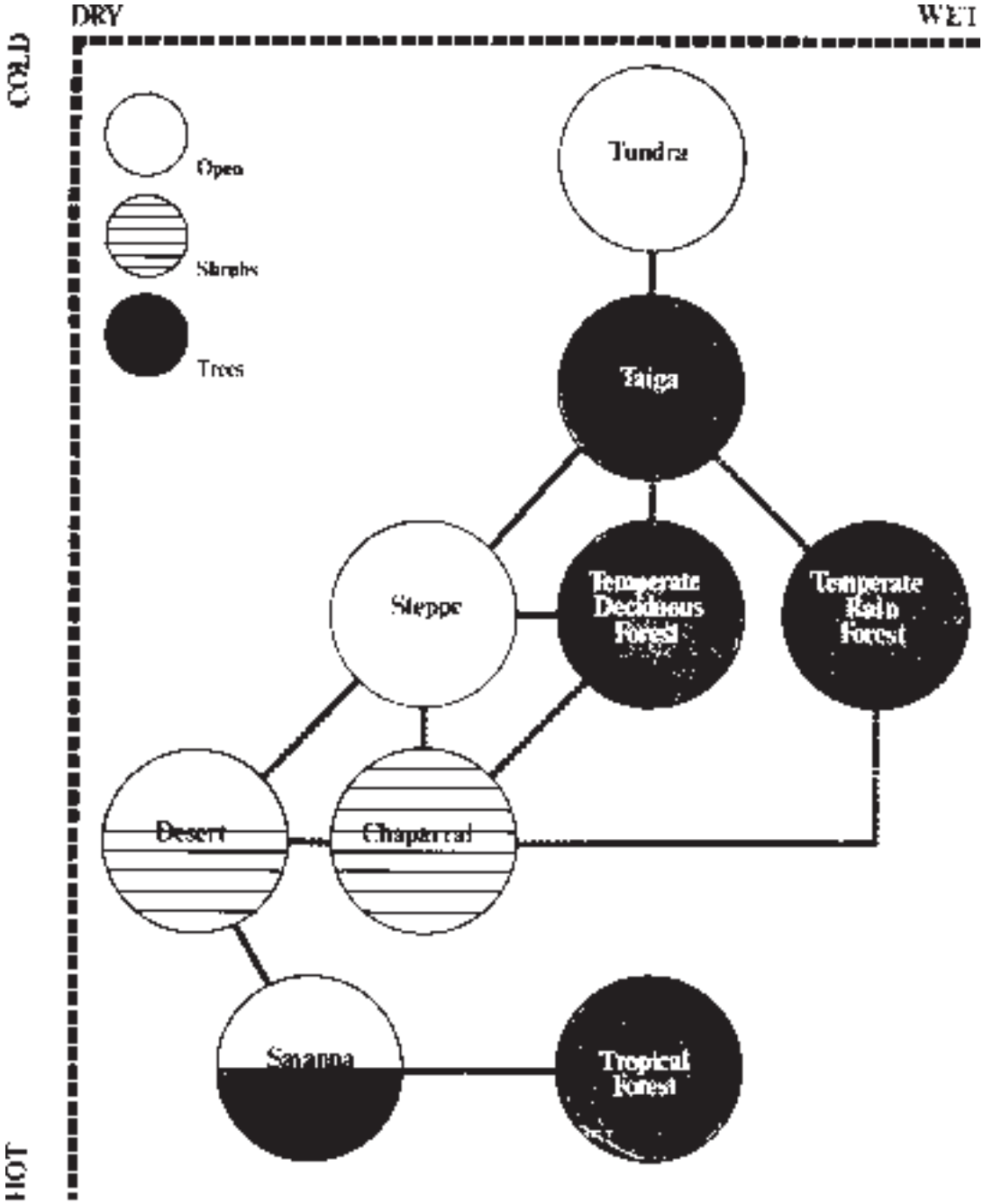
The following analysis of transitions considers the zoo bioclimatic zones from the equator poleward. Tropical forests grade into savannas in all the regions in which the latter occur. As rainfall decreases, it becomes more difficult for trees to exist, and the wet forest gives way to deciduous and then thorn forest, which grades in turn into grassland with scattered trees at the low end of the rainfall gradient. Soil types may vary little along this gradient but, as previously stated, tree growth may be precluded over the savanna areas by the presence of a hardpan layer beneath the surface that prevents their roots from reaching the water table. In other areas, as rainfall decreases a gradual transition from tropical forest through thorn forest to desert occurs. In the same manner savannas can grade into deserts.

Both hot and cold deserts in many parts of the world border on steppes, usually with an increase in rainfall. Under the same climatic regime, an increase in elevation produces the same gradient, as more moisture condenses out of the air under conditions of lowered temperature. The transition is a smooth one, the desert shrubs increasingly replaced by grasses and forbs. With progression toward the coast and increased precipitation, in particular in regions with only winter rainfall, desert shrubs grade into chaparral, which in turn

interdigitates with other habitats such as temperate deciduous and rain forests as the mean temperature decreases with higher latitude. The rain forest conifers are replaced by those of the taiga toward the north in the northern hemisphere.

The steppes in turn border on both temperate deciduous forests and taiga, primarily by the interdigitation of forest and open vegetation rather than by a smooth transition. Patches of grassland within forests and forest within grasslands are common. This edge is controlled by factors that are not always understood, but probably both rainfall (higher in forested areas) and fire (maintaining grassland) are important.

With increased latitude deciduous forests become mixed and eventually predominantly conifers of the taiga, with a gradual change in the relative proportions of the two tree types. Pines and some other conifers are common throughout the deciduous forests, and birches and aspens grow widely in the taiga, so neither type is "pure." In some regions, these two forest types are separated by grasslands, as in the Great Plains of North America.



Finally, toward the north the taiga trees become shorter and shorter and grade into tundra, which in turn becomes less and less complex and lower and eventually disappears into areas of perennial ice and snow.

These same sorts of changes occur with increasing altitude in temperate-zone mountains, and in an amazingly short distance in western North America one can ascend from desert through grassland and increasingly wet coniferous forest to alpine tundra. Many of the plants and animals of each of these zones are the same as or close relatives of species characteristic of the zones at sea level at higher latitudes. Because of both climatic (wind direction, slope exposure) and edaphic (soil type, ground water, presence of fire) factors, a very complex pattern of intermingling of bioclimatic zones may occur in mountainous regions.

DUPLICATION AND SIMULATION OF THE BIOCLIMATIC ZONES

The Seattle Climate

Of obvious critical importance in determining whether various bioclimatic zones can be duplicated at the zoo is a consideration of the basic Seattle climate. Mean long-term figures for Seattle show a mean annual temperature of about 11°C. and a mean annual precipitation of about 800 mm. It thus has a PET ratio of about 0.8, making it a wet climate. The rainfall varies over the year considerably, from 131.1 mm. in the wettest month (December) to 14.2 mm. in the driest month (July). Thus the climate is not dissimilar to the Mediterranean (winter-rain) conditions prevailing farther south, but it is colder. Mean monthly temperatures vary from 4.5°C. in January to 18.8°C. in July, with well-defined seasonality in temperature, although less than interior localities at the same latitude. The placing of Seattle on the Holdridge diagram allows us to assess the feasibility of duplicating bioclimatic zones of increasing distance away from the Seattle point on the diagram. Clearly the location of Seattle not too distant from the exact center of the life zones considered on the diagram accounts for the amazing variety of plants that can be grown horticulturally in this region, and it is important evidence for the feasibility of the planned presentation theme.

BIOCLIMATIC ZONES DUPLICABLE WITH LITTLE OR NO MODIFICATION

Seattle falls within the cool temperate latitudinal region on the Holdridge diagram, and any zone in that region should be duplicable if moisture regimes can be controlled. The deciduous forest and the coniferous forest zones (especially the temperate rain forest) are clearly totally feasible, as a great variety of temperate-zone conifers and hardwoods grow well in the Seattle area. By reducing soil moisture a steppe climate can be simulated with relatively little difficulty. Large tracts of grassland, kept in an early successional stage by grazing and/or mowing, exist in the Puget Sound lowlands, and soil type and drainage can be adjusted to provide either wetter (long-grass) or dryer (short-grass) situations.

BIOCLIMATIC ZONES DUPLICABLE WITH MODERATE MODIFICATION

In the same temperature zone, cold-desert (and thereby desert in general) conditions could be simulated by providing maximum drainage of surface soil water. Certain plants grown in Seattle because of their attractiveness (*Yucca*, *Kniphofia*) are characteristic of deserts, and additional plants from similar areas should grow here if the appropriate steps are taken. However, many of the typical plants of the hot deserts (most cacti, for example) will not grow outside in Seattle. Moving into the next colder temperature zone, the boreal, an environment of the nature of that of the true taiga will be possible, as trees of all the genera characteristic of that forest can grow in Seattle, for example spruce (*Picea*), fir (*Abies*), pine (*Pinus*), larch (*Larix*) and birch (*Betula*). It will prove more difficult and challenging to duplicate a typical muskeg pond of this zone, but the plants that live at the edges of such a place are obtainable from acid bogs in western Washington if the acidity of the water can be controlled in the zoo situation.

Moving still farther north, the tundra zone is rather dissimilar to the Seattle region in climate, yet in physiognomy it is much like the steppe, which is easily simulated here. A major

difference is the prevalence of lichens and mosses in the tundra and its generally wetter nature; the former may be more difficult to provide than the latter, but it may be feasible to import lichen-covered rocks for this purpose. This fortuitous similarity in physiognomy of two vegetation types under very different climatic regimes provides additional incentive for the presentation theme.

Tropical savanna can be simulated by combining grassland (previously discussed) with certain trees with the general appearance of savanna trees. For example, acacias are characteristic of many savannas, and the black locust (*Robinia*) that grows well in Seattle has many of the features of acacias, which are in the same family. This similarity holds for typical thorn forest trees, many of which are in this group (Leguminosae).

The tropical rain forest is certainly the most difficult habitat to simulate outside at this latitude, as many of its characteristics are not duplicated in plants that can be grown outside here, for example the buttressed-rooted trees, the palms, the lianas and the epiphytes. The subtropical rain forests, found naturally between the tropical rain forests and the temperate deciduous forests, are intermediate between them in some aspects of physiognomy, but many of the plant species characteristic of the subtropical forests will grow in Seattle—evergreen magnolias (*Magnolia*), hollies (*Ilex*), live oaks (*Quercus*) and other evergreen trees. For those tropical-zone animals that must be exhibited or that can be exhibited out of doors, these evergreen, glossy-leaved trees can provide some simulation of tropical forest.

BIOCLIMATIC ZONES DUPLICABLE ONLY INDOORS

As discussed above, very good duplication of the tropical forests and hot deserts may be possible only under controlled climatic conditions, and the same may be true for tundra. Approximate simulation should be possible out of doors, and there is every reason to believe that additional research will discover plants that would contribute to such a simulation.

PLANTS SUGGESTED FOR SIMULATING ZONES DIFFICULT TO DUPLICATE

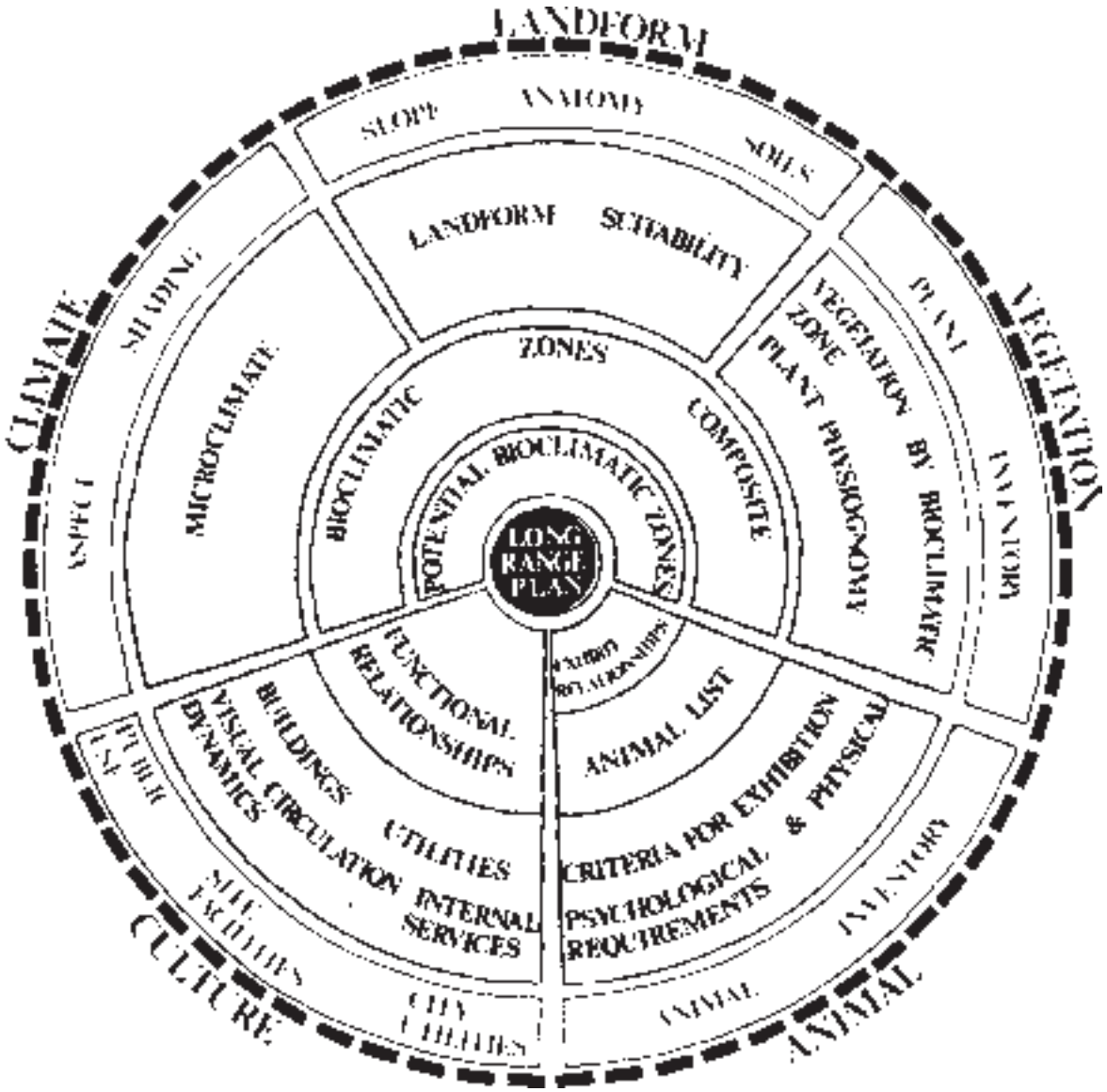
The following list includes plants that are known to grow in the Pacific Northwest that simulate plants not hardy here but characteristic of the warmer bioclimatic zones. Aquatic plants and grasses other than canes and bamboos are not listed. The list is by no means exhaustive but should provide a variety of ideas for later design development. *Care must be taken to determine if any of these species is potentially toxic to any animal with which it might be exhibited.* This applies as well to plants recommended in scenarios.

TROPICAL FOREST	SAVANNA	DESERT	CHAPARRAL
Actinidia chinensis	*Ailanthus altissima*	*Artemisia tridentata*	*Adenocarpus decorticans*
Ailanthus altissima	*Albizzia julibrissin*	*Caragana spp.*	*Aesculus californica*
Akebia quinata	*Aralia elata*	*Cistus spp.*	*Arbutus menziesii*
Albizzia julibrissin	*Aralia spinosa*	*Cytisus battandieri*	*Arbutus unedo*
Arundo donax	*Berberis thumbergii*	*Ephedra spp.*	*Arctostaphylos auriculata*
Aucuba japonica	*Berberis triacanthophora*	*Genista hispanica*	*Arctostaphylos columbiana*
Azara microphylla	*Caragana arborescens*	*Genista horrida*	*Arctostaphylos manzanita*
Bambusa spp.	*Caragana pyg maea*	*Nolina microcarpa*	*Arctostaphylos stanfordiana*
Camellia japonica	*Chaenomeles spp.*	*Opuntia spp.*	*Baccharis spp.*
Camellia sasanqua	*Crataegus crus-galli*	*Pediocactus simpsonii*	*Ceanothus griseus*
Camellia sinensis	*Crataegus lavallei*	*Tamarix spp.*	*Ceanothus incanus*
Catalpa bignonioides	*Cydonia vulgaris*	*Yucca spp.*	*Ceanothus jepsonii*
Chamerops excelsa	*Elaeagnus anagustifolia*		*Ceanothus thrysiflorus*
Chamerops humilis	*Elaeagnus pungens*		*Ceanothus veitchianus*
Choisya ternata	*Elaeagnus umbellata*		*Ceanothus velutinus*
Clematis armandii	*Eucalyptus niphophila*		*Cercis occidentalis*
Diospyros kaki	*Genista hispanica*		*Cercocarpus ledifolius*
Diospyros virginiana	*Gleditsia triacanthos*		*Cistus spp.*
Eriobotrya japonica	*Hippophae rhamnoides*		*Chrysolepis chrysophylla*
Euonymus fortunei radicans	*Lonicera tatarica*		*Convolvulus mauritanicus*
Euonymus myriantha	*Lycium halimifolium*		*Cupressus bakeri*

TROPICAL FOREST	SAVANNA	DESERT	CHAPARRAL
Fatsia japonica	*Maclura pomifera*		*Cydonia vulgaris*
Ficus carica	*Melia azedarach*		*Cytisus spp.*
Gunnera chilensis	*Poncirus trifoliata*		*Elaeagnus angustifolia*
Gunnera manicata	*Prunus spinosa*		*Erica arborea*
Hosta spp.	*Pyrus ussuriensis*		*Genista hispanica*
Hydrangea aspera	*Rhus typhina*		*Hippophae rhamnoides*
Hydrangea petiolaris	*Robinia hispida*		*Juniperus communis*
Hydrangea quercifolia	*Robinia pseudoacacia*		*Juniperus phoenicea*
Ilex altaclerensis	*Rosa acicularis*		*Lavandula officinalis*
Ilex chinensis	*Shepherdia canadensis*		*Lithocarpus densiflora*
Ilex platyphylla balearica	*Sophora japonica*		*Myrica californica*
Lagerstroemia indica	*Ulex europaeus*		*Pinus edulis*
Laurus nobilis			*Pinus halepensis*
Ligularia dentata			*Pinus muricata*
Ligularia tussilaginae			*Pinus pinea*
Ligustrum lucidum			*Pinus sabiniana*
Magnolia fraseri			*Quercus garryana*
Magnolia grandiflora			*Quercus lobata*
Magnolia macrophylla			*Quercus wislizenii*
Magnolia obovata			*Rhamnus alaternus*
Magnolia tripetala			*Rosmarinus officinalis*
Magnolia virginiana			*Umbellularia californica*
Nadina domestica			
Paorrotia persica			
Paulownia tomentosa			
Peltiphyllum peltatum			
Petasites japonicus			
Photinia glabra			
Photinia x fraseri			
Phragmites communis			
Phyllostachys spp.			
Pieris japonica			
Polygonum auberti			
Polygonum cuspidatum			
Polygonum sachalinense			
Prunus caroliniana			
Prunus laurifolius			
Prunus lusitanica			
Prunus virginiana			
Pyrus kawakami			
Quercus laurifolia			
Rhodadendron spp.			
Rhus tricolor			
Sarcococca humilis			
Sarcococca ruscifolia			
Sasa spp.			
Sophora japonica			
Sycopsis sinensis			
Ternstroemia japonica			
Trachelospermum jasminoides			
Trachycarpus fortunei			
Trochodendron aralioides			
Umbellularia californica			
Viburnum rhytidophyllum			
Vitis californica			
Vitis coignetiae			
Wisteria chinensis			
Wisteria japonica			

DESIGN FRAMEWORK FOR DEVELOPMENT OF THE LONG-RANGE PLAN

The mass of inventory data collected is organized into five interrelated groups of information: 1) Climate, 2) Landform, 3) Vegetation, 4) Culture and 5) Animal Life. Each of these areas was first examined extensively (world and regional scale), then intensively (site scale). This centripetal process resulted in a sequential synthesis from *inventory* (cells in white outer band) through *analysis* (gray band), and *generation of alternatives* (potential site bioclimatic zones) and *concept selection* (black central core). This sequence … as an expanding spiral of project development, is here shown inverted, emphasizing the focusing of generalized information towards the specific solution of project requirements …



ESTABLISHING THE BIOCLIMATIC ZONES

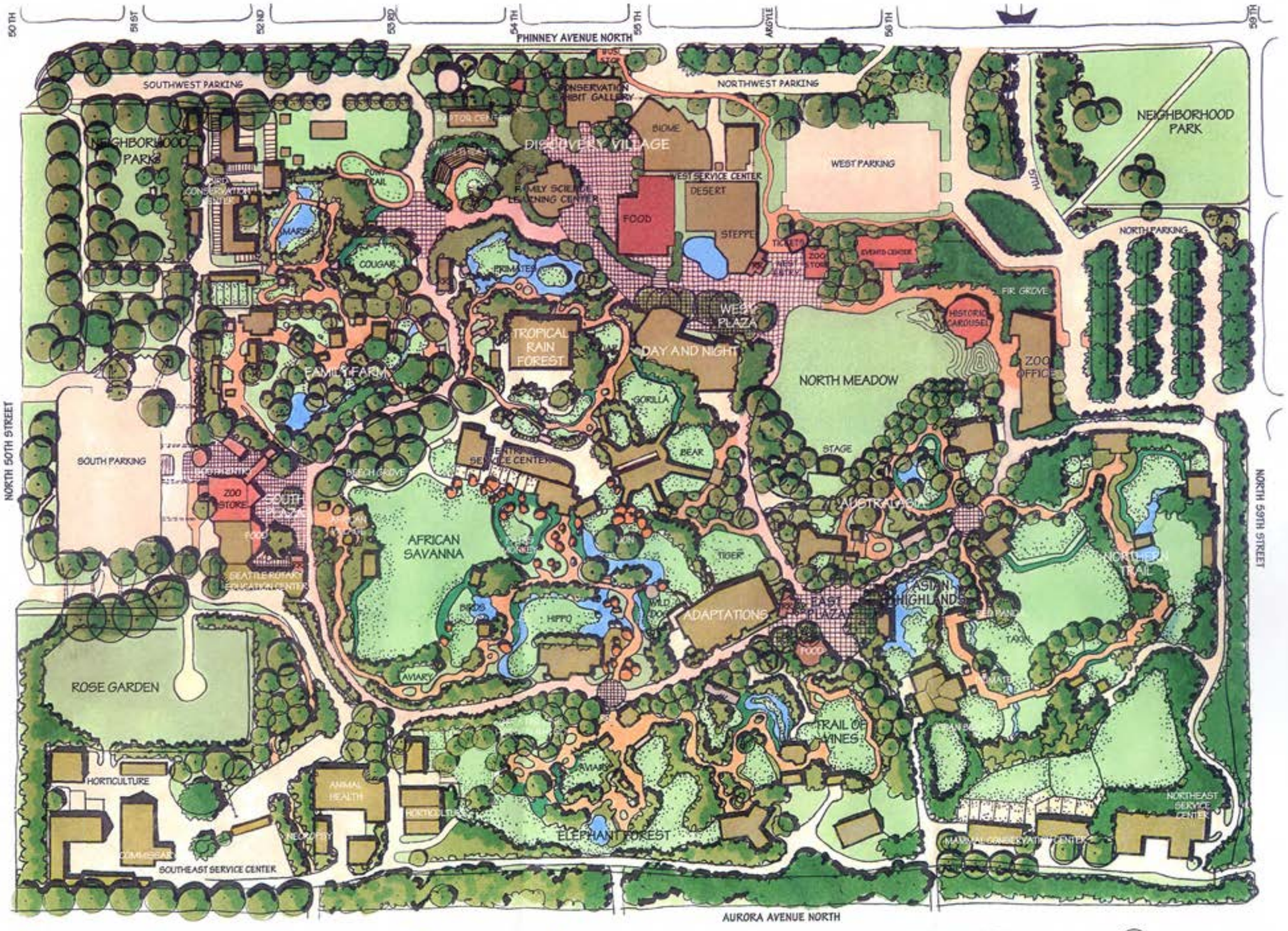
Analysis maps combined in this matrix identify areas most suitable for establishment of each zone. Areas having three or more overlapping attributes of a given zone (dots on the matrix) have primary suitability. Areas of secondary suitability are not shown but were used in the final determination of the Bioclimatic Composite.

Once primary and secondary suitabilities were determined, potential zone areas were combined, first into Warm/Dry and Cool/Wet pre-composites and finally into a Bioclimatic Composite, which follows.

