

# **Global Federation of Animal Sanctuaries**



## **Standards For Bat Sanctuaries**

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# INTRODUCTION

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## GFAS PRINCIPLES

The Global Federation of Animal Sanctuaries (GFAS) will designate an organization as “verified” or “accredited” based upon its substantial compliance with the standards listed below. GFAS recognizes that some organizations under consideration will operate valid rescue and rehabilitation programs with a goal of releasing wildlife to the wild pursuant to IUCN and/or other international or national standards. For those animals, lifetime sanctuary care may not be part of the organization’s mission. While the care for these animals may be provided on an interim basis only, the organization is still expected to meet the standards below with regard to all animals in its care and for purposes of these standards it will be identified as a “sanctuary.”

Consistent with GFAS’ philosophy and the standards below, it is expected that a sanctuary does not adopt policy positions that are in opposition to the welfare of the species of animals in the care of the sanctuary (for example, while it is not required that a primate sanctuary affirmatively promote a policy against laboratory research using primates, it should not promote a policy in favor of such research).

**Note:** Several standards make reference to a sanctuary’s “Director.” GFAS recognizes that a sanctuary may use a different title, and the term “Director” is intended to reference the sanctuary’s Sanctuary Director, who may be called an Executive Director or Chief Executive Officer, etc.

GFAS also recognizes that sanctuaries may rely on volunteers for certain functions, including some aspects of animal care (such as food preparation). Standards referencing “staff” may take into account appropriately qualified and trained volunteers as well as employees.

Appendix I of this document provides further guidance/suggestions on facility design and bat care. These are not requirements but rather provide sanctuaries with access to knowledge gained from experience at other sanctuaries/bat care facilities.

**Revisions:**

## ANIMALS COVERED BY THESE STANDARDS

### Family/Genus

- a. Family: *Craseonycteridae, Emballonuridae, Furipteridae, Hipposideridae, Megadermatidae, Molossidae, Mormoopidae, Mystacinidae, Myzopodidae, Natalidae, Noctilionidae, Nycteridae, Phyllostomidae, Pteropodidae, Rhinolophidae, Rhinopomatidae, Thyropteridae, Vespertilionidae*,
- b. Genus: *Acerodon, Aethalops, Alionycteris, Ametrida, Antrozous, Aproteles, Ardops, Arielulus, Ariteus, Artibeus, Asellia, Asellicus, Balantiopteryx, Barbastella, Bauerus, Brachyphylla, Cardioderma, Carollia, Casinycteris, Centronycteris, Centurio, Chalinolobus, Cheiromeles, Chilonatalus, Chiroderma, Chironax, Chroeronicsus, Chroenycpteris, Chrotopterus, Cisstugo, Coelops, Cloeotis, Coleura, Cormura, Corynorhinus, Craseonycteris, Cynopterus, Cyttarops, Desmodus, Diaemus, Diclidurus, Diphyllea, Dobsonia, Dyacopterus, Ectophylla, Eidolon, Emballonura, Enchisthenes, Eonycteris, Epomophorus, Epomops, Eptesicus, Erophylla, Euderma, Eumops, Falsistrellus, Furipteris, Glauconycteris, Glischropus, Glossophaga, Glyphonycteris, Haplonycteris, Harpiocephalus, Harpiola, Harpionycteris, Hesperoptenus, Hipposideros, Histiotus, Hylonycteris, Hypsignathus, Idionycteris, Kerivoula, Laephotis, Lampronycteris, Lasionycteris, Lasurus, Latidens, Lavia, Leptonycteris, Lichonycteris, Lionycteris, Lissonycteris, Lionchophylla, Lonchorhina, Lophostoma, Macroderma, Macroglossus, Macrophyllum, Macrotis, Megaderma, Megaerops, Megaloglossus, Melonycteris, Mesophylla, Micronycteris, Micropteropus, Mimetillus, Mimon, Miniopterus, Mirimiri, Molossops, Molossus, Mormoops, Mormopterus, Mosia, Murina, Musonycteris,*

Myonycteris, Myotis, Mystacinia, Myzopoda, Nanonycteris, Natalus, Neonycteris, Neopteryx, Noctilio, Notopteris, Nyctalus, Nycteris, Nycticeinops, Nycticeius, Nyctiellus, Nyctimene, Nyctinomops, Nyctophilus, Otomops, Otonycteris, Otopteropus, Paracoelops, Paranyctimene, Penthetor, Peropteryx, Pharotis, Philetor, Phoniscus, Phylloderma, Phyllonycteris, Phyllops, Phyllostomus, Pipistrellus, Platalina, Platymops, Platyrhinus, Plecotus, Plerotes, Promops, Ptenochirus, Pteralopex, Pteronotus, Pteropus, Pygoderma, Rhinolophus, Rhinonicteris, Rhinophylla, Rhinopoma, Rhogeessa, Rhynchoycteris, Rousettus, Saccolaimus, Saccopteryx, Sauromys, Scleronycteris, Scoteanax, Scotoecus, Scotomanes, Scotonycteris, Scotophilus, Scotorepens, Scotozous, Sphaerias, Sphaeronycteris, Stenoderma, Sturnira, Styloctenium, Syconycteris, Tadarida, Taphozous, Thoopterus, Thyroptera, Tomopeas, Tonatia, Trachops, Triaenops, Trickyteris, Tylonycteris, Uroderma, Vampyressa, Vampyromes, Vampyrum, Vespadelus, Vestertilio, Xeronycteris

#### **Version Updates:**

New and Updated content released on February 2015

- G-1 Nonprofit/ Non-Commercial Status, P-3 Disposition Ethics and Responsibility, P-4 Disposition of Live Bats, P-5 Euthanasia

New and changed content released on July 2015.

- V-7 Breeding/Contraception – Section a.

## **BAT STANDARDS**

GFAS notes that there may be other acceptable ways of meeting the intent of each standard, aside from those detailed below, and that in some instances there may be legal, cultural or other significant barriers to meeting GFAS requirements. The standards are considered mandatory, but GFAS will consider specific exceptions to some of the listed requirements (e.g., exact enclosure size, manner of record keeping, legal requirements that impact a sanctuary's acquisition policy, etc.). GFAS encourages sanctuaries to offer feedback on the standards and to explain any reasons why it believes it cannot meet a particular standard, or why the standard is not applicable and/or appropriate to its situation. Sanctuaries are also welcome to indicate a timeline for meeting a standard if the standard is not yet met at the time of application for accreditation or for verification.

The exceeding of the standards is encouraged. In addition to meeting these standards, an organization is expected to comply with all applicable international, national, state/province, and local laws and regulations.

## **BAT HOUSING**

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### **H-1. Types of Space and Size**

**Unless otherwise directed by a veterinarian, bats are provided sufficient opportunity and space to move about freely and normally, and to exercise choice in location so as to reduce stress and maintain good physical condition.**

## **General**

- a. The habitat and living conditions are species appropriate and replicate, in as much as possible, the bats' wild habitat with a balance between hygiene and the species' physiological and psychological needs. This includes adequate space, both vertical and horizontal, and appropriate space, in terms of diversity and complexity.
- b. The physical space provides varied opportunities for the bats to interact with the environment and key elements are changed often, resulting in a dynamic living space.
- c. Facility design takes into account caregiver-bat safety and the ease of maintaining a positive relationship.
- d. Bats are provided access to as many areas of the enclosures as possible, except during staff maintenance activities, unless security concerns dictate otherwise. All enclosures interconnect without creating 'dead ends' to allow for freedom of movement of subordinate individuals.
- e. Outdoor enclosures are double contained (cage within a cage), with a minimum of 3 in. (7.6 cm) between the outer and inner enclosures to prevent thumbs and toes becoming entrapped, and with a minimum height to allow for natural behaviors.
  - Enclosures meet national and/or international standards for containment of non-native bat species.
- f. Outdoor enclosure doors, joints and vents are designed minimize openings to prevent escape.
- g. Bat enclosures use soft-sided materials and are free from sharp edges to prevent wing tip injuries. Surfaces are non-porous and non-abrasive.
- h. The habitat provides appropriate visual, olfactory, and acoustic barriers.
- i. The habitat provides security from predators and unauthorized human access.

## **Open Space Settings**

- j. Open space enclosures, which may be indoor or outdoor units, are designed to provide the maximum possible freedom and complexity for enclosure residents. The enclosures have sufficient area per animal to accommodate natural individual and group activities. While it may not be possible to monitor every animal in an Open Space enclosure on a daily basis, design allows for regular inspection of animals and facility maintenance as needed.
- k. Where open space settings are the primary enclosure, the following are also provided:
  - Shelter which can serve as night housing and/or secure space during inclement and extreme weather.
  - Space for use while the primary enclosure is serviced and/or for animal management needs including introduction of new individuals to a group, or temporary separation for health or social reasons. (Note: This space might also be night housing, etc.)
  - Alternate housing for sick or injured individuals.

## **Controlled access settings**

- l. Controlled access enclosures, which may be indoor or outdoor units, provide sufficient space for natural activities but are also designed to allow caregivers to monitor each individual animal on a daily basis, to easily shift individuals, pairs or small groups as needed and to isolate animals for individual care. As with Open Space enclosures, design also includes:
  - Shelter which can serve as night housing and/or secure space during inclement and extreme weather.

- Space for use while the primary enclosure is serviced and/or for animal management needs including introduction of new individuals to a group, or temporary separation for health or social reasons. (Note: This space might also be night housing, etc.)
- Alternate housing for sick or injured individuals.

### **Indoor Housing**

- m. Indoor housing provides year-round protection from the elements. For sanctuaries located in colder climates (where freezing temperatures occur regularly during any part of the year and temperate or tropical species are housed), indoor space is insulated and is large enough to allow for all forms of species-specific behavior (flying, roosting, climbing, etc.).

### **Dimensions**

- n. Many factors influence the minimum space required for bats, including, but not limited to: group size, group composition, and enclosure complexity. The following guidelines are minimum recommendations. Facilities should provide as much space as is possible and/or practical.
- o. Enclosures are of sufficient size to permit natural and normal behaviors including: continuous free flight, hovering, climbing and safe socializing as appropriate to the species.
- p. Sanctuaries meeting only the minimum requirements for enclosure space employ additional environmental enrichment, focusing on physical and mental exercise rather than food, to compensate for reduced space and complexity.
- The use of a rotation system, which allows groups and/or individual bats to regularly spend time in a larger or different space, is strongly encouraged in these circumstances to increase enrichment and encourage activity.
- q. Outdoor enclosure shape may be variable (rectangular, L-shaped or hexagonal) to take in natural features in the landscape such as rock formations, hills and trees. Design encourages continuous flight using a central structure or enclosure furnishing to impede cross flight. Food presentation and roosting structures are designed such that they do not reduce total flight space. Space includes a minimum of one (1) animal transfer door leading to indoor shelter.
- Enclosures, particularly those for sanguinivorous bats are constructed on non-toxic materials that are capable of withstanding pressure hosing and other cleaning procedures.
- r. Netting of durable material of suitable size and strength is used.
- Polyethylene or vinyl-coated wire of 0.5in (1.3 cm) recommended for frugivorous and sanguinivorous bats.
- Polyethylene or cloth mesh of 0.05 in. (0.125cm) recommended for nectivorous and insectivorous bats.
  - Wire-coated mesh is not recommended for these species.
- s. Minimum enclosure size for a group of 20 bats is 12x the wingspan of the largest bat housed, squared.
- Enclosure size is increased by 15% for each additional 10 bats housed.
- Recommended height of 6.5 ft. (2m) to 7.5 ft. (2.3m) to allow caretakers to observe bats and access them from the ceiling.

