Bison Prairie:

new directions toward a more holistic approach to zoo design

by

Constantina Douvris

A practicum
submitted to the Faculty of Graduate Studies
in partial fulfillment of the requirements
for the degree of

Master of Landscape Architecture

Department of Landscape Architecture
University of Manitoba
Winnipeg, Manitoba.

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES

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A B S T R A C T

Zoological gardens have withstood many changes since their beginnings. Today not only do many zoological gardens struggle to maintain a certain level of quality, but they are faced with tightening budgets. In light of these issues the role of the landscape architect has become more important not only as space makers but to integrate new criteria and respond to changing philosophies of zoo design within limited resources.

The Assiniboine Park Zoo in Winnipeg, Manitoba is presently in its 93rd year of operation. For many years it has been an important source of information and entertainment for people of all ages. The onslaught of new knowledge in the last two decades has brought certain issues to the forefront such as Cultural Enhancement, Landscape Immersion, Habitat Imitation, and Behavior Enhancement.

It is time now for the Assiniboine Park Zoo to revisit their mandate and embark on a new era. This study intends to investigate some of these important issues and develop a new site design for the bison enclosure that will serve as a prototype for the redevelopment of the Assiniboine Park Zoo. The **Bison Prairie** enclosure will encompass a more holistic representation of the natural environment for this animal.

to my parents Stavroula and Demetrios Douvris

figure 1.

A C K N O W L E D G M E N T S

It is with sincere appreciation that I would like to thank my advisors Charles H. Thomsen (Professor and Head, Landscape Architecture, University of Manitoba), Doug Ross (Director, Assiniboine Park Zoo), and Dr. Mary Benbow (Professor, Department of Geography, University of Manitoba) for their support, guidance and invaluable input. In addition I would like to acknowledge the staff at the Assiniboine Park Zoo and countless others for providing me with vital insight.

Finally, I am forever indebted to my family and friends for their love, endless assistance, encouragement, and for "herding" me along.

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P A R T : I I

INTRODUCTION

As early as 2300 BC collections of animals have been an interest and priority for many groups of people. Although the objectives of these collections have changed, and with that their purpose in society, the one thing that can be said to have remained constant is their immense popularity. People's interests in zoos have ranged from a need to overpower nature and possess these animals, to feelings of responsibility for them, as well as educational and entertainment interests.

figure 2. Pony Ride

Zoos today play a large part in conservation goals by protecting natural areas and animals, and educating visitors about these goals through various display techniques. Zoos continually examine their own relevance to modern society and must respond to heightened public awareness regarding animal welfare. This strategy serves as a double-edged sword. With every advancement forward in display techniques, safety procedures, conservation efforts and the care of animals, parts of these zoos remain unimproved and archaic in contrast . Therefore there is a constant battle for zoos to move forward and keep up with the evolution of zoo design and animal care that zoos and associated professionals themselves instigated.

The Assiniboine Park Zoo in Winnipeg, Manitoba is not excluded from these challenges. The contrast between the modern enclosures and the older ones serve as a visual account of the substantial change that has occurred over the years. This study intends to continue in this direction of change toward a zoo that is responsive and reflective of new ideas concerning the care and display of animals.

1.1 Objectives

Inviting change to the design of zoological parks is apparent in North America and elsewhere. Many zoological parks have revamped their facilities in line with new priorities and objectives concerning animals in captivity. New knowledge and the discovery of new techniques in the areas of landscape immersion, behavior enhancement, habitat imitation and cultural enhancement approaches have been utilized to modernize many zoos. The main objective of this study is to explore these issues and design an enclosure that attempts to incorporate these concepts. The Bison enclosure will be the subject of this exploration and will serve as a prototype for the whole zoo. Following are the main design objectives for the new Bison Prairie ;

figure 3. ...blessing a kill...
figure 4. Bison Mask
figure 5. Purple coneflower
figure 6. White-tailed Deer

• **landscape immersion** is a technique that in effect causes the visitor to feel that they are really in the animals habitat along with the plants and animals, by use of hidden barriers, planting and other materials which are consistent in the animal's enclosure and the public viewing areas.

• **cultural enhancement** is the incorporation of cultural elements significant to the animals place of origin and their association with humankind.

• **habitat imitation** is when the enclosure includes elements from the animals natural habitat such as specific vegetation, and associated animals in an effort to re-create the image of the place.

• **behavior enhancement** is when the animal is supplied with the elements that support and promote natural behavior. This may also include activities and objects that are not considered natural but enrich the animals daily activity which would also defeat boredom.

The general objectives for this exploration is to design an enclosure that:

- is aesthetically pleasing.
- allows the visitor to be interactive with the exhibit in some way.
- is more informative and interesting for the visitor.
- is safe for the animals, zoo keepers and visitors.
- allows for easy care and maintenance of the animals.

1.2 The Study

Study issues at the Assiniboine Park Zoo are as complex as in any zoo, due to the zoo's unique regional needs and characteristics. The Assiniboine Park Zoo is one of the most northern zoos in North America and boasts the coldest average temperatures. Due to this there are limitations concerning which animals would best suit a northern zoo environment. Today, many zoos have adopted a regional expression, or enclosures that display animals in their local, native habitat.

1.3 Methodology

The first step of this study was to review current literature and selected case studies pertaining to the design of zoological parks, as well as the cultural/historical and behavioral aspects of Bison and associate species. In addition, interviews with the Zoo Director, Curator and Zoo Keepers were undertaken to outline the needs of the Assiniboine Park Zoo and to describe the behavioral needs of specific animals.

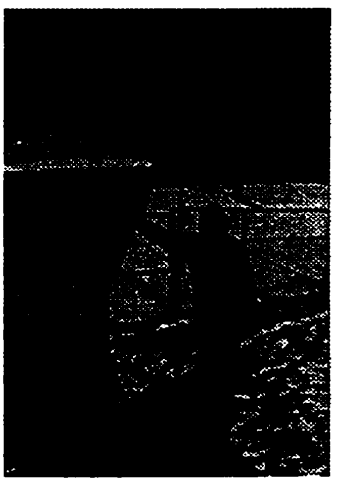


figure.7 Zoo Keeper

After completing a traditional analysis of the Bison enclosure at the Assiniboine Park Zoo a qualitative inventory was

employed. The existing Bison enclosure together with some of the other enclosures were appraised for their ability to deliver aspects considered important to the success of the whole zoo. These aspects included variables such as views, enclosure techniques, materials, educational and visual experience, vegetation, recreation, cultural and historical references.

A short questionnaire was then utilized to gather specific information, such as enclosure sizes and populations, from selected zoos in Canada and the American northern states. Twelve zoos include Bison in their collections, and seven of these responded to the questionnaire.

Findings from the research, interviews, analysis, inventory, and questionnaires pinpointed needs and challenges to be met in the design and planning of the Bison Prairie.

B A C K G R O U N D

The study of zoos is not a new interest but an old one. It was as early as 322 BC that Aristotle, the Greek philosopher, studied animals and produced the first known work, "History of Animals". Much can be learned from the earlier periods of animal collections.

Looking at the recent history of zoos simply reveals that we may be in a period of discontent with the way we display and collect animals. Conversely the macro-evolution of animal collections reveals a pattern paralleled in most of life's systems. History reveals that periods of discontent are often followed by a revolution of new ideas. Although at times zoos seemed to be living dinosaurs, they adapted to suit the needs of the day and then were rewarded with periods of popularity and change. Today, zoo managers and planners are engaging in a discussion about new directions.

2.1 Zoological Gardens

2.1.1 From the Menagerie to Conservation Centres

Knowledge of zoo design has come a long way from the dark ages of the **Menagerie**. A menagerie was a collection of wild animals kept on display in cages. These cages allowed visitors to get a close view of the animal and as such were designed without thought for each animal's needs. These menageries can still be found on road sides in North America and elements of the menagerie still exist in the Assiniboine Park Zoo.

figure 8. Menagerie

2300 B C - 500 A D Early Collections

To our knowledge, collections of animals have been recorded as early as 2300 BC. From this time and onwards into the 6th century AD collections were owned, organized and viewed by royalty alone. Ownership of these wild beasts, as they were referred to, was symbolic of the power and prestige of the rulers or nobility. The capture of exotic animals gave special status to their collectors. They would often bestow these animals as gifts to other rulers as a show of diplomacy. Entertainment and aggrandizement of animals were apparent in Egypt and Rome. In the case of Marcus Terentius, an extreme display of this occurred when hosting dinners in his aviary. Dramatically, he would allow his guests to choose which of the birds flying overhead they would like to eat. There are however a few cases where the animals were revered and studied. Certainly this so called reverence was often born out of the collectors' ignorance and awe of the animals exotic nature. The most notable of these positive interactions was that of the Greek philosopher Aristotle. He studied Alexander the Great's (leader of Macedonia) collection, and subsequently wrote an encyclopedia of zoology called "History of Animals." The study of

animals for educational advancements was not a popular trend though, and would not see fruition until the 1800s.

In these early collections the animals were housed in small cages or enclosures so as to ensure full view for the onlookers. Having a live "object" to be viewed at close quarters, was the only objective pursued during this age. Education for the onlookers for the most part was defeated by this simple, sterile display. The well-being of the animals such as behavior or physical needs were not at this time important. Collections were simply a random assortment of individual species with no relationship to other animals in the collection. Over time these collections became more organized.

500 AD -1700 AD The Middle Ages and the Renaissance of Roman Style Aggrandizement

During the Middle Ages, after the fall of the Roman empire and rise of the Church scant attention was paid to collections of animals. People at this time were engrossed in their devotion and fear of God. It was not until the 13th century, after the fall of the Holy Roman Empire, that collections of animals were back in vogue. In England much like Rome, animals were used for aggressive entertainment. Once again, powerful people collected them, unabashed by these ostentatious displays. Only the richest and most powerful people in society were granted access to view the animals. In London the people were even expected to pay a tax for their care. Collections were an expression of the nobility's wealth, power and dominance in society throughout Europe. It was also popular for elites such as Leonardo da Vinci to keep animals as models for their art (Koebner 1994).

figure 9. Coliseum

In contrast the 18th century marked the beginning of widespread accessibility. The people demanded admittance to what was to be called a **Zoological Park** or collection of menageries, ("zoo" being the ancient Greek word meaning living being or zoion). In 1790 the people stormed the menagerie at Versailles during the French revolution demanding access.

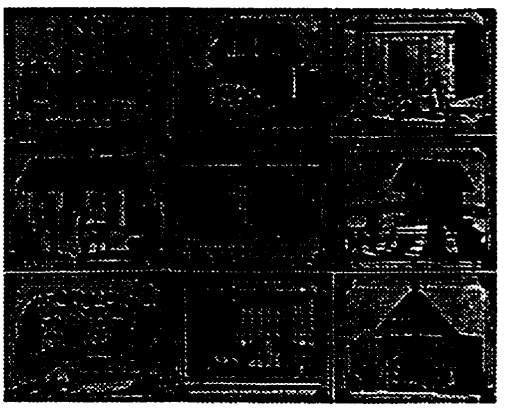


figure 10. Curious Buildings Reflecting the Exotic Nature of the Animals

However, there was little educational value and little regard for the animal's welfare at this time. The approach of zoos`at this time could still be described as anthropocentric. Information about the animals and the method of their display was expressive only of the animals significance to humankind.

Although accessibility of the animals to the greater populous was a positive change in the evolution of the zoo, one negative aspect was the increasing popularity of the Traveling Exhibit. These side-shows would often put animals through torturous displays for the entertainment of the visitors. Owners, such as Wombell were known for their excessive showmanship. In one incidence Wombell's elephant died on the way to a fair and a competitor shrewdly promoted that they had the "only live elephant in the fair". Wombell's response to this was advertising that they had the "only dead elephant in the fair", bringing him record attendance rates (Hancocks 1971, 121).

Zoological parks at this time were often featured with architecture that was not designed around the animal's requirements, but rather an attempt to reference a particular building type popular in the animal's country of origin. Unfortunately, this was not done in a logical manner. For example the ostrich house in Cologne (1860) was designed to look like a Mosque. Mosques may have been an impor-

tant cultural element of this animal's country of origin, but obviously this is not the ostriches natural habitat. Therefore, this approach did not leave anyone with increased understanding of the animal, but rather a confusion of important details of the animal and its natural habitat. This cultural inclusion may have foreshadowed later attempts at habitat re-creation as well as cultural fusion in enclosure design (Hancocks 1971, 106).

With the onslaught of scientific curiosity zoos once again began to change. The mid 1800s to 1900 marked a new trend which focused on the natural sciences. These included zoology, which is the study of animals - their anatomy, evolution and behavior. Zoological gardens were a welcome change for the city dweller from the grim industrial cities typical of this period. Thus the zoological garden's popularity exploded and the abundance of wealth at this time allowed for the preservation of zoos and natural areas. In 1828 the addition of a zoological garden in Regent's Park became the inspiration for the United Kingdom, Europe and the United States. Zoological gardens were designed and planned places encompassing park land and recreation areas, where plants and animals were exhibited together. The first planned and designed zoo in America was conceived in 1859 by Dr. William Carmac, and its opening in Philadelphia was delayed by the civil war in 1874.

figure 11. English Romantic Landscape

By the early 1900s twenty three zoological gardens were established in the United States alone (Koebner 1994, 68). Still, few people understood the animals' behavior and physical needs. The trappers and hunters who supplied these animals did not bother to study animal behavior, nor did they find importance in relating this information. Therefore the exhibits displayed little information about each animal. Enclosures were sparse and open so that the animals had nothing to interact with and nowhere to hide from the visitors. Animals would sometimes become ill or

die at young ages in these conditions. It soon became difficult to replace them, as they were being hunted to extinction or near extinction in the wild. Foreign countries realizing the monetary value of these animals began demanding payment. It soon became apparent that zoos needed to figure out how to breed the animals in captivity and keep them healthier. The importance of this would not be realized until the 20th century.

1900 AD - 2000 AD Evolution of the Modern Zoo

Significant and rapid change occurred in the design of zoos in the twentieth century. Most notably, this change occurred at the turn of the century. This was when the idea of the zoo went through important modifications, which swept most of the western world. The twentieth century had served as a period of enlightenment in the care and display of captive animals and still does.

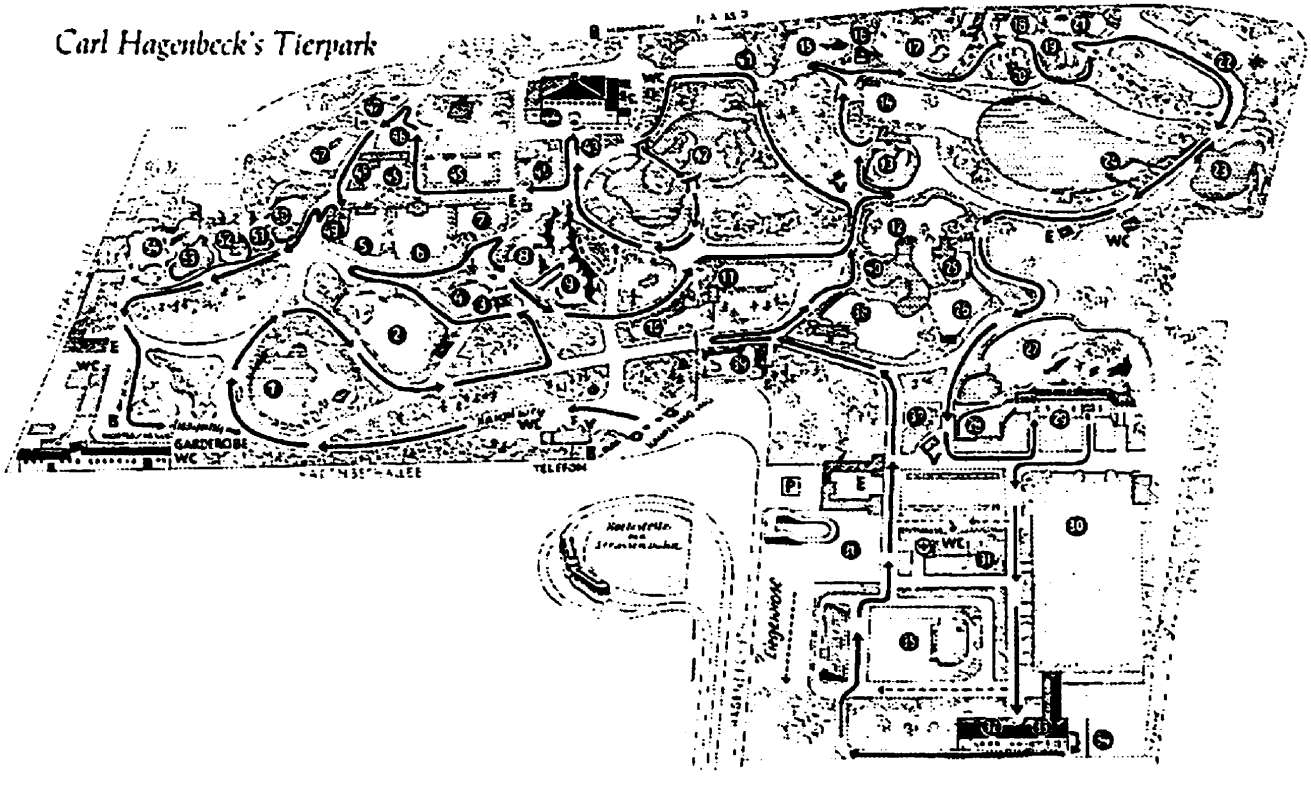


figure 12. Map of Tierpark

In 1890 **Carl Hagenbeck** first introduced the idea for the Hagenbeck Tierpark Zoo in Hamburg Germany. This zoo was unique in that it tried to mimic each animal's natural habitat as well as fusing cultural elements of the their native land. He did this by hiring zoo attendants in appropriate costume to represent various cultures (Koebner 1994, 70). This idea changed zoo design and management around the world. Hagenbeck, who had once supplied animals for zoos and circuses, realized that people were attracted to exotic animals. The Hagenbeck Tierpark Zoo introduced a variety of new techniques that would increase the visitors interest and improve the enclosures for the animals. " I wished to exhibit them not as captives, confined to narrow spaces and looked at between bars, but as free to wander from place to place within as large limits as possible and with no bars to obstruct the view and serve as a reminder of captivity" (Koebner, 71).

figure 13. Tierpark's Ruined Burmese Temple

Hagenbeck also began to utilize design techniques to create enclosures that appeared to hold groups of species of common habitats. This was the first attempt to try to relate more information about the animals to the viewer. He replaced cages with moats that contained the animals but were not as obvious to the visitors. Also the enclosures were camouflaged with plants and landscaping; a whole picture of the animals natural life came alive. Hagenbeck's sons travelled to the US to implement these new ideas.

figure 14. Logging Camp

Hagenbeck's introduction of **cultural** and/or **historical** themes have gained popularity in recent years. Inclusion of a cultural fusion proved to enrich the educational value of the enclosure, by revealing the whole story of the animal in its habitat. An example of this approach is at the Dickerson Park Zoo in Springfield, Missouri (fig 14.). A Logging Demonstration Camp displays elephants from Asia and exhibits their interdependence with humans (Polakowski, 37).

figure 15. Preparing for Animals Feeding

Dr. Heini Hediger made advancements in the scientific world in the 1950's. He demonstrated that small spaces could provide for animals' social, psychological and physical needs. He commented in 'Man and Animal in the Zoo' that "The standard by which a zoo animal is judged should be according to the life it leads in the wild." The way we approached the design of zoological parks was beginning to change once again. Today scientists are hired by zoos to understand the animal's behavior and try to provide for their needs. This marked the beginning of the end of an anthropocentric approach to housing zoo animals, at least in major institutions.

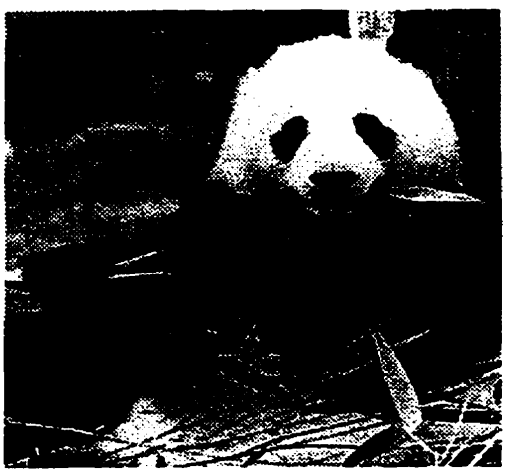


figure 16. Giant Panda

Major headway was made in the 1960s in the way animals were studied. It became extremely important to understand animals in their wild state so as to provide for them in captivity. Results of this allowed for successful breeding and longevity of life in their new homes. Taking into account their **natural behavior**, humans provided zoo animals with interesting things to do, often referred to as behavioral enrichment. This stimulated the animals and helped prevent boredom and emotional problems. Searching for food was an activity that could occupy the animals for most of the day. It increased their satisfaction in the artificial environment. For example the Borneon orangutan at the San Diego Zoo spends most of its day digging for honey (Koebner, 1994). Field biologists such as Jane Goodall and George

figure 17. George Schaller

Schaller have contributed to our increased knowledge of many animals. This knowledge was applied to the design of exhibits and the care of the animals and in effect important information was presented to the public. The inclusion of education departments at zoos became popular for the purpose of teaching people about the wonders of the animal world.

In the 1970s a segment of the population began to criticize the treatment of animals in zoos. Animal welfare organizations began to demonstrate against zoos. For example the Humane Society wrote guidelines for the care of animals in zoos. The AZA (American Zoo and Aquarium Association), formed by zoo professionals as part of the National Parks and Recreation Association, eventually split from the former and began to monitor themselves. They recognized that zoos are valuable as entertainment, only if they serve to educate the public and further the world scientifically. Also a new spirit of cooperation became apparent. Trading of animals between zoos became common for a variety of reasons such as limiting surplus animals, and breeding purposes. Rather than competition for the rarest collections (as in earlier years), it was in this decade that cooperation among zoos for the better welfare of animals was the norm.

figure 18. Jon Coe

Jon Coe, Grant Jones, Dennis Paulson and David Hancocks conceived the idea of **Landscape Immersion** when they designed the gorilla habitat in the Woodland Park Zoo in Seattle, Washington during the 1970s. Going beyond Hagenbeck's ideas, animals were put into a naturalistic environment complete with plants, rock work and other animals. The animals and visitors were immersed into a replication of the natural environment, enriching the educational value of exhibits. It was an attempt to get visitors to understand habitat on a more visceral or basic level. Zoo professionals hoped this would cause the visitor to care about the animals and their environment. Curators and

designers were now expected to fully understand the animals natural environment and their behavior in it, to allow them to re-create a reasonable facsimile. Elements such as the English "ha ha", moats and the borrowed landscape were integrated into the design of zoological parks to better represent the natural habitat of the animal. In addition zoological parks began to be organized differently by focusing on grouping animals in similar habitats with certain climactic and vegetative features rather than broad geographic groupings or species groupings.

figure 19. Woodland Park Zoo

In the 1990s, zoos are now reaching out to protect endangered animals and habitats in the wild. The AZA now insists that the priorities of their mission must be reversed; conservation, education and scientific study must come before recreation. A good example of this is the pygmy chimpanzee who survives only in one pocket in the African country of Zaire. A total of eighty five live in several small groups in zoos around the world. Through cooperation they must be managed and conserved as one population if they are to survive at all (Koebner 1994, 74). Many lessons are learned from this kind of management. Today natural areas and animals threatened by extinction are also being managed in a similar manner as are our zoos. This is not to say that recreation and other promotional programming is not a fundamental aspect of the zoo mission. It is through these activities that funds are raised for the financial sustainability of zoos so that they can meet conservation goals.

Today zoos have joined together to write The World Zoo Conservation Strategy supported by The World Wildlife Fund and The International Union for the Conservation of Nature. Zoos are encouraged to reach three conservation goals which are:

• to support the conservation of endangered species and ecosystems

• to offer professional support and facilities to increase scientific knowledge that will benefit conservation
• to promote an increase in public awareness of the need for conservation.

In North America more people visit zoos than all professional sporting events combined (Koebner 1994, 74). All these people are exposed to this conservation message and in time they could have a dramatic impact. Ideally zoos have reached this point in their evolution and are advancing daily. Realistically many zoos are struggling to maintain and incorporate these new ideas. There are however some exemplary zoos that have the financial and social support to incorporate these changes. Following are some of these zoos:

• Woodland Park Zoo,
Seattle Washington. 1994. The Northern Trail exhibit was created after an intense analysis stage where the animals of the taiga, tundra and montane habitats in Alaska were studied. Natural materials and geologic simulations are employed to stimulate and accommodate species typical behavior. (Powell 1997,)

• Arizona-Sonora Desert Museum,
Tucson. 1992. Designed by Jones and Jones, this museum focuses on the natural history of the state of Arizona and the state of Sonora, Mexico.

