

# Bringing Nature into the Zoo: Inexpensive Solutions for Zoo Environments

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## Abstract

*Animals in captivity have traditionally been kept in sterile and inappropriate environments. Typically this situation still prevails in zoos. Cages are designed only for restraint of the animals, expediency for the public, and convenient maintenance by keepers. The animals' behavioral needs are often ignored. By using nature as a norm, and by using natural materials, the spatial and temporal environment of a captive animal can be easily and greatly enriched. Several examples which have been used at Woodland Park Zoological Gardens are discussed. Their application and expansion are appropriate for most urban zoos.*

## Introduction

Most zoo visitors have seen animals engaged in stereotypic movements, aberrant sexual behavior, excessive inactivity, or abnormal maternal care. These are common problems for zoo animals (Morris, 1964). Inadequate and sterile environments have been a tradition in zoos. They create behavioral defects and physiological stress, which in turn can increase susceptibility to disease and parasitic infection, as well as have significant effects on reproductive success (Hediger, 1969).

Correction of these conditions requires an increase in complexity of the captive animal's environment. There must, however, be a guide as to what type and degree of complexity. The answers can be found in nature.

## Nature is the Norm

For too long zoo administrators and designers have looked to other zoos for solutions. Mistakes from the past have thus been perpetuated. Instead, one should look to nature: the captive environments should duplicate as many as possible of the essential characteristics in the animal's natural physical and social environment.

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Organisms in nature may live in an environment of great complexity. They experience spatial variations created by soils, rocks, vegetation, water and so on. Temporal variation occurs through such factors as light, temperature, humidity, food availability and seasonal changes in vegetation. Other organisms in the community also add to environmental variation (Barash, 1977).

Typical zoo environments, in comparison, are very sterile. Perhaps the worst aspect of this sterility is the awful predictability of the zoo environment: nothing changes from day to day or year to year.

Wild animals have evolved complex behavioral repertoires which are flexible and extensive enough to cope with the diversity of their natural environments (Barash, 1977). It is therefore not surprising that predictable and inappropriate furnishings, in sterile cages, produce boredom which in turn creates behavioral problems. What is alarming is that such conditions are so often accepted by the public as "normal," and that so little has been attempted to solve these problems.

Facilities for zoo animals tend to enclose simple spaces, and cage furniture tends never to be changed. Worse, the furnishings rarely complement the animal's special behavioral and anatomical adaptations. Arboreal animals such as gibbons are often seen in enclosures no different from those provided for terrestrial species, such as baboons.

The potential effects of environmental sameness were highlighted in a situation where a tiger, born and raised in a zoo, was released into a large outdoor area at the World Wildlife Safari, Winston, Oregon. It began to stumble and walk so erratically that it was thought to be ill. In fact the tiger, which had known nothing but a flat concrete floor, was having great difficulty coping with a natural substrate which had some variation in terrain.

## Space and Time

There are two essential and basic methods of increasing environmental complexity in the zoo: *spatially*, through the addition of furnishings, and *temporally*, through periodic changes in the environment (Hancocks *et al.*, 1979). The use of natural materials to make a zoo enclosure more complex brings numerous benefits to the animal; moreover, the public is highly influenced by the aesthetics of an exhibit. If the zoo visitors see an animal in a naturalistic environment, they have a better chance to realize, if only subconsciously, that there is a link between *animal* and *habitat*, and furthermore, that the two are interdependent.

Mankind has destroyed great parts of this planet out of a loss of respect for nature. If wildlife rehabilitation and habitat reconstruction are to become realities, and not just idle dreams, we will need an enlightened, aware and sympathetic public which has learned to respect wild animals in their own right.

Hundreds of millions of people visit zoos each year, and many of their attitudes are fashioned by what they see at the zoo. Simulated natural environments can therefore have critical importance. At a cost per square foot ratio, naturalistic environments are also much less expensive than traditional zoo "houses." An 18,000 square foot naturalistic habitat for gorillas has recently been built at Woodland Park Zoological Gardens, at a cost of less than \$500,000. A typical Ape House of comparable size would cost at least two to three times that amount and still not offer as much environmental complexity.

