A GEOGRAPHICAL ANALYSIS OF WILDLIFE ATTRACTIONS IN THE UNITED STATES AND CANADA

By

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CHAPTER I

INTRODUCTION

Over 100 million people visit zoos and wildlife attractions annually in the United States, making the animal attraction among the nation's top entertainment destinations (Nelson 1990). An important characteristic in the display of animals at wildlife attractions today is the type of facility in which the animals are displayed. The goal of obtaining a more natural setting for the display of animals can be seen at many wildlife attractions, although some older attractions continue to use facilities consisting of bare cages. The term "landscape immersion" is used to describe exhibits in which both the animals and visitors share the landscape, giving the visitor a more realistic view of the animals' natural habitat (Coe 1985). To achieve this, fences and cages are removed in favor of the use of moats or other perceptual illusions to separate animals (Polakowski 1987). Other display methods include glass panels, light shields, and thermal or electric barriers to show the animal more naturally rather than in a barren, barred cage. By giving the animal a superior location relative to the viewer, visitors can feel as if they are

dominated by the animal in its own habitat (Coe 1985). This provides a display combining both the naturalistic setting of an animal's habitat with a more realistic impression of the animal not caged, but in fact, dominating the visitor (Coe 1985).

The type of animals displayed is an important factor in the type of facility used in wildlife attractions. Birds will generally be kept in an aviary separate from, or as a part of, a zoo. Reptiles are kept in reptile houses in zoos, or in areas where the climate is more favorable and reptiles are more abundant, such as in the case of alligator farms in Florida (Fisher 1966).

The classification discussed by Nelson (1990), and conducted by Sedway and Associates of San Francisco, divided 133 wildlife attractions in the U.S. and Canada into four categories. The four types of facilities contained in their classification were aquariums, zoos with an aquarium, marine wildlife attractions, and all other zoos and wildlife parks. This classification differentiated between aquariums and marine wildlife attractions since the latter contained outdoor facilities for display with a marine wildlife theme (Nelson 1990).

Nelson (1990) also notes that zoos are most popular among local residents while aquariums attract more tourists. The reason for this difference is that most metropolitan areas have zoos, while aquariums are much less common (Nelson 1990). Most zoos in the U.S. are controlled by city governments which initiated them as institutions to provide

entertainment and cultural enhancement for residents or to be a symbol of city prestige (Kirchshofer 1968). As zoos moved away from cage exhibits to larger open exhibits as a way of replicating natural habitats, there was an increased need for space (Zwerin 1986). For many cities, this space for expansion was not available. As a result, other types of facilities began to appear on the edges of cities where there was also undeveloped areas capable of better simulating the natural environment of exotic animals.

Weather and climate are important factors that influence the type of animals displayed and their facilities. Most visits to wildlife attractions in the U.S. occur during the summer. Colder climates, indicative of the Northern U.S., may have a significant impact upon the types of outdoor displays that are possible (Nelson 1990). In many facilities, special climate controls must be added to provide for the animals' care (Hediger 1950). These facilities are equipped with electronically controlled temperature, humidity, and even precipitation to mimic an animal's natural climate (Quick 1984). Many animals are removed from their outside naturalistic settings and placed indoors during winter months (Swain 1989). These indoor viewing areas, combined with outdoor enclosures, are necessary for tropical species during long cold winter months or for polar species during hot summer months (Meyer 1979). Many wildlife attractions must close during months of extreme weather. This is often the case with attractions located in the northern U.S. (Kirchshofer 1968).

Climate and location play major roles in how an animal is to be displayed and the type of displays which must be used to exhibit the animal during extreme weather, while still protecting it. This will be a factor in how the animal is perceived by visitors.

Historical Background

Zoos and other types of animal displays have existed for thousands of years, allowing people to see exotic animals first-hand. The first animal displays can be traced back to the 15th century B.C. in Egypt (Zwerin 1986). Such facilities could be considered the first zoos (Zwerin 1986). The term "zoo" is frequently used in a generic fashion to mean any facility which displays animals. In actuality, there are a variety of different facility types which display animals to the public.

The exotic menageries kept by elite rulers in early Rome and China, and later in European courts would play important roles in the design of facilities for the display of animals. These were designed for spectator viewing rather than for the comfort of the animals (Hancocks 1971). Later, the purpose of zoos moved away from display for the comfort of the elite to displaying for the general public. However, the facilities where the animals were kept did little to accommodate their basic needs. Facility design eventually attempted to create a mood that reflected the animals' history or native country through zoo or display area architecture (Hancocks 1971). Still, the facilities

were nothing more than cages where the animals could easily be viewed by the public. Over time, animal collections slowly changed their form as animals were taken on the road, traveling as circuses from one city to another (Fox 1986).

It was not until the 1700's that the first zoos were established. The Zoological Gardens of London used the idea of displaying animals in a garden setting to achieve a more natural look, even though the animals themselves were still displayed in cages. It would be from this concept that the term "zoo" was coined. The Zoological Gardens of London was also responsible for initiating the first reptile house and aquarium in the 1800's (Hancocks 1971). This type of facility was replicated and improved in cities throughout the world.

The oldest zoos in the U.S. were built a little over a century ago. The first zoo in the U.S. was Central Park Zoo in New York City, which was established in 1864 (Gersh 1971). However, only in this century have cities begun recognizing zoos as among their most important cultural institutions (Maddex 1985). Early zoos in the U.S. were greatly influenced by those in England, especially in terms of the walkways and gardens used and that the animals were displayed in rectangular cages. Later, zoo designs moved in the direction of monumental architectural structures with inside and outside cages and concrete surfaces for easy cleaning (Slusarenko 1986).

The modern zoo is a source of entertainment and civic pride; it is not surprising to find that nearly every large

city has a zoo (Zwerin 1986). In the U.S. and Canada there are more than 800 live animal exhibits (Ulmer and Gower 1985). These attractions range from small roadside exhibits, consisting of only a handful of animals, to large municipal zoos (Ulmer and Gower 1985). However, most wildlife attractions in the U.S. and Canada are quality facilities, attempting to provide native plant species to create naturalistic settings for the display of animals. This method of display, having begun in the last few decades, has become increasingly popular (Swain 1989).

Problem Statement

The type of facilities and animals displayed by wildlife attractions ranges greatly, making the term "wildlife attraction" very general in its application. To examine the regional variations among attraction types in the U.S. and Canada, the creation of a classification of these different displays is essential. The research discussed by Nelson (1990), while differentiating between basic types, still fails to recognize many other types of facilities and factors, or to include any form of spatial analysis corresponding to a wildlife attraction's location in relation to factors such as location, climate, and cultural influences. Therefore, this study examines the following research problem: **little has been done to examine the cultural and environmental factors affecting the spatial characteristics and varieties of wildlife attractions in the United States and Canada.**

Objectives and Hypotheses

The primary objective of this research is to develop a typology for wildlife attraction classification based upon a consistent set of criteria. With the large number of facilities present in the United States and Canada, a classification based upon certain criteria can aid in understanding the locations and display types utilized by facilities across the two countries. Using this information and having reviewed the available literature, the following hypotheses are evaluated:

1. A wildlife attraction typology can be developed, based on the physical attributes of facilities in which the animals are displayed and kept.
2. The proximity of a wildlife attraction to its urban center will have an effect upon its classification in the typology.
3. Climatic conditions will influence wildlife attraction types and animals/facilities present at a location.

Based upon the types of animals displayed and animal display methods, a predictable pattern in the distribution of certain wildlife attractions is expected.

Methodology

This study focuses on developing a typology for classifying wildlife attractions and on performing a spatial analysis to determine the distribution and variety of wildlife attractions in the U.S. and Canada. The following methods were used for obtaining and analyzing data.

The primary objective of developing a typology of

wildlife attraction classification addresses the following hypotheses:

1. A wildlife attraction typology can be developed, based on the physical attributes of facilities in which the animals are displayed and kept.

A questionnaire was sent out to 200 zoos, parks, aquariums, and aviaries to obtain information regarding their facilities, attendance, location, seasons of operation, animals displayed, and display methods. This information was necessary to create a classification or typology of wildlife attractions. Cluster analysis was then used to determine facilities with similarities as an aid in the development of a typology. Cluster analysis is a statistical method used to group variables based upon similarities or dissimilarities. The end product of this analysis is a set of natural categories or clusters which can be mapped (Lorr 1983 and Everitt 1975). This analysis was conducted using the computer software SAS. The method developed can be useful for clustering and mapping animal displays having similar characteristics. Through the development of categories or classes, different factors can be examined to determine regional trends.

2. The proximity of a wildlife attraction to its urban center will have an effect upon its classification in the typology.

A simple descriptive analysis was done by measuring the distance of attractions from the edge of their nearest urban center. This distance was then compared to the attractions typology to determine whether or not there was a relationship between distance and the typology. In

addition, the population of the city in which the attraction is located was also considered to see if there is a relationship between the size of the population of the city and its typology.

3. Climatic conditions will influence wildlife attraction types and animals/facilities present at a location.

Climatic factors, such as extreme heat and extreme cold, were taken into account in determining how animal displays were affected at different locations. Different indicator species were examined to determine the areas where these species needed climate controlled facilities or were not displayed due to climate. An indicator species is an organism that can be used to measure the environmental conditions that exist at a locality (Tootill 1981). Seven species were chosen which are subject to extreme climatic variation. Facilities where these species are kept were examined to determine the types of displays necessary for the different species. This was done to determine the boundary line separating climate controlled facilities from where no special facilities are needed to maintain a species. Also examined was the reduction of operating hours or closing of a facility based upon weather or climatic factors. Cartographic methods were used for the display of climatic data to show regional differences based upon climate. Maps were created to show areas where it is necessary for a species to have climate controlled facilities year-round, through out a portion of the year, or where such facilities are not necessary.

Definition of Terms

Wildlife attractions come in different forms according to many factors such as animals displayed, types of display, size of display, etc. An explanation of the types of attractions and terms is provided in Table 1.

TABLE 1

DEFINITIONS OF TERMINOLOGY RELATING TO

WILDLIFE ATTRACTIONS

1. Wildlife attraction: Any facility featuring mammals, birds, fish, reptiles, or amphibians individually or in combination for the purpose of display for the viewing of the general public.

2. Zoo: A place where a collection of wild animals is kept for public showing. Also called zoological park, zoological garden, or wild animal park.

3. Aviary: A building or large cage for the display of many birds.

4. Aquarium: A facility where live water animal and plant collections are exhibited.

5. Marine wildlife attraction: Contains outdoor facilities for the display of mammals, birds, fish, reptiles, and amphibians with a marine theme.

6. Reptiliaries: Any facility whose primary purpose is the display of reptiles or amphibians. Also called a reptile house or farm.

7. Drive-Thru Animal Park: A facility in which the primary way in which animals are viewed is from the visitors car. Also called safari parks.

8. Indicator Species: An organism that can be used to measure the environmental conditions that exist in a locality.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Few geographers have examined the spatial characteristics of wildlife attractions. This is unusual considering the fact that wildlife attractions have a strong presence in the United States and Canada. There is an abundance of popular literature on various aspects of zoos and wildlife attractions, as well as work from the fields of zoology, veterinary medicine, and architecture. While non-geographic in nature, this literature provides a framework for a spatial analysis of wildlife attractions in the United States and Canada.

Types of Wildlife Attractions

There are many different types of facilities which are used to display animals for public viewing. Some of these attractions focus upon one specialization while other facilities display a wide range of animals. The way that a facility is classed or recognized is generally based upon the animals it displays and how they are displayed.

The most well known wildlife attractions are zoos,

zoological parks, and gardens. When animals were first gathered it was done by the elite for their viewing only. Zoos became status symbols, which is one reason why many modern cities have one today (Gersh 1971).

No longer are wealth and leisure the only reasons for zoos. Gersh (1971) cites six other purposes for zoos: recreation, nature appreciation, education, research, conservation, and sociological development. Slusarenko (1986) discusses how recreation and education have evolved to become important purposes of zoos in that they can entertain, influence, and educate public attitude. Polakowski (1987) states that recreation is the foremost role of zoos and accounts for why zoo attendance competes with other types of entertainment. Zwerin (1986) cites that more people go to zoos and aquariums each year then go to all pro baseball and football games combined.

Gersh (1971) describes nature appreciation as being similar to recreation, but leading to a sense of wonder at the variety of life through the proper exhibition of animals. Polakowski (1987) discusses how education is of equal importance to other purposes of zoos, however, educational messages must be communicated without marring the recreational aspect.

Research within zoos has been a very important purpose of zoos and dates back to the London Zoological Society (Hediger 1969). Markowitz (1982) describes how zoos should focus their research efforts upon work that minimizes danger toward, and brings benefits to, the animal. Markowitz

(1982) and Gersh (1971) both cite how zoo animals can be of great use in research where normal laboratory animals such as rats are not satisfactory. Research in zoos can help answer questions such as how birds navigate over water on cloudy nights, or what psychological barriers exist which keep most animal species from killing other animals of the same species (Gersh 1971).

Conservation has become a common reason for establishing zoos within the last few years because habitat loss has lead to species becoming threatened or endangered (Gersh 1971 and Polakowski 1987). Arrandale (1990) discusses the role zoos and aquariums have taken in the past fifteen years to conserve animals, not just for human enjoyment, but in an attempt to save entire species.

Finally, Gersh (1971) describes modern zoos as having a sociological purpose. This refers to how the zoo can appeal to all age groups, sexes, ethnic backgrounds, and levels of education. Polakowski mentions community values as an important goal due to the importance of the local community. These purposes make them probably the best known wildlife attractions. Nelson (1990) notes that zoos and wildlife parks account for almost two thirds of the total attendance as compared to attendance at other wildlife attractions.

The aquarium, as an attraction open to the public, is described by Dieter Backhaus as a special building constructed to contain many tanks and their population (Kirchshofer 1966). In addition, all animals exhibited are dependent upon water as their natural habitat for all or a

part of their life. Hancocks (1971) goes farther to say that the aquarium has evolved beyond its original meaning as defined by Backhaus. Aquariums not only display aquatic environments for recreational purposes, but also for scientific purposes. This is done through exhibits involving birds, insects, amphibians, fish, and plant life as a series of ecological groups which allows for a display in which animal life is presented rather than a species exhibited to the public (Hancocks 1971). Such displays present animals in their environment with other animals rather than just showing an animal outside of its habitat.

Another wildlife facility which is very similar to an aquarium, yet distinct enough to be in a class of its own, is the marine-wildlife attraction (Nelson 1990). Hancocks (1971) describes these types of attractions as 'oceanariums' because they are commercial rather than scientific enterprises. These facilities are generally located in areas with favorable climates and near coastal areas to reduce operating costs (Hancocks 1971). Blunt (1976) notes that as such facilities grow in popularity, they appear in larger numbers, and within inland cities such as Chicago. These attractions specialize in action-packed shows that can often draw greater crowds than naturalistic exhibits (Hancocks 1971). In addition to species which are common among many aquariums, these attractions feature trained marine mammals such as dolphins, sea lions, and whales (Hancocks 1971).

