# ANIMAL ENRICHMENT AND WELLNESS PROGRAM

Enrichment is a process for improving or enhancing zoo animal environments and care within the context of their inhabitants' behavioral biology and natural history. It is a dynamic process in which changes to structures and husbandry practices are made with the goal of increasing behavioral choices available to animals and drawing out their species-appropriate behaviors and abilities, thus enhancing animal welfare. (AZA/BAG 1999)

Animals in nature work to find food, to make nests, and to find shelter but play is another natural activity. For example cats that play with their prey before killing it are thought to be practicing their hunting and prey-handling techniques. Enrichment promotes a species natural behavior by giving the animal options and choices for behavior. An enriched captive environment is one that is interesting, allows animals to perform natural behaviors, permits animals to be more active, and provides animals with additional choices, which increases the animals' control over their environment leading to an improvement in the animal's mental state. An animal's wellness involves both the physical health of the animals (e.g., preventing and treating illnesses and injuries), as well as their psychological well-being.

There are four different objectives of the zoo's enrichment and wellness program:

- **Animal welfare** - reduce abnormal behavior and improve quality of life. This goes beyond providing food, water, shelter and medical care. (see also **Veterinary** and **Commissary** sections below)
- **Conserve natural behaviors** - improve breeding success, promote foraging and hunting.
- **Visitor education** - gain awareness. Docents are a key to this objective.
- **Animal management tool** - keep stress down as much as possible.

There are different types of enrichment that can be provided within the context of captive management. Keepers evaluate an animal's entire **physical environment** of how they are exhibited and consider that species' natural behavioral and biological needs. Habitats may provide a variety of substrates, levels, and complexities depending on the species. Keepers also look at **routine husbandry** (how the animals are breed and raised), and how each species forage for food. Thirdly, they consider **social groupings** of non-solitary animals that would promote grooming and play and simulate what they would encounter. Keepers also consider **novel objects** on a variable schedule to decrease boredom of one particular object and to keep their environment changing and stimulating. New objects encourage exploration. Considerable thought and effort is put into **behavioral training** using positive reinforcement to decrease stress on the animal. Behavioral training can be used for shifting animals on/off exhibit, for medical procedures, and as enrichment. The training is useful in gaining the animal's trust and allows the keeper close, visual observations of that animal. Lastly keepers consider **sensory stimulation**, which include taste (textures & spices), smell (spices & urine), tactile (novel objects & human touch), auditory (music & natural sound), and visual (magazines, mirrors & light beams) stimuli. Each species is evaluated individually and a plan that may include a combination of these types of enrichment is established.

Enrichment should be goal based such as:

- increase range of natural behavior
- decrease or eliminate abnormal behavior
- decrease stress
- increase exploration

- increase use of space
- present challenges
- increase repertoire of natural behavior

Once goals are set, the enrichment plan is implemented and finally evaluated to ensure that goals are being met and the animal's well-being is improving and the animal is being stimulated by their environment. Continual evaluation is important in improving and providing increased stimulation for the animals.

Below are some examples of things that are provided for the animals at the San Francisco Zoo. (**See also in Study Guides - Bone Cart Inventory: Enrichment Items**)

**African Savannah**: The three acres provides a large habitat for mixed species giving the animals options of where to go. The savannah can be broken up into the northern and southern side providing a means for animal management when animals need to be separated. Little additional enrichment is needed because the mixed species provides a type of enrichment for all the animals. Acacia browse is provided in various spots and heights for the giraffes. Giraffes come out through the shoot each day and their hooves are checked. A watering hole simulates the natural environment and allows the animals to get their daily water requirements. Several creep areas provide spots for the small yellow backed duiker, who is more shy and prefers the more dense covering. Sticks are provided for the marabou storks to encouraged nest building.

**One-horned & black rhinoceros**: space for locomotion, pool for cooling down and dust for protection from insects and cooling, balls for object manipulation and stimulation, and deadfall and rocks provided for rubbing horn against and scratching.

