

Suggested Guidelines for Captive Elephant Enrichment

The management of captive elephants is very challenging: their immense size, strength and intelligence test how well enclosures are able to satisfy their daily needs. Like all highly social animals elephants have well-developed cognitive and sensory capacities designed to adapt them to their respective environmental niches. With their basic needs readily provided for, a stimulating environment is necessary to combat inactivity and boredom.

The following guidelines have been compiled to aid in the development of an enrichment program for captive elephants. Given the intelligence, size, and strength of elephants, effective strategies must account for daily wear-and-tear while remaining keeper friendly to ensure the safety of the animals, staff, and visiting public. A successful enrichment program requires knowledge of both individual histories and species biology in order to encourage species-appropriate behaviors and promote optimal psychological and physical well-being.

NATURAL HISTORY

Today only two genera comprise the modern mammalian order Proboscidea (and its sole modern family, Elephantidae): the African elephants (*Loxodonta*) and the Asian elephants (*Elephas*). African elephants (weighing 8,000-14,000 lbs. standing 8-14 feet tall) are found throughout the African continent south of the Sahara Desert and have been divided into two main subspecies (which some experts now classify as separate species). The Savanna or Bush elephant, *Loxodonta [africana] africana*, inhabits grassy bushlands throughout eastern, central, and southern Africa. It is this (sub) species of African elephant, which is seen in the world's zoos. The smaller, darker Forest elephant, *Loxodonta [africana] cyclotis*, is found in the equatorial forests of central and western Africa; there are currently no forest elephants in captivity outside of their native range. Asian elephants (weighing 6,000-14,000 lbs. and standing 7-12 feet tall) reside in a variety of habitats including grasslands, shrublands, and forests. Several subspecies have been named, of which the Indian elephant (*Elephas maximus indicus*), the Sri Lankan elephant (*Elephas maximus maximus*), and the Malaysian elephant (*Elephas maximus hirsutus*) are represented in North American zoological collections.

Both African and Asian elephants are gregarious, with females and calves typically living in a small family unit. These families are matriarchal, organized around a stable group of related females. Periodically, closely related family units will congregate in groups of twenty to forty individuals. Larger aggregations with hundreds of elephants are rarely seen now, but are often reported in historical accounts. Males of both species are usually solitary, although they may join up with other males in temporary bachelor herds.

As the largest land animals on the planet, and with an appetite to match, wild elephants spend an average of 18-20 hours per day foraging and feeding. The rest of their time is spent bathing, playing, sleeping, and socializing. Elephants are most active at dusk and dawn, and typically sleep at night (accumulating only about four hours a night, either while standing or lying down). Elephants in the wild may consume over 300 pounds of food per day, of which less than 50% is actually digested. As generalist herbivores, they will take

advantage of whatever resources are seasonally available. Over 400 species of plants, grasses, herbs, and shrubs (including tree bark, fruits, and berries) have been recorded in the diets of wild elephants. When the vegetation they consume lacks minerals, they will regularly search for and consume mineral-rich soil and rocks.

Elephants are well adapted to manipulate their environment in order to meet their needs. The prehensile trunk - an elongated nose and upper lip - is perhaps their most important feature, responsible for grasping food items (from large swaths of grass to the smallest individual leaf) and transferring them to the mouth. The trunk is also used for breathing, smelling, and, importantly, transferring water to the mouth (the only way that elephants, with short necks and great height, are able to drink). Tusks are present in both sexes of the African elephant (*Loxodonta africana*) but are only found in Asian (*Elephas maximus*) bulls. Elongated incisors, the tusks are used for chiselling, digging, sparring, and displaying to conspecifics. The powerful hind legs and sheer bulk of elephants enables them to access food resources, which would otherwise be unobtainable: foliage of very tall trees may be obtained by simply pushing the whole tree over. This, combined with their prowess for digging small "wells" for water, establishes elephants as "keystone species" of their habitats, as they make essential resources available to numerous other species.

