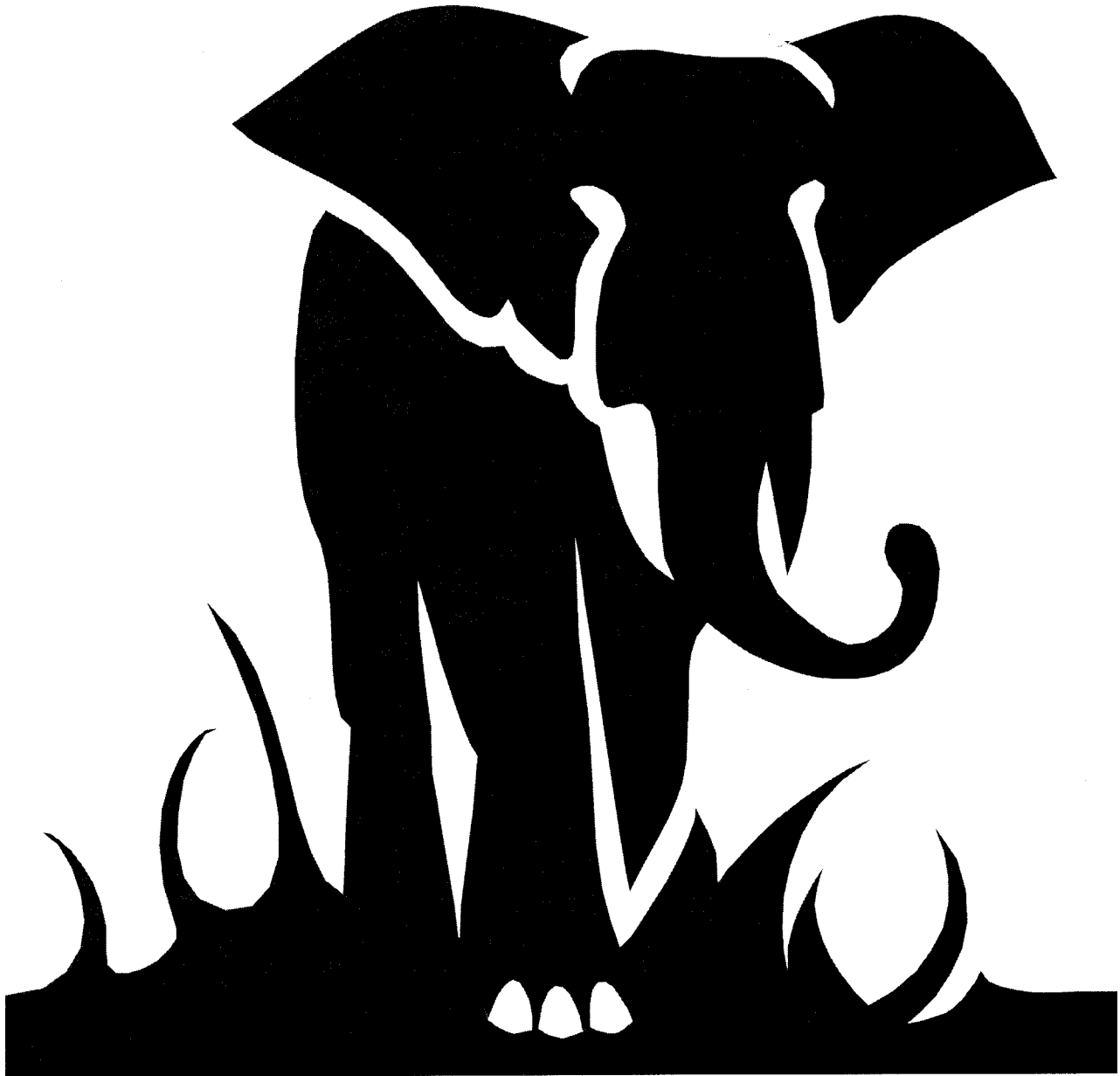


ELEPHANT CARE MANUAL MILWAUKEE COUNTY ZOO



FOURTH EDITION-**

2004

MILWAUKEE COUNTY ZOO ELEPHANT CARE MANUAL

January 12, 2004
(Fourth Edition)

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**ACKNOWLEDGEMENT FOR RECEIVING
THE ELEPHANT CARE MANUAL**

My signature acknowledges that I have received a copy of the Milwaukee County Zoo's Elephant Care Manual, 2004 edition. I understand that the manual will be used to establish a consistent foundation around which our protected contact elephant management program is developed. The manual outlines the Milwaukee County Zoo's policies, procedures, and goals for managing elephants and will be up-dated as frequently as is necessary to insure that the contents of the manual remain current. Any changes in the contents of this manual will be posted in the pachyderm area. All elephant care staff are required to initial any posting to acknowledge their understanding of the policy change.

As a member of the elephant care staff, I understand that I am responsible for reading, learning, and practicing the Milwaukee County Zoo's policies and procedures. I understand that it is my responsibility to comply with the policies and procedures outlined in this manual.

PRINTED NAME : _____

SIGNATURE: _____

DATE:

PURSuing EXCELLENCE IN MANAGING ELEPHANTS

Elephants are intelligent, social, and potentially lethal animals. They require intense and specialized care if they are to remain healthy in the captive environment. The question we must constantly ask ourselves is "How can we accomplish this safely?"

Our Zoo is one of the first in the United States to develop and implement a new elephant training system called Protected Contact. Through protected contact we are exploring a fundamental change in the management of captive elephants. The historic approach to elephant management physically places the keeper in the animal's environment. Any loss of control in this situation can be catastrophic for the keeper. Protected Contact, on the other hand, is just that - contact from a protected position. It is accomplished through a combination of facility design and the skillful modification of the animal's behavior. In this system keepers with hands-on contact, operating from a position of relative safety, will work with the elephants to forge cooperative relationships. Our purpose is to provide a safer working environment for keepers without compromising the quality of care we provide our animals.

This manual is your introduction to our elephant management system. As we continue to develop and implement the protected contact system of elephant management, you will become a key player in the team responsible for operating with safe elephant management techniques.

Bruce A. Beehler, D.V.M.
Deputy Zoo Director
Animal Management and Health
Milwaukee County Zoo

ACKNOWLEDGMENTS

The first edition of the Milwaukee County Zoo's Elephant Care Manual, completed in 1996, was developed using the Zoological Society of San Diego's Elephant Keeper Manual as a model. A special acknowledgement is also due to Gary Priest, a behavioral consultant to the Milwaukee County Zoo, for his advice in the development of the protected contact program at the Zoo and his assistance in the preparation and compilation of the original elephant care manual.

All of the editions of this manual are the result of the outstanding effort of many employees of the Milwaukee County Zoo and consultants who have shared their knowledge to create a safer alternative for elephant management. Thanks to each of the Milwaukee County Zoo staff members who are committed to the welfare of animals under their care. Because of them, this manual will be a valuable resource for developing a consistent approach to elephant management at our institution and others.

CHAPTER 1

PHILOSOPHY, METHODS AND GOALS

ELEPHANT CARE PROGRAM PHILOSOPHY

The Milwaukee County Zoo elephant program is designed to allow elephant care in a manner that is safe for both the elephants and their caretakers. In captivity, working closely with the elephants provides both physical and mental stimulation for the animals. This care allows handlers to observe the animals closely for the detection of physical or psychological changes, and strengthens the bond between the handlers and their charges. The program provides the daily care necessary to maintain the elephants' health and well being.

ELEPHANT CARE METHODS

The need for regular care of elephants in captivity has been amply demonstrated. Elephants that do not receive such care are more prone to a variety of health disorders that result in a poor quality of life and reduced longevity.

As a result of this need, elephant care is qualitatively different than the care of many other zoo animals. For example, tigers are cared for in a no-contact manner - they are shifted and fed, cleaned and observed without physical contact with their caretakers. The need to physically contact tigers is limited to veterinary clinical care, may only occur a few times in the tiger's lifetime, and is accomplished using chemical immobilization. In contrast, elephant care requires routine physical contact by the caretakers, which is referred to as "hands-on" care. This is a labor-intensive process that can be dangerous if misapplied. A consistent program that ensures handler control of the animals is essential for safety.

Hands-on care can be provided by "free-contact" where the elephant handlers enter the enclosure and maintain dominance over the animals, or "protected-contact" where the animals are trained to respond to commands with physical barriers between the caretaker and the elephant. Our Zoo uses the protected-contact method. An elephant chute has been installed which will supplement the protected contact care of the animals.