Bioclimatic Matrix

MICROCLIMATE:	SAVANNA	DESERT	STEPPE	CHAPARRAL	TEMPERATE DECIDUOUS	TEMPERATE RAIN	TAIGA	TUNDRA	MONTANE
Warm	●	●		●					
Moderate		●	●	●	●	●			●
Cool			●		●	●	●		●
Cold							●	●	●
Dry	●	●	●	●					●
Wet					●	●	●	●	●
SLOPE									
0 - 3%			●					●	
3 - 7%								●	
7 - 12%				●					●
12+%				●					●
TREE COVER									
Open	●	●	●	●				●	●
Deciduous	●				●	●			
Coniferous						●	●		●
TREES BY ORIGIN									
Temperate Deciduous					●				
Temperate Rain						●			
Taiga							●		

BIOCLIMATIC ZONES AND EXISTING CONDITIONS


50TH
51ST
52ND
53RD
54TH
PHINNEY AVENUE NORTH
55TH
ARGYLE
56TH
59TH
SOUTHWEST PARKING
NORTHWEST PARKING
NEIGHBORHOOD PARK
CONSERVATION EXHIBIT GALLERY
VISITOR CENTER
BIOME
DISCOVERY VILLAGE
WEST SERVICE CENTER
DESERT
STEPPE
FOOD
WEST PARKING
57TH
NEIGHBORHOOD PARK
NORTH PARKING
MARSH
COUGAR
PRIMATE
TICKETS
ZOO STORE
EVENTS CENTER
FIR GROVE
HISTORIC CAROUSEL
WEST PLAZA
TROPICAL RAIN FOREST
DAY AND NIGHT
NORTH MEADOW
ZOO OFFICE
FAMILY FARM
GORILLA
BEAR
STAGE
NORTH 50TH STREET
SOUTH PARKING
ZOO STORE
SOUTH PLAZA
ENTRY SERVICE CENTER
BEECH GROVE
AUSTRALIA
NORTH 59TH STREET
AFRICAN SAVANNA
LION
TIGER
NORTHERN TRAIL
SEATTLE AQUARIUM EDUCATION CENTER
HIPPO
WILD DOG
ADAPTATIONS
EAST PLAZA
ASIAN HIGHLAND
TAPIR
AVIARY
TRAIL OF VINES
ROSE GARDEN
HORTICULTURE
ANIMAL HEALTH
ELEPHANT FOREST
NORTHEAST SERVICE CENTER
SOUTHEAST SERVICE CENTER
AURORA AVENUE NORTH
VISITOR AMENITIES
EXHIBIT & SUPPORT FACILITIES
PLAZAS
OUTDOOR EXHIBITS
PRIMARY PATH
EXHIBIT PATH
LAWN AREAS
WATER FEATURES
DRY CONTAINMENT MOAT
SERVICE ROADS
ILLUSTRATIVE PROPOSED PLAN
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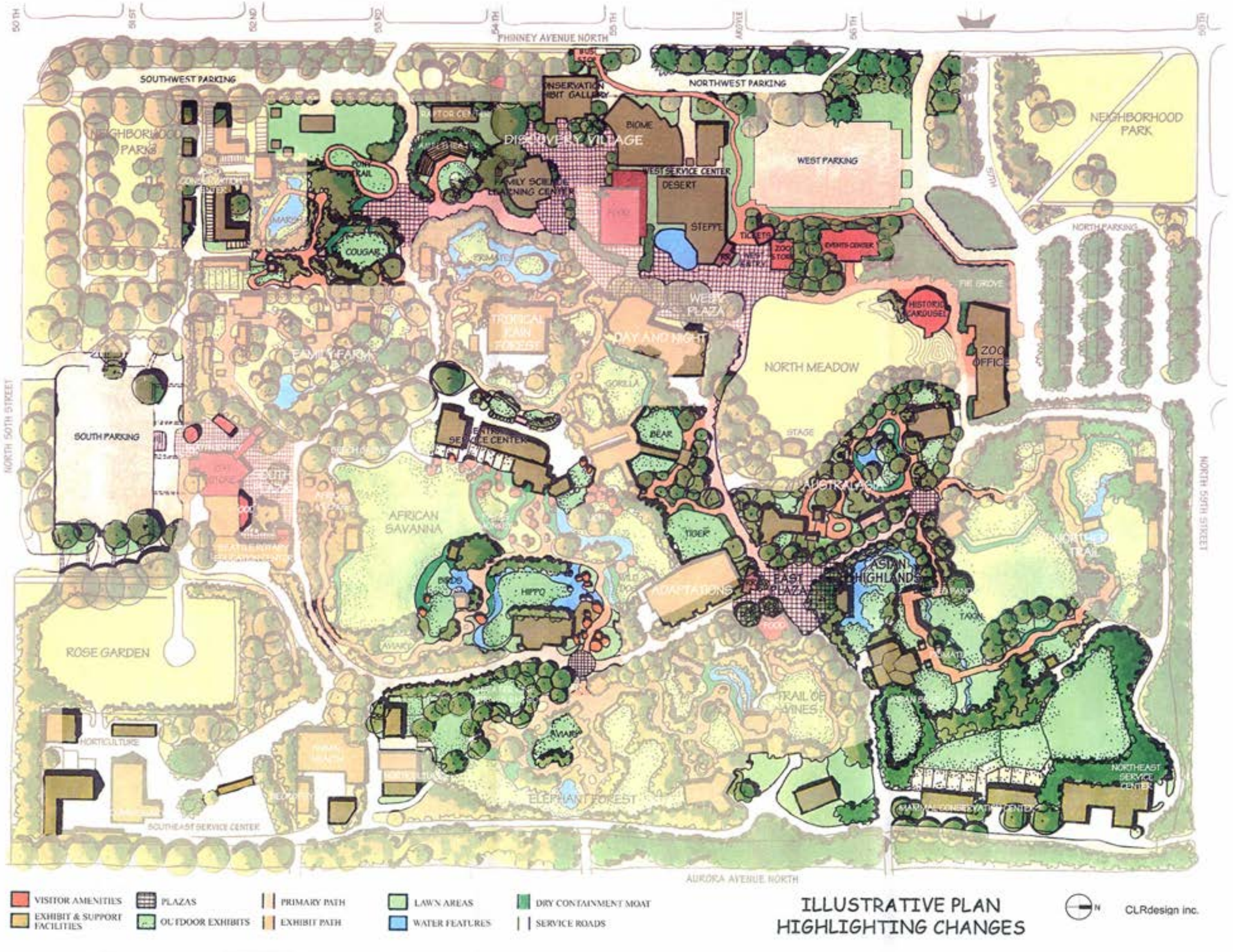
CLRdesign inc.



ILLUSTRATIVE PLAN HIGHLIGHTING CHANGES

CLRdesign inc.

DEVELOPMENT GUIDELINES

Larry Sammons / Woodland Park Zoo

Trail of Vines (Asian Tropical Forest), Woodland Park Zoo

DEVELOPMENT GUIDELINES

GENERAL GUIDELINES FOR SITE DEVELOPMENT: INTRODUCTION

Excerpted from the 1976 LRP except where indicated by "[ ]"s

In this section, Development Guidelines and Recommendations assuring continuity in implementation are set forth. The direction is given in two forms: **GENERAL GUIDELINES FOR SITE DEVELOPMENT** and **EXHIBIT SCENARIOS.**

General guidelines for site development represent fundamental principles and acceptable practices that have been officially adopted in terms of: 1) Circulation, 2) Exhibit Viewing, 3) Barriers, 4) Internal Services and Animal Service Areas, 5) Architectural Character and Materials, and 6) Utilities. For the most part, these general guidelines are not cast as dimensioned standards. They are design criteria established to guide future zoo development in terms of character, materials, function and visual or spatial experience.

The *exhibit scenarios* document and apply the research undertaken on specific animal habitats; they establish a verbal and/or graphic image of future exhibits and suggest specific techniques for implementing each. Each of these exhibit habitats offers an inherent flexibility; and although specific animal species are recommended for each, as in nature, a variety of animals can be accommodated within them, thus allowing for adjustment in the collection while maintaining a rational organization for it over time.

These scenarios, combined with the general guidelines, establish the spacial confinement, barrier and viewing concepts for each exhibit as well as defining the appropriate selection and use of plant materials, textures, landforms, soils, etc. that are essential to the replication of each particular exhibit habitat....

GENERAL GUIDELINES FOR CIRCULATION

GUIDELINES FOR PARKING

Importance of Parking

Parking and associated access improvements are a significent element of this updated plan. Well-planned parking is essential to remedy a chronic shortage of on-site parking, which inconveniences zoo visitors and the surrounding neighborhoods. The provision of additional on-site parking is consistent with local plans and policies that seek to protect neighbors from the overflow parking created by activity centers such as the zoo. Increased on-site parking is not anticipated to create a significant increase in vehicle trips; rather, it would accommodate existing parking demand that is currently occurring on neighborhood streets and would meet projected attendance increases due to regional growth. Following completion of additional on-site parking, Woodland Park Zoo will also implement policies and incentives to encourage zoo visitors who arrive in vehicles to park in the new structure, thereby reducing spillover traffic in the neighborhoods.

Today, the zoo is largely dependent upon revenues earned from its guests and members, including parking, admission, food and gift sales, and special events receipts. This represents a marked change from the 1976 Long-Range Plan. At that time the zoo was largely supported by the City and was much less dependent upon earned revenue, which today (2004) makes up 60% of its annual operating budget.

Parking Demand

While there are no national standards for parking supply in zoological parks, a survey conducted by the American Zoo and Aquarium Association shows that Woodland Park Zoo has significantly less parking for visitors than other zoos responding to the survey. A general look at parking demand suggests that approximately 1,400 public parking spaces are needed. Visitor surveys conducted May 2001 and August 2001 indicated that the average vehicle occupancy was 3.4 which is considered efficient. The 1,400 parking spaces are based on that average occupancy.

In keeping with projected regional growth, attendance at the zoo is expected to increase by approximately 23% between the years 2000 and 2020. Without the additional parking proposed, overflow parking that is currently occurring in the neighborhoods is expected to continue and grow over the next 10 to 20 years. New on-site parking at the zoo will accommodate the increased demand and will encourage zoo visitors who are currently parking on the street to park on zoo grounds.

Visitor Comfort and Safety

Woodland Park Zoo will provide parking that is accessible, easy to find and as close as possible to the zoo's entrance gates. Whether accommodated in surface lots or a parking structure, visitors will find parking facilities that are safe, comfortable and attractive. Families arriving in minivans or sport utility vehicles will find adequate space to unload children and strollers. Due to the short-term nature of zoo visits and unfamiliarity of many visitors, all parking stalls should be 8' 6" wide except ADA stalls, which will conform to code requirements. Lighting will be ample, pedestrian routes well marked and attractive plantings near at hand. As an important part of both the first and last experiences of a visit to Woodland Park Zoo, parking areas will reinforce the overall zoo message of welcome.

Staff and Volunteer Parking

Approximately 160 staff and volunteer parking spaces are currently needed. This demand will be met through a combination of existing onsite and offsite parking. Through effective trip reduction measures the demand for parking is not expected to grow even as the number of staff and volunteers increases over time.

Overflow Parking

Overflow parking will continue to be available in Lower Woodland Park.

Alternative Transportation

To help relieve overflow parking in the neighborhood, Woodland Park Zoo will continue to develop an alternative transportation plan in conjunction with King County Metro and the Seattle Department of Transportation. The plan will provide incentives for improved transit, bicycle and pedestrian access, as well as bicycle corrals and transit options for major events. Woodland Park Zoo will also develop an employee trip reduction plan, dedicated employee carpool spaces, and explore extending transit pass subsidies to all zoo staff, adding a flexcar and participation in the guaranteed ride home program.

GENERAL GUIDELINES FOR SERVICE ACCESS AND CIRCULATION

One change to service access is anticipated (the service gate adjacent to the ARC would move to the north). The width and turning radius of service routes should accommodate large trucks, mobile cranes, and the movement of replacing exhibit furnishings (logs, rocks, etc.). Service routes are to be constructed to handle heavy loads and high volumes.

GENERAL GUIDELINES FOR VISITOR ACCESS AND CIRCULATION

The pedestrian circulation system has five major elements: a) three major visitor hubs and b) three minor visitor hubs connected by c) a primary pedestrian loop path that, together with the visitor service hubs, connects to d) secondary pathways which immerse visitors in the simulated habitats of the animal exhibits that can be further explored along e) tertiary trails. Each visitor service hub will have a unique character that distinguishes it and makes it memorable. This clarity of concept and ease of recognition will naturally assist visitors in orienting themselves and finding their way throughout the zoo. Exciting exhibit experiences will alternate with attractive and convenient areas for family rest and refreshment.

Accessibility

All zoo facilities and programs will comply with contemporary accessibility standards as defined within the Federal Americans with Disabilities Act (ADA) and the Americans with Disabilities Design Guidelines (ADAG). Special needs groups and individuals are welcome constituents of Woodland Park Zoo. The zoo will attempt to accommodate all reasonable requests for assistance to make their zoo visit enjoyable and fulfilling.

Separation of Pedestrians from Service Traffic

Potentially conflicting circulation systems for pedestrians and vehicles are separated either spatially or by time of use. Thus, access and parking have been limited to the periphery of the site, and scheduled use of interior pedestrian and service paths moderates any conflicts in the few cases where overlap is unavoidable.

Shuttles and Carts

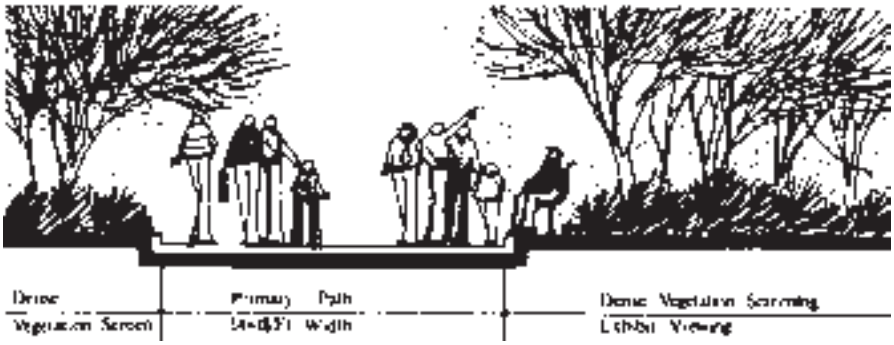
Small (8-15 passenger) shuttles and 4-6 passenger carts may be operated by the zoo as a convenience, primarily for fatigued visitors or those with ambulatory limitations. They would operate only on primary pathways and in plaza areas on a priority basis. The shuttles would be wheelchair accessible.

Electric carts and other mechanized group conveyances are generally not allowed on secondary paths or at viewpoints within immersion zones. In these zones, paths are designed to preserve the intimacy of a pedestrian scale and to offer an alternative to urban roadways designed primarily for machines of human transport. At viewing areas and along interconnecting paths, the goals of landscape immersion and respectful context should not be subverted by expanses of asphalt required for safely transporting groups of riders through streams of pedestrians. Electric carts and other vehicles for transporting groups may create stimuli that are frightening and stressful to animals on exhibit and to unsuspecting pedestrians.

Wheelchairs, personal (individual) mechanized conveyances, strollers and even wagons can be accommodated on all secondary pathways.

Shuttle and cart vehicles may be stored in the parking structure.

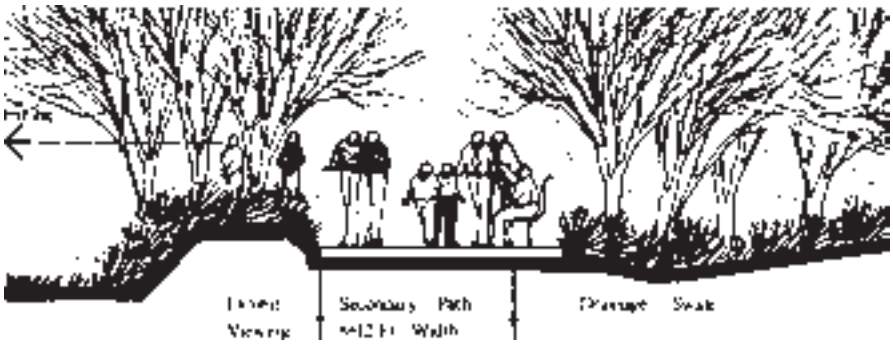
PRIMARY PATHWAYS



The primary pathways are designed more for public movement than for animal viewing. Large crowds tend to overwhelm the personal animal-viewing experience. In order to accommodate the flow of guests and the occasional passing of a zoo shuttle, primary pathways should range from 14-20 feet in width. Primary pathways should gently curve in order to eliminate long views of pavement. However, they must accommodate maintenance and emergency vehicles such as fire trucks and off-hour delivery trucks.

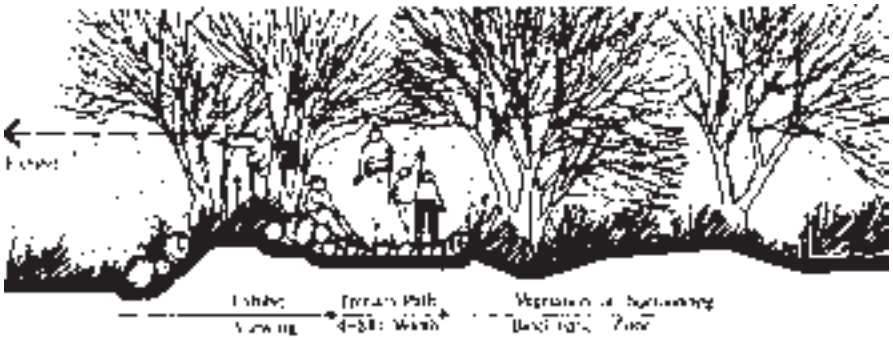
Visitor amenities located along primary pathways include picnic and event lawns. Comfortable benches and seating alcoves are especially appropriate in these areas, which are central to the zoo's dedicated "people zone." Butterfly, bird and other wildlife-attracting plants will be exhibited and interpreted in these areas, although such plants will be widely planted elsewhere throughout the zoo.

SECONDARY PATHWAYS



The secondary circulation system is designed for more intimate viewing experiences and immersion within the natural habitat zone. Secondary paths will vary from 8-12 feet in width. No public services are located along these routes, (with the exception of the proposed Safari Lodge) although passive rest and informal areas for interpretive programs will be found, often in association with exhibit-viewing areas. Unlike the more urban primary pathways serving large numbers of people, the secondary system will carry dispersed groups through naturalistic landscapes. These paths will be aligned and carefully interwoven through these landscapes to avoid cross viewing of paths, other visitors, or inappropriate views of animal management facilities or service vehicles. Generally, no visible curbs or drainage structures will occur along these paths, but landscaping appropriate to the habitat will be tight to the path's edge and runoff will be locally absorbed.

TERTIARY PATHWAYS



The tertiary system expresses the greatest harmony between exhibit, habitat zone and visitor. Here the most intimate relationship is gained along unobtrusive trails (4 to 6 feet wide). In some areas, even narrower paths resembling game trails will be appropriate. All aspects of the design should be a sensitive approximation of the native environment of that designated area. Therefore, no services or furnishings will be provided along these routes with the exception of interpretive elements. Materials will be natural, although all must stand the test of constant use in all types of weather and retain the character of the particular exhibit. Thus, cobblestone paths may be appropriate to montane exhibits; compacted red or white sand to desert exhibits; while cinders, stabilized soil, gravel, wood decking or flagstone may be intrinsic to others. No areas on tertiary paths will be provided for gatherings. Visitors will find a rock or log to sit on, or a tree to lean against if they wish to rest.

WELCOME GATES

The purpose of Welcome Gates is to clearly mark entries to exhibit zones, as well as to help guests understand where they are on zoo grounds and what they are likely to see if they choose to enter the zone. Welcome Gates should be clearly obvious from all approaches, but should generally not be visible to those exiting the exhibit. Gates should be "culturally appropriate" and visually sympathetic to the habitat zone presented. Welcome Gates may vary widely in style and expression throughout the zoo and do not need literally to be gates, so long as they create a strong sense of arrival and identification.

GENERAL GUIDELINES FOR INTERPRETIVE AREAS

The Seattle Rotary Education Center at the main South Entry presently provides classrooms and an auditorium for educational and public use. The proposed Discovery Village will become the central hub for visitors of all ages to learn about the zoo and its exhibits as well as the zoo's wildlife and conservation programs. Public viewing shelters, which contain interpretive features, will also be developed within each major exhibit zone. Informal (non-seating) spaces will be incorporated within animal viewing areas to accommodate small groups (15-20) for public programs and staffed discovery boxes.

GENERAL GUIDELINES FOR EXHIBIT VIEWING

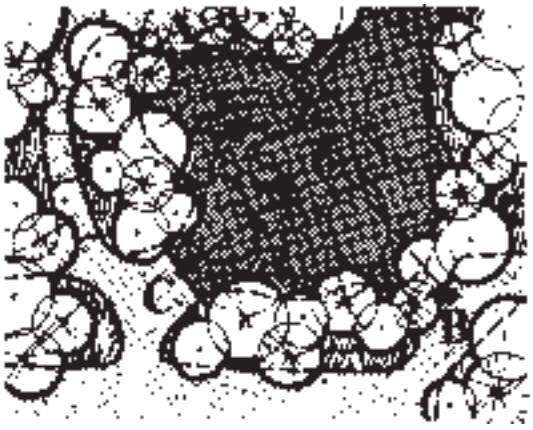
Excerpted from the 1976 LRP except where indicated by "[ ]"s

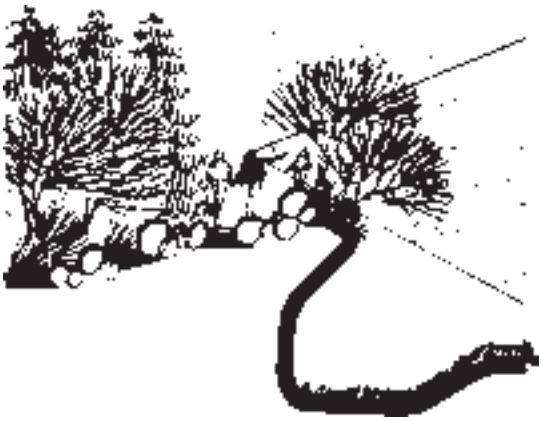
LANDSCAPE IMMERSION: Ideally the viewer should move through the characteristic landscape of the natural habitat zone seeing its sights and savoring its moods. Only then can we become aware that the landscape is also inhabited by animals separated by unseen barriers. The success of this landscape immersion depends entirely upon two factors: 1) the completeness and correctness with which the characteristic landscape is projected, and 2) the care and accuracy with which the viewpoints and views are located and composed, concealing barriers, enhancing perspectives, composing light and shadow and, most importantly, visually unifying animal space and visitor space. [For a more complete development of the immersion concept see Coe 1985.]

With the exception of #9 and #10, all general guidelines for viewing listed below were excerpted from the 1976 LRP.

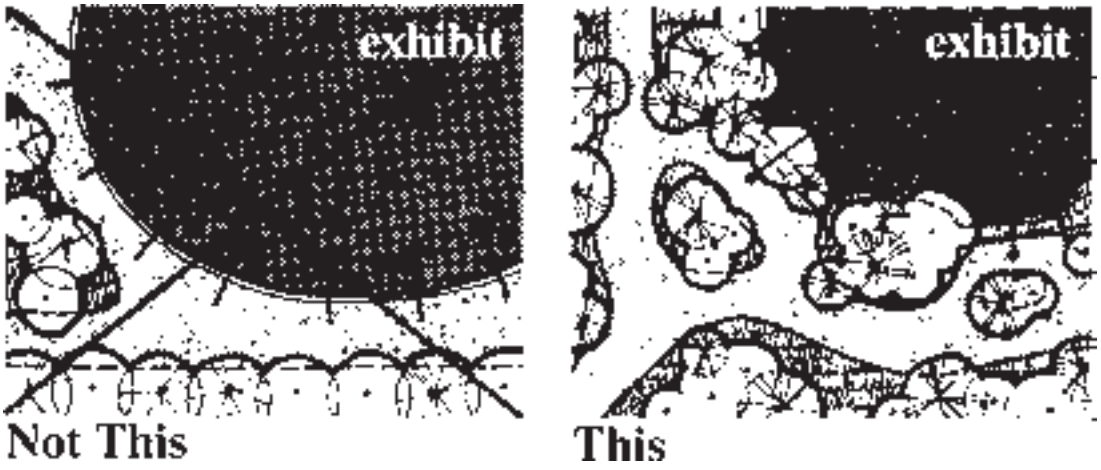
1. Insure that animals are seen as only a part of the surrounding landscape, which they co-occupy with the viewer.

2. Provide selected views only into the exhibits.





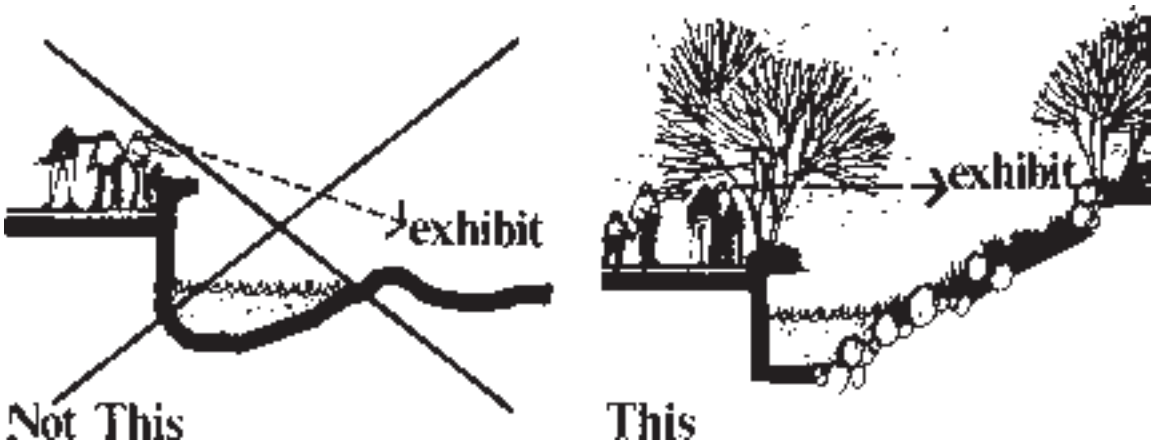
3. Eliminate continuous viewing of exhibit areas along circulation routes.