### Using Natural Materials

It is quite inexpensive to modify existing enclosures with natural materials. Captive felids are typically housed in concrete and tile cages (Figure 1). This type of zoo cage was developed before the advent of antibiotics. Modern and sophisticated veterinary care has reduced the need for daily disinfecting of sterile enclosures (Hancocks et al., 1979). There is no justification for housing cats in that manner today, and recent improvements at Woodland Park Zoological Gardens demonstrate how simply and inexpensively the changes can be made.



**Figure 1** — (Before) The feline cages at Woodland Park were typically barren and sterile. In their deprived environment the cats had nothing with which to interact or to use as visual and physical barriers.

An enclosure for caracals, for example, has been modified to resemble their desert habitat. Sand, gravel, volcanic rocks, weathered tree branches and dried sagebrush were collected by the keepers at no cost. For the first year the caracals had free access to an unmodified cage, next door, where they were fed. The animals chose to spend over 80 percent of their time in the naturalistic enclosure, and often carried their food into that area to eat (Crockett and Hutchins, 1978).

A similar approach has been made with sand cats, Pallas cats and ocelots. Again, all work was carried out by keepers, and it has been most encouraging to note the extent of their ingenuity, and their enthusiasm for maintaining this exhibit.

Only the ocelot enclosure (Figure 2) required expenditure of funds. About \$200 was spent on house plants (palms, rubber plants, philodendron, dracaena, etc.), while mosses and ferns were gathered from nearby countryside. Now we



**Figure 2** — (After) The quality of space was enriched by adding rocks, logs, live vegetation, and a substrate of various natural materials including sand, gravel and mosses.

find that people are pleased to donate plants for the ocelots' exhibit, and since damage by the animals is only slight, it is a simple matter to maintain a lush, green environment.

While none of these enclosures can be considered ideal, they do illustrate that quick and easy improvements can be made which provide significant benefits for the animals, and an enriched viewing experience for the public.

Other examples, perhaps even more simple, can be seen at Woodland Park's antiquated Primate House. This is a very traditional zoo building, with wire mesh and concrete cages. (It is important to note that the number of species in this building has been reduced in favor of larger group sizes. This, combined with changes in the physical environment, has eradicated problems of extreme inactivity.)

A multi-dimensional network of arboreal pathways has been created for the primates using natural tree branches, which are available at no cost and easily replaced. This may seem simple and obvious, but why is it not done more often? Some of the cages in the Primate House were devoid of furnishings, except for one or two metal pipes, during the first 66 years of its existence. This situation still prevails in some zoos.

Hay is also piled thickly on the floors of the primate cages. Sunflower seeds and raisins (*not* inexpensive!) are scattered among the hay, and the animals spend

hours each day in activity similar to natural foraging behavior.

In some of the cages, long and slender branches were fastened to the ceiling in such a way that the joint was flexible. These became the focus of much play activity by infant monkeys. This development was an idea of one of the keepers, and it has become obvious that keepers are a great source of imagination, compassion and enthusiasm when given the opportunity to use their abilities. A similar inexpensive trick was devised by a keeper who hung a large, dead branch from a tree in the elk enclosure. The bull elk now has something worthy of his antler activity. He no longer damages the tree trunks by scraping, as in the past, and the awful possibility of cutting off his antlers, which still happens at some zoos, no longer even has to be considered.

Natural branches are a good and inexpensive addition to any area inhabited by ungulates. Several large piles of maple branches placed in a sika deer enclosure at Woodland Park soon became a focus of activity for the entire herd. Much time was spent in stripping the bark; newborn fawns bedded down in the brush piles; and the stag used them to remove velvet from his antlers (Crockett and Hutchins, 1978).