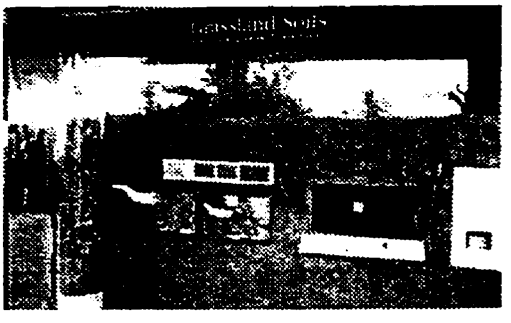


figure 20. Arizona-Sonora Desert Museum

• Calgary Zoo,
Calgary Alberta. The Canadian Wilds exhibit, still under construction presents animals and plants in natural groupings. The site also incorporates a wetland area and other on site water management techniques.

2.1.2 Time line

2300 BC	*A stone tablet describes a collection of rare animals in the Sumerian city of Ur.*
1500 BC	*Egyptian pharaoh Thutmose III is reported to have kept a collection of animals for his pleasure. His step mother Queen Hatshepsut is recorded as having successfully sent expeditions in search of wildlife.*
1100 BC	*Assyrian king Tiglath-Pileser had large preserves or wild animals.*
1027-221 BC	*Emperor Wen Wang of the earliest Chinese Dynasty (Zhou Dynasty) called the park where he kept animals the "Garden of Intelligence." To study and learn marvels of nature and wildlife.*
336-323 BC	*Alexander the Great, leader of Macedonia who conquered most of the known world including Persia, India and Egypt, kept elephants, bears, monkeys and a great variety of animals. He was gentle and care ful with his vast collection. King Ptolemy I of Egypt, inherited this collection and organized the first known Zoo.*
322 BC	*Aristotle, a Greek philosopher and Alexander's tutor, studied Alexander's collection. He wrote an encyclopedia of zoology called History of Animals, describing 300 species of vertebrates.*
116-27 BC	*Marcus Terentius let guests dine in his aviary. Guests chose which bird they would like to eat*
27 BC-476 AD	*During the Roman Empire display for aggrandizement and entertainment reached its peak. Fights between bears, lions, gladiators and unarmed people were put on display.*
37-68 AD	*Roman Emperor Nero often dined with his pet tigress, Phoebe. If guests dared to upset the Emperor they chanced ending up as Phoebe's dinner.*
1215-1250	*Frederick II, King of Sicily and Emperor of the Holy Roman Empire considered a great patron of the arts and sciences, kept animal collections, many for*

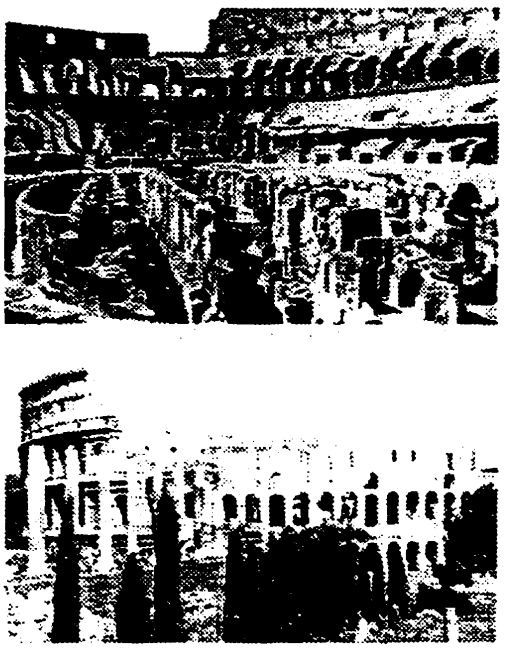


figure 21. Coliseum

	scientific study. He even traveled with his animals as far as Worms, Germany for his wedding.The animals were dressed in gems, ornaments and beautiful cloth for the occasion.
1216-1272	*Henry I 's grandson Henry III built the Royal Menagerie outside the royal residence in the Tower of London for other royalty to see.*
1445	*When Henry VI married Margaret of Anjou he gave her a lion for a wedding gift. She then expanded the Royal Menagerie.*
1400's (late)	*Renaissance painters in Florence, Italy used the animals in the menagerie as models. Leonardo da Vinci kept animals of his own for this purpose. During this time animals were seen as creatures of beauty and nobility. Austria and Germany had menageries.*
1521	*A Spaniard, Cortez, an early explorer came upon the Aztec city of Tenochtitlan where the leader, Montezuma kept a spectacular collection of animals throughout the city. These animals were well cared for. Cortez destroyed the people and the animals.*
1530-1584	*Ivan the Terrible from Russia kept bears in dens within his castle. Like Russia , the rulers in Poland and Sweden kept bears as a show of power.*
1542-1605	*Akbar the third Mogul emperor of India kept one of the best menageries. He forbade animal fights. His collection was open to his subjects but not regular citizens.*
1626	*Louis XIII founded the Menagerie du Jardin des Plantes, in Paris.*
1643-1715	*King Louis XIV had menageries at all his chateaux's. At Versailles though, the enclosures were quite different from the others. Here, scenes of flowers and birds were painted on the walls.*
1700s	*Royal Menagerie at the Tower of London was opened to public citizens.*
1752	*Holy Roman Emperor Francis I of Vienna gave his*

figure 22. Akbar the Great

wife Maria Theresa a collection of animals, called the Schonbrunn Menagerie.

1790 — *People stormed the menagerie at Versailles during the French revolution demanding access. The nobility at this time was disbanding, their land was being redistributed. The animals were now being collected into one menagerie.*

1793 — *Animals from Versailles and elsewhere were collected at the Jardin des Plantes in Paris. The Zoological Garden was now conceived, where collections were considered of scientific interest .*

1800's — *Traveling shows were common. People going overseas to hunt big game was also popular. Money was to be made in the animal trade by explorers and traders. Those animals that died were easily replaced. Menageries consisted of rows of caged animals: one species alone in a cage next to a lone individual of a different species, much like a stamp collection (Koebner, 63).*

1828 — *Strong interest in natural history and animals was the impetus for the creation of the Zoological Society of London and the zoological garden in Regent's Park. This became an example for the United Kingdom, Europe and the United States during the next stage of zoo evolution.*

1809 - 1882 — *Charles Darwin during his five year journey wrote a book called "The Origin of Species by Means of Natural Selection"*

1847 — *The Oxford Dictionary states that the word zoo was first used in print on this date.*

1860 — *The Jardin d'Acclimatation in Bais de Boulogue typified zoos at the time in which notorious sideshows were an integral part of the facility.*

1861-1865 — *The Civil War in the USA took the attention and energy of the country. After, American cities grew in size and strength, and with them grew menageries. Central Park Menagerie was one of the first built,*

figure 23. Jardin des Plantes

figure 24. Versailles Menagerie

then came the Lincoln Park Zoo, both found in the state of New York.

1874 *Dr. William Carmac wanted to create a zoological garden in Philadelphia in 1859, similar to those of Europe. Delayed only by the civil war, he then succeeded in creating the first planned and designed Zoo in America. The zoo would be designed for the purpose of housing animals looked after by full time staff. In 1900 the Philadelphia zoo opened the first research laboratory.*

1877 *The word 'zoo' is popularized from the British music hall song 'Walking in the Zoo is the OK thing to Do' (Hancocks, 1971).*

1896 *A ruined castle was renovated for barbary sheep at Dusseldorf. This building was a great expense and extremely whimsical for its purpose.*

1899 *William T. Hornaday opens the Bronx Zoo, after quitting his job as a taxidermist with the Smithsonian menagerie.*

1907 *Carl Hagenbeck opened the Hagenbeck Tierpark Zoo.*

1930s *President Franklin Roosevelt created the Public Works Program to employ people after the Depression. This gave zoo's additional resources to work on much needed repairs.*

1950s *It was not until after the war that zoos flourished once again.*

1944-1950s *Dr Heini Hediger, Director of the Switzerland and Zurich Zoos, had a major influence on the way zoos provide for the animals needs.*

1950 *Dr. Heini Hediger makes advancements in the way animals are housed.*

1960 *Jane Goodall, and George Schaller made advancements in the knowledge of habitat and behavior of animals through the use of field studies.*

1963 *Marlin Perkins, zoo director of the Omaha Zoo was put on the air as the host of "Wild Kingdom", until*

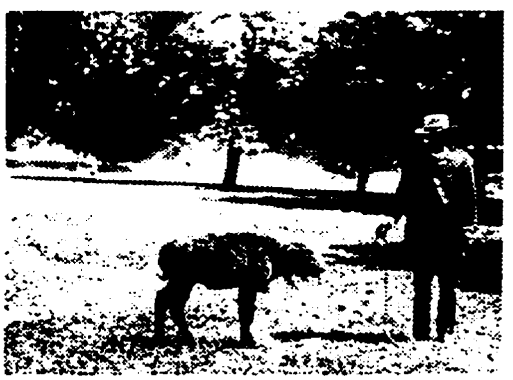


figure 25. William Homaday

1991.

1970 *Jon Coe, Grant Jones, Dennis Paulson, David Hancocks introduce the concept of Landscape Immersion.*

1973 *The Endangered Species Act restricted capture of wild animals. Zoos depended on zoo bred animals mostly (Polakowski 1987, 21).*

1980s *The spending spree of the 1980's allowed for changes at zoos' in North America.*

(most of the information for the time line was found in Koebner 1994, unless otherwise stated)

2.1.3 Focus Issues

This study will attempt to address the important issues mentioned in the evolution of the modern zoo and implement them into the design of the Bison Prairie. Incorporating these issues will enrich the educational and aesthetic value of the enclosure as well as provide for the animal's needs. The Bison and the prairie have a rich cultural importance to Manitoba. A holistic approach warrants inclusion of the way in which the Bison were connected to the people and the land. This, together with the incorporation of habitat characteristics of the Bison and provisions for the animals needs and habits, illustrate to viewers the holistic picture of the Bison at the height of their existence. Landscape immersion techniques will assist the viewer to experience the enclosure as though they are a part of it. Here then are the principles or description of the focus issues which will be utilized in the design stage of the study.

- LANDSCAPE IMMERSION
- HABITAT IMITATION
- CULTURAL ENHANCEMENT
- BEHAVIOR ENHANCEMENT

Landscape Immersion Techniques

There are a variety of ways to make the viewer feel as though they are part of the habitat displayed in the enclosure. Immersion techniques not only erase the strong distinction between the pathway and the enclosure area but can

figure 26. Landscape Immersion Enclosure

also cause the viewer to feel like they are discovering the animals in their natural setting. This creates drama and excitement.

To achieve this kind of impact, one must look closely at the details. Special care must be taken when designing the boundaries of the enclosure. There are many techniques and materials that can be used and must be designed with each animal in mind. Materials, size, rhythm and shape of the pathway all have significance in designing a successful enclosure. To best create the illusion of a natural area one must also ensure that other enclosures, which are separate entities with their own natural theme, should not be inadvertently in the same sight lines. This rule should also include views to unsightly buildings, hardware, and any elements that deter from the natural image. A feeling of discovery and anticipation, as mentioned before, would be forfeited if there was only one viewpoint into the enclosure. Open views would permit the animals and all four corners of the exhibit to be seen as well as the hordes of people that may be attracted to this one viewpoint. Following are some examples of viewing areas and barriers that David Hancocks outlines in 'Seeking to Create Illusions of Wild Places'.

Viewing from a Public Shelter

A public shelter allows the visitor to view animals while protected from wind, rain or snow and at the same time it allows the visitor to get quite close to the animal. These shelters are usually built into the landscape so that they appear to be a part of the enclosure. For example at a bat display the shelter can be nestled in a cave so that the visitor will perceive they are in the animals environment. Plants can be used to conceal spectators and minimize intrusion on the animal.

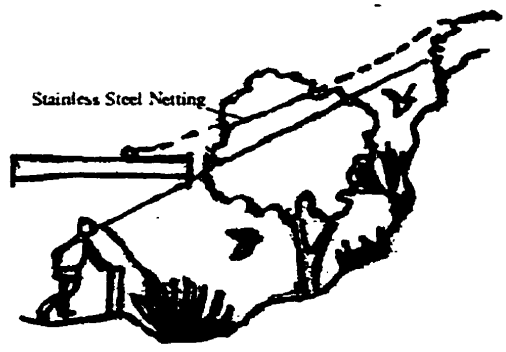


figure 27. Public Shelter

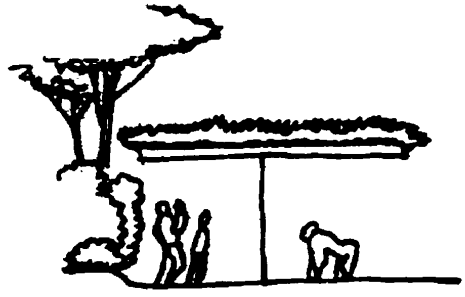


figure. 28. Public Shelter

Viewing from a Partially Screened Edge

This type of viewing is more typical and already utilized quite readily at zoos. It consists of a vegetative strip between the enclosure and the viewing area as well as between the viewing area and the primary circulation route. When special care is given to selecting plants and deciding their placement, this type of viewing area can be very successful. Plants that are part of the animals natural habitat should be used within the enclosure and duplicated in the pedestrian areas. Plants should also be placed thoughtfully to frame views and screen unwanted elements. They can be arranged to conceal spectators and minimize intrusion on the animal, but must be low enough for children to see the view.

figure 29. Partially Screened Edge

Viewing from a Bridge

Views from a bridge into a enclosure can be extremely interesting given the appropriate situation. Dense planting is needed in this situation so the whole enclosure is not seen from this elevated height. Walking on a wooden bridge over a serpentine body of water can be designed to add excitement to the tour. A bridge could serve as a cultural element as well, mimicking the vernacular of the area. An example could be a free spanning foot bridge accented with vines to recall an image of the jungle.

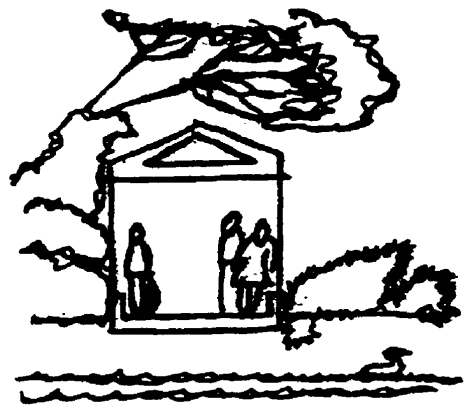


figure 30. Bridge over Water

Underwater Viewing

Although this type of viewing area is rarely utilized due to the expense, its dramatic impact on the visitor warrants its inclusion. This shelter is submerged in water so that the viewer can see the animals' behavior underwater. The shelter itself can be designed to replicate a naturally existing cave or hollow.

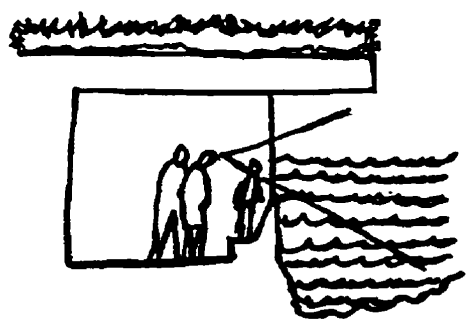


figure 31. Underwater Viewing

The Ha Ha

This can most simply be described as a one sided dry moat. A gently sloping interior edge allows the animal to access the moat, but the sharp change in gradient on the opposite side eliminates the ability for the animals to exit the enclosure. When treated as a natural land form such as a dry ravine with a river-cut bank or rock outcrop on the opposite side, it can look quite realistic.

The One-Sided Water Moat

Similar to the ha ha, the water moat is a little deeper and filled with water. Not only is it a useful barrier, but the wet moat can be used to showcase another behavior the animal participates in. Cleaning of the water in the moat can be an issue.

figure 32. One-Sided Water Moat

The Sunken Fence

This is another moat which is used to hide a fence in between two animal enclosures. It can be utilized in a situation where the predator and prey are displayed as if in the same area, as they would appear in nature. The moat can be planted with repellent vegetation to discourage animals from hiding in the hidden areas.

The Double-Sided Dry Moat

A double-sided moat visually connects two areas of land while physically separating them with a moat. Similar to the sunken fence this technique could create the illusion that two species of animals are occupying the same area. This technique can also protect planted areas from the animals by physically separating them and still allowing a visual connection to increase the perceived space and lushness of the vegetation.

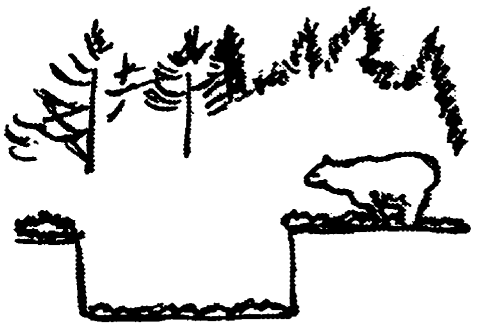


figure 33. Double-Sided Dry Moat

The Fence

Fences are the cheapest form of containment but also have severe visual disruption. When a fence is utilized care

should be given by screening it with planting. A chain link fence painted black can also lessen its prominence.

Habitat Imitation

Every animal belongs to a distinct habitat made up of many elements characteristic of the eco-region it belongs to. An effort to replicate these elements would allow for a more cohesive, holistic approach to designing enclosures. One way to achieve a holistic enclosure would be to include a variety of additional animals that represent at least a part of the food chain in the featured animals eco-region. Including native plants found in this eco-region would also enhance learning possibilities and the appearance of the enclosure.

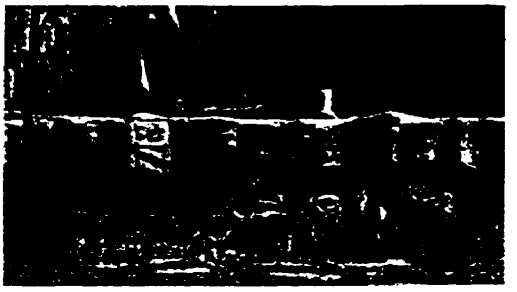


figure 34. Mixed Animal Enclosure

Behavior Enhancement

Incorporation of native plants and other animals would inadvertently be a starting point for behavior enhancement as well. Providing the animals with natural activities such as interacting with other animals and eating plants would free the animal from boredom and enhance their lives in captivity. This would also allow the viewer to understand the animals habits and day to day living as well. Food could also be given to the animals in a way that promotes hours of scavenging, exploring and, of course, eating. There are many ways to encourage natural activities for the animals. One can do this by understanding the animal's natural behavior in the wild and designing the enclosure to provide for these activities. Some zoos participate in what is called behavior enrichment, where animals are given items such as balls to play with. This technique gives the animals hours of activity to once again defeat boredom.

Cultural enhancement of an enclosure allows one to pinpoint and express significant information about any individual species in relation to humankind. This includes information such as its origins in time and place in the evolution of civilization and its historical significance. All these elements help paint a picture of the animal and how it exists, that is to say the specifics of how it fits into this eco-system alongside humans. This is achieved in a variety of ways depending on what information will be related. In some cases designers ensure that the architecture and built forms resemble the vernacular of the locality. An example of this is the Thai Elephant Forest at the Woodland Park Zoo, where the village architecture is inspired by mid nineteenth century indigenous Thai architecture (Vider 89). Another cultural approach would be to show the animals historical value to human needs and consumption. For example the Thai village is actually a logging camp representing the historic use of the animals to harvest teak for more than 3 000 years. Another example is at Fort Macleod, Alberta, at the Head-Smashed-In Buffalo Jump. Here is an excellent remnant of a ten metre high sandstone cliff that was used for thousands of years by the Blackfoot natives to lead Bison to their fatal fall. There are many cultural elements that can be related about each individual species that would begin to unravel a broader look or understanding of the animal.

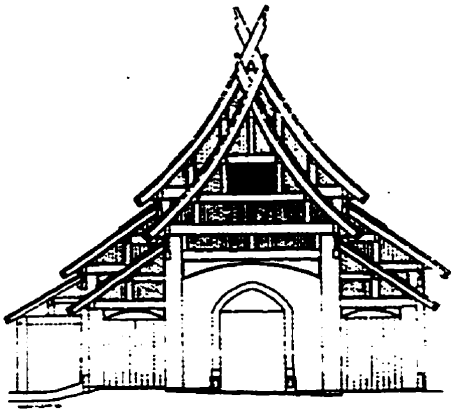


figure 35. Thai Inspired Architecture

figure 36. Buffalo Jump

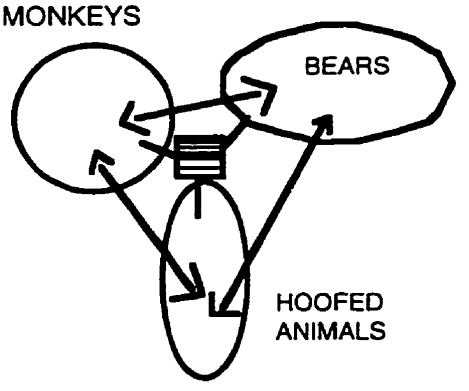


figure 37. Taxonomic Theme

2.1.4 Planning Concepts

Before designing an enclosure it is important to understand the organization of the whole zoo. Any one enclosure must fit within the context and philosophy of the zoo as it already exists or complement proposed changes in the zoo's evolution. Today, zoos are arranged in a variety of manners. Some have come about piecemeal adding pieces and parts without any strong identity to the whole, while others have

undergone intense planning stages. Both methods result in a general form or arrangement, or at least a combination of forms. Following are some of the more common planning concepts found at zoos today.

The early menageries employed 'systematic themes' to organize their collections (Curtis 1968, 7). This was the arrangement of animals by their taxonomic relationships. For example, hoofed animals would be collected together and so would felines and bears. Collections such as these were often one dimensional and did not relate any layers of information about the animals habitat when placed beside like species. 'Popular themes' were also developed from earlier collections. This was simply a collection of the most popular animals, usually exotic animals which visitors were most intrigued with (such as giraffes). There can be problems with this arrangement, especially when selection of animals are driven foremost by popularity of an animal and the hopes of increased attendance rates. The care of the animal may be diminished when a zoo is driven simply by the popularity of an animal rather than its appropriateness.

figure 38. Giraffes

A 'zoogeographic theme' would allow the zoo curator to choose an animal by its appropriateness to the overall concept of the zoo in question. This is an arrangement of animals collected in groups of their respective geographic zone, eco-region or continent. Considerable information can be related about the animals place of origin and habitat through this type of planning concept. Cultural elements could then be associated with the enclosures quite easily, including the people, their lifestyle, their music, art and architecture. This provides the designer with many significant elements to draw upon for the enclosure design. In essence an enclosure rich with information and visual interest would result.

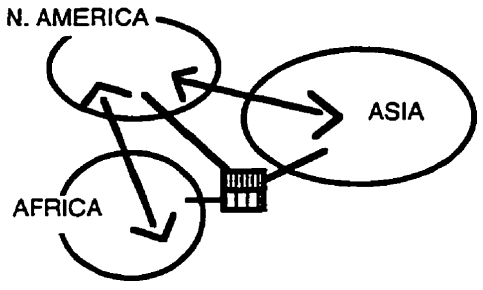


figure 39. Zoo-Geographic Theme

A sub theme of this is the regional zoogeographic theme, where a zoo may choose to limit their collection to native animals. Native animals and plants would be for the most part readily available and would need little acclimatization if any. A regional theme would somewhat decrease the costs associated with housing and care for exotic animals. Unfortunately people often expect to see some of these popular animals and would be disappointed otherwise. A proper balance would have to be met so that attendance rates of zoos stay intact, otherwise it would not be economically feasible.

'Habitat and Ecological' themes would nicely complement a zoogeographic theme by arranging animals in their specific habitat within a region. The habitat would link diverse species who interact together. Educationally speaking this system would have considerable value due to the variety of information about the animal incorporated in the design. In addition, the enclosure would be a lot more attractive than a series of unrelated cages. A habitat or ecological arrangement would also allow the zoo curator to display natural predator and prey relationships, with hidden barriers of course. Combining animals would take much care and planning to be successful but the benefits easily outweigh the costs. It is not uncommon to have combination themes, that is zoos that utilize more than one theme for their organization. This occurs frequently at zoos that have been organized over time. Combinations of animals can be of great benefit as they can increase the educational value and aesthetics of the enclosure. Combinations by their nature relate more information about the animals and with well integrated visual elements they can be quite aesthetically interesting. In conclusion the most successful zoos are those that choose a theme or concept and thereafter abide by the guidelines and limits associated.