4. Augment the sense of anticipation by sequential staging of approach views before animals are actually seen.

5. Screen out cross-viewing of other people and exhibits.

6. Provide at least one major view location for interpretation of each exhibit; this must accommodate the special needs of all age groups and the handicapped.



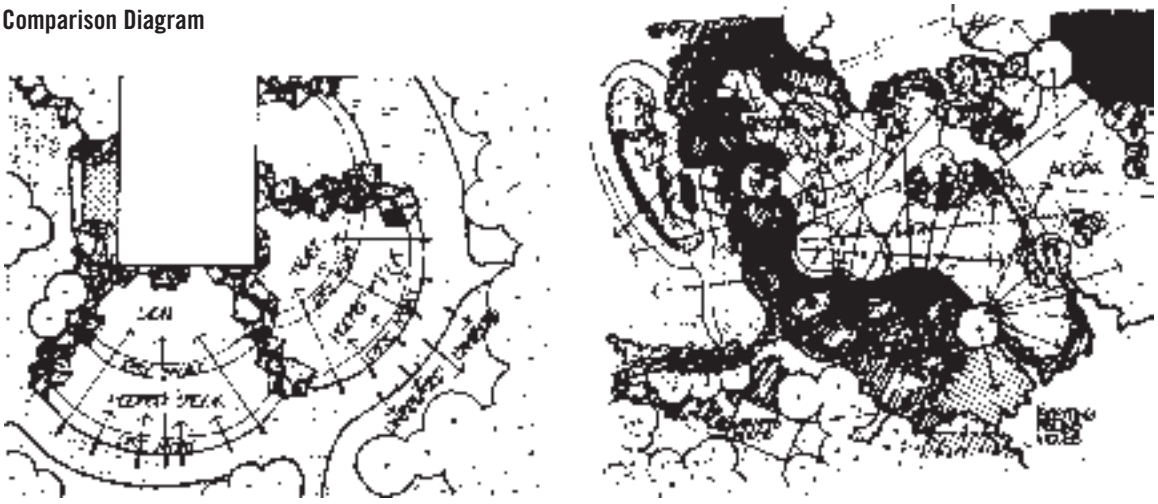
7. Avoid looking down directly on animals: they should be at or above eye level, the only exception being animals at or below the surface of water bodies.

8. Eliminate views of animals from outside the zoo and from parking and entry areas. [Special "behind-the-scenes" views will be possible such as from the Beech Grove public activity area into the winter paddock and barn, since this activity area is not a themed natural habitat zone.]

[9. In summary, design exhibits to avoid static, set-piece views in which the entire extent of the animal area is obvious. Preferably, exhibits should be designed to unfold dynamically, view by view, from a variety of overlooks. In this way exhibits will appear continuous with their surroundings and indefinite, i.e., unlimited, in extent.]

[10. The wide range of viewer's height of eye (viewing for those in strollers, those in wheelchairs and those standing) should be considered in the design of viewing areas.]

Comparison Diagram

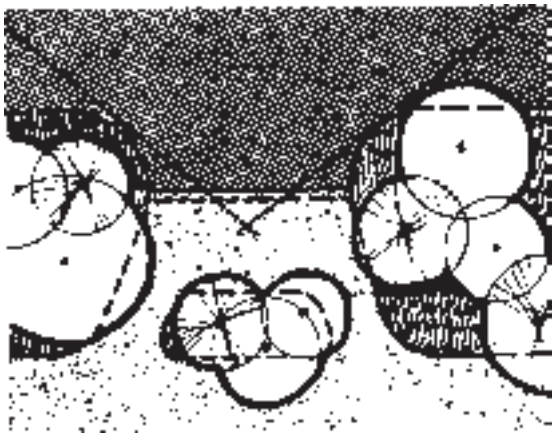


ILLUSTRATED VIEWING TYPES

The following discussion of viewing types is excerpted from the 1976 LRP except where indicated by "[ ]"s

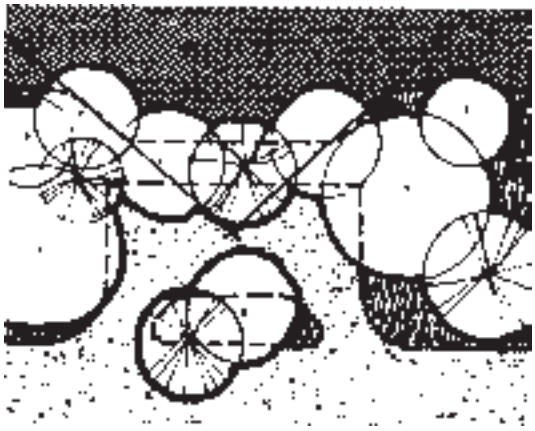
TYPE 1 VIEWING: Open Edge

In this situation, foreground vegetation will be absent or below eye level to allow an unobstructed view of the animals exhibited. This type of viewing will be used when the objective is to: 1) get close to the animals, 2) view small animals, and/or 3) present an unobstructed view to children and people confined to wheelchairs. The viewing area will be set into dense planting to isolate it from other viewing areas. [Note: This type of viewing should not be used where there is danger of people or objects falling into the exhibit or causing harm to animals.]



TYPE 2 VIEWING: Partially Screened Edge

A planted edge between animal exhibit and viewing areas, and a planted island between viewing areas and circulation routes is a typical viewing solution. The viewing area will be inset from the continuous exhibit edge to eliminate cross views from other viewing areas. When landforms or planting buffers are used, steps, boulders, logs, etc. will be incorporated to assist viewing by children.

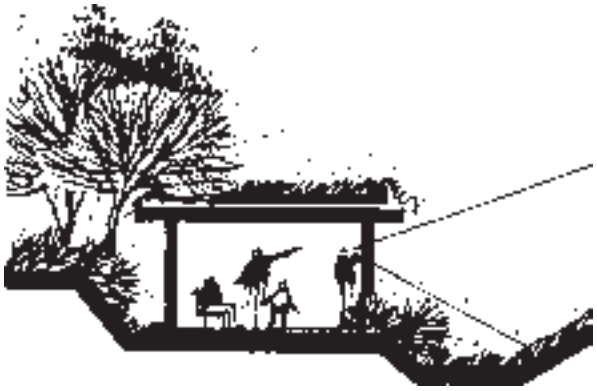


TYPE 3 VIEWING: Mesh Enclosure

Entire enclosures of glass or wire mesh are used in exhibits for the animal whose leaping distance exceeds the practicality of moats or other partial barriers … Planting and landforms will screen and complement the view and buffer the exhibit from surrounding areas.

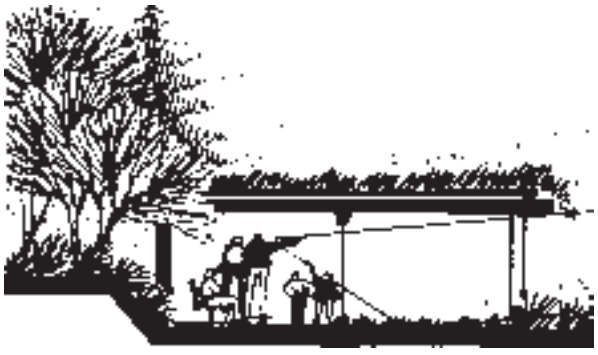
TYPE 4 VIEWING: Shelter

Viewing shelters are used for major exhibits, in which visitors spend extended time. The structure will be in the character of the exhibit set against landforms and/or dense plant materials. See Architectural Guidelines.



TYPE 5 VIEWING: Animal Day Structure

A combination viewing/animal structure can be used in exhibits in which animals accept close interaction with people, i.e., gorilla. The animal will not be enclosed in this structure. Rather, it will be a voluntary extension of its environment. See Type 4 Viewing and Architectural Guidelines.



TYPE 6 VIEWING: Covered Viewing Into Mesh Enclosure

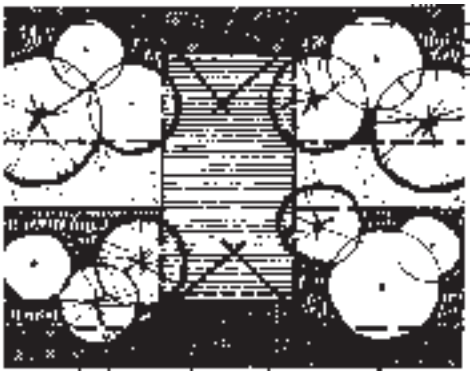
This viewing type is a variation on Type 3 Viewing: Mesh Enclosure, with Type 4 Viewing: Shelter. Used together, the viewing structure frames out views of the mesh enclosure itself.

TYPE 7 VIEWING: Boardwalks

Boardwalks [generally] will be used … in marsh and aquatic exhibits. Plant massings appropriate to the exhibit will be used to camouflage the walk and the visitor from adjacent views, while allowing less dense areas for selected views of the exhibit.

TYPE 8 VIEWING: Bridges

Bridges will be used in very limited situations with the viewing edge restricted to 20' in maximum length. This application allows a clear unobstructed view for … [visitors in wheelchairs] and children. As with Type 1 and Type 2 viewing, the viewing area will be set into dense planting to isolate it from other viewing areas.



TYPE 9 VIEWING: Covered Bridges

Covered bridges are used in connection with major exhibits where visitors may spend extended time at water-related exhibits. Where the bridge bisects exhibits of differing species, appropriate fencing material will be incorporated under the bridge deck to modulate and separate the two sides from each other.

TYPE 10 VIEWING: Underwater

[Partial underwater viewing is especially exciting and informative when viewing water-loving animals such as bear, otter, tiger, jaguar and hippopotamus. Aquatic and semiaquatic species such as fish, anaconda and crocodile require underwater viewing to be fully appreciated.] The expense of such exhibits makes their widespread use generally unfeasible, but they should be considered, as they add a very special dimension to the zoo experience.

[Like other activity areas, exhibit viewing areas occur at varying levels of circulation though no views of the exhibits are allowed directly from busy primary paths. In all cases, viewing areas must relate to the individual exhibit and the larger natural habitat zone.]

GENERAL GUIDELINES FOR BARRIERS

The following guidelines are excerpted from the 1976 LRP except where indicated by "[ ]"s

Barriers are essential for both visitor and animal safety, but they should be designed and located to be as unobtrusive as possible.

The birds, mammals, reptiles, amphibians, [fish and arthropods] chosen for exhibit at Woodland Park Zoo represent a vast range of physical mobility and behavioral tendencies. Moreover, individuals within each species vary widely in their abilities and predispositions toward escape under a wide range of stimuli. Thus, to produce a detailed prescription for the containment of each of the species would involve an exhaustive study well beyond the scope of this report. However, the following general discussion and recommendations are pertinent.

ANIMAL BARRIERS

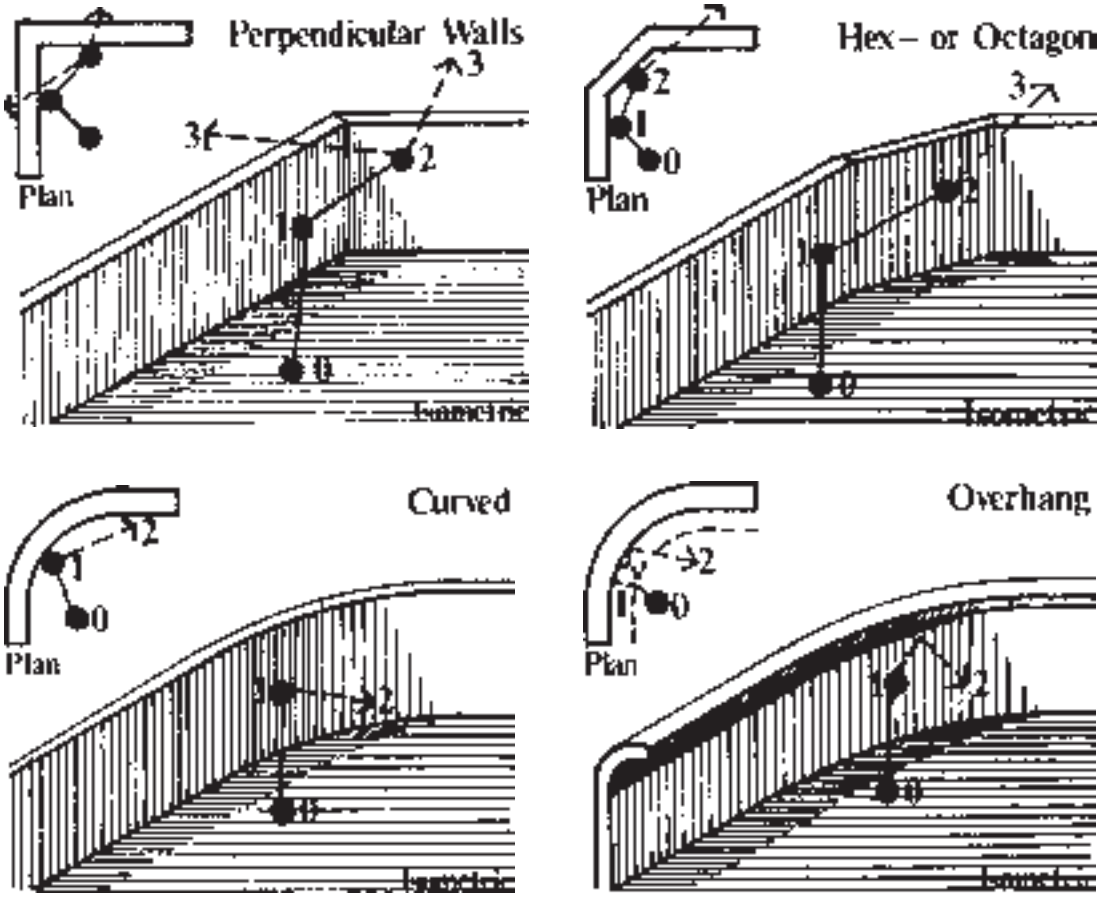
Physical Barriers

These include walls, moats, fences, glass partitions and complete enclosures. Where barriers are intended to separate one species of animal from another, the selection of type must depend upon an understanding of the animals contained. Barriers intended to separate animals from the public must additionally consider human behavior.

Problem Corners

Right-angled or acutely angled corners should be avoided. Not only do they allow the possibility of subordinate animals being "cornered" by dominant individuals but they invite escape by agile animals. Many primates, ungulates, felids and others have the ability to leap against a corner and ricochet against an adjoining wall to an even greater height.

The usual after-thought approach is to build higher and more visible corner barriers. A far better solution is to avoid creating corners altogether.



Psychological Barriers

The behavior of all animals is partially determined by a web of psychological inhibitions that are both learned and innate. Kittens may become frightened of great height while sloths avoid "floors." [Many] bats avoid bright daylight while many birds will not enter a darkened space. Some reptiles will not cross a cold surface while elephants avoid … a moveable surface and cattle will not cross a large perforated surface. These characteristics and others can be exploited successfully as "natural" barriers.

Modern technology has also supplied a variety of artificial means of inducing avoidance behavior. These include electric shocks, chemical odor and taste repellents, invisible glass or plastic barriers and ultra-sonic noise. Many of these techniques are unproven but may merit further research and development.

The aforementioned are essentially "external" controls. A wide variety of "internal" controls are also possible. These include formal training, social ranking within or between species, hunger and activity patterns and simply "habit."

Because individuals vary widely in their reaction to psychological barriers and because these barriers may lose their effectiveness when animals come under the extreme stress of a panic reaction, back-up physical barriers are usually needed. [Psychological barriers should not be used as the only means of containment.]

Recommended Barrier Types

The following barrier types are specifically suggested for development at Woodland Park Zoo …

TYPE A BARRIER: MOAT

Type A-1a One-Sided Drymoat

These types of moats allow animal access, having a gently sloping interior edge. In viewing areas they should be made to replicate natural landforms such as dry ravines or abandoned river-cut banks. Since they allow animal access, these moats should not be used for hidden or rear barriers. [Dry moats may be designed to detain runoff water, to increase the efficiency of sewage systems and to help recharge ground water.]

Type A-1b One-Sided Water Moat

Water moats are ideal for foreground barriers, for they can easily be made to resemble a variety of water bodies ranging from sparkling mountain freshets to placid lily pools to nearly dry seasonal floodways. A few animals such as gibbons and woolly monkeys can be contained entirely with water; most often, however, the water barrier must be combined with overhanging "water-cut" banks. As a general rule, the moat should be deep enough to prevent escape when drained and, in all cases, the edge nearest the animal area should be shallow, sloping gently to a deeper midstream and minimizing danger of drowning.

Full water moats are not recommended because, having two steep walls, they constitute an obvious danger to animals.

Type A-2 Full Dry Moat

Full dry moats are excellent barriers for the rear of animal areas, for they allow backgrounds of dense plantings or adjacent animal areas to be seen by the viewer. Properly sited, they will be completely invisible. Full dry moats are also useful for frontal barriers but are more difficult to integrate into exhibit design than are water moats. [Access and egress for both animals and service staff must be provided.]

TYPE B BARRIER: WALL

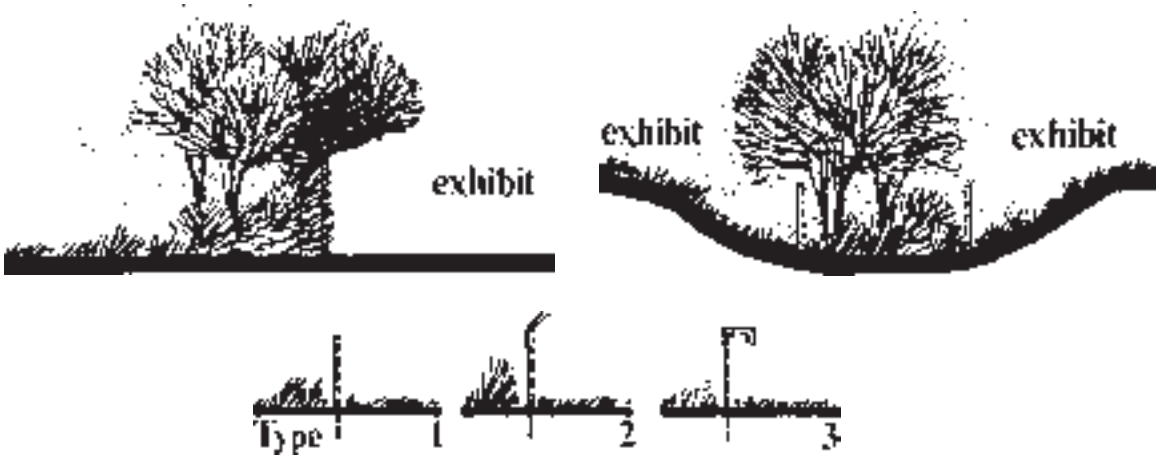
All walls that can be seen from public areas should resemble natural formations such as river-cut banks or rock outcroppings. In unseen areas, walls may be made of the most suitable construction.

TYPE C BARRIER: HA-HA

The ha-ha is essentially a ditch or swale obscuring a fence or wall, and is best suited to background areas. Where possible, this swale should be filled with suitable repellent planting [or employ other means] to prevent animals from using the areas.

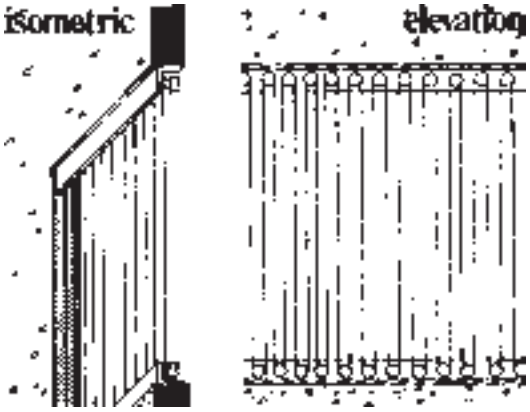
TYPE D BARRIER: FENCE

The type of fencing used depends upon the characteristics of the animals contained. Type D-1 vertical fence for easily contained animals. Type D-2, overhanging fence for more agile animals. A straight fence set with an inward incline serves this same function. Type D-3, double-overhanging fence, is used for all but the most arboreal of climbing animals. The loose inner fabric contains the animal, thus, preventing escape. The additional sketch shows fencing combined with screen planting.



TYPE E BARRIER: HARP WIRE

Closely spaced, tightly tensioned vertical wire or fine cable can be used to restrain small mammals and birds and is much less visible than wire mesh. The combined load of these wires requires a sizable supporting frame and adjustable tension-setting mechanisms. Harp-wire systems can be insulated for electrification.

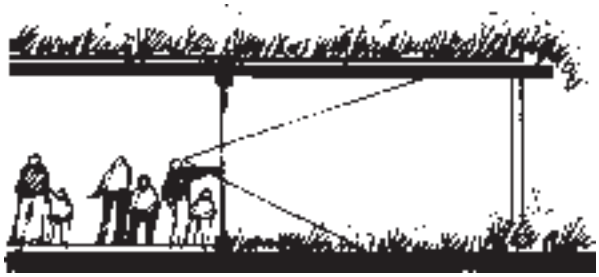


TYPE F BARRIER: ELECTRIC FENCE

Controlled electric charges provided by commercially available fence chargers can be applied to any insulated metal, including mesh or individual wires or even coated glass. This produces a harmless but very effective electric shock when touched. Such barriers may be easily shorted, however, and should therefore not be used alone as primary barriers. Their chief usefulness is reinforcement to any of the other barriers listed above.

TYPE G BARRIER: GLASS

Properly designed and maintained, reinforced glass partitions can be the least visible solid barriers and have the advantage of preventing transmission of airborne disease organisms. However, severe problems of reflection can occur in improperly located windows, and desirable animal sounds and odors are restricted. Daily cleaning, inside and out, is required.



TYPE H BARRIER: NETTING OR MESH

This complete enclosure is required for birds or mammals so agile that alternate barrier types are impractical. Mesh overhead barriers may also be used in waterfowl exhibits to prevent access of unwanted local opportunistic species.

TYPE I BARRIER: BURIED MESH

Burrowing animals require an artificial “floor” barrier. Mesh has the advantages of allowing free drainage and being relatively inexpensive. Such materials should be noncorrosive. Buried shreds of rusted wire could pose a serious hazard to future generations of animals.

PUBLIC BARRIERS

TYPE J BARRIER: RAILING

This type of barrier is principally useful as a barrier to visitors and may include rustic rail fences or low "kick-rails" depending upon the surrounding exhibit character. [Where railings protect the public from drop-offs of more than 1'6" or from other dangers, they must be at least 3'6" high, unclimbable and with openings no larger than 4" in diameter.]

[Curved pipe and wire rope "kick-rail" – This barrier is used to protect landscaped areas.]

[Security fencing is used at nonviewing locations to prevent visitors from leaving the path and finding themselves in dangerous positions near drop-offs, deep water or dangerous animals. Typically, 4' high mesh barriers of small unclimbable wire mesh hidden in dense plantings are used for this purpose.

Security fencing designed to exclude unauthorized personnel from non-public areas should be 8' high.

Zoo perimeter fencing or other barriers must meet USDA Standards.]

GENERAL GUIDELINES FOR LANDSCAPE DEVELOPMENT AND SITE FURNISHINGS

Guidelines have been excerpted from the 1976 LRP.

The use of the bioclimatic-zone concept is a clear, flexible, bold and effective means of presenting a comprehensive, consistent, educationally accurate and memorable zoo experience. Success will depend upon the consistency, thoroughness and accuracy with which landscape development is carried out. Superficial, misdirected or half-hearted attempts will not only produce mediocrity, but confusion and contradiction as well.

Successful development within this framework will not only require close adherence to these guidelines and to the exhibit scenarios, but will require thorough design development. No matter what aspect of the work is being advanced, it is essential it be approached with an attitude of disciplined creativity. Initially, an in-depth understanding must be gained of the natural forms and processes being replicated. What, for example, is the implied origin of an artificial rock face, or the implied successional stage of a forested exhibit?

The final product must be able to withstand reasonable scrutiny at every level. It must seem "right" to the child, the adult, the resident, the tourist, the scientist and the maintenance

worker. Because most projects will require many years to mature, interim or successional methods must be employed that are also effective and appropriate to the fullest extent possible.

Landscape development includes horticultural aspects (plantings and their maintenance), earthforms, artificial rockwork, water bodies, paving and exterior furnishings.

GENERAL GUIDELINES

All of the landscape elements must be responsive to the following general criteria:

1. Appropriateness within the overall Bioclimatic-Zone Presentation Theme.
2. Appropriateness within its geographic, geologic, or ecologic setting as described in the exhibit scenarios (i.e., either a material or feature native to the setting or an accurate replication or simulation of the desired indigenous material or feature).
3. Appropriateness to the biologic setting into which it is placed (for plant materials, i.e., slope, exposure, soil type, moisture requirements, etc.).
4. Appropriate to the visual/aesthetic function for which it is intended (i.e., accent, background, screen, etc.).
5. Appropriate to the physical function for which it is intended (i.e., durability, strength, support, flexibility, etc.).
6. Appropriate to the educational or behavioral response intended (i.e., creates the required psychological response, historical reference or informational association).
7. Appropriate in all ways to the well-being of the resident animals and the visiting public directly or indirectly affected (i.e., non-poisonous, comfortable, safe, etc.)