## **H-2. Containment**

**Bats are safely contained.**

## **General**

- a. Other than when being transported or for medical reasons, bats are kept at all times in secure enclosures or other appropriate areas.
- b. Enclosures are designed to allow for bats' normal defense reactions and appropriate 'flight' or escape distances.
- c. All enclosures are designed, constructed and maintained to securely contain bats and to present no likelihood of harm to them.
- d. Distance or barriers between bats and between enclosures and personnel is sufficient to minimize stress to the bats and reduce the risk of disease transmission.
- e. Enclosures are designed to allow for proper, safe cleaning and drainage.
- f. A regular program of sanctuary maintenance is in place.
- g. Materials are appropriate for their particular application and are maintained in good repair.

## **Outdoor Enclosures**

- h. Perimeter containment of outdoor areas is constructed so as to prevent digging under the barrier by native wildlife and domestic species. Fence is buried to a depth of 12 in. (30.5 cm) and or the enclosure has a buried wire floor connected to the fencing.
- Wire flooring, if used is covered in sufficient substrate to prevent bat contact with the wire. Flooring is regularly inspected to ensure depth is sufficient to protect bats from harm.
- i. Fences and enclosures are inspected daily for signs of digging. Where fencing meets hard surfaces such as rock or concrete, the fencing is securely anchored in place.
- j. Enclosure material is sufficiently secured to supporting posts in such a way that the weight of predators could not detach it from the support nor dislodge the supporting posts.
- k. Gates and doors are designed and maintained so as to prevent native wildlife and domestic species from lifting them from their hinges or unfastening the securing device.
- l. Solid wall enclosures allow for sufficient sunlight and airflow throughout the enclosure.
- m. Indoor colony enclosures closely approximate outdoor enclosures in design and construction materials.
- In most climates, indoor enclosures are recommended for sanguinivorous bats, as their tolerance to temperature variations is extremely limited.

## **H-3. Ground and Plantings**

**Ground cover indoors and out is healthy for bats. Plantings are appropriate and safe.**

### **Vegetation**

- a. Any vegetation capable of harming bats is kept out of reach. Plants with thorns are avoided to reduce risk of wing tears.
- b. Trees within or near animal enclosures are regularly inspected, trimmed or felled as necessary to avoid bats being harmed by falling branches, toxicity, or trauma.

- In enclosures housing woodpeckers and other tree drilling species consideration is given to leaving dead branches in the enclosure for enrichment.
- c. Any natural materials (e.g., plants and their products, such as seeds or fruit) are assessed for toxicity to the species held before use.
- d. All outdoor enclosures for bats include living or fresh vegetation, which can provide visual barriers, shade and resting sites.
- All plant materials in an enclosure are evaluated for potential toxicity, including leaves, buds, seeds, fruit, bark and flowers.
- e. Trees - Key shade trees within an outdoor enclosure are identified and protected from damage. Health of trees close to fence lines is checked regularly and any removed if there is fear of it coming down on fence line.

#### **Outdoor Enclosures**

- f. Outdoor enclosures have a natural substrate consistent with the needs of the species (soil, sand, grass, etc.). Hygiene and ease of maintenance are considered which determining substrate.
- Naturally occurring hard objects such as rocks are removed from the enclosure.
- Substrate is not abrasive and does not adhere to bats.
- The substrate drains well.
- Appropriate rainwater runoffs are included in enclosure design as needed.

#### **Indoor Enclosures**

- g. All indoor enclosures have a padded or soft-textured floor to prevent injuries to downed bats.
- Concrete floors are covered with a non-porous cushioned surface appropriate for regular cleaning.
- Floors are impervious to water, sloped to a drain and quick drying.
  - Standing water is avoided as a bacterial and drowning hazard.
- h. Where possible, indoor enclosures include plants, which provide enrichment and offer acoustic and visual barriers, allowing for establishment of territories and reduction of social stress.

### **H-4. Gates and Doors**

**Bat enclosure gates and doors are appropriately designed to ensure both bat and human health and safety.**

#### **General**

- a. Housing requirements all include a double entry system so that there are two doors (or a door and a safety net) between the bats and freedom at all times. The two elements are never open at the same time.
- Doors and gates are designed to allow transport crates to be moved in and out of the enclosure.
- b. Gates and doors are designed to remain functional under all circumstances, are maintained in good working order and free from any encumbrances that may prevent opening and closing.

- Safety catches are present on any doors leading to the outside, except where there are two or more doors between the bats' enclosure and the outdoors.
- c. Gates, doors and safety netting are designed/chosen to allow caregiver view of enclosures while operating the doors.
- d. Doors and door hardware are properly maintained to ensure proper functioning.

## **H-5. Shelter**

**Bats have access to man-made shelter that provides each individual with protection from extreme weather (including, but not limited to, prevailing wind, snow, sleet, rain, sun, and temperature extremes).**

### **General**

- a. Bats have space to seek refuge from sun, wind, inclement weather and enclosure mates. Shelters are of sufficient size and/or number to comfortably provide protection for each bat housed in the facility.
- b. Roosting options take into account the bat species' roosting strategy.
- c. A sufficient number of roosting structures are provided to accommodate all bats within the enclosure simultaneously. Wicker baskets, boxes, natural and artificial vegetation and artificial cave structures provide both day and night roosting options. Roosting structure placement and numbers ensure displaced male bats can retreat, preventing aggression.
- d. Crevice dwelling species are provided with sufficient artificial crevices in the form of fabric pouches or cloths, fleece or foam objects to allow all bats in the enclosure to hide behind or inside the objects.
- e. Roosting structures for vampire bats, who prefer cave-like or domed sites, can be constructed from 0.25 in. (6.35 mm) hardware cloth, molded into a dome, then covered in Plaster of Paris.
- f. Grooves or pebbles are incorporated into the plaster before it dries to provide a suitable roosting surface.
- g. The structure is sealed with a water-based polyurethane finish.
- h. Vampire bat roosting structures may also be made of laminated plastic or non-sealed wood, which are easier to clean.
- i. Light fixtures are placed in such a way as to prevent them being used as roosting structures.
- Roosting boxes are constructed from non-treated wood.
  - All four sides of the roost box are grooved or lined with polyethylene mesh to provide the bats with an easy to grasp surface.
  - A long landing platform is provided on meshed or grooved boxes.
- j. Shade is provided in multiple locations within enclosures to ensure that all bats have simultaneous access to shade throughout the day.
- k. Shade and shelter can be created through natural and artificial means including shade trees and shade fabric.

- I. Shelter areas provide dry space during wet weather, as well as protection from wind.

## **H-6. Enclosure Furniture**

**Bats are provided with an appropriately complex and rich habitat to explore, to ensure the animals' physical, nutritional and stimulation needs are met.**

### **General**

- a. Enclosures are equipped, in accordance with the needs of the species housed, with climbing options (ropes, swings, ladders, vines, branches and trees), appropriate substrate, vegetation and other enrichment materials designed to aid and encourage normal behavior patterns and minimize any abnormal behavior.
- b. Appropriate complexity is provided through the use of various natural and artificial materials in the enclosure, using a combination of items including, but not limited to, those listed above.
- c. Items are removed when they become soiled, damaged or novelty has diminished.
- d. Bats are provided access to the vertical space available within the enclosures.

### **Outdoor Enclosures**

- e. Visual barriers are used to provide relief from human activities, sound and other disturbances.
- f. Climbing options are designed to promote natural static flight.
- The ends of ropes, ladders and swings are kept above floor level (a minimum 1.5x the height of the largest bat in the enclosure to prevent injury due to hitting the enclosure floor).
- Non-abrasive ropes, enclosure structure coverings and a variety of cloth materials provide tactile enrichment.
- g. Scents, native plants and flowers may provide olfactory enrichment. Plants with thorns are avoided to reduce risk of wing tears.
- h. Nectarivorous bats may be provided with food plant species.

### **Indoor Enclosures**

- i. To the greatest extent possible, indoor enclosures meet outdoor enclosure criteria.

### **Roosting Structures**

- j. Bats are provided opportunities to roost on a variety of branches or manmade structures as appropriate for the species.
- k. See also H-5 'Shelter' for species specific roosting structure information.

## **H-7. Sanitation**

**Proper sanitation is practiced to reduce pathogen transmission.**

## **General**

- a. Local, county, state laws regarding proper waste removal are observed.
- b. Disinfectant and sanitizing products used allow for safe cleaning of bat enclosures where it is not possible to transfer bats from enclosures prior to cleaning, disinfection and/or sanitizing.
- Areas are wiped dry after use of stronger disinfectants, such as dilute bleach, before bats are once again allowed access.
- c. As fomites (shoes, clothing, etc. which carry infectious materials) may be a source of zoonotic disease, all who may come in contact with such materials are made aware of these risks and trained accordingly. (See also Standard V-8, Zoonotic Disease Protocols).
- d. Uneaten perishable food is removed within a timeframe appropriate for the type of foodstuff and size of enclosure, prior to molding or contamination

## **Removal of Animal Waste**

- e. Animal waste is removed from the habitat as often as necessary to prevent contamination of the bats contained therein, to minimize disease hazards and to reduce odors. This also enables caregivers to collect fecal samples in a timely manner.
- f. Soiled substrate is removed and replaced with fresh materials as needed to prevent buildup. If odorous, substrate is changed regardless of how long in place.
- g. Bat waste is handled with precautions appropriate to bio-hazardous waste, and is not composted.
- h. Damaged and soiled enrichment items are removed in a timely manner.
- i. Efforts are made to prevent native wildlife getting access to bat waste.

## **Tools**

- j. Each enclosure has dedicated tools to prevent cross contamination between enclosures. When resources restrict the ability to have dedicated tools, tools are disinfected between enclosures to prevent the spread of parasites and disease.
- k. Tools are labeled when use is restricted to specific areas.
- l. Sanitation tools or equipment, including wheelbarrows, are not used for transport or storage of foodstuffs or bedding.

## **Cleaning and Disinfection**

- m. Feeding areas, water and food containers are cleaned and disinfected daily.
- n. Care is taken to minimize overspray of waste, directly or via aerosolizing, into adjacent enclosures during cleaning.
- o. Bats are not present in enclosures being cleaned using power hoses. Care is taken to prevent accidental spraying of animals in adjacent enclosures when power hoses are used for cleaning. Enclosures may be swept and mopped with bats present.
- p. Masks are available to staff cleaning bat enclosures and surfaces are dampened to reduce the risk of inhalation of aerosolized avian waste and dander.
- q. Concrete floored enclosures are dried thoroughly before bedding material is replaced.