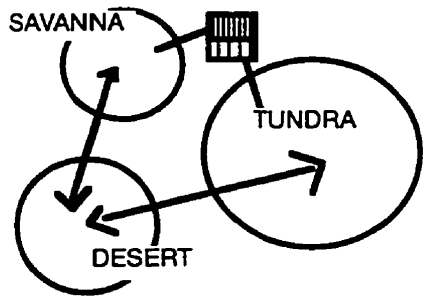


figure 40. Habitat/Ecological Theme

2.2.1 Context

The Assiniboine Park Zoo is located in Winnipeg, Manitoba, just south of the Assiniboine River west of downtown Winnipeg. It is an integral part of Assiniboine Park, although it was not conceived as such from its beginnings. The Assiniboine Forest and Tuxedo Golf Course are situated to the south of the park. Within the Assiniboine Park Zoo is the North American Region to the south. The Bison enclosure is located in the south east corner of the North American Region. Adjacent to the site is the south entrance and parking lot which also spans Corydon Avenue, a major city thoroughfare.

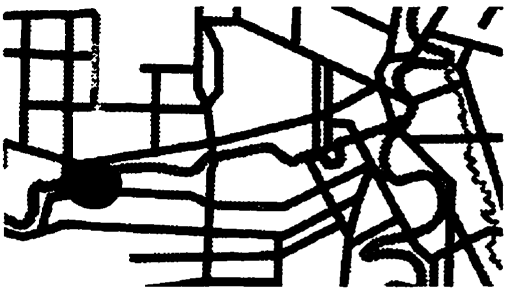


figure 41. Map of the City

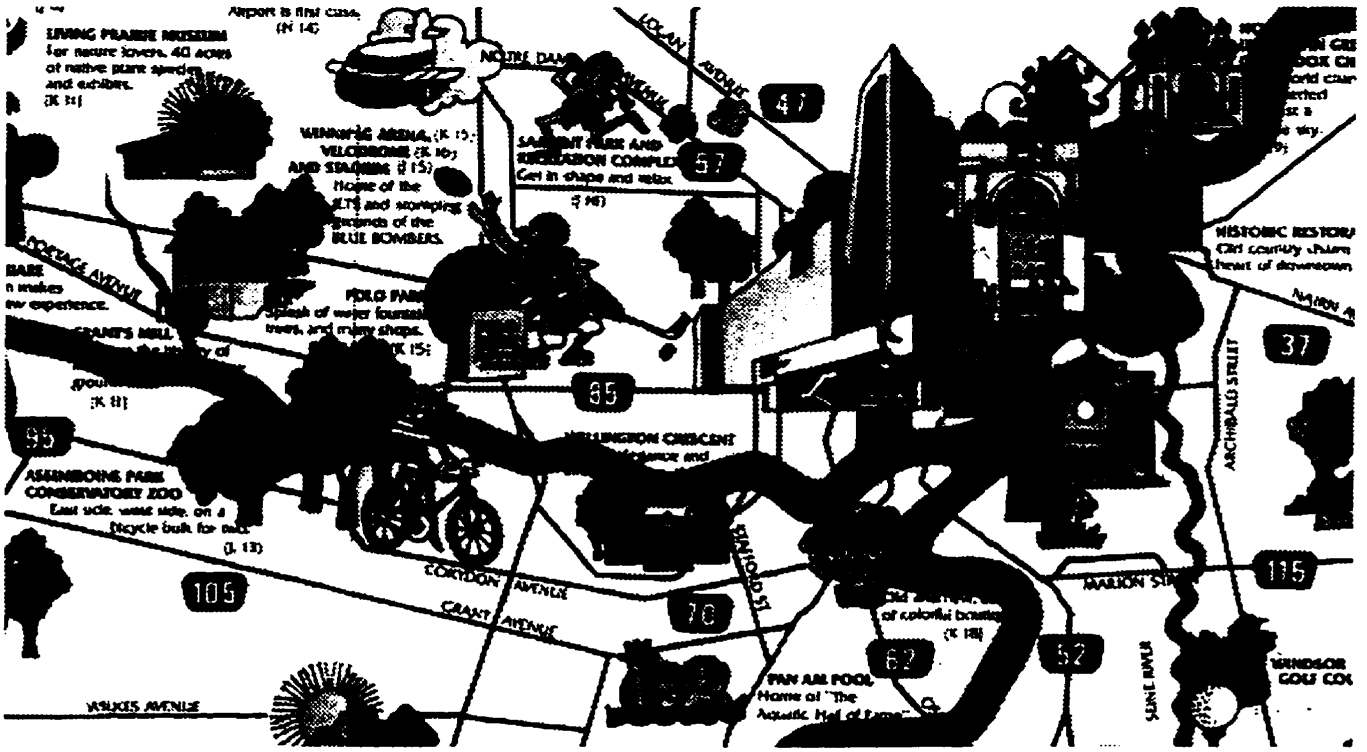


figure 42. City Tourist Guide

In 1904 land was purchased along the south side of the Assiniboine River to the west of Down Town Winnipeg for what was to be a suburban park. The park was to mimic the English Landscape Style from Britain which was adopted and refined for North America by Frederic Law Olmsted. This style evident in New York's Central Park and Montreal's Mount Royal, was a composition of certain elements or principles such as open meadows and lawns, geometrical flower gardens, curvilinear pathways and naturalistic or free form bodies of water. The origins of the zoological garden were in 1904 when the Parks Board was given the opportunity to purchase several species of native animals (Parks and Recreation Department 1972). They felt that the zoological garden was important for the study of natural history. Therefore, along with the purchase of park land, the park's board began the purchase of native animals. Animal compounds were constructed and collected in the north west section of the park. These structures were considered temporary, and their surroundings were absent of any landscape development.

Here then was the beginning of what is today the Assiniboine Park Zoo. Frederick G. Todd a landscape architect from Montreal and a student of Olmsted drew up the plans and recommendations for the park. The implementation of these recommendations was to span many years. Inclusion of the zoo was integral but not a priority in the development of a park and therefore grew quite haphazardly until redevelopment in the 1950's. Recommendations to collect only native animals were not adhered to and soon exotic animals were collected with no theme or planning concept in mind.

In 1915 the Park's Board decided to contain all animals in one zoo rather than scattered throughout the park system.

Animals from Kildonan Park and elsewhere were sent to Assiniboine Park to create one large collection. Not until the prosperity of the 1950s was any real attention given to the zoo despite its astounding popularity. During the depression people found solace and entertainment from picnicking in the park and viewing the zoo animals. Finally the zoo popularity was to influence the renovation and expansion of the zoo. The parks board organized an advisory committee to oversee the expansion, modification and planning of zoo facilities. Development of the zoo would now undergo the scrutiny of this committee which led to the modernization and first vision for the zoo. They also conceived the idea of having a zoological society. The creation of a children's zoo was the number one priority in the new plans. At this time the Parks Board began to seriously investigate information on planning and managing a zoo. Mr. T. R. Hodgson, Park Superintendent at the time, visited nine North American Zoological gardens to find information and to make contacts. By 1951 the Assiniboine Park Zoo had collected 144 individual animals (from 25 different species). In 1953 work was completed by Mr. Wallace, a zoo architect from the St. Louis Zoological Gardens. He designed a master plan for an enlarged zoo encompassing the additional 66 acres purchased from the town of Tuxedo. After 49 years this was the first master plan in the history of the zoo. The following years would encompass ongoing maintenance and major design changes to the zoo. The Bear Range in particular, opened in 1957, was the first of its type in Canada and the largest in North America (The City of Winnipeg 1972).

zoological society of manitoba

figure 43. Logo

In 1958 the first Zoo Director was hired, Dr. G Voss former Director of the Krefeld Zoo in Germany. This was an important evolution for the Assiniboine Park Zoo. It marked a period when the zoo was being managed by one person wholly responsible and with the power and ability to implement their vision. Construction and change would continue

steadily through the years and every new director was committed to expanding the zoo and their animal collections. In 1960 a new master plan was developed, and the greatest rate of development at the zoo followed from the years spanning 1961 to 1974. Clive G. Roots was hired as the zoo director in 1970 after Dr. G. Voss left to build the new Toronto Zoo. In 1974 the Native Animal area was designed and built. The Zoological Society of Manitoba was revived in 1983, and has since been responsible for the construction of many projects. The society is of even greater importance to the zoo today. One example of this, is the introduction of a zoo gift store, that they have managed since its construction in 1989. This venture generates revenue for a variety of projects at the zoo.

2.2.3 Strategic Plan

Today the zoo is undergoing another stage in its evolution. Similar to many zoos it has grown and evolved somewhat piecemeal, due to funding restraints and other factors. The present director of the zoo, Mr. Douglas Ross, is preparing what is referred to as a 'strategic plan' which will outline a holistic mandate or concept for the reorganization of the zoo and its new direction.

figure 44.

ANALYZING THE SITE

An analysis and an inventory of the Assiniboine Park Zoo were undertaken. Analysis of the site was confined to the existing Bison enclosure which is the area selected for this study. The inventory included the whole zoo, allowing an understanding of organization patterns and enclosure techniques being utilized at the Assiniboine Park Zoo. A questionnaire was sent to zoos in North America who presently have Bison exhibits to acquire information and to aid the design phase.

3.1 Map of Existing Enclosures

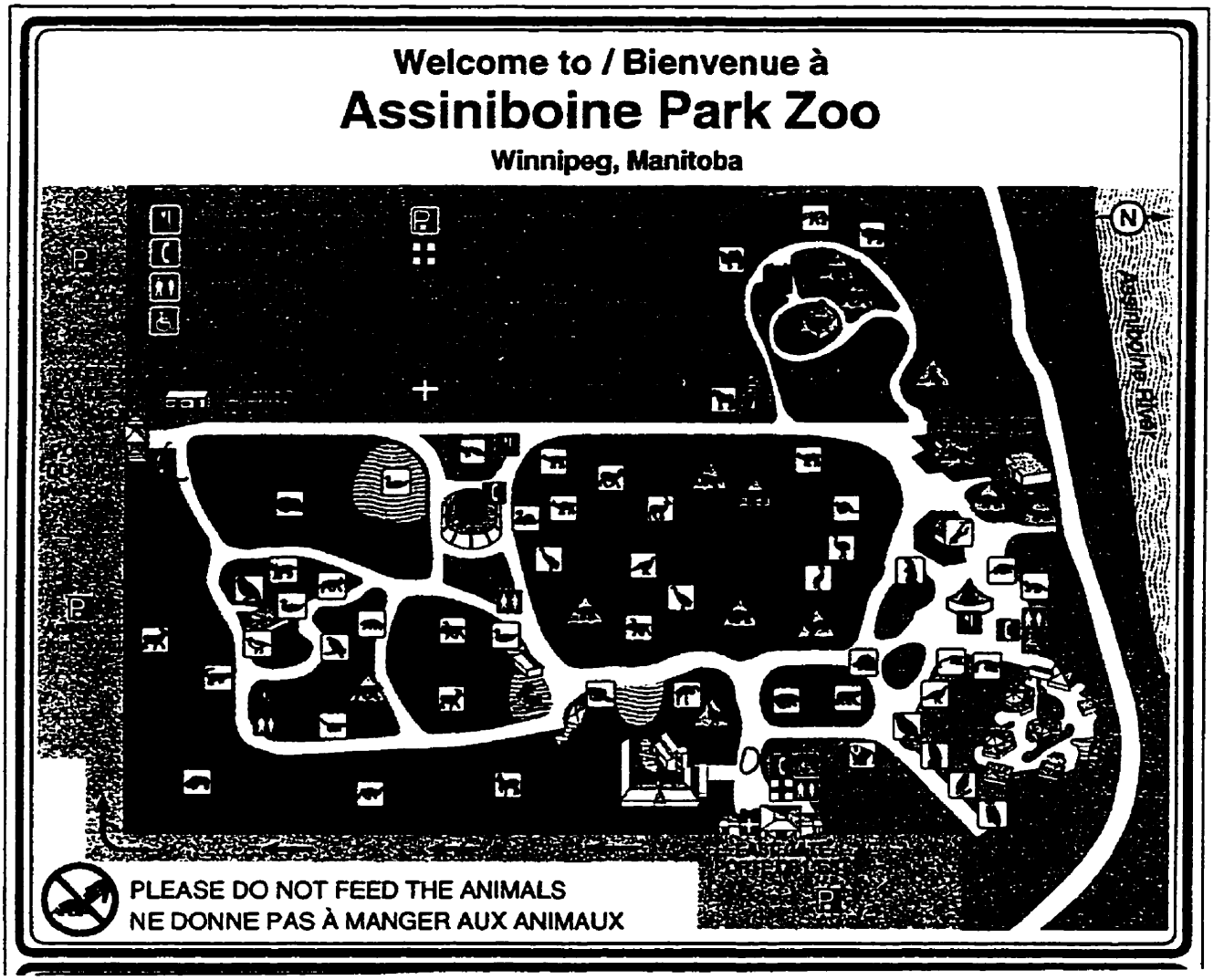


figure 45.

Kevin Lynch's 'Site Planning' text was used as a reference for the site analysis. Interviews were also utilized as part of the analysis. Meetings with the Zoo Director, the Curator, and various zoo keepers allowed essential information to be gathered. The understanding and daily involvement of the zoo keepers with the Bison was invaluable to the study.

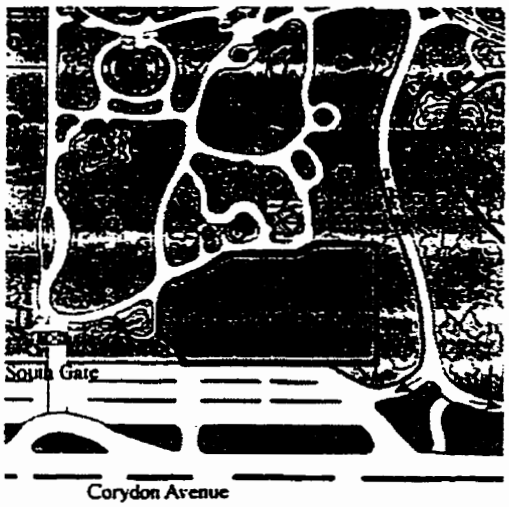


figure 46. Detail of Zoo Layout

3.3 Results of the Analysis and Interviews

General Site Context

The existing or present Bison Enclosure is located in the south east corner of the North American Region. Primary circulation routes run along the north and west sides of the enclosure. Washrooms and food concession are also next to the enclosure to the north.


figure 47. Information Panel

Physical Data

The primary viewing area is on the west side of the enclosure adjacent to a pond. It consists of a bench and one information panel stating the animals name and basic information. The only other views into the enclosure are glimpses afforded by taller visitors along the north side and from the parking lot to the south. Therefore viewing the animals can be crowded on busier days and is limited to one large twen-

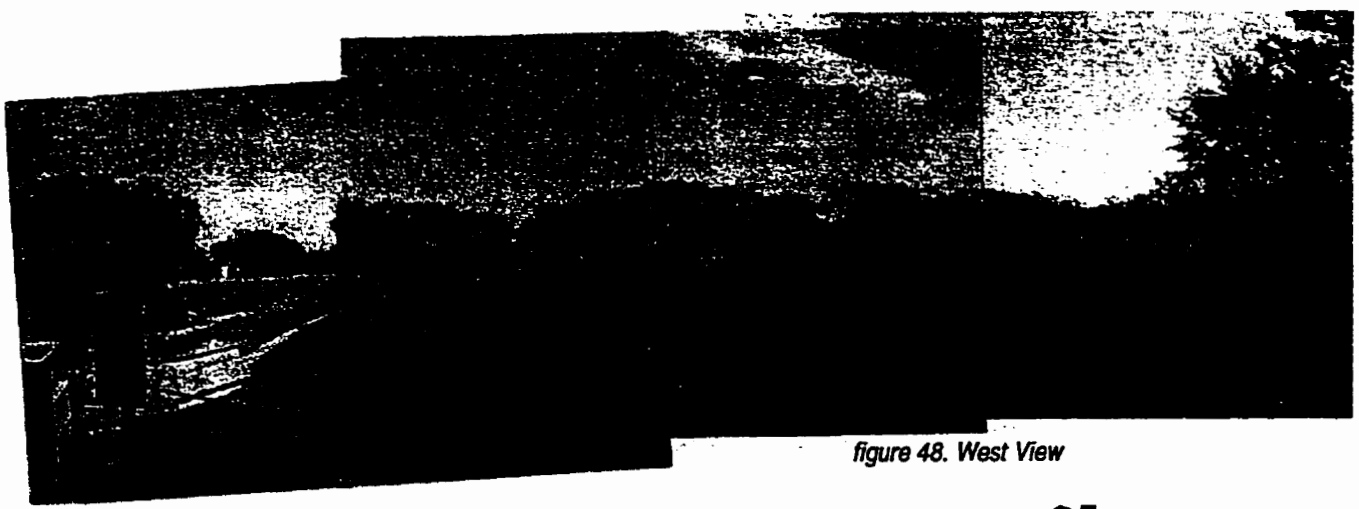


figure 48. West View

ty metre lookout area.

The viewing type can be described as a 'sunken fence', with the addition of a short railing to keep pedestrians away from the moat area. This type is usually only successful when the moat is at a distance from the pedestrian so that the fence is hidden away from view. The viewing path is at a higher elevation than within the enclosure. Unfortunately a higher elevation deters the pedestrian from having a sense of how large the Bison are which is one of their most outstanding characteristics. The pathway is made of concrete and asphalt and has little or no vegetation to screen or frame views. Actually, the enclosure itself is completely open, so much so that one can see the parking lot along the south side of the enclosure from the viewing area. The openness is extremely disturbing not only due to the visibility of traffic but also the noise generated from Corydon Avenue. This prevents viewers from focusing on the enclosure and experiencing the site as a place of its own.

figure 49. West View

There are no native trees or shrubs in the enclosure, except for the few types of grasses planted for grazing and a colonnade of elms. The elms are remnants of an old roadway entering the park and are consequently unnatural in their appearance. The site is in need of planting, preferably with native plants to diversify the habitat and create layers of vegetation. In addition, there is no relief from the sun and wind for the animals except for the elms which are utilized quite heavily for rubbing and resting. Visually, the space is monotonous due to the lack of variation in the type or quality of views, light, and experience.

figure 50. North View

The Bison building functions well, although change is needed to accommodate all the animals. Zoo staff mentioned a need for repair of the loading area and the need for moveable walls to separate animals. The fencing is stable except on the west side where a drainage problem has been given

figure 51. View of Parking Lot and Fence

over to ponding, which in turn has caused the chain link fence and footings to heave and the cement walls to sink. The sinking is problematic because it enables the White-Tailed Deer to escape. Work has been completed recently on the paddock due to erosion. Gravel ridges have been added which allow for better drainage. Ponding is also occurring at the gate to the paddock and in the 'circle pasture'.

figure 52. Elm Trees

The trail around the perimeter of the enclosure is worn due to frequent walking of the animals. This is where most of the animals circulate especially in the winter months. There is some concern about grass and soil erosion on the site and of overgrazing. Erosion may become extremely problematic with the addition of other animals to the site.

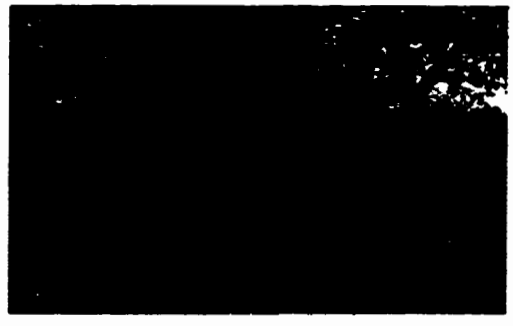


figure 53. Periphery of Site

Animal Activities

Presently sharing the site are two female Bison, four male White-Tailed Deer, and one female White Tailed Deer. One male and one female Bison, four female and one male Pronghorn are expected to arrive. These animals along with an existing male Pronghorn are likely to be moved into the Bison enclosure. Many concerns mentioned in the physical data such as soil erosion and drainage will become acute problems with the arrival of additional animals.

figure 54. Bison

The new animals' activities will have to be provided for in keeping with the activities already occurring on site. Some of these such as circulation routes and grazing have already been mentioned. Greater diversity of land forms consistent with their natural habitat should be reflected in the design of the enclosure. Areas for the bison to wallow and stones for them to rub need to be provided, as well as well places of refuge for the smaller animals.

figure 55. White-tailed Deer

Cultural Data

Zoo attendance at the Assiniboine Park Zoo was an average of 1.5 million visitors per year from the years 1968 to 1975.

June and July are the busiest months and respectively attendance drops greatly in the winter months. The majority of visitors arrived in vehicles, travelling average distances of two to four miles and would stay at eh park for an average of two to three hours (Reid, Crowther and Partners Limited 1977).

Additional statistics acquired by the Assiniboine Park Zoo showing zoo attendance from 1970 until 1996 reveal another trend. From the 1970's until today there seems to be a gradual decrease in attendance reaching lows of 426, 972. This decrease can be due to a variety of factors such as the increase of other activities available in the city of Winnipeg, as well as the introduction of an admission price to the zoo. In my view this is compounded with the fact that the zoo standards have remained static in light of new advancements in zoo exhibits. People have become more educated and possibly more critical of the zoo and its relativeness to society. Keeping in mind the macro-evolution of zoos in society as discussed in section 2.1.1., one would see that zoological gardens lose and gain popularity periodically with any major restructuring in philosophy. Until zoos were able to catch up in design and relevance to citizen's beliefs they would lose support. Another belief is that a renewal of peoples interest in the zoo came about due to the periodic introduction of new exhibits. In my view it is a combination of the two. These new exhibits usually encompass many of the new design philosophies already discussed.

figure 56. "Boo at the Zoo"

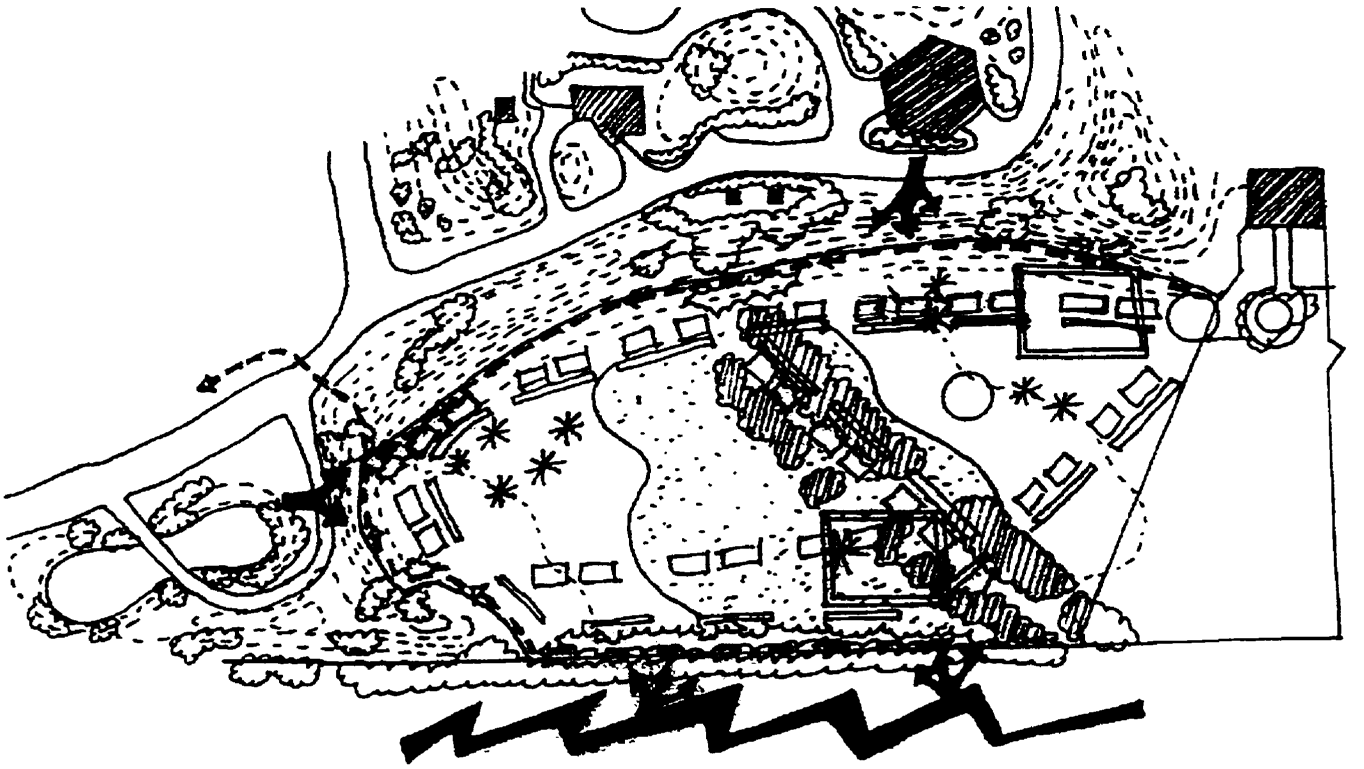
The question then is how does the Assiniboine Park Zoo face these needed changes to attract more support. Looking at recent years of zoo attendance increased with special events. In 1989 for example the Pandas increased attendance from the former year by 38 %, interrupting the overall decrease in attendance already discussed. In 1993 the Down-Under exhibit boasting koala bears also increased

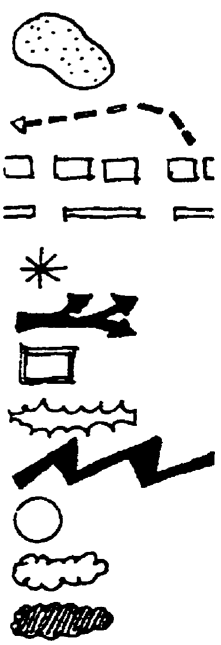
attendance but the numbers are not as dramatic due to the introduction of an admission rate that same year. 1995 and 1996 show record attendance for the zoo in the months coinciding with Boo at the Zoo and Lights of the Wild. Attendance in December for Lights of the Wild has never been surpassed. October attendance for Boo at the Zoo was only last met in 1979. These special winter events are a great way for the people of Winnipeg to get out to the zoo. Outdoor activities are not as plentiful as the wide array of summer events and festivals, thus opening a great opportunity for the zoo.

figure 57. "Lights of the Wild"

Other attractions at the Assiniboine Park are the Conservatory, the duck pond, the Leo Mol Sculpture Garden, the miniature railway, and the many recreational activities such as the cycle/walking pathways and informal recreation opportunities. The 1977 study found that seventy five percent of the visitors to the park included the zoo as one of their stops.