HORTICULTURAL ASSESSMENTS

A horticultural assessment of all vegetated areas affected by proposed construction will be conducted during the early design phase of a capital project, whether associated with an exhibit or not. The zoo's horticultural staff typically conducts these assessments, although the zoo may retain an independent, certified arborist for some projects. Assessments include a detailed survey of all trees 6" caliper or larger, smaller trees of value and other plantings, and an analysis of the health and preservation value of the specimens and plantings surveyed.

Exhibits and other projects should be designed consistent with the "GENERAL GUIDELINES" above and to minimize tree removal whenever possible, particularly removal of trees identified in the horticultural assessment as having high preservation value.

HORTICULTURAL RECOMMENDATIONS

Plan Ahead

The exhibit scenarios suggest planting, specific or generic, most appropriate to the intended result. Some of these plant materials are indigenous to this area and others are designated replicators. Where possible, commonly available plants are suggested, but often species are required that may not be easily found in the quantities or sizes required. For this reason it is advisable to use these specifications as a means of anticipating future demands in order to seek out or pre-establish stocks of hard-to-acquire materials. Where substitutions must be made, sufficient research is required to substantiate that the substitutes have essential equivalency.

It may, at times, be possible to establish trees some years in advance of the actual exhibit development. At other times trees may be relocated within the site, often as a result of other

new construction. These guidelines and scenarios, together with the Long-Range Plan, will make it possible to determine in general the best place to relocate such trees.

Special Supervision

The nature of the work suggested requires a full-time staff overseer of special expertise … a person with sound credentials in plant science and traditional horticulture in addition to study and personal experience in understanding the visual and biological characteristics of a wide range of world climate zones. This person [will] provide long-term continuity for both major new projects and daily landscape maintenance operations.

[Exhibit Areas]

Throughout this report the term "Exhibit Areas" is used to mean the entire area developed consistently within the framework of the scenario. It thus includes public zones such as secondary or tertiary pathways, overlooks and interpretive areas and non-public zones such as screen and background planting areas as well as the animal zones traditionally referred to as "exhibits."

Planting Guidelines for Exhibit Areas

1. Plant materials and the manner in which they are planted shall be consistent with the scenario for the area of the work.

2. Because of the importance given to landscaping in the zoo presentation theme, construction budgets must allow significantly more funds for this area of the work than are normally allocated.

3. Whenever possible, a sum should be set aside from the construction budget to cover repair and replacement of landscape work damaged by animals during their initial occupancy. Also, plans must be carefully prepared but flexible and require adjustment to meet the needs of individual animals or improved maintenance practices.

4. No plant materials potentially harmful to the animals exhibited shall be used in the vicinity of the enclosures. Many zoos have lost valuable animals because the public has fed them poisonous plants from nearby ornamental plantings. Determination of toxicity can require very specific testing, for plants known to poison some species may be the traditional browse of others.

5. No formal or purely ornamental plantings are to be established in exhibit areas. However, the use of flowering and attractive plant materials appropriate to the bioclimatic zone and arranged to appear completely natural is to be encouraged if these contribute to the vividness and memorability of the exhibits.

Planting Guidelines for Major Activity Areas

The following discussion pertains to areas of public use not designated as exhibit areas.

1. Plantings should establish an [appropriate] atmosphere … a fitting background for intensive human activity …

2. Plantings should be functionally selected for the purpose intended (shade, screening, etc.) and should be planted in ways minimizing maintenance.

3. Where ornamental accents are welcome (such as at zoo entry points), they should be concentrated for increased effect and reduced maintenance.

4. Plantings in activity areas should contribute to the essential concept of the prevailing adjacent bioclimatic zone, or serve as a transition for it …

5. Turf areas are not appropriate in areas of intensive use such as entry plazas … where heavy use would create maintenance problems.

6. Turf areas are appropriate, however, in passive recreation zones such as picnic areas. However, where heavy shade prevents vigorous turf growth materials such as fir bark, composted bark chips or gravel should be substituted.

[7. Plantings throughout the zoo, including those in off-exhibit service areas, should be selected for their ability to attract desirable wildlife such as birds and butterflies.]

HORTICULTURAL MAINTENANCE RECOMMENDATIONS

Excerpted from the 1976 LRP

… In forested exhibition zones, leaves and organic litter will be allowed to accumulate, while in plains exhibition areas, grass will go naturally unmown. Horticultural maintenance will stress establishment and maintenance of natural planting in exhibit areas, including both public and animal zones, and will include activities such as pruning and training "windblown" alpine trees and propagating unusual or commercially unavailable plants which are essential to establishing habitat realism …

HORTICULTURAL MAINTENANCE GUIDELINES FOR EXHIBIT AREAS

Excerpted from the 1976 LRP except where indicated by "[ ]" s

1. Practices which leave the appearance of human activity (such as mowing, raking, spading, formal pruning, clean-up of organic debris, etc.) are not appropriate in exhibit areas. When such activities are essential they shall be done in a manner leaving no trace of human activity.

2. Horticultural maintenance within exhibit areas must be carefully coordinated with animal keepers …

3. Horticultural maintenance operations should be restricted to non-peak visitor hours to the extent practical.

4. Irrigation systems should all be automatically controlled to optimize water conservation but must have manual override capabilities. Systems must be zoned to consider animal needs, activities and safety. No irrigation equipment shall be installed within the reach of primates or animals such as rodents and carnivores, which may be inclined to chew on exposed apparatus. Sprinkler heads used in ungulate areas should be of the type used for playfields to eliminate surface obstruction.

   When possible, irrigation systems shall be operated during the night and early morning hours … [to avoid impacting neighborhood use, to conserve water that might otherwise be lost through evaporation, and to convey an environmentally appropriate message to zoo visitors.]

MAINTENANCE OF PUBLIC ACTIVITY AREAS

1. High-maintenance ornamental plantings must "pay their own way" through significant added value to the visitor experience. They should be used sparingly and in areas where they have a high positive impact on the visitor's experience.

2. Planting or turf areas that become worn or damaged from over-use should be assessed and paved or otherwise reinforced if needed rather than simply being annually replanted.

3. High-use turf areas such as the North Meadow and Beech Grove will be maintained at a high service frequency using integrated turf maintenance practices.

BOTANICAL GARDEN

Woodland Park Zoo desires to become a designated botanical garden. Accordingly, the following improvements will be made.

1. Completion of a detailed survey and record of plants in the garden.

2. Rigorous record keeping of plant acquisitions and de-acquisitions.

3. Increased horticultural interpretation.

4. Increased ornamental plantings in appropriate locations, such as along the garden walk, near the North Meadow and at the Events Center areas, and at the zoo entries.

5. Further development of plant conservation activities, both on site and off site.

6. Increased horticultural and plant conservation education programs.

LANDSCAPE CONSTRUCTION

The zoo has had excellent success in doing its own landscape construction, plant acquisition and installation on major new exhibits, as well as smaller projects. This capability should be encouraged and further developed.

NATURAL AND ARTIFICIAL ROCKWORK, ARTIFICIAL TREES AND OTHER FEATURES

Statements 3 and 4 are excerpted from the 1976 Long-Range Plan (LRP) except where indicated by "[ ]" s

1. Artificial rockwork, trees, vines and other landscape props should be used only as fully integrated elements in the overall habitat simulation effort where they contribute significantly to the natural history story being told and as to the solution of specific functional requirements.

2. Artificial rocks, trees and other features should be designed for the well being and benefit of the animals that utilize them. Incorporation of behavioral enrichment features and other animal amenities should be encouraged.

3. When possible, natural rocks should be used for foreground and small-area applications. [Artificial rockwork is at present more economical and more controllable for large applications.]

4. Concrete cast in latex molds taken from natural rock outcroppings should be used where large foreground rock formations are desired and where close public scrutiny is expected. These molds are especially suited to replicating stone with complex structure such as gneiss, schist and limestone.

5. Use of artificial foliage and flowers is appropriate where needed in nocturnal and other special conditions, preferably in background locations.

6. Artificial rockwork, trees and other features in public areas should be unclimbable by the public except where special learning activities have been designed such as in the existing Habitat Discovery Loop.

WATER BODIES

Excerpted from the 1976 LRP except where indicated by "[ ]" s

1. When concrete paving is required to line water bodies, exposed edges should be obscured by natural stones and overhanging turf or vegetation.

2. Paving which lines shallow, quiet, reflective pools should be dark colored, preferably with integral color additives and/or textures.

3. Marshy areas which can be expected to receive trampling from large animals should be paved with submerged gravel or cobbles, having the interstices planted to the appropriate marsh plants.

4. An expansive and continuous system of seemingly interconnected water bodies has been developed to add visual and topographic continuity … However, for reasons of animal health and hygiene, these water bodies are, in fact, not interconnected, each being recirculated within its own exhibit zone as described in detail in the Exhibit Scenarios. Pick-up and discharge points must be carefully obscured from public view.

PAVING

Excerpted from the 1976 LRP except where indicated by "[ ]" s

The following discussion includes a variety of uses of paving in public activity areas, circulation ways and within animal enclosures.

1. Paving of primary and secondary circulation areas (see previous discussion of Circulation) should be of Portland cement or asphaltic concrete of sufficient durability to allow passage

of service trucks and emergency vehicles. These materials are available in a wide range of colors and textures, which should be chosen to complement the nature of the surrounding development or match existing abutting paving. The continuous, plastic nature of these materials lends itself to a feeling of movement and dispersal.

2. Major activity areas should be surfaced with unit pavers to set them apart as areas in which to pause and gather. These unit pavers should be larger with more highly finished, easily cleaned surfaces. In all cases these pavers must be designed to meet heavy service traffic and to accommodate wheelchairs and strollers.

3. Secondary and tertiary circulation ways may be surfaced in a wide range of materials suitable to the bioclimatic zone or exhibit area which they traverse. [Examples include gunite, embossed concrete and other naturalistic simulations.]

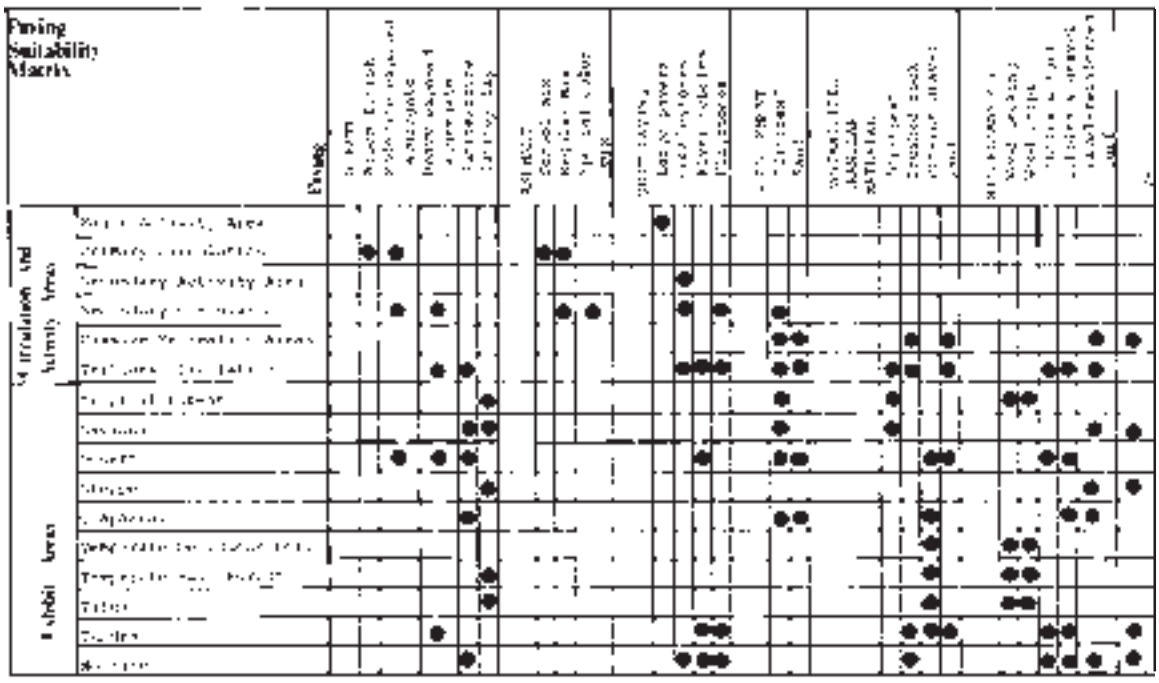
4. Just as appropriate transitions are required between plantings of adjoining bioclimatic or geographical areas, so also are appropriate transitions required between various paving styles and materials. In fact, these may be critical. The following suggestions are made:

   a. The closer a paved surface is to a major activity or circulation area (with increased use and speed of travel), the more refined and regular it should become (i.e., concrete pavers, asphalt paving), while more remote and dispersed areas should be paved with natural materials of rougher texture.
   b. Highly contrasting juxtapositions between paving materials should be avoided by the use of intermediate materials. A gradual progression should be made from one exhibit to another or from exhibit to major circulation pathways.
   c. The surfaces of exhibit viewing areas and interpretive structures should be paved with materials closely related to materials used within the exhibit viewed.

5. The suitability of various paving materials for the use areas proposed is summarized in the following matrix.

6. Definition of various types of surfacing and paving:

   a. Portland cement concrete



1) Broom finished – homogeneous smooth surface used typically for sidewalks.
2) Fine to medium exposed aggregate – exposing the gravel or seeding and trowling in selected gravel gives a more natural appearance. This process occurs naturally after many years of wear.
3) Large exposed aggregate – large flat pebbles up to 4" in size and trowled into the surface; often used for stream beds and low-traffic areas of special interest.
4) A wide range of color additives and colored aggregate materials are available.

b. Asphaltic concrete
1) "Class B" is the standard surfacing used for roads and parking areas and contains fine-medium-sized aggregate which becomes exposed after years of use.
2) "School mix" uses a fine aggregate and … [is generally used for walkways.]

c. Unit paving - applies to a wide range of manufactured paving slabs, blocks or bricks and includes cut or split cobblestones and natural cobbles.

d. Soil cement - used here to signify a variety of materials bound or stabilized by small quantities of Portland cement or chemical binders such as "Road Packer" and others. The finished surface greatly resembles the natural material used but is more resistant to wear and remains stable in wet weather. It can be made from any of the following inorganic materials.

e. Granular materials
1) Pit-run gravel - contains a naturally graded mixture of fine silts, sand and rounded gravels which compact to a fairly durable and very natural appearing but rough surface.
2) Crushed gravel - compacts more tightly than pit-run, also much more uniform and even.
3) Sand - compacts well if finely graded in size.
4) "Cintrex."

Exterior Furnishings and Graphics

Excerpted from the 1976 LRP except where indicated by "[ ]" s

Included in this category are the many useful facilities provided for the visitor such as benches, tables, trash receptacles, drinking fountains, information kiosks and general graphic features. Although the detailed specification of these elements is beyond the scope of this report, the following general guidelines are given:

1. Furnishings should generally be standardized as to type, size and overall character throughout the zoo to provide overall visual continuity and easy recognition. However, color and finish should vary from location to location in accordance with the character of the surrounding bioclimatic zone or activity area.

2. Facilities should be simple and functional, and, although clearly recognizable, should not call attention to themselves [when they are in proximity to naturalistic exhibits].

3. Furnishings should be designed to provide for the special needs of the handicapped, the young and the aged. For example, benches should have nearly level seats with comfortable backrests, as deeply reclining seats are difficult for older people to raise themselves from. Benches should be low to accommodate a full range of body dimensions.

4. Attempts should be made to integrate various necessary features into one object where their functional requirements are mutually supportive. For example, a sign kiosk could also incorporate a trash receptacle and/or lighting fixtures.

5. Materials should have primary or elemental character (e.g., stone, iron, wood, etc.) rather than highly manufactured or artificial character (e.g., plastic, stainless steel, enamel paint, etc.)

6. Amusement or novelty items such as trash receptacles resembling cartoon characters may be fine examples of contemporary popular art but are not appropriate for this site for they call attention to themselves and thus detract from their surroundings.

7. Location of features should be coordinated with layouts of paving, drainage, etc.

8. All facilities should be located to minimize maintenance and allow for clean-up by powered sweepers.

9. Facilities should be carefully sited to enhance their usability, i.e., sign posts should be set before simple backgrounds, benches should provide for sitting in a variety of exposures and at viewing areas of interest.

10. Extensive lighting is not required, for in this location high-use summer evenings are naturally well lit while dark winter evenings are little used because of frequently inclement weather. Therefore, lighting should generally be restricted to moderate security needs [and to areas with evening uses].

11. A systematic, coherent concept of interpretive graphics should be developed for the entire zoo. It should contain the following elements:

    a) The primary message or identification should be given immediately and simply and at an elementary level.
    b) Additional interesting information should be given in a manner appealing to an average education level.
    c) Technical information (i.e., scientific names or specific information of interest principally to the specialist) should be provided as the least conspicuous element of the panel or in separate well-prepared guidebooks.
    d) Graphic panel sizes should be modular and interchangeable with provision for updating and replacement. [The use of recycled products is encouraged.]

Criteria for Choice of Animals for Exhibition

The following criteria were excerpted from the 1976 LRP

The list of animals for exhibit in a zoo should be constructed with great care and insight, as the rationale for the very existence of a zoo can be found in its animal exhibits and their effects on their viewers.

In actuality a combination of desirability and practicality will determine the ultimate list. The list for Woodland Park Zoo was constructed by taking into consideration the following guidelines, not necessarily in order of importance.

1. EDUCATION:

A. Social Behavior — this is an especially wise choice … as we are a social species and can benefit from watching other ones …

B. Evolutionary Adaptations — the products of evolution are the animals themselves, both what they look like and what they do. Many of the "why" questions asked by children find their origins here, and biologists spend much time attempting to answer these questions to their satisfaction. Viewing these animals as end-products of evolution can be an exciting endeavor to the layman also, and the zoo should provide not only the raw material in the form of the animals but also an abundance of interpretive material cast in this manner. Each of the bioclimatic zones is inhabited by animals with characteristic adaptations, and these can be emphasized in the choice of animals.

C. Convergent and Parallel Evolution — many unrelated animals of equivalent zones on different continents have converged in appearance or behavior or both, and exhibiting them near one another for easy comparison will provide a source of wonder and thoughtful contemplation for the public.

D. Adaptive Radiation — another course to follow, exactly the opposite of the previous one but no less educational, is to examine a particular group of animals to see how they have diverged in different bioclimatic zones …

2. **INTEREST:** It is hard to separate this attribute from education, as most phenomena are interesting because we learn something new from them. This is another rationale for emphasizing social species, as they are more likely to interact with one another in complex behavior patterns than isolated individuals of different species would, thus furnishing activity to direct the attention of onlookers. Animals of bizarre shapes or bright colors fall in this category, providing fascination as well as material for greater understanding of nature.

3. **REPRESENTATION:** There is a truly remarkable diversity of animals on the face of the earth, and attempting to exhibit a representation of this diversity furnishes material for both education and interest.

4. **RESEARCH:** Some species, especially those with secretive habits, can be effectively studied in a zoo environment, especially if it simulates nature in important respects. A zoo can furnish research material for any segment of the academic community from grade schools to universities, and it is no less valuable to any citizen who wants to learn more about nature in a systematic fashion.

5. **CONSERVATION:** With increased concern over species that are rare or endangered, it is natural to turn to zoos as repositories of breeding stocks of as many of these species as possible, and it is logical that particular zoos emphasize particular species with which to work.

6. **PRESENT ANIMAL INVENTORY:** Whenever possible, animals already present on the zoo inventory were chosen for the Long-Range Plan, providing their choice was consistent with the above guidelines.

[Woodland Park Zoo periodically updates its Collection Plan based on these criteria as well as upon its extensive cooperative commitment within the American Zoo and Aquarium Association (AZA) Species Survival Plans. Changing conservation and management priorities require that the Collection Plan remains flexible. This of course means that many exhibit and off-exhibit areas must also remain flexible in their design and management. AZA Taxon Advisory Groups make recommendations for husbandry and other standards and these will continue to be important to the zoo's plans and its professional operation. The zoo should strive to provide sufficient breeding and support facilities to meet conservation priorities and to further the goal of maintaining self-sustaining captive populations in cooperation with other institutions.]

General Guidelines for Animal Care Areas

Excerpted from the 1976 LRP except where indicated by "[ ]" s

ANIMAL SERVICE AREAS

The detailed discussion of the many specialized requirements for handling and maintaining the variety of animals exhibited is also beyond the scope of this report, but the following general guidelines are presented:

A. Animal Surveillance. In the proposed Long-Range Plan exhibits will be dispersed throughout the zoo grounds and closed-circuit TV monitors will be provided at each of the animal service areas, … in order to maintain constant animal surveillance when required. The camera(s) should be located to view both the den area and the outer enclosure.

B. Keeper Safety.

1. The service facilities themselves should conveniently and safely provide keeper access to the den areas and to the enclosures.

2. A separate access to the den area should be provided for the keepers and should be well protected from the animal areas.

3. To ensure keeper safety upon entering the exhibit area, a mesh or glass-enclosed vestibule should be provided so that the keeper may clearly observe the animals. There should be no possible areas adjacent to the vestibule in which an animal could hide and attack a keeper stepping from the structure.

4. In all cases, a double-door system should exist between the animals in the holding area and the zoo proper, such that an animal is confronted by a minimum of two barriers before it can escape.

5. The containment area should provide a temporary animal holding area, a main containment area and separate isolation cages that can readily be moved and relocated as necessary.

6. Provision must be made for safe access and operation to all areas within.

7. An area should be provided within the enclosure from which the keeper can observe the animals.

8. Space should be provided to store minor but necessary supplies and to prepare feed.

9. Direct visual access must be provided to all doors, gates and closures.

C. Animal Safety

1. Animal holding areas should be free from projecting objects which could cause injury during play or panic reaction.

2. When hoofed animals and large flightless birds are introduced into moated enclosures, they should be protected from the moats by highly visible temporary fencing until they become accustomed to the limits of their areas. Low permanent barriers such as stones or rails should line the edges of hidden moats, warning the animals of danger. These low barriers should be kept below the sight lines of viewers.

3. Slick or potentially slippery floor surfacing must be avoided in holding areas.

4. Sudden noises that could potentially initiate a panic reaction in high-strung animals must be prevented. These include fire alarms and warning buzzers, clanging steel gates and clamor of adjacent construction activities. Elimination of sudden noise is especially important in nursery areas.

5. No potentially poisonous substances such as certain paints or preservatives shall be used in or near animal holding areas. Rusty wire mesh or hardware must be replaced before animals could eat broken fragments; nails, which might work loose, should be rejected in favor of screws and bolts for wood construction.

D. Animal Comfort

1. Heating and ventilation must be zoned for local control of small units; for example, maternity dens and nursing areas. This is also necessary for the proper management of fragile animals.

2. Whenever possible, controlled amounts of natural light and ventilation should be used. Many animals, particularly ungulates and birds, are in no way naturally adapted to “indoor” conditions. Therefore, holding areas, though necessarily artificial, should provide a maximum of natural light and draft-free ventilation.

3. Holding areas should be kept at the cool range of most animals’ tolerances; the difference between indoor and outdoor temperatures not exceeding 20ºF., if possible. Most animals have means of adapting to consistently cool temperatures but may

become dangerously chilled by sudden or dramatic contrasts between indoor/outdoor temperatures.

4. Proper design of acoustical properties of holding areas is just as important as design of heating, ventilating and containment characteristics of holding areas. All must be considered.

5. Floor surfaces must meet the specific needs of the animals housed. In many cases the floors should be resilient. They could either be high-impact gymnasium flooring or deep beds of dry peat or sawdust that could be changed periodically. Where this method is used, access for small front-end loaders should be provided.

6. Many species impregnate their holding areas with their characteristic scent, thus "staking out" their territory. In such cases the odor, while often objectionable … is essential to the animal's psychological well-being.

E. Animal Handling

1. Conditioning and training responses should be used whenever possible to move animals.

2. For small and medium-sized animals, removable catch cages should be located between outside entry points and holding areas so that the animals become completely accustomed to passing through them on a regular basis. Only then will intelligent animals enter catch cages predictably after once having been detained there.

3. Capture methods must be suited to the character and sensitivity of the animal.

4. Whenever possible, and as a standard policy, keepers should socialize their charges to the extent that they can safely … [provide] necessary routine care. Smell and sound are as important as visual familiarity. Care must be taken to assure that socialization does not lead to unnatural behavior or the replacement of essential intraspecific behavior.

5. Fire protection, detection, control and emergency exit for animals to safe exterior enclosures is essential. Even the smell of smoke can cause casualties from panic reactions.

General Guidelines for Utilities

The zoo's utility infrastructure was substantially upgraded during the implementation of the 1985 bond program. Major underground utility corridors were established, generally under the primary path. Utilities included underground water supply lines, irrigation piping and a 26 KV electrical system feed from both ends of the zoo. This comprises electrical cables installed in conduits encased in a concrete raceway with step down transformers and load breaks in underground concrete vaults at several locations. Communication cables, both copper and fiber optic, have been installed in a similar manner and adjacent to the electrical system. Also installed were natural gas lines, new sewer lines and storm drains with buried detention vessels and surface retention areas that serve much of the zoo.

