

**PROVIDING ENRICHMENT IN HIGHLY CONTROLLED ENVIRONMENTS:  
BLACK-FOOTED FERRET (*MUSTELA NIGRIPES*) ENRICHMENT PROGRAM  
AT THE PHOENIX ZOO**

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**Abstract.** The black-footed ferret was believed to have been extinct until 1981, when it was rediscovered in Wyoming. In 1987, several institutions led by the U.S. Fish and Wildlife Service teamed up to save the species. The Phoenix Zoo has played a significant part in the recovery program since 1991. Enrichment options are being synchronized with recommendations from the U.S. Fish and Wildlife Service and Black Footed Ferret Species Survival Plan (SSP), as well as being regulated by specific quarantine requirements.

This article provides a list of approved, well-working enrichment ideas ready to be used in facilities that house black-footed ferrets and provides examples of suitable enrichment to elicit species-appropriate behaviors coupled with the challenge and complexity of providing enrichment under quarantine situations for potentially releasable animals.

Key words: Black footed ferret, *Mustela nigripes*, endangered species, captive breeding, species-appropriate behaviors, enrichment

## **HISTORY**

The black-footed ferret (*Mustela nigripes*) was thought to be extinct after 1974 when the last known small colony disappeared from southwestern South Dakota. In 1981 the species was rediscovered in Wyoming however the population of about 130 animals was almost wiped out due to outbreaks of sylvatic plague and canine distemper transmitted to them through prairie dogs. Between 1985 and 1987, the last of the remaining ferrets (18 animals) were taken into captivity at Sybille Canyon, Wyoming (known as the National Black-footed Ferret Conservation Center) in an attempt to save the species. In 1987, a captive-breeding program was initiated by the U.S. Fish and Wildlife Service, the Wyoming Game and Fish Department, and the American Zoo and Aquarium Association. This program has since expanded into a multi-agency organization.

Since 1991 ferrets have been actively reintroduced back into the wild but are still considered one of the most endangered mammals in North America. The Black-footed Ferret Recovery Implementation Team (BFFRIT) was established in 1996 to integrate the expertise and resources of various institutions in order to create a comprehensive recovery program. The BFFRIT is a multi-agency conservation organization effort led by the U.S. Fish and Wildlife Service, which includes representatives from federal and state governments, zoos, and nonprofit organizations. All organizations that hold black-footed ferrets must participate in the SSP program.

## **PROGRAM GOAL**

Recent surveys estimate the wild population at 850 animals in 11-12 locations. Scientists hope to increase the wild black-footed ferret population to 1500 individuals by the year 2010 in an attempt to downgrade the species status to "threatened" (Lockhart & Vargas & Marinari & Gober). This plan requires a firm and carefully choreographed behavioral management program which includes specific husbandry and veterinary care needs correlated with the breeding program.

The goal of the Phoenix Zoo's behavioral enrichment program is to coordinate with the breeding program and in-house quarantine regulations, as well as the guidelines set by the U.S. Fish and Wildlife Service and the Black-Footed Ferret SSP. The behavioral enrichment program must also be consistent with the priorities of both current and future recovery efforts of BFFRIT.

The program has to overcome many challenges such as:

- Internal and external regulations
- Quarantine limitations on enrichment options
- Breeding versus retired animals
- Enrichment options during breeding versus non-breeding season
- Adult versus kit enrichment
- Species-appropriate enrichment for potentially releasable animals

## **CURRENT MANAGEMENT**

The Phoenix Zoo currently houses 10.11 black-footed ferrets. Due to high susceptibility to diseases such as canine distemper and human influenza, all animals that are part of the black-footed ferret SSP programs are held in permanent quarantine in the Black-Footed Ferret breeding (2500 square feet) compound. Foot bath is required when entering the building. Staff needs to shower, change into separate clothing (including footwear kept in the building) and wear disposable gloves and face masks prior any contact with the animals.

The building has a heating/cooling system used to maintain ambient temperatures between 55 and 80°F year round. Full spectrum florescent lights that are controlled by an astral timer are used to provide ambient lighting (Swanson, 2006).