Although the Assiniboine park Zoo is a success, with increasing attendance in the winter months due to the energy and enthusiasm of the staff in introducing winter activities, its character can be described as disjointed. There is no theme on site in terms of image and materials tying individual enclosures together as one cohesive grouping. The Assiniboine Park Zoo has been a popular spot for many citizens of Winnipeg over the years. Work in the area of image and a strategic plan would improve its image in the community and promote the zoo nation wide as a resource.





grazing areas
water/drainage
circulation- bison
circulation- deer
wallowing areas
viewing areas
rest areas - bison
rest areas - deer
noise
ponding
vegetation
rubbing areas

3.5 Methods of the Inventory

Qualitative measures were used to examine each enclosure. These measures were derived from the focus issues which are considered to be fundamental parts in a successful zoo enclosure. Recording was undertaken with particular interest in the cases that failed or succeeded. Doing this helped pinpoint the do's and don'ts of zoo design and the lessons to be learned from a somewhat outmoded zoo such as the Assiniboine Park Zoo.

3.6 Results of the Inventory

3.6.1 Cultural Enhancement

There were no strong examples of cultural and/or historical enhancement of the enclosures at the Assiniboine Park Zoo. Mostly what was found were habitat features that imply some cultural references. The beaver den for example included information panels that mention the animals use in the fur trade in Canada. It stops here though, not indicating its great significance to Canadian history. Another example would be the play area included adjacent to the camel enclosure, which makes some cultural reference. The image is reminiscent of Arabia, but by a more 'disneyesque' technique consisting of fake palm trees, sand, and purple and gold trimmings. Although this approach is very successful with young children, and may be used at other locations within the zoo, it sorely lacks content and more should be done when considering that it is the only reference to the animals place of origin. The Bison enclosure, similar to the beaver, completely ignores the great regional significance of the animal. Many opportunities of learning are lost with this simplistic approach and presentation. Information panels similar to the one found at the Pronghorn enclosure, that mentions the animals relationship to the Bison is certainly a start. The problem with this is that the connection is made with the hopes that all visitors will read it. Visual connec-

figure 58. Beaver Den

figure 59. Camel Play Area

tions are a stronger method of communication in a zoo type environment and allow people of all ages to be able to begin to reflect on the information given.

3.6.2 Landscape Immersion

Examples of Landscape Immersion techniques can be found throughout the zoo. Only in very few cases though has the idea been implemented in a complete fashion. One such enclosure would be the Tropical House, where plants branch over pathways and birds fly over head. The visitors feel as though they are totally immersed in the animals habitat in this exhibit. The winding pathway, an exposed aggregate surface, is very subtle within the dominant habitat surrounding it. There is also a wonderful sense of discovery. One could sit for hours peering into the vegetation from ground level to the tops of the trees attempting to spot the variety of birds. Agreeably there is the inclusion of one technique that has not been mentioned in any of the literature. Simply it can be described as an enclosure within the enclosure. On entering the Tropical House you are immediately a part of the animals habitat and scattered throughout are a few cages for animals needing additional security. This idea can be used in an exterior environment allowing people to enter the enclosure of a few 'harmless' animals and separated discreetly from more 'harmful' ones. Not only does this erase some unneeded boundaries between harmless animals and the visitors but also expresses a similar relationship between them toward the more harmful ones.

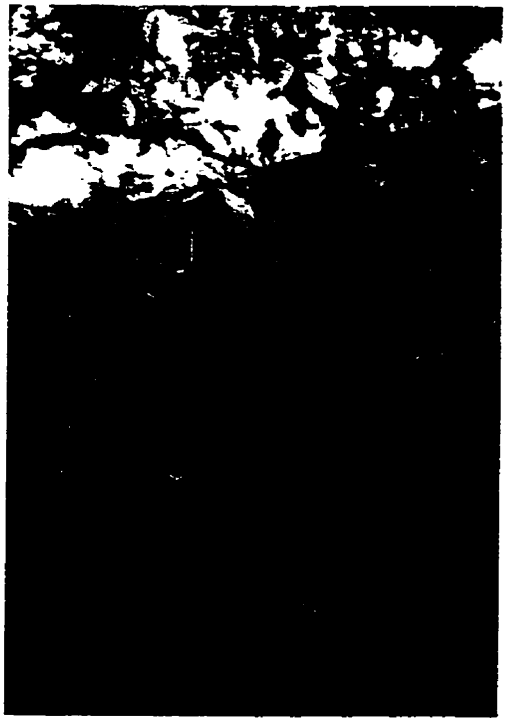


figure 60. Tropical House

The Kinsmen Discovery Centre is another success story in relation to Landscape Immersion. Techniques used to immerse the visitor and invite them to interact with the animals is done in a more purposeful manner. Pedestrian areas and pathways are designed to mimic the interior of the enclosures. Often the space looks like a whole separated only by a pane of glass, rather than the typical distinction

between the viewer space and the viewed area. Sound is also used in the Discovery Center to complete the overall experience.

Many of the enclosures at the zoo were built prior to the 1970's, when Landscape Immersion techniques were first discussed. Many lessons can be learned from these earlier precedents. The monkey house is an example of the antithesis of landscape immersion. Aside from the obvious disregard for the animals habitat, the boundary between the animals and visitors is very direct. The enclosure is situated in the largest gathering area of the zoo, likened to a open plaza. These distractions sabotage any attempts to focus the visitors attention on the animals. The enclosure space in the monkey house is alarming, reminiscent of the old menagerie style of housing animals. They live in little sterile boxes that the pedestrians can view through the glass. The beaver den is a miniature river dam attempting to mimic the natural habitat, but fails in its delivery. Not only does the building sit on top of the landscape instead of integrating into the land form, more seriously the service entrance stands out and becomes the focal point. This enclosure successfully builds boundaries between the visitor and the animal. Finally, the Bison enclosure despite its large sized is also lacking in this area as one can see the whole of the enclosure from almost any point. There are no intimate views buffered with vegetation. Typical of Assiniboine Park Zoo as a whole, two sides of the enclosure are wrapped by a wide asphalt path and at least four feet of short grasses on either side. There is no sense of anticipation or discovery when approaching any of these exhibits.

figure 61. Monkey House

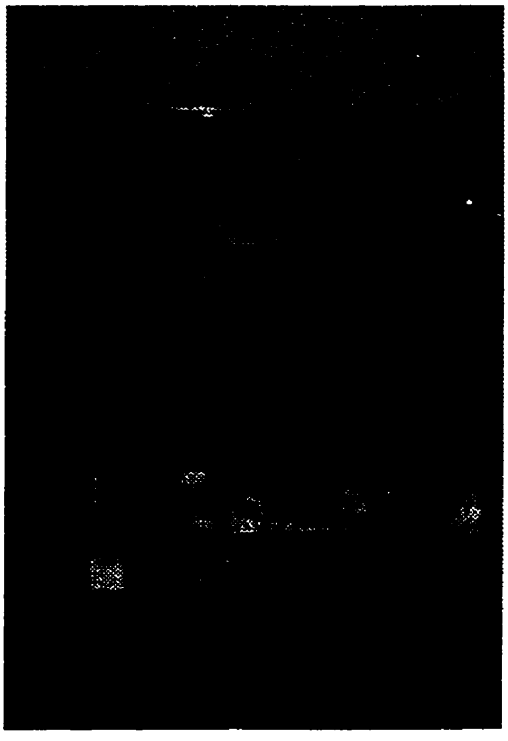


figure 62. Inside the Monkey House

figure 63. Typical Pathway

3.6.3 Habitat Imitation

There are some elements of the animals natural habitat integrated in most of the enclosures at the Assiniboine Park Zoo. The Tropical House includes vegetation from tropical areas reflecting the regions the birds come from. There are many layers of planting here, from a herbaceous layer to towering trees. There are also pools of water, and ponds. The Kinsmen Discovery Centre also has a good example of habitat imitation. The Meerkats enclosure includes elements such as elevation gradients, molding, plants, wood chips, water, sounds, and other elements of their natural habitat.

Some less successful enclosures at the zoo are ones that include some form of habitat but fall short in their presentation. The Camels are displayed in an enclosure with sand, which of course is somewhat reminiscent of the desert. Surrounding this is a two foot concrete drop from their stage into an environment that looks more like the Canadian shield, complete with rocks, junipers, spruce and a aspen stand. Mixed messages such as this are not uncommon at the zoo. An example is the Caribbean Flamingo enclosure. Here you will find Caribbean Flamingo mixed in with Hawaiian Geese and Mandarin Ducks. These are unrelated species, except for their love of water. All that is found here are two sterile ponds supplied for their use. The vegetation in this enclosure is plentiful but does not mimic their natural habitat. Included are Oak, Elm and Spruce trees with typical suburban turf grass.

figure 64. Camel Enclosure

figure 65. Flamingo Enclosure

3.6.4 Behavior Enhancement

The Tropical House which was already discussed not only includes exotic plants but also includes a variety of behavioral opportunities. Physical features in this enclosure promotes the birds to walk, fly, wade in water and to build nests from scavenged sticks which results in a very lively enclo-

sure. The Discovery Centre is a very active space as well due to habitat enhancement. It seems then that often habitat imitation directly benefits the animals activity level as well. The Meerkats for example are a wonderful example of habitat and behavior enhancement. Habitat imitation elements diversify their space and promotes many activities that they partake in in the wild. Visitors will see them chewing on sticks, standing on lookout duty, climbing, and digging.

figure 66. Kinsmen Discovery Centre

Display of animals as close as possible to their proper distribution and natural combinations would be advantageous not only to the animal but to the visitors learning possibilities. The Pronghorn for example live in herds. They also interact with a variety of species much like any animal. At the Assiniboine Park Zoo the single male Pronghorn is in its own enclosure nowhere near the Bison or other associated animals. The Bison are kept in an enclosure with the White-Tailed Deer. They are supplied with grasses for grazing, and this is the extent of their behavioral enhancement. To improve the animals' lives and defeat possible boredom, more behavioral needs must be met.

3.7 Results of the Questionnaire

The questionnaire was issued to the following Zoos in North America asking them about their Bison enclosures. (refer to the appendices for a copy of the questionnaire) Questionnaires that were returned are indicated with a bullet .

- Assiniboine Park Zoo
  Winnipeg, Manitoba
- Jardin Zoologique de Granby
  Granby, Quebec
- Jardin Zoologique du Quebec
  Charlesbourgh, Quebec

•Metropolitan Toronto Zoo
Scarborough, Ontario
Brian Hart
Bowmanville, Ontario
•Minnesota Zoological Garden
Apple Valley, Minnesota
•Dakota Zoo
Bismarck, North Dakota
Bronx Zoo Wildlife Conservation Park
Bronx, New York
•Buffalo Zoological Gardens
Buffalo, New York
Denver Zoological Gardens
Denver, Colorado
San Francisco Zoological Gardens
San Francisco, California
Abilene Zoological Gardens
Abilene, Texas

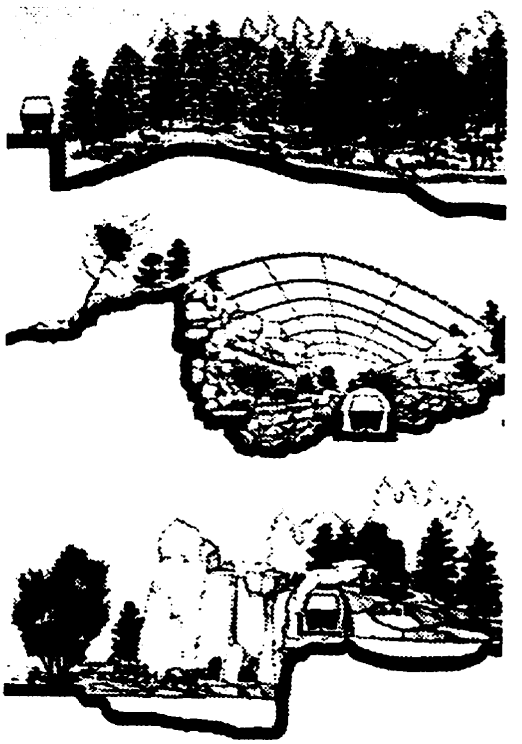


figure 67. Northern Trek Exhibits, Minnesota Zoological Garden

The responses from the questionnaire proved to be helpful as a comparison of physical features. The Assiniboine Park Zoo's Bison enclosure fared somewhere in the mid range in terms of the size of the enclosure. Conversely the size is relatively larger when considering the square footage per Bison. Here, the Assiniboine Park Zoo's Bison enclosure is 35 839 sq.ft. per Bison as compared to the average at 28 494 sq.ft. per Bison. The Assiniboine Park Zoo falls a bit below the average when considering all the animals in the enclosure. The Dakota Zoo was favorable in this analysis as it scored well above the average and was by far the largest Bison enclosure with the most sq.ft. per animal (106, 667 sq.ft.). This large amount of space is not necessarily needed for the animal's physical and behavioral needs. Therefore this figure may not be of concern if the space provided consists of needed elements and utilizes the entire area more effectively.

The most common activities the Bison engage in are grazing, rubbing, wallowing and walking. Few of the zoos provide ponds or water moats for the animals to wade in (which is a natural activity for the Bison in the wild). Some negative activities that have been observed by the Jardin Zoologique du Quebec and the Metropolitan Toronto Zoo are what they refer to as abnormal aggression, lethargy and poor appetite. Most of the respondents left that question blank either due to the animals stress being non existent, or the reluctance of the respondents to reveal any negative information.

figure 68. Bison

Habitat features were also surveyed in the questionnaire. Most zoos use grasses for grazing as the major ground cover. In addition to this there is little vegetation listed, and that which was, was mostly native trees and ornamentals placed without any apparent sensitivity to the animals natural habitat. Some exceptions to this would be the Metropolitan Toronto Zoo, the Dakota Zoo and the Minnesota Zoological Garden which were among the larger zoos in the survey. All of these claim to have Bison enclosures either nestled in the trees or a variety of appropriate plants in the enclosure. Yet all the zoos claim to have features such as buildings, fences, cement walls, and openness that hinder their natural appearance. The Minnesota Zoological Garden, the Metropolitan Toronto Zoo and the Assiniboine Park Zoo are the only zoos in the survey that include at least one more animal species in their Bison enclosure. Included are White-Tailed Deer, elk and Pronghorn.

When asked if there are any unique features that make their Bison enclosure a success, most zoos responded with the amount of viewing areas available for the visitor. The Minnesota Zoological Garden mentioned the large bowl shape of the exhibit, and the fact that all areas are in view to the public. Also a prairie dog exhibit is situated adjacent to

the Bison enclosure. Large herd sizes characteristic of Bison in the wild were pinpointed as a unique feature at the Metropolitan Toronto Zoo. The herd number is nineteen Bison, certainly the largest surveyed.

Finally, none of the zoos claim to have any cultural or historical enhancement elements incorporated into their Bison enclosures despite the strong significance of this animal to the American prairie.

figure 69. "The Dream", Henri Rousseau

C O N C E P T

The Assiniboine Park Zoo is in an era of change despite many economic and organizational restraints. The Zoo Director, zoo staff and the Zoological Society of Manitoba are actively seeking out new directions for the zoo and its collection of animals. Therefore this is an opportune time to discuss the cohesiveness of the Assiniboine Park Zoo and its new "**vision**".

During the analysis and research stage it became obvious that a vision for the zoo could only be successful if every subsequent decision made would conform to this vision and move forward within this mandate or strategic plan for the future. Therefore, before discussing the Bison Prairie in detail, a few words must be made about the zoo as a whole entity and how the different parts fit in. In essence the Bison Prairie is a prototype or a model which exemplifies how other enclosures can be implemented throughout the zoo.

Planned organization of the zoo would enhance the theme or concept established. The Assiniboine Park Zoo has traces of a zoo geographic theme but notwithstanding misplaced animals and a mixture of sub planning themes. Cohesiveness of the zoo would be greatly improved if the geographic areas were sub-divided into a number of zones, representing the different eco-regions or habitats. The North American region for example would include zones such as the Prairie, Northern Tundra and the Boreal Shield environment. In this vision information about habitat and ecological areas are interdependent with the animals that live there. This would be a movement toward relating a more holistic story describing the animal and its habitat than what is typically seen in zoos. "By enabling us to observe these animals going about their lives much as they would in the wild, it is reinforcing the understanding that wild animals and wild habitats are inseparable, that preserving endangered species means preserving the habitats in which these species live" (Powell 1997).

Considering the cold climate of Winnipeg, Manitoba the vision for the Assiniboine Park Zoo in this study is to focus on cold climate animals. Not only would this allow focus on local or regional animals which are acclimatized to Winnipeg winters and thus easily cared for , but interesting partnerships could be created with other continental cold climate areas such as central parts of Asia, Russia, and Scandinavia. The Assiniboine Park Zoo could over time, begin to create a niche of its own as a northern climate zoo. This would in effect attract visitors to the zoo by virtue of it being a unique place of study and interest. Animals having particularly interesting winter habits would attract winter visitors, an especially appropriate time to draw on people in Winnipeg, Due to the lack of winter activities as was dis-

cussed in the "Assiniboine Park Zoo, History" section in the document (2.2.2). Appropriately this approach would have a strong regional expression, but at the same time fulfill peoples insistence for the inclusion of exotic or popular animals.

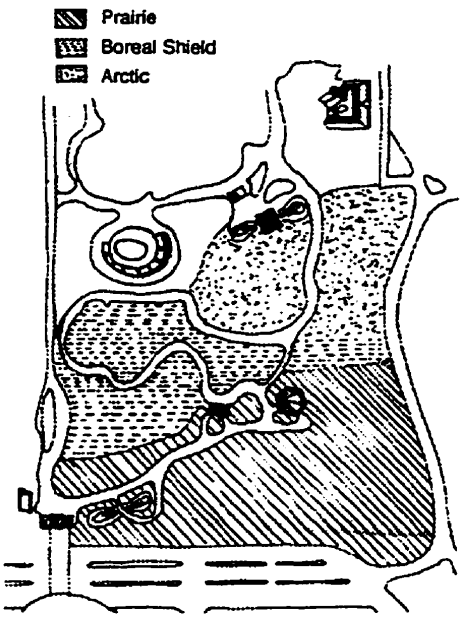


figure 70. Proposed Organization of Zoo

4.2 Design Approach

The Bison Prairie will be just one eco-region in a series of habitats representing Canada. Passage between one eco-region to the next will mimic natural secession. The prairie eco-region at the beginning of the path will lead one toward the invading aspen park land and then on to the boreal shield. Transition zones or ecotones will be perceptible as in nature. This will set the stage for all the actors and their props. Not only will the animals animate the space but so will all the visitors who will be an integral part of the story line. The site will express a certain time, place and date that is significant to the prairie and its inhabitants.

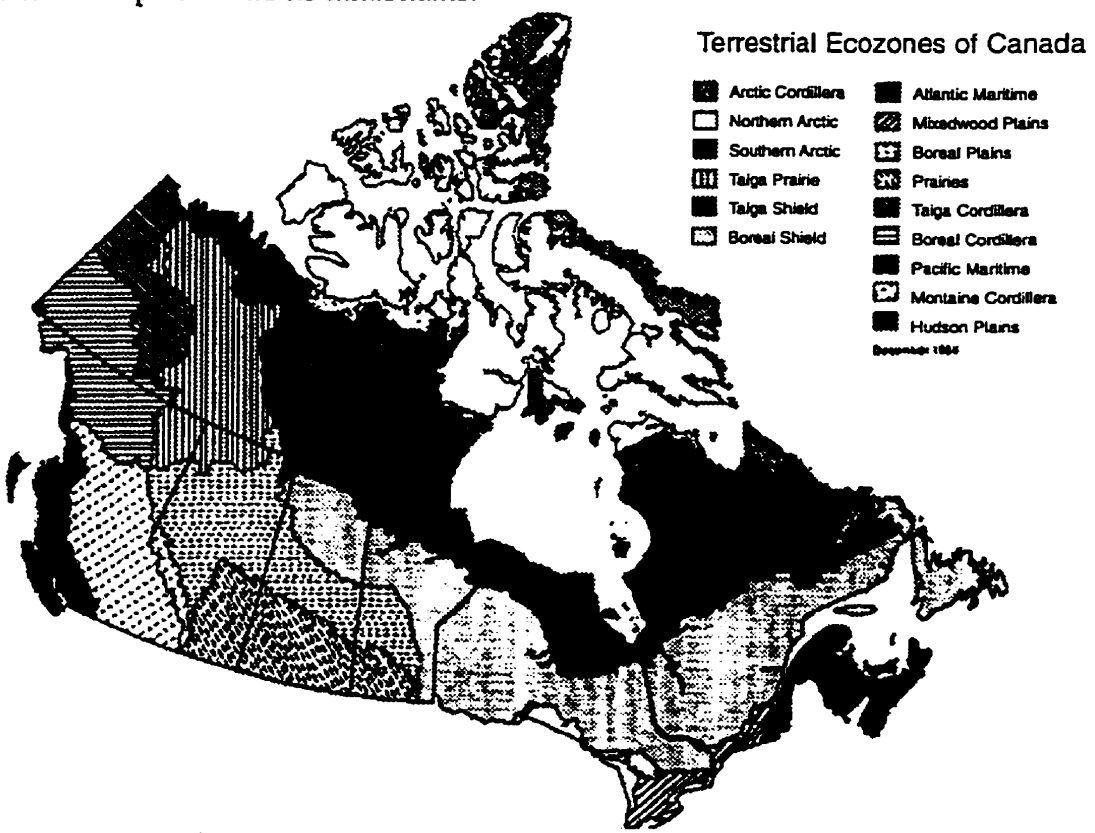


figure 71. Terrestrial Ecozones of Canada

figure 72. Purple coneflower

DESIGN INTENTIONS

The Bison Prairie is intended to be a representation of the prairie eco-region. Not a place, but a place in time, when the Bison was the staff of life for all living things on the prairie.

Interpretation and understanding of the site is partially the visitor's responsibility. Here they will find many ideas represented through written words, visual connections, and, of course, personal reflection.

In this section are the layers of information that drove this study and the design. The information materializes in different ways for people to discover in their own time.

The Prairie to many people is a wonderfully romantic place deep with a history of survival, endurance, and even defeat. The people who lived on the land are made out to be heroes for simply existing in this cold and inhospitable place. Who were these people who have been glamorized by the movies and television and what was their relationship and affect on the prairie? They are just as much a part of the story of the Prairie in Canada as the Bison.

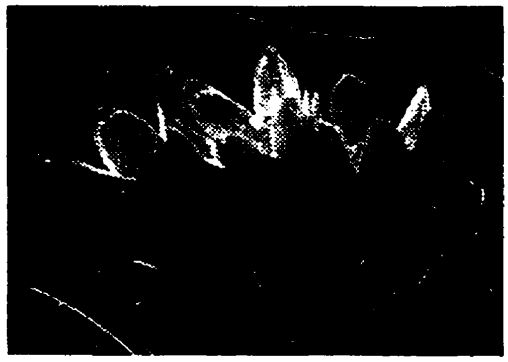


figure 73. Prairie Crocus

5.1.1 Native People and the Buffalo Culture

The Native People on the Prairies were nomadic, following the migration patterns of the Bison. They traveled in hunting parties where the men and boys would hunt the great Bison and the women would prepare the meat and skins for their appropriate use, such as food, shelter, clothing, and tools.