- r. All hard surfaces including walls, floors, ceiling, benches, climbing structures, cage mesh and caregiver work areas are sanitized regularly to the extent possible. Note that in large outside enclosures with plenty of exposure to sunshine and rain, there may not be a need for regular scrubbing and cleaning but areas are monitored for potential sanitation problems.
- s. Cleaning and Disinfection Standard Operating Procedures are developed and followed to address:
  - safe disinfectant use to prevent hazards to the bats, caregivers and the environment;
  - cleaning and disinfecting protocols for food preparation and veterinary care areas using more powerful disinfectants on hard surfaces;
  - daily, weekly, monthly and quarterly cleaning schedules for all hard surfaces including walls, floors, ceiling, benches, cage mesh and staff work areas are designed to minimize the risk of disease transmission;
  - disinfectants and other cleaning products stored separately from foodstuffs.
- t. A Material Safety Data Sheet (MSDS) or equivalent is readily available for all cleaning products in use and all containers are properly labeled as to contents.

## **H-8. Temperature, Humidity, Ventilation, Lighting**

**Temperature, humidity, ventilation, and lighting are appropriately addressed.**

### **Temperature**

- a. The temperature is within an acceptable range for the species housed.
  - Weather is considered in addition to temperature.
  - Allowance is made to accommodate individual animals not able to tolerate temperatures above or below the usual range of comfort for the species.
  - Great caution is taken with elderly, infant and disabled bats.
  - Windbreaks and shade are sufficient to accommodate all bats simultaneously with consideration for social structure and relationships within and among pairs/colonies.
  - Care is taken to prevent direct bat contact with heat sources.
- b. In all enclosures bats have access to heated or cooled areas when ambient temperature falls outside of the acceptable range for the species housed. Providing bats with opportunities to choose temperature ranges within the enclosure is preferred.
  - Insectivorous bats are maintained at temperatures between 68°F (20°C) and 77°F (25°C).
  - Nectarivorous bats are maintained at temperatures between 70°F (21°C) and 85°F (29°C).
  - Sanguinivorous bats are maintained at temperatures between 65°F (18°C) and 85°F (29°C).
    - Particular care is taken when temperatures are high as these species have high metabolic rates and are inefficient at cooling themselves.
  - Frugivorous bats are maintained at temperatures between 70°F (21°C) and 90°F (32°C).
    - These species cannot withstand temperatures below 50°F (10°C).
  - Any climate control systems include back-up power in case of equipment or power failure.

### **Humidity**

- c. Optimal indoor humidity varies among bat groups. High humidity can be mitigated through proper ventilation or dehumidifier systems. Where forced air heat is used or in dry climates, misters, spray bottles or humidifiers (cleaned regularly) are used to add moisture to the air.
  - Insectivorous bats are maintained in 50-60% humidity.
  - Nectarivorous bats are maintained in 75-85% humidity.
  - Sanguinivorous bats are maintained in 40-60% humidity.
    - These species are unable to tolerate a wider range of temperatures when exposed to high humidity.
  - Frugivorous bats are maintained in 60-90% humidity.

### **Ventilation**

- d. Proper ventilation of indoor enclosures is used to maintain bat health.
  - Air recirculation systems, heaters, air conditioners and humidifiers are regularly cleaned and serviced to reduce risk of respiratory disease.
  - To the extent possible, separate air handling systems are maintained between bat housing areas to prevent disease transmission.
  - Window and door placement is designed to ensure sufficient cross-ventilation in warm climates.

### **Lighting**

- e. Light, natural and artificial, is appropriate for the species housed in terms of intensity, spectrum and duration.
- f. Every effort is made to approximate the natural day length of the species housed. For most bat species a 10-14 hour daylight cycle is recommended with 12 hours being best for insectivorous bats. An artificially shortened photoperiod may adversely impact food consumption and other natural behaviors.
- g. Indoor enclosures - Natural lighting is optimal and can be obtained using skylights, windows, roll-up doors and other means.
  - Bats have daily access to direct, natural unfiltered light.
  - Nocturnal lighting has blue filters to prevent interference with light cycles.
  - A dimming system is used to prevent stress from sudden exposure to bright light or complete darkness.
  - Supplemental lighting is provided to ensure adequate light for caregivers to observe animals, clean enclosures and perform related animal care tasks, both day and night.
- h. Outdoor enclosures - Supplemental lighting is available for use in outdoor areas in event of an emergency.

## **NUTRITION REQUIREMENTS**

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### **N-1. Water**

<b>Fresh clean water is available in sufficient quantity.</b>
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### **Quantity**

- a. Fresh clean water is available at all times to all individuals.
- b. Multiple water sources are available for colonies of bats to ensure all bats have constant access to water sources.

### **Quality**

- c. Water quality parameters are maintained at a generally acceptable level for bats in terms of turbidity, salts, etc.
- d. Potable water sources are tested for contaminants annually.
- e. All water sources are cleaned at least daily, and more often if needed.
- f. If automatic water devices are not used in hot climates, water sources are shaded or changed multiple times to avoid overly hot water.

### **Water Sources**

- g. Water is presented in small shallow dishes on ledges/shelves or from hanging cups around the enclosure perimeter at approximately one head to toe bat length from the ceiling. Shelves for water containers are large enough to allow bats to walk along them and drink from the horizontal position. Shelves are covered with vinyl drawer liner or similar to allow the bats to walk without slipping and prevent small bats from falling into the water dish.
- Where multiple species are housed together, water containers are placed at varying heights to accommodate the different species.
- Glass beads or marbles may be placed in water containers to reduce the risk of drowning.
- Mesh ladders may be attached to the wall or ceiling of the enclosure extending into the water container as a safety precaution for smaller bats housed in multi-species enclosures.
- For vampire bats the feeders may be the same type as those used for providing blood meals, placed low in the enclosure.
- In natural enclosures where flowing water or small ponds provide a water source, the depth should not exceed 3 – 5 mm. to prevent drowning.
- h. Water containers are monitored on a daily basis for intake. Where possible, individual bats' water intake is monitored.
- i. Where bats are kept in a colony situation, multiple water stations are provided at various locations and heights to allow all bats access to food and water.

## **N-2. Diet**

**A properly balanced and healthy diet is provided appropriately based on the needs of each individual, pair or colony of bats, following veterinary instructions for special needs.**

### **General**

- a. A veterinarian or qualified nutritionist periodically reviews all aspects of the bats' diet at the sanctuary.
- b. Diets of individuals, pairs and colonies of bat species (including vitamin supplementation) are of a quality, quantity and variety to match the physiological and psychological state of the individual as it

changes over time, with consideration for the age, life stage, species, condition, and size of the individual.

- c. Food is wholesome, palatable, free from contamination and of sufficient quantity and nutritive value to maintain all bats in good health.
- d. The sanctuary utilizes a feeding regimen that ensures each individual receives adequate nutrition regardless of status in social group.
- e. Where possible and appropriate, each bat, pair or colony's daily dietary needs are documented and made available to animal care staff.
- f. In large enclosures, routine observation of feeding activity ensures all bats are able to access sufficient food.
- g. The natural diet of each bat species is taken into account when developing sanctuary diets.
- h. Care is taken to avoid the use of pesticides near bat enclosures, particularly where insectivorous species are housed.
- i. Fresh plants, including leaf lettuce, fruits, vegetables or flowers may be offered regularly to nectarivorous and frugivorous bats to enhance natural foraging behavior.
- Caregivers are trained to identify safe, non-toxic plants appropriate for feeding to bats.
- Some bats will forage on grasses in enclosures where it is part of the substrate.
- These items are strictly for enrichment and are not considered part of the basic diet.

#### **Dietary Recommendations for Vampire Bats**

- j. Vampire bats are obligatory blood feeders, unable to digest solid foods of any kind, including coagulated blood. They are fed approximately 20 ml of blood per day as a baseline, with modifications as needed.
- k. Cattle blood is the preferred primary diet for this species.

#### **Dietary Recommendations for Frugivorous Bats**

- l. A mix of fruits, vegetables and juices are fed, along with veterinarian approved supplements.
- At least 3 varieties of fruits are offered with 2/3 of the diet being hard fruits such as apples and pears to maintain dental hygiene and jaw strength.
- The remaining 1/3 is soft fruits.
- Some fruits may be offered whole with the majority being chopped into small pieces to reduce waste.
- See *Appendix 1* for further information on frugivorous bat diets.

#### **Dietary Recommendations for Nectarivorous Bats**

- m. A diet in the ratio of 70–75% nectar and 25–30% fruits is appropriate.
- Typical nectar composition:
  - 85–90% unsweetened 100% fruit juice (ideally freshly prepared on site or organically sourced).
  - 1.5% corn or flax seed oil.
  - 1.5% finely ground high protein monkey biscuit or similar.

- 5% commercial nectar supplement.
- 1% fructose or sucrose powder.
- 1% human baby cereal powder.
- Commercial diets for hummingbirds and lorikeets have also been used successfully for feeding frugivorous bats.
- Very soft fruits may be added to the diet in a ratio of 75% ripe banana and 25% melon.

#### **Dietary Recommendations for Insectivorous Bats**

- n. Mealworms are the main component of insectivorous bat diets.
  - Mealworms are removed from their substrate, cleaned and fed live.
  - Mealworms are 'gut-loaded' prior to feeding.
- o. rickets, dipteran larvae, superworms, and/or 'meadow plankton' may be used as nutritional supplementation.
- Note: Superworms are not fed to insectivorous bats under 20 grams to avoid the small bats being injured by the worms.
- p. Elderly, debilitated insectivorous bats, particularly those with dental problems may be fed a complete soft diet:
  - 1.5 cups mealworms blended with 0.5 cups water
  - 2 tbsp. water
  - 2 tbsp. human vegetable or fruit baby food
  - 0.5 tsp. flax seed oil

#### **Vitamins/Supplements**

- q. Prior to offering supplements and/or vitamins, the health and condition of the individual, pair or colony of bats, as well as the diet, is reviewed by a nutritionist experienced in bat care and/or the attending veterinarian.
- r. See Appendix 1 for further information on vitamins and other supplements used for bats.

#### **Treats/Enrichment items**

- s. Species appropriate enrichment foods are fed in small amounts and dispersed throughout the enclosure to encourage natural foraging behaviors.
- See *Appendix 1* for recommendation on species appropriate enrichment items.
- t. Preferred food items from the basic diet can be reserved for enrichment through the use food enrichment devices/techniques.
- u. The calories in foods used as enrichment are considered when planning the overall diet.
- v. Bats confined to indoor enclosures for medical or other reasons are provided with more frequent enrichment opportunities.

### **N-3. Food Presentation and Feeding Techniques**

Food is prepared and presented in a safe and appropriate manner to meet bats health and social needs.