HOW DO YOU SAFELY CONTROL THE BEHAVIOR OF AN ANIMAL THAT IS 50 TIMES LARGER THAN AN ADULT HUMAN?

In a single sentence, this question sums up the entire purpose of this manual. The question is not a new one. No doubt it has been posed thousands of times by elephant keepers since the traditional style of elephant management developed several thousand years ago. Breaking with routine and tradition is never easy, but two fundamental developments caused us to re-evaluate our management practices for elephants in Milwaukee.

First, as an organization we came to recognize that our reasons for managing the behavior of elephants are different from the traditional needs. We do not manage elephants as work animals, but for exhibition and education. Secondly, an alternative to the traditional management system has emerged. Operant conditioning as a technique for behavior modification did not exist 60 years ago. It has proven successful with a wide variety of animal species. A consistently applied operant conditioning program for the management of elephants holds great potential for safely providing care.

CAPTIVE ELEPHANT MANAGEMENT DILEMMAS

Keeper Deaths - In the last 25 years, more than 20 people have been killed by elephants in the United States, and most of them were elephant handlers. Statistics of elephant related injuries in the United States or fatality figures for Europe are not known. OSHA regards elephant handling as being a higher risk occupation than either police work or fire fighting.

Employment Behavior - Today, with society's greater mobility, modern employment behavior has changed. The average working adult in the U.S. changes professions once every five years. As a result of our attempt to maintain the traditional system of elephant management in this new environment, relationships between man and elephant have generally become less secure.

Increased Public Sensitivity To Animal Welfare - The plight of wild elephant populations and increased sensitivity to animal welfare in general has caused the traditional free contact system to be examined under the light of close public scrutiny. Free contact relies on long-term relationships and the keeper's position relative to the elephant's dominance hierarchy. Maintaining social dominance sometimes requires the use of physical discipline. Despite the justification, this has come to be viewed by some in a negative light.

MILWAUKEE COUNTY ZOO ELEPHANT MANAGEMENT PROGRAM - PROTECTED CONTACT

The term PROTECTED CONTACT was coined to describe an alternative system to traditional elephant management. In this system, keepers do not enter into the enclosure with the animal. Instead, they work with the animal from a shielded position outside the enclosure. Because the keepers in protected contact remain outside the elephant's enclosure, no physical discipline is required to insure keeper safety or maintain behavioral control. Keepers working from positions behind protective barriers can selectively reinforce, shape, and maintain all the behaviors required for proper elephant husbandry.

Our current elephant facilities are continually being modified to enhance staff safety and support the protected contact approach to elephant care. The masterplan for a multi-million dollar renovation of the elephant facilities has been completed. Construction of the renovations is dependant on fund-raising, and is anticipated for 2007 or 2008.

ELEPHANT MANAGEMENT GOALS AND OBJECTIVES

Additional details can be found in the Pachyderm Collection Plan and the training goals and progress information kept in the pachyderm area. Current goals include:

- A. Continue to refine elephant management procedures and update the manual.
- B. Continue to present a variety of behavioral enrichment activities.
 - 1. Install scratching posts in interior exhibits.
 - 2. Install massive branched logs in exterior exhibits.
 - 3. Scatter and hide food items to encourage searching.
 - 4. Introduce a variety of harmless playthings to be manipulated.
 - 5. Use spices to add unusual scents to the exhibits.
 - 6. Allow growth of non-toxic plants in the moats for the elephants to reach.
 - 7. Continue operant conditioning for mental and physical stimulation.
 - 8. Shift animals between indoor and outdoor exhibits at random intervals.
 - 9. Provide browse whenever feasible.

- C. Maintain 0.2 animals for exhibit and potential future reproduction.
- D. Continue to improve the protected contact procedures for the African Elephants, while maintaining the ability to provide necessary care to the elephants.
 - 1. Using operant conditioning techniques and positive reinforcements, train the elephants to voluntarily allow appropriate care with the elephant care staff outside the elephant enclosures. (See attached list for behavioral training goals).
 - 2. Modify the existing facilities to enhance safety while allowing care from outside the enclosure.
 - 3. Continue staff training in operant conditioning of elephants with the use of consultants, visits to other facilities, and internal communication.
- E. Continue development and presentation of a public African elephant program demonstration consistent with protected contact and positive reinforcement. The program emphasizes visitor education and incorporates information about our elephant care procedures.
- F. Complete renovation of elephant facilities by 2008.

CHAPTER 2

...FOR THE KEEPER NEW TO THE AREA

Welcome aboard! You are training to learn to handle elephants in protected contact will be intense. During this period you will be working closely with your training mentor and other keepers to learn the skills you will need to operate safely in our protected contact elephant management program. During this probation period, you will be expected to become familiar with the Elephant Care Manual and all policies and procedures for elephant management.

Regardless of your experience or background, initially you should expect that your movements in the elephant area to be very restricted. As your training progresses, you will first learn to back up other trainers during training sessions. At the same time, you will be learning the Elephant Demonstration dialogue in preparation for making presentations. Ultimately, you will be given the responsibility to conduct your own training sessions with the elephants.

There are three PRIMARY purposes for such intense training:

- 1. To do everything possible to ensure your safety when working around our elephants.
- 2. To assure the consistent application of technique when training our elephants.
- 3. To ensure your complete understanding of our program and expectations.

SAFETY

Despite the safety advantages of protected contact, the potential for injury remains. Special caution must be observed when within range of the elephant's trunk or when your hands or arms are through the barrier. The entire program is developed with safety in mind. Safety measures are listed in detail in Chapter 4 of this manual. **You are responsible for fully understanding and complying with the program safety measures.**

YOUR FIRST FEW WEEKS IN THE AREA

The Elephant Manager and Primary Trainers will be responsible for your training with elephants, and the Area Supervisor will be responsible for your general training for the area. On your first work day you will be instructed in the protocols of the work area. As a rule, you should behave as you would expect a guest to behave while visiting a restricted work area. Several protocols will pertain only to you as a new person in the area. Our primary concern is to assure your safety as a new keeper operating in a new and unfamiliar work place. Until told otherwise, you should always remain behind the yellow lines, which indicate the elephant's trunk range.

Regardless of your experience or background, you will find your freedoms in this work place a bit restricted at first. Do not be surprised at the amount of time we will take in your preliminary training. Observing how things are done and asking questions of the Elephant Manager is your most important assignment during this introductory period. We take the protocols very seriously, any breach of protocol will result in appropriate disciplinary action.

Even though keepers in protected contact operate from positions behind barriers, they are still so close as to usually be within reach of the elephant's trunk. Any time a keeper is within the reach of the elephant, the keeper must behave as if he or she was in the same space as the elephant. **Full attention must be paid to the elephant because your life may depend on it.** While you are in the training stage, until and unless instructed otherwise, you should have no physical contact with the animals or attempt to give commands.

The Elephant Manager will maintain your own personal training records in the area. This record will track your progress and the tasks you have yet to accomplish. Your first duties will be yard pick-ups and barn cleaning, food preparation, barn set-up, and gate operation. Early on, you will be expected to learn to present Elephant Demonstration dialog.

CHAPTER 3 PERSONNEL TRAINING

PERSONNEL RESPONSIBILITIES

Only those keepers regularly assigned to the pachyderm area and who have completed the appropriate training are permitted to serve as elephant mechanic, controller or primary trainer. Exceptions to this are for emergencies, or must be approved by the Deputy Zoo Director. Elephant program staff functions and the current incumbents are as follows:

Elephant Manager – Beth Roszak – responsible for designing and implementing the elephant care program, including training of elephants and elephant care personnel. The Elephant Manager grants final approval for all new behaviors.

Primary Trainers – Beth Roszak and Joan Volpe – responsible for training new procedures to the elephants.

Elephant Controller – Dana Nicholson, Beth Roszak, Joan Volpe, Ray Hren, Richard Schweitzer - responsible for controlling the elephants during elephant/caretaker interactions. The assigned elephant controller coordinates all protected contact training sessions.

Elephant Mechanic – Dana Nicholson, Beth Roszak, Joan Volpe, Ray Hren, Richard

Schweitzer, Ryan Strack, Bob Collazo – responsible for performing elephant care procedures with the elephants under the direction and oversight of the Elephant Controller.

Elephant Program Trainee – Responsible for learning to safely and effectively function as an Elephant Controller and Elephant Mechanic. Training is under the direction of the Elephant Manager with oversight by the Area Supervisor and the assistance of Controllers and Mechanics.

Zoo Area Supervisor (Pachyderms) – Dana Nicholson – responsible for the supervision of the staff, facilities, animals, programs and budget of the Pachyderm Area.