As a result of their size, unique appearance, and cultural significance, elephants are extremely popular with people - a trend seen from the first animal collections to modern zoos. At the present time, well-managed facilities housing elephants play an ever-important role in research and conservation while providing the public with educational and recreational opportunities. As charismatic ecological kingpins, captive elephants have the important role of being ambassadors for their species and their wild habitats.

EXHIBIT ENRICHMENT

A zoo exhibit must walk the fine line between meeting the needs of the animals it contains, their keepers, and the viewing public. The evolution of exhibits is moving away from cramped quarters where the animals are readily visible to more naturalistic areas which (hopefully) incite the inhabitants to display natural behaviors - a benefit for both the animals themselves as well as providing a more educational message for the viewing public.

With the current trend towards naturalistic zoo exhibits, designing built-in enrichment opportunities should be a major consideration in the creation of new elephant exhibits. The cost of retrofitting naturalistic modifications far exceeds that of including them in the initial plans. Ideally, an effective elephant exhibit should focus on providing space for its denizens, (as well as a variety of choices and opportunities) to interact with their environment and conspecifics (and possibly different species). While all plans will vary with the individual sites available, several major considerations should be made when designing a new exhibit for pachyderms.

LAYOUT: Whenever possible, exhibits should be designed with a maximum of useable space for its inhabitants. Extremely steep slopes, for instance, might be used less frequently than more gentle ones. While safety concerns should always be considered, topographical variety

can promote interest and activity. In addition to ensuring the space is useable, careful positioning of features such as: the night house, water sources, feeding stations, and mud wallows, can encourage exercise and activity. This also aids in keeping the elephants active (and burning calories in the meantime). The layout of the exhibit should be carefully planned so as to allow escape routes for subordinate animals, as well as avoiding bottlenecks and corners where confrontations could be forced. A "safe zone" where elephants have the ability to interact freely (move, push, throw, and play) with enrichment items can help limit damage to the exhibit and cut down on repair costs.

EXHIBIT FEATURES: An effective elephant exhibit should ideally include a water feature. Pools are one of the most costly components to install, but they are usually well utilized by the elephants. Streams and Waterfalls, another popular feature, also create a point of interest. These features assist with bathing/skin care, thermoregulation, and provide a positive experience for the public as well. Shade structures provide another important choice for the animals, but require some creativity to naturalize. Well-planned rockwork or faux termite mounds provide great places for elephants to scratch, thereby maintaining healthy skin. These components can also effectively hide enrichment items that would otherwise not fit into a naturalistic exhibit. Natural furniture, such as logs, integrate easily into naturalistic exhibits, but - unlike concrete constructions - will be broken, destroyed, and otherwise enjoyed by elephants. To facilitate frequent replacement of natural furniture and make other repairs easier, the exhibit should be accessible to trucks, skid loaders, backhoes, and other large pieces of equipment.

Incorporating enrichment opportunities into exhibit design is ideal but can also be costly. However, effective enrichment opportunities can be made for a relatively small investment, concentrating on items that have varied uses. The addition of varying substrates (such as soil, sand, clay, and sawdust) provides opportunities to dust bathe, as well as a place to hide novel items to encourage foraging. Installing large logs or telephone poles provides a place for elephants to rub and scratch themselves as well as an anchor from which to hang browse or suspend enrichment toys. Secure anchors (embedded in substrate or attached to solid furniture) allow for the attachment of large interactive enrichment items, such as sweeper brushes, tires, root balls, ice blocks, and the like.

Regardless of size, all items - including tires and logs, which are somewhat "elephant proof" - still need to be affixed into position to reduce the likelihood of them ending up in a keeper or public area or damaging exhibit barriers. When using chain and securing devices (quick-links, clevis pins, or anchor shackles), daily inspections should be conducted to ensure that they are tight and not damaged. Swivels should be used whenever possible at points of attachments to avoid binding, and loops of chain should be avoided (tusks may be damaged).

