

Wildlife Ecology

Niche

- Range of resources and conditions over which an organism can successfully survive and reproduce

AND

- The methods it uses to acquire resources
= “address” + “profession”

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Niche

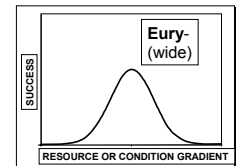
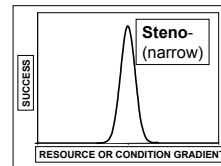
- **Fundamental niche:** maximum range of resources, conditions, and methods where an organism could potentially be successful
- **Realized niche:** resources, conditions, and methods actually used by the organism
 - Why?

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Niche

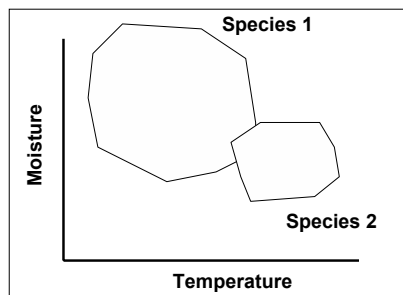
- G.E. Hutchinson: Niche = n -dimensional hypervolume

- Each dimension represents a resource or condition
 - food, water, cover, space, temperature



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Niche: 2-D



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Habitat

- “the resources and conditions present in an area that produce occupancy – including survival and reproduction – by a given organism”
 - Hall et al. 1997 cited in Bolen & Robinson

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- **Competition:** When two or more organisms both exploit the same limited resource
 - intensity determined by niche overlap

Modes of Competition

Scramble competition: each individual uses resources without regard to other individuals

Interference competition: some individuals restrict access to resources by others
How?

CONCEPTS

Competitive exclusion principle: two species that depend on the same limiting resource often cannot coexist

Resource Partitioning: restriction of the realized niche in the presence of a competitor to reduce niche overlap

Competition and Management

Question:

Do cattle compete with mule deer and elk in Oregon?

Stewart et al. 2002. *Journal of Mammalogy* 83:229-244

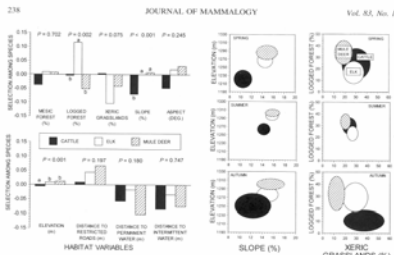


FIG. 2.—Selection of habitat variables (rod mines available, divided by used plus available) among cattle, elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*) on the Starkey Experimental Forest and Range, Oregon, 1993–1995. Values for selection vary from +1 to -1, and negative values for distance measurements indicate selection (i.e., animals are closer than predicted from random). P-values are from analysis of variance with planned contrasts, following significant differences in selection or avoidance of habitat determined from MANOVA (Wilks' lambda, $P < 0.001$). Differences in lowercase letters indicate significant differences ($P < 0.05$).

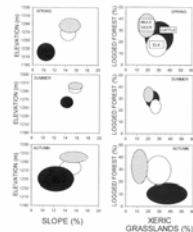


FIG. 3.—Bivariate plots of niche partitioning based on elevation and slope (left) and on logged forest and serotinous grasslands (right). Ellipses are 95% CI for cattle, elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*), across seasons on the Starkey Experimental Forest and Range, Oregon, 1993–1995.

mule deer and elk in avoidance of steep slopes and high elevations. Although native herbivores selected similar slopes and elevations, mule deer and elk strongly partitioned use of vegetation communities (Figs. 4–6).

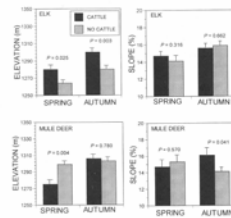


FIG. 5.—Mean (+SE) seasonal use of elevation and slope by elk (*Cervus elaphus*—above) and mule deer (*Odocoileus hemionus*—below) in response to presence and absence of cattle on the Starkey Experimental Forest and Range, Oregon, 1993–1995. P-values are from analysis of variance following significant treatment effects from MANOVAs (Wilks' lambda, $P < 0.05$).

slopes or at high elevations with rugged terrain.

Most studies concerning niche partitioning among large herbivores have not considered cascading effects of competition between 2 species on a 3rd. Thus, studying only 2 of these large herbivores would not have revealed how the niche dynamics of cattle, elk, and mule deer were interconnected. Moreover, in the absence of data on cattle, measuring either habitat use or selection might lead to misinterpreting the habitat requirements of elk and mule deer and to subsequent errors in managing habitat for those ungulates.

We observed substantial resource partitioning in use of slope, elevation, and vegetative communities by cattle, elk, and mule deer. We also demonstrated changes in niche breadth of elk following the addition and removal of cattle from the study site, which likely indicated competitive displacement. Nonetheless, most aspects of the ecology of large mammals are influenced by density-dependent mechanisms (McCluskey 1970, 1990), and that observation

Things to Remember

- Definitions of *niche* (including *fundamental* and *realized*) and *habitat*
- Steno- vs. Eury-
- Competition:
 - what makes it strong vs. weak?
 - *scramble* vs. *interference*