#### **General**

- a. Feeding and drinking receptacles are placed in positions that minimize the risks of contamination from soiling by the bats, wild birds, rodents and other potentially invasive species.
- b. Food receptacles are selected with ease of access to food as the primary consideration.
- Food receptacles are placed at a height that allows bats to hang over container to feed. Receptacles may be suspended from the ceiling or sides of the enclosure, with several feeders placed lower to the ground and others in more open areas to allow easier access by older, less maneuverable bats and subordinate individuals.
- Mealworms for insectivores are placed in containers deep enough to prevent the mealworms escaping but shallow enough to allow ease of access by the bats.
- Vampire bats are fed close to the ground using glass or plastic tube bottom feeders, ice cube trays or Petri dishes. These feeders are large enough to accommodate more than one bat to help reduce competition.
- Fruits, as species appropriate, may be offered on skewers, from tree branches or in suspended dishes.
- Nectar, as species appropriate may be placed in open dishes provided the dishes are shallow and glass beads or marbles are placed in the bottom to reduce the risk of small bats drowning.
  - Where hummingbird or oriole feeders are used to provide nectar, the feeders are free of bee guards and other obstructions near the openings.
- c. Bats are offered their diet a minimum of once daily, at the end of the light cycle to minimize spoilage, particularly in warm weather. Feeders for most species are removed at the beginning of the light cycle, also to reduce risk of food spoilage.
- Vampire bats have food available 24 hours a day as they are at risk of dying of starvation when unable to feed for more than 48-72 hours. Bats being consistently fed by other bats are removed for medical examination.
- Single feeding regimens are carefully monitored and reviewed frequently to ensure they meet the nutritional and psychological requirements of the bats. Additional feedings are recommended for for large colonies.
  - A few feeders with fresh food may be provided during the day but these feeders are removed and replaced at the end of the light cycle.

#### **Feeding Techniques**

- d. Variations in food presentation are considered part of the enrichment program for bats. Distributing feeders throughout an enclosure at varying heights allows natural foraging behavior.
- e. When changing feeding presentation, additional feeding stations are initially used to provide multiple opportunities for subordinate bats to feed.
- f. It may be necessary to separate bats to prevent aggression and allow for accurate determination of food consumption; however, in as much as possible, integrated individuals are fed together to

maintain social relationships. Provision of multiple feeding stations in bat colonies aids in reducing competition and aggression.

#### **Diet Changes, Increases or Decreases**

- g. Adjustments made to an already formulated and nutritionally balanced diet are made to the entire diet to ensure continued nutritional balance.
- h. Considerations for diet increase include weight and condition of all bats in the group, overall food consumption, activity level of the colony, feeding competition and other medical or behavioral considerations.
- i. Condition scoring may be an appropriate method to monitor the effectiveness of dietary adjustments.
- j. Diet increases or decreases are made in modest increments with bat response to the change assessed for a minimum period before additional changes are made.
- k. Underweight individuals experiencing health or behavioral problems may be separated for supplemental feeding as needed to avoid undesirable weight gain in conspecifics.

### **N-4. Food Storage**

**Food is stored appropriately.**

#### **General**

- a. Separate and secure facilities are provided for proper and hygienic storage of food.
- b. Produce, juices, jams and blood (if not frozen) are stored in a clean, dry refrigerator, and is ordered at regular intervals in amounts that can be used prior to spoilage.
- c. Items frozen for use are dated and labeled, and no frozen items are thawed and refrozen.
- d. Insects are housed per instructions from the provider or in appropriate insect colony housing. Insects intended for use as food are housed in appropriate containers to prevent contamination by insect pests.

### **N-5. Food Handling**

**Food is handled and prepared in an appropriate manner to retain nutritional value, freshness, and freedom from spoilage, invasive species or other forms of contamination.**

#### **General**

- a. Food is protected against dampness, deterioration, mold, and/or contamination by insects, wild birds, rodents or other animals.
- b. No food that is spoiled or otherwise contaminated is served.
- c. Fruits and vegetables fed to insect colonies are changed often to prevent consumption of spoiled food items.

- d. Diets are prepared in a safe and hygienic manner to reduce the possibility of contamination or spoilage.
- e. Blood for vampire bats is collected in a manner that does not cause contamination. Blood is treated with either chemical anticoagulants or defibrillation. The sanctuary follows all applicable local, state/province or national laws regarding the handling and distribution of blood products.
- Chemical anticoagulation is preferred as defibrillation alters the composition of the blood. For each gallon of blood add:
  - 12.5 gm. Dextrose
  - 4 gm. Citric acid
  - 11 gm. Sodium citrate
  - Mix thoroughly
- f. Food preparation techniques meet all local, state/province, and national regulations.
- g. Separate cutting boards, utensils and food preparation surfaces are used when meats, fish and produce diets are prepared in a common kitchen area.
- h. Foods not fed frozen are thawed in a refrigerator to minimize risk of spoilage. Frozen foods are not thawed and refrozen.
- i. Food preparation surfaces are thoroughly cleaned after use.
- j. Staff and volunteers wash hands thoroughly prior to handling food, and wearing gloves during food preparation is recommended.

## **VETERINARY CARE**

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### **V-1. General Medical Program and Staffing**

**There is a written veterinary medical program, overseen by a veterinarian, with adequate support staff at the Sanctuary, with 24/7 veterinary care available on call.**

- a. The sanctuary has a written veterinary medical program, including long term preventative medical protocols, disease surveillance and containment procedures, that is developed and carried out under the supervision of a licensed veterinarian – the attending veterinarian - who has training or experience in providing medical care for the bats and other species housed at the sanctuary, and who is aware of specific concerns regarding the bats at the sanctuary.
- b. One or more full-time veterinarians specifically concerned with the veterinary medical program is highly recommended for sanctuaries whose budget will support the salaries of such trained personnel. Sanctuaries unable to employ a full-time veterinarian have access to a part-time veterinarian, under a contractual or other similar arrangement, with training and appropriate experience with the bat species housed at the sanctuary.
- c. Veterinary care is available 7 days per week and 24 hours per day for the sanctuary on an on-call basis when a veterinarian is not physically on grounds. When the primary veterinarian is unavailable, there are other suitably experienced veterinarians on call.

- d. There are support staff to carry out the following roles: (1) Husbandry (bat caregivers), (2) Technical (medical technologists, veterinary nurses, or individuals trained at the sanctuary), and (3) Clerical. The sanctuary has available properly trained and qualified professional and supporting personnel as necessary to implement these roles.
- e. A staff member is trained to serve as medical program director, dealing with emergencies until a veterinarian arrives or is reached. He or she is able to direct any restraint of the bat, perform basic first aid, be responsible for administration of post-surgical care, and be skilled in maintaining appropriate medical records.
- f. Medications are stored appropriately on site, according to label directions. Medications requiring refrigeration are stored separately from food items.

## **V-2. On-Site and Off-Site Veterinary Facilities**

**Veterinary facilities are appropriately located, designed and equipped.**

- a. Any on-site veterinary facility at the sanctuary meets all local and state/province building regulations.
- b. Surfaces in the on-site veterinary facility with which bats can come in contact are non-toxic and can be readily disinfected.
- c. The on-site facility is located away from areas of heavy public use to minimize noise levels for hospitalized bats.
- d. The on-site facility has separate areas for any of the following veterinary functions performed on-site: physical examinations and medical treatments, enclosures for hospitalized bats, sterile surgery, necropsy, medical quarantine, laboratory, radiology and pharmaceuticals storage which includes, when necessary, a safe for narcotics that meets the standards set by applicable regulations (e.g., the Drug Enforcement Administration [DEA] in the United States).
- Food preparation areas, storage areas and staff locker room/housing with showers are separate from the medical facility.
- e. If the sanctuary does not have an on-site veterinary facility, or only a partially outfitted veterinary facility, it has a contract or similar arrangement with a nearby veterinary hospital for off-site diagnostics and treatment as needed. The hospital should have a sterile surgical facility with anesthetic equipment, radiology equipment, a laboratory, and pharmaceutical storage. If necropsies are performed at the hospital, there is a separate area for necropsies and a separate storage refrigerator for storage of carcasses.
- f. See also Standard V-4 "Clinical Pathology, Surgical, Treatment and Necropsy Facilities."

## **V-3. Preventative Medicine Program**

**The sanctuary has a complete preventative medicine program.**

- a. Appropriate preventative medicine programs are in place to manage all bats, with special attention paid to geriatric animals.

- b. The preventative medicine program includes quarantine procedures, parasite surveillance and control, immunization, contraception, infectious disease screening, and periodic reviews of diets, husbandry techniques and invasive species control.
- c. The attending veterinarian, in consultation with the sanctuary director, determines a schedule for routine physical examinations or colony health monitoring and implements any necessary treatment. All bats are monitored for abrasions, wing tears and bite wounds due to territorial aggression.
- Frugivorous bats are monitored for thumb and nail injuries, lip abrasions, dry skin and feet, and fractures.
- Nectarivorous bats are monitored for wing fractures, particularly of the humerus.
- Insectivorous bats are monitored for periodontal disease and wing fractures.
- d. A veterinarian, veterinary technician/nurse, or other trained personnel performs fecal examinations to look for pathogens (random enclosure sampling is adequate for group-housed bats) as needed, based on the history of the bat/pair/colony. Results are recorded and treatment repeated as necessary.
- e. All bats are immunized if recommended by the attending veterinarian, using currently recommended procedures and products as appropriate for the country, species and individual. Where possible, killed vaccines are utilized to minimize the potential for adverse reactions. Schedules and products are dictated by the disease status of domestic and wild animals in the area surrounding the sanctuary and relevant local and national laws.
- f. When bats are immunized, the type, serial number, and source of product are recorded in the individual animal's medical record.

## **V-4. Diagnostic Services, Surgical, Treatment and Necropsy Facilities**

**Diagnostic services, surgical facilities and services, medical treatment for sanctuary bats and necropsy are all high quality, humane, professional, legal, and safe.**

### **Diagnostic Services**

- a. Diagnostic laboratory services are available on- or off-site to assist with the evaluation of bats and the diagnosis of disease.
- Where diagnostic services are performed on-site appropriate safety equipment and training is in place, e.g. radiation exposure monitoring, personal protective equipment and hazardous material handling equipment; and there is a maintenance program in place for X-ray machines and other laboratory equipment
- Diagnostic capabilities include radiology, cytology, microbiology, parasitology, complete blood count, blood chemistry, urinalysis, serology and other appropriate laboratory procedures.

### **Surgical**

- b. The sanctuary has access to surgical facilities (either on-site or at a nearby veterinary hospital) that are clean, free from excessive noise and unnecessary pedestrian traffic, have adequate lighting, ventilation, and temperature controls, and can be easily cleaned and disinfected. For off-site aseptic surgical facilities, an on-site area that can be adapted for occasional or emergency aseptic surgical use is available.)
- c. Surgical facilities have access to appropriate anesthetics including injectable and inhalant anesthetics, reversal agents, etc. Where gas anesthetic equipment, including scavenger units, is

used equipment is cleaned and calibrated and filters are replaced, annually at a minimum. Gas cylinders are safely stored and replaced regularly. Facilities have sterilized surgical packs, surgical preparation solutions, intravenous fluids, fluid administration equipment, pulse oximetry, heart monitoring equipment (e.g. electrocardiogram, stethoscope), and emergency drugs on-site with appropriate maintenance and/or replacement schedules for each.