HOLDINGS: In addition to examining exhibits, holding quarters should also be designed (and/or retrofitted) with enrichment in mind. Indeed, providing occupational activities is probably more important when elephants are in confined quarters than when given space (and thus increased choice). This is especially true if elephants are to be confined indoors

overnight - since these animals sleep very little (approximately 5 hours per 24 hour cycle) they will spend a significant amount of "active" time here. Increasing the enrichment options for both keepers and elephants for overnight occupation should be a key point in designing indoor elephant facilities. Built-in wall anchors at varying heights provide points of attachment for countless pieces of furniture.

While varying the height of enrichment is enriching in itself, this can be difficult and dangerous for keepers. Pulley systems offer a safer option for suspending items than using wall mounted anchors and a ladder. Whether a permanent pulley system (manual or automatic power) is in place, or a portable winch is used, it will offer an easier and safer way to offer enrichment. As an added benefit, if items can be changed easily, enrichment rotation is more likely to become part of the daily routine.

SOCIAL ENRICHMENT

In the wild, both Asian and African elephants live in social groups. Thus in captivity, the presence of other elephants is one of the most effective forms of enrichment possible. Providing an appropriate social environment allows elephants to display natural behaviors, creating opportunities to bond, breed (in some cases), and ensure proper social development of calves. Unlike other forms of enrichment, once a herd has been established, there is relatively little maintenance required apart from looking after the elephants - they provide enrichment to each other in a self-sustaining system. Unfortunately, establishing a family unit can be difficult due to the individual elephants involved. Conversely, in a well-established group, time which might otherwise be spent performing aberrant behaviours is spent interacting with other members of the family unit.

The maintenance of large and extended family units makes enrichment more challenging due to animal hierarchy. Dominant elephants may monopolize enrichment opportunities on exhibit if not sufficiently spaced. Multiple enrichment items or stations should be used, especially when implementing food based enrichment strategies, to ensure that all herd members have chance to use them.

Elephants with limited conspecific opportunities greatly benefit from interactions with their keeper/handlers. This is very true of singularly housed individuals. In these situations, it is desirable to have one or more staff members assigned to care for and spend time with the elephant for the entire day. The brief period spent interacting while training and cleaning, does not adequately compensate for the amount of time they would spend socializing with other elephants.

One excellent way to bond as a "herd", as well as to provide exercise, is to accompany captive elephants on walks outside of their enclosure (if feasible). These outings not only provide a change of scenery, but also offer potential opportunities to graze or browse.

For many captive elephants, training is one of the most common forms of keeper-elephant interaction. Both the initial training and subsequent maintenance of behaviours are forms of enrichment, keyed to stimulating the mind while bonding with the trainer. Medical

procedures, demonstrations, and general husbandry behaviours are all par for the course. They also have a positive impact on husbandry and public education (furthering the goals of an effective elephant exhibit). When spread throughout the day, the interactions during training, feeding, watering, and social visits break up the monotony of an otherwise routine husbandry schedule, sparking interest and stimulating activity.

DIETARY ENRICHMENT

The sheer amount of food eaten by elephants (and time spent doing so) makes dietary enrichment a logical starting point for introducing variety into the lives of captive elephants. Unfortunately, the propensity for elephants to eat can also be a problem, as without proper diet and exercise they can become obese. Thus, when using food-related enrichment, it is important to consider the regular diet of the animals in question, which may need to be adjusted accordingly. For instance, if a large amount of browse or grass is provided, the amount of hay fed should be decreased appropriately. Please note that ALL enrichment food items should be approved and measured out by nutrition, enrichment and veterinary staff, as well as a designated elephant manager.

Most elephants benefit from a wide assortment of different foods, which makes varying their day-to-day diet a fairly simple form of enrichment. Merely altering the type of food offered - be it different varieties of produce, various types of hay, or the addition of small amounts of sweet feeds, corn, or other grains - can be enriching for an elephant used to standard fare. And while providing preferred food items evokes "pleased" behaviours, offering non-preferred items can be equally stimulating.