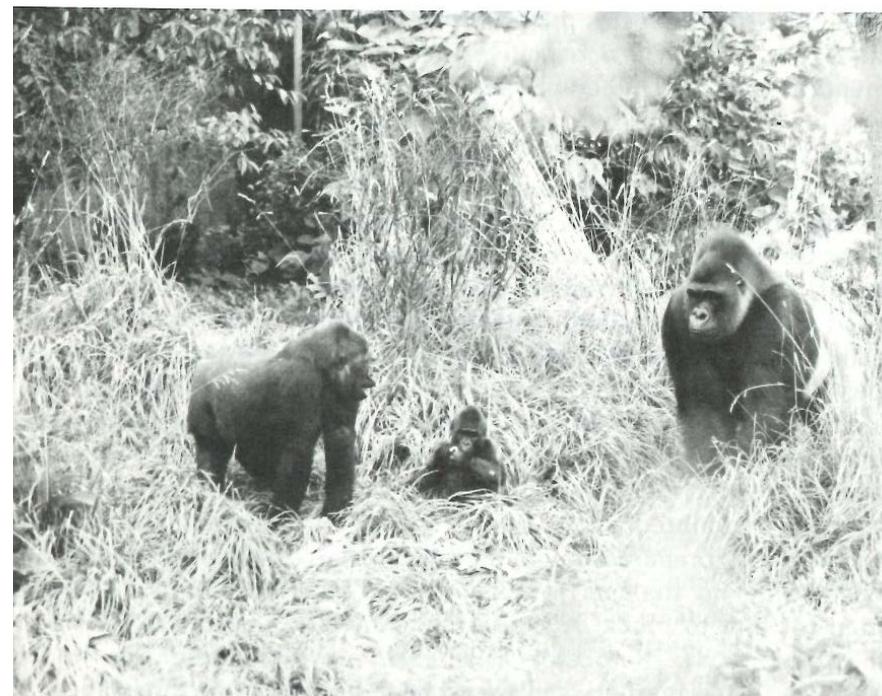
Similarly, larger boulders and dead trees are added (or removed) from time to time in the bear grottos. Rotting logs are given to several species, and generate much activity and interest. Such logs typically harbor many insects which are hunted by the zoo animals, and invariably almost the entire log is eventually destroyed, much of it ending up in the animals' stomachs.

Rotting logs, therefore, can be seen as an important addition to the diet of captive animals. In fact, both the type and the availability of food are important factors in seeking naturalistic solutions to behavioral problems.

### *A Question of Food*

That food is a vital concern to animals is obvious; its importance, however, is often magnified in captivity. Attempts are being made at Woodland Park to offer not only a nutritionally sound diet, but also one which replicates essential characteristics of a natural diet. Gorillas in zoos have traditionally received fruits as a major part of their diet. In common with many other zoos, Woodland Park now uses a diet composed principally of vegetables. But this change alone is not enough. The method and time of presentation is also of special value to the animal, and keepers are therefore encouraged to use ingenuity in making food available. Before the gorillas at Woodland Park were relocated to a large, naturalistic habitat (Figure 3), they were housed in a concrete Ape House. Keepers presented food in paper sacks or cardboard boxes on occasion, which prolonged the discovery and eating time for the gorillas. Peanut butter was sometimes smeared all over a metal grating, and the gorillas would spend hours cleaning it off. In their new area, food is periodically scattered around to give the animals an opportunity to forage among the tall grass and dense shrubs.

Major feedings for the gorillas occur in the early morning and late afternoon. This is not the best time as regards public visitation, since most people stick to the old custom of visiting the zoo at the worst time of day—between about noon and mid-afternoon. It is beneficial to the animal, however, if feeding patterns similar to its natural situation are followed. Thus scheduled feeding



**Figure 3** — A new exhibition habitat for gorillas at Woodland Park encloses about 18,000 sq. ft. The terrain includes live mature trees, uprooted fallen trees, a stream cascading into a shallow pool, exposed large rocks and lush vegetation. All attempts have been made to replicate the essential characteristics of the gorillas' wilderness habitat.

times have been abolished at Woodland Park. They were, in any case, only designated for the excitement and convenience of visitors who had little option but to watch bored and inactive animals at all other times (Hutchins and Hancocks, 1978-1979).

