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Is Habitat Use by Greater Sage-Grouse Proportional to Availability of Plant Morphotypes?

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Background

Plant and Herbivore Interactions
- Many animals select plants that are high in protein for reproductive success
- Selective foraging: Behavior where animals avoid toxins and meet nutritional needs
- Plants have defense mechanisms to deter herbivores
  - Thorns
  - Unpalatable
  - Difficult to digest
  - Produce toxic chemicals

Study System
- Greater Sage-grouse (Centrocercus urophasianus) consume 100% sagebrush (Artemisia spp.) in winter months (Patterson 1952)
- Grouse select plants that are high in protein and low in toxins (Frye et al. 2013)
- Sagebrush produce toxins known as monoterpenes as a defense toxin that can:
  - Inhibit enzymatic reactions
  - Interrupt cellular processes
  - Decrease plant digestibility
- Sage-grouse can see and smell the plant chemicals because the compounds emit light at different Wavelengths

Sagebrush Morphotypes
- Within a landscape there are different sagebrush species
  - Artemisia arbuscula and A. t. wyomingensis
- Within a sagebrush patch there are different sizes of individuals
  - Small, medium, and large (Figure 1)
- Morphotypes have distinct structural and chemical features that may influence selection below a species level

Objective

- Do Sage-grouse select specific sagebrush morphotypes?
- Do Sage-grouse maximize biomass consumed per bite or minimize toxin consumed per bite?
- How does selection change with plant density or abundance?

Hypothesis

We hypothesize that sage grouse are choosing a specific sagebrush species based on its nutritional values and low chemical concentration.

Methods

Identified Browsing at Patch Site
- Field Site: Raft River, Idaho
- Flushed radio-marked sage-grouse and identified their foraging site using tracks and fresh pellets
- Performed density counts for each morphotype of sagebrush along 10 m transects in cardinal directions (North, South, East, West)
- Recorded the volume and number of bite marks for each plant (Figure 2)
- Statistics will be done on the proportion of used plants versus available plants in the patch using a Chi-squared analysis
- Simulated bite biomass will be compared using ANOVA tests comparing each species of sagebrush

Anticipated Results

- We are evaluating if Sage-grouse browse certain morphotypes in proportion to availability.
- We are evaluating if Sage-grouse are differentially selecting morphotypes based on biomass per bite or toxin concentration per bite.
- Sage-grouse appear to be selecting medium Artemisia arbuscula, followed by small A. arbuscula (observation from data).
  - Shows that morphotypes do play a role in browsing because it has a higher quantity of bite marks
  - However, Sage-grouse can forage on A. tridentata wyomingensis.

Significance of Study

- Contributes to a growing understanding of how sage-grouse select and use habitats throughout the year
- Advances knowledge for habitat availability and landscape degradation as the distribution of morphotypes change, which may influence Sage-grouse habitat use (Figure 3)
- Provides insight about plant-herbivore interactions and how herbivores select plants to consume, based on biomass intake rates, toxin concentration, or availability of plants.

Literature Cited

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