- d. If on-site, the sanctuary ensures that surgical equipment is maintained in good working order and is on a program of routine preventive maintenance and calibration.
- e. Only a licensed veterinarian performs surgery, using standard operating procedures. (Note: A veterinary technician/nurse appropriately trained by a veterinarian in states or provinces where such action is permitted by veterinary practice acts can perform surgical first aid.)
- f. The veterinarian uses aseptic surgical procedures whenever applicable.
- g. Veterinarians and support personnel are compassionate and knowledgeable about the humane aspects of bat treatment, including the proper use of anesthetics, analgesics, and tranquilizers.
- h. Surgical incisions are observed daily, or as frequently as possible while minimizing stress to the bats, for signs of dehiscence or infection. Analgesics are administered post-operatively when appropriate.

### **Treatment**

- i. Medications are maintained and used in accordance with local, state/province, and national laws and regulations and are administered in accordance with the state veterinary practice act, or equivalent outside the US.
- j. The sanctuary has a pharmacy on-site where routinely used drugs, such as emergency resuscitative medications, antibiotics, anthelmintics, fluids, anesthetics, analgesics, tranquilizers, etc are maintained.
- k. All medications are purchased, prescribed and administered under the guidance of the veterinarian.
- l. When distributed to bat caregivers, medications are properly labeled and packaged, with the contents identified and instructions for the amount, frequency and duration of administration as well as identification of the bat, pair or colony to receive the medication, the expiration date of the medication, prescribing doctor and number of refills if any.
- m. All medical treatments and drug prescriptions are documented in the bats' medical record.
- n. Basic physical capture and restraint equipment to facilitate medical treatment is available at the sanctuary.

### **Necropsy**

- o. Whenever possible, there is an isolated area on the grounds for performing necropsies, or appropriate storage facilities for holding the deceased bat until the body can be transported to a facility for a postmortem examination as soon as possible, understanding that necropsies performed longer than 24 hours after death may be of limited value due to autolysis of the body. (Note: Any refrigerated area for holding dead bats is physically separate from live bat holding, treatment, and surgery areas and from food supply storage or preparation areas.)
- p. Disposition of dead bats and their parts meet all legal restrictions.
- q. Dead specimens not used are incinerated or disposed of as deemed suitable by the veterinarian in accordance with local, state/province and national regulations.

## **V-5. Quarantine and Isolation of Bats**

**Appropriate quarantine and isolation policies and accommodations are in place and utilized.**

- a. Upon arrival, all bats undergo quarantine for a minimum of 30 days, according to the protocol established by the attending veterinarian, or for a greater period if required by applicable law. The quarantine period may be longer for bats that have received minimal screening prior to arrival, such as animals from the wild. Bats previously housed together may be quarantined together.
- b. If the sanctuary does not have an adequate quarantine facility, steps are taken to have bats undergo quarantine under these guidelines prior to their arrival.
- c. Local, state/province, or national regulations regarding quarantine of newly arrived bats are followed.
- d. All utensils and outer clothing used in quarantine are restricted to that area.
- e. Protective clothing and footbaths are used by all staff entering the quarantine area or areas containing quarantined animals.
- f. Caregivers have access to masks for use when cleaning or handling anything with which the quarantine bats come into contact.
- g. Gloves are worn or sterile hand-washing technique is used before and after working in the quarantine area.
- h. Where possible, staff working in quarantine areas does not work with other sanctuary animals. If this is not possible, work is done in the quarantine areas last.
- i. Quarantine staff cares for newly admitted bats in their quarantine area before caring for sick animals, which are housed in separate isolation enclosures.
- j. The quarantine area allows for daily cleaning and sanitation, either with removable catch trays or a drainage system that allows fecal matter to flush into a septic system; waste is otherwise removed and disposed of properly.
- k. In enclosures housing bats carrying infectious or transmissible diseases, to the extent possible, all surfaces of the enclosure are properly sanitized.
- l. Quarantine areas have adequate ventilation, heat and air conditioning, which are used to ensure optimum conditions, particularly in the case of young, elderly or sick bats that may be more sensitive to environmental changes.
- m. Separate air handling systems are maintained in quarantine and general sanctuary population areas to reduce the risk of disease transmission.
- n. Quarantine animal waste is handled separately from all other manure or compost at the facility. Because of the risk of disease transmission, quarantine waste is not spread on pastures or composted.

## **V-6. Medical Records and Controlled Substances**

**Complete medical records and appropriate statistics are maintained, and controlled substances are prescribed and stored legally.**

## **Medical Records**

- a. An electronic database format is recommended for most record keeping, but in either case, the sanctuary has a back-up system for the records.
- b. Records that, if not required by law, are required by GFAS include but are not limited to:

### **Individual Records**

- Individual animal records showing origin, age, species, gender, microchip number, photo, bio, etc.
- Individual or colony veterinary record.
- Weight, current diet and record of diet changes.
- Food consumption and preferred food items.
- Where applicable and appropriate, any positive reinforcement training records showing completed objectives and those in development.
- Acquisition documents;

### **Group Records**

- Welfare assessment for the bats as a whole including measures of: disease prevalence, morbidity and mortality rates, and activity levels.
- Inspection reports, as applicable, from international, national, state/province and local agencies, as well as accrediting organizations;
- Other animal documentation as applicable, such as complaints or police reports pertaining to specific bat and bat escape reports.
- c. Medical records are dated, legible and indicate examination findings, treatments (types of medication, dosage, duration), surgical procedures, anesthetic procedures (type of agent, dosage, effect), results of all laboratory tests (parasitologic, hematologic, bacteriologic, etc.) pathology reports, plus immunization records with all relevant dates, bat identification and nutrition/diet information, and, where applicable, necropsy reports.
- d. Copies of medical records accompany any individual, pair or colony of bats who is/are transferred to another sanctuary.
- e. Medical records are maintained under the direction of the veterinarian or trained bat caregiver. Where possible, duplicate record sets are stored at another site, or in a fire proof or theft proof safe on site or an online storage system.
- f. Statistics are tabulated regularly on the rates and nature of illness and mortality in the sanctuary.

## **Controlled Substances**

- g. Only a licensed veterinarian prescribes controlled substances used at the sanctuary, and all such substances are secured in accordance with any applicable laws.
- h. The sanctuary maintains appropriate records and logs for all controlled drugs used. Controlled drug logs are kept up to date and comply with any national or other legal requirements (such as the Drug Enforcement Agency in the U.S.).
- i. Expired controlled drugs are marked as such and stored separately.
- j. Controlled drugs are discarded in accordance with applicable national, state, and local law and regulations (such as the USDA and DEA in the United States).

## **V-7. Breeding/Contraception**

**No intentional propagation of bats occurs, sound practices are in place and implemented to prevent propagation and to properly care for pups born at the sanctuary.**

- a. Although GFAS recognizes the importance of appropriate “conservation breeding” programs, they fall outside the mandate of GFAS Accreditation programs unless they adhere to the following guidelines:
  - Animals are not brought into captivity for the purpose of breeding. Animals that are allowed to breed should enter a wildlife facility as a result of normal acquisition protocols such as surrender or government confiscation and be considered an endangered or threatened species with available release sites within the state/province, conducted with specific conservation goals, in accordance with local, state/province, national, and international law and regulations.
  - Breeding should not be forced – that is, not the result of artificial insemination or being placed in enclosures of insufficient size or otherwise not in keeping with GFAS standards.
  - Breeders – that is, the parent animals – should be released into the wild with their young. If breeding animals are deemed non-releasable, there should be documented evidence from a qualified professional that the animals cannot be released because of a physical condition or other reason that would make them unable to survive in the wild. Offspring of non-releasable parents should not be released until an age of species-specific maturity for survivability.
  - Non-releasable breeding animals should receive the care required of all animals under the GFAS standards and should not be maintained for the purpose of breeding if they have incurable or unmanageable pain or suffering and do not have an acceptable quality of life.
  - The facility should have an identified release site for the breeding animals and offspring, with any necessary permits or memoranda of understanding in place. While GFAS may consider whether a definite plan (such as ongoing surveys of land for potential release sites and a timeline for releasing animals) is sufficient, it will not be sufficient for a facility to simply say that it hopes or plans to be able to release the animals one day. Thus, a facility may not breed any animals in captivity, even highly endangered animals in order to create a sustainable population, without a definite release plan in place.
  - Bats are prevented from reproducing by maintaining single sex colonies or by castration of males to be housed in mixed sex enclosures. Note: Females of several bat species naturally segregate into maternal colonies.

## **V-8. Zoonotic Disease Program**

**The staff and sanctuary veterinarian are knowledgeable about zoonotic diseases that may affect bats at the sanctuary, and implement appropriate policies and procedures as needed to mitigate risk and deal with any exposures that occur.**

- a. The sanctuary's veterinarian is knowledgeable about zoonotic diseases that may affect bats at the sanctuary. The sanctuary has emergency procedures and a defined process to avoid transmission of potential or emerging diseases through bites, scratches, body fluids, aspiration of volatilized materials, direct contact with bats and other means. (Note: Additional precautions may be necessary for staff classified as increased risk of disease, including those who are immune-compromised.)
- b. Personnel have adequate training to understand the potential risk of disease transmission, including potential sources of disease, modes of disease transmission, and clinical signs associated with disease.
- c. All personnel are informed when a zoonotic disease occurs at the sanctuary.
- d. Staff has any appropriate tests and immunizations prior to employment and annually thereafter, as appropriate for the country, animal species and individual.
- e. When a reportable disease is identified, all appropriate local, state/province, and national regulatory officials are contacted.
- f. All areas in which the staff has direct contact with bats have hand-washing facilities available in the immediate vicinity (or an equivalent; e.g., bactericidal hand-wipes)
- g. Human food consumption by the staff does not occur in the immediate area of animal contact.

## **V-9. Euthanasia**

**Euthanasia is governed by an ethical written policy that includes identification of appropriate personnel and procedures.**

- a. The sanctuary has a written policy addressing the circumstances surrounding euthanasia decisions and procedures, including the following:
- b. Euthanasia is performed in compliance with any national or local law, administered under the strict supervision of a licensed veterinarian and is performed by the veterinarian, his/her authorized representative, or a trained staff member who is knowledgeable and skilled in performing euthanasia in a compassionate and professional manner and where possible, with an established relationship with the sanctuary.
- c. Euthanasia is in the best interest of the individual animal only used as a final option, and is not used as management tool (such as a means to create space for more animals).
- d. Acceptable reasons for euthanasia include:
  - Incurable disease/injury that is likely to cause unmanageable pain or suffering;
  - Disease/injury where treatment is likely to cause unreasonable pain or suffering;
  - Disease/injury where treatment will not be effective in restoring the bat to an acceptable quality of life;

- Disease/injury where treatment is beyond the normal community standards of monetary expenditure and would cause an excessive burden on the sanctuary resources, and no other sanctuary can step in, after reasonable efforts to locate such a sanctuary;
- The process of aging has resulted in an unacceptable quality of life;
- In the event of presenting an infectious disease risk to some or all of the resident bats.
- For facilities engaged in the rehabilitation and reintroduction of wildlife, it is determined in accordance with an appropriate protocol or other “decision tree” analysis that an animal cannot be reintroduced to its natural habitat and there is no appropriate (consistent with these standards) long-term care option.
- e. Euthanasia is performed so that it avoids distress to the bat, and in as much as possible, is performed out of view of other bats.
- f. The species and ecosystems are carefully considered during disposition activities.