Browse is the quintessential food item for elephant enrichment. Not only is it a natural and preferred item, but it also keeps them busy for hours as they strip off the bark, manipulate the object and chew on the wood. Logs and branches should be provided whenever possible, but should be "approved" for elephant consumption. A toxic browse list should be kept on hand, by gardeners and keepers, to help identify elephant-friendly species and avoid potentially dangerous side effects from certain browse species. A list is available on the web at www.AZH.org/Links/ToxicPlantsLinks.htm. Care should also be taken with the size, shape, and physical nature of the browse offered. While elephants are known to eat Acacia and Barberry, sharp broken branches may cause injury, while large bamboo stalks can splinter, potentially damaging sensitive mouth tissues. In temperate climates, leafy browse is typically available only from late spring through autumn. During the winter months there is still plenty of fresh twigs, branches, and logs for them to consume and peel off the bark. If possible, thawing favorite varieties frozen over the summer months, is a special treat during the winter months. The size of browse offered can vary dramatically depending on what is available, but elephants will typically use anything, from the smallest branch to entire trees. Care should be taken to secure large pieces of browse (weighing over 20 pounds), which have the potential to cause damage to the exhibit, barriers, or people (if thrown).

Altering the way in which food is presented is one of the easiest and most effective ways to keep elephants busy. Varying times when food is presented, offering different portion sizes,

and making foraging a priority can make a world of difference to captive elephants. With feeding and foraging taking up 80% of a wild elephant's time budget, increasing the challenge involved with obtaining food for captive elephants can stimulate the mind and extend the time which the task takes. Simulating browsing from trees, hay nets, suspended above the elephant's head, are an excellent source of enrichment. To feed from these nets, the elephants must concentrate on maneuvering their trunks (burning energy and sharpening senses), and are only able to pull down small portions at a time.

Smaller items, such as grain, herbivore cubes, and chopped produce, can be placed in boomer balls or barrels with holes drilled in them, encouraging the elephants to manipulate the objects in order to feed. Due to the immense strength of elephants, care should be given when choosing the ball/barrel and the way it is presented as elephants have a tendency to destroy things! (Additional guidelines may be found in the "Novel Enrichment" section). Novel produce, such as whole melons, and squashes, provide captive elephants an opportunity to be manipulative and destructive in the most positive of ways, while temporary feeders can be made by drilling holes in hollow fruits (such as pumpkins). Feeder balls and barrels can also be added to hanging nets (with or without hay), creating a double-feature, which can extend foraging time even after the hay is finished.

Scattering different food items around the exhibit encourages elephants to move around and explore their surroundings, and is similar to foraging in the wild. Mustard, ketchup, peanut butter, salad dressings (fat free), and many other condiments can be used in addition to produce and dry fodder. Logs with holes drilled into them and large rocks placed in the exhibit can provide hiding spots, further increasing the level of difficulty. Burying food items in bark chips, leaf litter, or dirt gives the elephants something to pick through or dig for. However, this sort of enrichment should be used only sporadically and the elephants observed while they are feeding, to avoid impaction from substrate ingestion.

Creating elephant-sized popsicles is a great treat during warm months. The foundation for these treats is obviously water, which can be frozen in rubber tubs, garbage cans, or any sturdy bucket or container. Variety can be introduced by adding whole and/or chopped produce, small bits of browse, or any other part of the elephant's diet prior to freezing. Additionally, juices, sugar free drink crystals, and herbal tea may be added to give extra color and flavor to the treats. An appropriate rope or chain, placed into the tub prior to freezing, can provide opportunities for the popsicle to be hung or secured.

NOVEL ENRICHMENT

The challenge of pushing, pulling, shoving, throwing, climbing, rubbing, and manipulating objects is excellent enrichment - evidenced by the destructive tendencies of many animals if they are not sufficiently occupied. The sheer size and intelligence of elephants makes it difficult to find or create items that will withstand their power and stimulate them for any period of time.