Deputy Zoo Director, Animal Management and Health – Dr. Bruce Beehler – responsible for the management of the Pachyderm Area, including staff, facilities, animals, programs and budget.

TRAINING QUALIFICATION CRITERIA

The following information is provided as an example of the order of what you will learn during your training. As you progress to each new level, you will be qualified as having mastered the previous level. A formal meeting will be held with you and all of the elephant staff to confirm the completion of your training and to certify your qualification at each level. A formal review of your qualifications will be conducted by the Elephant Manager on a semi-annual basis. Note that as training progresses, the keeper is first certified as an “elephant mechanic”, and later progresses to “elephant controller”.

Elephant Mechanic:

1. The keeper has read and understood the Elephant Care Manual, the assigned chapters of "Don't Shoot the Dog" and other relevant introductory information.
2. The keeper has demonstrated knowledge of all safety policies and procedures and follows them.
3. The keeper has demonstrated knowledge of daily routines including diets, cleaning, and record keeping, and performs these routines at an acceptable level.
4. The keeper has demonstrated knowledge of general elephant facts and the individual behaviors and medical histories of the Zoo elephants at an acceptable level.
5. The keeper has qualified and is authorized to begin supervised introductory work with an animal in the protected contact system, in the presence of an elephant controller and also, when in trunk range, with a qualified backup person.
6. The keeper is authorized to perform mechanic duties under the direction of the elephant controller without a back-up person.

Elephant Controller:

1. The keeper has been qualified as an Elephant Mechanic.
2. The keeper may perform protected contact behaviors with an animal for which he/she has been qualified, in any order, while under the direction of an elephant controller and, when in trunk range, with a qualified backup person.
3. The keeper has demonstrated knowledge of operant conditioning methods and acceptable levels of training consistency, timing, judgement, and problem solving. The keeper is authorized

to perform protected contact behaviors with an animal for which he/she has been qualified, in any order, without another elephant controller being present.

Elephant Primary Trainer:

1. The keeper has been qualified as an Elephant Controller.
2. The keeper is authorized to shape behavior and condition new behavior while under the immediate direction of a qualified elephant controller.
3. The keeper has unrestricted authorization to shape and condition protected contact behaviors without the immediate direction of an elephant controller. (Under the conditions of the Elephant Protocol, no keeper will engage in the conditioning of new behavior without prior discussion with and authorization by the Elephant Manager.)

CHAPTER 4 SAFETY

SAFETY AND ELEPHANT HANDLING RULES

Keeper safety is the driving force behind the development of protected contact. It is everyone's responsibility. If a keeper sees a situation that seems unsafe, it is the keeper's responsibility to immediately alert the individual at risk, and then report the incident to the area supervisor. Established safety protocols for operating in protected contact are strictly enforced. Consistent animal handling protocols are conducive to keeper and animal safety.

A formal elephant program safety review will be conducted on a biannual basis. The pachyderm staff, Deputy Zoo Director, and Zoo Safety and Training Officer will participate in the review. The review will encompass the elephant exhibit, service area and support area facilities and the operational procedures (including the animal care, training, and emergency procedures).

Specific safety and elephant handling rules include:

1. At least two qualified handlers must be present when working within trunk range of the elephants as defined by the yellow lines on the floor - one designated as the controller and the other the mechanic.
2. The controller or mechanic must wear a radio, and both the mechanic and the controller must wear an approved knife.
3. Greet the elephants when you begin to work them. Use this time to assess their physical and mental state. Allow time to acquaint yourself with the animals before beginning any routine.
4. Move carefully and naturally around the elephants, and always remember that your attitude is important.

5. Strive for consistency with the commands, praise and corrective actions. Too much of any of these can be confusing to the elephant.
6. Only the controller should give the commands. The mechanic should assist in command and control of the elephant only in situations where the controller requests assistance. If the controller is preoccupied, the mechanic will notify the controller of the intent to assist.
7. Perform the mechanic tasks efficiently to avoid needless handling.
8. Praise the elephant for proper behavior. Reassure the elephant that is reluctant or uncomfortable.
9. Never allow an elephant to put its trunk around you or to push you.
10. When working with an elephant in a stall or through rigid metal bars, trainers must be alert to the possibility of injury as a result of limbs being trapped between the metal and the elephant as it shifts position within the stall.
11. Should you witness a situation that seems unsafe, you have the responsibility to first call it to the attention of the person they believe to be at risk, and then report the incident to the area lead.
12. During all training sessions in the barn or yard all conversations should reflect the work at hand. To prevent distractions or confusion, all other conversations not pertaining to the session should be engaged away from the area where training is taking place.
13. While you are within trunk reach, do not turn your back to an animal.
14. At the end of a set or during a training pause always step back out of trunk reach of the animal.
15. Always use the protective barriers to your best advantage to insure your personal safety when working in protected contact with these animals.
16. The keeper with responsibility for controlling the animal also has responsibility for directing the movement of all gates.
17. The controller will position the animal's head away from the mechanic performing a task within the elephant's reach.
18. Elephants should never be reinforced for behaving aggressively or displacing another animal. Wherever possible animals should be reinforced for relaxed trunk position.
19. The elephant staff is responsible for checking all locks in the barn and checking tools and hoses every night to ensure that the elephants cannot reach them.
20. Plan and discuss all training session goals prior to starting the session.

21. When a person has responsibility for controlling an animal, no other keeper may pre-empt operation with that animal, unless a time-out has been called by a senior person.
22. Keepers receiving animals during separations must have with them a sufficient quantity of food to receive and hold the animals. They must also have with them a clicker.
23. Keepers are to stay out of trunk range when working with the elephants in the yard.

ELEPHANT ENCLOSURE ENTRY

No one is permitted to enter an elephant enclosure with an elephant without the express permission of the Zoo Director, Deputy Zoo Director, or Curator of the Day. Permission will only be granted after weighing the risks and benefits, and with the assumption that the elephants do not recognize the handlers as dominant.

One approved exception is the protocol for cleaning Lucy's stall in the event that she cannot go outside. In that case, Lucy is short chained to one front corner of the stall, a controller stays with her, and other keepers clean the stall well out of trunk range. The keepers then leave the stall, Lucy is then shifted to the opposite front corner, and the procedure is repeated.

Other potential exceptions, subject to approval on a case by case basis, include the application of devices to an elephant that is unable to rise without assistance or the performance of a veterinary procedure with the elephant under general anesthesia. Planned responses to these situations will be developed with the elephant care staff.

ELEPHANT AGGRESSION TOWARDS PEOPLE

In the event of an elephant threatening a handler, the situation will dictate the response. Threats by an elephant may be overt actions or changes in body posture. Examples include pushing or kicking; ears out with head down and trunk curled as if ready to hit out with the trunk; slapping a curled trunk against the ground. A threat may be a warning that an attack will follow. A threat might be the result of someone (usually the person being threatened) annoying or startling the elephant in a manner that is outside the elephant's range of experience. The handlers must be certain that they are not doing anything unusual and that nothing of a bizarre nature is happening around them. Stopping the behavior may involve a verbal command like "No!", distracting the animal by giving a command for an unrelated behavior, or a time out.

In the rare event of an overt elephant attack towards a person, the handlers must use whatever force or means is available to protect human life.

RE-DIRECTION OF ELEPHANT AGGRESSION

We will not risk human life in an attempt to stop fighting elephants. Operant conditioning provides a mechanism that can be used to reinforce an animal's positive attitude. Behavior modification techniques can also be used to reinforce positive social interactions between working members within the herd. Operant conditioning provides us with a safe and positive means to mitigate herd dynamics.

Our primary strategy in the redirection of aggression is to identify where and when aggression is likely to occur and then work to develop strategies and means to prevent the aggression from

happening in the first place. Dealing with aggression after the fact always presents greater difficulty and potential danger.

CHAPTER 5 ELEPHANT TRAINING

ELEPHANT INTERACTIONS

Elephants in the wild live in social groups with a dominance hierarchy established by vocalizations, body posture, sparring, or even outright fights between the elephants. An elephant lower in the dominance hierarchy may be disciplined by another elephant by being pushed, butted, tusked, hit with the trunk, or body slammed. These body slams can lift an eight or ten thousand pound elephant off the ground.

Even in protected contact, where the elephant handlers are not in the enclosure with the elephants, significant care must be taken to prevent injuries while in the vicinity of the elephants. In protected contact, physical discipline is not used, and the elephants must be enticed to participate in the care procedures.

