

# *Wildlife Nutrition*

A Publication of Canada's Accredited Zoos and Aquariums  
Nutrition Advisory and Research Group (CAZA-NARG)

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## **Wishing You a Happy New Year!**

**I have been fortunate to work with many wonderful people in 2013. It is always a privilege to be part of the development and improvement of an institution's nutrition program.**

**In this edition of the CAZA-NARG newsletter, we will start off the new year by looking at appropriate nutrition as part of ensuring animal welfare for captive wildlife. Then, a short review on some aspects of herbivore nutrition. I received the most inquiries on herbivore nutrition during 2013 and it has been the first inquiry of 2014.**

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## Wildlife Nutrition and Animal Welfare

What does nutrition have to do with animal welfare?

Typically, factors in animal welfare include humane handling methods, housing, appropriate and timely medical treatment. Rarely is the provision of appropriate nutrition considered a factor in the welfare of captive animals.

An appropriate diet is essential to captive animal welfare. Appropriate diets are the basis of successful animal husbandry and supports all aspects of an animal's physiology including growth, reproduction, longevity and, health. It also supports healthy animal psychology if the diet provides occupation (something to do), variety and reduces and/or eliminates pain and suffering that may arise from inappropriate diets.

A major impediment to the provision of appropriate diets can be a lack of knowledge on the nutrient requirements of a species. The reality is that we do not know the nutrient requirements of many captive animals. Research in wildlife nutrition – as compared to domestic animal nutrition - is limited because it is not as lucrative as that of domestic animals'. Most research in animal nutrition is for pet and food animals and, often, there is an inappropriate use of pet and food animal research when making dietary decision for captive wildlife because it is the only information available.

A lack of knowledge on the nutrient requirements of wildlife and inappropriate application of knowledge can result in animal diets with nutrient excesses and deficiencies that can cause impaired immune functioning and nutritional pathology. Over the past two decades, the apparent incidence of nutritional pathology in captive wildlife averages at approximately 70% requiring financial investment to treat health problems that were created by inappropriate nutrition.

The obvious question: if we recognize the importance of nutrition in the welfare issues of captive animals BUT we do not have the knowledge available to provide appropriate nutrition, what options exist for the zoological or wildlife professional? Despite an apparent impasse, zoological and wildlife professionals do have options:

1. **Existing research.** Some relevant research does exist on some captive wildlife species. This research can provide insights into the physiological and psychological functioning of a species.
2. **Wild feeding ecology.** Seek and use reliable information on the wild feeding ecology of a species.
3. **Wildlife nutritionists.** Use the services of an animal nutritionist who has training and/or experience in wildlife nutrition. Wildlife nutritionists can assist in assessing existing research and guide decision-making to provide the best possible captive diet based on current knowledge.
4. **Appropriate decision-making.** The cost of a diet is a factor for most institutions and organizations, but cost is not a reliable guideline for diet decisions. Dietary decisions cannot be appropriate if they are based solely on most affordable product.
5. **Formulate for the species and the individual.** Appropriate nutrition is done on a species level. However, appropriate nutrition must also consider the individual because of factors such as age, size, activity and reproductive status.
6. **Appropriate commissary protocols.** Once an appropriate diet is formulated, protocols should exist that ensure food safety. Food safety includes storage guidelines, hygienic preparation, timely delivery and removal of food and, clean receptacles for feeding and drinking. Storage guidelines must keep the food clean, fresh and prevent spoilage. Food presentation must be appropriate to the wild feeding ecology and physical abilities of the animal.
7. **Diet and body condition monitoring.** Ingestion of the diet must be monitored to ensure all animals have access to their appropriate share of food. Staff must monitor feed intake, feed refusal, body condition and feces as indicators of the appropriateness of the diet and health state of the animal. Records of feed intake, weight histories and body condition should be kept.
8. **Use veterinary support.** The veterinarian is an important team member and must have access to accurate dietary records and observations to support diagnostic services.

**Eliminate public feeding.** Public feeding of animals often creates uncertainty because the practice of allowing public feeding means the staff can never be certain of the amount or type of food eaten by an animal. Public feeding also creates the possibility of an animal ingesting food and/or objects that could cause gastric distress or death.