"Boomer balls", spools, beer kegs, large plastic barrels, milk crates, plastic sleds and garbage cans can all be given to elephants to play with. Being hollow, many of these items

are not officially "elephant proof", and can be crushed or collapsed by an eager pachyderm. To avoid injury to the elephants and to extend the life of the toys, these enrichment items can be suspended off the ground (to prevent an elephant from stepping on them) or hung just within trunk-reach (to prevent them from putting inappropriate items in their mouths or using their tusks). Nonetheless, it is inevitable that with use toys **WILL** get damaged and destroyed - rotating toys frequently can extend their individual lives, but don't expect any enrichment device to last forever. If a toy does get damaged it should be either repaired or discarded.

A frugal elephant department can often obtain used heavy-duty items - including tires, sweeper brushes (great for scratching posts), and large corrugated tubing - from local transit authorities for free or at minimal cost. The industrial strength of these objects makes them a perfect fit for an elephant enrichment program. Tires are readily available (in part due to the difficulties of disposing them), and make excellent toys due to their elasticity and hollow nature. The inside of the tire can act as a hiding spot for food, but is also prone to trapping rainwater when outside (a potential health hazard). A simple solution to this problem is to drill a hole one or two inches in diameter in the middle of the tire's tread and positioning this hole at the bottom when hanging it, allowing any water to drain out. Before being given to elephants, tires must be inspected for protruding wire hazards; non-steel belted tires are a better choice if available. Likewise, the size of the tire and its presentation needs to be considered. Mid-size tires such as those from all-terrain vehicles (ATVs) are roughly the size of an elephant's foot; these should be offered high off the ground away from the feet, which could become stuck or lodged inside the tire.

While many elephants will play with new objects, sustained interest can be encouraged by converting the toys into puzzle feeders. Adding holes, bars, smaller balls, and axes of rotation to balls and barrels are all possibilities, which create effective feeders. Dry feed works best in these containers as little residue is left behind once they are emptied.

Items strung on a chain when fiddled with can make noise, or a "mobile" made with a tire as the body of it with odd pieces of pipe hanging off of it that clamor together, can be hung above the elephant's head. Hanging 2-3 foot pieces of chain in the exhibit also provides something that the elephants enjoy playing with or sucking on. Objects that make sound, playing an electronic keyboard, drum, harmonica or xylophone are behaviors that can be easily taught to the elephants by their keepers. The process of making various noises and sounds can be very stimulating.

During warm weather sprinklers, misters, and water foggers can be set up for elephants to enjoy. These should be placed such that the elephants have a choice to get wet or not. Motion activated sprinklers or shower systems can also be added to an exhibit as a novel enrichment item.

Many elephants are taught easy interactive behaviors like painting or using sidewalk chalk. Some zoos use an easel, while others place their canvas or other items to be painted on the

ground. As an added bonus the resulting "artwork" can be sold, generating funds for the elephant program.

OLFACTORY ENRICHMENT

Despite their great sense of smell, olfactory (scent) enrichment tends to be underused with captive elephants (perhaps because smell is one of the senses least used by people). Nonetheless, offering different scents is an excellent way to introduce novel stimuli to the environments of captive pachyderms. When spread over space and time, scents encourage exploration of the surroundings and stimulate activity in a different way than typical food or toy enrichment might.

Spices, herbs (both fresh and dried), aromatic oils and extracts, condiments, hunting lures, perfumes, colognes, and body sprays all possess different and unique scents which may pique the interest of captive animals, including elephants. These items have the added benefit of being readily available and generally safe for use. Application of scents to objects within the exhibit requires some creativity, as powders have a tendency to blow away (taking their aroma with them). Mixing spices into a thick paste that can be smeared on furniture works well, as does diluting them heavily with water and applying them using a spray bottle.

Biological scents (which might be encountered in the wild) are available from fresh, clean urine. Fresh urine is naturally sterile, and contains a wealth of biological signals, including the sex, and reproductive and nutritional status of its depositor (hence one of the reasons that urine is used by many species to mark their territories). Offering urine from unfamiliar elephants (not exhibit mates), individuals of the opposite sex and different species can evoke exciting responses and may promote herd cohesion. Similarly, presenting surplus semen to a cow may elicit a reaction due to pheromones within the ejaculate.

