

# The Challenge



**A**s you drive down a country road and look out the window you see animals grazing. Whether it's a herd of pronghorn, a group of cows or a flock of sheep, animals seem to have simple lives. They don't have to worry about the mortgage, bills, appointments, kids or in-laws. If only your life were that easy. But have you ever stopped to think about the challenges animals face? Challenges??? What's challenging about eating?

On the surface, the behavior of herbivores may appear to be little more than the idle wanderings of animals searching for food and a place to rest. However, foraging is far a far from simple activity. It is a process that provides insights into an age-old dilemma faced by herbivores and people alike: How do creatures of habit survive in a world of change? The demands herbivores face in finding food to eat and a place to live are similar to those people face in making a living. These demands occur because climate, soils, plants, herbivores, predators and people are interrelated parts of systems that change constantly. Change requires that each part of the system continually adapt. Understanding the challenges herbivores face, and how they cope, can reduce stress and increase profits.

**Finding nutrients.** Whether they're on open ranges or confined on pastures, animals live in a changing world. Like people, herbivores must cope with changes in themselves and their environment. The amounts of nutrients - energy, protein and minerals - animals need change throughout life. They change during growth and throughout pregnancy. They increase when animals are ill or infected with parasites. These changes may happen gradually during pregnancy or as parasites increase, or

they may occur quickly with changes in physical activity or weather. Unlike people who get nutritious foods from familiar and predictable places such as grocery stores, restaurants, and gardens, herbivores must forage in changing landscapes loaded with chemical complexity. Nature constantly changes the amount of energy, protein, vitamins and minerals in plants. Individuals must recognize nutritional deficiencies in themselves and in the plants they eat. Individuals that do, survive. Those that don't, won't. How do animals detect nutrients in foods and what can managers do to help them?

**Avoiding toxins.** Plants also pose a toxic challenge. Virtually all plants on pastures and rangelands produce toxins, often in high concentrations, that serve as chemical defenses against grazing. Even garden vegetables—corn, tomatoes, potatoes, broccoli, spinach—contain toxins, but in low concentrations thanks to our efforts to select low-toxin varieties of plants. However, some foods like sorghum grains, commonly fed to cattle, have been selected for a high level of tannin to prevent losses from birds. Unfortunately, tannins are toxic to both cattle and birds. There are tens of thousands of toxins, and they all vary in chemical structure and activity. In animals, toxins interfere with metabolic processes or reduce digestibility of foods. If eaten in sufficient quantities, they can cause illness or death. How do herbivores keep from over ingesting toxins and what does this mean for managers?

**Physical barriers.** Herbivores also must deal with plant structure, such as standing dead material in some grasses, thorns in forbs and

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woody plants, and differences in plant canopy shape and structure. As plants mature, physical properties that make foraging difficult increase while nutrient concentrations decrease. Structure can make foraging easier or more difficult and can increase or decrease ingestion rate, which in turn can influence foraging efficiency and food preferences. While combinations of plant physical and nutritional characteristics that increase nutrient intake are likely to be preferred, combinations that reduce nutrient intake are less likely to be preferred. Animals that can navigate through such structural challenges enhance their nutritional welfare. How effective are herbivores at coping with plant structural defenses, and what can managers do to maximize foraging efficiency for herbivores on pastures and rangelands?

**Food on the move.** Perhaps the trickiest challenge animals face is the fluctuation in nutrients, toxins, and physical characteristics of foods. While the biochemical composition of foods at the grocery store is relatively constant, the nutrient and toxin concentrations of plants on pastures and rangelands vary from morning to night, from day to day, and from season to season. Plant biochemistry can also vary from place to place. The nutrient and toxin concentrations of plants vary whether plants grow in sun or shade, on wet or dry locations or on fertile or infertile sites. An animal's challenge is to track these biochemical changes as they occur. Can herbivores figure out where and when to eat to meet their needs for nutrients and avoid ingesting toxins, and, if so, what are the implications for managing pastures and rangelands?

**Animals on the move.** Changes in the environment pose yet another challenge. Either by catastrophic events such as floods and fires or by managers moving animals to new locations, animals are regularly faced with unfamiliar environments. Herbivores that adjust quickly to drastically different environments can reduce nutritional stress and greatly increase chances for survival. How well do animals adapt to new foraging environments and how can managers help to reduce the stress of moving and thereby increase profitability?

**Conclusions.** In this fact sheet, we have raised a number of questions concerning the challenges animals face when foraging. In other fact sheets we provide answers and insights to these questions and others you may have about foraging. Additional fact sheets and information about the BEHAVE Project can be found on our web site at [www.behave.net](http://www.behave.net).

### Additional Readings

Provenza, F.D., 2004. Foraging Behavior: Managing to Survive in a World of Change. USDA-NRCS. To view or order: [www.behave.net](http://www.behave.net).

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