Whenever an elephant is engaged in a training session where people are within trunk range, two qualified elephant handlers must be present. One is designated as the "Mechanic", and performs elephant care such as bathing, foot trimming, or applying restraint devices under the direction of the Controller. The other handler is designated as the "Controller" and is responsible for controlling the elephant's behavior and movements. Unless the Mechanic is told by the Controller to give a command, only the Controller gives commands to the elephant. The Controller determines what the Mechanic is to do, and keeps the Mechanic informed as to the commands that will be given to the elephant. The Controller is responsible for ensuring the safety of the Mechanic. The Mechanic may assist in handling the elephant, but must receive the Controller's permission to assist unless there is a life-threatening situation.

GENERAL TRAINING PROTOCOLS

Planning: Specific project objectives will be discussed in advance and clearly established before training begins. No deviations, new behaviors, or training strategies are permitted without approval of the Elephant Manager and your mentors.

Daily Records: Records will be kept on-site for trainer review and will be completed by the elephant controller for each session or demonstration. This record system catalogues the animal's physical and behavioral responsiveness, appetite, and progress on behavioral tasks. Records will also note any aggressive behavior, (highlighted in ORANGE marker) or physical health problems, (highlighted in YELLOW marker). (See sample records in this section). At the beginning of his/her workweek, each keeper is responsible for reviewing the animal records for any anomalies that may have occurred during the previous two days.

Bridging Stimulus: To promote consistency, clickers will be provided and used as conditioned reinforcers. The clicker will serve as the bridging stimulus for all protected contact training. Because verbal bridges may vary from one trainer to the next and are therefore less consistent, they are not appropriate in this context.

Primary Reinforcer: Preferred food items from the elephant's regular diet will be the primary reinforcer used for training. No reduction of an elephant's normal daily food intake because of poor training performance is allowed.

Positive Punishment: There will be no use of physical discipline with elephants in protected contact. There will be no use of stimuli intended to annoy such as loud noises or squirting water. A verbal reprimand using the word, "NO" is permitted, but no other yelling at the animal is allowed. A stern tone of voice may be used to indicate displeasure with the animal behavior. Withholding or decreasing the amount of food treats is also permissible.

Negative Punishment: The use of time outs and/or the termination of the training set are appropriate disciplinary measures in response to an animal's lack of attention. The time out is a very effective tool in encouraging an animal's attention. The time out is patterned after what often occurs in nature when an animal fails to respond quickly enough to take advantage of an opportunity. Trial and accidental success is a natural part of adaptive learning and is used by all animals to exploit their environment.

If during the course of a training session, an animal makes a mistake, it is given another opportunity to perform the desired behavior. Time outs are only used when response time or attention is poor. The time out provides a short neutral time interval for the animal to refocus. Once the session resumes, a positive working attitude is immediately reinforced. Time outs also allow the trainer time to examine the situation and determine possible solutions.

ELEPHANT HANDLING TOOLS

A number of tools are used in our program to facilitate the handling and control of the elephants:

Target - This is a stick, rod, or other extension that serves as a focus for operant conditioning of the elephant. The elephant, through food rewards and other positive reinforcements, learns to touch the target with various parts of the body on command. This allows the handler to position the elephant over or through protected contact barriers.

Hands - Elephant handlers use their hands to guide, caress, examine, and care for the elephant. Special attention to safety must be taken because of the close proximity of the animal.

Chains - Lower leg chains are used to limit an elephant's movement. They are applied to prevent fighting between incompatible elephants, prevent stealing of another elephant's food during feeding times, and as a protected contact device during some elephant care procedures. Chaining gives the handler a greater degree of control while doing bathing and footwork, during veterinary examinations, and while cleaning enclosures.

Ropes - Ropes are used to limit an elephant's movements or guide the direction of the movements. They are also used to assist an elephant unable to rise. The ability to stretch under a load provides a "give" that reduces likelihood of injury to the elephant.

Block and Tackle - This is used to help position or assist in lifting an elephant that is sick or injured and unable to rise unassisted.

Straps and Webbing - These are used as a sling in conjunction with ropes and block & tackle to assist an elephant that is unable to rise.

The elephant control and handling tools are limited to the types and uses listed above, with the exception of life-threatening emergencies. For life-threatening emergencies, a CO₂ fire extinguisher and a long ankus will be readily available. In addition, elephant care staff are required to wear an approved knife. The Zoo Director or the Deputy Zoo Director must approve any other exceptions.

COMMAND PROCEDURES

The vocal command is to be given clearly and audibly. The elephant must be given the time and opportunity to respond before proceeding. If the command is ambiguous (e.g. which foot to "pad"), or if the vocal command needs to be reinforced, the elephant will be touched directly by the handler or with a handling tool to provide a tactile cue.

The elephant will be given positive reinforcement with food, vocal, and/or tactile praise after the proper completion of the command or a series of commands. Failure to respond to the command will be followed by a reprimand that may, in protected contact, include a repeat of the verbal command, a verbal reprimand, a time out, or an end of the session. A single properly done reprimand is more effective than several improperly done.

To be effective, reprimands must be something out of the ordinary. Constant use of a loud voice, verbal reprimands, or other discipline will diminish their usefulness.

One feeding may be postponed or the elephant may be given a "time out" for no more than one hour if the elephant fails to respond appropriately to commands.

ELEPHANT BEHAVIOR LIST

VERBAL COMMAND	CUE	BEHAVIORAL CRITERIA
PAD	VERBAL (inside) VERBAL + TARGET POLE HELD BEHIND DESIRED FOOT (outside)	Elephant presents rear foot backwards
SWITCH	VERBAL (command given after pad)	Elephant presents opposite rear foot backwards
STAND ON IT	VERBAL + TARGET POLE IS TAPPED ON OBJECT right hand/left foot left hand/right foot	Elephant is to rest front foot with pad exposed
ON THE WALL	VERBAL + PLACE HAND ON WALL right hand/right side of stall left hand/left side of stall	Elephant to move towards wall until side of body is touching wall

HAND	VERBAL + EXTEND HAND (PALM SIDE UP)	Elephant extends trunk into handler's hand and allows trunk to be held, stroked or moved
RELAX	VERBAL + STROKE BODY PART TO BE RELAXED	Elephant relaxes body part being touched by handler
BIG EARS	VERBAL + BOTH ARMS EXTENDED TOWARDS EARS	Elephant bring both ears forward at 90° angles simultaneously
SHIFT	VERBAL + HAND POINTED TO DIRECTION TO MOVE TOWARDS	Elephant moves in the direction indicated, usually to another stall
HEAD DOWN	VERBAL + TAP TRUNK	Elephant lowers head
EYE	VERBAL + EXTEND HAND TOWARDS DESIRED EYE	Elephant moves eye toward handler's hand and allows examination
COME	VERBAL	Elephant will come stand in front of handler or will walk with handler
STEADY	VERBAL	Elephant to hold position until released
NO	VERBAL	Elephant to stop undesired behavior
GOOD	VERBAL	Used to encourage or guide behavior or secondary bridge
MOVE UP	VERBAL	Elephant moves forward towards handler
BACK	VERBAL	Elephant moves back away from handler
EASY	VERBAL	Elephant slows down, calms attitude

TRUNK	VERBAL + RIGHT HAND RAISED SLIGHTLY OVER HANDLERS HEAD WITH INDEX FINGER POINTED UP	Elephant curls trunk on top of head
MOUTH	VERBAL + RIGHT HAND IN SAME PLACEMENT AS TRUNK; THUMB AND INDEX FINGER MAKE A BACKWARD "L" (command after trunk)	Elephant opens mouth wide exposing upper molars
FOOT	VERBAL + TARGET POLE HELD IN FRONT OF DESIRED FOOT right hand/left front foot left hand/right front foot	Elephant lifts front foot and touches target pole
EAR	VERBAL VERBAL WITH HAND right hand/right ear left hand/left ear VERBAL + TARGET POLE HELD IN FRONT OF DESIRED EAR right hand/left ear left hand/right ear	Elephant will open ear 90° angle
LEAN IN	VERBAL + ARM EXTENDED AT 90° ANGLE TO BODY left arm/right body side right arm/left body side	Elephant pivots on front legs to present side of body to handler
TURN AROUND	VERBAL (Lucy) VERBAL + FORM U-SHAPE WITH RIGHT HAND AND TWIST AT WRIST (Brittany)	Elephant turns away from handler at 180° angle presenting rear end
TARGET	VERBAL + TARGET POLE HELD IN FRONT OF ELEPHANT	Elephant touches target pole with forehead
TOUCH	VERBAL + PRESENT PALM OF EITHER HAND IN FRONT OF ELEPHANT	Elephant extends trunk and touches tip of trunk to palm

BLOW	VERBAL + TOUCH SIDE OF TRUNK WITH FINGER (ask in touch position)	Elephant exhales
TRUMPET	VERBAL + CLOSE FINGERS TO THUMB ON RIGHT HAND	Elephant vocalizes
PICK IT UP	VERBAL +LEFT HAND FLAT OVER CLOSED RIGHT HAND	Elephant retrieves object
GIVE	VERBAL + EXTEND OPEN HAND TOWARDS ELEPHANT	Elephant gives object retrieved
PUT IT AWAY	VERBAL	Elephant puts trunk back in stall or lowers trunk
GO GET YOUR PELLETS	VERBAL	Elephant released to eat pellets
LINE UP/ GO OUTSIDE	VERBAL	Elephants get in position to be let outside – Lucy in front of hallway door; Brittany behind Lucy or in shift stall
IN THE POOL	VERBAL + POINT TO POOL	Elephant moves into pool
LEAVE IT	VERBAL	Elephant to stop attempting to reach/grab at object
ALL DONE	VERBAL	Training session over – elephant released

TRAINING TERMINOLOGY DEFINITIONS

Training: The art of using conditioning techniques to obtain desired behaviors.