### Problems Wanted!!

Each issue of "Wildlife Nutrition" will present and discuss a specific dietary challenge submitted by readers. Any aspect of the nutrition of captive wildlife will be considered for publication. The dietary challenge may be a question, situation or nutritional pathology. The identity of the submitting individual and/or their organization will be confidential. Please submit to:

Wildlife Nutrition  
info@caza-narg.ca



## Some Review: Herbivore Nutrition Forage versus Pellets

The CAZA-NARG newsletter topic that garnered the most response in 2013 was easily the provision of forage to wild herbivorous species in captivity. The interest in this topic was related to species as small as a porcupine and species as large as an elephant.

In this article, we will discuss the ratio of forage to pellets because it appears to be the most difficult to assimilate into practice. In general, recommendations include a ratio of forage to pellets from 50:50 to as high as 70:30 for captive wildlife. The ratio depends on the species and life stage of the animal. In many cases, in captivity, herbivores are fed a diet of pelleted feed with some forage added only for enrichment. Therefore, increasing forage ratios to 50-70% is a large increase.

First, let us review the terms forage and pellets. Forage is a bulk feed and can include fresh and dried hay, fresh or dried browse (e.g., leaves) or (to a limited extent) romaine, spinach and other greens commonly ingested by humans. Pellets are dense sources of nutrients, high in dry matter (low in moisture) and are considered a “complete feed”. “Complete feed” means that chopped forage is mixed with other ingredients including vitamins and minerals, processed and formed into small pieces often tubular in shape. These pellets are most often designed to be fed – and are often used – as the total diet without forage or with only minimal forage added.

However, current research and practice indicates that captive, wild herbivores do not thrive on pellet diets or pellet diets with only some forage added. This current research and practice also indicates that we need to increase the ratio of forage to pellets in herbivore diets.

Providing diets with a higher ratio of forage to pellets appears to be a problem for many folks in theory and in practice. In many situations, theory and practice can act as a barrier to increasing forage in captive diets.

I am presenting some of the most common feedback I have received about increasing forage and labelled it as a theory or practice problem with some suggestions for solutions:

1. **Theory: The term “complete feed”.** Pelleted feeds are often called “complete feed”, “total nutrition”, “total mixed rations” and other similar terms that imply that that the product is the only feed required by the herbivore. These terms and feeds originate in the pet and food animal industry. The reality – for captive wildlife species that are herbivores – is that pellet diets or diets high in pellets relative to forage do not provide the bulk and fibre length (in amount and type) needed for normal gastric function to support the gut microorganisms. This means that even the best pelleted feed is not an appropriate diet for an herbivore if it is fed without an appropriate ratio of forage. **Solution:** change the theory to “use forage diets that use pellets as supplements”.
2. **Theory: If it is not broke, don’t fix it.** Traditionally, captive herbivorous wildlife – especially large species – are fed a complete feed pellet as the main diet ingredient and some forage is given throughout the day as dietary enrichment. This way of feeding is very similar, if not identical, to how food animals like cattle are fed. Captive wildlife have lived and bred on such diets for several decades and we are inclined to view this as proof of the adequacy of a diet. However, we may tend to also view chronic gastrointestinal problems, reduced immune functioning and poor hide and coat quality as normal for captive herbivorous species. **Solution:** Envision the concept of improvement in many aspects of appearance and health. Facilities that have adjusted captive herbivorous diets to include the appropriate forage to pellet ratio have learned that chronic gastrointestinal problems, reduced immune functioning, poor hide quality and reproductive problems are not the norm for captive herbivorous species.
3. **Theory: A cow is a cow.** For decades, diets for captive wildlife diets have been formulated based on an analogy with domesticated animals. This practice arose from the belief, for example, that all ruminant species have the same nutrient requirements therefore one can feed a caribou the same as dairy cattle. Or, a pet rabbit is small and an herbivore, therefore wild small herbivores like beavers or porcupines can be fed rabbit feed. However, most feeds for pet and food animals are not appropriate for captive wildlife. **Solution:** Research is available on the nutrient requirements of some captive wildlife species. Base captive diets on the wild feeding ecology of a species. Use the services of an animal nutritionist who has training and/or experience in wildlife nutrition to assess existing research and guide decision-making to provide the best possible captive diet based on current knowledge.