**Big cats**: Behavioral training enables a medical exam such as ultra sounds for pregnancy or minor procedures to be preformed without anesthesia. Exhibits have various levels and places to hide. Large plastic trash containers are provided for tactile stimulation and play. Balls encourage playing and pouncing. Scents, such as cinnamon, around the exhibit stimulate olfaction. Hiding food spices or other scents and food in logs stimulate the cats into searching their exhibit. Decorated boxes are stuffed with food to elicit natural behaviors of foraging. Cats are often rotated between exhibits providing the enrichment of new scents and areas to explore.

**Primates**: Climbing structures and vertical and horizontal space encourage exercise and exploration and locomotion in a natural way. Chimpanzees are provided magazines to stimulate eyes and provide hands the opportunity to manipulate objects, large plastic balls, and other objects can be stuffed with plant material or novel food items like cereal, sunflower seeds, hot sauce, and spices. Food is hidden and scattered for gorillas around the exhibit encouraging foraging. Balls and tubs provide for play and object manipulation. Apes "twig" into tree trunk borings to retrieve the treats placed there by keepers. Fennel is given to Patas monkey for sensory stimulation.


Patas monkey enjoying fennel grown in Conservation Corner

**Polar bears**: Providing ice gives the polar bears the ability to explore different temperatures and textures. Colorful balls are provided to encourage exploration and visual stimulation. Pools provide a natural environment and ability to cool down. Behavioral training enables staff to perform minor medical exams and procedures if needed.

**Grizzly Bears:** Add variety to diet with edible browse, fish, edible wild berries and meat. Provide foraging opportunities with live fish in pool, burying foods in substrate, or by putting food in boxes. Giving peanut butter and honey for different textures and smells. Use a variety of olfactory enrichment such as fennel. Behavioral training enables staff to perform minor medical exams and procedures if needed.

**Penguin Island**: These penguins live in colony as they would in wild. Exhibit simulates the burrows & open water they would find in their natural habitat. Chicks go to fish school where they learn to be hand-fed by keepers and even swim. The spray of water as the pool fills is a form of enrichment. It provides current in the water and changes up the environment.

**South American Aviary**: Birds are in free flight. Water provided for bathing. Various perching areas encourage exercise and exploration. Variety of species to simulate their natural environment.

**African Aviary**: Birds are in free flight. Water provided for bathing. Various perching areas encourage exercise and exploration. Variety of species to simulate their natural environment.

**Scarlet Macaw:** “Scarlett”, the scarlet macaw, has had a history of plucking feathers, a common behavior in pet parrots. An indoor play perch and renovated large outdoor enclosure for day use with multiple perches, feeding stations, and chewing options to emulate wild foraging were added. Training also began for medical behaviors, such as showing her wings and presenting feet for nail trims.

## ZOO's VETERINARY CARE

Although the hospital is equipped and staffed to care for the sick or injured animals in the collection, the emphasis is on preventative care and protection from the disease process.

I. Annual exams are given to all animals in the collection:
- **Visual** exam: pull up history and update, written and verbal observations from keepers noting any change in behavior or eating are included. Behavior patterns are established for this particular animal, this species and any seasonal displays.
- **Vaccination** update
- **Parasite control** update
- **Fecal pathogen** update
- **Dietary** evaluation: (see **commissary** information below)

II. There are four "Life Cycle Evaluations" where you pick points in the animal's life to justify risk of anaesthesia and have a more thorough examination.
- **Neonatal**: look for what might cause problems, gives baseline data
- **Sex mature** phase: do ultrasound of reproductive tracts
- **Mid-life** evaluation
- **Geriatric** evaluation: riskiest, determine disease process to know how to handle it to make animal more comfortable

III. **Quarantine** program for new incoming animals: All animals coming into the zoo are held before being introduced. This period is normally a minimum of 30 days.

IV. **Necropsy** program: look for what may have caused death, necropsy done on all animals that die at the zoo. This includes exhibits or any animal that crawl onto zoo grounds and dies. Feral animals give ideas of diseases that may be around the environment and one can tailor vaccines to these findings.

V. Maintain a **serum bank**: bleed on a routine exam or if there is a problem. Establish norms values for each species - all institutions download samples.