Stimulus control: When a trained behavior occurs consistently in response to an appropriate cue.

Behavior: To act, function, react or perform in a particular way.

Operant Conditioning: A type of learning in which the probability of a behavior reoccurring is increased or decreased by the consequences that follow. This includes positive reinforcement, negative reinforcement and punishment.

Reinforcement: Anything which, occurring in conjunction with an action, tends to increase the probability that the action will occur again. It is the information telling the animal what you like and don't like.

Primary Reinforcer: Anything that is naturally rewarding, that satisfies biological drives and does not depend on learning i.e. food, water.

Conditioned Reinforcer: Any stimulus that has acquired its reinforcing properties through association with a primary reinforcement. Initially it is a meaningless signal that is paired with a reinforcer until it becomes a reinforcer itself i.e. whistle, clicker, the word "good".

Bridge: Conditioned reinforcer that communicates to the animal that it is performing the correct behavior.

Positive Reinforcement: Following an action or response with something pleasant - (the subject wants).

Negative Reinforcement: Following an action or response by removing something unpleasant - (the subject wants to avoid).

Schedule of Reinforcement: Rules that govern the delivery of reinforcement

Continuous Reinforcement: Reinforcement is given after every correct response.

Fixed Ratio Reinforcement: Reinforcement is only available after a predetermined number of correct responses.

Random Ratio Reinforcement: Reinforcement is available after a different number of correct responses.

Differential Reinforcement: Reinforcing selected responses of higher quality to improve performance.

Jackpot: A reward that is much bigger than a normal reinforcement and comes as a surprise to the subject.

Punishment: An unpleasant action that occurs after a behavior. This is usually done to decrease the likelihood of the behavior reoccurring.

Positive Punishment: Following an action or response the addition of an aversive stimulus (something the subject seeks to avoid)

Negative Punishment: Following an action or response the removal of positive stimulus (something the subject seeks to encounter)

Timeout: A form of negative punishment in which positive reinforcement and/or the opportunity for positive reinforcement is withheld for a brief period of time immediately following an inappropriate or undesirable response.

Stimulus: Anything that causes some kind of behavioral response.

Response: The actual performance of the behavior.

Cue: Stimulus in the presence of which a given response is reinforced.

Extinction: Method of eliminating a behavior by not reinforcing it any longer.

Incompatible Behavior: A behavior that interferes with, or cannot be performed at the same time as another behavior.

Superstitious Behavior: An undesired behavior that was unintentionally reinforced that becomes linked to the desired behavior.

Successive Approximation: Using a plan of steps, each step increasingly directed toward molding the goal behavior.

Shaping: Method of training using successive approximation.

Habituation: Accustoming the animal to a situation by prolonged exposure.

Desensitization: Actively pairing a positive reinforcer with a negative event until the negative event loses its ability to adversely influence behavior.

Acclimation: Physiological changes as organism adapt to environmental variations.

Regression: Deterioration in the learning progress or performance of a behavior, usually temporary in nature.

Generalization: When the reinforcement of a specific behavior increases the frequency of similar behaviors.

CHAPTER 6 ELEPHANT CARE PROCEDURES

The elephants at our Zoo have been trained to respond to a number of commands. These commands are all used to facilitate their care. Many of the commands are directly related to examination and treatment. Other are used for controlling the movement of the elephants during handling, or to facilitate exercise. Routine health care and treatments can be applied without stress or risk to the elephant. Examples of important aspects of elephant care include:

Foot Care: Foot disorders are one of the most common health problems of captive elephants. Feet require continual attention to prevent overgrown sole, cracked sole, foreign body penetration, overgrown nails, split nails, ingrown nails, and overgrown cuticle. Failure to prevent or treat any of these conditions with regular care will lead to pain, lameness, local infection, tissue destruction, and ultimately systemic infection and death.

The sole, nails, cuticles, and top of each foot of all elephants are carefully examined and cleaned daily by the Elephant Mechanic and treated as necessary (sometimes on a daily basis). Problems noted on the examination will be entered into the daily report. The Primary Trainers are responsible for the upkeep of the elephants' feet, using standard accepted practices under the direction of the Area Supervisor.

The mechanic will examine each elephant foot every day. At least twice a week a formal foot care session will include foot trimming and nail filing. The mechanic performing the foot care will determine other foot care needed on each foot. Care includes trimming of nails, corrective trimming for nail splits, corrective trimming of sole cracks, flushing and tub soaking of sole abscesses and fistulas, softening and removal of excess cuticular growths, thinning of overgrown sole, removal of stones in sole cracks, and treatment of wounds.

With progressive operant conditioning, the elephant Brittany will be trained to stand quietly for baseline and follow-up foot radiographs to help track the condition of her feet in the event of future foot problems. Lucy will not tolerate this procedure without sedation or immobilization. Because of her advanced age and good foot condition, the risks of attempting foot radiographs outweigh the benefits, and these procedures will not be attempted.

Questions or concerns regarding foot care will be directed to the Area Supervisor. The Area Supervisor will either make suggestions or do the required foot care. Foot lesions requiring medical attention will be reported to the veterinary staff.

Skin Care: The elephants are hosed and scrubbed daily to care for their skin.

Tooth examination: The elephants receive regular mouth examinations for molar malocclusions and other tooth and soft tissue abnormalities. Tusk condition is also monitored.

Blood sampling: Regular blood sampling allows monitoring of the elephants' health, reproductive status, and other physiological information. Blood samples are routinely obtained from the ear. Training is underway to also safely collect blood samples from the rear leg.

Diets: Diets are determined by the Area Supervisor and Elephant Manager under the direction of the staff veterinarians based on their understanding of the animal's individual nutritional requirements. In most training systems, where food rewards are used to reinforce desired behavior, the amount of diet is determined by the individual animal and its willingness to earn the reward (motivation). Like people, animals of the same species may have different metabolic rates. As a rule, the animal is given as much food as it can consistently metabolize, given the variables of age, individual metabolism, behavioral state, activity level, and season of year.

Exercise: Elephants in the wild are incessantly on the move in search for food, water, and safety. With the provision of these items in captivity, the incentive to move about is reduced. Advantages of regular exercise include improved body tone, maintenance of healthy joints, reduction of boredom, and increased rapport between the elephants and their handlers. Also, exercise can be physically therapeutic - "Captive elephants can develop loss of joint function after even minor trauma if they are not required to move that joint after the injury". (Ibid. p. 911). Each day, elephant care staff will encourage the exercise of the elephants with:

- Feeding: Food staples, such as hay and pellets, will be scattered whenever possible, except when the elephants are sharing a stall.
- Treats: These items will be scattered and hidden to encourage foraging behavior, except during training sessions.
- Toys: Enrichment items that require manipulation will be provided daily. Examples include large branches, Boomer Balls filled with treats, bran bags, etc.
- Shifting: Keepers will shift elephants in and out at random to encourage walking.
- Inside Training: During training sessions keepers will encourage elephants to move about the stall as much as possible, moving from one end to the other to perform various behaviors (including fun behaviors). The bath session will provide opportunities for calisthenics
- Outside training: When conditions permit, elephants will move between controllers or follow controllers to various stations throughout the exhibit yard. This will be done when the elephants are separated.
- Pool: From late spring to early fall the pool will be filled. Elephants will be encouraged to be using the pool as often as possible by placing browse, treats or special food items on the edge of the deep end of the pool.