The new naturalistic exhibits at Woodland Park have brought about some unforeseen benefits. Monkeys will catch and eat insects attracted to flowering vegetation in the enclosures, and dig up and consume other small creatures from the soil. In other instances live prey is offered as a deliberate attempt to enrich the animals' temporal existence. Moths released in the Nocturnal House generate considerable excitement and activity for dourocoulis, greater and lesser galagos and slow lorises (which are not necessarily always slow). Consumption of live crickets is also important for a wide diversity of species and is thought to be a critical factor in the successful breeding of some species, such as Hartlaub's ducks. Live trout purchased from a fish farm are fed by the hundreds throughout the year to bears, herons, penguins, sea lions and otters. The animals show great enthusiasm in pursuing and eating live fish. Some of these fish are maintained in areas such as the beaver pond and the water moats around primate exhibits, which serve as "holding tanks" until the fish are larger. The animals thereby also receive occasional changes in prey size.

In comparison with the behavioral benefits achieved, the cost of purchasing live fish and insects (the moths are donated from the University of Washington) is

negligible. We anticipate that this program can be expanded and diversified.

Ironically, the public will accept live feeding of fish and insects—and it should be mentioned that such feeding would not be tolerated if their death were not instantaneous—but the attitude toward stimulating predators by feeding live mammals is not as clear-cut. Indeed, occasional complaints are received because some animals at Woodland Park receive whole carcasses of chickens, rabbits and sheep, and visitors often report, with much concern, that “the snowy owl is eating its mate” or “the snow leopard has caught a bunny rabbit.”

It seems that the public will accept that a human has killed an animal which is then offered for food, but cannot tolerate the idea of a tiger killing its own prey. The extent of this confused attitude even goes to the extreme of one zoo visitor who wrote a letter to a Seattle newspaper (which, *mirabile dictu*, actually printed it) complaining that whole chickens and rabbits were now being fed to the cats at the zoos, whereas in the old days they used to receive only “nice slabs of meat” (*Seattle Post Intelligencer*, April 21, 1977).

Natural foods undoubtedly offer significant benefits compared to total reliance on commercially prepared or pelleted food. At Woodland Park an adult ocelot had been plucking the hair from its own body, until whole bird carcasses were provided for him to pluck. A similar incident was reported by Desmond Morris at the London Zoo. The ocelot, when given a whole chicken for the first time, plucked off all the feathers and then began violently plucking the grass. Morris described the plucking behavior as “breaking like a dam” (Morris, 1964). Feeding whole sheep carcasses to snow leopards at Woodland Park also stimulates much activity. The cats spend much time playing with the carcass, pulling it apart, consuming it, and rolling in the skin afterwards. Even if live feedings are not possible, the occasional feeding of whole carcasses will provide the animals with an opportunity to engage in a wide variety of natural behaviors.

### People Problems

An analysis of public objections to live feeding is useful, since we have found that some zoo visitors—though only a very small percentage—actually dislike the concept of naturalistic environments for animals, complaining that the animals can hide from view, take no interest in the observer, and are difficult to see among “all those plants.”

Several objections to live feeding could be caused by a variety of factors related to our material affluence. In several parts of the world cats and dogs are used as food, but in our society these animals enjoy high status. Affluence has also masked our own predatory tendencies; large-scale food processing has divorced the act of killing from the eating of meat (Hutchins and Hancocks, 1978-1979). Similarly, our view of wildlife is warped. Many people’s perceptions of wild animals are fashioned only, or at least mainly, from the zoo: this is now the only contact they have with nature. This fact alone should encourage all our efforts to improve the conditions in zoos, and to solve the behavioral problems of animals in captivity.

If, for instance, we cannot raise the consciousness of zoo visitors to accept the natural activities of predators, how will we be able to ensure these animals’ continued existence in the wild? And if, as many claim, zoos are to become

“genetic reservoirs” from which captive-bred animals will be reintroduced to rehabilitated habitats, how will they fare if they have never had the chance to learn any natural patterns of behavior in the zoo?

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