New utilities were functionally and visually integrated into exhibits and visitor areas to be easily serviceable yet unobtrusive. For example, surface water runoff detention became wetlands and "dry" stream beds. Careful attention to detail was given to the placement of structures and system elements like manhole covers, drains, catch basins, electrical vaults, fire hydrants, hose bibs, etc. that were potentially visible. Even the smallest of these will stand out in a naturalistic context, especially if they are in principal fields of view. Runoff from landscaped areas is not permitted to cross pathways. They should be graded so as not to accumulate standing water and should channel rain water to nearby drains located either adjacent to paths or out lines of travel, since grates can be hazardous.

Runoff from most animal areas is considered to be wastewater and channeled to the underground sewer system. Surface runoff from zoo visitor areas feeds to either surface detention or directly into the underground storm lines.

These systems were designed to serve the utility requirements of new development and to the extent of foreseeable future growth. Also, water use management and conservation were made important criteria in the design of exhibits and support facilities and are to continue to be important design considerations for future development. This is essential to operational cost saving strategies and to reduce capital investment to "up size" utilities. Portions of the zoo are still served by older systems. These are to be upgraded to the standards of the newest system as the need or opportunity arises. Revisions to the new systems are to meet the same requirements.

The zoo's policy is not to abandon utility systems or other buried structures, or to bury construction debris on site. However, it is the policy of the zoo to utilize surplus "clean" soil from utility installation on site if there are suitable uses for it (e.g., landscape berms).

Future development should maintain the zoo's stringent design standards, criteria, and objectives successfully employed during the design and development guided by the 1976 Long-Range Plan. Development should also respond to any new applicable USDA and City of Seattle requirements, and conserve water and energy.

WATER

The zoo's water system is generally good with about 2000 gpm capacity. The only major water-intensive exhibit proposed is Hippo River, which will utilize a re-circulation and filtration system. Improved water conservation practices will lower long-term operational costs and support the zoo's conservation mission.

STORM DRAINS

Extensive planting throughout the zoo has reduced the runoff rate. New ideas in storm water treatment should be encouraged. The southwest area of the zoo has an old storm water system that may need substantial repair or replacement.

SANITARY SEWERS

The southwest area of the zoo has an old sanitary system that may need substantial repair or replacement.

ELECTRICAL/COMMUNICATIONS

The primary power/communications vault and conduit system should be extended to provide connection points for the Bird Conservation Center, Central Holding Center, Mammal Conservation Center and Northwest Service Center; and to provide a complete power loop to minimize the impact of localized outages, by connecting the vault at the East Plaza with the vault at the Elephant Barn.

Emergency power generation for critical circuits (such as: animal life-support systems; security; etc.) within selected facilities should be considered in the construction, renovation, or major maintenance of those facilities.

NATURAL GAS

A policy will be required for the installation of new gas lines in utility corridors. Natural gas is used in many of the newer facilities with highly efficient heating systems replacing older oil-fueled systems. The obsolete fuel tanks have either been removed or abandoned in place. There are two oil burners still in operation on zoo grounds and they are to be removed as upcoming redevelopment projects are implemented.

ENERGY CONSERVATION AND RESOURCE RECYCLING

The zoo's water and energy consumption is constantly monitored to ensure the most efficient use and conservation of those resources. The water supply is metered at two locations but the zoo has installed more than 20 sub-meters to help identify specific use in specific areas. This monitoring along with changes in operating procedures allowed the zoo to achieve a 16.4% reduction in its water consumption in 2001 compared to the prior year. Much of the irrigation system is automated and highly efficient. Total water consumption for 2001 was approximately 71,000 ccf for potable water and 21,000 ccf for irrigation. New construction should optimize recycling of construction waste and long-term resource conservation within the mission-driven design requirements of each project.

General Guidelines for Architectural Character

Excerpted from the 1976 Long-Range Plan (LRP) except where indicated by "[ ]" s

> Because of Seattle's equable climate, most exhibits can be established and maintained outdoors. Therefore construction of large, complex buildings will be unnecessary. [Discovery Village, which combines display and administrative space, the Desert Exhibit, and Day and Night Exhibits are reasonable exceptions.] Borrowing an analogy from ecology, successful architectural design will depend on adaptation. All structures must respond in form to their surroundings. This allows an emphasis on the naturalistic orientation of the Bioclimatic [and Natural Habitat] Presentation Theme, making it possible to avoid essentially unnatural and incompatible juxtapositions of wild animals with self-conscious buildings.
>
> This approach supports a dominant, well-knit, natural landscape in which both man and animal exist on a nearly equal level. In fact, man will appear the intruder, peering from "hidden blinds" (viewing structures) or through semi-transparent screens of vegetation into enclosures the bounds of which are undiscernible. These viewing structures, which will be the most characteristic architectural elements of the proposed development, are essential to the educational experience and enjoyment of the zoo. They will be submerged below viny bowers, under sod roofs or low-canopied trees. The viewing structures will be essentially outward-looking places giving shelter and comfort without turning away from the world of plants and animals.

Cultural Resonance

Just as the term "landscape immersion" was developed to identify the unique exhibit approach of the 1976 Long-Range Plan, the term "cultural resonance" was coined to describe one of the principal themes of the Thai Elephant Forest exhibit at Woodland Park Zoo, which includes buildings inspired by the designs of an Asian temple and elephant camp (Jones, 1989). Cultural resonance encourages the detailed presentation of appropriate vernacular architecture from around the world, where it supports and amplifies the natural habitat theme and demonstrates the importance of local peoples in sustainably sharing habitat with wildlife. Other examples at Woodland Park Zoo include the Northern Trail Tundra Center, which resembles a sod-covered pit house of the Athabascan of central Alaska. The African Village near the South Entry area is another appropriate example.

Environmental Design

Buildings consume a large portion of all resources within the United States. The United States consumes a large portion of the world's resources. Changing resource consumption at Woodland Park Zoo can positively impact the world, demonstrate the zoo's commitment to protection of the world's ecosystems and keep the zoo at the forefront of education about the environment.

Many people define "sustainable" design as the balancing of environmental, economic and social concerns in the built environment. Environmentally, sustainable design explores the full range of impacts implicit in the life of a building. Economically, sustainable design can reduce operating costs and increase worker productivity. Socially, sustainable design creates simpler, more natural places for people to live and work.

Leadership in Energy and Environmental Design (LEEDTM) Rating System of the U.S. Green Building Council has been adopted by a number of municipalities as the standard for their capital improvement projects, including the City of Seattle, at the LEEDTM Silver level. It allows for an understandable, measurable and verifiable statement of the ultimate impact of a building or development on the environment.

General Architectural Guidelines for Exhibit Buildings

Excerpted from the 1976 LRP except where indicated by "[ ]" s

A.FORMS AND MATERIALS

1. All structures should appear to grow from the landscape.
2. All structures should appear subordinate to and compatible with the surrounding landscape.
3. The use of strong contrast as a means of establishing individual architectural identity is fundamentally incompatible with the Presentation Theme.
4. Throughout the zoo structures should present an overall unity of character, while secondary variations in color, texture and material should be carefully integrated with the various landscapes of the bioclimatic zones.
5. Whenever possible, materials should be of an elemental, or at least primary, industrial nature, such as stone, wood, brick, concrete, iron, etc; highly finished or processed materials such as plastic, ceramic tile, aluminum, or stainless steel are not appropriate.
6. Structures should incorporate a minimum of materials; each specifically suitable to the visual and functional use it is designated to perform.
7. Materials should be self-maintaining. The use of paints and finishes requiring constant maintenance is to be discouraged.
8. Materials should encourage attachment by vines or covering vegetation. Textured concrete, brick and trellised wood structures are appropriate examples.
9. Buildings sited near existing trees must give "right-of-way" to the trees without damaging root or crown.
    a. Shallow grade beams supported by occasional posts or pilings are far less damaging to roots than are continuous spread footings.
    b. Building walls and eaves should be notched or otherwise modified to fit around existing trees.
10. Natural lighting and ventilation are to be exploited whenever possible, allowing controlled access to the natural variations of weather and season.
11. Roof forms should not dominate the skyline. Low, flat sod- or vine-covered roofs or pitched roofs of cedar shakes or shingles with low eaves and irregular or broken skylines are appropriate examples.

B. FIRE PROTECTION

Fire protection is essential for both public and animal areas. The following guidelines, together with municipal fire codes, are of utmost importance in providing for the safety of resident animals and the viewing public.

1. Smoke-detection systems should be used, which give warning without causing panic to the animals.
2. Sprinkler systems should be used where appropriate.
3. Proper smoke venting should be provided to prevent dangerous panic reactions by people and animals.

INCLEMENT WEATHER AND SEASONAL VIEWING

In the foreseeable future, indoor facilities for the security, health and operant conditioning of most zoo animals will be required. However, these environments should not be confused with those that have the potential to reinforce—without significant interpretation—the connection between the survival of animal species and the natural ecosystems that sustain them. The off-view seasonality of some of the zoo's collection will coincide with times of low visitation. Therefore, interpretive and marketing approaches might emphasize destinations such as "Discovery Village," the "Desert Exhibit" and other proximal features that will simultaneously provide significant shelter for zoo animals and visitors.

Cold, inclement weather affects zoo attendance and the visibility of certain animals requiring heat and protection from wind and rain. Whenever possible, the needs of these animals should be addressed in a respectful manner that supports an emphasis on wild habitat. Culturally appropriate architecture can be used to provide the necessary shelter and heat, but great care must be taken to ensure that visible architecture does not overpower or compete with the visitor's appreciation of the inseparable connection between animals and natural habitat. Woodland Park Zoo should resist the predictable pressure to provide indoor exhibits for all animals in its collection.

General Architectural Guidelines for Non-Exhibit Buildings

1. INTRODUCTION

As a means to clarify and unify the visual experience of the zoo between exhibits and at entry-exit locations and visitor service nodes, the following general architectural guidelines for chiefly non-exhibit buildings and structures are suggested.

The design criteria for non-exhibit buildings, while firmly rooted in the same aesthetic that drove the Arts & Crafts movement of the late 19th century and the design ethic of the National Park Service style, dictate a contemporary reinterpretaton of those impulses as opposed to a mere recreation of those styles. Hallmarks of these design idioms are an honesty in the use of materials and an integration into the landscape. The intent of this approach is to create a continuity of image and character that unites the zoo visually and which places in sharper relief key exhibit zones. Areas containing exhibit clusters which are thematically unified are expected to depart from this zoowide style. At the same time, the idea is to create a design style, or idiom, which most zoo visitors will find compatible. It should not be inconsistent with thematically vernacular styles in exhibit structures that are emblematic of more exotic locales such as an African savanna or Indonesian rain forest.

For Woodland Park Zoo, there is a certain appropriateness in reinterpreting these styles for non-exhibit buildings. Seattle has long been a gateway to some of the best of the country's national parks. There will be few zoo visitors who are not familiar and at home with traditional National Park Service (NPS) designs. And with the bungalow as a staple of Seattle house architecture, the Arts and Crafts style is an enduring presence in the region.

A further benefit to the zoo is how these styles have historically accommodated a spectrum of interpretation and expression. Across the zoo there are multiple sites for visitor-service and other clusters, indicated on the plan diagram. Esthetic or functional requirements that differ from zone to zone will be met easily by a hybrid of the two styles that projects variety within a uniform image. For example, the West Entry and Events Center zones might be designed to incorporate high-quality landscape and architectural elements for high-end catering and to meet event-client expectations. By contrast, the South Entry zone should adopt a more functional, durable look, with greater attention to armored detailing and ease of access for large crowds.

2. ZOOWIDE APPLICATIONS AND ARCHITECTURAL CRITERIA

With the exception of what will be termed "utilitarian" structures (see Section 3), the hybrid style drawing on Arts and Crafts and NPS precedents will have applications across the zoo on a variety of chiefly visitor-service buildings and clusters. These structure types and sub-areas, discussed in subsequent sections, may be divided into, though not restricted to, the following zones:

- West Entry Complex
- Zoo Office
- Events Center
- South Entry Complex
- East Plaza
- Pony Trail
- Amphitheater

Key Architectural Criteria

A number of issues and objectives, or "criteria," are associated with the need to project an image of handcrafted, honest structures closely incorporated with their surrounding landscape. Key criteria are as follows:

Guiding Principle
- Maintain an Arts and Crafts "Honesty of Materials" design ethic

Massing/Scale/Fit
- Human scale – invites visitors in
- Multiple forms to break up mass
- High volume – natural light interior spaces
- Steep roofs/dormers with overhangs creating shelter
- Simple but elegant joint detailing

Materials
- Materials should invite touch – with strong texture
- Use of natural materials – wood, glass, stone
- Simulation of shake or wood-shingle roofs

Special Opportunities
- Create Northwest/park immersion transition landscape entries
- Create special photo opportunity zones using elements such as sculpture, waterfalls, gardens, geology, murals, artwork
- Convert existing buildings by moderate facade additions/renovations

Integration with Adjacent Exhibits and Other Non-Exhibit Buildings
- Roof forms must not be visible from exhibit habitat zones
- Where large roof forms are required, develop a heavy perimeter landscape with high berms, trellises, and arbors to emphasize foreground views

Landscape Buffers and Screens
- Use heavy landscape and trellis/arbor elements to screen unwanted views

Graphics
- Graphics should reflect overall understated historical design approach

Colors
- Colors are derived from natural materials, with appropriate accents

3. UTILITARIAN STRUCTURES

Structures in this category cover a wide range of functional, utilitarian buildings not requiring a major unifying architectural theme. Nevertheless, a consistent treatment is suggested for buildings of this type, involving heavy landscaping to screen them from visibility.

3.1 Historic Carousel Structure

The carousel will feature an historic early 20th-century model and the design of the building elements and exterior spaces should emphasize this character. The design intent should be to complement the carousel but to let its historic elements be the visual focal point.

Suggested Elements

- Linked Plaza with Events Center Complex
- Carousel building
- Birthday party rooms
- ADA restrooms
- Support/set-up and storage
- Ticketing/queuing

General Design Criteria

- All season design with summer options for open panels/walls
- Clerestory to break up roof mass
- Building complements/does not compete with carousel
- The sound system is to be designed so that the music cannot be heard beyond the immediate area of the carousel

Conceptual Land Use Criteria

- Approximately 5,590 SF footprint
- Carousel is 50' diameter
- 80' diameter cover structure
- Restrooms and party spaces are added as bump-out elements
- Usage of berms to screen party rooms
- Space provided for interpretation of carousel and zoo

3.2 West Parking Garage

The West Parking Garage will be located in the NW corner of the zoo, adjacent to Phinney Avenue and south of 57th Street.

Suggested Elements

- Parking for approximately 700 vehicles
- Covered bicycle parking and lockers
- Vehicular access directly to and from Phinney Avenue for both the West Garage and North Lot
- Bus load and unload area

General Design Criteria

- Site Integration
- Resource Conservation
- Visitor Experience
- Minimized Presence
- Landscaping Emphasis

Key Architectural Criteria

- Esthetically pleasing design from all views, exterior and interior appropriate to the naturalistic zoo environment and park-like setting
- Hidden from the outside, while transparent from the inside
- Architecture that supports the landscape and site

- The setting is Northwest Temperate Forest (our local Bioclimatic Zone)
- Sustainable/Green Building Design Principles (e.g., recycled materials, minimize hauling, maximize natural ventilation and lighting)
- Screen-walls and/or planters to block car headlights and screen cars (balanced with the goals of natural ventilation and lighting)
- Pedestrian access separated from vehicles
- Ease of use and operation, potentially including a self-park system
- Stall sizes and elevators geared to the zoo's audience
- Longevity

3.3 Other Suggested Applications

- Restrooms
- Storage structures
- Miscellaneous structures visible to visitors

Key Architectural Criteria

- Low roof forms
- Building entry dominated by heavy landscape using arbors and trellis
- Colors should be natural and muted
- Materials should be functional … easy to maintain
- Restroom graphics should be large, bold and immediately recognizable

4. VISITOR SERVICES AND OTHER NON-EXHIBIT ZONES

As many as six visitor service or non-exhibit zones hold the potential for treatment under guidelines that follow Arts and Crafts and NPS precedents. These subareas are discussed and illustrated below, with design and site planning criteria varying by zone:

4.1 West Entry

The zoo's new West Entry will be located in the area of the current pony facilities. It will be designed under the following specific guidelines:

Suggested Elements

- Entry Plaza and landscape
- Retail/gift
- Ticketing and membership
- Visitor services
- Information
- Security/lost and found
- Restrooms

General Design Criteria

- High aesthetic experience emphasis
- Immersion landscape transition
- Sculptural and botanical garden displays
- Natural geologic displays
- Extended shelter elements
- Architecture memorable for orientation

Conceptual Site Planning Criteria

- Desert Exhibit edge is heavily landscaped as visual screen
- Gift shop retail should be located along right hand exit route
- 60%-70% total attendance will use this gate
- Entry/event buildings replace fencing as zoo perimeter barrier

4.2 Zoo Office

The Zoo Office will be located north of the North Meadow, in the general area of the existing North Gate. It will provide efficient workspace and enable better interaction and collaboration among zoo staff from different departments.

Suggested Elements

- Workspace for 115 staff
- Cafeteria for staff and volunteers, same space to double as Board Room
- Staff meeting rooms
- Interpretive Services work area and copy center
- Storage
- Reception
- Mailroom
- Showers and lockers
- Restrooms
- Elevator

General Design Criteria

- High aesthetic experience emphasis
- Demonstrate the application of "green" architecture
- Natural ventilation and light
- Open two story entry space

Conceptual Land Use Criteria

- Approximately 15,500 SF footprint, with two levels above grade and a basement
- Direct access from outside of the zoo for business visitors
- Direct access to the zoo grounds for staff and volunteers
- View through the entry to the zoo beyond
- Views of the building from North 59th Street screened by distance across parking lot and several layers of existing evergreen trees and other vegetation
- Views of the building from the North Meadow screened by existing landforms and existing and proposed deciduous trees and other vegetation
- Interpretation of the building's "green" architecture as part of the exterior public space

4.3 Events Center

Adjacent to the proposed "West" parking garage, the Events facility would provide space for meetings, classes, lectures, workshops, celebrations, dinners, etc. Its location would offer convenient linkages to the historic carousel, the zoo's new West Entry and the existing North Meadow.

Suggested Elements

- Separate entry/Plaza and dropoff
- Assembly room(s) (dividable)
- Set-up/serving/prep space
- General furniture storage
- Restrooms
- Catering/service offices
- Exterior decks

General Design Criteria

- High aesthetic experience emphasis
- Northwest Lodge borrows from WPA/Craftsman periods
- Heavy roof with dormer/clerestory elements
- High volume/natural light spaces
- Architectural linkage to carousel
- Architecture memorable for orientation

Conceptual Land Use Criteria
- Gateway option for event use
- Assume 9,000 SF footprint (65% event/35% support)
- 400-person capacity assumed @ 15sf/p
- Business offices as a part of the support space
- Design additional terrace to visually include carousel as part of event complex
- Provide extensive perimeter for service loading/takeaway zones
- Preserve views through evergreens to meadow from event complex
- If possible, incorporate existing evergreens as part of exterior deck/terra

4.4 South Entry

The existing South Entry will have a revised layout for ticketing and other visual and operational improvements.

Suggested Elements (incorporating existing)
- Entry Plaza and landscape
- Retail/gift
- Ticketing and membership
- Visitor services
- Information
- Security/lost and found
- Restrooms

General Design Criteria
- Armored design details for intensive use
- High aesthetic experience emphasis

4.5 East Plaza

This plaza will anchor the northeast quadrant of the zoo, providing access to key exhibit zones including Northern Trail, Asian Highlands and Trail of Vines. It is also on the zoo main visitor circulation loop.

Suggested Elements
- Visitor Plaza
- Food and snack buildings
- Restrooms
- Retail
- Multi-use event

General Design Criteria
- Armored design details for intensive use
- High aesthetic experience emphasis

4.6 Pony Trail

Structures associated with the relocated Pony Ring should relate to typical Northwest, temperate forest, farm structures.

Suggested Elements
- Pony barn and sheds
- Visitor shade structures
- Visitor service buildings
- Discovery Village amphitheater structure

General Design Criteria
- Northwest farm architecture

NON-EXHIBIT DEVELOPMENT RECOMMENDATIONS

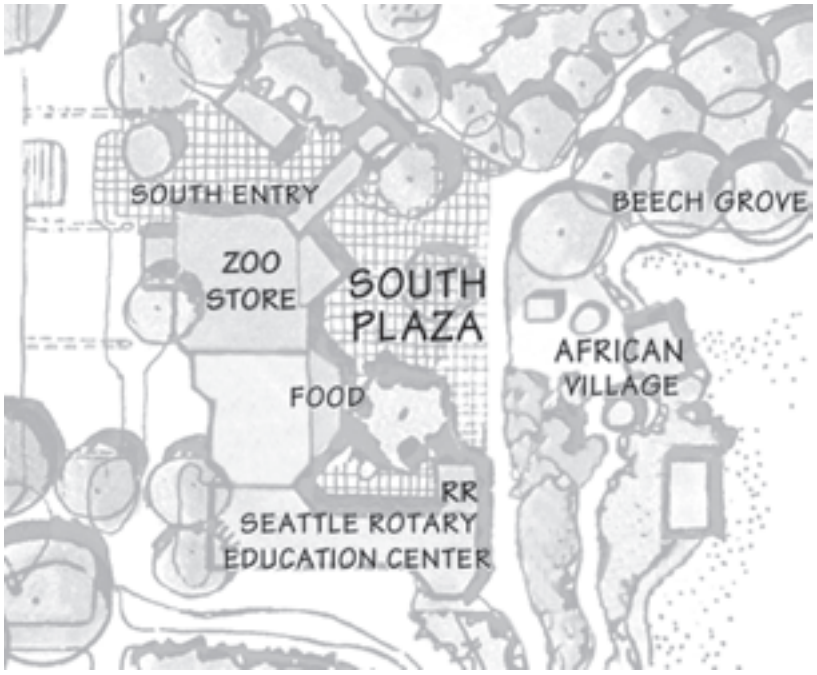
Photo by Isobel Alexander

NON-EXHIBIT DEVELOPMENT RECOMMENDATIONS

SOUTH ARRIVAL AND PARKING

The South (Fremont Avenue and North 50th Street) Entry will continue to provide convenient drop-off as well as access to the parking. Service access to the southeast service area will be maintained. It is essential that the entry road creates a memorable first impression, establishes a theme for things to come, and leads visitors clearly to the pedestrian entry, parking and exit. The Final Revised Environmental Impact Statement identifies several access possibilities that may be pursued in the future. They all involve entry and exit along North 50th Street and include service access to the southeast service area.

The existing surface parking lot, which currently provides 275 parking stalls for visitors, may be realigned in the future to provide a modest increase in capacity.

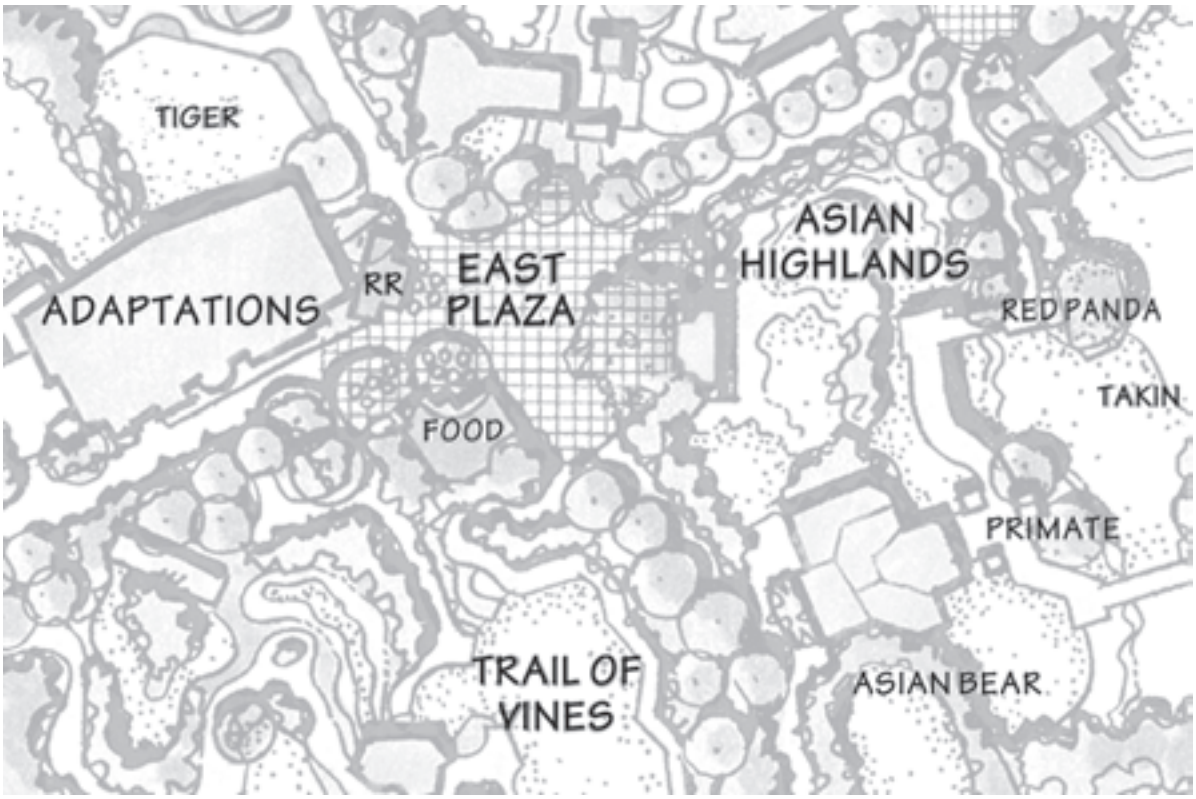


SOUTH ENTRY AND PLAZA

The revised South Entry will allow family leaders to queue for tickets while other family members review orientation materials and program schedules or purchase items such as film or rent strollers. The group will then pass through a control point where tickets are taken. This approach not only shortens lines greatly, but also provides greater ticket control. Most importantly, it provides an open and inviting appearance to arriving guests. Structures flanking the entry path will create a small-scale village flavor while providing for the convenient purchase of zoo memberships and facilitating member access.