VI. Maintain a **tissue bank**: 2 samples are collected (one to evaluate, one to save for future). Pathogen and vitamin levels are evaluated.

VII. **Zoonotic disease** identification and surveillance program: diseases can transfer from animal to human, send out messages to others.

VIII. **T**ools of Zoo Medicine
- **Observations and historical information**: every animal has a medical file. The file can establish norms for specific animal over time
- **Physical exams**: can be done with/without anesthesia depending on animal.
- **Blood testing**: important role in diagnosis of bacterial or viral infections, anemia and evaluating the animal's organ function as well as liver or kidney disease, diabetes, etc.
- **Microbiology**: cultures of urine, nasal discharge and/or fecal matter can be collected and analyzed. Samples can indicate or differentiate between a bacterial, fungal or parasitic infection.
- **Imaging**: radiographs, endoscopy, and ultrasound are useful in visualizing the internal anatomy of an animal.

- **Drug therapy**: medicating exotic animals can be a challenge because established dosages are not always available.  Drugs are administered either orally or a dart.
- **Surgery**
- **Research and consultation**: global database for zoo vets to check what is normal for species

## The Zoo's Commissary Department

Located behind the scenes at the San Francisco Zoo prepares diets for the zoo animals daily. The commissary department is also responsible for: ordering all foods (grains, meats, produce, hay, alfalfa, crickets, mealworms, vitamins, fish, etc.), and supplies for both animals and zoo keepers (tools, cleaning supplies, animal equipment needs, etc.); receiving food and supplies; deliveries of such to all animal sections at the zoo; inventory control; dietary monitoring and analysis. Other duties include issuing and servicing uniforms for the employees here at the San Francisco Zoo.

Every 12 months, the commissary department prepares a shopping list for the upcoming year.

Basic needs include:

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|---|---|
| Horsemeat (chunk) | 10,000 lbs. |
| Feline/Canine Diet (horsemeat based) | 23,000 lbs. |
| Knuckle Bones (horse) | 4,200 each |
| Fish (herring) | 30,000 lbs. |
| Capelin | 6,000 lbs. |
| Apples | 73,000 each |
| Oranges | 23,500 each |
| Yams (sweet potato) | 23,000 lbs. |
| Bananas` | 15,000 lbs. |
| Lettuce (romaine) | 22,000 heads |
| Carrots | 10,500 lbs. |
| Assorted Greens: pinach, kale, collard greens, dandelion, spinach, swiss chard, endive | 17,200 bunches |
| Hay/Alfalfa/Timothy/Straw | 150 tons |
| Grains | 150 tons |

Odds & Ends:

| | |
|---|---|
| Mealworms | 576,000 each |
| Crickets | 210,000 each |
| Superworms (large mealworms) | 49,000 each |
| Goldfish (feeder) | 5,600 each |
| Chicks | 4,500 each |
| Capelin | 6,000 lbs. |
| Eggs | 610 dozen |
| Bleach | 3,360 gallons |
| Latex gloves | 80,000 pairs |
| Mice | 125,000 each |
| Herring | 30,000 lbs. |

- Meat expense: $60,000 - (Horsemeat from Nebraska)
- Produce expense: $90,000
- Grain expense: $80,000
- Uniform expense: $20,000

updated: 2012

**THE COMMISSARY**

**In the wild, what do animals spend most of their time doing?**
"In the wild, both the temporal and the spatial distribution of food resources are typically complex, so that food acquisition may require a large proportion of an animals' daily time budget. In most habitats, seasonal variation in food quantity and quality is pronounced, whether driven by changes in temperature, precipitation, or oceanic currents." (#)

**What is a nutrient-rich diet?**
"The total number of nutrients (vitamins, minerals, amino acids, fatty acids) that are required by mammals is now known to be about 45-47, depending on the species." (#) Food is chemically defined through sampling and analysis.