The drive-thru park is a variation of the zoological

park. These facilities are generally operated by the private sector and are intended as profit generating operations (Johnson 1971). Drive-thru parks allow the visitor to drive a vehicle through the park at their own pace to view the animals, and provide a feeling of spaciousness that is more difficult to facilitate in a zoo (Johnson 1971). The animals can be viewed in open fields instead of fenced enclosures, allowing the visitor to imagine animals in their natural environment (Johnson 1971). Fox (1986) argues that these attractions are an illusion whose existence is primarily for profit and secondarily for entertainment. Fox states that these attractions portray animals as being plentiful, when in fact many species are endangered in the wild. Drive-thru parks are generally located on the outskirts of large cities within large expanses of land (Johnson 1971).

Aviaries are attractions whose primary purpose is to display birds. The aviary is generally found as a portion of a zoo, but may also be found as its own facility (Hancocks 1971). Aviaries range in their designs from those where the birds are displayed within small cages to others where birds are displayed within a large open area surrounded by netting to allow flight (Hancocks 1971). A variation upon the latter type of aviary has been the walk-thru aviary (Hancocks 1971).

The first reptiliary was opened at the London Zoo in 1849 for the display of reptiles and amphibians (Hancocks 1971). Hancocks describes these facilities as having

significant popularity among the public. Often, however, these facilities are ranked by visitors as the least popular type of facility (Hancocks 1971). Street (1967) and Johnson (1971) note that many reptile farms were established to help in developing serum for poisonous snake bites. Reptiliaries are very common in areas where reptiles are abundant, and are represented by alligator farms in places such as Florida and Louisiana (Gersh 1971).

Display Techniques

There are many different display techniques which are used to landscape exhibits and present animals. The different types are used for different specimens and by different facilities. Landscape immersion is the process through which the visitor shares the same landscape, but not the same area with the animal being displayed (Polakowski 1987). Swain (1989) describes this as giving the visitor the impression of actually standing in a jungle or on the tundra. This is done through a combination of different methods. Coe (1985) discusses how invisible barriers separate the zoo visitor and animal as part of the display. Coe suggests that the relative position of the animal and the viewer can stimulate the visitor to learn more about the animal. Jackson (1990) discusses how different plants can be used to landscape exhibits, and the importance of horticulture in the zoo environment. The benefits of plants in zoos, and how plants have been utilized as barriers has also been researched. Michelmore (1990) notes how a barrier

of evergreen shrubs between adjacent enclosures of rival animals or between the enclosures of predatory and potential prey can reduce stress in animals. Barriers of plants can also be used as safety barriers such as a flower bed along an enclosure fence to keep visitors back (Michelmore 1990). Zwerin (1986) discusses the benefits of artificial rocks to tie in with the habitat and to hide other features. Both natural and artificial rock work can be utilized in landscape displays for animals at zoos (Curtis and Abney 1976).

The oldest form of cage that animals have been kept in is the pit which has been commonly used for bears (Hediger 1969). Hediger describes this type of display as a depression in the ground with smooth walls. Another style is where wooden palisades are used to contain the animal and the animal can be viewed at eye level through narrow gaps in the palisades (Hediger 1969). A third display method makes use of iron bars to contain the animal. This facilitates better viewing than the wooden palisades (Hediger 1969). Slusarenko (1986) notes that this method results in rows of rectangular cages with neatly trimmed hedges. Slusarenko (1986) also describes how cages were designed with surfaces finished in tile or concrete to facilitate easy cleaning, but how such practices lead to poor aesthetics. Hancocks (1971) describes how these types of cages were built to create a mood rather than to meet an animal's requirements.

Another method of fencing animals was to use wire netting (Hediger 1969). Hediger described how this barrier,

while allowing an improved view for zoo patrons, created greater risks to the animal being displayed. An animal not recognizing the netting as a barrier might rush it and harm itself or visitors.

A different type of barrier came into wide use in exhibits designed to create unobstructed views (Polakowski 1987). The moat or ditch barrier was created by Carl Hagenbeck, and was completely different in its origin than the old type of sunken ground barrier. In this new type of exhibit the moat serves as a barrier instead of an exhibition area (Hediger 1969). The animal being displayed would live on a platform which was blocked in the rear by a wall or cliff. In the front a moat or ditch, which can be empty or filled with water, separates the animal from the visitor (Hediger 1969). These same methods have spread to zoos around the world (Meyer 1979). Hediger (1969) describes how exhibits can be arranged to display many species where they appear to all be in a single enclosure, while in actuality they are separated by moats which are hidden to the zoo visitor.

Wire netting is used in many aviaries to allow for the flight of birds and allow for visitors to walk among the birds (Hancocks 1971, Kirchshofer 1968). Birds have also been kept behind glass barriers (Hediger 1950). Hediger (1950) suggests, however, that even though the onlooker has an unobstructed view, the transparency of the glass cannot be detected by the bird and can often result in an injury to the specimen. Glass cages have also been used for reptiles

and small mammals because of their ease in helping to regulate temperature and humidity (Kirchshofer 1968).

Another method which has become popular in the last few decades to contain and display animals is the light shield. This technique involves having the cage illuminated and the visitors standing in a darkened viewing area so that the open face of the cage appears as a dark barrier to the animal (Kirchshofer 1968, Johnson 1971). Johnson (1971) also discusses the use of thermal and electric barriers to provide unobstructed views of specimens. Polakowski (1987) and Johnson (1971) discuss safari or drive-thru parks where the animals are able to be viewed within large open areas where the boundaries of the enclosure are not obvious.

Locations of Wildlife Facilities

Zoological parks and aquariums are common in the United States and Canada; however, aquariums are generally less abundant than zoos. Hancocks (1971) cites that aviaries are generally a part of the zoo, but can be found as separate attractions. Reptiliaries are also generally part of a zoo as a reptile house (Hancocks 1971), or can be found in geographic areas where reptiles are more abundant and the climate is more favorable (Gersh 1971). Marine wildlife parks are generally found in coastal areas where the climate is more favorable and costs are lower for this type of commercial activity (Hancocks 1971).

Climate as an Impact Upon Facilities and Displays

Because of the wide variety and sensitivity of animals exhibited at wildlife attractions, climate plays an important factor in their display. Hediger (1969) notes that in cold climates it becomes necessary to keep tropical animals in specially conditioned accommodations and that of all climatic factors, temperature is the first concern in dealing with animals and their displays (Hediger 1950). He also suggests that each animal has its own optimum temperature (Hediger 1969).

When dealing with species sensitive to slight climatic changes, many facilities keep animals in indoor enclosures where the environment can be controlled. This includes where light can be simulated for dawn and dusk, temperature and humidity automatically regulated, and sometimes when precipitation is simulated (Quick 1984).

Meyer (1979) discusses how zoos diffused from the Northeast to the Midwest in the United States, and how changes in climate have influenced the early design of zoos and the different methods of display and care for animals. One method that becomes necessary for the care of animals is to move animals before severe weather begins. Street (1967) uses the example of flamingos in a zoo. If flamingos are not removed from their outdoor enclosure prior to freezing temperatures they will become frozen in their pond. When they attempt to move in the morning they will break their legs and must be destroyed.

Different types of housing are generally constructed for different animals to accommodate specific climates. Large houses with adjoining yards are constructed for elephants and rhinos. Reptiles are kept in heated houses, and hardier North American fauna generally remained outdoors (Meyer 1979). Eisenberg (Meyer 1979) classifies the United States into climatic regions consisting of the Northwest, Southwest, Great Lakes, Southern Plains, and New York in terms of climatic influences on zoos. He notes how zoos in the Northwest do not have a severe winter. In contrast those in the Great Lakes region have severe winters making it necessary to limit the viewing of animals to indoor areas.

Data Sources

Sources ranging from professional organizations to individual authors have listings of wildlife attractions or facilities featuring animal exhibits. Johnson (1971) lists a large number of zoos and aquariums within the United States and Canada. Fisher (1966) and Kirchshofer (1968) also feature within their text, listings of premiere zoos and aquariums from around the world. Meyer (1979) gives a listing of some of the best zoos which are located in North America. Over 850 zoological parks, farms, marine displays, and aquariums are listed and described for the United States and Canada by Ulmer and Gower (1985). Gersh (1971) provides a detailed listing of zoos and other attractions in the United States and Canada in his book. In addition, Gersh

also lists selected zoos from Latin American countries. Organizations such as the Zoological Society of London and the American Association of Zoological Parks and Aquariums also publishes listings of zoos and aquariums which are members of their organizations (Olney and Ellis 1990, AAZPA 1993).

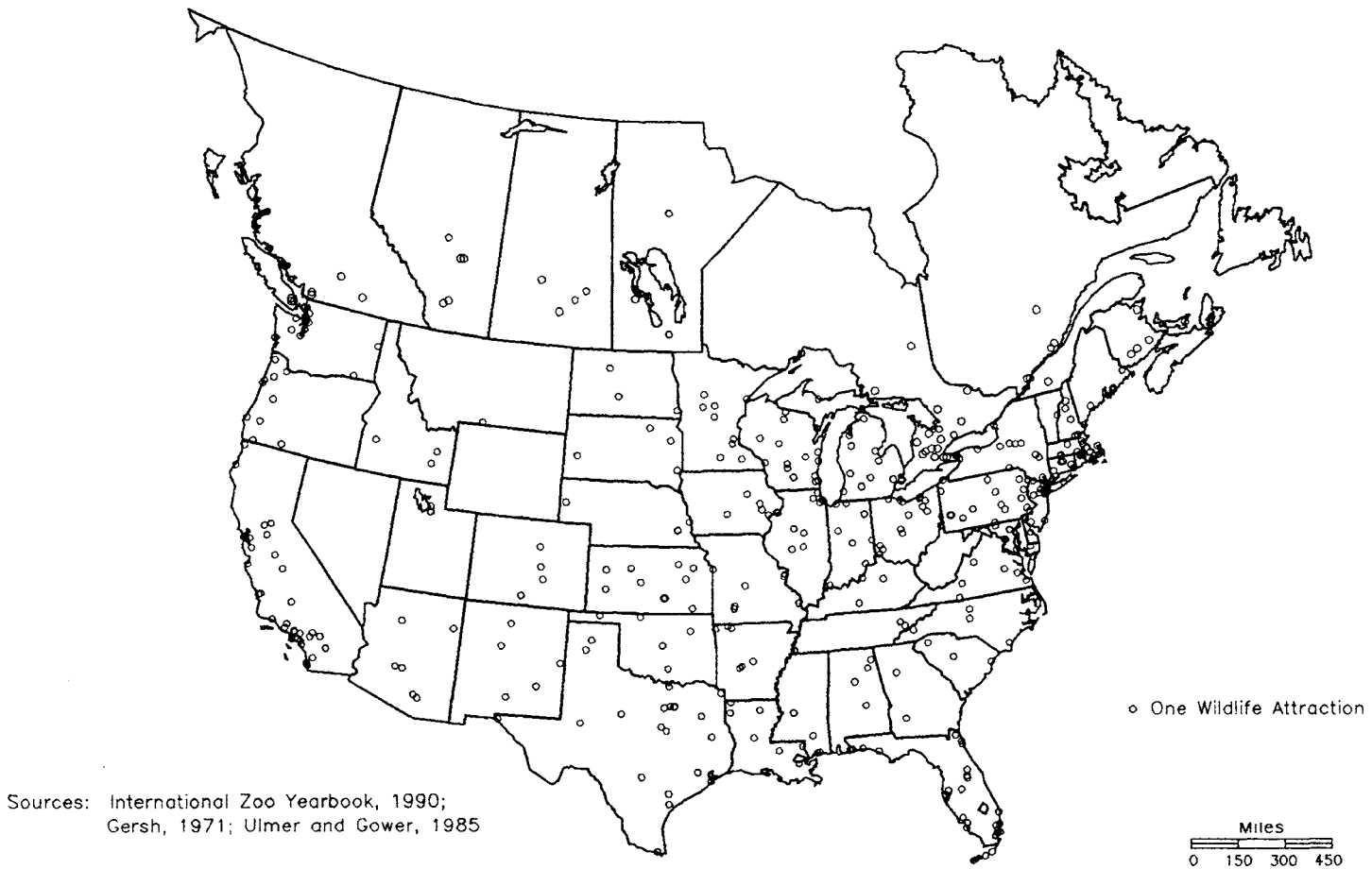
CHAPTER III

ANALYSIS OF TYPOLOGY

Sample Group and Sampling Methods

The creation of a typology for the classification of wildlife attractions was the primary objective of this research. Wildlife attractions across the United States and Canada were sampled to gain the data necessary for the analysis. A sampling list was developed using three sources containing addresses and descriptions of various wildlife attractions in the United States and Canada. This list was compiled from Gersh (1971), Ulmer and Gower (1985), and the International Zoo Yearbook (Olney and Ellis 1990). From these three sources, over 900 facilities were identified that feature some kind of animal display. The next step was to identify only facilities whose primary purpose is the display of animals. The sampling list which was then created and consisted of 473 wildlife attractions, the distribution of which are shown in Figure 1. From the sampling list a random number table was used to determine the 200 wildlife attractions to be surveyed (Appendix A).

A mail questionnaire was then developed to obtain data on various aspects associated with wildlife facilities



Sources: International Zoo Yearbook, 1990;
Gersh, 1971; Ulmer and Gower, 1985

Figure 1. Wildlife Attractions in the United States and Canada.

(Appendix B). The survey design and format were developed using Dillman's (1978) guidelines for mail questionnaires, and Lounsbury and Aldrich's (1986) guidelines for questionnaire design. The questionnaire was mailed out to the 200 selected attractions in December of 1993 (Figure 2). Of the 200 attractions contacted, 107 facilities replied for a response rate of just over fifty percent. Six of these were omitted due to the facilities having closed. This left a total of 101 usable respondents (Figure 3).

Typology Analysis

To break down and analyze the data obtained in the survey, statistical methods were used to evaluate the first hypothesis:

1. A wildlife attraction typology can be developed based on the physical attributes of facilities in which animals are displayed and kept.

Cluster analysis was used to develop a method by which to classify observations into groups based upon similar characteristics as a means of developing a typology. The cluster analysis was conducted using the SAS software package. Table 2 lists the variables which were selected as key factors in the clustering of observations. These variables were chosen because they reflect how the facility is administered, the variety and number of animal species, and display methods used at each facility. Of the 101 observations, three observations were omitted in the cluster analysis due to missing values. From the remaining 98 observations five clusters were created based on variables

Figure 2. Wildlife Attractions Selected by Random Sample to be Surveyed

Figure 3. Wildlife Attractions Responding to Survey

TABLE 2

VARIABLES USED IN THE CLUSTERING OF WILDLIFE ATTRACTIONS

Year facility was Established
Size of facility in acres
How facility is administered
Daily fee charged for adults
Daily fee charged for children
Daily fee charged for seniors
Is the facility profit or non-profit
Approximate attendance for 1992
Number of mammal species
Number of bird species
Number of fish species
Number of reptile and amphibian species
Primary way animals are viewed by visitors at the facility
Methods used in the display of animals at the facility
Does the facility feature shows with trained animals

used in the analysis (Table 3). The characteristics of cluster memberships are shown in Figures 4 through 18.