Weights: Regular body weight measurements serve as a general indicator of growth and health status. Body weights will be conducted on a semi-annual basis, or more frequently as required by the Veterinarians. Body weight will be determined by correlation with body measurements, as described by Hile, et.al. (1997).

Blood Sampling: Regular blood sampling allows monitoring of the elephants health, reproductive status, and other physiological information. Blood samples are routinely obtained from the ear. Training is underway to also safely collect blood samples from the rear let.

Enrichment: Elephants will be provided with varying enrichment items and random changes in activity opportunities to provide physical and psychological stimulation. An enrichment schedule is posted to ensure enrichment variety. The enrichment activities will be documented in the daily training log for each elephant.

Emergency Care: An injured or ill elephant may not respond to commands in a typical fashion. However, an elephant may be more easily calmed in the presence of a familiar handler even in an emergency situation. The ability to examine and treat an animal in a health emergency without using chemical restraint may be life-saving for the elephant. The Elephant Manager will conduct emergency procedure training and drills, including elephant down procedures, and the use of the elephant chute.

CHAPTER 7 EMERGENCY PROTOCOLS

EVACUATION OF A PERSON FROM AN ELEPHANT ENCLOSURE

Upon discovering that a person is in the elephant exhibit or moat, the following procedures will be followed as quickly as possible:

The **person who makes the discovery** will:

1. Notify Pachyderm area personnel directly and/or by radio.
2. Notify the Switchboard by dialing 113 or by radio.

The first pachyderm staff member will:

1. Instruct the person in the moat to either stay down and still or help extract the person as the situation warrants.
2. Call for assistance.

The **Pachyderm Staff** will:

1. Open the exhibit doorway and attempt to get the elephants out of the exhibit or to the opposite side of the exhibit.
2. If a person is in the moat, have one person take a ladder and help a person in the moat to exit if possible. If the person is coherent and able to move, using verbal instructions, calmly guide the person out of the exhibit as quickly and quietly as possible. If the person is incoherent or not able to move, wait until the elephants move well away from the area before attempting to provide assistance. Staff must use professional judgement regarding their personal safety before entering the moat or outdoor exhibit.
3. If a person is in the exhibit or service area with an elephant, the pachyderm staff will attempt to distract the elephant using whatever means available (including verbal commands, CO2 extinguishers, pepper spray, tools, etc.) and to assist the person out of the area.
4. The remainder of the staff will open the elephant doors to other enclosures and attempt to get the elephants attracted well away from the person in the elephant space using food rewards, verbal cues or other attractants.

The **Switchboard** will:

1. Notify the Senior Animal Staff by radio and by an all-beeper code of "777".
2. Call for an ambulance and the sheriff to report directly to the African Elephant area. Zoo staff will assist in escorting emergency personnel to the site.
3. Make a general call on radio channel 1 for crowd control around the area.

The **Curator of the Day** will coordinate the rescue effort between divisions and with the outside agencies.

The **Veterinarian of the Day** will coordinate preparations to immobilize or kill the elephants if necessary.

ELEPHANT IN THE EXHIBIT MOAT

The **person who makes the discovery** will notify Pachyderm area personnel directly and/or by radio.

The **Pachyderm Staff** will:

1. Notify the Deputy Zoo Director, Curator of the Day, Veterinarian of the Day, and Zoo Director.
2. Shift the other elephant out of the outdoor exhibit.
3. Assist in the elephant extraction under the direction of the Deputy Zoo Director or Curator of the Day.

The **Deputy Zoo Director or Curator of the Day** will:

1. Assess the situation and determine the appropriate means of extraction.
2. Notify the appropriate staff for crowd control, media interactions, and crisis management.
3. If the elephant is not injured and able to walk – either the north moat steps or the south steel platform will be used to allow the elephant to walk out of the moat.
4. If the elephant is unable to walk or is injured, sedation would be done under the direction of the Veterinarian before attempting to use the cargo slings. The pachyderm staff will provide the necessary slings, ropes, chains and other devices. The emergency crane equipment and operator will be obtained by contacting: **DAWES Rigging & Crane Rental, 805 S. 72nd Street, 453-7979 or 453-5335.**
5. In the event that the animal is severely injured, the Director, Deputy Zoo Director, or Veterinarian have the authority to determine if the animal should be euthanized.

ELEPHANT DOWN PROCEDURE

(Elephant unable to rise without assistance)

Rapid response is critical in the event of a downed elephant. The longer the elephant is down, the less likely the elephant will be able to stand. Staff safety will be the number one priority when responding to a downed elephant.

During first shift, the **Zoo Staff Member** discovering the downed elephant will immediately notify one of the elephant care staff, who will in turn notify the remainder of the elephant care staff, the Deputy Zoo Director, and the veterinary staff.

On second and third shifts, the **Nightkeeper** will notify one of the following persons (listed in priority order):

1. Deputy Zoo Director
2. Pachyderm Area Supervisor
3. Senior Staff Veterinarian
4. Staff Veterinarian

That person, in turn, will determine what other people are to be called in.

A **team leader** will be established (1. Deputy Zoo Director, 2. Pachyderm Area Supervisor, or 3. Veterinarian on duty, and will determine the course of action.

Elephant care staff will gather the appropriate equipment, including

1. block and tackle
2. cargo slings
3. large clevises
4. long 1": rope
5. grab bars
6. extension ladder

Elephant care staff will work to calm the animal and prevent struggling.

ELEPHANT MEDICAL EMERGENCY RESPONSE

In the event of a medical emergency, the veterinarians will be contacted immediately. If necessary, the elephant care staff will work to apply a chain with come-along to a front leg, then turning the animal parallel to the front stall to secure a back leg. The animal can then be guided into the shift stall using a come-along and ropes.

CHAPTER 8 ELEPHANT INFORMATION

ELEPHANT PROFILES

HOUSE NAME: **LUCY**

SPECIES: African Elephant

SEX: Female

BORN: approx. 1957

ACCESSION NUMBER: 196

STUDBOOK NUMBER: T92

CAPTIVE HISTORY:

Lucy arrived at the Milwaukee County Zoo on 8/30/62. She was purchased from Seago. Lucy was wild caught and was estimated to be 5 years old at the time. In the absence of a formal elephant management program, a minimal amount of behavioral control was attempted with her until 1980. During the period prior to 1980, the keepers were free to walk with the elephants both inside their stalls and in their outside yard. In 1979, something caused another elephant (Babe) to lash out at her keepers. As a result, a formal free contact elephant management program began in 1980. Lucy is currently being conditioned to work within a protected contact management system.

PHYSICAL CHARACTERISTICS:

Lucy's tusks are considerably longer than Brittany's.

MEDICAL HISTORY NOTES:

On several occasions in the past 12 years, keepers have found Lucy down on her side and unable to right herself. Keepers and veterinary staff have observed nothing that might account for this

occurrence. In each instance, Lucy has been assisted to her feet by zoo staff, using straps and block-and-tackle. Occasional constipation has also been observed in Lucy. (See weight sheet attachment)

BEHAVIORAL PROFILE:

Lucy is a sensitive elephant who responds best in an environment of trust and patience. She takes more time to learn new behaviors than Brittany. Although Lucy usually displays a docile nature, she has shown aggression towards people. At times, she will charge people as they walk past her stall. Lucy startles easily when surprises occur in her immediate area. She also will become upset if someone raises a shovel or similar object in the stall around her. In both instances, Lucy will react to the perceived threat by turning quickly towards the object and sometimes charging at it. Lucy may offer her tongue to be scratched. At no time will a keeper put a hand in her mouth – she may bite. Lucy has a habit of turning around and backing into the building when coming in from the outside yard. This resembles submissive elephant behavior seen in the wild. Brittany always enters the building first. While Lucy is submissive to Brittany, she will use her weight to block and pin Brittany against the wall in the stall to keep her from going to the outside yard before her. Lucy is always the first one to go out into the yard.

HOUSE NAME: **BRITTANY**

SPECIES: African Elephant

SEX: Female

BORN: approx. 1981

ACCESSION NUMBER: 4786

STUDBOOK NUMBER:

CAPTIVE HISTORY:

Brittany arrived at the Milwaukee County Zoo from the Greenville Zoo, South Carolina, on 6/8/2001. She was estimated to be 20 years old at that time. Brittany was wild caught at a young age and during her formative years she traveled with the Carson and Barns Circus. Brittany did not work out well as a circus elephant, she often ran out of the tent during performances. She was then sold to Greenville in 1999 to be a companion to that zoo's lone female African. However, the two elephants proved to be incompatible and Brittany became available to become Lucy's companion.

