

## 1. Specific Question and Response Variable

Research Question:

Does the observed pellet group count (as a proxy for deer abundance) vary seasonally in Black Rock Forest, and how can this variation be accounted for when using pellet counts to estimate deer populations?

Response Variable:

pellet\_count (number of pellet groups per plot). This is a count variable (discrete).

If represented in a 2D figure, pellet\_count would be on the y-axis (continuous/discrete count data).

## 2. Explanatory Variables (Fixed Effects)

Primary explanatory variables:

season (categorical: Spring, Summer, Fall, Winter) – Key variable of interest to examine seasonal variation.

year (categorical: 2014, 2015, ..., 2022) – Included to control for yearly fluctuations in deer populations.

If represented in a 2D figure:

X-axis: season (categorical) or year (categorical if plotting trends over time).

Data type: Categorical for both variables.

## 3. Other Variables Explaining Variation (Random Effects)

Potential random effects include:

plot\_id (categorical) – Each plot is surveyed multiple times across different seasons and years. Accounting for plot\_id as a random effect helps control for site-specific variations in pellet counts due to differences in habitat, terrain, or other unmeasured factors.

Other possible covariates (if available in future analyses):

Environmental factors (e.g., vegetation cover, elevation, soil type) – May influence deer movement and pellet deposition rates.

## 4. Effect of Random Effects on Regression Line

Grouping by plot\_id (random effect):

Likely to change the intercept of the regression model because some plots may have consistently higher or lower pellet counts due to environmental or landscape factors.

The slope (seasonal variation) may remain similar unless certain plots experience stronger seasonal effects (e.g., plots near food sources might show larger seasonal fluctuations in deer activity).

## 5. Statistical Approach and Considerations

Planned Analysis:

Generalized Linear Mixed Model (GLMM):

Response variable: pellet\_count (count data).

Fixed effects: season, year.

Random effect: (1 | plot\_id) to account for repeated measures.

Family:

Poisson regression: Suitable for count data but requires checking for overdispersion.

Negative Binomial regression: If overdispersion is detected, this will be used to account for extra variability.

Questions & Considerations:

How much overdispersion is present? If variance exceeds the Poisson assumption, switching to a Negative Binomial model will be necessary.

Should we include interaction terms? For example, seasonal interactions could capture if seasonal effects vary by year.

Do additional environmental covariates improve the model? If available, vegetation cover or elevation could refine predictions.