Class 1 Attractions

Class 1 wildlife attractions, while not necessarily more elaborate than Class 2 attractions, are premier facilities (Appendix A). More than 50 percent of Class 1 attractions were established prior to 1930 and most are from large metropolitan centers. These facilities tend to be larger than those in any other cluster. They usually contain their own aquarium collection, aviary, and reptile house, placing many different types of facilities within one area. Because Class 1 attractions are generally associated with cities, most are administered by municipal governments and/or are supported by a local society. A feature that makes the Class 1 attraction stand out is that this entire cluster of facilities is composed of non-profit organizations. Attendance at Class 1 attractions was found to be above 250,000, with almost 50 percent of the facilities having a yearly attendance of greater than one million. This is only comparable to cluster 4, Marine Park Attractions, which has an average yearly attendance of greater than one million. Class 1 attractions also offer a greater overall number of species displayed than the other clusters. The most common display methods used at Class 1 attractions include moated displays (100%), fenced enclosure displays (95.7%), and glass cages (91.3%). In addition,

TABLE 3

CLUSTERS OF WILDLIFE ATTRACTIONS

Cluster Number	Cluster Name	Frequency
1	Class 1 Attraction	23
2	Class 2 Attraction	60
3	Aquariums	9
4	Marine Park Attraction	2
5	Other Attractions	4
		98 *