Feces are another source of interesting odors, but fecal material is **NOT RECOMMENDED** for enrichment. Unlike urine, feces are not sterile and may contain pathogens, micro-organisms, and/or harmful chemical compounds. This, coupled with the fact that feces can be manipulated and ingested makes them inappropriate for use in a standard elephant enrichment program. If you do decide to use fecal material, be sure to consult with veterinary staff for proper guidelines and procedures.

CONCLUSION

Despite increasing scrutiny over their captive management, elephants remain one of the most recognized and popular zoo species. Enrichment can be an effective way to address concerns over welfare while calling attention to educational initiatives and conservation issues.

In order to promote species-specific behavior, and allow them to exhibit their full behavioral repertoire, the elephants' environment must be enriched. An effective enrichment program, based on basic biology and natural history, will provide interesting choices and cognitive

stimulation for the elephants under our care. Ultimately this not only improves the welfare of individuals, but the public's impression of captive elephant management as well.

The following serve as examples of enrichment items that may be appropriate for elephants as well as an overview

Exhibit Enrichment

- Pools
- Shade structures
- Faux termite mounds
- Variable/Natural substrates
- Dust bathing items: sand, dirt, bagged pine shavings
- Large telephone poles
- Anchors for securing novel items
- "safe areas"
- Access for large equipment

Dietary Enrichment

- Smaller portions fed more frequently
- Variable feeding times
- Spread out diet to encourage movement
- Condiments (mustard, ketchup, BBQ sauce, salad dressings, etc. (fat free preferred)
- Peanut butter
- Chopped or whole produce
- Air popped popcorn
- Browse (fresh, frozen, logs w/ bark)
- Sugar cane
- Raw or cooked pasta
- Sugar free candy (treats)
- Unsalted pretzels
- Spaghetti sauce
- Olives
- Canned vegetables
- Frozen foods or "popsicles"
- Breads
- Sweet feed, corn, grains
- Low sugar cereals
- Sugar free Jell-O (jigglers work best!)
- Feeder balls, logs, barrels
- Hay nets
- Herbs
- Catnip

Social Enrichment

- Social opportunities: species appropriate social groups
- Appropriate exposure and responses contraspecifics
- Communal (unrestrained) housing
- Introductions
- Keeper interactions

Sensory Enrichment

- Vinegar
- Vics Vapo Rub
- Chapstick
- Food extracts
- Spices (allspice, cinnamon, cloves, nutmeg, anise, crushed red pepper, etc.)
- Herbs
- Perfumes
- Body sprays
- Hunting lures
- Aromatic oils
- Vaseline
- Catnip

Novel Enrichment

- Large street sweeper brushes
- Tractor, car, motorcycle tires (no steel belts)
- Boomer balls, spools, etc.
- Beer kegs
- Large plastic barrels
- Large corrugated tubing
- Bowling balls
- Bouncy balls
- Mobile – chain through odd pieces of pipes, etc.
- Milk crates
- Plastic sleds
- Plastic garbage cans
- Card board boxes
- Painting, sidewalk chalk (non-toxic)
- Harmonica, drum, keyboard, or other instruments
- Sprinklers, misters, water foggers
- Motion activated shower
- Chew chains
- Cardboard carpet tubes

Safety Considerations

- Large items need to be affixed or contained to keep them away from public viewing areas, out of moats, or causing structural damage to your facility, exhibit barriers, or other enrichment items
- Daily inspection of items, chains, clevis', and quick-links are essential to make sure they are secure and in good shape
- Damaged items may cause injury to the elephants
- Avoid small tires on ground or chain loops that might ensnare the elephant's foot
- Plants or parts of plants may be toxic, a list of such items should be on hand
- Overwhelming panic can lead to injury of an individual or family group members
- Elephants may ingest unsuitable objects such as twine, clevis', screws, etc.
- Use of food based strategies can lead to weight gain, or elephants not consuming important dietary supplements
- Multiple items, spaced out appropriately will help prevent hoarding by dominant individuals

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