PHYSICAL CHARACTERISTICS:

Brittany is a rather small African elephant. She weighs less than 6,000 pounds, compared to Lucy's estimated weight of 8,500 pounds. She is much smaller in size and much quicker in her movements than Lucy. Brittany's tusks are also much shorter than Lucy's tusks.

MEDICAL HISTORY:

Except for cracks in her rear nails, Brittany has no known health problems.

BEHAVIORAL PROFILE:

By all past accounts, Brittany has always been a "well mannered" elephant, meaning she has never shown any aggression towards humans. In the circus and at the Greenville Zoo, Brittany was trained and worked in a free contact system. Since her arrival, she has demonstrated a willingness to cooperate with keepers in learning to work in our protected contact management

system. Brittany is a fast learner and very quick in her movements. She is prone to anticipate during training sessions, often offering behaviors, rather than wait for the trainer's cues. Brittany also has a stubborn side. She will sometimes refuse to participate in a training session involving her bath. For the most part, Brittany responds well to her trainers and she seems to enjoy interacting with her keepers. Brittany's relationship with Lucy is amiable. Although, Brittany is the dominant of the two, she is very respectful around Lucy and has not displayed any aggressive behavior towards Lucy so far.

ELEPHANT DEMONSTRATION BEHAVIORS DEMONSTRATION OUTLINE

- I. DEMONSTRATION OPENING/INTRODUCTION TO OPERANT CONDITIONING**
 - A. Positive reinforcement
 - B. Bridging stimulus
 - C. Target touching

- II. THE ELEPHANT AS A LIFE FORM**
 - A. Gross anatomy - all the major physical features
 - B. Behavior - Matriarchal society
 - C. Current status - elephant biofacts, tusk, teeth, etc.
 - D. Infrasonic vocalizations

- III. INTRODUCE THE MILWAUKEE COUNTY ZOO'S NEW ELEPHANT MANAGEMENT PROGRAM USING POSITIVE REINFORCEMENT**
 - A. Target touching
 - B. Target following
 - C. Bridging stimulus

- IV. INSIGHTS TO THE CAPTIVE CARE OF ELEPHANTS**
 - A. Right front foot present and hold
 - B. Left front foot present and hold
 - C. Rear foot present and hold
 - D. Oral examination
 - E. Right ear present
 - F. Left ear present

ELEPHANT FACTS AT A GLANCE

BODY SIZE

- Elephants are the largest living terrestrial mammals. They continue to grow 75% of their lives.
- A cow's growth rate will slow after sexual maturation and levels off in her 40's. The average weight is about 7000 lbs. with an average height of about 8½ feet.
- A bull's growth rate slows after sexual maturation but undergoes a second growth spurt in the 20's, also leveling off in his 40's. The average weight for a bull is 12,000 lbs. with an average height of 10.5 feet.
- The record weight for an African bull was 22,050 lbs. and 13'1" tall at the shoulder.
- An elephant heart weighs about 30 pounds, and it beats an average of 46-50 times per minute. The pulse can be taken at the base of the ventral side of the ear. Respiration is about 10 breaths per minute.

SEXUAL DIMORPHISM

Bulls are larger than cows, sometimes reaching twice the size of adult cows of the same species. Bulls have a visible penis, but their testicles are within their abdomen.

SKIN

The skin can comprise up to 2,000 lbs. of entire body weight. It is sparsely covered with coarse hairs. The skin averages 1 inch thick with the thinnest areas being the mouth, anus, back of the ears, and the outside of the upper foreleg, and the thickest areas on back and head. All elephant skin has wrinkles, but the African elephant characteristically has the most wrinkled skin. The wrinkles hold moisture in the skin as well as increase the skin's surface area to allow more efficient heat dissipation. The skin is well supplied with nerves and blood vessels and is sensitive to the touch.

SKULL

The skull is disproportionately large (avg. 115 pounds) for the purpose of supporting the trunk and tusks. Together with the teeth, it is designed for crushing plant material. The skull has air cavities throughout the bone.

TRUNK

Elephants use their unique trunks as both a nose and as a hand. The trunk is actually an elongation of the upper lip and nose. The trunk has more nerves than any other of the elephant's sensory organs, and may have more than 100,000 muscles. It is the elephant's primary source for gathering information about its surroundings. It gathers scent as well as tactile information. A subordinate animal will frequently greet a dominant animal by placing its trunk in the other's mouth. Elephants have a Jacobson's organ on the roof of the mouth to chemically sense the environment. The trunk is used to communicate with sound as well by being used as a resonance chamber. It is also used as a tool of ingestion. African and Asian elephant trunks differ in two ways: African elephants have deeply fissured rings around the trunk while Asian trunks are comparatively smooth. Also, African elephant trunks have two finger-like projections at the tip used for grasping objects where the Asian has one.

TEETH AND TUSKS

The teeth and skull are both specialized in the elephant for crushing plant material. Elephants have only chewing teeth, about the size of a small brick, with one or two present at a time on each side of the mouth. They have six sets of these teeth that are replaced over a lifetime. The last set is replaced at around 40 years of age.

The elephant tusk is actually a modified upper incisor. Tusks are present on all elephants including milk tusks in babies. Both male and female Africans usually have visible tusks, in Asians it is usual for only the male to have visible tusks. Tusks continue to grow an average of 6½" a year, but are worn down through use. Only 2/3 of the tusk is solid ivory, the remainder, near the root houses the nerve. Elephants typically preferentially use one tusk more than the other. As a result, one tusk is often shorter and well rounded owing to more frequent use. Tusks are used to help gather food and as a weapon.

SENSES

Ears and Hearing

Of the two types of elephants, Africans elephants have the larger ears. The ears are important for thermoregulation. The ears house a broad network of blood vessels. Blood leaving the ears is 10-15 degrees cooler. Like marine mammals, elephants can voluntarily vasodilate and constrict blood vessels in the extremities. Eight muscles control the movement of the ear. The ear's opening has guard hairs and can be closed at will, to prevent water from entering. Hearing is acute in the elephant, and they use the ability to communicate through various sounds and low frequency infrasonic vocalizations produced in the forehead. Elephants have 4 main sounds (rumbles, trumpets, squeals, and screams) and can generate about 25 different vocalizations. The ability to generate infrasonic sounds is a recent discovery and is under scientific investigation.

Eyes and Vision

Elephants have poor distance vision and on a dull day can probably detect movement only up to about 50 meters. Their close range vision seems to be excellent however. They do communicate through gross body postures (body language) and visual displays. By subtle visual cues and sounds, elephants can detect if others are alert, suspicious, or dominant. The typical alert posture is head up, ears out, and trunk up. The Harderian glands lubricate the eyes.

LOCOMOTION

Normally, elephants walk at a speed of less than 4 mph. This speed however, can be doubled and maintained for hours. At the top end, an elephant can move at speeds of up to 25 mph. The fastest human runs for short distances at 22 mph. Elephants cannot run, jump, trot, canter or gallop. Jumping, with their immense weight, would shatter bones. Elephants are frequent swimmers and have excellent balance.

ACTIVITY CYCLE

Elephants are diurnal with their day starting at 3 or 4 a.m. Elephants eat for about 16 to 20 hours out of every day and can cover about 20 miles of territory in a day while foraging. While they are active, elephants alternate between traveling and eating. They spend the hottest part of the day under the thickest shade available and return to open country later in the afternoon. Often they will forage till midnight.

While on the move, the social group acts as a coordinated body. Rarely does any member of the

group move more than 50 meters from the matriarch. They keep in constant touch with one another through smell, sight, and contact calls.

As an important part of their skin maintenance, elephants require daily baths with both water and dust. This bathing helps the elephant avoid fungus, bacteria, and parasite vectors as well as helping protect the animal's skin from cracks and excessive dryness. Dust baths also shield the sensitive skin from sunburn.

Elephants can lie down only briefly, because of the pressure that is exerted on their lungs and the increased blood pressure when prone. Elephants can sleep while standing. They relax their trunks but seem to avoid letting them touch the ground probably because of ants and snakes. Often, they can be seen with trunks draped over a tusk or in the crook of a tree. Elephants snore.

SOCIAL NATURE

Elephants live in a matriarchal (dominant female) society. The matriarch is usually the oldest, and remains the most alert. She controls the herd's movement. Members of the herd depend on each other for defense, social interaction, and for assistance in raising calves. Bulls grow increasingly solitary with age and are actively expelled from the herd at maturity. At this point, their interactions with cows are only for breeding. Bulls also have a hierarchy of sorts with each other. It is based on familiarity, size, strength, and age. They are surprisingly social and are always found within a mile of another bull.