* 3 observations omitted due to missing values

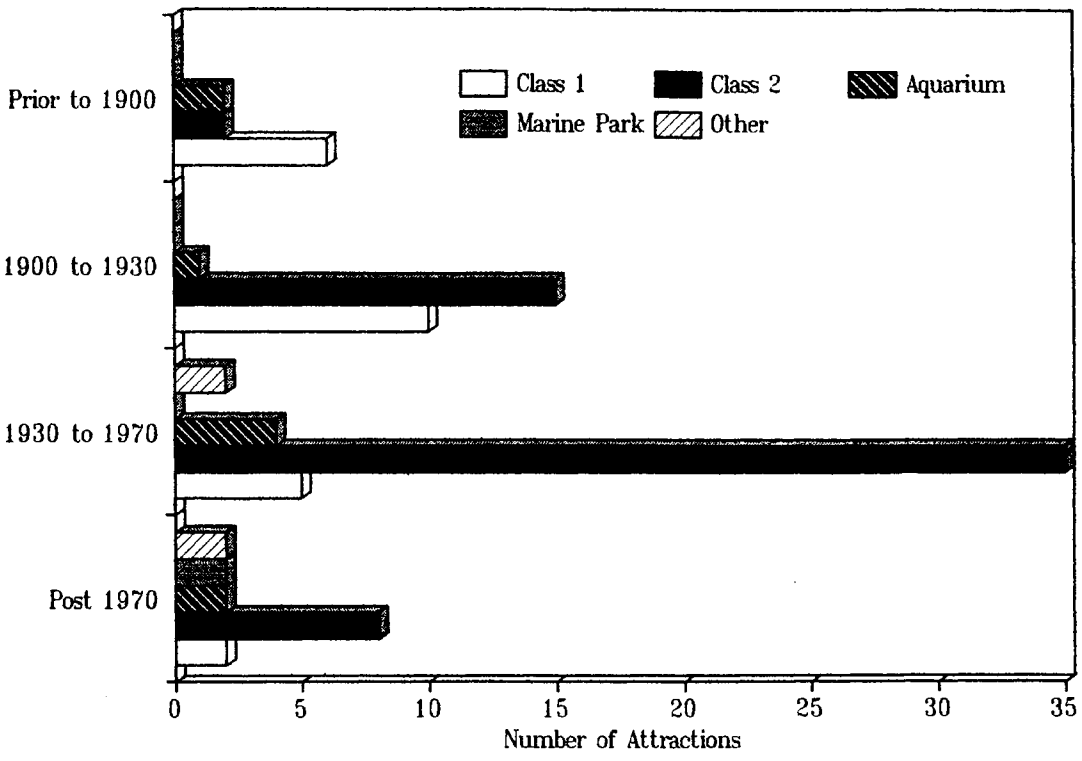


Figure 4. Dates of Wildlife Attraction Establishment by Cluster

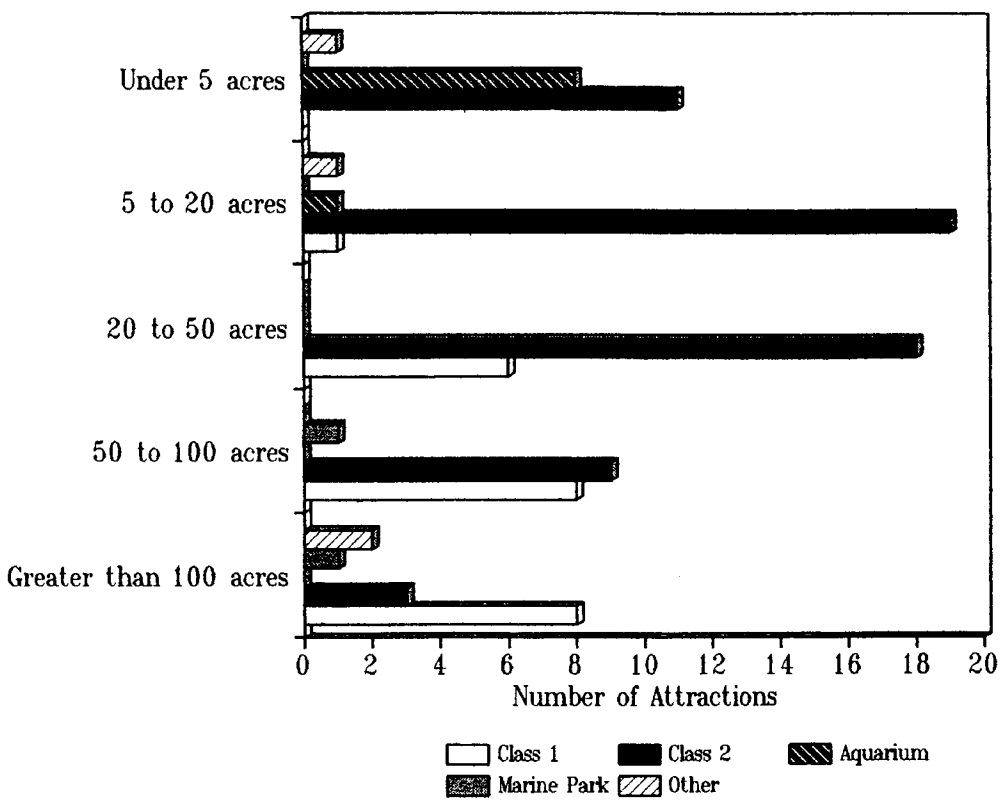


Figure 5. Size of Wildlife Attractions by Cluster

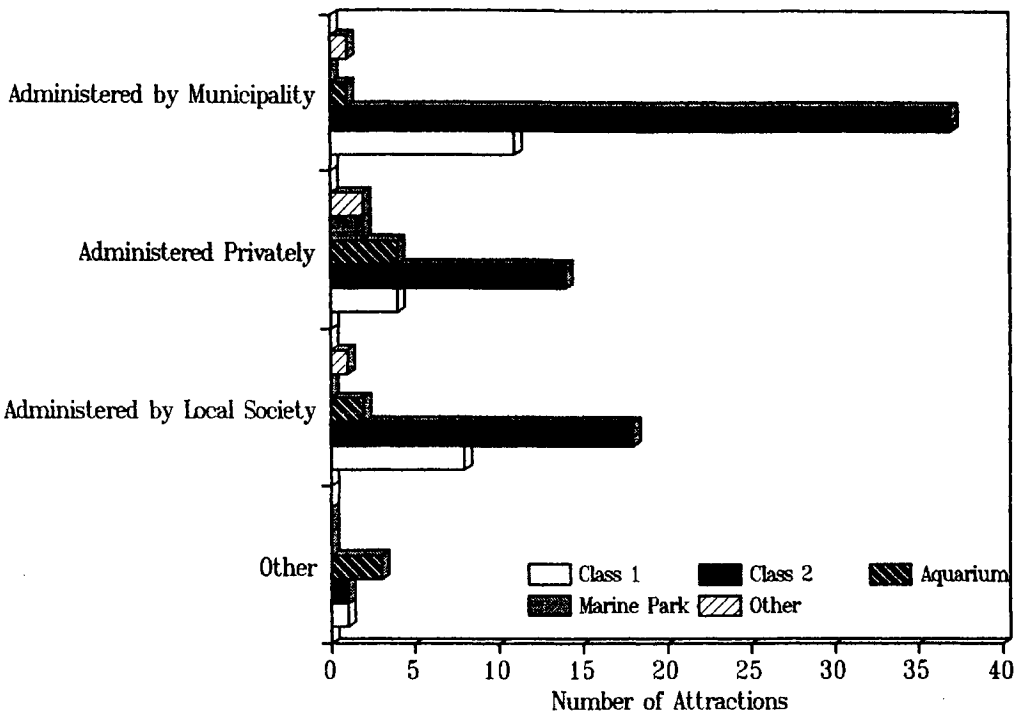


Figure 6. Administration of Wildlife Attractions by Cluster

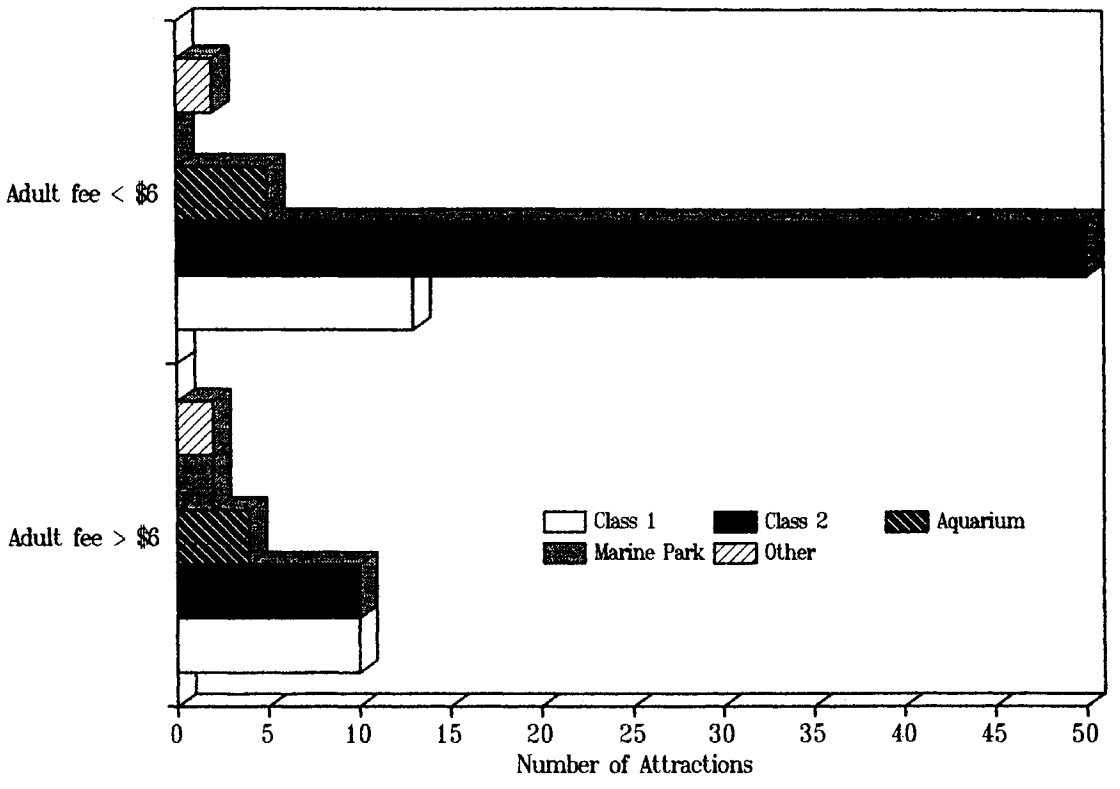


Figure 7. Adult's Fee Charged at Wildlife Attractions by Cluster

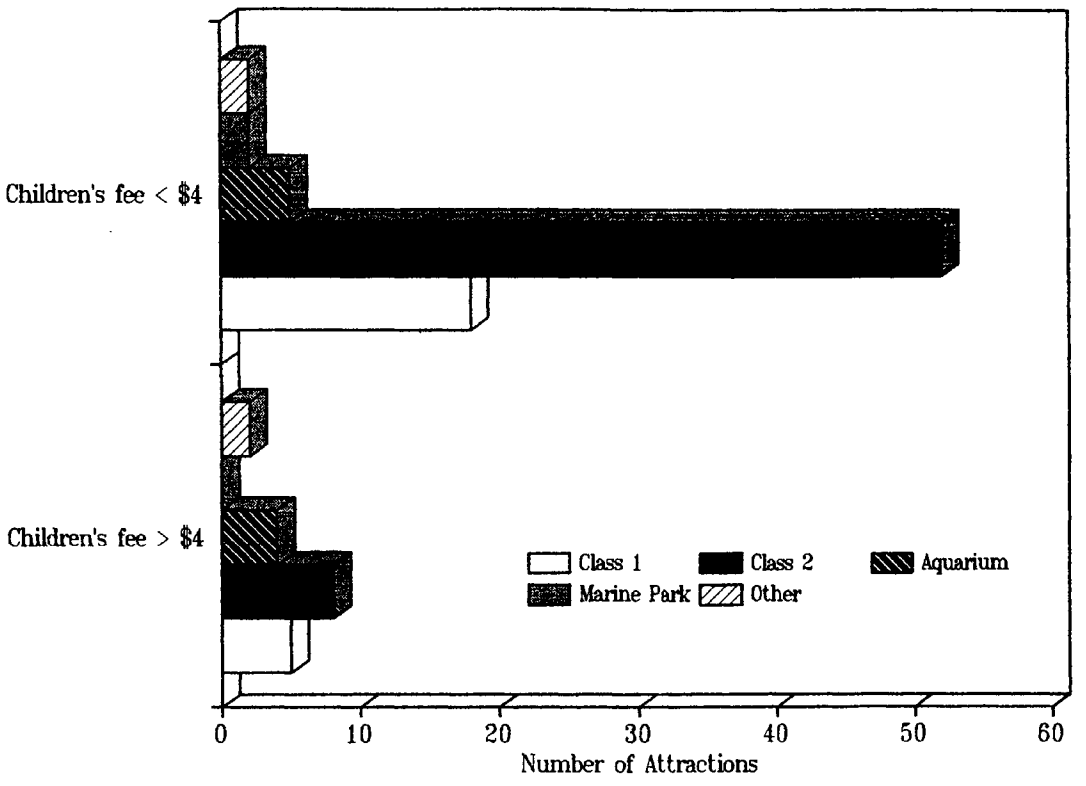


Figure 8. Children's Fee Charged at Wildlife Attractions by Cluster

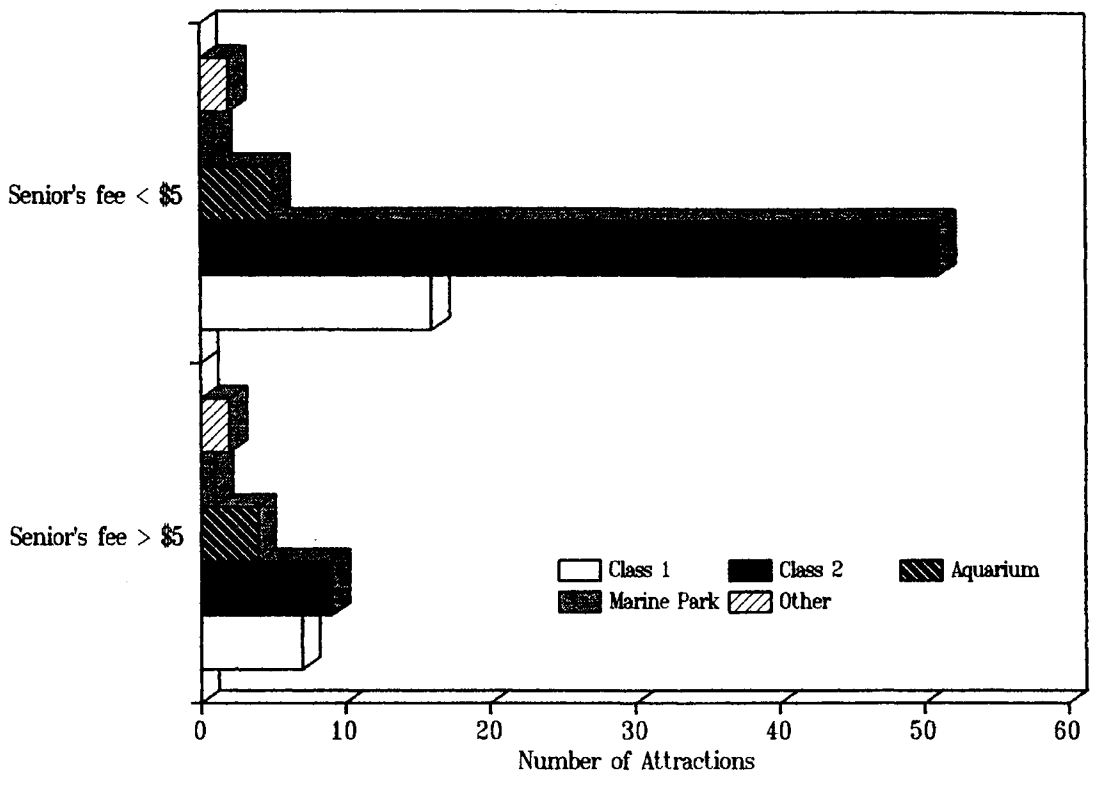


Figure 9. Senior's Fee Charged at Wildlife Attractions by Cluster

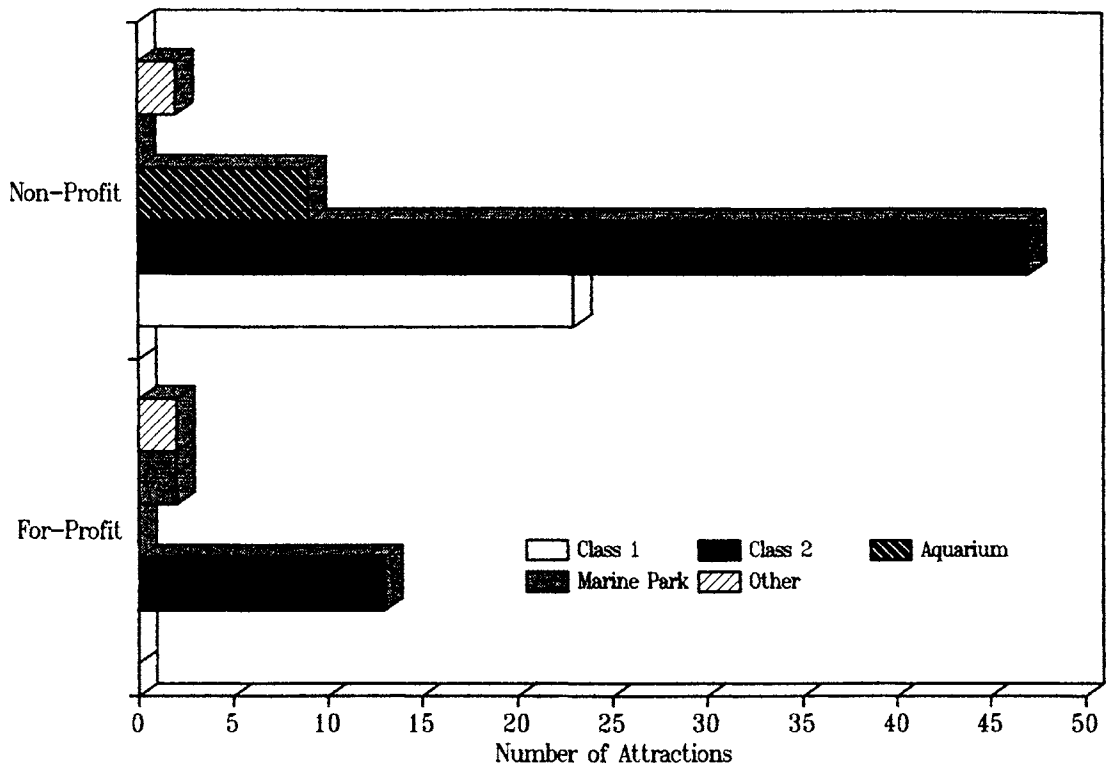


Figure 10. Non-Profit or For-Profit Wildlife Attractions by Cluster

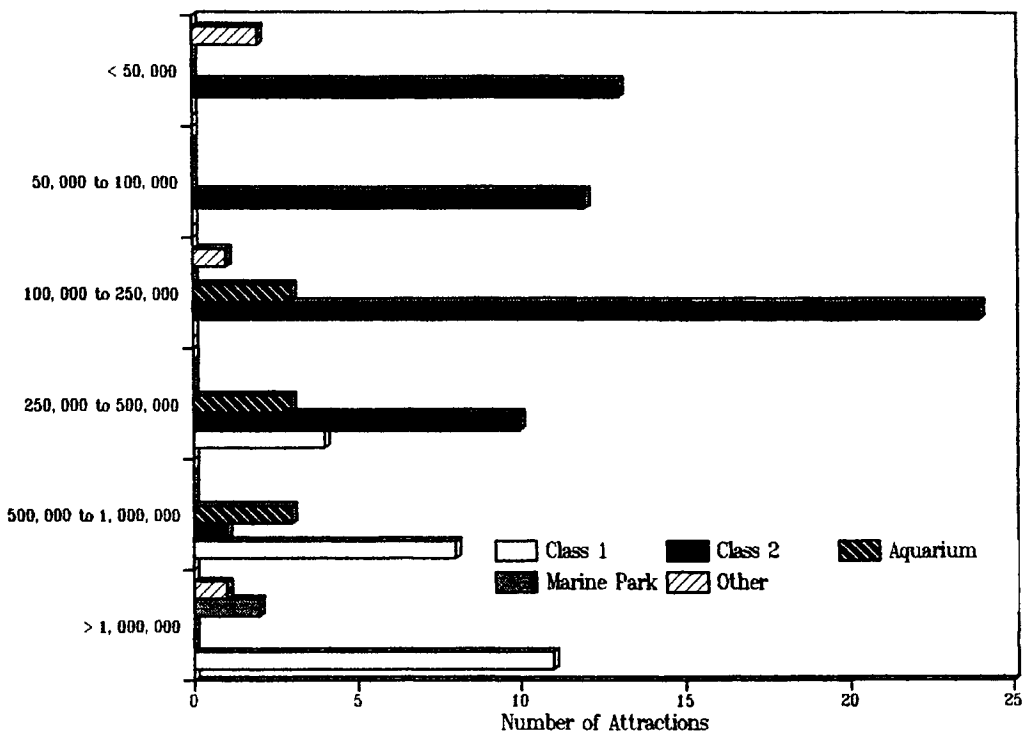


Figure 11. Attendance at Wildlife Attractions by Cluster

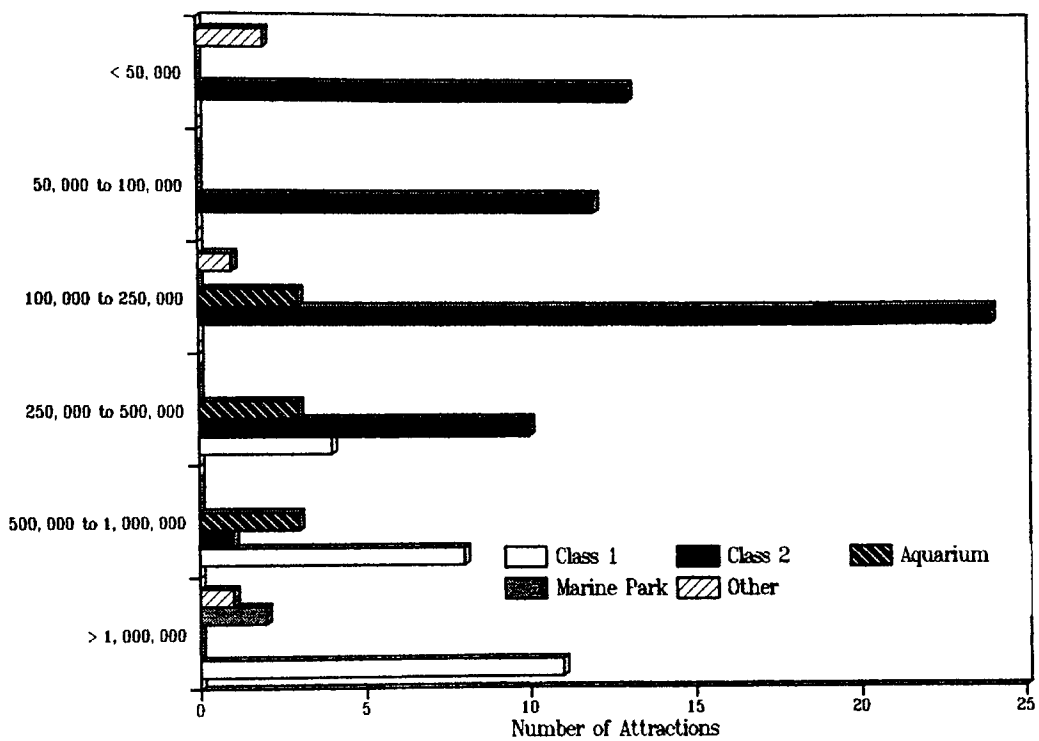


Figure 11. Attendance at Wildlife Attractions by Cluster

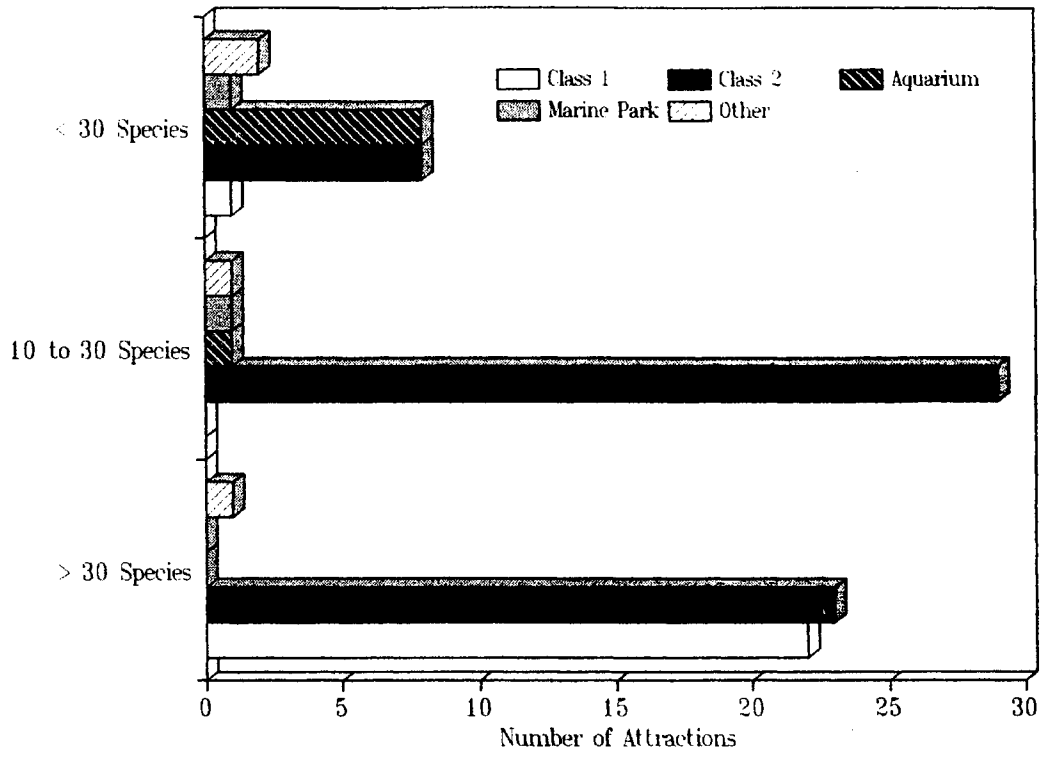


Figure 12. Number of Mammal Species Displayed at Wildlife Attractions by Cluster

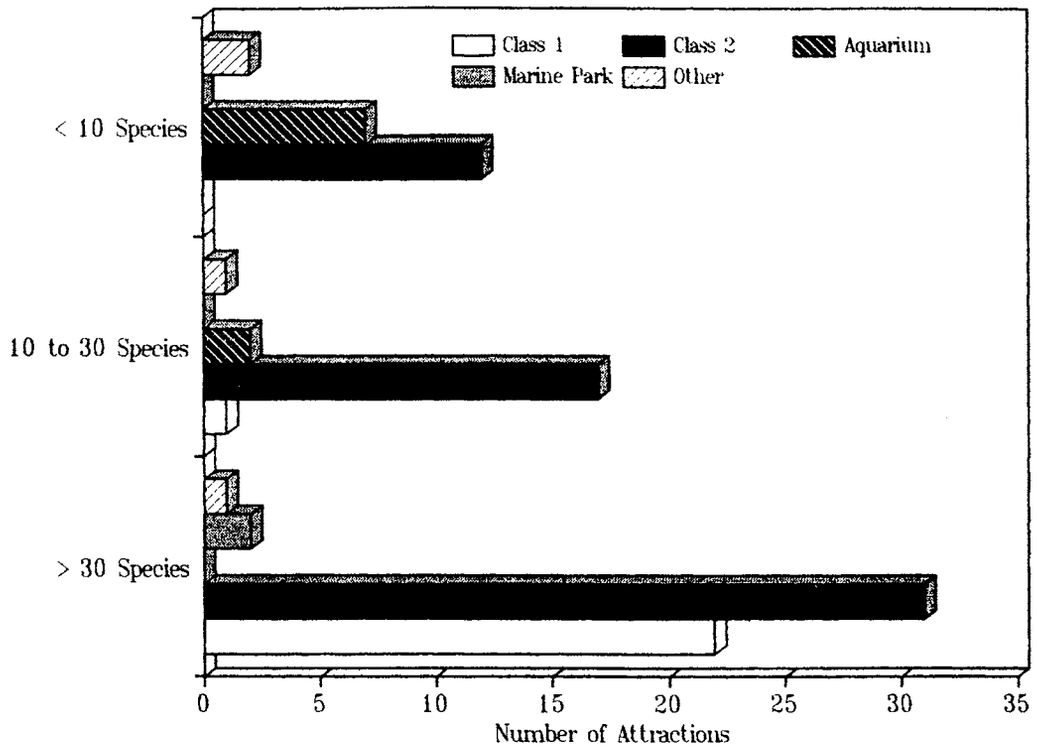


Figure 13. Number of Bird Species Displayed at Wildlife Attractions by Cluster

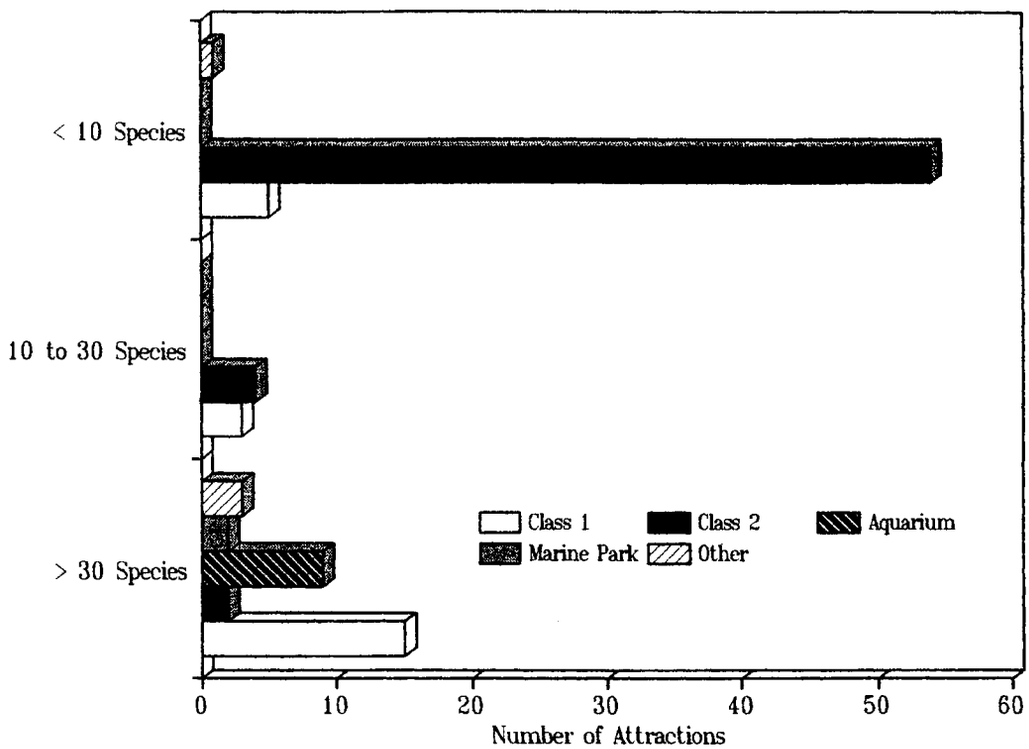


Figure 14. Number of Fish Species Displayed at Wildlife Attractions by Cluster

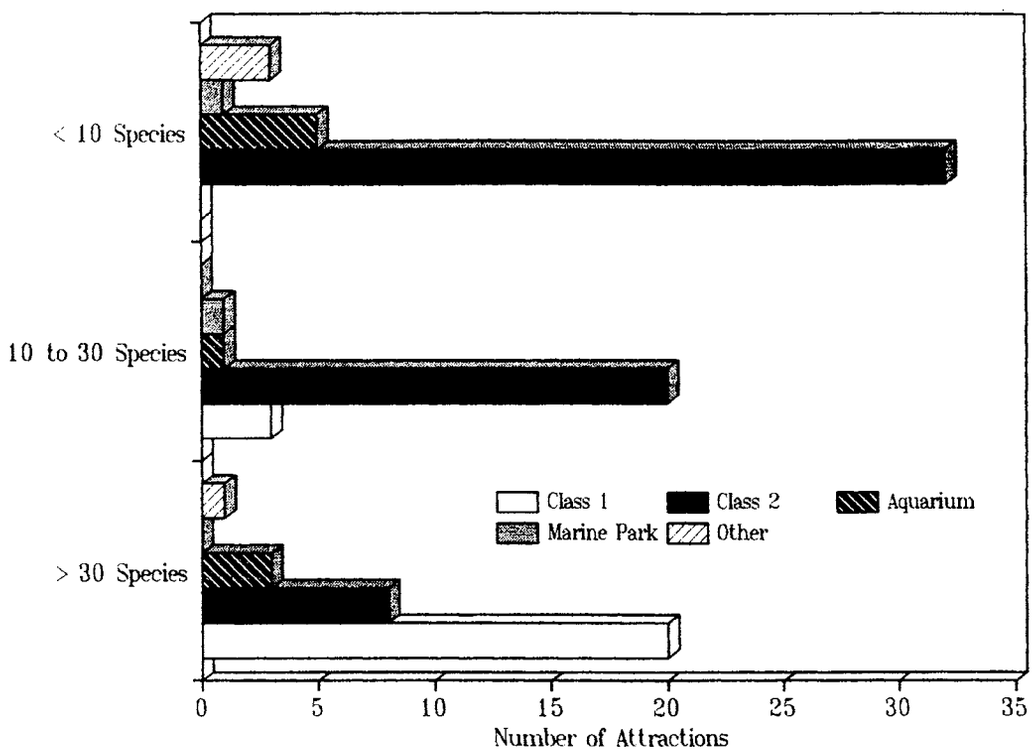


Figure 15. Number of Reptile and Amphibian Species Displayed at Wildlife Attractions by Cluster

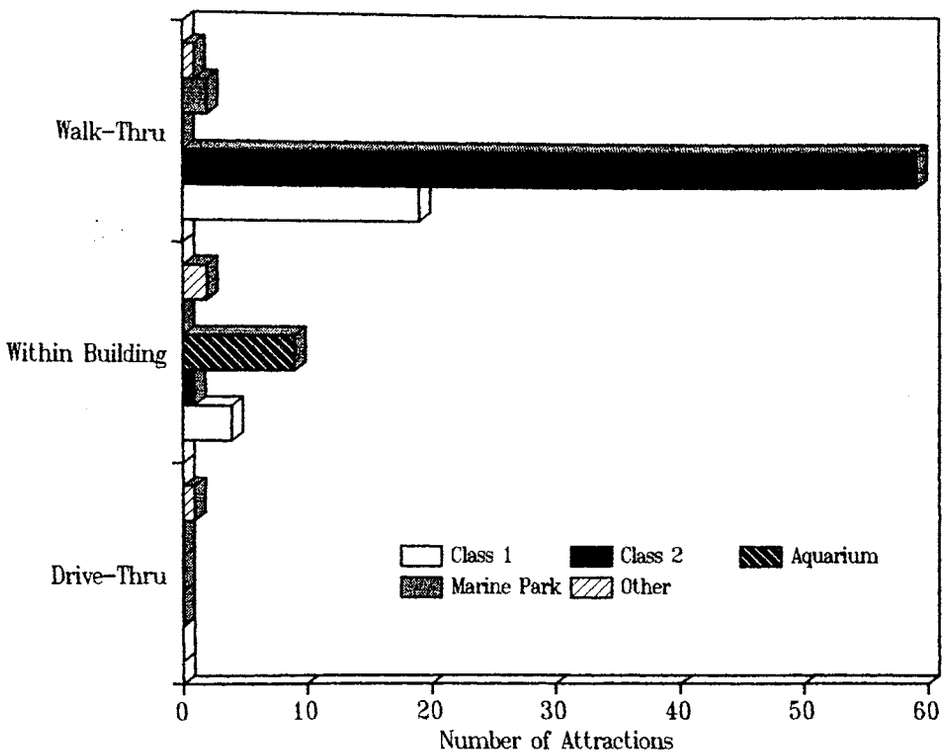


Figure 16. Primary Viewing Methods of Displays at Wildlife Attractions by Cluster

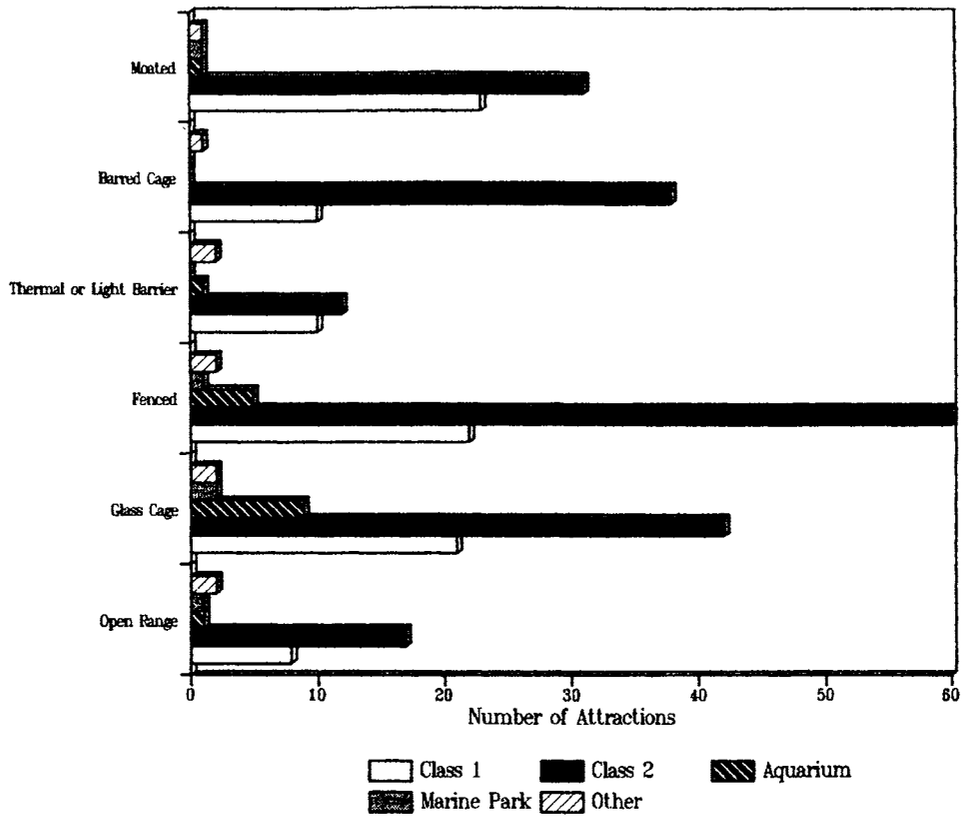


Figure 17. Frequency of Display Techniques at Wildlife Attractions by Cluster

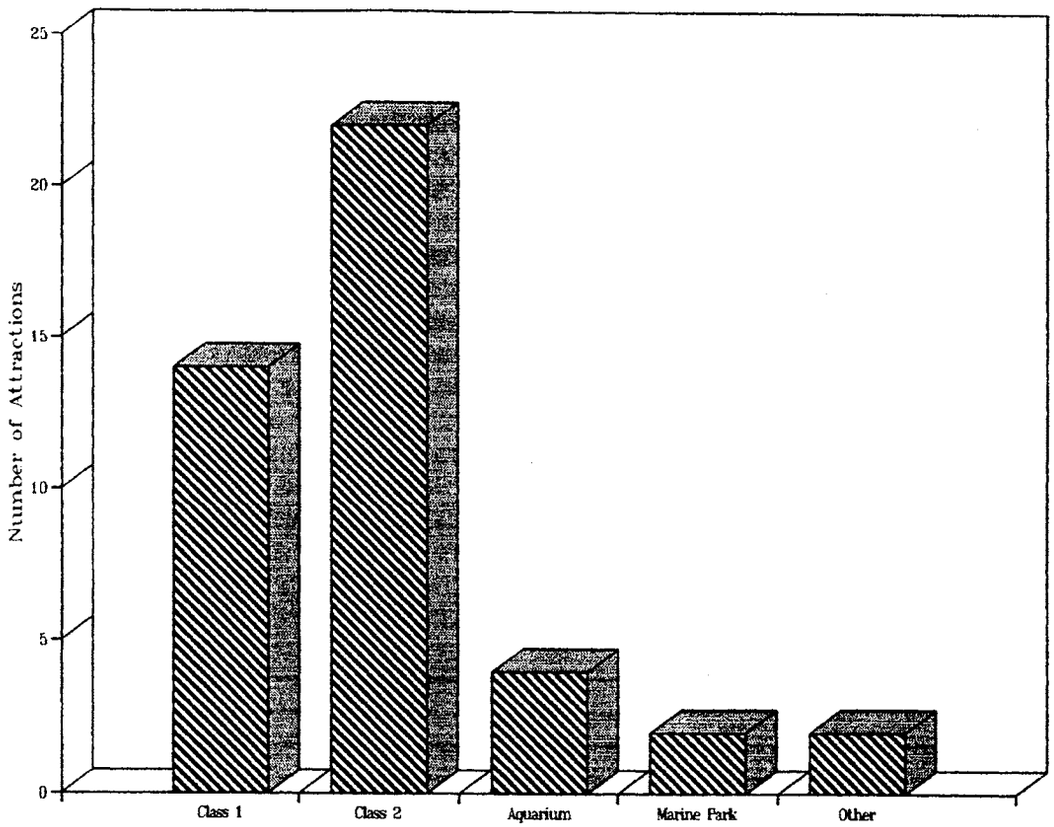


Figure 18. Frequency of Wildlife Attractions Featuring Animal Shows by Cluster

shows featuring trained animals are fairly common at the Class 1 attractions. About 61 percent of Class 1 attractions have these shows.

Class 2 Attractions

The Class 2 wildlife attraction is the largest cluster, containing 60 observations (Appendix A). This cluster includes smaller zoological parks, aviaries, and reptiliaries. Of the Class 2 wildlife attractions over 60 percent were established after 1930. These attractions are generally small with 80 percent being less than 50 acres in size. Most of the Class 2 attractions are operated by municipal governments or local societies. In contrast to Class 1 attractions, almost 25 percent of the Class 2 facilities are privately owned. Approximately 20 percent of Class 2 attractions are for-profit organizations setting them apart from the Class 1 attractions which are all non-profit operations. While Class 1 attractions have attendance in excess