The South Entry Plaza will be enlivened with attractive new plantings, paving and overhead features to add further character and color to this important area. Visitors who entered the zoo through the new West Entry, and are now halfway through their visit, can also take advantage of the extensive gift shop and a new snack area, which will overlook the plaza. The ZooStore can even move out into the plaza like a street market. The South Entry Plaza will also be an important zoo shuttle stop.

EAST PLAZA



A second major visitor hub will be located between the present Adaptations Building (Feline House) and Raptor Center, fronting on an expanded food service facility. Public restrooms, a shuttle stop, picnic tables and shady rest areas will be provided for visitor needs. Perhaps the most interesting feature of the East Plaza will be the Banyan Grove, where inter-arched Southern magnolias may be used to simulate the sacred banyans found in many Asian villages. These groves are centers of village life, alternately shading markets, festivals, storytelling and tired visitors. The East Plaza will accommodate all of these opportunities as well as provide culturally appropriate portals to the Trail of Vines, Australasia and Adaptations exhibits.

WEST ARRIVAL AND PARKING AREA

Pedestrian Access from Phinney Avenue North would include a gateway and path to the new West Entry. Access from the north parking lot would include a gateway and path to the new West Entry.

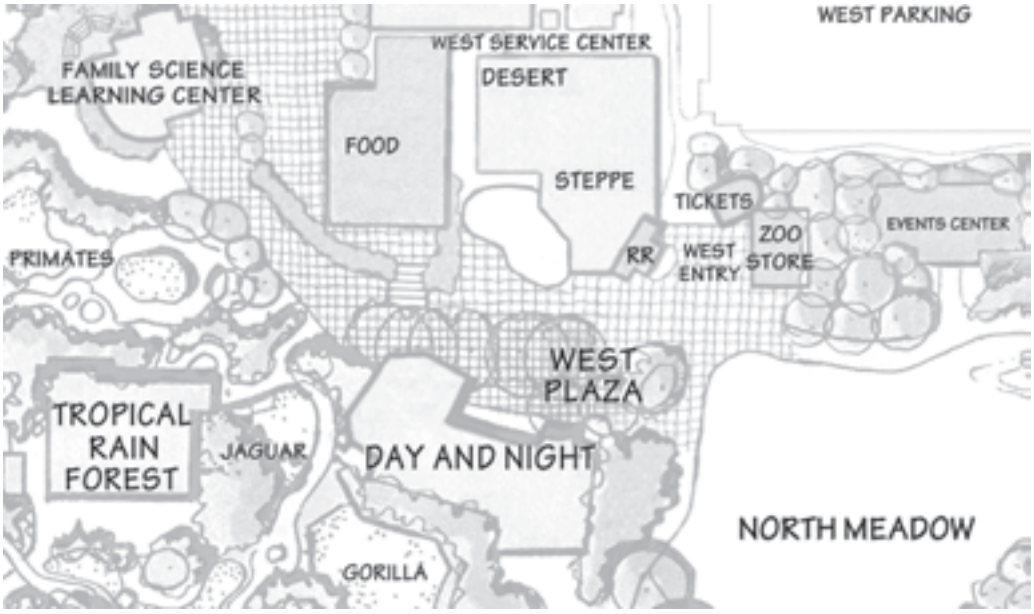
Vehicular entry and exit would be directly off of Phinney Avenue North between North 56th Street and North 57th Street, and will provide access to the new west parking and the existing north parking. An area for busses to load and unload is also planned.

The West Parking Garage would accommodate approximately 700 vehicles. It would be approximately 30 feet tall with stairwells and elevator penthouses extending up to an additional 15 feet. Screen-walls on the top deck would be up to 4 feet tall. Design features include: vegetative screening; parking stall sizes and elevators geared to the zoo's audience; covered bicycle parking and lockers; and ease of use.

Associated work is necessary to accommodate construction: the office trailers need to be relocated until a permanent office building is completed.

The northwest lot will continue to provide approximately 62 parking spaces for visitors.

WEST ENTRY AND PLAZA



A new West Entry will be developed adjacent to the new west parking, replacing both the zoo's present north and west entries.

The new West Entry would incorporate ticketing and admissions, public restrooms, zoo store, first aid station and stroller rental. The design will allow family leaders to queue for tickets while other family members review orientation materials and program schedules or purchase items such as film or rent strollers. The group will then pass through a control point where tickets are taken. The area will be enlivened with attractive plantings and other features to add character and color.

NORTH PARKING

The north parking lot provides 195 visitor parking spaces. The layout of the lot is not envisioned to change appreciatively. However the primary access to it would be via the new vehicular entrance at North 56th Street and Phinney Avenue. The current North Entry will close to general zoo visitors when construction of the new west entry is completed. A new pedestrian path will connect the north parking lot to the new West Entry. By locating the primary access to this lot at North 56th Street and Phinney Avenue, the zoo hopes to significantly reduce zoo-related traffic on North 59th Street.

SOUTHWEST PARKING

The southwest lot will continue to provide approximately 122 parking spaces for visitors.

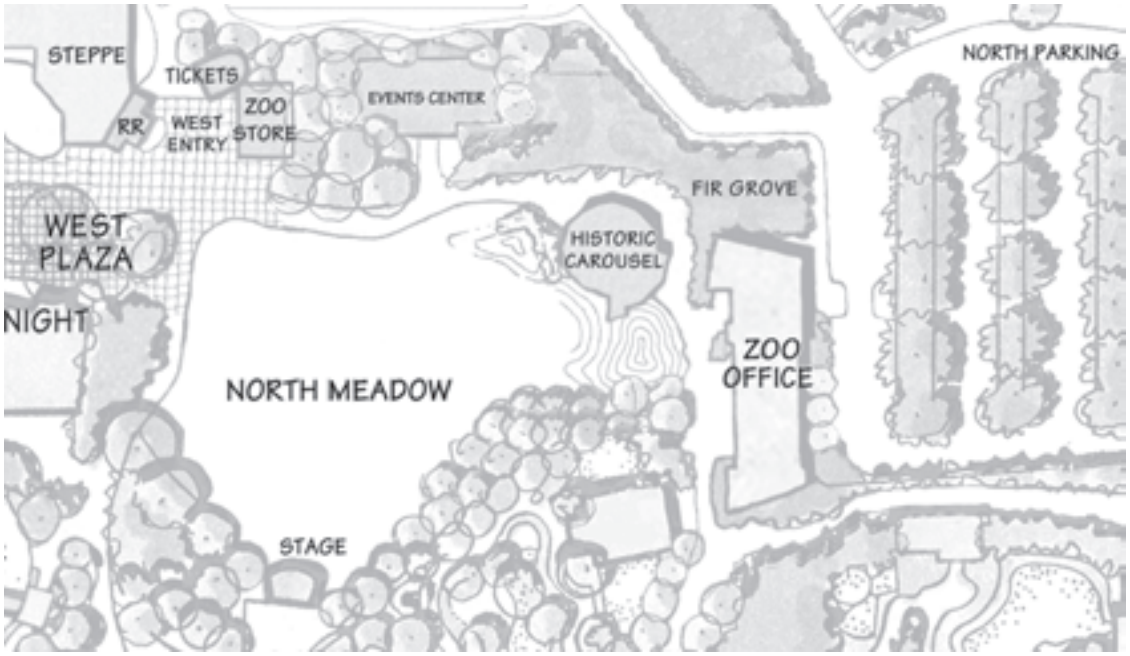
SECONDARY VISITOR HUBS

The intersection of the African Savanna path and the new entry to the Elephant Forest along the primary path loop provide an ideal location for a secondary visitor hub. Existing public restrooms are nearby and a shuttle stop and wayfinding kiosk may be complemented with seasonal refreshment stands. The popular adjacent hippo exhibit and elephant demonstrations will insure that this area will be well used.

The southwest area of the zoo will be anchored by the new Zoo Amphitheater and relocated Pony Ring. It is served by existing restrooms and will also provide a rest and orientation area, shuttle stop and seasonal refreshment outlets.

A secondary visitor hub located just west of the elk and wolf barn will provide the entry and exit to the Northern Trail, Asian Highlands and Australasia exhibits.

NORTH MEADOW



This two-acre public open space was originally destined to become a North American prairie exhibit. However, it has been an important public gathering and evening concert venue for generations. In the mid-1980s the zoo modified the 1976 LRP to dedicate the North Meadow as a permanent public open space and its popularity increases to this day. The addition of a hill in the mid-1990s created opportunities for informal play, sunning and concert watching. In 2000 the hill was reshaped; berming and screen planting between the meadow and Australasia exhibit were added and automatic irrigation was installed. Suggested improvements include providing support space behind the stage, and ongoing improvements to drainage, soil, and turf to increase the traffic tolerance of this popular active space.

ZOO OFFICE

Many zoo staff currently work in temporary trailers and buildings that are separated from one another, resulting in inefficiencies. The new two-story zoo office, with a footprint of approximately 15,400 square feet, will be located at the site of the current North Entry. In general, those staff whose work requires an office setting and frequent collaboration with each other would be located in the Zoo Office. These include executive staff, as well as staff from departments such as admissions, communications, creative services, development, education, finance, group sales, guest services, human resources, marketing, membership, and planning. The rest of the zoo staff would continue to work at various other locations around the zoo site. For example, zoo keepers would continue to be located in animal exhibit spaces; animal health staff would continue to be located in the expanded Animal Health facility; staff who provide volunteer or teacher training, run education programs on the zoo grounds, or take education programs to schools or community groups, would remain in the Education Center; and maintenance staff (including grounds maintenance, custodial maintenance, and facilities maintenance) would continue to be located in shops that also support other activities.

In addition to improved work and meeting spaces, the building will provide a cafeteria, enabling zoo staff and volunteers to gather informally and reducing the need for staff to travel offsite for lunch.

A key design objective for the Zoo Office is to demonstrate the application of “green” architecture by the use of such features as natural wind ventilation, passive solar heating, a green roof, rainwater harvesting and reuse, natural materials, and energy efficient design. In addition to emphasizing the zoo’s conservation mission, the building’s increased energy efficiency would reduce day-to-day operations costs. The building will be constructed to Leadership in Energy and Environmental Design (LEED) standards developed by the U.S. Green Building Council.

By orienting the offices primarily in an east-west direction, and with the location of the North Meadow to the south, the Zoo Office can be almost entirely day lit and naturally ventilated. The northern office facade will be designed to maximize the opportunity for cross ventilation from north and south winds and allow for a soft northern light into the workspace. A basement will provide storage space and other support functions.

HISTORIC CAROUSEL

The 50-foot-diameter Historic Carousel will be housed in an all-weather structure with a footprint of approximately 5,600 square feet in the northwest corner of the North Meadow. The building will be designed to allow it to be opened during good weather, and its location adjacent to the North Meadow takes advantage of the meadow's active, family-oriented character. It will include restrooms and approximately 840 square feet of rental space with an operable wall that can divide the space into two rooms. The rooms will have a combined capacity of 100 people, and are expected to be used primarily for children's birthday parties.

The North Meadow, designated a "public activity space" in the 1987 update to the Long-Range Plan, currently offers active, programmable space used for concerts, large scale celebrations, family and corporate picnics, and other activities. The Historic Carousel will offer families with children an additional option for fun, active play on zoo grounds, and rider fees as well as birthday party rentals will provide the zoo with a new source of revenue to support operations and programs. The Historic Carousel and associated facilities respond to a frequent request that the zoo provide more active options for young children. Carousels are customary at zoological parks around the country. Other zoos with carousels include the Denver, Oklahoma City, Columbus, Atlanta, Fort Wayne, Memphis, Riverbanks, San Francisco, Indianapolis, and Roger Williams Park zoos.

The Historic Carousel will be visible from the West Plaza and North Meadow, but hidden from view from natural habitat areas. The Carousel will be screened by existing vegetation, and be barely visible from outside the zoo grounds. The zoo has consulted with a sound system expert to develop specifications for the Carousel sound system. The system will incorporate numerous small, directional speakers to provide the desired sound coverage while preventing "sound bleed" beyond the immediate area of the Carousel. The Carousel will not utilize the tradition band-organ.

EVENTS CENTER

Located at the north end of the zoo adjacent to the North Meadow, the Events Center will be used for zoo-sponsored events and programs in addition to serving as a group rental venue. The zoo currently hosts a variety of events in existing facilities on the zoo grounds, but has no dedicated space to accommodate the demand for such events. The Events Center will provide dedicated indoor space that will allow for year-round community use of the zoo for community gatherings, classes, workshops, weddings, family reunions, company parties and other social gatherings. Event Center rentals will be a source of revenue to support zoo operations and programs, particularly during the off-peak seasons, when zoo revenue and attendance typically drop significantly. The center's location, at the edge of the North Meadow, will allow coordinated use of the meadow and the Historic Carousel for community gatherings, company picnics, or similar events.

The Event Center will enable the zoo to accommodate during the rainy season the same types of group activities it currently accommodates during the dry-weather months. It is modeled, in part, on similar events centers that have been successfully integrated into many other zoological and botanical parks throughout the country, including the Oregon, Denver, San Francisco and Atlanta zoos.

A one-story building with a basement, the Events Center will accommodate approximately 400 people. The building footprint will be approximately 9,000 square feet, with approximately 6,000 square feet on the ground floor available for assembly space. The assembly space will be able to be subdivided to serve two or three separate events. Remaining space on the ground floor will include a reception area, restrooms, and coatrooms. Support facilities for catering and maintenance will be located in the basement.

The Events Center will be located more than 400 feet from the nearest residence on Phinney Avenue North and more than 600 feet from the nearest residences on North 59th Street. Screened by existing trees and other vegetation, the building would be barely visible from outside the zoo grounds. The Events Center would have a separate entrance located near the new west parking lot, and would be accessible without entering the zoo grounds. Service access will be from the new West Entry.

PONY TRAIL

This historically popular attraction will be relocated to the zoo's southwest quadrant to provide barns and yards for the ponies and a positive, memory-making contact experience for young children within this under-utilized area of the zoo. This location also allows the pony barn to be serviced from the zoo exterior, yet easily accessed from within the zoo. A buffer between the ponies and the Bird Conservation Center should be provided.

AMPHITHEATER

A new Zoo Amphitheater would occupy 13,000 square feet of space near the Family Science Learning Center. The Amphitheater would provide a gathering space for up to 500 visitors, with both bench seating and informal grass seating. The zoo would use the Amphitheater for presentations of raptor flight that currently occur in the northeast quadrant of the site, as well as for other programs demonstrating natural animal behavior. Facilities on the amphitheater grounds would include a stage, a raptor center with a footprint of 2,000 square feet, and small temporary holding facilities for other program animals.

SOUTHEAST SERVICE CENTER (Horticulture, Maintenance and Animal Health)

1. The hay storage sheds will maintain their present use. Road circulation will be revised to allow access by large truck-trailer units to loading docks at the Commissary and horticulture staging areas. The present security office will be relocated to the South Entry.

2. The Horticulture Department nursery area will include bulk storage areas, at least three greenhouses, and shaded areas for storing and growing plants. There will also be a desert greenhouse included in the development of the Desert Exhibit.

3. The "Zoo Doo" composting area will continue in its important function at its present location.

4. Designated staff parking for this area will be provided within the area or along widened segments of the east service road. (See earlier discussion of parking demand).

5. The Animal Health Facility will develop a new quarantine area (3,000 square feet). A proposed research laboratory would be built as a second floor addition to the necropsy building (1,000 square feet).

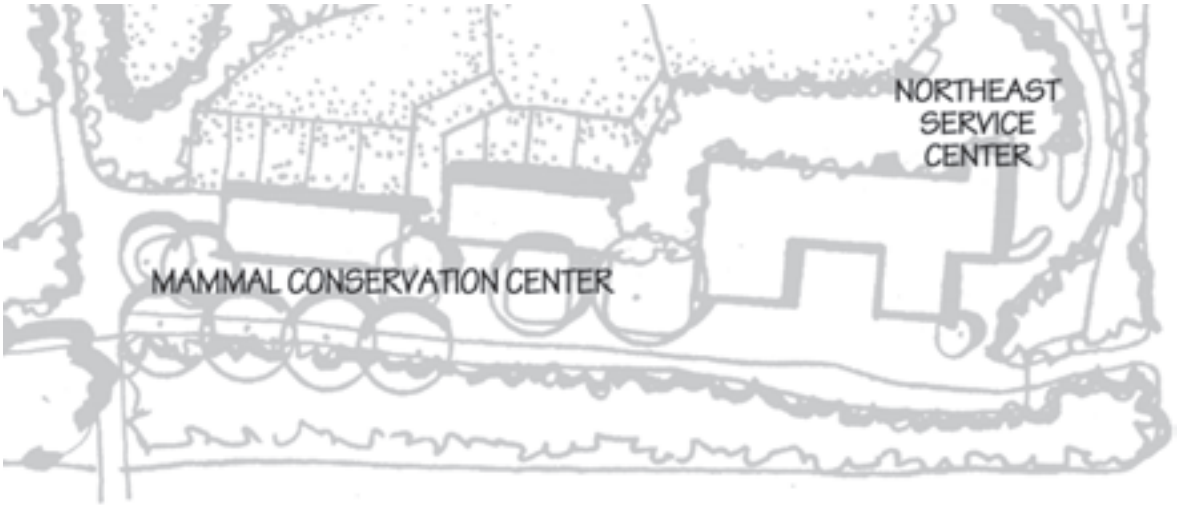
NORTHEAST SERVICE CENTER (Exhibits Shop, Graphics and Facilities Maintenance Shops)

Craft and exhibit shops will be clustered and well screened from surrounding areas. Staff parking is available in the area. Facilities will include the following approximate square foot areas: design studio (1,600), graphic production (1,600), exhibits (1,200), spray booth (500), paint shop (800), carpentry shop (800), metal shop (1,200), electrical shop (400), plumbing shop (400), and offices for Facility Management, clerical and other support functions (1,000) all arranged around a (2,400) common work area.

WEST SERVICE CENTER (DISCOVERY VILLAGE, FOOD SERVICES, DESERT, PROGRAM ANIMAL FACILITIES)

This area will provide delivery access and support for Discovery Village, Food Services, Desert and Program Animal Facilities. Facilities will include: loading dock, food service storage (approximately 8,000 square feet), program animal facilities (approximately 3,700 square feet) and vehicle storage.

MAMMAL CONSERVATION CENTER



Off-exhibit holding and management of small- to medium-sized hoofstock and other small mammals will be provided in the zoo's northeast corner. Two holding buildings will be 3,000-5,000 square feet each in area with attached kennel-like runs connecting to larger exercise yards. They will in part replace the existing barn at this location.

Powerful animals may be held temporarily in the robust holding facility on the east side of the bear grotto building. Additional primates and larger felids will be held in their primary display areas.

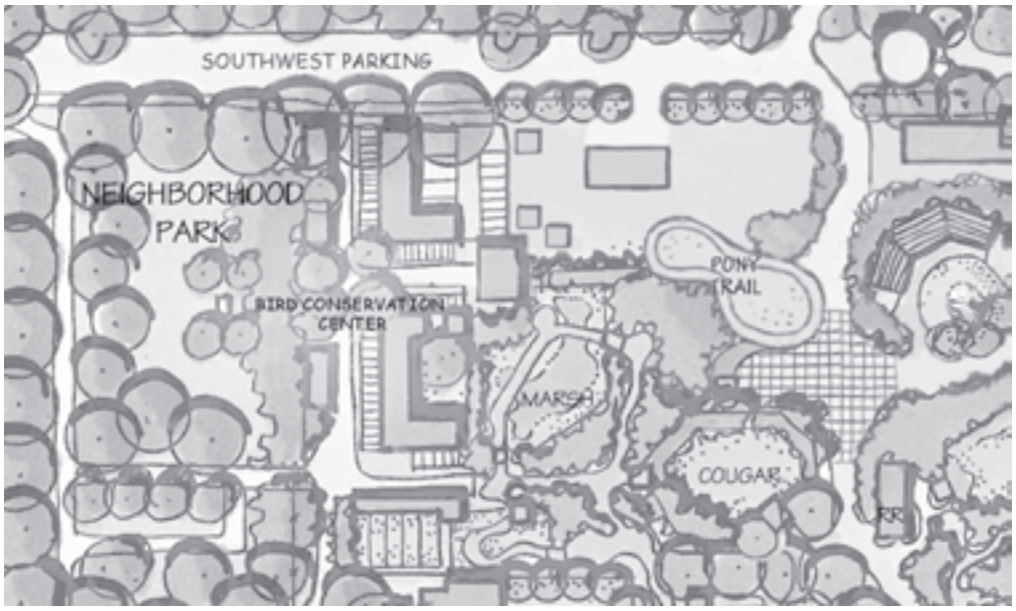
CENTRAL SERVICE CENTER

Present holding and service facilities in the African Savanna are inadequate or difficult to access. The Central Service Center will provide a new 3,500-square-foot giraffe barn, 4,000-square-foot savanna hoofstock barn and a new 500-square-foot patas monkey holding area. This area will also service the proposed Safari Lodge interpretive building (including catering access for special events), the new Leopard/Kopje exhibit (see scenario), the bear grottos, several new Tropical Rain Forest exhibits with small African mammals or birds, and the Tropical Rain Forest exhibit. Service drives and turning radii will be large enough to accommodate fire trucks and service vehicles. The Central Service Center conveniently concentrates a large number of service functions in one area, providing well-screened parking for service vehicles. A keeper break area with offices, lockers, kitchen and lunch room, showers and a meeting room will be included in the area. A hay storage area is also required.

The Safari Lodge and Central Service Area will close the present public access from the Savanna exhibit to the gorilla exhibit. However, the Tropical Rain Forest path has recently been opened to the primary pedestrian loop near the Family Farm, providing an even more convenient route from the South Entry to the popular gorilla exhibits.

Placement of the giraffe barn in this position will allow winter viewing of the giraffes from the present Beech Grove near the primary pedestrian path. Opportunities for conducted "behind-the-scenes" tours will help demonstrate the importance of the zoo's off-exhibit activities.

BIRD CONSERVATION CENTER



The southwest corner of the zoo will house the Bird Conservation Center, which will include the present Southwest Holding Buildings as well as a new Incubation Building, offices, staff break area, and general holding and breeding facilities for a range of small, medium and large birds, including waterfowl. The southern end of the present Pheasantry (Conservation Aviary) may be converted to off-exhibit use after some pheasant and crane species move to the future Asian Highlands exhibit. The southwest area can accommodate about 16,000 square feet of indoor bird breeding, holding and office space, with outdoor flight areas attached. This total represents about a twofold increase in space from today's levels, which will be critical to the success of maintaining a diverse bird collection for exhibition. Accommodating these uses, and those of proposed adjacent facilities, will require loss of the present swamp exhibit, waterfowl and crane yards. The outdoor pond for western pond turtles will be retained or relocated. The popular Temperate Marsh exhibit will be retained and improved in its current location.

REPTILE CONSERVATION CENTER

The off-exhibit breeding and management area for reptiles and amphibians will be located at the rear of the proposed Desert Exhibit at an upper level where natural light is available. (The desert plant greenhouse will be located nearby and some shared uses may be possible.) Staff work areas may be provided on a lower floor. A total of about 2,000 square feet of space will be provided.

EXHIBIT SCENARIOS

Woodland Park Zoo

EXHIBIT SCENARIOS

The design, construction and operation of successful immersion exhibits require an integration of science and art. The exhibit scenarios described below are examples of what might be created for a specific area using the zoo's philosophy and the Development Guidelines.

As exhibits are identified for implementation a design program will be prepared to include the following decisions:

1. Animal list will be finalized based on the zoo's Collection Plan and other factors
2. Education and conservation messages will be identified
3. The exhibit concept will be defined using the zoo's philosophy and Development Guidelines
4. Budget and schedule will be established

Through the schematic and design development phase other details will emerge. Research and experimentation must proceed in concert with design development and should continue after initial construction and occupancy of the exhibits. This will provide a basis for evaluation and, if required, modification.

Recommendations are made in the following subject areas:

1. Animals exhibited
2. Setting (geographic location, plant community)
3. Terrain (topography and geology)
4. Soil (inferred type and functional requirements)
5. Water (features such as streams, ponds and marshes)
6. Vegetation
7. Viewing (overlooks or viewing types)
8. Barriers (moats, walls)
9. Animal service areas
10. Utilities

EXHIBIT 1: AFRICAN SAVANNA IMPROVEMENTS

Natural Habitat Zone: African Savanna

Setting: Short-grass grasslands in Africa

Enclosure: Varies

Exhibit Locations: Present African Savanna exhibit area

The inclusion of large birds such as: ostrich, marabou stork, crowned crane, vulture and ground hornbill on the open savanna will require shelter, safe retreat areas for the birds and modifications to the containment barriers.

Exhibit 1a: Wild Pig Exhibit
The present hippopotamus exhibit will be drained, filled with red sand, recontoured, and converted to display warthogs or red river hogs. Buried heating pads (hog warmers) will increase animal comfort in cooler weather.

