The Notion of “Grazing Resource” Revisited Considering Habits and Skills of Herds and Farmers

Fred D. Provenza
Professor Emeritus
Dept. Wildland Resources, Utah State University
Logan, Utah, USA

Michel Meuret
Director of Research
Dept. Science for Action and Development, INRA
Montpellier, France
Is there a need to discuss further the notion of “Grazing Resource”?

Not here!
Is there a need to discuss further the notion of “Grazing Resource”? Maybe here!
Farmers, ranchers, and researchers know herbivores are highly selective.
Sheep eat sagebrush in the morning and fourwing saltbrush in the afternoon. Sheep eat clover in the morning and grass in the afternoon.
On pasture, the diversity of edible plants can become food “resources” only if the farmer or herder, through his experience and skills, motivates his animals to select and eat it. Otherwise, plants remain... plants.

Hubert, 1994. Cahiers d’Agricultures
We can do chemical analyses for primary and secondary compounds, but that tells us nothing.

A plant becomes a “food resource” only if an animal is motivated to eat it, and many factors are involved.
Many factors influence an animal’s motivation to eat a plant on diversified pasture.

- Learning in utero and early in life
- Learning to mix plants in the diet
- Managing grazing: from set stocking to management-intensive grazing to close herding
- Learning complimentary sequences
Learning *In utero* and Early in Life
What does it mean for creatures to be locally evolving with landscapes?
Natal experiences affect food and habitat preferences in a broad range of animal taxa including insects, fish, birds, and mammals

(Davis and Stamps, 2004)
A Mother's Lifelong Influence on Diet and Habitat Selection

In utero
Mother’s Milk

Mother as a Behavioral Model
Preference for forages high in secondary compounds is not due solely to differences in breeds, as illustrated in cross-fostering studies with two breeds of goats.

(Glasser et al., 2009)

Offspring from one breed (Damascus) were reared from birth by females from the other breed (Mamber) and vice-versa.

The preferences of the kids for high-tannin browse strongly reflected the preferences of their foster mothers.
Lambs exposed to saltbush *in utero* grow faster and handle a salt load better than lambs from mothers on grass pasture...

(Chadwick *et al.*, 2009)

...they excrete salt more rapidly, drink less water and maintain higher intake when eating saltbush.
Calves exposed to straw in utero eat more straw, digest straw better, and grow faster than calves not exposed to straw.

(Wiedmeier et al., 2012)
Cows fed straw as calves 5 years before...

✓ higher body weight/condition
✓ produced more milk
✓ shorter post-partum intervals
...when fed straw as the bulk of the diet during pregnancies from 5 to 8 years of age.

(Wiedmeier et al., 2002)
Environments influence gene expression, which influences form, function and behavior.
Food neophobia has long been neglected in studies of grazing management, as well as technical advice to livestock farmers.

When relocated on rangeland, animals that know only cultivated meadows don’t know what or what not to eat. They can be out of control for weeks, or even for the entire grazing season.

(Despret and Meuret, 2016)
Experienced farmers and herders are aware of animals’ habits and culture. They don’t relocate them from one environment to another without considering this.
“What would you do if you were unwillingly plucked off of your pretty farm in the green hills of Missouri, transported to a new ranch in the badlands of Wyoming, given a brand new set of friends, all new food, different weather, a novel landscape, and salty water? You most likely would protest and perform below your potential, at least initially.”

Jim Howell (farmer), 2005.

*Cows Have Culture Too: Understanding Livestock/Landscape Interactions.*
“...What if you had been on that same Wyoming ranch your whole life, and had been in charge of the winter country in the Red Desert all that time. You know every square foot of that place, where all the best grass patches are, the good places to take shelter in blizzards, how far you can ride out and still get back before dark, etc. You are intimate with the land.”
What price do we pay when we ignore transgenerational linkages to social and biophysical environments?
Learning the Value of Plant Mixtures for Herbivores
Explanations for why animals eat a variety of foods.
Landscapes with diverse arrays of plants are nutrition centers and pharmacies with vast arrays of primary and secondary compounds.

Nothing is more important for health through nutrition.
Livestock producers find that morbidity and mortality of stockers decrease...

...when cattle forage on diverse mixtures of forages as opposed to monoculture pastures.
Cattle learn to “clean their plates” rather than “eat the best and leave the rest”
Learning to Create Complimentary Plant Mixing at the Meal Scale
Biochemically diverse diets enable sequences that compliment one another, enhancing nutrition and health.

(Seefeldt, 2005; Mote et al., 2008)

An appetizer of bitterbrush helps the sagebrush go down.
Biochemically diverse diets enable sequences that complement one another, enhancing nutrition and health

(Lyman et al. 2011, 2012)

An appetizer of trefoil (sainfoin) helps the fescue go down.

Trefoil (tannins) → Endophyte-infected Tall Fescue (alkaloids)
Managing Grazing... from Conventional Set-stock to Management-intensive Grazing to Close Herding
Conventional continuous grazing/set-stock management paradigms and rules

Optimal stocking rate calculated from plant biomasses and nutritive values

Using fences as “Livestock-sitters”

Animals not expected to be imaginative or selective
Management-Intensive Grazing paradigms and rules (1/2)

(Gerrish, 2004)

Emphasis on managing local grazing pressure

Fencing and movement are critical facets of intensifying management

Emphasis on soil and plants responses
Some people now move livestock several times a day.

Growing emphasis on stress-free stockmanship.

Enhances plant mixing at day scale and performance of livestock.

Management-Intensive Grazing paradigms and rules (2/2)

(Gerrish, 2004)
Close herding paradigms and rules (1/2)

Acting as a guide who relies on positive reinforcement and a relationship based on mutual trust

Designing grazing circuits to create synergies among grazing patches by meal sequencing

Avoiding grazing weariness that occurs when diversity is too narrow and overly predictable

(Meuret and Provenza, 2014, 2015)
A given section of land is considered by a herder to be of good feeding value if the grazing patches to include within the circuit are effectively laid out relative to one another.

(Meuret and Provenza, 2014, 2015)
Grazing Circuits

- Stimulate appetite/intake
- Target grazing to enhance/maintain biodiversity
- Enable individuals to regulate intake of primary and secondary compounds

(Meuret and Provenza, 2015)
Offering forage diversity enables individuality
Variation among Goats

Intake of Blackbrush (Current Season’s Twigs, g/d)

80% of Goats

20% of Goats

(Provenza et al., 1990)
Variation among breeds of cattle and individuals with respect to larkspur toxicity

(Green et al., 2014)
Looking Ahead
Furthering the exchange of knowledge between farmers, herders and scientists...
Create new and complimentary “Grazing Resources”

...by rekindling our relationships with livestock and landscapes, rather than relying on fences as livestock-sitters.