of 250,000 at their facilities, approximately 80 percent of Class 2 attractions have attendance less than 250,000. Class 2 attractions do not have large numbers of species featured at their facilities, but there are facilities with specializations. These specialized facilities include aviaries and reptile farms, which have large numbers of bird and reptile species. Of the 60 attractions, 59 have animals displayed primarily through walk-through grounds. The most widely used display

method used within Class 2 attractions is the fenced enclosure (100%). Glass display cages and barred display cages are also used by greater than 50 percent of the Class 2 wildlife attractions. Only 37 percent of Class 2 wildlife attractions feature trained animal shows.

Aquariums

Cluster 3, made up of nine observations, is called Aquariums (Appendix A). Of the nine attractions, eight have as their primary purpose the display of fish species. The Staten Island Zoo is also included in this cluster. Its inclusion in this group is due to the zoo's large collection of fish species and the primary way in which animals at the zoo are viewed, which is within a building. This observation may be considered an outlier and should probably be located with either the Class 1 or Class 2 attractions.

The distribution of Aquarium establishment dates is fairly consistent over the time periods chosen. Most of these facilities are less than five acres in size due to the fact that they are generally situated within buildings. Unlike the previous two categories, the administration of aquariums varies with municipal administration being the least common. Aquariums are generally non-profit, but do have fairly large attendance. Some aquariums feature small numbers of other species, however, their primary purpose is usually the display of fish species with 100 percent of the sampled areas having greater than 50 species of fish. Glass

tanks are the most common display methods utilized by aquariums for displaying animals. About 50 percent of the aquariums sampled feature shows.

Marine Parks

Cluster 4 includes Marine Parks (Appendix A). This category consists of only two observations, Sea World of Ohio and Sea World of Florida. These two areas are recent attractions that have been established since 1970. They are large, private for-profit organizations. The adult fee charged is greater than that of attractions in other clusters (See Figure 7). Even with a greater fee these marine parks attract annual crowds in excess of one million persons. Marine Park attractions feature large numbers of fish and bird species, as well as mammal, reptile, and amphibian species that are set around a marine environment theme. Also popular at these facilities are shows featuring trained animals.