I go to kill the buffalo.
The Great Spirit sent the buffalo.
On hills, in plains and woods.
So give me my bow; give me my bow;
I go to kill the buffalo.
Sioux song
(Daly 1974, 52)

At these temporary camps many rituals would take place. The Bison were the center of the native people's life. The native people's existence and way of life was dependent on the Bison. They believed the Bison to be a spiritual force at the center of their religious beliefs. Hunting and consuming Bison were religious rituals. Every part of the animal was consumed for food, clothing and many other artifacts; any waste would be sacrilegious.

Seldom before in the history of mankind had one species shaped the life of a people as totally as the American buffalo influenced the way of the Plains Indians. Brought into intimate rapport with the tribes through their dependence upon him, the buffalo became a cherished symbol. His appearance and movements were poetically described. Parts of his body were valued as charms or sacrificed to spirit powers. He figured in dances, superstitions, taboos,

Figure 74. Bison Killing

societies, visions and cures....In short the buffalo was worshiped-as no other animal was ever worshiped in the Indians' domain (McHugh 1972, 110).

The buffalo dominated all phases of the Plains Indians' life: their thinking, their philosophy, their religion. The Indians followed the buffalo within their tribe's generally accepted territorial limits, for during the late summer and fall the animals transformed some tribes into nomads as they hunted the Buffalo (Dary 1974, 54).

In the camps great ceremonies surrounded the hunt. Hunting the buffalo was no easy task and took young boys many years to master. Hunting patterns varied depending on the lay of the land. On flat expanses of land the hunters would hide alongside the buffalo herds shooting them with bows and arrows. In later years they would hunt atop swift horses. Another technique would be to herd the Bison through narrow corridors that opened up into large open areas. These areas were often carved out of the forest and secured with temporary fences. When there was an opportunity of a large cliff, they would simply lead the Bison over the edge where they would plummet to their imminent death. This was called the "Buffalo jump".

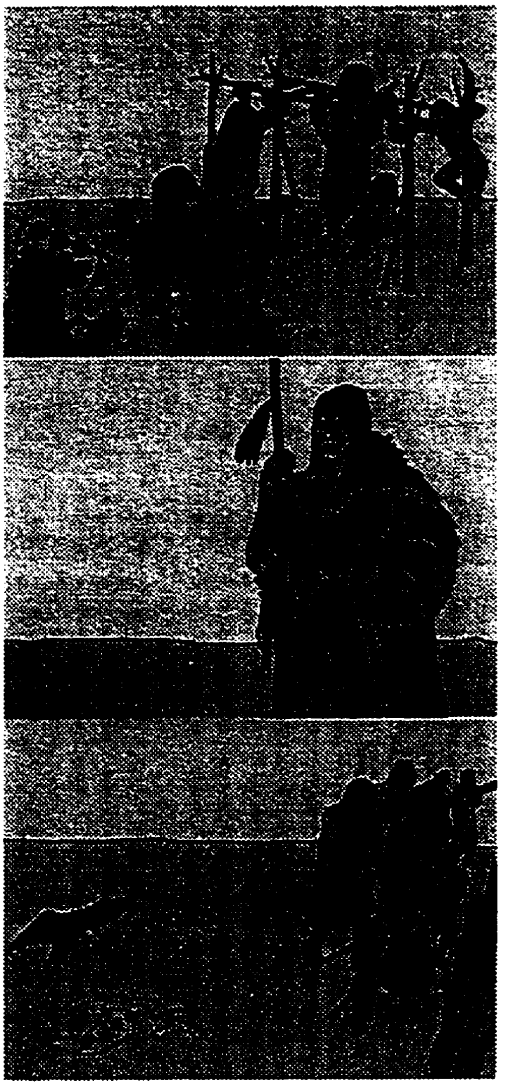


figure 75. "The Staff of Life"

As their predator, the natives invented many techniques to capture this animal. Maintaining a balance was always respected due to their reverence of this animal and the difficulty of the hunt. The native people intuitively engaged in a relationship with the Bison that was the perfect ecological scheme. With the introduction of the rifle by early white explorers and settlers they began a new phase.

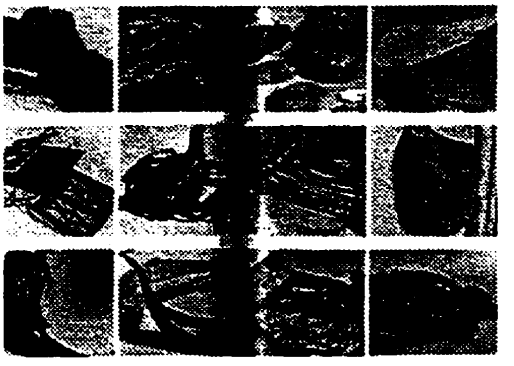


figure 76. Objects From the Parts of the Bison

As McHugh notes:
For centuries before the white man set foot upon the continent, the great herds had been coexisting with the Plains Indians in a rare balance between nature and man. The

Indian societies lived harmoniously and respectfully with their environment, taking what buffalo they needed for food and shelter, gearing their rhythms and rituals-their entire mode of life-to the ways of the roving herds. In this ecological scheme of the primitive American grassland, the Indian was a prominent partner in the natural community, a predator, one might say, who harvested a share of buffalo as methodically as the wolves that also stalked the open plain. In the legends the Indian wove about the herds, in the countless artifacts he manufactured from the hides and horns and hoofs of the animals, in his constant and varied use of buffalo meat, in his understanding of buffalo as a spiritual force of his prairie world, he maintained the close relationship between man and beast. In short, the Plains Indian culture was the buffalo culture (McHugh 1972, xxii)

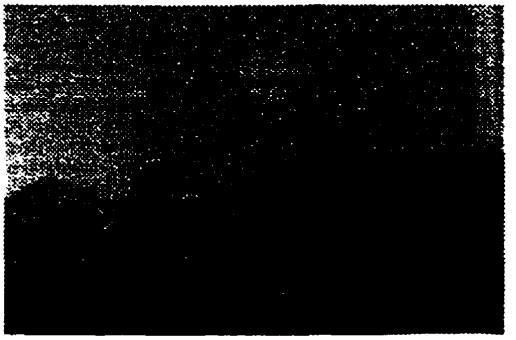


figure 77. "The Buffalo Hunt Chase"

The vision for the Bison Prairie at the Assiniboine Park Zoo is to relate this balance or relationship through a combination of information panels, displays and artifacts. Re-creation of a native camp and buffalo jump will be key in the design of the path through the prairie. These nodes will be places that people can either stop to reflect on the information delivered or continue on the path. They will provide a wonderful opportunity for educational and activity programming at the zoo. Involvement of the native community of Winnipeg at the outset would add to the quality of programming and potential interest for visitors. The native camp could serve as an overnight or day camp for children as well, where they can learn about the natives' traditional way of life first hand. A great depth of information would be available, but organized in such a way to be both conducive to short visits and detailed study. Different rituals could be reenacted at the site such as that of the buffalo rocks:

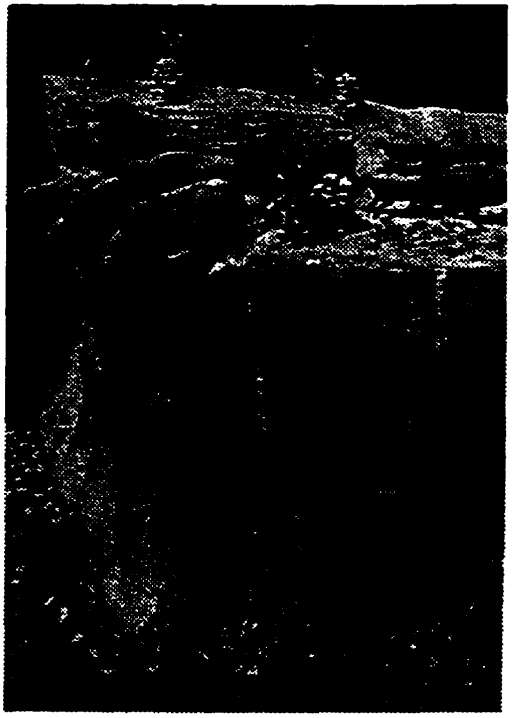


figure 78. Buffalo Jump

Among the Blackfoot and the Hidatsa, it was said that supernatural power for controlling the herds was invested

in iniskim, or "buffalo rocks," special trinkets that derived their magic from a resemblance to people or animals. The Iniskim were usually painted red, swaddled in a nest of buffalo wool, and wrapped in the skin of an unborn calf. Each bundle was then encased in a fringed pouch along with two bags of paint included for their purported magic. The pouch hung on a tripod behind the tipi, where tribute was paid morning and evening with a smudge of sweet grass.

The buffalo rock ritual was only one aspect of the complex repertory of charms, superstitions, and ceremonies brought into use before each hunt. The proceeding emphasized that the hunt was less a sporting venture than a solemn undertaking controlled by the supernatural (McHugh 1972, 52).

5.1.2 Early European Settlers

Early european settlers were amazed by the beauty of the prairies, largely uninhabited except for the endless herds of Bison. They were witness to the delicate balance between humans and beast and their impressions were recorded in endless journal entries.

Travel the buffalo trail, it's the best route.

Frontier advice
19th century
(Daly 1974,180)

This was a time when the early european settlers were only explorers not colonizers who would later change this relationship forever. Their presence marked the beginning of the Bison's impending doom.

figure 79. Pioneer with Bison Calves

Traveling through Canada and the United States was laborious- horses and drawn carriages were the only mode of transportation. The simplest passage through this country was following the Bison's migratory routes. It was along these routes that the country was first explored.

Visitors to the Bison Prairie at the Assiniboine Park Zoo will be transported back to this time in history. They will enter the path by way of the wagon trail and assume the role

of the Early European Explorers. The visitor will view the Bison Prairie in this role - an outsider looking in, at a time predating colonization. Thus the visitor is an actor in a story laid out by use of the path and nodes.

When the wagon teams advanced along the trail, the droves (of buffalo) quietly separated to right and left, leaving a lane through which the men could travel, a space within the herds that shifted westward with the caravan as it steadily pushed across the prairie (McHugh 1972, xxii)

Especially when the soil is moist, the travels of the massed herds may impress distinct paths in the earth. These incipient routes are then broadened and packed with each successive trek, until they are virtual wilderness highways. It was such roads that proved indispensable to early wagon caravans (McHugh 1972, 234).

5.1.3 Extinction

A cold wind blew across the prairie when the last buffalo fell... a death-wind for my people.

Sitting Bull
19th century
(Daly 1974,93)

From herds as far as the eye could see to rumors of a Bison here or there was the extent of their dramatic near extinction. Thankfully, the buffalo has been securely saved from possible extinction. The rescue began in earnest in 1905, when a group banded together to form a society to save the diminishing herds. Today buffalo number over thirty thousand and are increasing so steadily that reduction of herds are necessary to keep the animals in balance with their range.

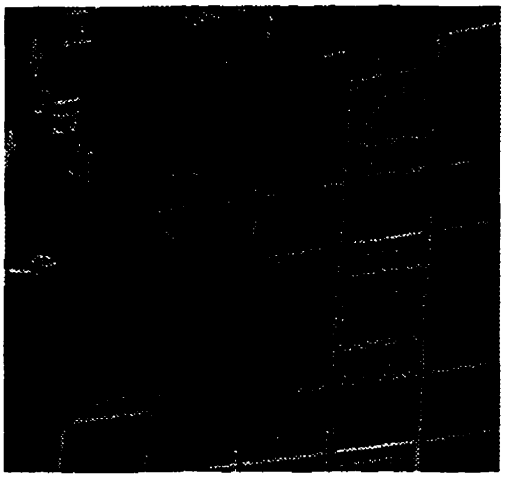


figure 80. Buffalo Stew

After early exploration of North America, Europeans came in droves, opportunists seeking fortune by the sweat of the natives. They introduced cigarettes and alcohol to the native population tempting them to change their moderate hunting techniques and hunt on mass. Millions of Bison were killed due to the greed of these opportunists. The native population became slaves to alcohol and with that gave up their

traditional lifestyle. They killed the Bison for these early white settlers, leading to the Bison's near extinction, the destruction of the prairie and of the native Bison culture.

figure 81. Dead Bison

The prairie was sustained by frequent fires started by the natives - used to herd Bison. Also, frequent trampling and seeding through use of Bison manure defended the prairie from the invading aspen park land and forests. Without the Bison these activities ceased and the prairies eventual disappearance commenced.

....the buffalo, faced but one fate - certain extermination. Under a relentless tide of explorers, sportsmen, settlers, and hunters, the American buffalo was due to perish in an orgy of marksmanship.

As surely as the herds disappeared from their prairie homelands, as surely as the tribes were forced onto reservations, the plains themselves were transformed from grassy wilderness to urban and agrarian sprawl. Prairie gave way to wheat field, wheat field to shopping center. Billboards, smokestacks, and power poles now line highways and railways cared from the old buffalo and wagon trails (McHugh 1972, xxiii).

figure 82. "Before the White Man Came", Clarence Tillenius

The Bison Prairie at the Assiniboine Park Zoo relates a story and with every story there is an end and often a moral. The need for conservation will be expressed through the pathway and nodes. Information panels describing these events and how they came about will educate the visitor about this historical occurrence and hopefully promote the idea of conservation. Panels describing the interdependence of animals with each other and their habitat will reveal the importance of conserving natural areas. Through the eyes of the early european explorer hopefully visitors will begin to see how we play a part in this relationship and how we are often the cause of its demise.

5.2 Landscape Immersion

The hope is that upon entering the site the visitor will feel as if they are approaching a Bison herd on the prairie. They will have to peer through the forested edge to capture a glimpse of them. Thus the visitors will be forced to actively seek out the animals in this scheme. Manipulating them in this way would in affect cause the visitor to feel that they are in the wild and observing these animals in their natural habitat.

Vegetative screening will be crucial in the design to break up the long monotonous views into the enclosure, to hide the Bison paddock and to blur the boundary between pathway and enclosure. Earth berms will also diversify the space and create added interest. Materials chosen for the inside of the enclosure will be used on the pathway and nodes as well. Much care will be taken to insure that there are no cross views into other enclosures, maintenance buildings or the adjacent parking lot. The sunken fence barrier with vegetative screening will be placed along the periphery of the site.

Theatrical techniques such as props, artifacts, and natural land forms will also be incorporated along the path to further influence the visitors experience of the site.

5.3 Behavior Enhancement

5.3.1 Grazing, Grooming, Social Behavior and other Activities

Bison are commonly known as grazers. Most favored plants are a few broad-leaved non grassy herbs and many species of grasses such as grama, buffalo, wheat, blue, blue-joint, June, dropseed, and wind-mill, as well as several fescues (McHugh 1972, 150). Only infrequently do Bison browse shrubs or trees, unlike the Pronghorn and White-Tailed Deer who are more likely to do so. On Northern ranges tall grasses such as wheatgrass *(Agropyron sp.)*, bluestem *(Andropogon sp.)*, bluegrass *(Poa sp.)* and the smaller fescues *(Festuca sp.)* are generally preferred by the Bison.

figure 83. Bison

The site will be planted with a variety of these grasses for the Bison as well as for the other grazing animals. Rotating pastures result in better utilization of the forage with less danger of depleting the cover and less likelihood of contaminating the ground (Dary 1974, 301). Unfortunately, the size of the Bison enclosure does not permit room for such an activity.

Grooming to remove molted fur is a very important activity for the Bison. Most commonly Bison will use trees, stumps and bushes to rub against. They use also boulders, earthen banks, prairie dog craters and mounds of snow (McHugh 1972, 150). At the Bison Prairie not only will there be additional vegetation planted for this purpose but boulders will also be utilized. Another common activity of the Bison is wallowing. This is when they roll on their backs in sand or mud creating great craters in the earth.

These need also to be provided for. Some of their wallows, deeply worn into the ground, are known to fill up with rainwater and become havens for, toads, and aquatic insects, which may even breed in the stagnant pools (McHugh 1972, 234).

figure 84. Bison Wallowing

Similar to most grassland species Bison travel in herds. Their social behavior has been contributed to the fact they have a n abundance of food on the prairies. The Bison are so social that they even perform daily activities together such as; grazing, loafing and cud-chewing (when the hastily swallowed grass is brought up, portion by portion, to be broken down more completely in a second chewing). Their day usually consists solely of these activities. Communication amongst the Bison occurs through chatter and grunting to warn of danger. The rutting season is between July or August. During this time groups of cows clump together into larger herds. Presently the Bison enclosure contains only two Bison, this is nowhere near their natural numbers. For the Bison to appear and exist closer to their natural state more Bison will have to be acquired.

5.3.2 Seasonal / Outdoor Needs

Bison thrive best where they are not closely confined. Large, open, grass pastures with a plentiful supply of clean, fresh water are best adapted to their needs. Although shade may not be an absolute survival requirement, herds may spend many mid-summer hours in the shade where available. Also, the presence of trees or large rocks adds to their well-being by providing rubbing sites (Dary 1974, 300).

Intensive planting is planned in this design scheme, as well as berming. Not only will these provide shade, comfort and interest but will also allow the Bison to hide from observation at will. This is an important psychological element that makes a relatively small space habitable for these animals.

One of the saddest sights today
Is watching a buffalo cow chew baled hay,
In a pen, in a zoo, like a sardine can;
It's a lump in the throat of an outdoor man.
J.R. Williams 20th century
(Daly 1974, 241)

The prairie habitat specific to the Manitoba low lands is a mosaic of Trembling Aspen, Oak groves and rough Fescue grasslands. The eco-region is much more complex than this it is a web of mammals, birds, insects, and plants all inter-dependent and important to the survival of the prairie.

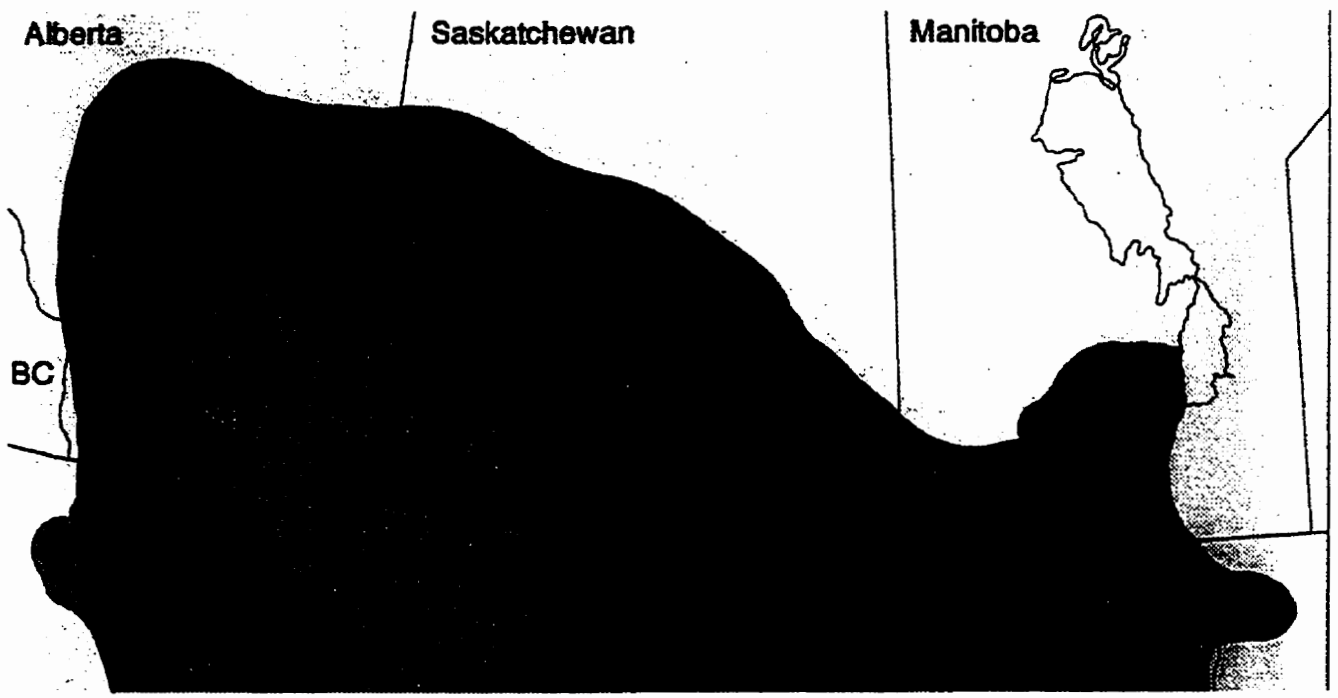


figure 85. Location of Prairie in Canada

The Bison Prairie will attempt to resemble this by including diverse species native to the prairies, both flora and fauna. Flora such as; Trembling Aspen *(Populus tremuloides)*, Balsam Poplar *(Populus balsamifera)*, Bur Oak *(Quercus macrocarpa)* and some climax species included in the ecotone between the Prairie and the Boreal Plains and Shield area such as; White Spruce *(Picea glauca)*, and Balsam Fir *(Abies balsamea)*. In addition, native shrubs such as Hawthorn *(Crataegus sp.)*, Hazlenut *(Corylus americana)*, High Bush-Cranberry *(Viburnum trilobum)* and many other species are found in the ecotone. Grasses (already mentioned) and wild flowers were once the dominant species in the long grass prairie and should be included in the design of the enclosure area (see appendix 7.4 for a plant list). Periodic controlled fires are important to maintain the prairie. This activity returns nutrients to the soil, clears away dead vegetation and other debris that inhibits grass growth and will kill tree seedlings. Some grass seeds need the intense heat of fire to germinate. These controlled fires could become an annual event that the Assiniboine Park Zoo hosts for visitors. Areas besides within the enclosure could be used for this purpose. The fauna in the Bison Prairie will include Bison, Pronghorn, Mule Deer, Burrowing Owl, Richardson's Ground Squirrel and whatever other animals join in to make this site their home.

Oh, give me a home where
the buffalo roam,
Where the deer and the
antelope play,
Where seldom is heard a
discouraging word,
And the skies are not cloudy
all day.

Brewster Higley
1873
(Daly 1974,279)

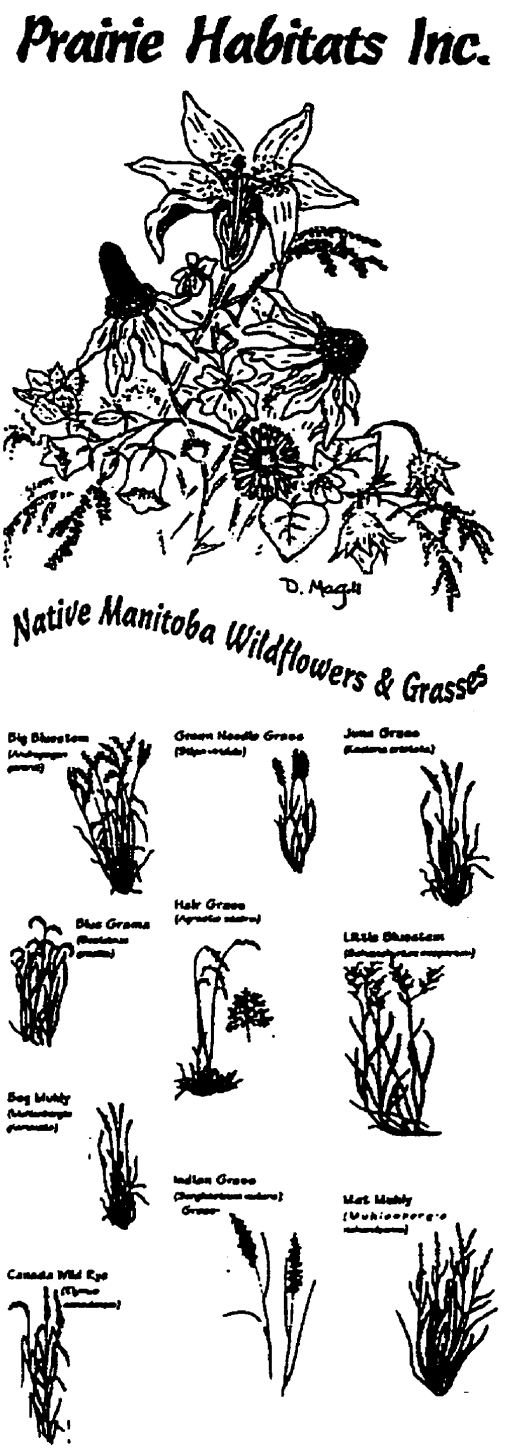


figure 86. Prairie Plants

Following are descriptions of the fauna that will be introduced into the Bison Prairie:

- Pronghorn

The Pronghorns top speed of fifty-five miles an hour makes it the fastest mammal on the continent. With its keen, wide-ranging vision it can spot approaching predators and observe the warning signals of nearby Pronghorn. In time of danger, the stiff hairs on the rump of a Pronghorn bristle and rise, becoming a broad patch of white. Like flashing mirrors, these rump-puffs telegraph signals across the plains, enabling distant Pronghorn to discern danger and relay the alarm (McHugh 1972, 219).


figure 87. Pronghorn

Pronghorn as well as the Mule Deer and less so the Bison enjoy higher ground. They also enjoy foraging on brush and tree branches. The Bison Prairie will include some of these diverse gradients of elevation and vegetation to accommodate this animal.