Behavioral Enrichment: Buried tubers in sand, browse branches hanging over embankment edge, supported by hidden elastic cord for increased play and interaction

Animal Service Area: Pig-activated tempered water shower, browse hanging hooks, barrier modifications as needed

Vegetation: Unchanged

Viewing: Recontouring will allow for views of animals at or above human eye level

Barriers: Unchanged

Utilities: Install a tempered water system.

Exhibit 1b: Aquatic Bird Exhibit
The upland area of the present hippopotamus exhibit and the adjacent foreground waterfowl exhibit will be converted to an aquatic bird exhibit. Pathways will be created between the upper and lower areas.

Water: Shallow upper pools will be created on the upper level.

Vegetation: Unchanged

Viewing: Unchanged

Barriers: New hidden barriers will separate the wild pigs from the aquatic birds.

Animal Service Area: The savanna ground bird holding building will be enlarged to provide winter shelter for the aquatic birds.

Utilities: New utilities will be required.

Exhibit 1c: Patas Monkey Exhibit
The existing patas monkey exhibit will remain.

Terrain: Unchanged, but provide “old” and “new” simulated termite mounds to allow elevated vantage points for the primates

Soil: Unchanged

Water: Unchanged

Vegetation: Unchanged

Viewing: Moated view unchanged. Provide new “nose-to-nose” indoor viewing through glass from proposed Safari Lodge interpretive center. New interpretive materials and an expanded outdoor viewing area for interpretive presentations will be provided.

Barriers: Improve to prevent escapes

Animal Service Area: New 500-square-foot patas monkey barn and off-exhibit yard in proposed central service area

Utilities: Unchanged

Exhibit 1d: Safari Lodge Interpretive Center
Designed to resemble an East African safari lodge with a thatched roof and decorated stucco walls, the 3,500-square-foot Safari Lodge will create a destination for the Savanna path. Guests who entered the savanna exhibit at the African Village will have walked nearly a third of a mile and their children will be

ready for a rest and change of pace. In addition to providing seasonal refreshment and year-round shelter and restrooms, the lodge provides indoor program space and interpretive features focusing upon the diverse plants and animals, seen and unseen, which make the African Savanna so interesting. Nose-to-nose viewing of lion, leopard, hyrax and patas monkey add to the excitement. The Safari Lodge itself provides a unique architectural and cultural resonance opportunity: the role of ecotourism partnering with local people as an option for sustainable conservation.

Exhibit 1e: Leopard/Hyrax Exhibit

Enclosure Area: 3,000 square feet.

Exhibit Location: Occupies the presently empty grotto on the southeast side of the bear grotto service entry. This area would be extended southward somewhat to attach to the proposed Safari Lodge.

Visual Character/Terrain: The habitat would resemble the side and base of a great dark granite inselburg or "kopje," the geolithic basement of Africa that rises from the plain like an "island in a sea of grass." The size and outline of the old bear grotto gunite has the appropriate scale for a kopje and artificial rockwork could be added easily to complete the effect. Kopjes are important life zones in the African savanna and were represented in the original exhibit construction by the lion and patas monkey basking rocks. However, characteristic animals of the kopjes, such as hyrax, pancake tortoise and leopard have not previously been presented at Woodland Park Zoo. The hyrax could be exhibited in realistic landscapes attached to the Safari Lodge.

Water: Small pools of water caught in crevices would be re-circulated and treated.

Vegetation: Oat grass, yucca (to simulate aloe), aloe (seasonal), black locust trees *(Robinia pseudoacia)* at base to simulate acacia.

Viewing: From the Safari Lodge through viewing glass, from a distance through fine steel mesh (type 6 viewing). Provide lighting for night viewing.

Barriers: Fine stainless steel woven mesh will contain the leopard and hyrax — both of which would be very difficult to contain using open moated barriers.

Animal Service Area: Will be developed within the renovated bear holding area.

Utilities: New utilities will be required.

Behavioral Enrichment: Multiple heated rock surfaces; crevices for shade; hidden dispensers for crickets, fruit and nut treats; overhanging browse.

Exhibit 1f: Meerkat Exhibit

Animal Species: Meerkat, bat-eared fox, crested porcupine, dik-dik.

Exhibit Location: On the south side of the savanna path between the present giraffe access path and patas monkey exhibit.

Enclosure Area: 500 square feet.

Soil: Very fast draining, yet with enough clay content for tunneling.

Water: Hidden drinking water supply.

Vegetation: Short grasses, thorn shrub for shade.

Viewing: Over dry moat.

Barriers: Over hanging wall 4' high resembling artificial clay bank, must be unclimbable. Buried mesh 12"-18" under soil surface.

Animal Service Area: Small heated holding structure hidden under artificial kopje rocks.

Utilities: New utilities will be required.

Behavioral Enrichment: Artificial termite towers 3'-6' high as lookout and basking points with cricket dispensers; hollowed out “aardvark holes” for shelter.

Exhibit 1g: New Hippopotamus River Exhibit

Animal Species: Hippopotamus, Egyptian goose, white-faced whistling duck, Cape teal.

Natural Habitat Zone: African Savanna

Setting: River meander and gallery forest

Exhibit Location: In the location of the present giraffe barn

Enclosure Area: 20,000 square feet

Terrain: Steep overhanging cut banks surround a sandbar at the base of a kopje formation. Farther downstream the river falls through gaps in dark granite outcrops before meandering past a pride of lions (present lion exhibit). Medium-sized boulders and small cobbles line the river bottom.

Soil: Sand and gravel bar

Water: The 300'-long river meander is at low flow, 3'-4' deep, but reaches 10' in a large, deep pool. The total volume of about 175,000 gal. is tempered, filtered and re-circulated.

Vegetation: Coarse grasses and reeds overhang the riverbanks, acacia-like (black locust) trees crowd kopje crevices and line the savanna path. Several large logs, their branches caught along the bank, bob in the water.

Viewing: From the south, visitors may see the hippos from across the river meander, perhaps glimpsing the lions beyond. But the most exciting sight is of the hippos seen from the underwater windows, which form an angle allowing the hippos to surround the visitors on two sides. Supervised behind-the-scenes viewing into the hippo barn could be provided.

Barriers: The 4'-6' cut banks are the principal barriers (total minimum height of 6' when pools are drained).

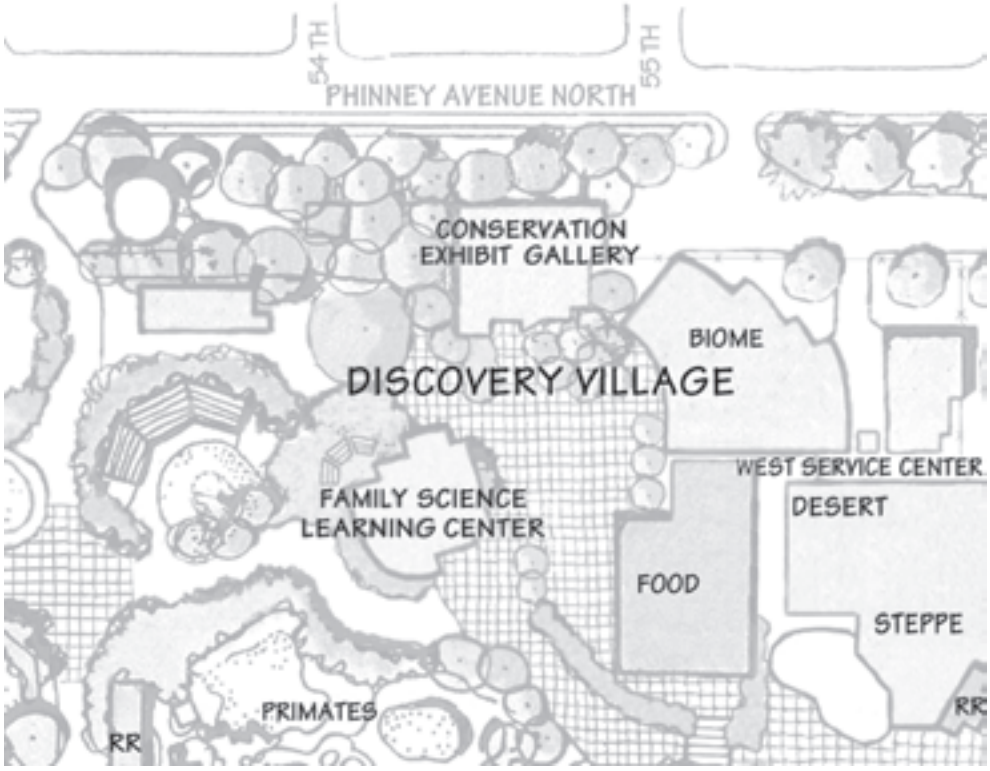
Animal Service Area: The 3,000-square-foot holding building hidden behind the simulated kopje boulders will contain five 20'x 20' hippo stalls, two with indoor pools. Large skylights will be mounted above each stall. A common restraint cage is located along the principal chute leading into the off-exhibit yard. A 400-square-foot staff area contains short-term storage for fruit, vegetables and hay. There will be a 1,500-square-foot filtration and mechanical equipment space sharing a loading dock with the filtration plant in a service yard enclosed by a culturally evocative, boma fence. The off-exhibit hippo yard will be approximately 1,000 square feet in area.

Utilities: Major utilities are required for frequent back washing of filters and occasional pool dilling. Recirculation, special effect pumps and water heaters will require a significant power supply.

Behavioral Enrichment: Floating tethered logs, some with browse attached, underwater jets which can be activated by the hippos; a waterfall that distributes floating treats such as fruit and lettuce; tempered indoor hippo-activated showers. Hippos may be excellent candidates for behavioral training and demonstrations.

Justification: The present hippo exhibit is difficult to service. There are no indoor pools for off-exhibit use and the water is cold. The hippos have tolerated these conditions but these facilities do not meet the high standards expected at Woodland Park Zoo. The proposed underwater viewing carries a significant cost for construction and operation because of the challenging filtration requirements. However, public response to these underwater giants is exceptional and their aquatic behavior can be truly appreciated in no other way.

EXHIBIT 2: DISCOVERY VILLAGE



Summary: Discovery Village will be an education and conservation facility at the zoo located near the site of the existing West Gate. The Village will function as a cluster of interconnected facilities and landscapes that provide a dynamic environment for interactive life-long learning. The Village will be oriented toward the interior of the zoo and intended to become a central hub for visitors of all ages to learn about the zoo and its exhibits as well as the zoo's wildlife and conservation programs. As an all-weather facility, Discovery Village would provide a resource for visitors in the off-season and on days when the weather is marginal. It represents a significant step in implementing the zoo's 1997 Education Strategic Plan and achieving the plan's primary purpose: "to inspire an understanding of nature and a commitment to conservation."

Discovery Village will provide a close-up view of the zoo's role in providing high quality animal care and its participation in conservation programs around the world. State-of-the-art technology will provide opportunities for visitors of all ages and education levels to enjoy hands-on learning about animals, habitat, nature and conservation.

The Village will be designed to more effectively serve the needs of the zoo's increasingly diverse and multi-generational audience. It will offer safe activities to engage toddlers in exploration and experimentation, and project areas where children can participate in activity-oriented workshops, storytelling, nature-based arts and creative activities. Parents will find comfortable areas where they can relax while watching their children explore and discover through participatory and self-directed activities. In addition, Discovery Village will provide dedicated space for the zoo's growing teen programs, where teens can take part in real science and conservation, participate in mentor programs with younger zoo visitors, and use technology to connect to peers as well as conservation and education programs at the zoo and around the world.

The Village will also feature a conservation exhibit gallery with rotating exhibits that allow for an all-weather experience and showcasing of the zoo's message of environmental stewardship.

While certain exhibits and presentations will change through time, the Village should always be a place where caring attitudes about life can be freely expressed and nurtured. Discovery Village will serve as the

philosophical heart of the zoo—a place where visitors come to understand the diverse connections among animals, ecosystems and people. Discovery Village should demonstrate the zoo's relevance in today's world and its unique role in the continuum of wildlife conservation. Tangible examples of respect, care, and hope for the future should provide an uplifting context for all who visit.

Indoor and outdoor discovery areas will engage the senses, making connections throughout the zoo and to distant outreach and research sites.

To meet the zoo's broader needs and the needs of zoo visitors, Discovery Village should:

1. Offer a venue for changing experiences and exhibits to attract new and repeat visitors.
2. Add exhibits and other learning environments to enlarge the zoo's indoor, winter core so that visitors have access to a fuller zoo experience during inclement weather.
3. Provide opportunities for contact or close association with animals, particularly in ways that will engage young children.
4. Provide an amphitheater, featuring demonstrations of the natural behavior of birds and other animals. The flexible nature of the amphitheater should also allow for other programs and more intimate demonstrations of the behavior of small animals.
5. Encourage personal interaction between zoo staff and visitors, as well as among zoo visitors themselves.
6. Provide opportunities for the exhibition of small animals that are difficult to display elsewhere at the zoo.
7. Help visitors understand how and why most of the zoo is organized ecologically, according to different biomes rather than taxonomic divisions.

Animal Species: Varied

Natural Habitat Zone: Pacific Northwest temperate forest/urban mix.

Setting: Located at the present West Gate and Activity Resource Center (ARC), extending along Phinney Avenue, south to the water tank. The area includes the site of the old Primate House, which was removed in 2003.

Terrain: Sloping at 3%-4% toward the east. Located on the western brow of Phinney Ridge.

Buildings: All buildings will be one or two stories, and be within the height limit for single family zoning. Some of the buildings may have below grade basements.

Family Science Learning Center is envisioned as a highly active and flexible space intended to provide "windows to the zoo" and "windows to the world." Here, visitors will gain a view/insight into behind-the-scenes activities and conservation projects at the zoo and in different biomes around the world. Located on the site of the old Primate House, in a one-story building, with a footprint of approximately 8,500 square feet.

Conservation Exhibit Gallery with rotating exhibits will allow for an all-weather experience, prototyping and showcasing the zoo's message of environmental stewardship. Located west of the Family Science Learning Center, in a tall one-story building, with a footprint of approximately 9,700 square feet.

Biome: Biome Central is conceived as an indoor orientation plaza from which visitors will enter one of two exhibition galleries representing different biomes; the Biome Exhibits will include small animals that typically require indoor facilities with precise climate control; animal support facilities; conservation/education workspace; and visitor restrooms. Located on the site of the ARC, in a two-story building, with a footprint of approximately 15,000 square feet.

Other smaller structures include an amphitheater stage and animal holding.

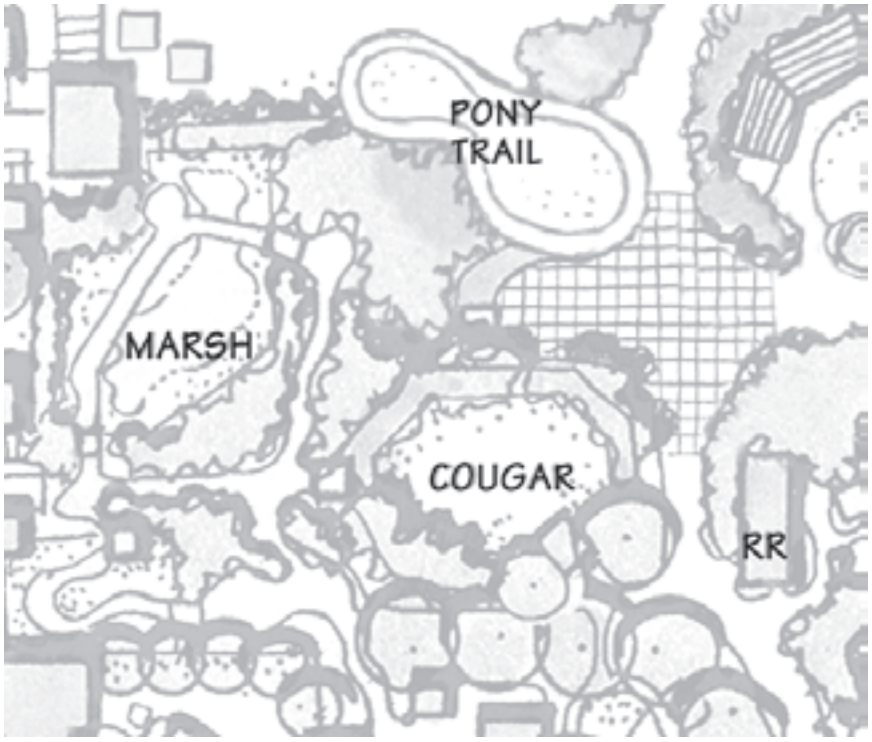
Soil: Existing urban mix in the top layer, 6" to 18" deep, provides excellent soil for planting areas. Below the top layer is a 10' to 15' layer of glacial till.

Vegetation: Large beech and London plane trees, and a black cherry that is a state champion tree of the species.

Barriers: Barrier-free accessibility. Safety barriers as required for safety and well being.

Animal Service Areas: Support areas for exhibits and program animals.

EXHIBIT 3: TEMPERATE FOREST COUGAR EXHIBIT



Summary: The exhibit will be found near the Habitat Discovery Loop in the forest zone of the Family Farm, adding real excitement to this otherwise make-believe environment. The trailside cougar encounter is found along a different trail, giving the impression that the cougars could be anywhere. This new trail connects the Family Farm with the Marsh exhibit.

Animal Species: Cougar

Exhibit Location: "Keeper Central" and Exhibits area (previously the Animal Health Facility)

Enclosure Area: "Cabin" habitat area, 7,000 square feet; trailside encounter habitat, 2,000 square feet

Terrain: East-sloping hillside

Soil: Well-drained soil mix, gravel beds in stream

Water: Tumbling brook, choked with dead trees from spring runoff

Vegetation: Primarily evergreen landscape featuring western red cedar, western hemlock, paperbirch, wild rose, salal and fern

Viewing: Through glass from a simulated log cabin (type 6 viewing). Viewing through dense vegetation and mesh along trailside encounter (type 3 viewing)

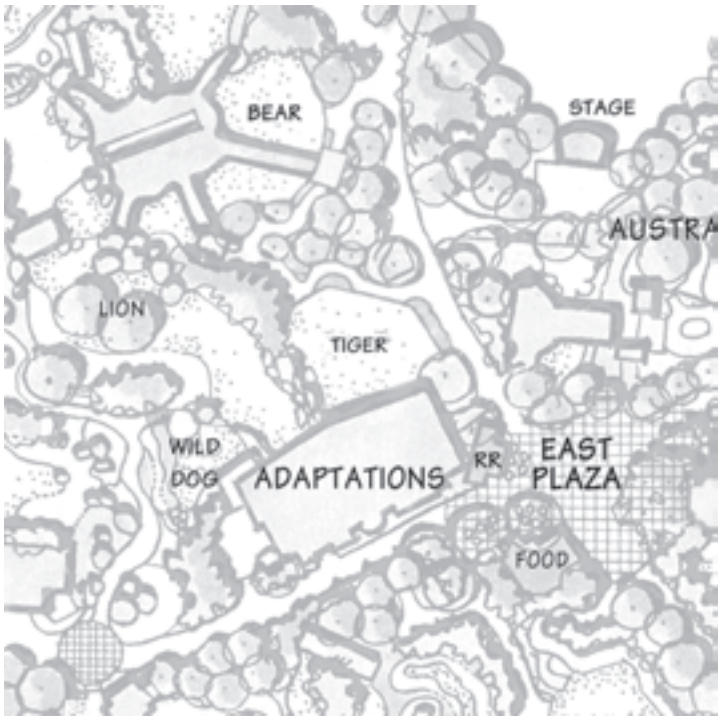
Barriers: Woven, darkened, stainless steel mesh enclosure, and second enclosure similar but linear, parallel to trail

Animal Service Area: Sufficient for three cougars plus shift area; indoor dens with covered outdoor kennels

Utilities: New utilities required including stream filtration and re-circulation system

Behavioral Enrichment: Live fish dispenser in shallow stream, interactive scratching log or snag, sand bed, other built-in enrichment

EXHIBIT 4: ASIAN BEARS AND TIGERS



Natural Habitat: Asian tropical forest

Setting: Tropical Asian forest

Enclosures: The existing sun and sloth bear exhibits will serve as the foundation for the creation of enlarged naturalistic enclosures appropriate for highlighting the natural behaviors of these species. The existing tiger and cougar exhibits will be redeveloped to create two highly naturalistic enclosures, allowing the tigers access to a variety of elevations, microclimates and viewpoints.

Exhibit Locations: The existing exhibits associated with the old "Bear Grotto" and current Adaptations Building (former Feline House) and the approximately 25,000-square-foot area between the two facilities. Bounded to the south by the Savanna lion exhibit and to the north by the primary path connecting the East and West Plazas.

Exhibit 4a: Tiger Exhibit

Natural Habitat: Asian tropical forest

Animal Species: Sumatran tiger

Exhibit Location: Present tiger exhibit extending west toward bear grottos.

Enclosure Area: Two exhibit areas with a combined 9,000 square feet. Individual exhibit sizes do not need to be equal.

Terrain: Varied

Soil: Well-drained soil mixture

Water: Stream with rapids and small pools. Water system filtered and re-circulated. Fog system for special effect.

Vegetation: Artificial trees, some quite large, are themselves planters for living plants including fig simulators such as magnolia, hardy rubber tree and commercial fruiting fig. Many other tropical forest simulator species similar to those used in the Elephant Forest exhibit will be appropriate. Vines and tall growing bamboo species will also be used.

Viewing: Through mesh and glass integrated with artificial trees. The emphasis will be upon many unexpected and surprise views through dense vegetation.

Barriers: Darkened, woven stainless steel mesh overhead as well as for side barriers in combination with artificial rockwork.

Behavioral Enrichment: Multi-level routes, simulated deer carcass for tying treats, bones, or rawhide, perhaps suspended from springy artificial vines allowing tiger to tug and pull at them. Shallow pools for bathing. Selected sheltered areas with supplemental heat sources.

Exhibit 4b: Sun Bear Exhibit

Natural Habitat: Asian tropical forest with emphasis on the naturalistic arboreal structures to stimulate and accommodate natural locomotion and building of arboreal "nests" for resting and feeding.

Animal Species: Sun bear

Exhibit Location: Present sloth bear exhibit and area to the east.

Enclosure Area: 4,500 square feet

Terrain: Gently undulating contours interspersed with rock outcrops.

Soil: Well-drained soil mixture

Water: Small shallow pool on rocky substrate to prevent contamination by the digging of the bears.

Vegetation: Expand on current use of tropical forest simulator species interspersed with leaf litter and fallen branches to provide an appropriate forest floor appearance.

Viewing: Close-up views through glass, in association with an interpretive shelter, and selected views from jungle pathway viewpoints.

Barriers: Glass and geologically themed vertical walls.

Behavioral Enrichment: Multi-level, horizontal arboreal pathways associated with a stratified forest. A variety of open elevated and sheltered feeding and resting stations with safe keeper access. Selected areas of supplemental heat sources, both arboreal and terrestrial.

Exhibit 4c: Medium-sized Mammal Exhibit

Natural Habitat: Asian tropical forest allowing for some arboreal activity with the additional emphasis on a portion of the exhibit containing a raised hillside and rocky outcrops.

Animal Species: Mammals such as sloth bear, primate species or other medium-sized mammal species.

Exhibit Location: Present sun bear exhibit and area to the north and east.

Enclosure Area: 5,500 square feet

Terrain: Varied and complex with rocky hillside and numerous rocky outcrops flowing into lower tropical forest.

Soil: Well-drained soil mixture

Water: Small, fast moving stream with sufficient elevation change to create small waterfalls and small pools flowing to a shallow forest floor pond. Water will be filtered and re-circulated.

Vegetation: Expand on current use of tropical forest simulator species planted in barrier-protected clusters to form multi-trunked thickets.

Viewing: Close-up views through glass, in association with an interpretive shelter, and selected views from jungle pathway viewpoints.

Barriers: Glass and geologically themed vertical walls, possibly mesh covered.

Behavioral Enrichment: Numerous substrate depressions and log/brush piles to encourage natural foraging, climbing sturctures, artificial log/tree stump with treat dispenser. Selected sheltered areas with supplemental heat sources.

EXHIBIT 5: ADAPTATIONS

Exhibit Summary: The present Adaptations Building (former Feline House) will be expanded to provide high-quality habitats for animals, as well as expanded holding.

Animal Species: To be determined, but examples could include small Asian forest birds, fruit bats, reptiles and small carnivores.

Natural Habitat Zone: Asian tropical forest

Area: Approximately 12,000 square feet, an increase of about 33% over present space

Viewing: Indoor immersion exhibits designed to encourage visitors to look carefully in all directions and find animals in unexpected places.