## **WELL-BEING AND HANDLING OF BATS**

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**All bats are routinely monitored to ensure their physical well-being. All aspects of husbandry, including veterinary care, environmental enrichment and diet are designed to optimize the bats' physical well-being.**

### **W-1. Physical Well-Being**

- a. The welfare of each individual bat, pair and colony is the overriding consideration in all sanctuary actions.
- b. Bats are able to enjoy lives that are as close as possible to that of their wild counterparts as regards stimulation and interest through adopting husbandry and management procedures, including appropriate housing and enclosure design, environmental enrichment programs, positive reinforcement training programs and a balanced diet to meet nutritional requirements.
- c. Bats are provided with opportunities to fly, roost and forage for food by providing species-appropriate open spaces for flight, places to hide and rest in comfort, and a variety of plants and substrates and/or other enclosure enhancements where food/enrichment items can be hidden.
- d. Regular assessments are performed in an effort to measure the welfare of individual bats through monitoring of nutritional, physical and social conditions. Qualified personnel conduct daily observations of each bat, pair or colony to monitor for signs of physical abnormalities. Any unusual activities are recorded in a log at each inspection. Sudden changes in food consumption and other behaviors are immediately brought to the attention of supervisory staff. Note: Where it is not possible to observe each bat, pair or flock on a daily basis, time is spent observing all bats on at least a weekly basis, an accurate population count is maintained and health issues monitored. An accurate count of the bats is taken and any unusual activities are recorded in the colony log after each inspection. Records may include observations such as condition of feces, eating and drinking patterns, administration of medications (if any), and general condition and behavior.
- Bats exhibiting compromised behavior are removed and examined.

- Insectivorous bats, due to their extremely high metabolism are inspected more regularly as their risk of sudden death is higher.
- See also *Appendix 1* for more information on causes and signs of stress in bats.
- e. Vampire bat colonies are regularly monitored for signs of aggression toward young males. Colony composition, size and access to feeding and/or roosting areas are monitored to prevent aggression developing.

## **W-2. Social Housing**

**Bats are grouped appropriately with the safety of bats and staff in mind.**

### **General**

- a. Bats housed in the same primary enclosure are compatible.
- b. Bats are not housed near animals that interfere with their health or cause them physical or psychological discomfort.
- c. Habitats are of sufficient size to allow appropriate space between individuals, within and between social groupings and to allow for temporary isolation from conspecifics.
- d. Bats are housed so that no individual endures constant harassment or suffers physical injury, nor do social behaviors prevent any individual from maintaining proper nutrition and hydration.
- e. The sanctuary has the ability to separate and isolate bats to address behavioral concerns.
- f. See also *Appendix 1* for further information on bat social housing.

### **Social Housing**

- g. Bats are housed in compatible pairs or colonies appropriate to the species' natural social structure(s) unless such pairs or colonies present a danger to any individual or group or are restricted by the attending veterinarian for health reasons.
- h. Nectarivorous and frugivorous bats may be housed together.
- i. There is adequate space and options are available for individuals or paired bats to separate or hide from the group.

### **Solitary Housing**

- j. With the exception of insectivorous tree bats, most bats are highly social and are never housed as single animals except as described below.
- k. Solitary housing is temporary and reserved for situations including, but not limited to: quarantine; medical assessment and/or care; lack of appropriate social partners or social tension resulting in disruption to the pair or colony, or physical aggression leading to injuries.
- Removal of individual bats is avoided if at all possible and, when necessary separation time is minimized. Auditory and visual contact with the colony is recommended whenever possible in such cases.

### **Mixed Species Housing**

- l. Mixed species housing of insectivorous and sanguinivorous bats is not recommended as these bats have not been housed with other species in captivity to date.



- m. Frugivorous bats have been successfully housed in multi-species enclosures.

**Introduction of any new bat to a social group is done according to introduction techniques appropriate for conspecifics and heterospecifics for each species, with staff safety ensured.**

### **W-3. Introduction of Unfamiliar Individuals**

#### **General**

- a. Every attempt is made to integrate bats into conspecific colonies or partnerships based on the bat, pair or colony's history.
- b. The introduction of a new bat to an established colony is closely monitored by staff for several hours.
- c. In general the introduction of unfamiliar female bats does not create problems within a colony.
- d. Introduction of male bats into existing colonies may result in some initial aggression as the social structure and territorial occupation may be challenged.
- e. After the removal of a high-ranking male, which may also result in some aggression as the social hierarchy is re-established, staff monitors the colony for several hours.

### **W-4. Behavioral and Psychological Well-Being**

**The behavioral/psychological well-being of each bat, pair or colony is evaluated and addressed, and a welfare plan and report is part of the bat, pair or colony file.**

#### **General**

- a. There is a formal, written enrichment program that promotes species-appropriate behavioral opportunities and ensures captive bats' psychological well-being. Environmental enrichment programs include at least some of the following, as species appropriate:
  - **Structural enrichment** - Enclosure design and furniture that add complexity to the environment and promote species-specific behavior.
  - **Object enrichment** – Objects that encourage inspection and manipulation and promote species-specific behavior.
  - **Food enrichment** - Varying food choices and food presentation that increase food procurement time.
  - **Social enrichment** – In addition to, or in place of, species appropriate pairing or colony structure, affiliative interactions between caregivers and bats may be appropriate in some rare instances. The decision to include social enrichment with caregivers should be made on an individual basis, considering only the social needs of the bat.
- b. All bat care staff are trained to recognize abnormal behavior and clinical signs of illness. Measures of well-being that are assessed include:
  - species appropriate behavior and interaction with other bats, e.g. social grooming in vampire bats;

- the bat's ability to respond appropriately to variable environmental conditions, physiological states, developmental stages, and social situations as well as adverse stimuli.
- c. Stereotypic behavior, self-injurious behavior, and inappropriate responses to various stimuli not previously documented or witnessed may be evidence of compromised well-being and are investigated. A plan to address the concerns is developed.
- e. g. multiple individuals sharing food with one vampire bat may indicate illness in the one being fed.
- d. Where possible and appropriate, a behavioral/psychological history of each bat, pair or colony is maintained and updated annually. A copy of this history is kept in the permanent file of the bat, pair or colony.

## **W-5. Bat-Caregiver Relationships**

**Positive relationships between bats and caregivers are maintained. Bats are not fearful or aggressive in response to human presence or routine care procedures.**

### **General**

- a. Bats arrive at sanctuaries with a variety of previous experience with caregivers, which caregivers take into account in their interactions with these species.
- b. Facility design plays a key role in caregiver-bat safety and the ability to maintain a positive relationship.
- c. Bats do not become fearful or aggressive in response to human presence or routine care procedures.
- d. A positive relationship between bats and regular caregivers, animal managers and veterinary staff is one in which the bats are given the freedom to integrate with their conspecific social group with minimal human interference or to interact regularly with caregivers if they choose.
- e. Most bats do not develop relationships with individual caregivers however many exhibit preferences among handlers, which is taken into account.
- f. Staff are trained to perform routine duties in a consistent manner which helps the bats to anticipate where people will be during feeding, cleaning, etc. which reduces the potential stress caused by inconsistent or disrupted routines.
- g. A protocol for introducing bats to new caregiver staff has been developed.
- h. Interactions with bats do not cause overheating, excessive cooling, physical harm, or unnecessary discomfort, and minimizes physical and psychological stress or trauma as much as possible.
- i. Negative interactions are avoided. However, when they occur, efforts are made to recover trust and a positive relationship, if the bat enjoys regular interaction with people.
- j. Physical abuse, deprivation of food or water and other forms of negative reinforcement or punishment-based training are never used to train, shift or otherwise handle bats.

## **W-6. Handling and Restraint**

**Any necessary handling and restraint is done safely and appropriately, with minimal distress to the bats. Staff are trained in bat-specific safe handling techniques/practices.**

### **General**

- a. Handling for veterinary care is done as expeditiously and carefully as possible in a manner that does not cause trauma, overheating, excessive cooling, physical harm, or unnecessary discomfort, and minimizes physical and psychological stress as much as possible.
- b. Staff and volunteers handling bats are given a background in scientific knowledge of, and advances in, bat behavior. Up-to-date information is utilized to ensure appropriate handling procedures to minimize stress.
  - Except in case of emergency, bats are only restrained by animal caretakers trained in bat handling.
  - Bats are not pulled from roosting areas, rather toenails are unhooked gently from mesh or perches, reducing the risk of injury.
  - Bats are not captured by trapping against rigid walls.
  - Bats are held in cupped hands or wrapped in towels to reduce risk of injury from being held by the wing tips or being squeezed too tightly.
  - Wings are carefully folded into the natural resting position during restraint.
- c. Bats may be safely captured using fine mesh insect or aquarium nets. Fine mesh fishing nets may be used for frugivorous species.
- d. Heavy gloves are worn when handling large bat species, vampire bats and flying foxes. Thin, soft, flexible gloves (e.g. goatskin) may be used for handling smaller, more delicate species.
- If a bat bites the glove it is not forcibly removed due to potential for injury to jaws and teeth. Quick, forceful puffs of air are blown into the face until the bat lets go.
- e. A written policy for the humane chemical restraint and safe capture of animals housed at the sanctuary is in place, to include:
  - Training and certification in the equipment, humane chemical restraint, immobilization process, and the use of drugs for veterinarian purposes or emergencies;
  - Procedures listing at a minimum those persons authorized to administer animal drugs, situations in which they are to be utilized, location of animal drugs in a safe and secure place, and those persons with access to them, and an emergency procedure in the event of accidental human exposure.
- f. All chemical restraint equipment is cleaned after each use, maintained in good working order and tested on a regular basis.
- g. Chemical immobilization is performed only by a licensed veterinarian or by trained staff under the guidance of a licensed veterinarian, or other qualified individuals authorized by the sanctuary director or veterinarian, following the laws and regulations of country where the animals are housed. Specific anesthetic protocols, including record-keeping, are followed.
- Where possible and appropriate, positive reinforcement training is used to minimize the need for chemical immobilization and to reduce stress during procedures.

- With appropriate training, many procedures can be performed cooperatively and without anesthesia, such as examination of body parts, treatment of superficial injury and heart rate monitoring.