**What purpose does a good, nutritious diet serve?**
"Given that capture in the wild is no longer an appropriate method of stocking most types of zoo animals, and that zoos must therefore, design breeding programs that will sustain captive animal populations, the goal of zoo feeding programs must be to provide, nutritional support for all stages of life, including gestation, lactation and early postnatal growth. Important relations have been demonstrated between nutrient intakes and rates of growth, reproductive performance, digestive function, and disease processes." (#)

**How are nutritious diets formulated in zoos?**
"There is a common belief among non-nutritionists that if foods consumed by wild mammals could be chemically defined through sampling and analysis, we would know with some certainty how and what to feed in captivity. While knowledge of food choice and composition in the wild is helpful, it does not provide sufficient quantitative information to aid in dietary formulation for captive omnivores. Our tendency to feed fruits and vegetables to captive primates stems from our knowledge that fruits and leaves, and other plant parts are consumed by many primates in the wild, yet cultivated produce bears little resemblance nutritionally to the plants consumed by wild primates." (##)

"Zoo animal nutrition remains a new and relatively unexplored field:

- 1930's - H. L. Ratcliffe pioneered the concept of complete, formulated diets at the Philadelphia Zoo
- 1960's (late) & 1970's - Aside from early reports of severe metabolic bone disease in large carnivores and monkeys (e.g. Bland Sutton, 1888), there was little recognition that nutrient deficiencies might be wide-spread in . zoo animals, or that the reproductive performance of zoo animals might be curtailed by inappropriate diets (e.g., Crawford, 1968). [This was about the time that zoos were changing their focus and becoming an education/conservation center rather than just a menagerie of animals for enjoyment.]
- 1975-1980 - The first zoos to hire professionally trained nutritionists were the Metro Toronto Zoo in 1975, and the National Zoological Park in 1978, [The San Francisco Zoo contracted with a nutritionist from the National Zoo.] and the Chicago Zoological Society in 1980.
- 1983, 1992 - C. T. Robbins' books on wildlife nutrition represented a major contribution to the field of non-domestic animal nutrition.

"The number of computer programs have been devised for evaluating animal diets, including ones developed by zoo nutritionists that contain many typical zoo food items in the data base. While such programs greatly facilitate dietary evaluation, they do not obviate the need for an educated interpretation of the computer output." (#)

So that the nutritious wheel is not being reinvented, zoos share information.

**Who determines what the SF Zoo animals eat?**
A team of keepers, curators, vets, and the commissary. Each diet is individually planned and prepared according to the needs of the animals. Keepers keep in mind breeding and nursing cycles, as well as seasonal changes and weight gain.

**What particularly do the animals eat? How much? Who coordinates the diets?**
The Commissary Department orders, receives, and prepares all diets. They are done in a sanitized kitchen area that has multiple large, walk-in storage areas, e.g. refrigerator/cooler, freezer, shelved room for various chows, and barn for various hays.

The Commissary's budget is/over $400,000 and $150,000 of that is for produce alone. (See the Commissary shopping list above.)

"Browse" (eucalyptus, acacia branches, etc.) is gathered from around the City (Golden Gate Park, etc.) by keepers. All fruits and vegetables are first quality. Bread is donated by Delancy Street and is day-old.

**How else is food used in the care of the animals?**
- Special treats and considerations are given to the animals for:
- Seasonal treats (mini-pumpkins during Halloween)
- Training exercises treats (bears and cats during contact training for examinations)
- Vitamins, medications, and sometimes, birth control are hidden in treats
- Weight control (large cats fast on Mondays)
- Behavioral enrichment:
    - food is hidden throughout the exhibit to stimulate foraging behavior
    - puzzle boxes challenge primates
    - show use of tool-making and use
    - simulates hunting instincts (FCC sequence or live fish feeder in otter exhibit)

**Dietary tidbits:**
- Koala - eucalyptus (gathering by keepers, koalas select their favorites) [Koalas eat ONLY eucalyptus and of the 200 species of eucalyptus, they will eat from only 50 species.]
- Primates - fruits, vegetables, banana-flavored monkey chow, twig for treats
- Cats - horsemeat, bones; small cats get rats and rabbits (10,000 lbs.)
- Hoofed stock - chow, alfalfa, hay, browse
- Otters - live fish
- Grizzly bears – live fish