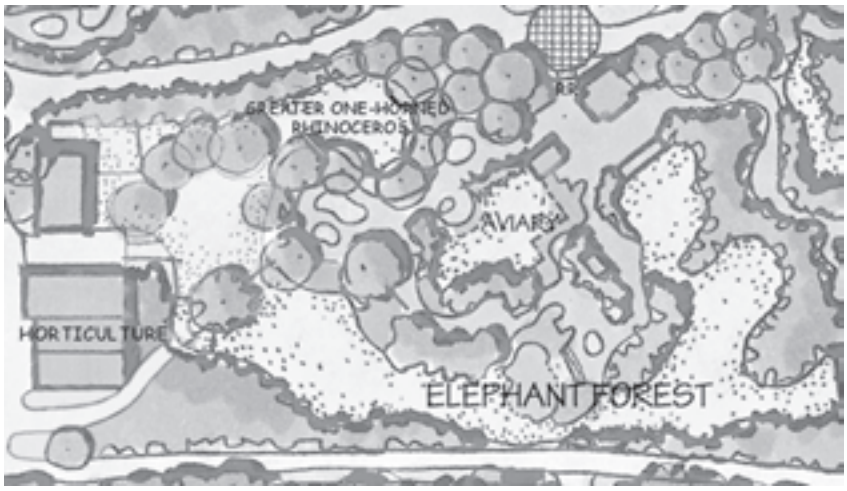
Barriers: Glass, fine mesh, simulated geology and buttress trees, artificial bamboo

Animal Service Area: In addition to normal holding and support areas there will be extra capacity for genetically valuable animals. Hidden outdoor exercise areas will be developed on the building roof for off-exhibit animals.

Behavioral Enrichment: Highly varied, depending upon the needs of the various species. Behavioral enrichment is especially important for the off-exhibit animals.

Utilities: The building will require a new utility and fire safety system.

EXHIBIT 6: GREATER ONE-HORNED RHINOCEROS



Summary: While this animal was part of the 1976 Long-Range Plan, there are no rhinos in the collection today. Development of this exhibit will enhance the visitor's experience of the Asian Tropical Forest Zone, help support conservation efforts and provide support for the captive management program of this unique endangered species.

Animal Species: Greater one-horned rhinoceros

Natural Habitat Zone: Asian lowland tropical forest

Setting: Terraced flood plain environment, with eroded sandstone, some trees, thickets of elephant grass simulators with pathways and pool(s).

Exhibit Location: West and southwest edges of existing elephant yard.

Enclosure Area: Approximately 30,000 square feet comprised of exhibit and management yards, support facilities and possibly a rotationally shared yard with elephants.

Terrain: Generally flat with softly terraced contours and pool(s).

Soil: Fast draining sandy soil mix

Water: Tempered and filtered water source for pool(s) and fresh water drinking source.

Vegetation: Continuation of existing plantings simulating an Asian tropical forest as well as elephant grass simulators.

Viewing: A close encounter with a rhino will be provided at a cultural or naturalistic interpretive area and views from selected points along the forest pathway.

Barriers: Combination of horizontal cable system similar to elephant yard, vertical pipe or posts and geologically themed shotcrete banks.

Animal Service Area: Approximately 4,000 square-foot structure containing four management stalls, restraint area, staff service and mechanical spaces.

Behavioral Enrichment: Browse branch hangers, tempered water pool(s), items such as deadfall, logs, trees and/or natural plantings; brush, rock or earth piles to create interest, encourage activity and provide rubbing areas to meet the skin care needs of the rhinos.

EXHIBIT 7: ASIAN HORNBILL AND ANOA EXHIBIT

Summary: The present Asian marsh waterfowl exhibit is under-utilized. Hornbills are large, active birds, major seed dispersers and important to many indigenous cultures.

Animal Species: Dramatic species such as rhinoceros hornbill and lowland anoa

Natural Habitat Zone: Asian lowland tropical forest

Setting: Near an elephant logging camp

Exhibit Location: Existing Asian marsh exhibit

Enclosure Area: 6,400 square feet

Terrain: Existing stream banks and complex topography

Soil: Existing

Water: Existing re-circulating stream system

Vegetation: Existing well-established forest plantings

Viewing: From existing pathways and overlooks

Barriers: Darkened stainless steel mesh aviary, cable supported from artificial tree masts

Animal Service Area: Renovation and extension of existing facilities

Utilities: Utilize existing utilities

Behavioral Enrichment: Fruit feeders disguised as durian fruit or as fruiting vines which can be raised and lowered for servicing; small tempered water wallow near a viewing area for anoas, browse hangers; enrichment features in both indoor and outdoor holding areas, hollow artificial tree for hornbill nesting.

EXHIBIT 8: ELEPHANT FOREST

Summary: Other than modification related to the Greater One-horned Rhinoceros exhibit, this popular exhibit will be largely unchanged except for the following areas:

Exhibit 8a: New Public Entry

A more central entry will be opened from the primary path opposite the African Savanna path and hippo exhibit passing between the present restroom building and Elephant Forest Pavilion.

Exhibit 8b: Elephant Conservation Center

A bull elephant barn and exercise yard will be built in the present open area north of the existing Elephant Barn.

EXHIBIT 9: ASIAN HIGHLANDS

Summary: Occupying 4.6 acres, this will be the largest exhibit complex to be developed in the area. It is the companion exhibit to the highly successful Northern Trail and will complete that exciting exhibit loop path.

Animal Species: Such as Asian cranes, waterfowl and pheasants, red panda, Asian bear, takin, blue sheep, goral, brown snub-nosed monkey, snow leopard, Pallas's cat

Natural Habitat Zone: Asian highlands (taiga, tundra and montane life zones)

Setting: Yunnan province of China and adjacent Himalayan highlands

Exhibit Location: Present Raptor Barn, elk exhibit and hoofstock yards for takin and anoa

Exhibit 9a: East Plaza Crane Exhibits

Summary: The Banyan Tree Grove divides the northeastern area of the East Plaza and creates a quiet, more contemplative area with a simple pavilion looking northeastward across upland fens toward rocky outcrops, the tops of cliffs lining the unseen valley beyond. Stately cranes, bright pheasants and waterfowl are visible from the pavilion in the fens or in the thickets that line the marsh pools.

Animal Species: Asian crane, waterfowl and pheasant

Exhibit Location: Present Raptor Barn

Terrain: Flat plaza area, plateau wetland

Soil: Well-drained soil mix

Water: Meandering reed fens flow into a larger marsh, the source of a fast-flowing stream surging into the valley below. All water will be filtered and re-circulated.

Vegetation: Reeds, rushes, sedges and rough grasses, thickets of Asian rhododendron, species viburnum, holly and juniper.

Viewing: Across the marsh from the viewing pavilion; from the path across the stream

Barriers: Very fine mesh fencing hidden partly submerged among the reeds

Animal Service Area: Off-exhibit yards and shelters combined with takin-bear holding complex

Exhibit 9b: Takin and Goral Exhibit

Animal Species: Takin, goral

Natural Habitat Zone: Exposed ledges and boulder slopes, sub-alpine forests

Exhibit Location: Present anoa yards

Enclosure Area: 20,000 square feet

Terrains: North-facing talus slopes and high meadows, with cliffs and rocks for both basking and shade

Soil: Very well drained with crushed rock to minimize trampling and assist hoof abrasion

Water: Several small mountain rills will cascade among the boulders to join the main stream, which rushes and splashes down its steep boulder-choked course (all streams are filtered and re-circulated).

Vegetation: Open alpine meadows with dwarfed conifers on upper slopes, spreading maple, oak and pine along the lower valley bottom, tall bamboo thickets in the lowest areas

Viewing: From the trail across the stream and from the suspension bridge, which crosses it

Barriers: Overhanging cliffs and boulders along the stream, fencing hidden under the bridge or in dense evergreen vegetation

Animal Service Areas: The barn will be a 2,200-square-foot heated shelter containing six 200-square-foot pens along with staff work and tool storage areas combined with the asian bear holding building. Two outdoor off-exhibit yards will be provided with 1,000 square feet each.

Behavioral Enrichment: Browse hangers, scented dead trees for scratching; cleanable hidden grain-feeding areas.

Exhibit 9c: Red Panda

Animal Species: Red panda, muntjac

Exhibit Location: Existing large spreading bigleaf maple tree *(Acer macrophyllum)*

Enclosure Area: 1,500 square feet

Soil and Terrain: Existing hillside under tree

Water: Hidden drinking water source

Vegetation: Existing big leaf maple tree

Viewing: From elevated platform anchoring

Barriers: Hidden mesh under elevated walkway, overhanging smooth bank (similar arrangement to that used in Northern Trail porcupine exhibit)

Animal Service Area: Small hidden shelters with small off-exhibit runs

Behavioral Enrichment: Browse hanging areas, artificial vines with fruit-like treat dispensers that can be lowered for servicing

Exhibit 9d: Monkey, such as Brown Snub-nosed

Exhibit Location: Existing grove of maple and red cedar

Enclosure Area: 2,000 square feet, 40’ high

Soil and Terrain: Existing slope

Water: Hidden drinking water provided

Vegetation: Existing maple and western red cedar, new artificial trees with flexible limbs and vines

Viewing: From elevated boardwalk at entry to asian bear exhibit

Barriers: Darken stainless steel mesh enclosure over existing trees

Animal Service Area: 600-square-foot heated holding building under overlook deck with service access from asian bear holding area

Behavioral Enrichment: Artificial vines and fruit treat dispensers that can be lowered for service

Exhibit 9e: Asian Bear

Exhibit Location: Present Asian goat (goral and takin) yard

Animal Species: Ursid species such as giant panda or Himalayan black bear.

Enclosure Area: Outdoor display areas of about 3,000 and 5,000 square feet and one off-exhibit yard of 7,000 square feet

Terrain: Talus slopes below cliffs and a boulder-strewn hillock.

Soil: Very fast draining soil mix

Water: Mountain freshets and small cascades with pools. All water systems filtered and recirculated.

Vegetation: Tall bamboo thickets, small open meadows, Asian species of pine, birch, maple and spruce, viburnum and (outside animal areas) rhododendron and holly.

Cultural Resonance: The elevated trail crosses and recrosses the stream valley on simple-looking suspension bridges (engineered for safety in spite of their fragile appearance). A replica of an ancient hermitage for monks is built into the grottos beneath the cliffs. Long abandoned by the monk, the structure provides shelter for viewers looking into adjacent exhibits. In actuality, views will be through glass framed in rough timbers. Glass-enclosed exhibit habitats may be used by the bears when they cannot be in their outdoor display areas.

Viewing: Looking up slope from the elevated boardwalk, indoor one-way glass viewing into natural-appearing habitats beneath sheltering cliffs.

Special Crowd Needs: Queuing can occur along wide elevated walkways, giving waiting visitors excellent views of surrounding exhibits. Fabric covers could be provided for rain protection. Special access could be provided for behind-the-scenes tours.

Barriers: Overhanging cliffs, mesh barriers under elevated walkway

Animal Service Area: The 1,600-square-foot building contains two on-exhibit 400-square-foot holding rooms and a shift-restraint area. There is also a well-isolated maternity den. Staff area includes: food preparation and storage, cold storage for fresh bamboo, other browse and produce; video monitoring area and treatment room. Service access is from the existing service road south of the present raptor area.

Exhibit 9f: Snow Leopard

Exhibit Location: East end of present wapiti yard

Enclosure Area: Two exhibits of about 3,000 square feet each

Terrain: The visitor path will be cut transversely through the sloping upland of the wapiti yard. This lowering of path grades will compel visitors to look up at the snow leopards to the east and towards the pheasant and deer exhibits on the west side of the trail. It will also help to cut off the traffic noise from Aurora Avenue to the east.

Soil: Fast-draining sand and gravel mixture

Water: Wet seeps across rock faces

Vegetation: Stunted juniper and spruce, tussock grass, wildflowers growing in the protection of boulders. Rhododendrons along the trail, with Asian species of birch, pine and maple.

Viewing: Through fine darkened mesh from under wind-toppled logs and from a mountain shepherd's simple stone cabin through one-way glass. A sod covered roof overhang will provide shelter for the satellite interpretive center for this zone.

Barrier: Darkened stainless steel mesh

Animal Service Area: Two 150-square-foot night rooms with view windows and a shift area with restraint will be located below the viewing cabin with a vertical connection to the exhibits. A service road will be extended from the present road below the bald eagle enclosure of Northern Trail.

Exhibit 9g: Pheasants

Animal Species: Asian pheasant and other appropriate bird species

Exhibit Location: West of the proposed snow leopard exhibits

Enclosure Size: Five enclosures of 400 square feet each

Terrain: Sloping upward

Soil: Well drained

Water: Hidden drinking water sources

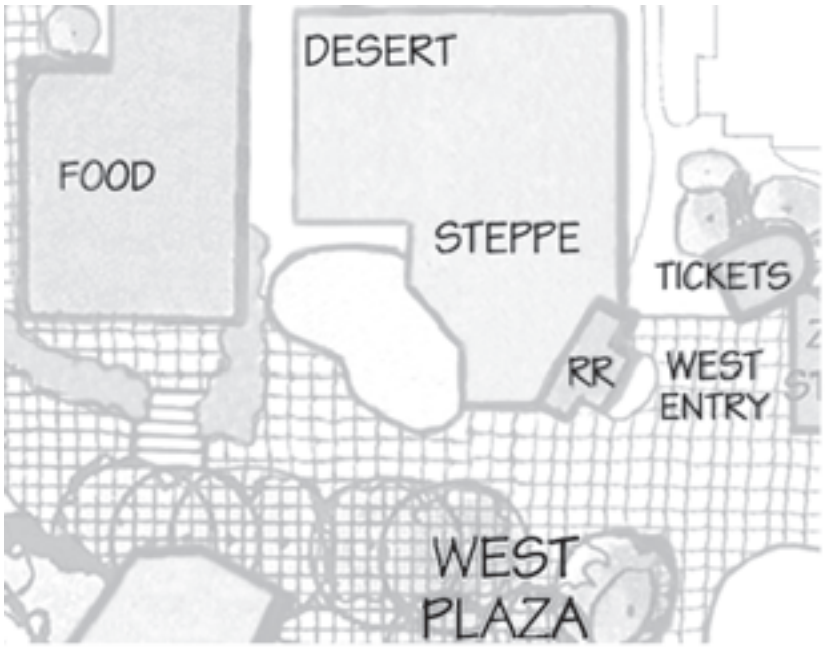
Vegetation: Asian sub-alpine species of rhododendron, rose, viburnum, pine, spruce, birch and maple are typical examples

Viewing: From the interpretive shelter

Barriers: Fine wire mesh

Animal Service Area: Small, sheltered off-exhibit pens. Five 200-square-foot pens with heated shelters.

EXHIBIT 10: DESERT EXHIBIT



Summary: Deserts are globally important biomes with animals showing highly varied adaptations to life in conditions of extreme aridity, very different from conditions in the Pacific Northwest coastal zone. From an educational point of view, desert life is important. Unfortunately, from an attraction point of view, desert animals suitable for indoor display and management tend to be small, unfamiliar and often inactive. Butterflies, hummingbirds and bats may be limited exceptions. In order to represent selected examples of desert life without creating over-ambitious exhibits whose construction and maintenance out-pace their ability to attract and hold the attention of visitors, a moderate-sized facility focusing on the Sonoran Desert of the American Southwest is recommended. Penguins that nest along coastal desert cliffs of southern latitudes will be included for both their amazing adaptations and their popular drawing power. Other desert animals and their habitats from around the world can be evoked through live displays or photographs, artwork and other interpretive media.

Overall Building Size: Ground floor 12,000 square feet, upper level 4,000 square feet.

Exhibit Location: Present area of penguin pool and wooded hillside. Note: Asian pine trees in this area should be salvaged for use in Asian Highlands exhibit.

Exhibit 10a: Humboldt Penguin

Enclosure Area: 2,000 square feet, 1,200 square feet outdoors, 800 square feet indoors

Terrain: Dark, water washed granite or sandstone sea cliffs and boulders continuing below "sea level." Simulated tide lines and bivalve incrustations to represent a high degree of tidal fluctuation. Bleached driftwood (some partially floating, bobbing in the waves as behavioral enrichment) and pale whale or sea lion bones imply other stories. Artificial rockwork must inconspicuously create safe steps and handholds for service staff.

Water: Well-filtered, sanitized and recirculated, 8'-10' deep in places, agitated by hidden water jets and wave machines, the water will be highly active, providing penguins abundant play opportunities. The water is continuous, indoors and outdoors.

Vegetation: Simulated algae and other seaweed, salt-tolerant herbs and succulents high on cliff crevices

Mural: Mostly of open sea and distant highlands or foggy sky

Viewing: Through glass with water level about four feet above pavement level; acrylic view bubbles penetrate both into and out of the penguin pool, like an aquatic version of the popular "prairie" dog pop-up views

Barriers: Viewing glass, cliffs

Animal Service Area: Penguins can enter simulated nest burrows with removable nest boxes. Group rooms, isolation areas and pools will meet or exceed penguin Species Survival Plan facility requirements.

Behavioral Enrichment and Special Effects: Bobbing driftwood, underwater jets and bubble injectors, fish dispensers, wave machine, fog, mist and wind, shared by birds and guests in outdoor exhibit.

Exhibit 10b: Javelina, Roadrunner, Doves, Hummingbirds and Other Small Species

Enclosure Area: 1,300 square feet within a 50' diameter walk-through diorama exhibit

Soil and Terrain: Sandblasted, exfoliated granite and sandstone, talus, boulders and sand

Water: A trickling seep emphasizes the overall aridity while eroded washes suggest the power of infrequent flash floods.

Vegetation: Typical of the Sonora Desert, including saguaro, opuntia, cholla and many other cacti; agave, yucca and ocotillo, palo verde, mesquite, creosote, saltbush as well as annual and perennial herbs

Viewing: Over view rails in walk-through diorama

Barriers: Boulders, steep banks and cliffs, fine dark steel cable mesh hidden in vegetation.

Animal Service Areas: Group pen of 150 square feet, isolation pen (50 square feet) and squeeze chute

Behavioral Enrichment: Cricket dispensers, artificial buffalo gourds with treats inside

Exhibit 10c: Large and Small Dioramas and "Gem" Boxes (25-30 small to medium displays) for a diverse presentation of reptiles and arthropods of the Sonoran Desert and exhibits for comparisons of similar animals from deserts around the world.

Total Area: 1,200 square feet.

Exhibit 10d: Discovery/Interpretive Area using a variety of state-of-the-art tools to learn more about deserts of the world, their unique characteristics, importance, conservation issues and solutions

Exhibit 10e: Mini Theater, where these decidedly "big sky" settings can be enjoyed using advanced audiovisual projection technology

Interior Circulation: 3,500 square feet

Interior Service Areas: Food preparation, mechanical equipment, storage, etc., 2,000 square feet

Curatorial Space and Reptile Conservation Area: 2,000 square feet on upper level with UV transmitting skylights as needed

Desert Plant Greenhouse: also on roof, 1,500 square feet, serviced by freight elevator from rear loading dock

Outdoor Horticultural Displays: Typical chaparral plantings such as manzanita, ceonothus, summac and typical annuals and perennials

EXHIBIT 11: STEPPE EXHIBIT

Summary: Found in the centers of the great continents, where extremes of climate do not permit the survival of forests, these temperate grasslands are characterized by vast open spaces of similar vegetative types. Associated with the primarily perennial grasses are many broad-leaved perennials. The prairies of North America, pampas of Argentina and the Eurasian steppes are the most evident examples of this major bioclimatic zone. Herds of medium to large herbivores, colonial and other ground dwelling rodents and carnivores such as wolves, coyotes and foxes primarily represent mammal species. There are usually few resident bird species; common are bustards, cranes, birds of prey, various grouse species, rhea and smaller partridge-like birds. Many of the birds of the steppes are nomadic or migratory and the North American prairies represent an important feeding and breeding ground for numerous species of waterfowl.

Exhibit Location: In association with the Desert Exhibit.

Exhibit 11a: Interpretive Center

In order to represent the vast expanses of a steppe region in a moderate sized facility, an interpretive center similar to the Tundra Center, focusing on one or more of these unique zones, such as the Mongolian steppe and North American prairies, is recommended (approximately 2,500 square feet).

Exhibit 11a: Small Mammal Exhibit

Animal Species: Small mammal, such as black-tailed prairie dog, white-tailed jackrabbit.

Enclosure Area: 4,000 square feet outdoors.

Terrain: Mounded grassland prairie.

Vegetation: Native short-grass-prairie species along with forbs such as lupines and composites of various genera. Bordered and backed by shrubs such as chokecherry and wolf willow along with aspen.

Viewing: From pathway with viewing rail.

Barriers: Exhibit will need a continuous “bowl” of a metal mesh material to allow for containment and adequate drainage. A 36”-non-climbable textured wall or other material will be necessary. Additional barrier height would be needed for jackrabbits.

EXHIBIT 12: AUSTRALASIA EXHIBIT

Summary: This area represents a theoretical transect from Southeast Asia through New Guinea to Central Australia. In this configuration, the public Garden Path could represent Wallace’s Line, the bio-geographic division between the fauna of the Asia and Australian realms. The Australasia exhibit may be built in two phases: Australasian Forest and Australian Outback.

Exhibit 12a: Lorikeet Walk-through Aviary

Exhibit Location: Present snow leopard exhibit (snow leopards relocated to Asian Highlands)

Enclosure Area: Area of present snow leopard mesh enclosure structure, approximately 6,500 square feet

Soil and Terrain: Existing

Water: Small cascade, stream and pools for birds to drink and bathe

Vegetation: Tropical forest simulation species. Note: Since lorikeets are very destructive of vegetation, larger feature plants should be planted in their containers and rotated periodically. Non-toxic vines, dead branches and trees should be provided for perching and environmental enrichment.

Viewing: From pathway within aviary and through aviary mesh from approach path

Barrier: Fine steel cable mesh

Visitor Involvement: Nectar cups can be purchased by visitors to allow these brightly colored nectar feeders to perch on visitors and drink. This will result in the closest and most memorable encounter many people will ever have of free-flying birds. A hand-washing station must be provided for visitors at the exit.

Animal Service Area: The 600-square-foot holding building forms one side of the enclosure. Large windows with drop covers allow birds free flight in and out of this retreat area and shelter. A 400-square-foot flock room and four isolation pens will be provided along with food preparation storage and mechanical equipment areas.

Behavioral Enrichment: Browse branches for chewing.

Exhibit 12b: Tree Kangaroo Canopy Exhibit

Enclosure Area: Two 1,500-square-foot indoor areas.

Vegetation: Superstructure of artificial trees and vines, canopy of living trees just out of reach of these folivorous marsupials.

Viewing: From slightly elevated boardwalk below the tree kangaroos

Barrier: Indoor area will have enclosures, walls and ceiling, primarily of UV transmitting glass

Animal Service Area: Group and isolation areas, food preparation, related service and mechanical areas will be provided

Exhibit 12c: Cassowary Exhibit

Enclosure Area: 3,000 square feet

Vegetation: Tropical rain forest simulation

Viewing: From path

Barriers: Fine woven-steel cable mesh hidden in vegetation

Animal Service Area: 200-square-foot heated shelter

Behavioral Enrichment: Cricket dispensers

Exhibit 12d: Komodo Monitor (Dragon)

Enclosure Area: 2,000 square feet

Terrain and Soil: Dry sandy streambed, large boulders and hillside beyond

Water: A dripping seep forming a shallow pool beside large smooth basalt boulders

Vegetation: Open gallery forest along stream, grey-green tussock grasses such as *Festuca* and *Elymus* and scattered palms (hardy Mediterranean species) on adjacent hillside

Viewing: Through glass from palm-thatched viewing blind, more distant view from trail

Barriers: Overhanging bank, glass and smooth wall hidden behind planted berm. (Young monitors are excellent climbers).

Animal Shelters: Several sheltered areas will be provided under fallen logs, streambank overhangs and boulders. These will be heated with high UV heating elements and radiant heat elements under the sand.

Behavioral Enrichment: Cricket dispensers will be provided for younger monitors. Artificial carcasses of deer and wild pig may be provided that would release food items when the animals shake the carcass.

Animal Service Area: Four, 150-square-foot holding dens with UV transmitting windows and skylights and radiant heating in some floor areas. Provide chutes for catch and treatment crates.

Exhibit 12e: Australian Outback

Summary: A rustic outback station (ranch house) houses a 3,000-square-foot interpretive center with mini-theater, interactive area, and displays of unique smaller Australian reptiles and arthropods. This area will also cover the subject of endemism and the management of small, isolated animal populations.

Exhibit 12f: Wallaby Walkabout

Animal Species: Wallaby, grey kangaroo, emu, magpie geese

Enclosure Area: 10,000 square feet

Soil and Terrain: Red sandy slopes and dune sides

Water: Shallow crescent shaped billabong (seasonal waterhole)

Vegetation: While hardy eucalyptus species will be used, the majority of plantings will be silver-leafed simulators of arid zone plants such as *Elaeagnus*, *Shepherdia* and *Artemisia*.

Viewing: Over a low rail barrier of slender eucalyptus poles and rails. Since this is a "walk-through" exhibit, the barrier is to enclose the visitors, not the animals.

Barriers: Fine woven-steel cable mesh hidden in plantings

Animal Service Area:: 2,000-square-foot off-exhibit holding area

Behavioral Enrichment: Wallabies seem to like to rest under shrub thickets. Some of these thickets should be near viewing areas. Browse can also be used to attract animals near viewing areas.

EXHIBIT 13: DAY AND NIGHT EXHIBITS

Summary: The present Day and Night structures will be rebuilt so that the new public level would be at about the same level as the West Plaza and the present penguin exhibit. The bottom floor level will serve as a basement service area providing much more space for both service and off-exhibit holding for small species. New service access will be from the northeast corner of the new building. The emphasis on nocturnal/diurnal animals could be maintained as could the cosmopolitan mix of species, featuring a variety of small animals not seen in other areas of the zoo. Collection and presentation programs would be coordinated with the Desert Exhibit, Discovery Village, and Adaptations exhibits, where other small animals are displayed.

The nocturnal exhibits would be both entered and exited through moderately lit areas, allowing visitor vision to more easily adjust to the lower light levels of the nocturnal exhibits.

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