**W-7.**

**Bats are appropriately transported to maximize safety and minimize stress and in accordance with all local, state/province, national, international requirements and laws.**

## **Animal Transport**

### **General**

- a. Bats are transported only when necessary, such as when being transported to the sanctuary, to a medical facility for care, or to another accredited Sanctuary for reasons as described in acquisition standards.
- b. Pre-transport health examinations ideally include a complete physical exam with attention to parasite checks, necessary vaccinations, and completion of any tests required by regulations of the receiving state/province or country.
- For large groups of bats, a general colony health assessment is performed with parasite checks and any required tests done on a random sample from the group.
- c. Health certificates and any required transport permits accompany the bats when being transported interstate or internationally. All transport abides by local, state/province, national and international law. A veterinarian is responsible for preparing and signing the health certificate.
- E.G. In the US, bats of the genus 'pteropus' are regulated as injurious non-native species and must be transported according to specific standards.
- d. Prior to transport, the sanctuary ensures that adequate facilities are available at the receiving end and food items that are familiar to the bat are available.
- e. Bats may be shipped communally.
- f. Food and water is provided to all bats prior to shipping.
- g. Where possible and appropriate, bats are acclimated to shipping container/crate prior to transport. Capture, restraint, and transportation methods consider the bat's temperament and behavior in order to minimize injury, and distress.
- h. At a minimum, transport enclosures meet appropriate animal welfare standards (e.g., IATA, US Animal Welfare Act Transportation Standards or similar).
- i. Transport crates and vehicles are in good condition and meet national and/or international standards. Equipment suitable for holding and transportation of bats kept within the sanctuary is readily available.
- j. Transport containers:
- have impervious surfaces, which are cleaned and disinfected after use.

- allow for the use of netting or similar devices to prevent escape from primary transport carrier.
  - have mesh covering all sides and the top to allow for appropriate roosting behavior. Pouches or roosting cloths if crevice dwelling species are being transported.
  - are padded with foam, pillows or similar to prevent injury.
  - are darkened to reduce stress.
  - provide adequate protection from weather extremes.
- k. Any bat taken outside the sanctuary, for an approved reason such as medical treatment or transfer to a more appropriate sanctuary, adoption or foster care facility, is in the personal possession of the sanctuary director, or of competent persons acting on his/her behalf and adequate provision is made for the safety and well-being of the bat and public safety.
- l. All bats taken outside the sanctuary are kept securely at all times. Bats are managed outside the sanctuary in such a way that the animal is under control and not likely to suffer distress, cause injury, or transmit or contract disease.
- m. Complete medical records, diet and husbandry information, and identifying papers (e.g., microchip or other identification methods) accompany all transported bats or colonies.

## BATS BEING RELEASED TO THE WILD

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GFAS strongly supports the efforts of wildlife rehabilitators and sanctuary managers to return wildlife to its natural environment, provided appropriate steps are taken to ensure that the animals released are likely to survive in the wild.

Facilities releasing bats to the wild must also make every effort to reduce risk of their having a damaging impact on ecological resources, including other animal species, found naturally in the release area. Examples of risk factors include but are not limited to:

- Displacement of indigenous animals;
- Transmission of novel pathogens;
- Disruption of local human communities, including damage to property;
- Alterations to the environment that disrupt the ecological niche of other species.

For a more detailed discussion of the potential risks, as well as time and financial commitment involved in creating a quality re-introduction project, see the International Union for the Conservation of Nature Species Survival Commission (IUCN/SSC) Reintroduction Specialist Group's "Guidelines for Re-Introductions".

### **R-1. General Considerations**

**The sanctuary has policies, agreements and plans in place to optimize the chances for successful re-introduction of bats into the natural environment.**

- a. The facility has a written policy regarding the handling of any potential problems involving released bats. The policy should include but is not limited to:
  - a plan to minimize the risk to humans and property in the area of release;
  - a plan for compensation for or mitigation of damages incurred by the released bats;

- a deterrent plan to discourage inappropriate activities, *i.e.*, spending time around human habitation.
- a plan for management or removal of bats who fail to integrate appropriately or who become habitual ‘problem bats.’
- b. In as much as possible, using the latest available information on potential health concerns regarding other species found in the area of release, bats are tested and treated for pathogens that might pose a threat to other wildlife.
- c. The facility has agreements in place with any and all appropriate authorities to allow the release process to proceed as smoothly as possible.
- d. Ideally, permissions, any necessary documentation, site determination, etc. begin as soon as it is determined that there are bats in care that are likely to be suitable for release.
- In particular, facilities obtain any permits or other forms of authorization needed to proceed with the release.
- Potential release sites are identified and evaluated as early in this process as possible.
- e. Cooperative agreements are in place prior to bats being released which may include, but are not limited to:
  - veterinary and scientific involvement in post-release monitoring;
  - community acceptance of the project and involvement in habitat protection and awareness raising;
  - landowner agreements enabling release, including the addressing of specific permissions and permits;
  - involvement of NGOs with similar or conflicting interests that may impact (positively or negatively) the project.

## R-2. Rescue Of Bats

**The sanctuary has developed guidelines for rescue work, taking into account staff and animal safety, contingencies for caring for the bat once rescued, and any local, state or national regulations or agency cooperation required.**

- a. Facilities accepting bats from the illegal trade have policies and procedures (ideally in writing) in place with the appropriate authorities that allow for rapid transfer of the animals to the sanctuary or rescue center. These policies and procedures are designed to reduce the risk of:
  - disease transmission;
  - habituation;
  - Inappropriate or inhumane treatment, due to lack of knowledge, by personnel involved in seizure of wildlife from the illegal trade.
- b. In as much as possible, while respecting local or national cultural/religious tenets, a euthanasia policy is in place to address situations where the bat’s prognosis for survival is too low to warrant attempting treatment.
  - In situations where field euthanasia is being considered, where possible and appropriate (*e.g.*, the bat is reasonably safe from further human interference and the stress of capture would outweigh the benefit of humane euthanasia), the option of leaving the bat *in situ* may be considered.
  - See also Standard V-9, “Euthanasia.”

### **R-3. Evaluation Of Suitability For Release**

**Bats admitted into sanctuary are evaluated for their potential suitability for release.**

- a. The sanctuary has a protocol in place (ideally in writing) to evaluate potential release candidates and to determine which bats are given priority for potential release.
- Bats who have spent little time in captivity and/or who have had little human contact are given priority for potential release.
- Bats found to be free of diseases and/or parasites of potential concern to the health of the population, particularly in the intended release area, are given priority for potential release.
- b. All bats are treated as potential release candidates, particularly those who have not been kept long term as pets. If bats admitted into sanctuary are determined to be potential release candidates, every effort is made to protect them from exposure to human activities and to keep them as wild as possible.

### **R-4. Quarantine And Prerelease Housing**

**The sanctuary has appropriate quarantine facilities and prerelease housing for bats, with consideration given to sick and injured bats.**

**(See also Standards H-1 to H-9, “Bat Housing,” and V-5, “Quarantine and Isolation of Bats”)**

#### **General**

- a. Non-quarantine housing for bats being considered for release provides as close to natural a setting as possible. The space allows for foraging, flying, roosting and other actions naturally performed in the wild.
- b. Quarantine facilities and prerelease housing for bats intended for release are situated a minimum of 66 ft. (20m), giving consideration to factors such as wind direction, from resident bat populations to protect them from exposure to pathogens present in the sanctuary population that could compromise their return to the wild. A wall surrounding the quarantine area reduces pathogen transfer risk and aids in restricting access to authorized personnel.
- Where this is not possible, sanctuary residents are screened for potential pathogens of concern, and pathogen-free bats are housed closest to the bats intended for release to the wild.
- Sanctuary bats being used as surrogates are screened for pathogens prior to introduction to any dependent bats.
- c. Where possible and appropriate, sanctuaries follow International Wildlife Rehabilitation Council guidelines (<http://www.nwrawildlife.org/content/minimum-standards>) in dividing housing into three types:
  - **Restricted activity/mobility** – for the initial stages of rehabilitation where the illness or injury requires the bat be treated and/or prevented from activities that would slow the rehabilitation process. At a minimum, the bat is able to maintain normal upright/alert posture and to stretch the body.
  - **Limited activity/mobility** – for the recovery stage of rehabilitation where the bat is regaining mobility and building strength, and staff does not need access to the bat on a daily basis. The bat is able to move short distances and perform some limited flying and perching/roosting activities.

- Unlimited/Prerelease – the final stages of rehabilitation where the main concern is ensuring that the bat is fit for release. In this phase, the enclosure provides the bats with opportunities to demonstrate the skills necessary for survival in the wild.

### **Quarantine Housing**

- d. Sick or injured bats are quarantined in such a way that the rehabilitation process is begun during the quarantine phase.
- e. Quarantine facilities have appropriate housing for the treatment of injured or ill bats.
- f. Quarantine facilities are designed to allow for monitoring and, as needed, modification of behavior of bats intended for release.
- g. Healthy bats admitted to quarantine have as large an enclosure as possible to help maintain natural locomotion and foraging behaviors.
- h. Upon arrival, bats are quarantined for an adequate number of days, ideally for a minimum of 30 days. In some situations a longer quarantine may be advisable.
- i. The attending veterinarian works closely with regional, national and international experts and authorities to determine appropriate quarantine timing based on health risks to which the newly admitted bats may have been exposed.

### **Initial Housing for Orphaned, Ill or Injured Bats**

- j. Bats admitted requiring treatment for illness or injury are housed in enclosures that allow for ease of care. These initial care enclosures can be smaller than that which is acceptable for long-term care.
- Dependent on illness or injury, either Restricted or Limited activity/mobility housing may be utilized.
- k. Enclosures provide visual and acoustic barriers to minimize stress.
- l. Dependent young bats are housed in nursery units, preferably with conspecifics, as species appropriate.
- Where safe, and species appropriate, adult bats are utilized as surrogates to care for the young bats, thus reducing human contact. Where this is not possible puppets and other devices may be used to prevent imprinting or inappropriate socialization.

### **Intermediate Housing for Dependent Bats**

- m. As soon as dependent bats are weaned, they are moved to intermediate housing, where human contact is decreased and interaction with conspecifics is increased, as species appropriate. Where possible, the bats are moved to the release site and cared for in a soft release enclosure.
- n. Bats are provided with adequate opportunity for flying, roosting/perching and foraging.
- o. In as much as possible, conspecifics are used to teach natural behaviors, if species appropriate and necessary.
- p. Intermediate housing is isolated from resident bat areas, ideally within a natural habitat, which allows the young bats to adjust to a more wild environment.

### **Intermediate and Prerelease Housing for Sick or Injured Bats**

***Note: Adult and independent young bats, dependent on their admitting condition, may not require intermediate housing.***

- q. Bats suffering from injuries that may affect their suitability for release are moved to intermediate housing while regaining strength. Bats are regularly evaluated to determine whether they are likely to be releasable. Once the bats are deemed fit, they are moved to prerelease housing.
- r. Independent bats brought in for rehabilitation that can be released back into the environment from which they came are returned as soon as it is determined that the animal has recovered sufficiently to resume its presence in its former area.
- Consideration is given to social and territorial issues that may affect safe return to the original habitat.
- s. Prerelease housing for adult and independent young bats is ideally situated at the intended release site, allowing the bats to acclimate to their new environment before release.
- t. In both intermediate and prerelease housing, sufficient vertical as well as horizontal space is provided to allow the bats to develop strength for flight and to display normal wild behaviors.

**Bats are fed an appropriate diet that approximates that which will be found in the habitat to which they are released, and foraging behavior is encouraged.**

## **R-5. Diet, Nutrition And Foraging Skills**

- a. As early in the rehabilitation process as possible, bats are exposed to the types of foods found naturally within the environment where they will be released and assessed for their ability to find appropriate foods and avoid inedible or poisonous foods.
- b. Release candidates are fed in such a way as to encourage natural foraging behaviors.
- c. Rescued bats admitted in poor physical condition may require specialized diets to recover their health. Nutritional deficiencies are assessed and diets modified to address those deficiencies. Once the bats are back on a normal nutritional plane, any foods not found in their planned release area are no longer fed.