4. **Practice: Availability of fresh forage.** In North America – especially in Canada - we are limited to a growing season of only several months. This means fresh forage is available for a limited time. **Solution:** Fresh forage can be harvested and stored as silage. Fresh grass and legume hay can be purchased year round either by transporting from warmer climates or buying from companies that bale fresh hay (e.g., Tri-forage Horsehae in Canada or Chaffhaye in the United States). Facilities with greenhouse capabilities can grow forage throughout the year.
5. **Practice: Cost and labour.** There are several aspects of forage that requires an increase in costs because of an increase in labour, an increase in product price and/or an increase in transportation costs. Forage is bulky and requires more labour, more equipment and more storage than only a pelleted feed. Forage also creates more work because of feed residues that form from storage to exhibit area. Animals that eat forage can create waste during feeding and later when waste products are produced as feces. Specialty forages can be extremely costly. **Solution:** We cannot change the physiological design and function of a species because we have brought that species into captivity. If a facility or organization cannot provide the appropriate diet in the appropriate manner for an animal, then the only solution is not to hold that species within the institution or organization.
6. **Practice: Large species.** Both small and large herbivorous species in captivity can lack the appropriate ratio of forage. However, large herbivorous species are most likely to have dietary deficiencies in forage because they require such large amounts because of their large gastrointestinal capabilities. The task of providing the amount and type of forage to such large animals can incur huge costs in labour and/or product. **Solution:** We cannot change the physiological design and function of a species because we have brought that species into captivity. If a facility or organization cannot provide the appropriate diet in the appropriate manner for an animal, then the only solution is not to hold that species within the institution or organization.
7. **Practice: Management issues.** Whether a forage is fresh or dry, using diets high in forage requires ongoing management skills that include sourcing, testing and storage to ensure that forage is high in quality, remains high in quality and is appropriate for a species. In addition, costs exist to support management and testing. **Solution:** We cannot change the physiological design and function of a species because we have brought that species into captivity. If a facility or organization cannot provide the appropriate diet in the appropriate manner for an animal, then the only solution is not to hold that species within the institution or organization.
8. **Practice: Transportation costs.** While many areas of Canada grow a type of forage locally, many areas of Canada cannot grow forage crops. In addition, domestic forage crops are most often limited to either grass hay such as timothy or legume hay such as alfalfa and obtaining a variety of forage – or any forage - requires trucking it in. Transport costs to get forage into isolated areas of Canada and/or to truck in a variety of forage crops are often considerable. **Solution:** We cannot change the physiological design and function of a species because we have brought that species into captivity. If a facility or organization cannot provide the appropriate diet in the appropriate manner for an animal, then the only solution is not to hold that species within the institution or organization.

**Herbivore nutrition is complex. The gastrointestinal microbes of herbivores produce most of the nutrients needed by the host animal. Therefore, one must feed and support the gut microbial colonies that will provide for the host animal. Bulk feed in the appropriate ratio to pelleted feed is necessary for these microbial colonies.**

**Increasing the bulk forage must be done gradually with careful monitoring of feed intake and fecal quality. As always, please contact me at any time if you have questions!!!**



## Wildlife Nutrition Aliments pour faune sauvage

- **Manufactured in Canada**
- **Formulated based on wild feeding ecology**
- **Quality products at affordable prices**
- **Custom feed products**
- **Consultation service with a wildlife nutritionist**
- **Transportation services available**

**CAZA Wildlife Nutrition Ruminant Browser:** Our browser pellet has been formulated based on the wild feeding ecology of browsing ruminant species\*. It is a low-sugar, low-starch pellet that offers the appropriate types and ratios of fibre recommended for browsing ruminant species. This product must be fed with forage (hay or browse).

\*Antelope species, caribou (reindeer), deer, elk, giraffe, goat species (most, including ibex and mountain goats), moose, mountain sheep, musk oxen

**CAZA Rodent Herbivore with Vitamin C:** Our Rodent herbivore with vitamin C is formulated based on the wild feeding ecology of herbivorous rodent species including beaver, capybara, porcupine and rock hyrax. It is a low-sugar, low-starch pellet that offers the appropriate types and ratios of fibre recommended for browsing ruminant species. This product must be fed with forage (hay or browse).

**For further information:**

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