Other Wildlife Attractions

The final cluster is cluster 5 (Appendix A) which consists of other wildlife attractions which were not clustered in the first four categories. These attractions consisted of a drive-thru wildlife park and two specialty attractions which could be added to Class 2. The fourth attraction is a marine theme park in Florida which was the first of its kind and was the predecessor to the Sea Worlds and other similar attractions. This attraction might

therefore, be added to the marine park cluster.

CHAPTER IV

ANALYSIS OF A WILDLIFE ATTRACTION PROXIMITY TO AN URBAN CENTER

Introduction

The distance of an attraction to its nearest urban center is an important factor in relation to the attraction's typology. Many attractions require large amounts of space, such as drive-thru or marine parks. Some zoos also require large tracts of land for the display of animals. In urban areas this land often is not available, especially in large, growing cities. Because of this, an attraction's proximity to an urban center may be reflected within its typology based upon variables which were used in the typology classification. Such variables are size, display methods, and number of species displayed.

Distance as a Factor

The distance that an attraction is from an urban center can therefore have an impact on the attraction's size, attendance, and other variables. Based upon this, the following hypothesis was analyzed:

The proximity of a wildlife attraction to its urban center will have an effect upon its classification in the typology.

A descriptive analysis was used to analyze an attraction's distance from an urban center. If the attraction was not within the urban area, the distance of the attraction to its closest urban area was measured. A road atlas was used to locate the attractions and cities and as a means to calculate distance. If the attraction was not within the suburbs of an urbanized area or had a population of less than 50,000, then it was measured to the closest urban center with a population of 50,000 or more. The cities, their proximity to an urban center, and their population are listed by cluster in Appendix C.

Of the Class 1 attractions, almost all were located within the city's urban fringe. The Class 1 attractions which were not within an urban area were all located within a distance of 10 miles from an urban area. This was to be expected since most Class 1 attractions are administered by cities.

Fifty one percent of the Class 2 attractions ranged in distance from an urban center from less than one mile up to 350 miles away. Most of these attractions were from smaller cities with populations less than 50,000. These attractions are generally administered by municipalities. The remainder of the Class 2 attractions are within the urban area of cities with populations of more than 50,000 persons.

The Aquarium class of attractions consists of nine attractions, of which 67% are located within an urban area. The other 33% range in their distances to an urban area from five miles to 85 miles. This helps to confirm what was found by Sedway and Associates (Nelson 1990) that while aquariums are much less common than zoos they depend more upon tourist visitation. Tourists are more likely to travel to visit an aquarium because it is something that they cannot do at home (Nelson 1990).

Of the two Marine Park attractions, one is located within an urban area while the other is located 12 miles from an urban center. These attractions are generally found in coastal areas. Of the two sampled, one was in Orlando, Florida which fits the coastal criteria while the other attraction was located in Aurora, Ohio. This second area's location supports Blunt's (1976) observation that as these attractions grow in popularity, they begin to appear within inland cities.

There are four attractions in the fifth category, of which two are located within an urban center while the other two are located outside of an urban center. Marineland of Florida is located 20 miles from an urban center and is similar in most respects to other Marine Parks. It is in a coastal area where operating costs are lower because of the more favorable coastal climate. This eliminates the need for housing and special climate controlled facilities which can be costly (Hancocks 1971). Wildlife Safari is a drive-thru animal park which is located 60 miles from an urban

center in Oregon. Attractions such as this generally need large areas of open land and are found at distances from urban centers. This type of attraction is similar to the aquarium since it is not readily available to many people, making it more probable that someone might travel a longer distance to see this type of attraction.

Population as a Factor

In addition to the distance an attraction is from an urban center, the population of urban centers are also reflected in a wildlife attraction's typology. The population for cities where wildlife attractions are located was obtained from the County and City Data Book, 1988 (U.S. Census Bureau, 1988) and the Canada 125th Anniversary Yearbook, 1992 (Communication Division of Statistics, 1991). The 1986 population figures were the most recent figures that could be obtained for Canada. 1986 population figures were used for the United States to maintain consistency.

Of the Class 1 attractions, there were four attractions located within cities with a population of greater than 1 million. Only five Class 1 attractions were in cities with populations less than 100,000 persons. Two of these attractions were in smaller suburbs of a large urban center. The Class 1 attractions located in cities with the lowest populations were also the Class 1 attractions which were furthest from an urban center.

Of the Class 2 attractions, only two attractions were in cities with populations of more than 500,000 persons.

Among the other Class 2 attractions, 38 percent were located in cities with populations of 100,000 or more, and 58 percent of the attractions were in cities with populations of less than 100,000. This may help to demonstrate that the Class 2 attraction is found in smaller cities away from urban centers.

Of the Aquariums, four are from cities with populations of more than 100,000 persons. While some aquariums are located in cities with populations less than 10,000, they are not far from an urban center. In addition, since they are less common than zoos, they can draw a more significant number of tourists.

The two Marine Parks are located in cities which do not have large populations but are in locations that can draw from a wide area. Within a 100 mile radius of Sea World of Florida in Orlando there are numerous cities with populations of 50,000 or more. Within 50 miles of Sea World of Ohio there are cities such as Cleveland and Akron which have populations over 100,000. Each of these attractions have an attendance of greater than one million per year which is due not only to surrounding cities, but is also related to the fact that tourists will travel a great distance to see such displays and animals.

The attractions which are in the fifth category because of their variation are also from cities with varying populations. The two attractions, Marineland of Florida and Wildlife Safari in Oregon, are both located in cities with small populations and are situated at a considerable

distance from urban centers. These attractions rely on tourism to support them instead of local patrons. The other two attractions in this category are types of specialty attractions which can not be classified because they are not like attractions in other categories. These attractions appear in larger cities where there is room for a diversity of wildlife attractions.

The distance of an attraction from an urban area and the size of the urban area are both important in the typology of the attraction. Even without having distance and urban population as variables in the typology development, distance and urban area size may effect other variables such as attraction size, attendance, number of species, etc. This reflects the importance of these two factors in wildlife attraction classification.

CHAPTER V

THE ROLE OF CLIMATIC VARIABLES ON WILDLIFE ATTRACTIONS AND ANIMAL DISPLAYS

Introduction

One of the qualities of wildlife attractions is that they display animals which are not endemic to the United States and Canada. Often these animals come from areas where the climate is very different from the climate of the location at which they are displayed. This can create special management and display problems with such animals, especially for those that cannot easily adapt to the change.

Climate as a Factor

Climate and weather conditions play important roles in the care and display of animals. Not only do individual animals have different requirements, the locations of different wildlife attractions also have their own climates which must be taken into consideration. Attendance at wildlife attractions during periods of extreme weather is an additional factor. Nelson (1990) discusses how the attendance at attractions is almost always lowest during the winter months and peaks during warm summer months in colder

climates. The situation is the opposite for warmer climates. Based upon these factors, the following hypothesis was analyzed:

> Climatic conditions will influence wildlife attraction types and animals/facilities present at a location.

Figure 19 displays wildlife attractions which were sampled, and differentiates between the attractions which must close or reduce operating hours, and those which do not need to close or reduce operating hours. Of the 101 sampled wildlife attractions, 92 responded to a question inquiring if they must reduce operating hours or close due to weather. Of the 92 wildlife attractions, 41 percent must close or reduce their hours of operation. Very few of the sampled wildlife attractions in the South appear to be affected by extreme weather conditions as compared to those in the Northern U.S. and Canada. Many of the wildlife attractions which are located in the Northern U.S. and Canada which do not close or reduce their operation during winter months can also be explained when the typology of the attraction is considered.

There were five classifications of wildlife attractions including Class 1, Class 2, Aquariums, Marine Parks, and other attractions. Figure 20 shows the number of attractions which must close or reduce operation and those which do not by their typology classification. Other attractions and Marine Park attractions categories were the smallest of the five and can not effectively be used to examine the effects of weather on these attractions.

Figure 19. Wildlife Attractions and the Effects of Weather Conditions

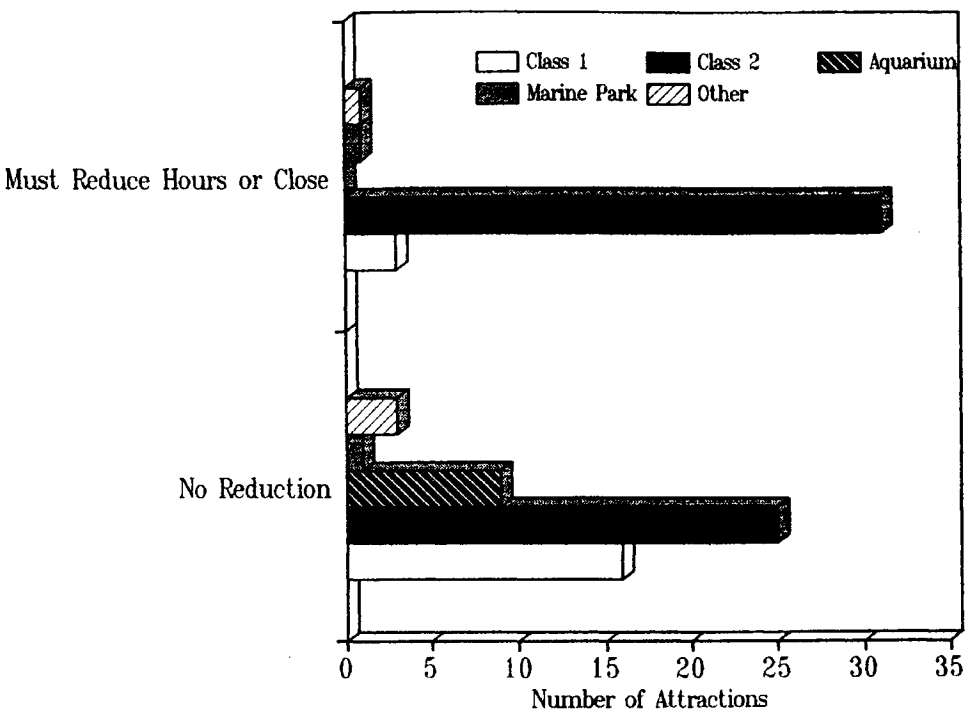


Figure 20. Frequency of Attractions Which Must Close or Reduce Operation and Those Which do not by Their Typology Classification.

Aquariums consisted of nine attractions, all of which do not require a reduction of their operating hours or closing of the facility. This can be explained by the fact that the primary way the animals are viewed at these locations was within a building. For this reason the animals or displays are not affected by long periods of extreme weather and there is no need to close or reduce operating hours.

Class 1 attractions consisted of 23 wildlife attractions. Of these attractions, 22 responded to the question concerning the weather and the operation of their attractions. 84 percent responded that it was not necessary to reduce hours or close compared to 16 percent which reduce hours or close. This can be explained in that these larger attractions bring larger attendance and can afford better facilities for animals to be displayed during more extreme weather conditions. With the smaller Class 2 attractions weather becomes an important factor. 55 percent of Class 2 attractions must close or reduce operation due to weather. Figure 21 shows the distribution of Class 2 wildlife attractions and the effects of weather conditions upon them. The large proportion of Class 2 attractions which are not affected by weather are in the southern U.S. or coastal areas. Most Class 2 attractions in Canada and the Midwest must close or reduce their operating hours. In the northeastern U.S. there is a mix of attractions which have weather as a factor in operation and those which do not. Some of the attractions which are not affected by weather in the northeastern U.S. are indoor facilities such as

Figure 21. Class 2 Wildlife Attractions and the Effects of Weather Conditions

aviaries or reptiliaries.

Class 2 attractions are those which are frequently found in smaller cities, or are a specialized type of facility with less attendance than Class 1 attractions. With less attendance it is better for these attractions to close or reduce operation during times when the weather is bad, such as winter months. When weather conditions improve they can then increase operating hours, providing a better environment for both the animals displayed and the wildlife attraction's visitors.

Display of Animals and Climate

Of the climatic factors, the one which most affects animals and the way they are displayed is ambient temperature since each animal has its own optimum temperature level (Hediger 1950). Many animals are capable of adjusting to temperatures which are below or above what they are accustomed to in the wild without any ill effects (Hediger 1950, and Street 1967). Yet, some animals are very susceptible to extreme temperature change and must be provided with special facilities if they are to be displayed at a location.

Seven indicator species were selected to determine where climatic factors such as temperature become important in the display of animals. The first indicator species selected was the polar bear. Of the sampled attractions only 21 displayed polar bears and 67 percent of these facilities do not have any special facilities for such

animals. The other 33 percent of the attractions keep polar bears in climate controlled facilities year-round, with one of these attractions moving them during extreme weather conditions. Figure 22 shows the distribution across the U.S. and Canada of polar bear display types. While it would be expected that the need for climate control for these animals would be in the southern U.S., the only attractions offering climate controlled facilities are in Oklahoma, Kentucky, and north-central Texas. Other polar bear attractions in the South have no special facilities. Some other attractions having climate controlled displays are in Illinois and Minnesota where the warm summers can be uncomfortable for the polar bear.

The hippopotamus is the second indicator species selected with 22 of the sampled wildlife attractions displaying them. Of these attractions, 60 percent do not have any special facilities, the remainder keeping their hippopotami in climate controlled facilities or moving them during extreme weather. The hippopotamus is a good indicator species since it does not adapt well to cold weather (Street 1967). Figure 23 shows the distribution of hippopotamus displays with respect to climate. In addition, Figure 23 shows the average January isotherm of 40 degrees Fahrenheit. With the hippopotamus, a boundary can be seen between the displays requiring climate control and those that do not. Most hippopotami displays which do not require climate controlled displays are located below or to the South of the 40 degree isotherm. Those hippopotami displays

Figure 22. Polar Bear Displays in Relation to Climate

Figure 23. Hippopotamus Displays in Relation to Climate

which require climate control are generally located above or to the North of the 40 degree isotherm. The 40 degree isotherm provides an effective boundary in identifying locations which require climate controlled facilities and those which do not.

Dolphins were selected as an indicator species even though they can cope with wide variations in temperature (Bryden and Harrison 1986). However, it is recommended that dolphin displays maintain a temperature of about 20 degrees Celsius (Bryden and Harrison 1986). The importance of water temperature for dolphins is that it not change rapidly (Coffey 1977). While in the wild these animals can swim away from unsettling conditions, however, in captivity they are unable to so. Therefore there is a need to stabilize water temperatures in dolphin tanks (Bryden and Harrison 1986). Only seven wildlife attractions in the sample group display dolphins (Figure 24). Of these seven attractions, five do not require climate controlled facilities. The two attractions which require climate control for their dolphins were in Oklahoma and Illinois. Of the other five not needing climate controls, three were located in Florida, and one each in Connecticut and Ohio. While managers at these two facilities state there are no special climate controls, there probably are some provisions for maintaining water temperature which did not fit into the questionnaire categories provided.

The fourth indicator species selected was the sea lion. Sea lions have been kept in captivity for many years and,

Figure 24. Dolphin Displays in Relation to Climate

given suitable conditions, can adapt well to captivity (Coffey 1977). However, sea lions are sensitive to high air temperatures and direct solar radiation (Peterson and Bartholomew 1967). Sea lions were displayed at 32 of the sampled wildlife attractions. Of these attractions, 63 percent have no special facilities for sea lions. Eleven attractions keep sea lions in climate controlled facilities year round while one attraction moves sea lions during extreme weather conditions. The display of sea lions in climate controlled facilities is done primarily in the Midwest and Canada (Figure 25). This may be due to freezing temperatures in the Midwest and Canada which necessitate heated pools for sea lions.