DIET AND FEEDING

Elephants have a simple stomach and digest only about 45% of their food. They are not ruminants but are instead hindgut fermenters. Fermentation takes place in the cecum, a large pouch at the junction of the small and large intestines. It takes approximately 24 hours for Asian elephants to digest their food and 21-46 hours for the African elephant. In the wild, elephants eat between 300-600 lbs. of food a day. They drink between 20-60 gallons of water per day. Bulls are reported to drink more water when in musth.

In the wild, the African elephant's greatest single food source is grass. They also eat herbs and woody plants. Grass is also important to Asian elephants but palms comprise nearly half of their food intake. At the Zoo, the elephants eat about 100-120 pounds of timothy and alfalfa hay per day, with small amounts of yams, apples, lettuce, oranges and bananas as treats. Browse is provided when available as a supplement and to ensure that the teeth wear properly.

An elephant produces about 200 lbs. of excrement per 24-hour period, with Africans producing more than Asians. A group of 10 adults can spread a ton of fertilizer per day.

REPRODUCTION AND DEVELOPMENT

There is little obvious seasonality in elephant reproductive cycles but it seems to coincide with increased rainfall. Cows can come into estrus at any time, and bulls can come into musth year round. Copulation lasts less than a minute.

AFRICAN ELEPHANT FACTS

Genus / Species: *Loxodonta africana* (Eltringham,1991,p.33)

Status: IUCN lists as vulnerable. CITIES lists as Appendix 2. (Nowak,1991,p.1286)

Population: Wild - Approx. 625,000 in 1989. (Nowak,1991,p.1286)

Captive - North America has 26 male and 153 females in 72 institutions.

(Blakely,1994,p.9,p.51)

* The wild population dropped from 1.3 million in 1981 to 750,000 in 1986. This decline was due to the ivory trade and increasing human population. Eastern and central Africa have lost up to 80% of their elephant population. (Estes,1993,p.224)

Subspecies: *L.a. africana* (Savanna or Bush), *L.a. cyclotis* (Forest). (Macdonald,1984,p.452)

Recent genetic studies suggest that the forest elephant is a species distinct from the African elephant.

Distribution: The African elephant was previously found in any area with trees and a water source located south of the Sahara desert. (Estes,1991,p.260) Currently *L.a. africana* populations are found in much smaller areas of east, central and south Africa. (Macdonald,1984,p.452)

* *L.a. cyclotis* inhabits the rain forests of West Africa. (Estes,1991,p.260)

Habitat: The most favorable areas provide both grasses and browse. Woodland areas, the edge of a forest, or bush country of more arid regions can all provide suitable accommodation. (Estes,1991,p.260)

Physical Characteristics:

* Average weight - Bulls 11,000 - 13,200 lbs., Cows 6,600 - 7,700 lbs.

Average height - Bulls 9'10" to 11', Cows 8'4". (Estes,1993,p.223)

* Record size (from a bull killed in Angola in 1955)

Weight = 22,050 lbs. Height at shoulder = 13.1'. (Macdonald,1984,p.452)

* Skin is gray or brown in color and is covered with sparse bristles and sensory hairs. (Estes,1993,p.223)

* Thickness ranges from 0.8" to 1.6". (Macdonald,1984,p.455)

* The thickest skin is found on the back and head areas. The thinnest skin is around the mouth, anus and on the backs of the ears. (Eltringham,1991,p.36)

* After blood has circulated through the back of an ear it may be cooled by up to 19 degrees centigrade. (Jackson,1991,p.28)

* The heart of an adult weighs 26.5 to 46.3 lbs. Approximately 0.5% of the total body weight. (Eltringham,1991,p.34)

* Typically there are 4 nails on each front foot and 3 nails on each rear foot. (Estes,1991,p.259)

* The African elephant trunk has two finger-like projections at the tip. (Eltringham,1991,p.33)

* The trunk is physically an extension of the upper lip and the nose. Studies now suggest that there may be over 100,00 muscles in the trunk. (Eltringham,1991,p.45)

* Skull weight in adults averages 115 lbs. The cranium is filled with extensive honeycomb-like spaces that allow such a large skull to be relatively light in weight. (Adams,1981,p.112)

* The brain of an adult weighs 10 to 12.1 lb. (Eltringham,1991,p.34)

* Tusks are actually upper incisor teeth and grow continuously at the rate of 6.7" per year. (Eltringham,1991,p.40)

- * The record tusk weight for cows is 25 kg. For bulls the record weight is 106 kg and length is 355 cm. (Estes,1991,p.259)
- * Elephants get six sets of molars during their lifetime. The average replacement ages are at 1.5 to 2 years, 3.5 to 4 years, 8 to 10 years, 20 to 25 years and at 40 to 45 years. The final set is usually lost between 60 and 70 years of age. (Eltringham,1991,p.40)
- * New teeth do not erupt vertically (as in most mammals), but grow in from behind the old teeth pushing them forward and out. (Nowak,1991,p.1277)
- * Hearing abilities are considered to be excellent. (Estes,1991,p.259)
- * Eyesight is thought to be only moderate, and appears best in shadows or dim light. (Estes,1991,p.259)
- * Elephants have no tear ducts, instead the Harderian glands serve to lubricate the eyes. (Adams,1981,p.115)
- * The length of the small and large intestines may reach 100 ft. (Eltringham,1991,p.34)

Communication:

- * 4 basic audible sounds are recognized, with many variations of volume, duration and pitch. These sounds are 1) Rumble, 2) Trumpet, 3) Squeal and 4) Scream. (Estes,1991,p.263)
- * A growl (or rumble) vocalization may carry for up to 1 km (0.6 mi.). This is used as a warning sound or to contact other members of the herd. (Macdonald, 1984,p.457)
- * Subsonic frequencies (14 to 35 hertz) have been established as a means of communication among African elephants. (Jackson,1991,p.32)
- * The position of the head, tail, ears and trunk are often used to convey visual messages. (Macdonald,1984,p.458)

Locomotion:

- * Normal walking speed is 3.7 to 5 mph. 6 to 8 mph is attainable by increasing the length of the stride. Top speed is 25mph. (Estes,1993,p.226)

Social Nature:

- * Females associate in stable family units (herds) averaging 8 to 10 individuals consisting of a matriarch, usually the oldest cow, and her daughters with their calves. Young bulls usually leave the family unit at 12 to 15 years of age. Adult and/or young bulls may form temporary social units, but interact with female family units as the females are sexually active. (Eltringham,1991,p.49)
- * A herd depends upon the matriarch to determine their activity patterns and direction. A response to threat or danger is dictated by the matriarch's response. (Estes,1993,p.225)
- * Sisters may stay together to form the nucleus of a family unit. (Macdonald,1984,p.455)

Activity Cycle:

- * An average of 16 hours per day is spent feeding. 4 to 5 hours out of every 24 are spent sleeping. (Estes,1993,p.225)
- * Peak feeding times are morning, afternoon and around midnight. (Estes,1991,p.262)

Diet and Feeding:

- * In the wild the focus of the diet is on grasses and herbs in the rainy season and on woody plants in the dry season. (Macdonald,1984,p.455)
- * Adults consume an average of 330 lb. of food per day. (Estes,1993,p.224)
- * Elephants only assimilate 44% of the food they eat. (Estes,1991,p.260)
- * Minimum water intake is 19 to 24 gallons daily. (Macdonald,1984,p.455)
- * Bulls can drink up to 60 gallons of water per day. (Estes,1993,p.224)

Reproduction and Development:

- * Breeding is not seasonal, however most breeding and births occur during the rainy season. (Estes,1993,p.226)
- * Cows usually become pregnant at 10 to 12 years of age and will produce young at 4 to 9 year intervals. Food availability and population density influence the frequency of birth. (Estes,1991,p.265)
- * Gestation averages 656 days. (Estes,1993,p.226)
- * Usually only single calves are born although twins are possible. (Estes,1991,p.265)
- * Birth weight averages 265 lb. (Macdonald,1984,p.458)
- * Young may suckle for 4 years or more. (Estes,1991,p.266)
- * Young bulls can leave the herd at 12 years of age or more. Their departure is dependant upon the onset of adolescence and the tolerance of the cows in the herd. (Estes,1993,p.226)
- * A cross between African and Asian elephants was recorded in 1979 at the Chester Zoo, England. A female Asian was bred by a male African and produced a live calf which, unfortunately, only survived for 10 days. (Eltringham,1991,p.36)

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