- Mule Deer

Historically the Mule Deer grazed alongside the Pronghorn and Bison on the prairie, therefore they would be an important animal to include in this enclosure. Presently White-Tailed Deer share this space with the Bison although their natural habitat is the forest and forest edge. In keeping with the historical theme established the Mule Deer will replace the White-Tailed Deer as the true inhabitant of the prairie.

- Richardson's Ground Squirrel

The ground squirrel lives within the most elaborate of all social colonies on the plains. Each colony is divided into a complex of wards and precincts, whose separate borders are strictly respected and whose members form their own closed societies, communicating with each other by means of an efficient system of gestures and calls. When an indi-


figure 88. Richardson's Ground Squirrel

vidual spots something suspicious, he gives a sharp bark that immediately sends all nearby squirrels scurrying into the closest burrows. After the danger subsides, the first animals to emerge rise up and wheeze an all-clear signal, and the colony returns to its normal pursuits.

The Richardson's Ground Squirrel will be given a home adjacent to the Bison Prairie and will act as one of the nodes along the path. Here visitors will be able to visually connect the ground squirrel with the associated species. Information about the animals relationship will be also supported by interpretive panels. Following is the story of the ground squirrel's relationship to the Bison.

The busy activities of the ground squirrels transform their towns into plots of barren earth or non-grass herbs, two types of terrain that are highly attractive to buffalo searching for spots to wallow or graze. The worst damage occurs when a buffalo bull spots the provocative slope of a ground squirrel crater, a ready-made wallowing place. Walking deliberately up to the mound, he paws it, pierces its crumbly rim with his horns and lies down to roll in the loose earth, flattening everything in a cloud of dust and a cascade of soil, sometimes even choking off the entrance to the burrow. When the bull departs, the harried owner surfaces to take stock of the damage. Bravely he commences repairs, reopening the entrance and diligently shaping the mound again (McHugh 1972, 223).

- Burrowing Owl

The Burrowing Owl is some what of an opportunist invading the homes of the ground squirrels. Ground squirrels laboriously dig their complex burrows only to be confronted and shoved aside by numbers of raiding owls or rattlesnakes. Ground squirrels often lose their young during this confrontation- the Burrowing Owl is known to consume them (Gomes 1997).

figure 89. Burrowing Owls

D E S I G N

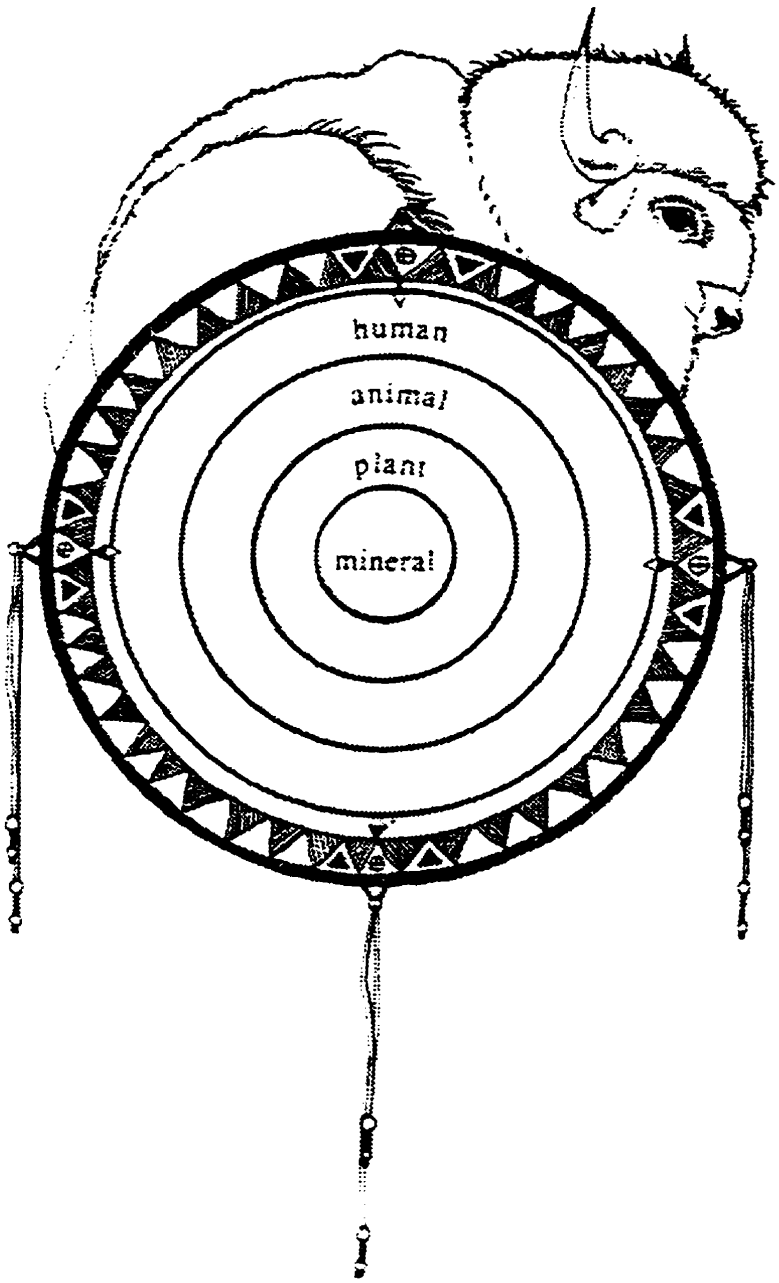


figure 90. The Medicine Wheel

S t o r y L i n e

It was a time in the prairie when white people were seldom seen and there was a rare balance between nature and humankind. The natives lived a moderate existence, in keeping with their needs only. They as well as the coyotes fed on the Bison. They stalked him from behind waiting for a vulnerable moment. The Bison was the staff of life for the natives in this vast land. The Natives, aware of the beast's greatness, consumed all of the animal. It was their ritual to do so. They understood him to be a spiritual force of his prairie world. The Bison was a key species in the ecology of the prairie.

The first white explorers would be astounded by the wild, rugged, natural beauty of the prairie. A place formed by whips of fire, gusting winds, and the heavy foot of the Bison. The explorers traveled in wagons along the most logical trails, the Bison's migratory paths. Here the explorers encountered thousands of animals and fewer humans feeding off the animals abundance. The explorers bore witness to the many lessons that could be learned here. Hunting the beasts was no small affair for the natives. The natives traveled alongside the Bison, camped and watched the animal until finally the natives participated in religious ceremony in preparation to ultimately kill the Bison.

The migration of these animals and prairie fires started by the natives stopped the invasion of the aspen park land into intermittent grassland that the Bison, Deer and Pronghorn grazed on. Many lessons can be learned from this age - the delicate balance between all living things and the special inter relationship that allowed for the Bison to prosper.

figure 91.

On entering the Bison Prairie of the North American Region from the south gate, the visitor is oriented by an information island with directional signage. The signage is unique to this enclosure area as it borrows from native art and symbols.

The first node on the path is an early white settlement complete with a caravan and a few buildings or shelters that can house a variety of interpretive and commercial elements such as maps of the new frontier land, concession stand, arts and crafts display and workshop, and even an old style photo studio. The visitor will stop here to take their photo, look at maps, rent a caravan and prepare to depart on their exploration of the Bison Prairie. This node sets the time and place for the visitors allowing them to take on the role of the early white explorer. Here begins the introduction of the cultural aspects of the prairie.

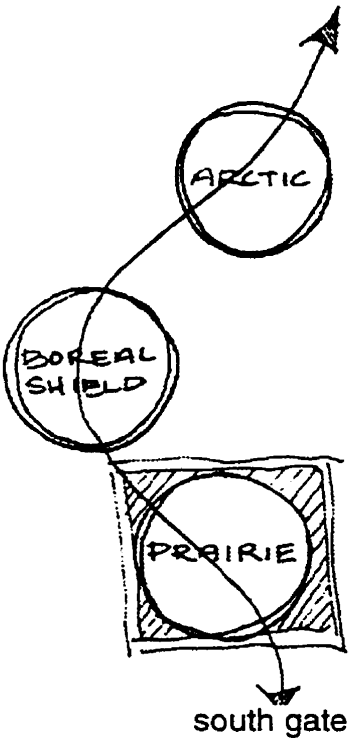


figure 92. Concept for North American Region

Adjacent to the settlement is a crossroads with interpretive signage. It is suggested that the settlers take the wagon trail following the bison migratory path as it is the best route. Along the stone dust path they come to a bridge crossing a stream. Down below they see a native camp setup beside the stream. The camp reveals many elements of native life, and the site can be used for a large range of activities from an interpretive node to an overnight children's camp. The camp includes tepees, fire pit, frames for stretching hide and other tools used to treat the hides. Surrounding the camp, plant material reminiscent of the aspen park land would be planted except for near the stream where river bottom plants would be utilized.

After crossing the bridge the visitor approaches the first lookout into the Bison enclosure. There are two such look-

outs framed by the vegetation on the path. The plants are used as a linkage and buffer between the visitor and the animals. On the path that surrounds the enclosure, the vegetation is reminiscent of the aspen park land which encroaches into the enclosure as well. Here a transition occurs from aspen park land to mixed grass prairie found further inside the enclosure. Interpretive panels introduce the flora and fauna of the prairie. Inside the enclosure there are berms and trees laid out in such a way as to break down the space and the views into it. This as well will supply the Bison and other animals with places to escape from view. To insure periodic visibility of animals by the visitors, attractive elements and objects of behavioral needs such as 'rubbing stones' are strategically placed within view of the visitor. At this node in particular a 'drinker' or water source for the animals is placed in view of the visitor.

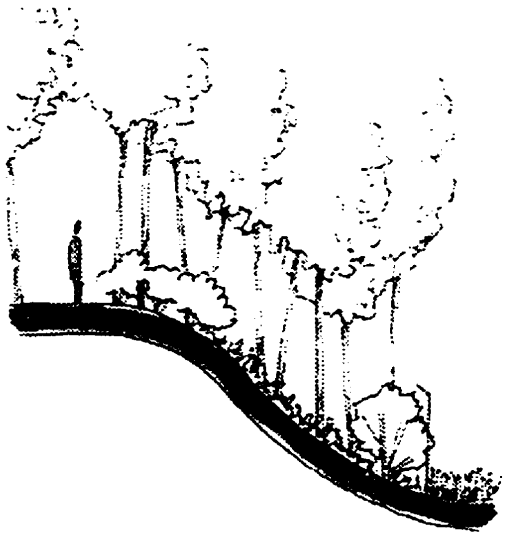


figure 93. Look-out

Interpretive panels quoting early witnesses of the prairie are placed around the site to give the visitor a feeling of how it once existed. Following is an early chronicle of the prairie by the zoologist Joel Allen in 1871.

There is such a quantity of them that I do not know what to compare them with, except the fish in the sea...
...numerous as the locusts of Egypt... they were crowded together so densely that in the distance their rounded backs presented a surface of uniform blackness.
We could not see their limit either north or west.
The plains were black and appeared as if in motion...
The country was on robe.
(McHugh 1972, 14)

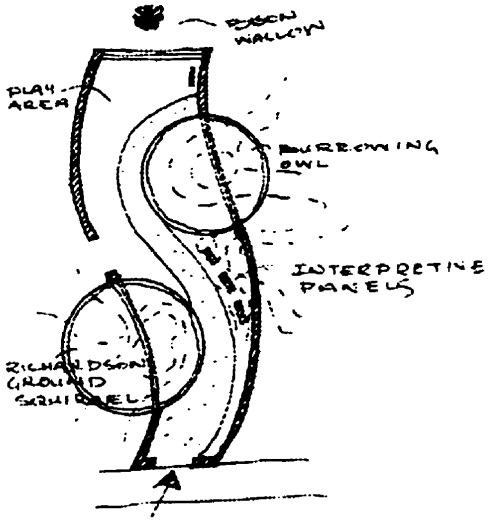


figure 94. Burrowing Animals Complex

The next node on the path is the burrowing animals complex. This complex serves as an indoor facility affording winter views into the Bison enclosure as well as housing the Richardson's Ground Squirrel, the Burrowing Owl, smaller insects and an interpretive children's play area.

The building is unique because it attempts to fuse with the landscape. The undulating prairie grass roof mimics the existing bermed cliff on the north side of the site. On entering the building one feels as though they are moving inside a land form. The Richardson's Ground Squirrel enclosure can be viewed from inside or outside the building, it is split by a plexiglas wall so as to transcend any visual borders. This plexiglas wall has a sliding door to allow or restrict the animals movement in or outside the building. The building interior is landscaped so as to echo the undulating landscape outside the building. The pathway inside serves as a slice through the otherwise continuous landscape. Ground Squirrels prefer sloping landscapes for their burrow, so this treatment is appropriate.

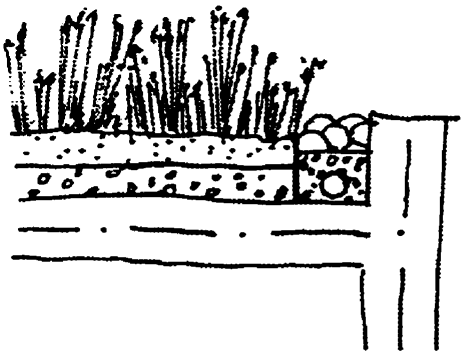


figure 95. Grass Roof

During winter hibernation the panels on the side of the enclosure will inform the visitor of the animals habitat. The plexiglas wall which slices through the landscape will include a view of the ground squirrels burrow beneath the earth. Information about the soils on the prairie can also be showcased. The Burrowing Owl's enclosure will house an exterior area as well. This will be a fly area for birds with a standard steel netting containing it. Descriptive panels will also be utilized on the side of their enclosure. Smaller insects will also be on display adjacent to these two animal enclosures.

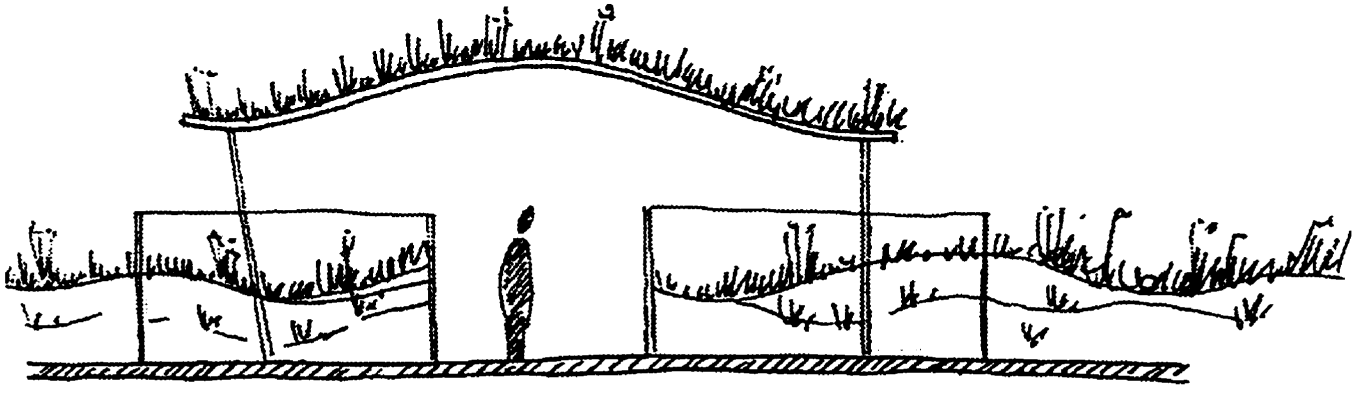


figure 96. Continuous Landscape

A transition takes place beyond this part of the building. The building slopes down onto the existing south slope of the berm. This area consists of an interpretive play area that reveals to the visitors the perspective of the Ground Squirrel and in essence its relationship with the Burrowing Owl and Bison. (see Section B.B.& A.A.)

To define this transition a large earthen mound crosses the pathway. Here the visitor may continue along the path into a large burrow that leads the visitor to the play area, or one can enter the lift that connects visitors to the children's crawl area for a unique lookout into the Bison Enclosure.

Adjacent to the large berm is the entrance for younger visitors to an interpretive burrow crawl space that tunnels around the back of the building revealing unique views into the Burrowing Owl and Bison enclosure. The crawl/play tunnel is a burrow that reveals the habits of the Richardson's Ground Squirrel through the seasons, beginning with winter hibernation. The entrance to the burrow is a hibernation den, with panels in the den depicting Ground Squirrels in their slumber. The visitor can then crawl into the burrow (tunnel) which connects with the lookout and lift. Interpretive panels explain what a Ground Squirrel colony is, and various individual chores squirrels perform such as being on watch for any predators or approaching danger. The lookout strategically faces out onto the Burrowing Owl and Bison enclosure. Panels describe how the Burrowing Owl will steal their burrow and worse, possibly feasting on the squirrel. (see the building plan)

The crawl space allows the young person to make choices as they crawl around to escape from the Burrowing Owl or to continue on the journey learning more about the animals as they go. For example the crawl space winds past views of the Bison and interpretive panels describe that animals relationship to the Ground Squirrel. The final exit connects

the visitor to the "Itchy Back" wallowing area. The children's play surface is molded into wallows and burrow entrances, here one can view into the Bison enclosure at Ground Squirrel height. A sand pit is strategically placed in view of the building so that Bison will wallow here to complete the connection. A burrow is constructed to tunnel right into the Bison enclosure and the Burrowing Owl enclosure as well.

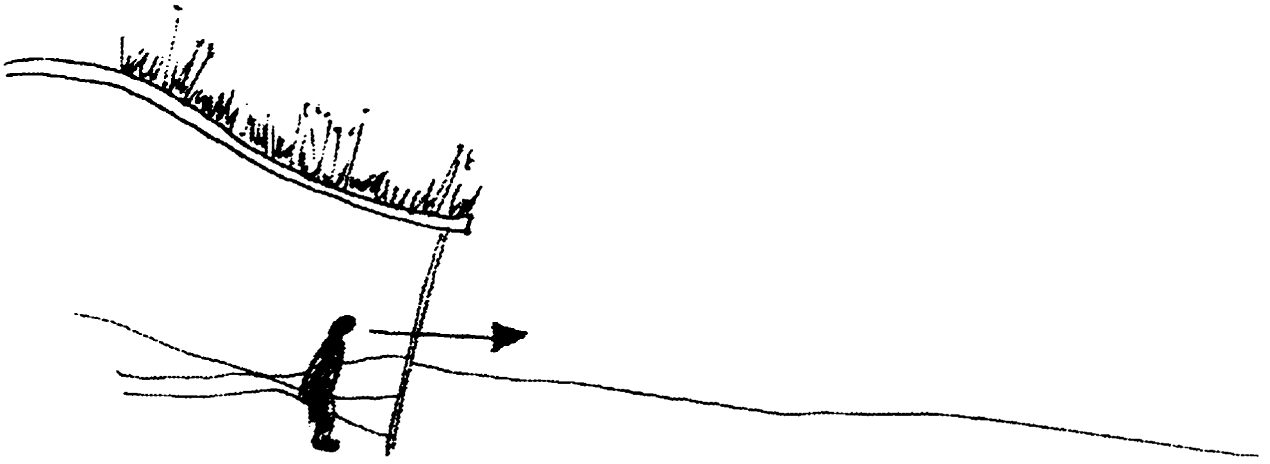


figure 97. Ground Squirrel Height

Relationships between animals are related in the burrowing animal complex. The building allows for additional winter interest at the zoo, and gives children a great way to learn independently without formal instruction.

The wagon trail path continues outside the building. Interpretive panels displaying native plants and wildflowers allow the visitor to begin to identify plants alongside the path. Knowledge of plants and their sheer numbers in a prairie habitat is revealed to the visitor.

The visitor approaches another node with large rubbing stones surrounding the path. Here they can learn more about the Bison's behavior and characteristics. Similarly sized rubbing stones are placed in the Bison enclosure for the animals use. The visitors can then see the Bison engage in the behavior of rubbing their hide and can visualize the animal's size in relation to themselves.

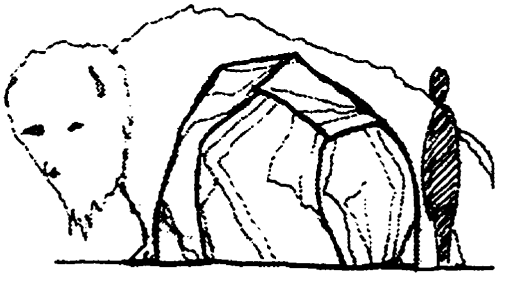


figure 98. Scale

The path continues along and suddenly a number of large stone sculptures depicting Bison running appear in the native grasses and wildflowers. Slowly, the Bison run merges to where the next node begins, the Buffalo Jump. The visitor stands on a sharp cliff that looks out onto an even steeper one with a sculpture again depicting a herd of Bison toppling over the edge of the cliff. This node includes interpretive panels and artifacts such as actual skins that the visitor can touch. The multitude of objects derived form the Bison are presented to the visitor as artifacts or sketches on interpretive panels. The panels also relate the Bison's once expansive numbers and their sudden demise.