Another indicator species examined was the alligator. Temperature is a primary factor in the display of alligators since they are cold-blooded animals and their body temperature is dependent upon the surrounding air temperature (Street 1967). Of the sampled wildlife attractions, 43 display alligators. Of these only 40 percent do not need climate controls. These attractions are located in the states of Florida, Alabama, Mississippi, Louisiana, Texas, and California as shown in Figure 26. The line shown in Figure 26 is the average January isotherm of 40 degrees Fahrenheit. The isotherm identifies the boundary between areas having climate controlled facilities and areas with no special facilities for the display of alligators. Most of the alligator displays which do not require climate controlled facilities

Figure 25. Sea Lion Displays in Relation to Climate

Figure 26. Alligator Displays in Relation to Climate

are located below or to the South of the 40 degree isotherm. This isotherm is also effective in showing the boundary between alligator displays since it follows the upper limits of the historical range of the American alligator in the Southern states.

The sixth indicator species is the galapagos tortoise. The galapagos tortoise, like the alligator, is cold-blooded and requires special care. The tortoise is capable of handling short spells of temperatures near or below freezing, but its movements become slow (Hairston and Burchfield 1989). There were 22 attractions sampled which display the galapagos tortoise (Figure 27). Only two of these attractions have no special facilities. Eight attractions keep tortoises in climate controlled facilities year-round while twelve facilities move tortoises during extreme weather.

The seventh indicator species selected was the flamingo. Temperature is of especially great importance in the display of flamingos. In the wild, temperature is a primary factor in the distribution of flamingos (Allen 1956). Since flamingos spend much of their time standing in water, freezing temperature can be very dangerous to the birds (Street 1967). Of the wildlife attractions sampled, 43 percent have no special facilities for flamingos. The other attractions which display flamingos keep them in climate controlled facilities year-round or move them during extreme weather. Figure 28 shows the distribution of flamingo displays with respect to climate, and the

Figure 27. Galapagos Tortoise Displays in Relation to Climate

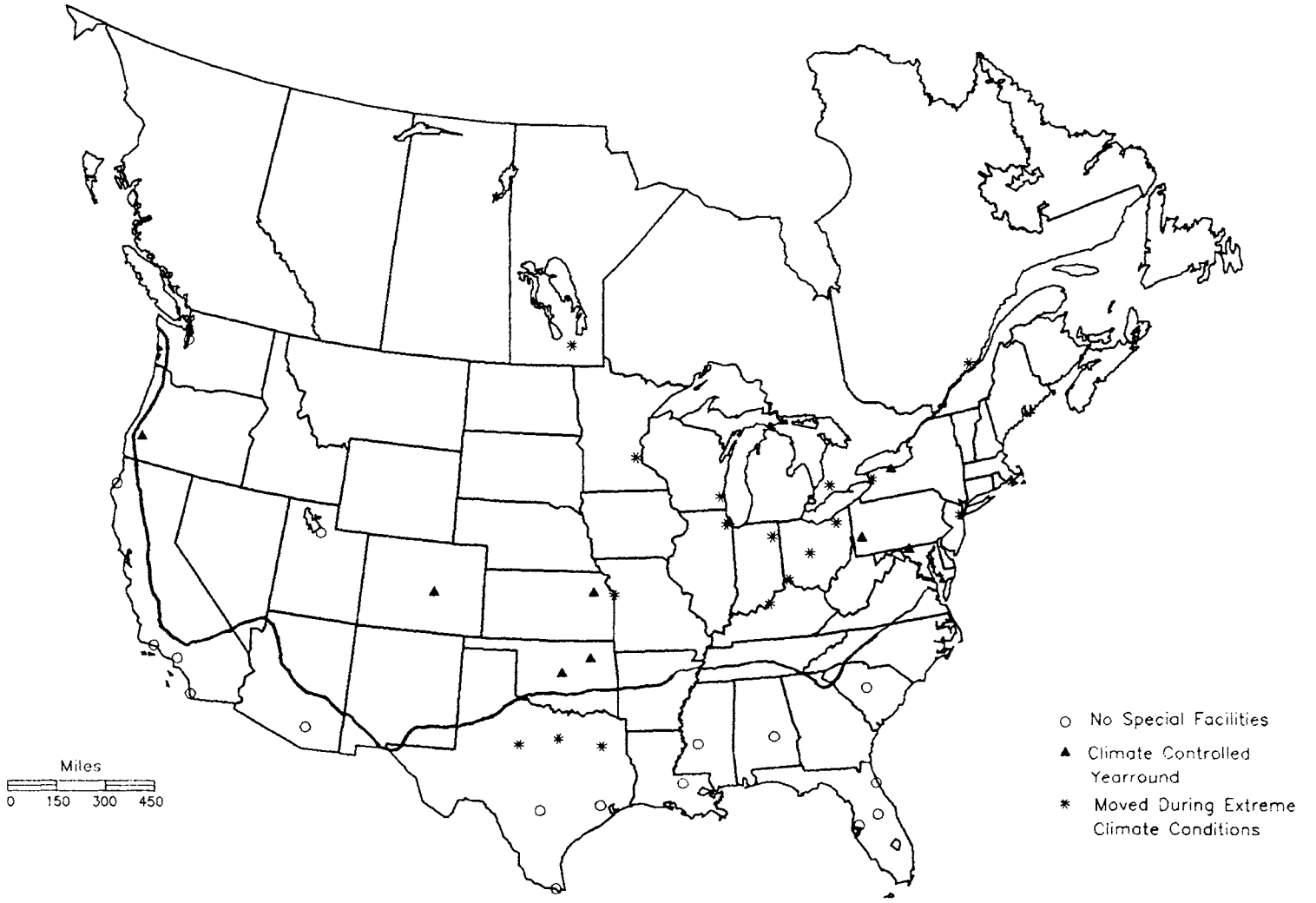


Figure 28. Flamingo Displays in Relation to Climate

average January isotherm of 40 degrees Fahrenheit. Most displays which do not require climate controlled facilities for the flamingo are located below or to the South of the 40 degree isotherm. Because of the importance of freezing temperatures and flamingos the 40 degree isotherm is effective in providing a boundary between displays which require climate controlled facilities and those which do not.

Indicator species helped to define boundary lines between attractions requiring climate control for their animals and those which do not. Other indicator species reveal that the location of special facilities may be determined by other factors more important than temperature for that species. It is apparent that among most of these species, climate and weather play an important role in animal display.

CHAPTER VI

SUMMARY AND CONCLUSION

Review of Research

Given the large number of wildlife attractions located in the United States and Canada there is a need for a consideration of their spatial patterns. It is of special importance that wildlife attractions be looked at from the field of geography because of the spatial and environmental factors that play an important role in their location, distribution, and methods of display. This study has addressed some of these issues by presenting a typology for wildlife attraction classification based upon a consistent set of criteria. Such research attempts to help us better understand the differences between attractions. The following hypotheses were examined:

1. A wildlife attraction typology can be developed based on the physical attributes of facilities in which animals are displayed and kept.

2. The proximity of a wildlife attraction to its urban center will have an effect upon its classification in the typology.

3. Climatic conditions will influence wildlife attraction types and animals/facilities present at a location.

Interpretation of Results

A mail questionnaire was sent to 200 randomly selected wildlife attractions across the United States and Canada to gain the necessary data for construction of a typology to address the following hypothesis:

1. A wildlife attraction typology can be developed, based on the physical attributes of facilities in which the animals are displayed and kept.

The response rate was approximately fifty percent and provided a sufficient sampling body. Based upon selected variables obtained from the survey, a cluster analysis was conducted in which wildlife attractions were grouped into four categories. A fifth category was created to contain outlier attractions which were impossible to place with any other group.

The first category created was labeled Class 1 attractions, and consisted primarily of zoological parks or gardens from large cities. These attractions are larger in scale and offer visitors a wide variety of species and display methods. The second category was the Class 2 attractions which were made up of zoos from smaller cities and towns, as well as specialty attractions such as aviaries and reptiliaries. This category was the largest in size with 60 of the 98 observations used in the cluster analysis placed in this category. The third category, Aquariums, consisted of nine facilities. These attractions were characterized as indoor facilities whose primary purpose was the display of aquatic animals. The Marine Park was the

fourth category with only two observations. This category was different from Aquariums since it displayed animals that have a marine theme with large shows featuring trained animals. The fifth category consisted of four attractions which were not classified through the cluster analysis. Based upon the results of the analysis the construction of a typology for classification the first hypothesis was retained.

The analysis of a wildlife attraction's proximity to an urban center examined the following hypothesis:

2. The proximity of a wildlife attraction to its urban center will have an effect upon its classification in the typology.

It was found that most Class 1 attractions are located within or just outside of an urban area. Class 1 attractions also were primarily from urban locations with large urban populations. Class 2 attractions were more varied in their locations with regard to urban areas. Aquariums had some observations outside an urban area which can be explained by tourists willing to travel a longer distance to see an unusual attraction. While not located in extremely large urban centers, Marine Parks were located in areas from which they can easily draw from many urban locations. The second hypothesis is conditionally retained due to the subjective nature of the analysis which was used.

Climate was examined as a factor to analyze the following hypothesis:

3. Climatic conditions will influence wildlife attraction types and animals/facilities present at a location.

Climate was examined in relation to whether or not attractions must close or reduce operating hours due to extreme conditions. Most Class 1 attractions found it unnecessary to close due to climatic factors. It was also found that Aquariums do not need to close or reduce operating hours since they are primarily indoor operations. However, among Class 2 attractions it was found that many must close or reduce hours due to climate because of their small size, or since most attractions from northern areas were Class 2 attractions. Marine Parks were not analyzed in relation to climate and operation due to the small number of observations. The use of indicator species was also effective in determining boundary lines to define the need for climate controlled facilities and the locations where such facilities are not necessary. Based upon the results of the climate analysis the third hypothesis was retained.

Limitations of Research

The most obvious limitation of this research is that, while there was an adequate response rate among attractions, many types of facilities did not respond. The attractions which did not respond to the survey were those which generally operate for a profit. The drive-thru park was represented with only one observation which was combined in a category having other outliers. The Marine Park category was also represented poorly, with only two observations. It is important to note that even with so few observations the two Marine Park attractions emerged within their own

category. Had more drive-thru parks been contained within the sampling body it is quite possible that they would have also emerged as a separate category.

The need to further study the distribution and classification of wildlife attractions can be examined in several different ways. The typology used for the classification of wildlife attractions could incorporate several more variables which could possibly further categorize wildlife attractions. The result could be categories of attractions with are more specialized in the types of species displayed and the types of display methods used.

Further research in the area of climatic factors can also help to determine boundaries for the climate controlled display of species by using indicator species.
As the natural environments of many species disappear, wildlife attractions will play important roles in the preservation of species. In addition, the wildlife attraction still plays an important role in entertaining urban populations. As these factors gain significance the need to better manage and display animals at these facilities becomes extremely important.

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APPENDICES

APPENDIX A

NAME, CITY, AND STATE/PROVINCE OF WILDLIFE ATTRACTIONS BY CLUSTER GROUP

CLASS 1 WILDLIFE ATTRACTIONS

Name	City	State/Province
The Los Angeles Zoo	Los Angeles	CA
The San Diego Zoo	San Diego	CA
Cheyenne Mountain Zoo	Colorado Springs	CO
Lowry Park Zoo	Tampa	FL
Brookfield Zoo	Brookfield	IL
Lincoln Park Zoo	Chicago	IL
Fort Wayne Children's Zoo	Fort Wayne	IN
Louisville Zoological Garden	Louisville	KY
Como Zoo	St. Paul	MN
Trailside Museums and Zoo	Bear Mountain	NY
Cincinnati Zoo	Cincinnati	OH
Columbus Zoo	Powell	OH
Oklahoma City Zoological Park	Oklahoma City	OK
Tulsa Zoo	Tulsa	OK
Metro Washington Park Zoo	Portland	OR
Riverbanks Zoo	Columbia	SC
Gladys Porter Zoo	Brownsville	TX
Fort Worth Zoo	Fort Worth	TX
Houston Zoological Gardens	Houston	TX
San Antonio Zoological Gardens	San Antonio	TX
Caldwell Zoo	Tyler	TX
Woodland Park Zoo	Seattle	WA
Milwaukee County Zoo	Milwaukee	WI

CLASS 2 WILDLIFE ATTRACTIONS

Name	City	State/Province
Montgomery Zoo	Montgomery	AL
Reid Park Zoo	Tucson	AZ
Grand Canyon Deer Farm	Williams	AZ
Sequoia Park Zoo	Eureka	CA
Micke Grove Zoo	Lodi	CA
Applegate Park Zoo	Merced	CA
Happy Hollow Zoo	San Jose	CA
Santa Barbara Zoological Gardens	Santa Barbara	CA
Beardsley Zoological Gardens	Bridgeport	CT
Dolphin Research Center	Marathon Shores	FL
Monkey Jungle	Miami	FL
Bever Zoo	Cedar Rapids	IA
Tautphaus Park Zoo	Idaho Falls	ID
Washington Park Zoo	Michigan City	IN
Lords Park Zoo	Elgin	IL
Glen Oak Zoo	Peoria	IL
Henson Robinson Zoo	Springfield	IL
Topeka Zoological Park	Topeka	KS
Emporia Zoo	Emporia	KS
Sunset Zoo	Manhattan	KS
Greater Baton Rouge Zoo	Baker	LA
Catoctin Zoo Park	Thurmont	MD
Zoo in Forest Park	Springfield	MA
Zoo Quarium	West Yarmouth	MA
Clinch Park Zoo	Traverse City	MI
Lake Superior Zoo	Duluth	MN
Hattiesburg Zoo	Hattiesburg	MS
Jackson Zoological Park	Jackson	MS
Kansas City Zoological Gardens	Kansas City	MO
Riverside Zoo	Scottsbluff	NE
Bergen County Zoo	Paramus	NJ
Ghost Ranch Living Museum	Abiquiu	NM
Spring River Zoo	Roswell	NM

CLASS 2 WILDLIFE ATTRACTIONS (CONTINUED)

Name	City	State/Province
Buffalo Zoological Gardens	Buffalo	NY
Seneca Park Zoo	Rochester	NY
Utica Zoo	Utica	NY
Thompson Park Zoo and Conservancy	Watertown	NY
Soco Gardens Zoo	Maggie Valley	NC
Dakota Zoo	Bismark	ND
Akron Zoological Park	Akron	OH
Clyde Peeling's Reptiland	Allenwood	PA
Claws N Paws Wild Animal Park	Lake Ariel	PA
Elmwood Park Zoo	Norristown	PA
National Aviary in Pittsburgh	Pittsburgh	PA
Slater Park Zoo	Pawtucket	RI
Bramble Park Zoo	Watertown	SD
Abilene Zoological Garden	Abilene	TX
Amarillo Zoo	Amarillo	TX
Tracy Aviary	Salt Lake City	UT
Virginia Zoological Park	Norfolk	VA
Pioneer Park Aviary	Wala Wala	WA
Circus World Museum	Baraboo	WI
Warbonnet Zoo	Hazehust	WI
Valley Zoo	Edmonton	AB
Kamloops Wildlife Park	Kamloops	BC
Thompson Zoo	Thompson	MB
Assiniboine Park Zoo	Winnipeg	MB
Kortright Waterfowl Park	Guelph	ON
Storybook Gardens	London	ON
Jardin Zoologique du Quebec	Charlesbourg	QC

