

The Utility of Animal Behavior Studies in Natural Resource Management

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On the Ground

- Although research on the behavior of individual animals has been growing in recent years, the role that individual variation among animals may play in the outcome of species interactions in nature may be somewhat overlooked in natural resource management. Recognizing potential implications of individual behavioral variation can aid in developing more cost-effective and sustainable management techniques. Four illustrative examples are provided.
- Livestock foraging behaviors are important to understand, as they affect an animal's ability to locate and identify forage with nutritional qualities required for optimal growth. Studying the behavior of individual animals can help livestock producers anticipate and influence livestock grazing patterns to increase efficiency and productivity.
- Sage-grouse populations have declined dramatically in many areas, and managers are required to consider their needs in all management decisions where the species persists. Sage-grouse exhibit complex mating, nesting, and migratory behaviors that are important to recognize for management to be successful.
- Mountain lions were generally assumed to prey mainly upon mule deer, but recent studies have found that individual lions may specialize on alternate prey such as feral horses or bighorn sheep. The Bureau of Land Management spends millions of dollars each year to manage feral horse populations. Revelations surrounding prey switching in individual mountain lions may support management goals in which feral horse predation is occurring but may hinder bighorn sheep translocation efforts by wildlife managers.
- Many plants important to land managers, including grasses, shrubs, and trees, are dispersed by granivorous rodents that store seeds in scattered caches, and a growing body of literature reveals that the majority of seedling recruitment for some of these species is attributable to scatter-hoarding by rodents. This relationship can be utilized for restoration applications, and variation in seed preferences

among individual animals may be valuable in this regard.

Keywords: individual variation, rangeland management, livestock, sage-grouse, mountain lions, granivorous rodents.

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Natural resource and land managers are aware of the value of population-level studies of wildlife, such as censuses and seasonal range use of game species populations. It is perhaps less appreciated that behavioral studies at the level of individual animals can also contribute valuable insights for management applications. Variation among individuals stems from variation in morphology, behavior, and physiology that influence an individual's ability to utilize alternative resources, resulting in distinct preferences and differences in how efficiently alternative resources can be used.¹ Understanding behavioral responses of individual animals and to what extent their preferences vary can aid in more efficiently and sustainably managing lands for multiple uses. By describing behavior at the individual level, we can understand the range of responses among animals within a population, allowing land managers to anticipate the needs of target species across space and time. When management plans are only based on the average behavior of the population, specialists or important demographic groups can get left out.¹

Animal behavior often varies by age, body size, sex, learning ability, and previous experience, resulting in different responses among individuals of the same species given identical circumstances.² Moreover, the success or failure of management strategies may be affected by this variation.² With advancements in tracking and global positioning system (GPS) technology, researchers have been able to observe animal behavior on a much larger scale than was previously feasible. Observing responses of animals to conditions of their rangeland environments provides more applicable information directly to land managers than laboratory or small pasture studies. Here we highlight four very different examples of the utility of behavioral studies for management issues.

Livestock

Behavioral studies of livestock, such as documenting movement and foraging patterns in large pastures or on open rangelands (Fig. 1), are perhaps the most direct application of how knowledge of behavior can guide rangeland management. Information on how variation in management techniques and landscape variables influence livestock behavior can increase efficiency and returns for livestock producers. In herding animals it is important to recognize how individuals respond to one another. Variation in foraging behavior among individuals is partly the result of behaviors that are learned through an animal's own experience and also learned from social interactions and observation of other individuals.³ In livestock, social facilitation, the increase in a behavior in response to observing others exhibiting the same behavior, has a large impact on an individual's inclination to consume new plants or food types.⁴ Foraging behavior can be manipulated through aversive training to certain forage using small doses of chemicals that induce illness, such as lithium chloride, but the strong influence of social facilitation can reverse induced aversion when animals are grazed with non-averted individuals.⁴ The behavior of peers and mothers have been found to influence diet in domestic cattle through influences on home-range or habitat use patterns and avoidance of toxic plants.⁵ Mothers can greatly influence foraging behavior in calves, resulting in considerable individual variation by passing on food preferences through odors in their milk, and individuals may prefer the natal habitat chosen by their mothers.³ Individual personalities that influence foraging behavior, such as a tendency for animals exhibiting more aggressive or bold behavior to explore new feeding sites, can also be passed between generations genetically.³ In herbivores, certain individuals within the herd often act as leaders and are responsible for initiating

movement toward water sources or new foraging locations.³ Suites of correlated behaviors (i.e., "behavioral syndromes," which are analogous to animal personalities) may be associated with animal performance through variation in the use of rangelands.⁶ Cows of one behavior type that covered more ground and went farther from a water source while foraging during the day were found to have higher weights, higher calf weaning weights, and a shorter period of postpartum anoestrus than cows that had a more concentrated search area and spent more time nearer to water.⁶ Howery et al.⁷ studied the habit at use and home ranges of individual cattle and found that most cows exhibited home range fidelity and suggested that selective culling of individuals that overused riparian areas could be a management strategy to minimize damage to sensitive habitats. Understanding how livestock select forage to meet nutritional needs in complex environments that vary spatially and temporally contributes to more efficient livestock management.

Research on individual behavior and learning can be applied through manipulation of foraging behavior. For example, cattle can learn to eat sagebrush and other sagebrush steppe vegetation, which can not only reduce feeding costs but was also found to increase grass and forb production with appropriately timed grazing.⁸ Cattle can also learn visual cues and associate them with food quality, increasing the efficiency of grazing in heterogeneous rangelands.² Identifying how livestock perceive variation within their environment can help ranchers intervene to elicit desired behavior. Ganskopp⁹ used GPS collars on cattle to compare responses to water and salt manipulation in an arid environment and found that patterns of foraging behavior and distribution can be manipulated by moving a water source, while salt placement had no effect. Cattle in this study also did not return to areas where they previously spent time, nor did they return to the previous location of the water station.⁹ Strategic placement of



Figure 1. Free-ranging cattle in southern Nevada.

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