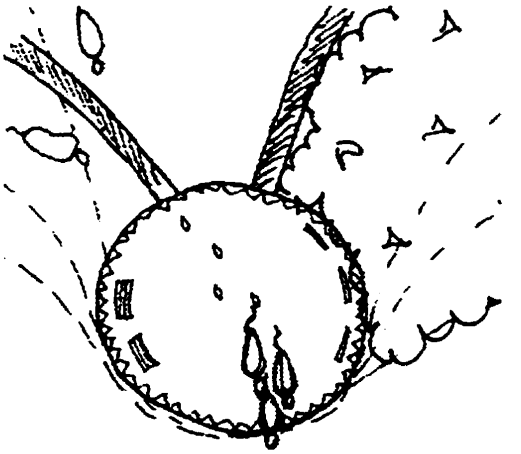


figure 99. Concept 1: Buffalo Jump

Following is an account of the slaughter by the Wichita, Kansas newspaper that will be placed on an interpretive panel:

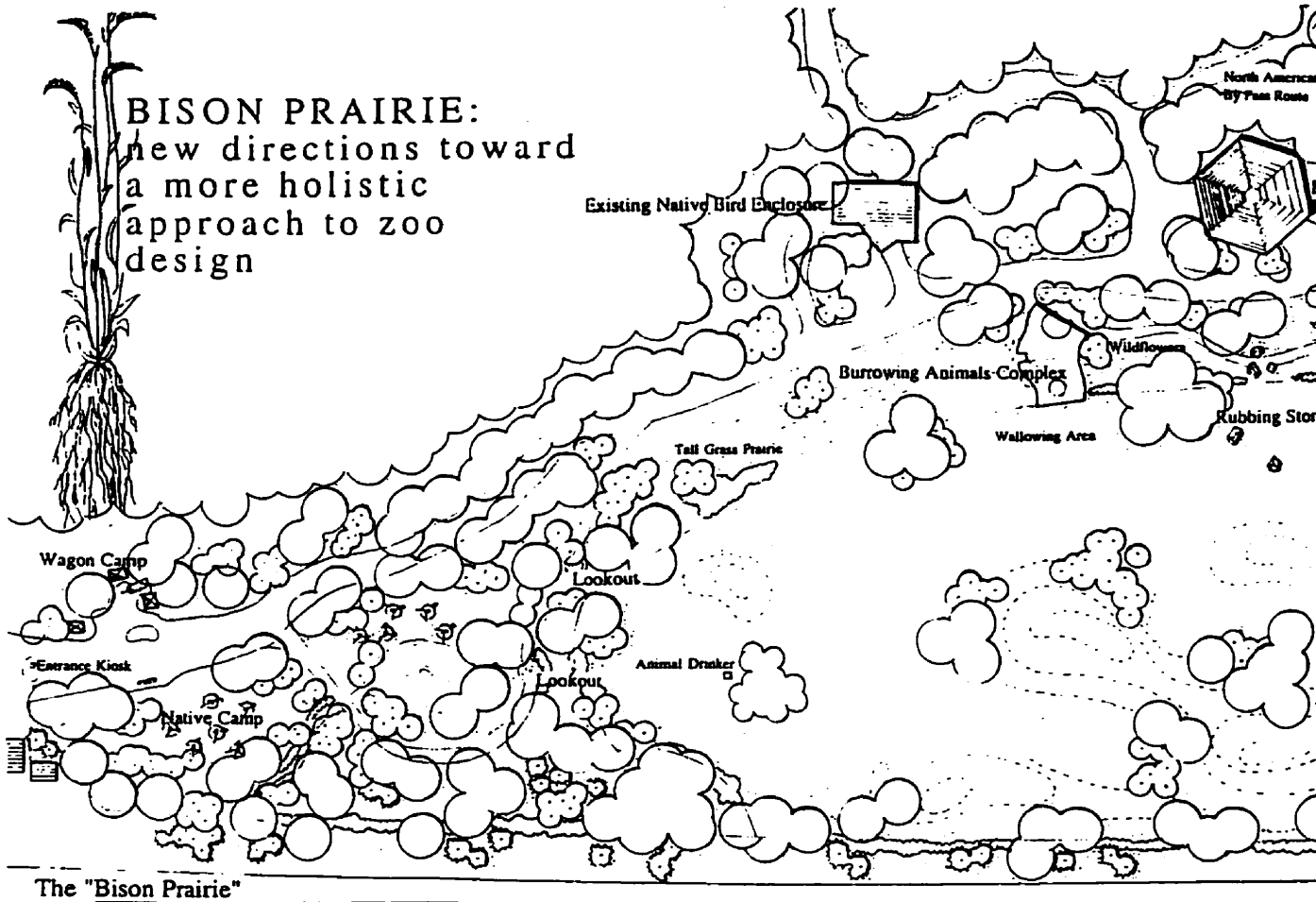
Thousands upon thousands of hides are being brought in here by hunters. In places whole acres of ground are covered with these hides spread out to dry. It is estimated that there is, south of the Arkansas and west of Wichita, from one to two thousand men shooting buffalo for their hides alone. (Dary 1974, 95)

figure 100. Concept 2: Buffalo Jump

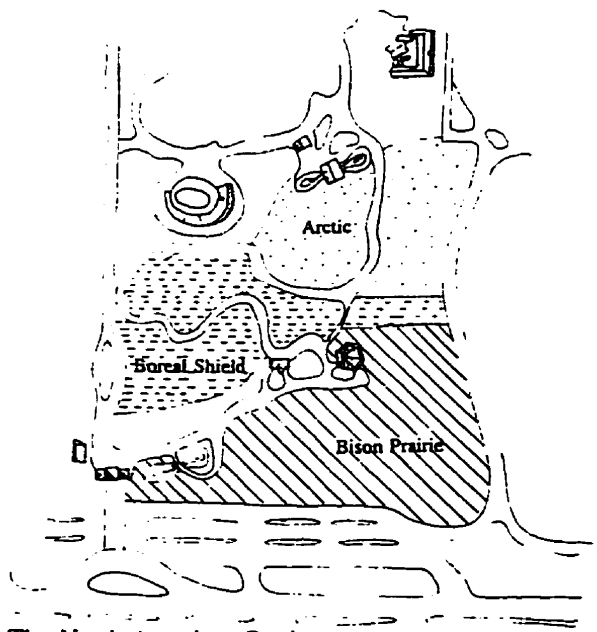
The visitor moves further along the wagon trail to the final node on the path. This node serves as a sacred area where the ritual of burning would take place. Here panels describe the extinction of the prairie and native ways due to the near extinction of the Bison.

Finally exiting the path or journey the visitor enters a transition area. An existing building stands here equipped with washrooms and a concession stand which can be modified to function as a boutique as well. Items of visitor interest can be sold here such as native and prairie artifacts, and food concessions selling such things as native herb teas and bannock. The visitor now begins their new journey into the Boreal Plains.

BISON PRAIRIE:
new directions toward a more holistic approach to zoo design

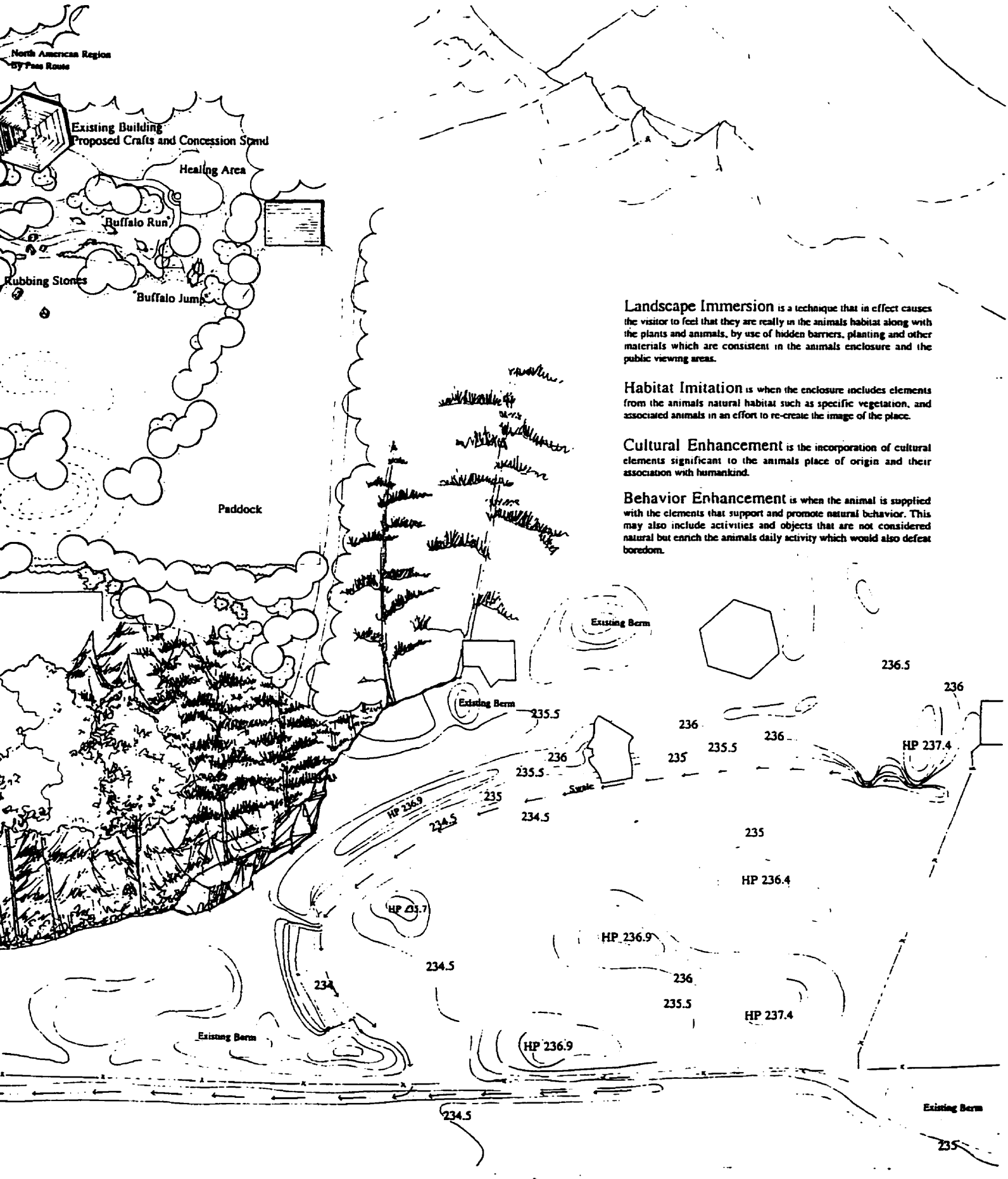


The "Bison Prairie"
Plan



The North American Region
Concept Plan *(N.T.S.)*

The "Bison Prairie"
Grading Plan

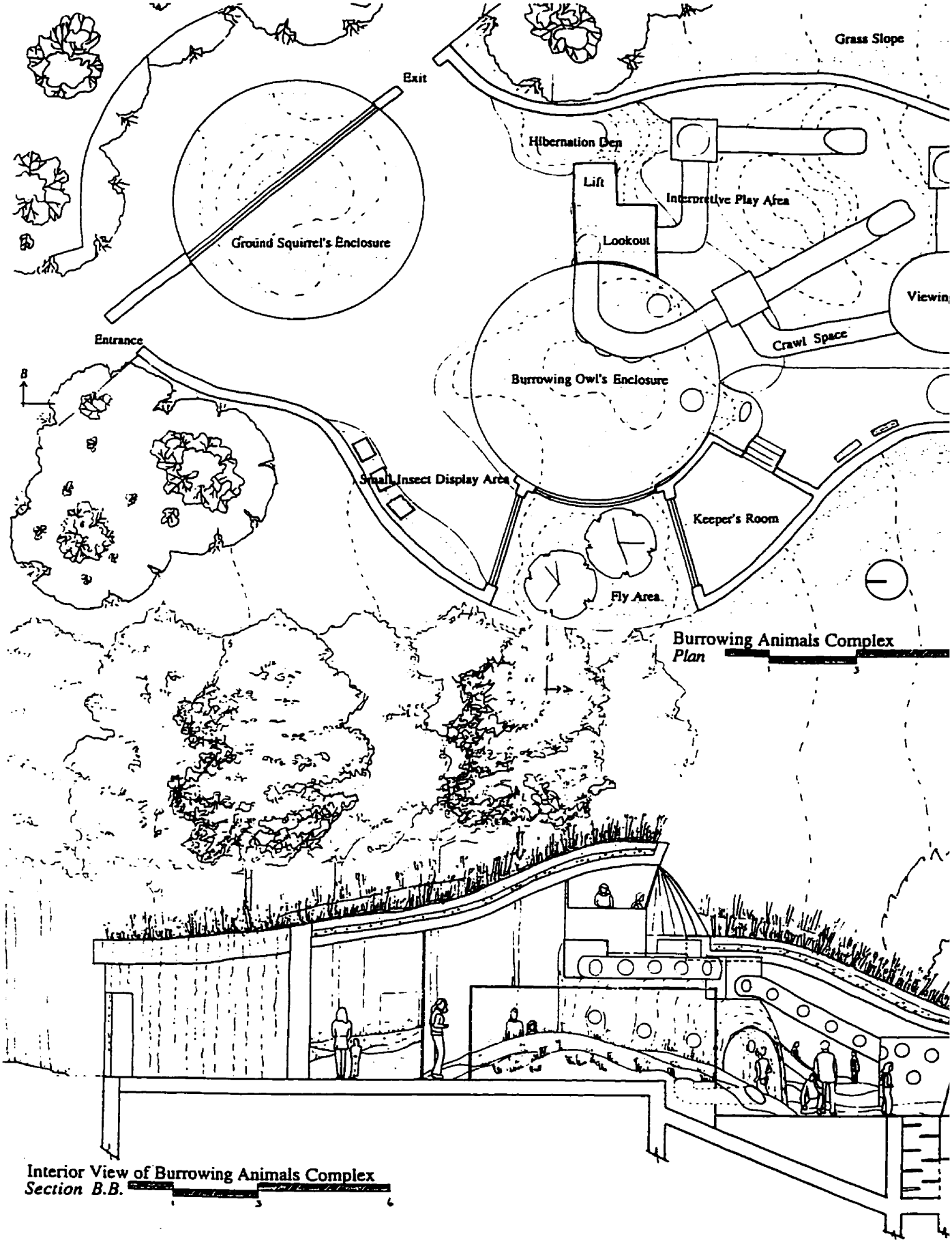


Landscape Immersion is a technique that in effect causes the visitor to feel that they are really in the animals habitat along with the plants and animals, by use of hidden barriers, planting and other materials which are consistent in the animals enclosure and the public viewing areas.

Habitat Imitation is when the enclosure includes elements from the animals natural habitat such as specific vegetation, and associated animals in an effort to re-create the image of the place.

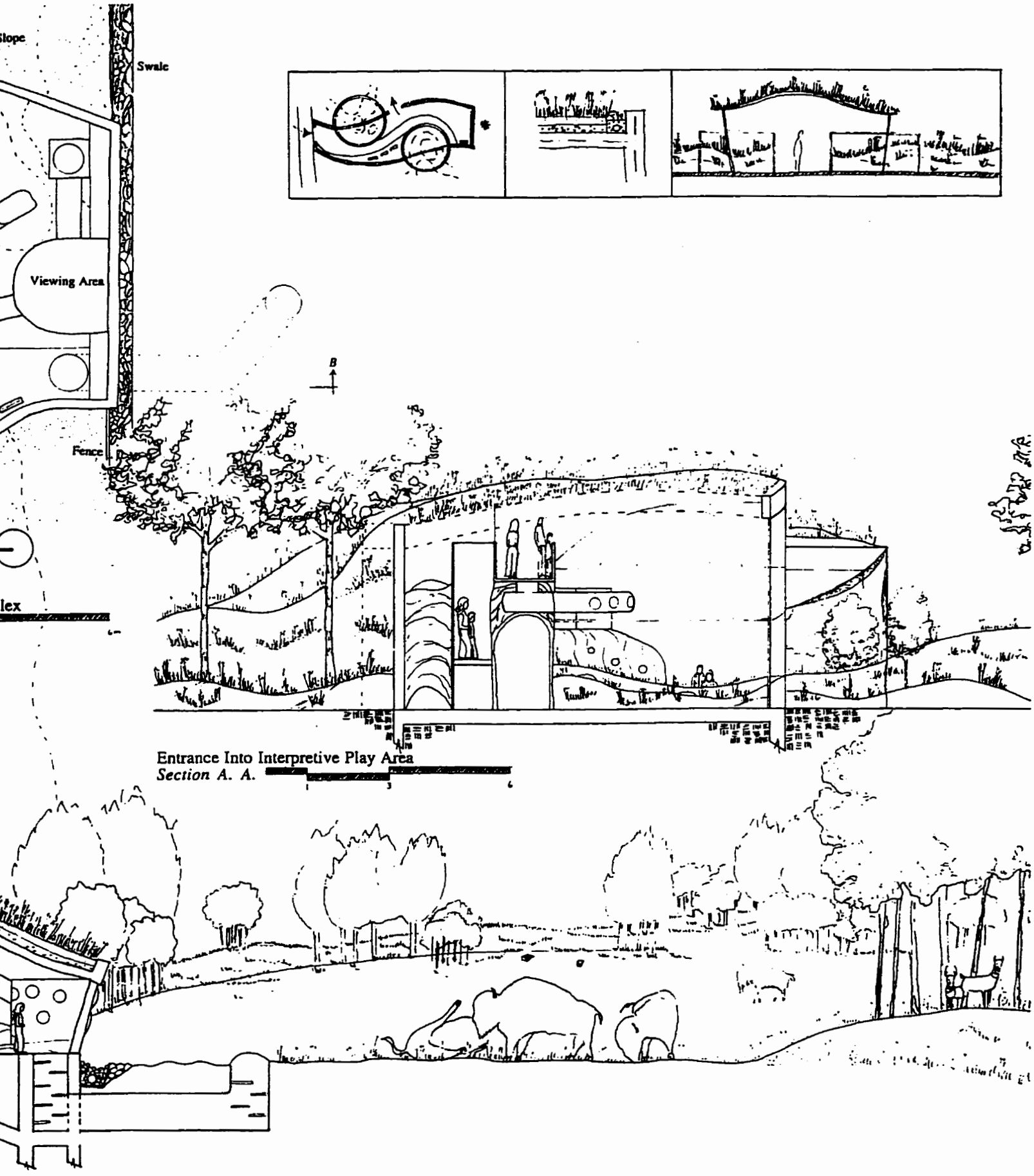
Cultural Enhancement is the incorporation of cultural elements significant to the animals place of origin and their association with humankind.

Behavior Enhancement is when the animal is supplied with the elements that support and promote natural behavior. This may also include activities and objects that are not considered natural but enrich the animals daily activity which would also defeat boredom.

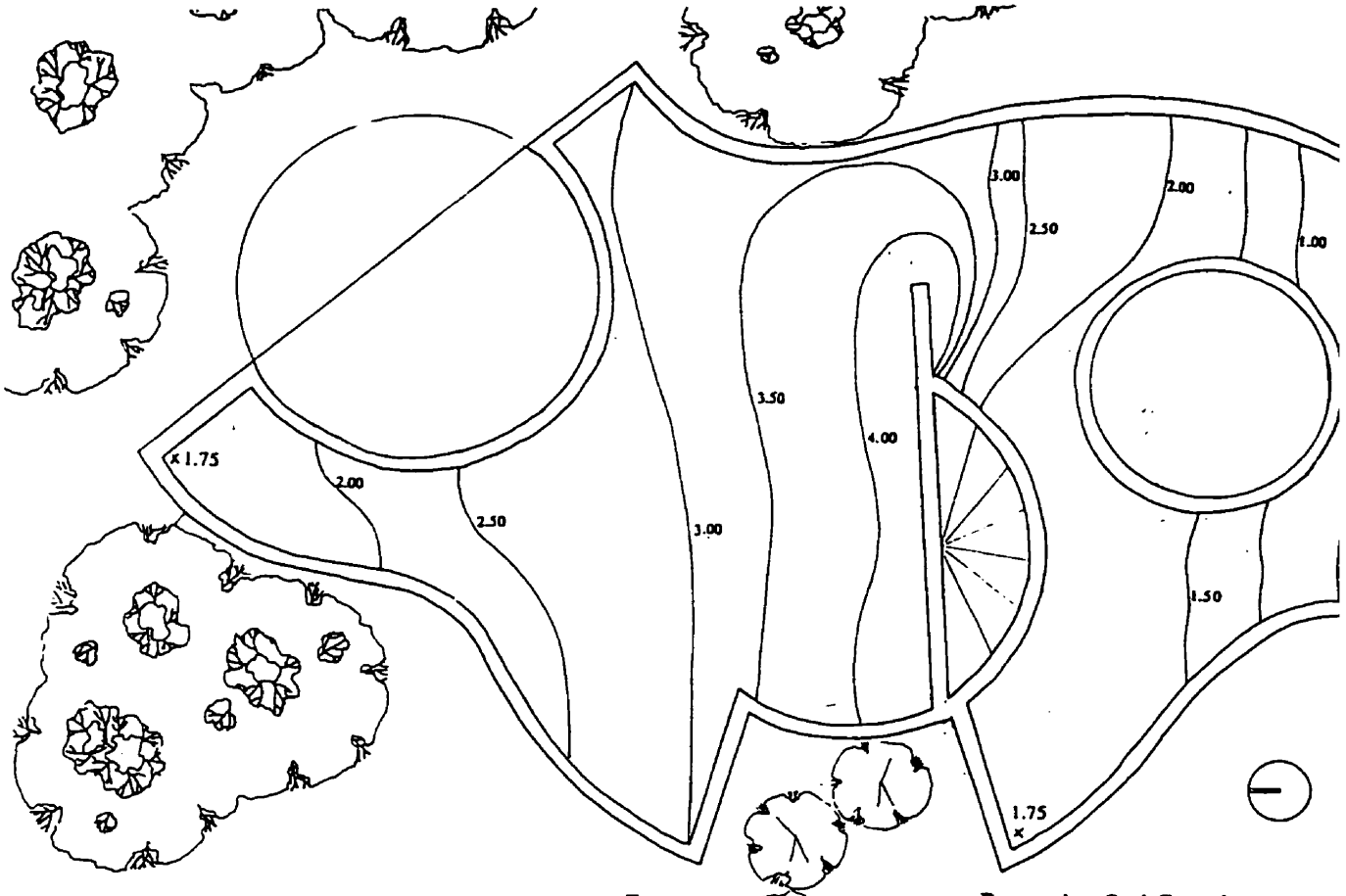


Burrowing Animals Complex
Plan

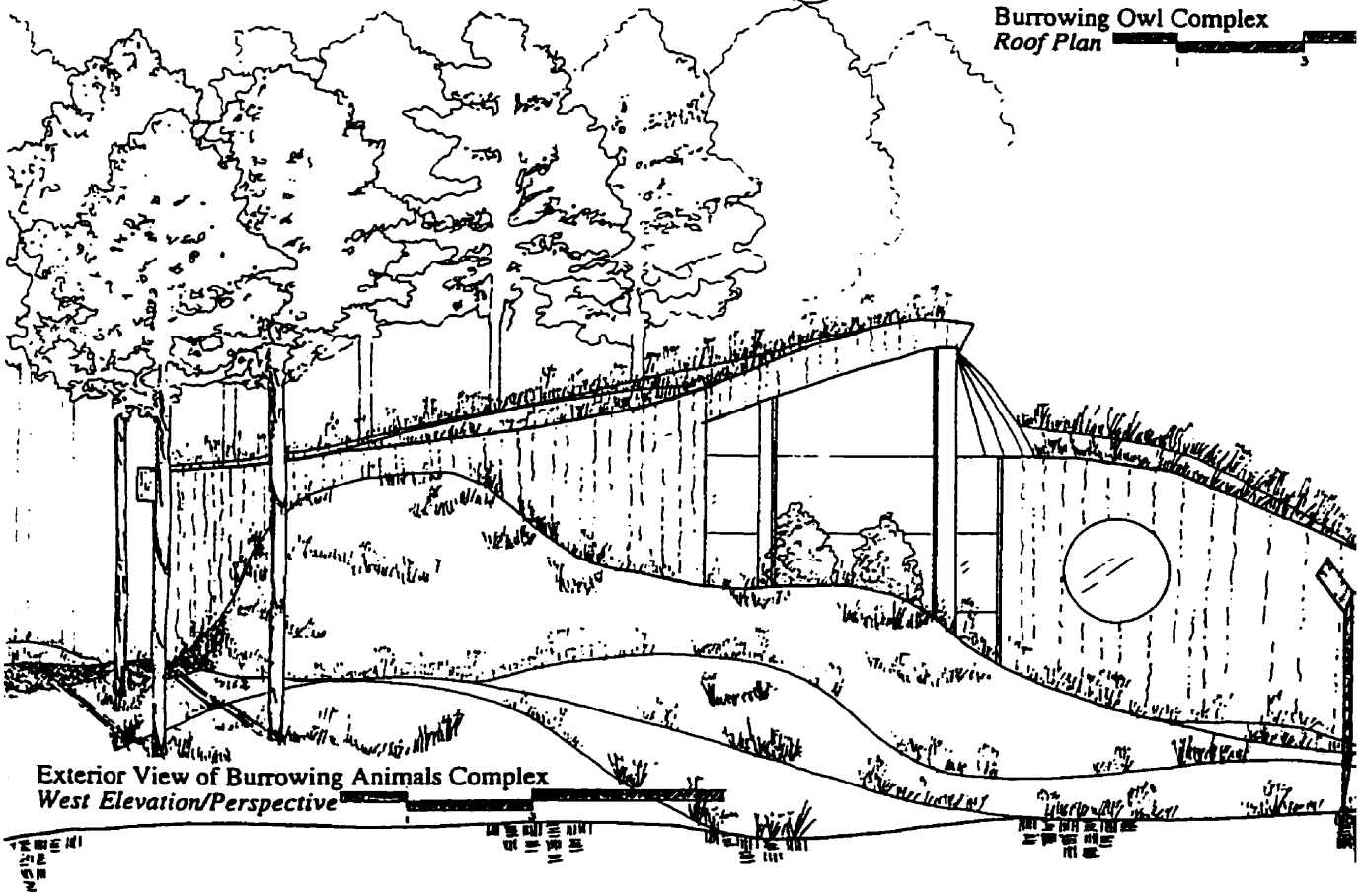
Interior View of Burrowing Animals Complex
Section B.B.