AQUARIUMS

Name	City	State/Province
Stephen Birch Aquarium-Museum	La Jolla	CA
Morro Bay Marine Rehabilitation Center	Morro Bay	CA
Mystic Marinelife Aquarium	Mystic	CT
National Aquarium	Washington	DC
Fisheries Aquarium	Woods Hole	MA
Staten Island Zoo	Staten Island	NY
The Seattle Aquarium	Seattle	WA
Vancouver Aquarium	Vancouver	BC
Aquarium du Quebec	Sainte-Foy	QC

MARINE PARK ATTRACTIONS

Name	City	State/Province
Sea World of Florida	Orlando	FL
Sea World of Ohio	Aurora	OH

OTHER WILDLIFE ATTRACTIONS

Name	City	State/Province
Marineland of Florida Inc.	Marineland	FL
Wildlife Safari	Winston	OR
Mathematics and Science Center	Richmond	VA
Biodome De Montreal	Montreal	QC

APPENDIX B

QUESTIONNAIRE AND QUESTION RESPONSES

QUESTIONNAIRE AND QUESTION RESPONSES

1. In what year was your facility established? _____

   Prior to 1900.....: 11
   Between 1900 and 1930: 26
   Between 1930 and 1970: 47
   After 1970.....: 17

2. What is the approximate size of your facility (in acres)? _____

   Less than 5 acres.....: 20
   Between 5 and 20 acres..: 22
   Between 20 and 50 acres.: 25
   Between 50 and 100 acres: 18
   Greater than 100 acres..: 16

3. What is the approximate size of your staff?
   FULL TIME..._____ PART TIME..._____

   Less than 10 full time staff.....: 38
   Between 10 and 25 full time staff.: 17
   Between 25 and 50 full time staff.: 15
   Between 50 and 100 full time staff: 13
   Greater than 100 full time staff..: 21

   Less than 10 part time staff.....: 50
   Between 10 and 25 part time staff.: 23
   Between 25 and 50 part time staff.: 12
   Between 50 and 100 part time staff: 9
   Greater than 100 part time staff..: 10

4. How is your facility administered?
   (check all that apply)
   MUNICIPAL..._____ LOCAL SOCIETY..._____
   PRIVATE....._____ OTHER....._____

   Administered by municipality.: 50
   Administered privately.....: 28
   Administered by local society: 29
   Administered by other.....: 5

5. What is the daily fee (non discount) charged at your facility?
   ADULTS...$_____ CHILDREN...$_____ SENIORS...$_____

   Adult's fee less than $6...: 71
   Adult's fee greater than $6: 30

Children's fee less than $4...: 81
Children's fee greater than $4: 20

Senior's fee less than $5...: 76
Senior's fee greater than $5: 25

6. Is your facility non-profit?
YES..____ NO..____

Non-profit facility: 82
For-profit facility: 19

7. Approximately what was your attendance in 1992? _____

Attendance less than 50,000..: 15
Between 50,000 and 100,000...: 12
Between 100,000 and 250,000..: 29
Between 250,000 and 500,000..: 17
Between 500,000 and 1,000,000: 13
Greater than 1,000,000.....: 15

8. Check the three months in which you had the highest attendance and the three months in which you had the lowest attendance in 1992.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
HIGH												
LOW												

Three highest		Three lowest	
June..:	78	January.:	76
July..:	71	February:	62
August:	55	December:	59

9. Please cicle the approximate number of species and individual specimens for each category present at your facility. Please do not leave blank.

	NUMBER OF SPECIES					
MAMMALS.....0	1-5	6-10	11-20	21-30	31-50	>50
BIRDS.....0	1-5	6-10	11-20	21-30	31-50	>50
FISH.....0	1-5	6-10	11-20	21-30	31-50	>50
REPTILES & AMPHIBIANS....0	1-5	6-10	11-20	21-30	31-50	>50

Mammals	Birds	Fish	Reptiles & Amphibians
0....: 7	0....: 7	0....: 38	0....: 12
1-5..: 7	1-5..: 5	1-5..: 16	1-5..: 15
6-10.: 6	6-10.: 8	6-10.: 7	6-10.: 12
11-20: 18	11-20: 12	11-20: 5	11-20: 17
21-30: 16	21-30: 9	21-30: 2	21-30: 9
31-50: 18	31-50: 15	31-50: 6	31-50: 11
>50..: 29	>50..: 44	>50..: 25	>50..: 22

NUMBER OF INDIVIDUAL SPECIMENS

MAMMALS.....0 <50 51-100 101-200 201-350 351-500 >500
BIRDS.....0 <50 51-100 101-200 201-350 351-500 >500
FISH.....0 <50 51-100 101-200 201-350 351-500 >500
REPTILES &
AMPHIBIANS...0 <50 51-100 101-200 201-350 351-500 >500

Mammals
0.....: 7
<50....: 19
51-100.: 22
101-200: 23
201-350: 15
351-500: 7
>500...: 8

Birds
0.....: 7
<50....: 21
51-100.: 19
101-200: 12
201-350: 13
351-500: 5
>500...: 12

Fish
0.....: 36
<50....: 18
51-100.: 9
101-200: 6
201-350: 4
351-500: 5
>500...: 20

Reptiles & Amphibians
0.....: 11
<50....: 43
51-100.: 13
101-200: 10
201-350: 11
351-500: 3
>500...: 6

10. Circle the months in which your facility must close or reduce operating hours due to weather conditions.
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC NA

Facilities which close or reduce hours.....: 38
Facilities which do not close or reduce hours: 54

11. During periods of extreme weather (snow, ice, extreme heat), is it necessary to move animals to special housing? If so, please check all the types of displays where this occurs.
ANIMAL PLACED INDOORS.....____
ANIMAL KEPT OUTSIDE WITH ACCESS TO CLIMATE CONTROLLED AREAS.....____
ANIMAL KEPT IN A CLIMATE CONTROLLED DISPLAY THROUGHOUT YEAR.....____
ANIMAL MOVED TO ANOTHER FACILITY FOR SEASON.....____
ANIMAL REMAINS OUTSIDE (NO SPECIAL SHELTER).....____

Animal placed indoors.....: 65
Animal kept outside with access to climate controlled areas.....: 58
Animal Kept in a climate controlled display throughout year.....: 44
Animal moved to another facility for season.....: 17
Animal remains outside (no special shelter): 58

12. Of the animals listed below, are special displays necessary during periods of extreme weather (extreme heat or cold)? If so, does it become necessary to move your animals to special climate controlled facilities?

	ANIMAL NOT DISPLAYED AT FACILITY	NO SPECIAL FACILITIES YEAR ROUND	CLIMATE CONTROLLED YEAR ROUND	MOVED DURING EXTREME WEATHER
POLAR BEAR	____	____	____	____
HIPPOPOTAMUS	____	____	____	____
DOLPHIN	____	____	____	____
SEA LION	____	____	____	____
ALLIGATOR	____	____	____	____
GALAPAGOS TORTOISE	____	____	____	____
FLAMINGO	____	____	____	____

Polar bear	74	14	6	1
Hippopotamus	73	13	6	3
Dolphin	88	5	2	0
Sea lion	63	20	11	1
Alligator	52	17	16	10
Galapagos tortoise	73	2	8	12
Flamingo	50	19	9	16

13. How are the animals viewed in your facility by visitors? (check all that apply)

(1) WALK THROUGH GROUNDS.....____
(2) WITHIN A BUILDING.....____
(3) DRIVE THROUGH GROUNDS.....____
(4) TRAIN/TRAM/BUS.....____

Walk through grounds.: 97
Within a building....: 75
Drive through grounds: 2
Train/tran/bus.....: 22

14. Regarding question 13, what is the primary way the animals at your facility are viewed? (Select 1, 2, 3, or 4 from question 13) ____

Walk through grounds.: 82
Within a building....: 16
Drive through grounds: 1
Train/tran/bus.....: 0

15. How are animals displayed? (Check all that apply)

ENCLOSURES WITH MOAT.....____
FENCED ENCLOSURES.....____
BARRED CAGES.....____
GLASS CAGES.....____
THERMAL, ELECTRIC,
OR LIGHT BARRIER CAGES.....____
OPEN RANGE AREA.....____

Enclosures with moat....: 58
Fenced enclosures.....: 93
Barred cages.....: 50
Glass cages.....: 77
Thermal, Electric,
or light barrier cages: 26
Open range area.....: 29

16. Does your facility feature a petting zoo?
YES...____ NO...____

Facilities featuring a petting zoo....: 58
Facilities not featuring a petting zoo: 43

17. At your facility do you attempt to recreate the animals' own habitat as part of their display? If yes please indicate the ways this is done. (Check all that apply)
NATURAL (ENDEMIC) VEGETATION.....____
SIMULATED HABITAT
(ARTIFICIAL VEGETATON AND LANDSCAPE).....____
SIMULATED HABITAT
(VEGETATION, BUT NOT ENDEMIC).....____
NO ATTEMPT MADE TO RECREATE HABITAT.....____

Natural (endemic) vegetation.....: 79
Simulated habitat
(artificial vegetation and Landscape): 66
Simulated habitat
(vegetation, but not endemic).....: 61
No attempt made to recreate habitat....: 17

18. Do you have shows or displays featuring trained animals?
YES...____ NO...____
If yes, approximately how many shows or displays do you have per day? _____

Facilities featuring trained animal shows....: 55
Facilities not featuring trained animal shows: 45

19. Does your facility display rare and endangered species?
YES...____ NO...____
Please list any rare species or species of specialization at your facility:_____
_____
_____
_____

Facilities displaying endangered species....: 88
Facilities not displaying endangered species: 14

20. Would you be willing to participate in a brief follow-up survey concerning your facility? If yes, please provide your name and telephone number.

NAME:_____ TITLE:_____

TELEPHONE NUMBER: ( ) ____---_____

APPENDIX C

ATTRACTION, DISTANCE PROXIMITY TO AN URBAN CENTER, AND POPULATION.

CLASS 1 WILDLIFE ATTRACTIONS

Name	Proximity to an Urban Center	Population (1986)
The Los Angeles Zoo	city	3,259,340
The San Diego Zoo	city	1,015,190
Cheyenne Mountain Zoo	< 1 mile	272,660
Lowry Park Zoo	city	277,580
Brookfield Zoo	city	19,020
Lincoln Park Zoo	city	3,009,530
Fort Wayne Children's Zoo	city	172,900
Louisville Zoological Garden	city	286,470
Como Zoo	city	263,680
Trailside Museums and Zoo	10 miles	< 2,500
Cincinnati Zoo	city	369,750
Columbus Zoo	6 miles	< 2,500
Oklahoma city Zoological Park	city	446,120
Tulsa Zoo	city	373,750
Metro Washington Park Zoo	city	387,870
Riverbanks Zoo	city	93,020
Gladys Porter Zoo	city	102,110
Fort Worth Zoo	city	429,550
Houston Zoological Gardens	city	1,728,910
San Antonio Zoological Gardens	city	914,350
Caldwell Zoo	city	75,440
Woodland Park Zoo	city	486,200
Milwaukee County Zoo	city	605,090

CLASS 2 WILDLIFE ATTRACTIONS

Name	Proximity to an Urban Center	Population (1986)
Montgomery Zoo	< 1 mile	194,290
Reid Park Zoo	city	358,850
Grand Canyon Deer Farm	88 miles	2,532
Sequoia Park Zoo	city	24,880
Micke Grove Zoo	25 miles	44,070
Applegate Park Zoo	city	47,020
Happy Hollow Zoo	city	712,080
Santa Barbara Zoological Gardens	city	79,290
Beardsley Zoological Gardens	city	141,860
Dolphin Research Center	68 miles	< 2,500
Monkey Jungle	city	373,940
Bever Zoo	city	108,370
Tautphaus Park Zoo	city	42,830
Washington Park Zoo	city	35,600
Lords Park Zoo	5 miles	72,110
Glen Oak Zoo	city	110,290
Henson Robinson Zoo	2.5 miles	100,290
Topeka Zoological Park	city	118,580
Emporia Zoo	46 miles	24,610
Sunset Zoo	42 miles	33,750
Greater Baton Rouge Zoo	< 1 mile	13,233
Catoctin Zoo Park	15 miles	3,120
Zoo in Forest Park	city	149,410
Zoo Quarium	36 miles	5,409
Clinch Park Zoo	90 miles	15,155
Lake Superior Zoo	city	82,380
Hattiesburg Zoo	city	40,740
Jackson Zoological Park	city	208,420
Kansas City Zoological Gardens	city	441,170
Riverside Zoo	70 miles	14,400
Bergen County Zoo	city	25,840
Ghost Ranch Living Museum	60 miles	< 2,500
Spring River Zoo	city	44,110

CLASS 2 WILDLIFE ATTRACTIONS (CONTINUED)

Name	Proximity to an Urban Center	Population (1986)
Buffalo Zoological Gardens	2.5 miles	324,820
Seneca Park Zoo	city	235,970
Utica Zoo	city	69,440
Thompson Park Zoo and Conservancy	city	27,040
Soco Gardens Zoo	26 miles	< 2,500
Dakota Zoo	city	48,040
Akron Zoological Park	city	22,060
Clyde Peeling's Reptiland	2 miles	< 2,500
Claws N Paws Wild Animal Park	9 miles	950
Elmwood Park Zoo	city	33,780
National Aviary in Pittsburgh	city	387,490
Slater Park Zoo	city	72,640
Bramble Park Zoo	80 miles	16,670
Abilene Zoological Garden	city	112,430
Amarillo Zoo	city	165,850
Tracy Aviary	city	158,440
Virginia Zoological Park	city	274,800
Pioneer Park Aviary	110 miles	25,260
Circus World Museum	30 miles	8,460
Warbonnet Zoo		< 2,500
Valley Zoo	city	573,982
Kamloops Wildlife Park		61,773
Thompson Zoo		
Assiniboine Park Zoo	city	594,551
Kortright Waterfowl Park	city	78,235
Storybook Gardens	1 mile	342,300
Jardin Zoologique du Quebec	1 mile	68,996

AQUARIUMS

Name	Proximity to an Urban Center	Population (1986)
Stephen Birch Aquarium-Museum	city	< 2,500
Morro Bay Marine Rehabilitation Center	85 miles	9,980
Mystic Marinelife Aquarium	5 miles	2,618
National Aquarium	city	626,100
Fisheries Aquarium	36 miles	1,080
Staten Island Zoo	city	374,600
The Seattle Aquarium	city	486,200
Vancouver Aquarium	city	1,380,600
Aquarium du Quebec	city	69,615

MARINE PARK ATTRACTIONS

Name	Proximity to an Urban Center	Population (1986)
Sea World of Florida	city	145,900
Sea World of Ohio	12 miles	8,550

OTHER WILDLIFE ATTRACTIONS

Name	Proximity to an Urban Center	Population (1986)
Marineland of Florida Inc.	20 miles	< 2,500
Wildlife Safari	60 miles	3,480
Mathematics and Science Center	city	217,700
Biodome De Montreal	city	2,927,400

VITA

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