**<u>Resources:</u>**
# *Nutrition and Dietary Evaluation in Zoos*, Olav T. Oftedal and Mary E. Allen
## *Nutrition*, Mary E. Allen

**SAN FRANCISCO ZOO ANIMAL SAMPLE DIETS**

**AVIARY**
4 oranges, 1 romaine, 2 ea assorted greens (no kale), 4 cooked yams, 3 cooked carrots, 113 tube feline, 8 hard boiled eggs, 2 cups frozen vegetables, 2 bananas
BAG: 5 apples (diced), 2 cooked carrots (diced), 1/2 cup of grapes or raisins. BAG: 1 speak broccoli (Mon, Thurs, Sat), 3 stalks celery (Sun, Wed), 1 scoop of peas (Tues, Fri), 2 pieces of fruit (whatever is available - pears, kiwi, peaches, nectarines, apples, etc.)

**BACKSTRING**
12 carrots, 24 bananas, 24 apples, 24 yams, 12 potatoes, 2 bok choy or spinach or romaine

**AFRICA ENRICHMENT PRG.**
1 bag yams (chopped), 1 bag carrots (chopped), 1 bags apples (chopped), 1 bag bananas (chopped)

**EMU**
2 apples (diced), 2 bananas (chopped), 112 romaine (chopped), 1 cup grapes

**KANGAROO**
8 yams (sliced), 10 carrots (sliced), 10 apples (sliced, 7 romaine, 3 loaves bread. (2 BAGS daily).
BAG: 2 yams (sliced), 4 apples (sliced), 2 carrots (sliced)

**CAPYBARA**
13 apples, 12 bananas, 4 corn, 1 celery, 11 kale, 1 spinach, 1 bok choy (Mon & Fri only - 2 handful of green beans)

**AFRICA**
(2 Boxes) 8 cabbages, 12 apples, 12 bananas, 12 carrots .

**OSTRICH**
4 scoops Ratite, 1 scoop Gamebird, 3 romaine

**COLOBUS**
20 yams (sliced), 8 cooked carrots, 3 kale,1 head romaine

**CASSOWARY**
(2 bags for ACC each day): BAG: 112 kale (chopped), 4 apples (diced), 2 bananas (chopped), 1 cooked yam (diced). BAG: 1/8 tube of feline

**TAPIR**
5 apples (chopped), 5 yams (chopped), 5 bananas (chopped)

**MARABOU STORK**
1-112 tube feline

**FLAMINGOS**
1 bucket O.H. Kruse Flamingo Fine Feed

**MANDRILL**
(Put into separate bags - Fruit, leaf-eater chow, assorted veggies and leafy greens)
14 oz. leaf-eater chow, 15 oz. assorted vegetables (broccoli, celery, green beans - Mon-Wed-Fri-Sun) (carrots, yams, cooked potato - Tue-Thu-Sat) 16 oz. leafy greens (romaine, dandelion, spinach Mon-Wed-Fri-Sun) (kale, chard, bok choy – Tue-Thu-Sat) 1 oz. assorted fruit -apples (Mon & Fri) -oranges (Tue & Sat) -grapes (Wed & Sun) -pears, nectarines, kiwi, peaches (Thu), whatever is available

**COOK DAILY:**
1/2 case yams, 25 carrots, 28 potatoes, Eggs if needed

**CHILDREN'S ZOO WEEKLY STANDING ORDER: (FRIDAYS) PRODUCE:**
1/3 case apples, 25 firm bananas, 80 firm carrots, 5 ears corn, 2 bags grapes, 2 cases mixed greens (no lettuce), 1 ea melons (no watermelon), 1/3 case oranges, 35 ea yams or sweet potatoes. Other: (First Friday of each month) 64 each frozen chicks (small) (deliver frozen), 72 each frozen mice (deliver frozen)

**INSECT ZOO WEEKLY STANDING ORDER: (Fridays) PRODUCE:** 5 heads romaine, 8 each apples, 1 each cabbage, 8 each oranges, 1 each melon, 1 each yam, 1 bunch grapes, 3 each bananas, 2 each cucumbers (seasonal)