## **R-6. Husbandry And Health**

**All aspects of care, including caregiver-bat relationships, introduction to social groups and overall health evaluation, are focused on preparing the bats for return to the wild.**

- a. Once a bat has been evaluated as a potential release candidate, all aspects of care are focused on preparing the bat for the wild.
- Human activities and noises are minimized in areas housing bats being prepared for reintroduction.
- Human interaction with bats being prepared for release to the wild is restricted to those activities that will enhance the bats' ability to live in the wild.

- b. The bat is placed in an appropriate social group or paired with a compatible conspecific, depending on species. Where appropriate surrogate conspecifics are not available, dependent young bats may be reared by human caregivers, using approved best practices for the species housed.
- Care is taken to ensure these young bats develop appropriate survival skills as well as intraspecific social behaviors.
- Bats are integrated into a social group as species appropriate as quickly as possible.
- c. Introductions follow Standard W-3 “Introduction of Unfamiliar Individuals.”
- d. Opportunities to explore, fly and learn skills in the natural environment are provided.
- e. Bats admitted into care from the wild at the stage where they are already independent, with recoverable illness or injuries, are treated and released as quickly as possible, taking into account the potential for the bat not being accepted back into its previous social group or territory, as well as seasonal presence of the species in the area.
- f. Caregiver-bat relationships for bats intended for release to the wild, while ensuring the bats' psychological well-being is met, focus on avoiding any types of interaction that may compromise the bats' chances for release;
- g. Veterinary staff evaluate overall health including:
  - recovery from the initial cause for admission to the facility;
  - pathogen surveillance to ensure the bat does not present a risk to the wild population as a result of exposure during the rehabilitation process, using the latest available information from the OIE-World Organization for Animal Health ([www.oie.int](http://www.oie.int)).
- h. Bats being cared for in sanctuary for later release back to the wild are managed in such a way as to optimize their chances for successful return to the natural environment.

## **R-7. Health And Safety Of Caregivers Working With Releasable Bats**

**No caregiver begins work with releasable bats until routine testing has indicated he or she poses no risk to the bats' release to the wild.**

**(See also Standard V-8, “Zoonotic Disease Program”)**

- a. Caregivers working with bats intended for release to the wild are routinely monitored for potential anthroponoses (diseases that have potential to be transmitted to the bats).
- b. Hematological testing and fecal cultures for pathogens may be utilized, as appropriate for the region, to ensure the health of both the bats and their caregivers. New caregivers should not have contact with the bats for the first two weeks of employment.
- c. Provision of adequate nutrition for staff is considered as a possible contribution to the continued well-being of both staff and bats.

## **R-8. Assessment of Health and Skills**

**Bats are fully assessed for health and appropriate skills prior to release.**

- a. Bats that have completed the rehabilitation process and have been successfully integrated into a social group or pair, as is species appropriate, are further evaluated for release, with attention to health and the skills attained.
- b. Each bat's skills (e.g. foraging, flying, appropriate interaction or avoidance behaviors in the presence of conspecifics, avoidance of dangers including poisonous foods and potential predators) are evaluated.
- c. A complete health assessment is performed including:
  - Overall fitness as relates to being able to survive in the wild, keep up with a conspecific group, avoid predators, etc.
  - Injuries and limitations that originally caused the bat to be brought into care are resolved, either completely, or to the extent that the bat has a reasonable chance for long term survival.
- d. Bats have been tested, and found free of pathogens that have potential to harm the wild population in the planned release area, based on the latest current knowledge.
- e. Genetic assessment has been done to ensure that the bats being released are of an appropriate subspecies/population/subpopulation for the release site, if the origin of the bat is unknown.

## **R-9. Determining Appropriate Release Sites**

**Release sites are evaluated for health and other threats and for appropriateness for the species.**

- a. The potential release site is evaluated for the presence of appropriate and adequate food sources.
- b. The area is evaluated for potential health concerns.
- c. The potential release site is surveyed to ascertain whether any wild bats are present, either permanently or seasonally.
- Migratory bats are only released as seasonally appropriate, i.e. when conspecifics are still present, or they are transported to a site appropriate for the season.
- d. The area is evaluated to establish carrying capacity for the species to be released, taking into consideration others releases that may have already taken place and issues of territoriality. Bats are released in an appropriate habitat where carrying capacity for the species has not been reached.
- e. The area is evaluated for instances of potential human-wildlife conflict.
- f. IUCN guidelines are, in as much as possible, followed when determining release sites for rehabilitated bats.
- g. Bats are released away from areas where there is potential for or has been a history of human-bat conflict.

## **R-10. The Release Process And Post Release Monitoring**

**Bats are supported as needed to adapt in their new environment and are monitored post release.**

- a. Once it is determined that the bats are able to sustain themselves within their new environment supplemental care is discontinued.
- b. A post-release monitoring program is in place to ensure the rehabilitation program is providing released bats with the skills necessary to survive, that the habitat is adequate and that, as species appropriate, the bats have integrated into the wild.
- c. Ideally, bats are returned to the wild using a soft release process wherein they are housed in an enclosure within the release area where supplemental food may be provided as needed and observation of their acclimatization may be observed.
- d. Post release monitoring, in conjunction with outside veterinary and scientific personnel, continues for a minimum of one year.
- Where possible satellite and/or radio tagging is used to monitor bats, particularly migratory species.
  - In addition to providing information on the individual bat tagged, data on migratory routes, critical stopover points and seasonal habitat used is often gained from monitoring released bats.
- Level of monitoring may decrease over time as bats are determined to be acclimating to the environment.



- Longer term monitoring of the bats and their impact on the habitat is preferred where possible.
- Practices used and results obtained, both positive and negative, are shared both within the facility and with others involved in bat reintroduction to aid in the continued improvement of the program.

## APPENDIX I

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### General

There are about 1,000 recognized species of bats (order *Chiroptera*) worldwide. They are greatly diversified both in habitat and in feeding strategies. Bats feed on insects, fruits, plant parts such as leaves and flowers, nectar, pollen fish, smaller vertebrates and blood.

Three species of bats are specialized sanguinivores, the vampire bats. The common vampire bat *Desmodus rotundus* is the species most often held in captivity. There are approximately 60 species of frugivorous bats belonging to the genus *Pteropus* found in the Africa, Asia, and Oceania.

Approximately 60 species of bats are specialized nectarivores. Even though a dozen species nectar feeding bats belong to the family *Pteropodidae*, the most common nectarivorous bats held in captivity belong to the *Phyllostomidae* family.

Approximately 70% of all species of bats are specialized insectivores. There are several hundred various species of insectivorous bats, the most common insect eating bats held in captivity belong to the *Vespertilionidae* and *Molossidae* family.

All bats require proper flight for their long-term well-being. They must be provided with sufficient space in an appropriate environment to ensure their physical and psychological needs are met. In addition to flight, vampire bats feature an elongated thumb enabling them to climb vertical walls, crawl on “all fours” and jumping in virtually in any direction. Sanctuaries must be prepared to meet the specialized habitat and dietary needs of any bat species held.

Insectivorous bats tend to be colonial roosters. Roosting sites include tree foliage and hollows, caves and manmade structures.

Sanguinivorous (vampire) bats have varying roosting habits ranging from solitary to small group to colony roosting. Preferring roosting sites include tree hollows, humid caves, old mineshafts, abandoned wells and other manmade structures. It is particularly important to ensure these species have enough appropriate roosting sites to reduce aggression.

Nectarivorous bats tend to roost in colonies, some as large as several hundred bats. Roosting sites include tree foliage, tree hollows, caves, and manmade structures.

Frugivorous bat species have varying roosting requirements and habits. Some roost in colonial groups, some in groups but not in clusters and some are solitary roosters. Flying foxes tend to roost in treetops, although some smaller species roost in other types of vegetation, caves and manmade structures. Other fruit eating bats may roost in trees, tree hollows, caves, and manmade structures.

### Diet and Nutrition

#### Frugivorous bat diet

Frugivorous bats feed primarily on tree fruits, vines and shrubbery in the wild, supplementing this diet with flowers, nectar, pollen, plant parts and occasionally insects.

The following ratio (well mixed prior to feeding) has been used successfully for captive bats:

- 36% apple
- 14% banana
  - Some facilities restrict the amount of banana provided due to its high fiber content.
- 12% melon

- 10% grapes
- 9% carrot or sweet potato
- 7% pear
- 6% dark leafy greens such as spinach or kale
- 6% supplements
- Smaller frugivorous bats may be fed a lower percentage of apple, with a corresponding increase in melon.

Fruit juices may be offered to smaller frugivorous bats.

Supplements, which may include glucosamine/chondroitin, a vitamin supplement (which includes C, A & E) and calcium, may be mixed into the fruit juice. There are commercial bat dietary supplements available.

Juices, if not freshly prepared on site, should be 100% fruit, not fruit juice beverages.

#### Nectarivorous Bat Diet

Nectarivorous bats feed primarily on nectar and pollen of night blooming plants in the wild. Some species also consume fresh fruits and insects.

#### Insectivorous Bat Diet

Insectivorous bats feed solely on insects and arachnids in the wild.

#### **Dietary Supplements for Bats**

Elderly or debilitated bats, particularly those with dental problems may benefit from the addition of Liquid Oral Care to the diet.

CoQ10 powder, vegetarian vitamin supplements or canine Vionate supplement and ground canine dental biscuits have been utilized in some insectivorous bat diets.

#### **Enrichment/Treats**

A variety of novel insects may be offered to insectivorous bats as enrichment.

Novel fruits, vegetables, flowers, juices and natural jams or preserves may be offered to frugivorous and nectarivorous bat species.

Jams and juices may adhere to the coats of insectivorous bats, resulting in bacterial skin infections and are not recommended for these species.

Vampire bats may be offered a variety of bloods such as swine, sheep, equine, chicken or other species for enrichment.

#### **Physical and Behavioral Well-being**

Signs of stress in many bat species include:

- Hanging from the ceiling by thumbs as well as feet
- Panting
- Vocalizing
- Cowering
- Hanging low to the floor

- Hanging exposed and away from their group

Signs of stress in vampire and nectarivorous bats include:

- Huddling in a corner with knees bent and wings at side, prepared for flight
- Lip licking with exaggerated movements (tongue rolling), gaped mouth or pinched lips

### **Social Housing**

Vampire bats have complex social structures, which results in significant social problems for individuals being reintroduced to a colony. Similar issues have been noted in some colonies of frugivorous and crevice dwelling insectivorous bats.

Vampire bats adopt orphans and care for unrelated young, elderly and convalescing animals.

Vampire bats regularly practice food sharing-regurgitating meals for other colony members.

Inter-male aggression is common in bats, with overcrowding and lack of sufficient feeding and roosting areas increasing the risk of aggression.

### **Bat-Caregiver Relationships**

Some bat species experience extreme stress and 'shut down' when routines are disrupted or care is inconsistent.