The animals are housed in wooden cages measuring 48 inches long by 36 inches wide and 24 inches high. Each cage has three main parts comprised of two nest boxes (one high, one low) which are divided into two sections and one main platform. The bottom box is connected to the main platform by rigid plastic tubing. The animals have access to an upper and lower nest box that measure 16 inches wide, 24 inches deep and 16 inches high. Nest boxes are important for ferrets as they are a fossorial species that require hiding and nesting areas.

The nest boxes are divided into two sections that are intended as a sleeping area and a latrine area. The sleeping side is provided with a paper based bedding material (Carefresh®) which provides a soft nesting area for the animals. The ferrets are provided water through sip-it type water bottles which are cleaned and disinfected weekly. (Swanson, 2006)

Fig.1.

Upper and lower nest boxes are provided to elicit fossorial behaviors

Photo by Tara Sprankle

Animals are sorted into three groups: breeding females, breeding males and non-breeding adults. The breeding females are located in back cages and the breeding males occupy the middle cages of the compound. The animals are never placed together except for breeding. The older, non-breeding ferrets are located in the front of the compound.

Enrichment limiting factors

1. **Quarantine:** no enrichment items previously used or touched by animals can enter the building
2. **Breeding season:** animals, while paired, do not receive enrichment items in order to encourage them to concentrate on breeding
3. **Age:** some novel enrichment items are provided for non-releasable animals, but are not necessarily for breeding age animals. Sexual maturity around one year of age; animals retire about age five from the program
4. **Area size:** enrichment is limited by the housing/holding size

Enrichment promoting factors:

1. **Quarantine:** the need for enrichment is exceptionally high due to quarantine conditions such as temperature and climate control, lack of vegetation and confined areas with little stimulation.
2. **Breeding programs:** captive animals have little chance of survival after release to the wild unless they have had an opportunity to maintain natural behaviors, such as the ability to mate, to rear young, to hunt or forage, escape predators and flee from man. Eliciting these behaviors in captivity is vital in raising valuable candidates for release programs. To create effective breeding programs, species-appropriate behaviors were thoroughly researched and examples were provided for institutions to follow.

3. **Reintroduction programs and preconditioning:** ferret kits that are destined for release in the wild need to be "preconditioned." Preconditioning consists of extended exposure to outdoor pens that have naturalistic prairie dog burrows and exposure to prairie dog prey (Vargas et al. 1996). The Phoenix Zoo provides live rodents (such as rats or hamsters) to the housing area when the kits are 50 days old which encourages the dams to teach the kits how to hunt and kill.
4. **Husbandry:** tunnel sections, plastic tubes and other enrichment items that are used as cage furniture are required to be disinfected as needed. Paper enrichment products are provided 1-2 per week and discarded after one day's use.

## ENRICHMENT ITEMS THAT ELICIT SPECIES-APPROPRIATE BEHAVIORS

### Enrichment items suggested by U.S. Fish and Wildlife service:

*Hard kibble* – Hills Science Feline Maintenance and Small dog biscuits such as Milk bones (¼ tsp; 3 x week):

- Extend foraging time and dietary availability
- “working” for food
- tooth maintenance
- stimulate the five senses

*Live prey* – only offered for kits and their mothers, after kits reach age 50 days. Rats (sub adult size; 1 rat per kit + mother, 3 x week):

- Develop hunting behaviors (stalking, chasing, killing, etc.)
- enrich the five senses
- proactive medical benefits such as tooth cleaning

*Dead prey* - Prairie dogs (adult size; 1 rat per kit +mother, cut up pieces 50 grams depending on availability; 3 x week) or mice (adult size; offered all year around, 1 mice per animal or 1 mice per kit +mother; 1 x week)

*ADS 4 inch ribbed tubing* - Used as permanent, but re-arrangeable furniture to:

- create visual barriers
- provide opportunities for climbing, exploring, and hiding
- for scent marking

*ADS elbows and Y connections* – Create permanent, but re-arrangeable tunnel system with tube pieces to:

- simulate prairie dog burrows for exploring, searching and hunting
- create a tunnel system for the animals to retreat during danger
- provide availability to their nest boxes to sleep.