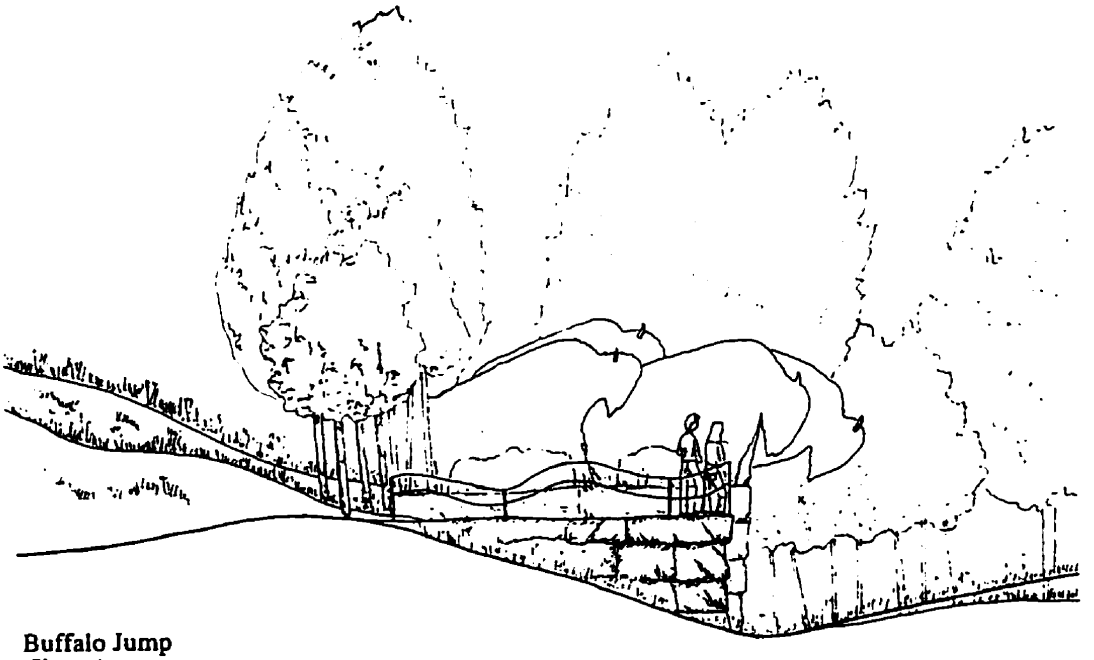
Entrance Into Interpretive Play Area
Section A. A.



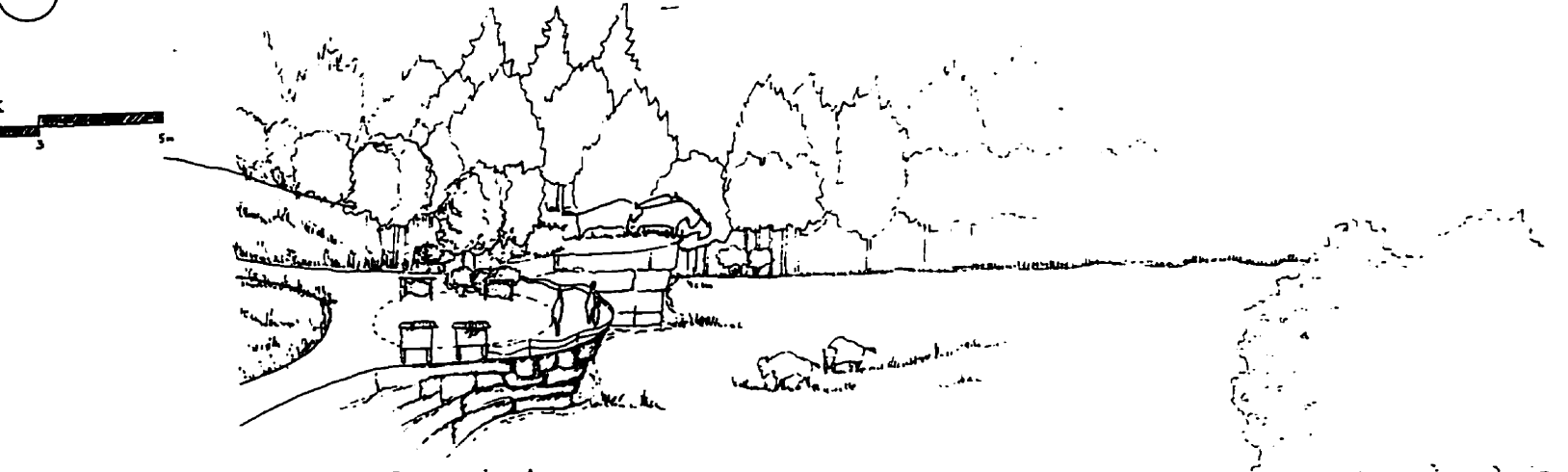
Burrowing Owl Complex
Roof Plan



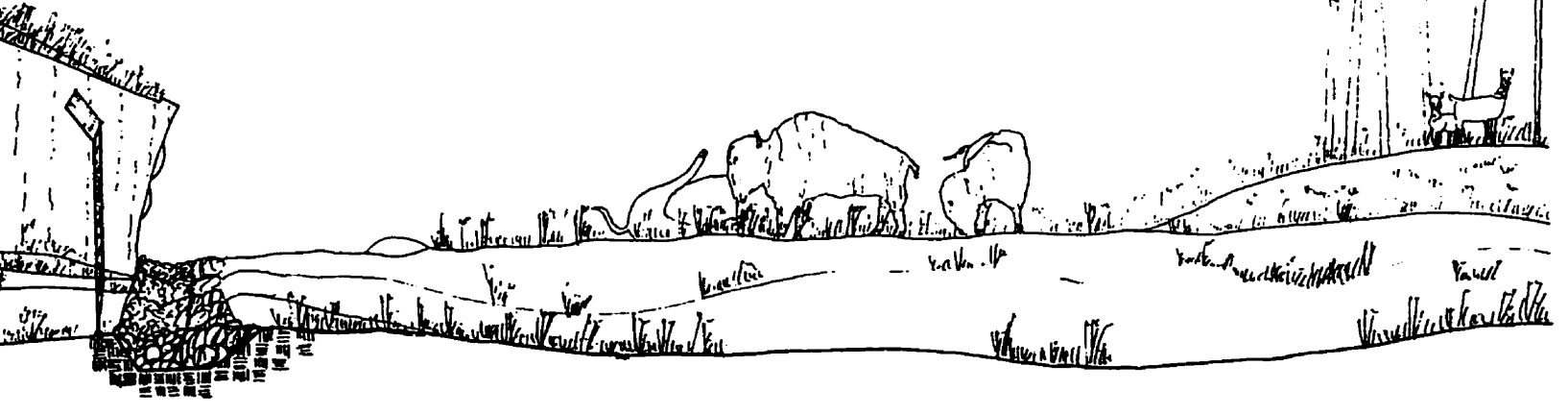
Exterior View of Burrowing Animals Complex
West Elevation/Perspective



Buffalo Jump
Elevation



Buffalo Jump Interpretive Area
Perspective



C o n c l u s i o n

The **Bison Prairie** represents a more holistic approach to enclosure design. Representation of the Bison's associate species, habitat, cultural, historical and behavioral significance creates not only a broader view of this animal but also displays the opportunity to create an extremely interesting journey. It is intended that these elements serve as a model for future zoo design. The value of this not only benefits the animals inhabiting the enclosure but also the visitors. When people are given an interesting path to walk, filled with elements of discovery and interpretation the visit becomes a richer one. It is in this environment that learning is most conducive. There are however important issues that go beyond the scope of this study

Future Recommendations

Economics

A look at the economic viability is the reality of creating public places in today's economy. New funding agents in addition to public sources are needed for these projects. Partnerships with corporate sponsors are more and more popular and commonplace.

Conservation

This study attempts to increase the visitor's awareness with respect to conservation issues. To further this, a subject for potential study would be active conservation. Actual care of endangered species and their management in the wild is an area of increasing importance and should be closely looked at.

Programming

In terms of the programming of the zoo, there are many opportunities. One that could be looked at is connecting each enclosure to its corresponding natural area by excursions to visit animals in the wild. Through the use of guided tours, pamphlets and other forms, the zoo could become a resource centre providing people with increased opportunity to access information.

There is much potential for study in the area of zoo design. Evolution of the zoo is important not only for its own advancement and sustainability but, due to its ongoing popularity, as a place of entertainment, education and service.

Appendices

7.1 Zoo Attendance Statistics

DATE:	1991	1992	1993	1994	1995	1996
January	4717	9963	11196	2198	3002	19171
Februar	13178	10930	10820	3579	3221	2439
March	27050	37767	10364	25663	13930	4371
April	42683	48785	27678	30125	24509	19694
May	77531	98143	61518	60547	52386	47876
June	96083	96003	93383	66517	64772	74706
July	84568	112585	105594	100551	99948	113643
August	99864	92777	99185	85999	86483	91454
Septemb	43455	32513	38985	30287	37155	31052
October	16240	34185	13137	11768	12309	48057
Novemb	5064	4930	4551	5235	2073	2245
Decembe	7465	2624	1783	4503	52209	24054
TOTAL	**517898**	**581205**	**478194**	**426972**	**451997**	**478762**

Questionnaire Bison Enclosure

Name of Zoo:
Location:

1.0 How many Bison do you have in your zoo? _____

list species	# male	# female
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2.0 Have these animals successfully reproduced? yes_____ no_____

If so how many young were born in the last five years?

list species	#
_____	_____
_____	_____
_____	_____
_____	_____

3.0 Do the bison display any stress related activities? yes____ no_____

4.0 If yes, please **check** which of the following activities have been observed?

pacing	_____
lethargy	_____
poor appetite	_____
abnormal aggression	_____
rejection of young	_____
other _____	_____
_____	_____
_____	_____

What do you think these stress related activities are due to?

_____

_____

5.0 How large is the bison enclosure in: square meters? _____
or square feet? _____

6.0 Are there any indoor facilities for the bison? yes_____ no_____

If yes, please describe how this facility is used?

_____
_____
_____
_____
_____

7.0 What other species of animals are included or found in this enclosure together with the Bison?

list species	#
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

8.0 Does the enclosure look like the animals' natural habitat?
yes _____ somewhat_____ no_____

Name the elements that **contribute** to the natural appearance of this enclosure?

_____
_____
_____
_____

Name the elements that **hinder** the natural appearance of this enclosure?

_____
_____
_____
_____

9.0 What plants are in the enclosure?

plant or species name

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

10.0 Please check which of the following natural activities the Bison have been observed doing?

grazing _____
wallow _____
rubbing (stones) _____
other _____ _____
_____ _____
_____ _____

11.0 Are there any human cultural or historical elements that are referred to or incorporated into the design of the bison enclosure?

yes _____ no_____

If yes, please describe:

_____
_____
_____

12.0 Are there any information signs at the enclosure?

yes_____ no_____

13.0 What other ways do you communicate information to visitors?

_____
_____
_____
_____

14.0 Are there any provisions for comfortable viewing by visitors in case of cold weather, snow, rain etc.?

yes _____ no_____

If yes, please describe these provisions:

_____
_____
_____
_____

15.0 Please describe any unique features that make your enclosure a success: for the visitor?

_____
_____
_____
_____

for the animals?

_____
_____
_____
_____

16.0 Any additional comments:

_____
_____
_____
_____
_____
_____
_____

Please fill out the following personal information

Name:_____
Address:_____
Office number:_____

Would you like to receive a brief summary of my results?

yes _____ no_____

Thank you for your time.

7.3 Animals per/sq. ft. spread sheet

	Winnipeg	New York	Toronto	North Dakota	Minnesota	Charlesbourgh	Granby
male bison	1	2	1	1	2	1	1
female bison	3	3	18	2	4	7	4
total	**4**	**5**	**19**	**3**	**6**	**8**	**5**
other animals	4	0	3	0	3	0	0
total	**8**	**5**	**22**	**3**	**9**	**8**	**5**
(sq.ft)							
enclosure size	143 356	7 000	304 920	320 000	217 800	8 156	10 925
bison/sq.ft	35 839	1 400	16 048	106 667	36 300	1 019	2 185
animals/sq.ft	17 920	n/a	13 860	n/a	24 200	n/a	n/a

average enclosure size	144 594
average bison/sq.ft	28 494
average animals/sq.ft	23 893

Note: 'Winnipeg' = Assiniboine Park Zoo, Winnipeg, Manitoba
'New York'= Buffalo Zoological Gardens, Buffalo, New York
'Toronto' = Metropolitan Toronto Zoo, Scarborough, Ontario
'North Dakota' = Dakota Zoo, Bismarck, North Dakota
'Minnesota' = Minnesota Zoological Garden, Apple Valley, Minnesota
'Charlesbourgh' = Jardin Zoologique du Quebec, Charlesbourgh, Quebec
'Granby' = Jardin Zoologique de Granby, Granby, Quebec

Grasses:

Big Bluestem *(Andropogon gerardi)*
Blue Grama Grass *(Bouteloua gracilis)*
Canada Wild Rye *(Elymus canadensis)*
Green Needle Grass *(Stipa viridula)*
Hair Grass *(Agrostis scabra)*
Indian Grass *(Sorghastrum nutans)*
June Grass *(Koeleria gracilis)*
Little Bluestem *(Schizachyrium scoparius)*
Needle & Thread *(Stipa comata)*
Nodding Rye Grass *(Elymus canadensis)*
Northern Wheat Grass *(Agropyron dasystachyum)*
Porcupine Grass *(Stipa spartea)*
Prarie Dropseed *(Sporobolus heterolepsis)*
Sheep Fescue *(Festuca ovina)*
Side Oats Grama *(Bouteloua curtipendula)*
Sweet Grass *(Hierochloe adorata)*
Switchgrass *(Panicum virgatum)*
Ticklegrass *(Agrostis scabra)*
Western Wheat Grass *(Agropyron smithii)*

Shrubs:

Chokecherry *(Prunus virginiana)*
Creeping Snowberry *(Gaultheria hispidula)*
Hawthorn *(Crataegus sp.)*
Hazlenut *(Corylus cornuta)*
HighBush Cranberry *(Viburnum trilobum)*
Plums *(Prunus sp.)*
Prickly Rose *(Rosa acicularis)*
Pussy Willow *(Salix discolor)*
Redosier Dogwood *(Cornus sericea)*
Saskatoon *(Amelanchier alnifolia)*

Wildflowers:

Black-Eyed Susan *(Rudbeckia hirta)*
Blue-Eyed Grass *(Sisyrinchium montanum)*
Canada Anemone *(Anemone canadensis)*
Closed Gentia *(Gentiana andrewsii)*
Crowfoot Violet *(Viola pedatifida)*
Culver's Root *(Veronicastrum virginicum)*
Cutleaf Anemone *(Anemone multifada)*
Dotted Blazing Star *(Liatris punctata)*
Dwarf False Indigo *(Amorpha nana)*
Flodman's Thistle *(Cirsium flodmanii)*
Fragrant False Indigo *(Amorpha nana)*
Gaillardia *(Gaillardia aristata)*
Golden Alexander *(Zizia aurea)*
Ground Plum *(Astragulus crassicarpus)*
Gumweed *(Grindelia squarrosa)*
Harebell *(Campanula rotundifolia)*
Heart-Leaved Alexander *(Zizia aptera)*
Hyssop *(Agastache foeniculum)*
Indian Breadroot *(Psoralea esculenta)*
Joe-Pye *(Eupatorium maculatum)*
Larkspur Violet *(Viola pedatifida)*
Lilac Beardtongue *(Penstemon gracilis)*
Long-Headed Coneflower *(Ratibida columnifera)*
Many Flowered Aster *(Aster pansus)*
Meadow Blazingstar *(Liatris ligulistylis)*
Meadow-Sweet *(Spiriaea alba)*
Narrow Leaf Sunflower *(Helianthus maximilli)*
New England Aster *(Aster sericeus)*
Northern Bedstraw *(Galium Boreale)*
Northern Bog Violet *(Viola cuculatta)*
Pale-Spike Lobelia *(Lobelia spicata)*
Pearly Everlasting *(Anaphalis margaritacea)*
Philadephia Fleabone *(Erigeron philadelphi)*
Pink Onion *(Allium stellatum)*
Prairie Coneflower *(Ratibida columnifera)*

Prairie Crocus *(anemone patens)*
Prairie Everlasting *(Antennaria campestris)*
Prairie Lily *(Lilium philadelphicum)*
Prairie Rose *(Rosa arkansa)*
Prairie Sage *(Artemisia ludoviciana)*
Prairie Crocus *(Anemone patens)*
Purple Coneflower *(Echinacea angustifolia)*
Purple Prairie Clover *(Petalostemon purpure)*
Pussy Toes *(Antennaria aprica)*
Saline Shooting Star *(Dodecatheon pauciflor)*
Showy Milkweed *(Asclepias speciosa)*
Shrubby Evening Primrose *(Oenethera serr.)*
Smooth Aster *(Aster laevis)*
Stiff Goldenrod *(Solidago rigida humilis)*
Tall Meadow Rue *(Thalictrum dasycarpum)*
Thimble Weed *(Anemone cylindrica)*
Three Flowered Avens *(Geum triflorum)*
Upland White Aster *(Aster ptarmicoides)*
Western Silvery Aster *(Aster sericeus)*
White Beardtongue *(Pentstemon albidus)*
White Camus *(Zigadenus elegans)*
White Cinquefoil *(Potentilla arguta)*
White Prarie Clover *(Petalostemum purpureum)*
Whorled Milkweed *(Asclepias verticillata)*
Wild Columbine *(Aquilegia canadensis)*
Wild Licorice *(Glycyrrhiza lepidota)*
Wild Strawberry *(Fragaria glauca)*
Wild Bergamot *(Monarda fistulosa)*
Wood Lily *(Lilium elegans)*
Wood's Rose *(Rosa Woodsii)*

(Plant list was provided by Corinne E. Godrup, Technical Assistant, Parks and Recreation, The City of Winnipeg)

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http://www.com/community/mnzoo/bison.html
Minnesota Zoo

http://www2.lbl.org/lbl/EBPrairieGate.html
Elk and Bison Prairie

http://www.npsc.nbs.gov/resource/othrdata/rareone/grassland.html
The Rare Ones

http://www.npsc.gov/
Northern Prairie Wildlife Research Center

Personal Interviews:

Steve Cornelson. Warden. Bison Enclosure, Riding Mountain National Park

Corrinne E. Goldrup. Technical Assistant. The City of Winnipeg.

Jill Oakes. Professor. Department of Native Studies. University of Manitoba.

Coreen Onischuk. Professor. Department of Animal Science. University of Manitoba

Harvey Payne. Adjunct Professor. Department of Native Studies. University of Manitoba.

Dr. Pruet. Wildlife Biologist. University of Manitoba.

Rick Riewe. Department of Zoology. University of Manitoba.

Dr. Robert E. Wrigley. Curator. The Assiniboine Park Zoo.
Zoo keepers were also interviewed.

Figure Credits

Glossary Of Terms

Behavior Enhancement
Providing natural activities and objects to enhance an environment and make the daily activity of an animal fuller and more meaningful.

Behavior Enrichment
Providing activities and objects to enhance an environment and make the daily activity of an animal fuller and more meaningful (Koebner 1994).

Eco-regions
Eco-regions are subdivisions of the ecozone characterized by distinctive large order land forms or assemblages or regional land forms, small order macro- or meso climates, vegetation, soils, water, and regional human activity patterns/uses (Ecological Stratification Working Group 1995).

Ecosystem
All of the organisms in a given place in interaction with their non-living environment (Forman and Godron 1986).

Ecozones
Areas of the earth's surface representative of large and very generalized units characterized by interactive and adjusting abiotic and biotic factors (Ecological Stratification Working Group 1995).

Endangered Species
A species facing eminent extirpation or extinction (The Committee on the Status of Endangered Wildlife Species in Canada).

Environment

It encompasses all the conditions, circumstances, and influences surrounding and affecting the development of an organism or group of organisms (Webster's New World Dictionary 1974).

Extinction

It is the fact or state of being or becoming extinct; dying out, as of a race, species of animal, etc. (Webster's New World Dictionary 1974).

Extirpation

A species no longer existing in the wild in Canada but existing elsewhere (The Committee on the Status of Endangered Wildlife Species in Canada).

Fauna

These are the animals of a specified region or time (Webster's New World Dictionary 1974).

Flora

These are the plants of a specified region or time (Webster's New World Dictionary 1974).

Habitat

This is the region where a plant or animal naturally grows (Webster's New World Dictionary 1974).

Ha Ha

A ditch or sunken fence used to create a hidden boundary. This is a technique used to cause relative formelessness (Newton 1971).

Holism

The view that an organic or integrated whole has a reality independent of and greater than the sum of its parts (Webster's New World Dictionary 1974).

Keystone Species

An animal that is important in the ecosystem, and that other animals are dependent upon (Koebner 1994)

Landscape Immersion

Terminology for exhibits that make the visitor feel that they are in the habitat along with the plants and animals (Koebner 1994).

Menagerie

A random grouping of wild animals for exhibition with little planning for their care or housing (Koebner 1994).

Native

This is to belong to a locality or country by birth, production, or growth; indigenous (Webster's New World Dictionary 1974).

Natural Exhibits

Animal enclosures and exhibits which recreate the animals' natural habitat (Koebner 1994).

Zoo

An abbreviation for Zoological Park or Zoological Garden. A park or facility where exotic animals are kept for the purpose of conservation, education, and recreation (Koebner 1994).

Zoo Curator

A manager of all the keepers and the animals under their care. He/she is responsible for which animals should breed, which should be traded to other zoos and which animals are needed to strengthen the collection.

Zoo Director

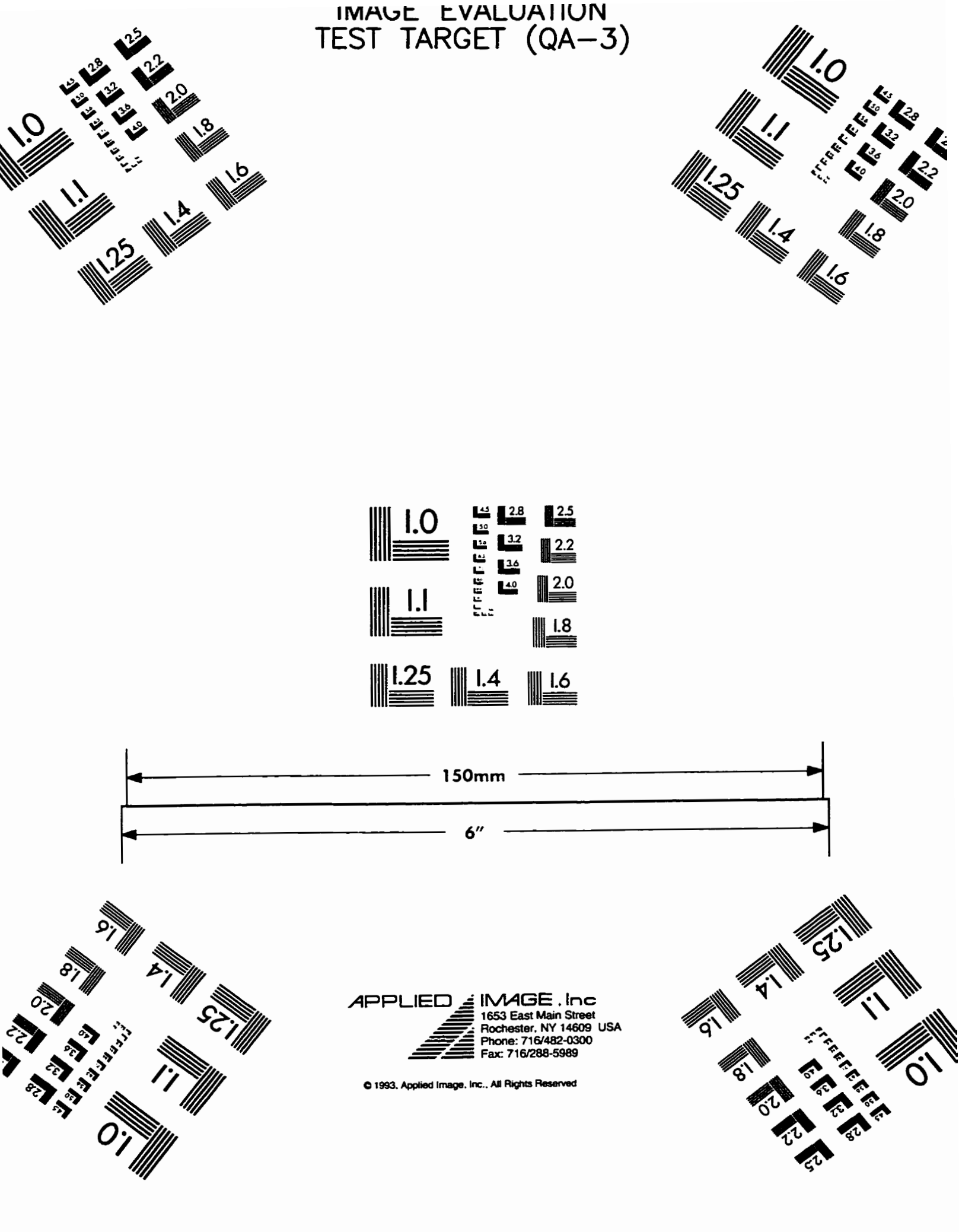
A person who leads the zoo and makes the major decisions. He/she will represent the zoo to the public and deal with daily tasks of running the zoo while keeping in mind the big picture.

Zoogeographic

Animals of a particular geographic region (Koebner 1994)

Zoo Keeper

A person responsible for the daily care and well-being of a captive animal.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