Fig. 2.  
Black-footed ferret exhibiting tunneling behaviors  
Photo by Tara Sprinkle

*Petite Gumabone wishbone* (1-2 x per month);

- playing
- imitate hunting, stalking, catching, retrieving
- proactive medical aspects such as tooth cleaning.

*Plastic colanders* (1 x per week to retired animals);

- exploring
- hiding (animals pull over tunnel to extend opening and watch outside life through holes)
- and work for food

*Paper boxes* (1-2 x per week);

- shelter
- exploring
- working for or storing food

Fig. 3.

Black-footed ferret exploring a glove box

Photo by Tara Sprankle

*Paper bags* (1-2 x per week);

- shelter
- exploring
- working for or storing food

Fig.4.

Black-footed ferret using brown bag for foraging

Photo by Tara Sprankle

*Paper towel tubes* (1-2 x per week)

- exploring
- hunting
- working for or storing food
- hiding

### **Enrichment items suggested by the Phoenix Zoo:**

*Golf balls* - these are not offered to breeding animals or kits due to the potential for canine breakage (1 x per week to retirees only);

- playing
- imitate hunting, stalking, rolling-moving and chasing down into burrows
- catching and retrieving

Fig. 5.

Black-footed ferret playing and/or imitating hunting behaviors via golf ball  
Photo by Tara Sprankle

*Plastic 4 inch boomer ball with holes* - boomer balls need to be larger than 4" to prevent animals taking them down into tunnels (2-3 x per month);

- playing
- imitate hunting, stalking, rolling-moving and chasing down into burrows
- catching and retrieving.

\*Note: Boomer ball style balls can be very easily lodged in tunnel entrances, essentially blocking the path until they are removed by a keeper. These items are best offered with holes drilled in them for a textured/grip-able surface. This would allow the ferrets to get a grip on the ball and remove it from the tunnel if necessary.

*Paper towels* (~3-4 x per month);

- playing and to move around
- woven into cage side
- stuffed in tubes or boxes
- offered underneath mouse diet.

### **United States Fish and Wildlife service recommended enrichments not used by the Phoenix zoo**

*Hard kibble* (no amount or frequency available)

- Totally Ferret Kibble - not used at the Phoenix Zoo due to inhibition of breeding behaviors

*Live prey* (no amount or frequency available)

- Pinkies or pups size mice - not utilized at the Phoenix Zoo; hard to obtain, not cost effective
- Pinkies or pups size rats - not utilized at the Phoenix Zoo; hard to obtain, not cost effective
- Adult size hamsters - not utilized at the Phoenix Zoo anymore; hard to obtain, not cost effective

*Dead prey* (no amount or frequency available)

- Adult size hamsters - not utilized at the Phoenix Zoo anymore; hard to obtain, not cost effective

*Plastic square milk crates* - not utilized in the Phoenix Zoo; hard to obtain

- used as furniture to create visual barriers
- climbing and exploring
- hiding and for scent marking

### **Enrichments not recommended by United States Fish and Wildlife service:**

*Nylabones* – they splinter and are very difficult to clean imbedded feces from chewed areas

*Cardboard paper towel rolls* for kits – kits can get head stuck in tube end

*Rubber Tuffly or Kong chew toys* - able to chew apart and ingest rubber

*Concrete or cinder blocks* – animals can get locked away from their boxes and is difficult to disinfect

The restrictions of quarantine situations combined with regulations of different institutions, while maintaining the priorities of recent and future recovery efforts of the BFFRIT, is a highly difficult but manageable task. Proper species-appropriate behaviors can be elicited in small, confined areas by behavioral enrichment. As a result, The Phoenix Zoo has successfully bore 325 kits in the last 15 years. The animals which learned and maintained proper ferret behavior were “preconditioned” and released into the wild. Some ferrets were kept in the breeding program for future reproduction. None of the animals exhibited stereotypic behaviors.

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