



# Twick or Tweet, Give Me Something Good to Eat

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## Introduction

The Eastern Colorado Front Range and plains region has a relatively uniform climate compared with other areas of Colorado. Important climatic features for growing crops include the abundance of sunlight and the large proportion of the annual precipitation that falls during the growing season – 70 to 80 percent during the period from April through September. We initiated a study to test whether some of Colorado's seed crops were at risk of being foraged by nearby grassland birds.

## Research Objectives

We studied birds foraging preferences with four different seeds that are common in agriculture around the Greeley area with the following objectives in mind:

- To use the amount of seed remaining in each of the 4 seed types (dryland grass seeds, sunflower seeds, jubilee corn seeds, and tender treat red corn seeds) as an indicator of the birds' perception of foraging costs (harvest cost) and predation risks.
- To determine a foraging preference among seed eating birds.

## Hypothesis

The different seed types will have different harvest costs (H in the foraging equation) for birds; therefore, birds should quit a food patch containing seed types with a higher harvest cost sooner than those with a lower harvest cost. This should also lead to the birds opting for the easier seed alternatives, with better foraging efficiencies, when located in close proximity.

If given the 4 seed options, then the birds will select preferentially from lowest harvest cost to highest in this order: tender treat red corn, jubilee corn, dryland grass seeds and sunflower seeds, in that order. We expect the sunflower seeds to have a high digestive cost with it being necessary to remove the shell before getting to the seed, and a greater cost of predation as well because of more time needed for this process. The dryland grass seeds can easily blend with and/or be buried by the sand and so again would have a greater cost of predation and missed opportunity cost because of the longer time needed for foraging. We expect that the two corns will have the lowest harvest cost, but the added attractiveness of the red corn will allow for optimal foraging efficiency over the plain jubilee corn.

## Site Description

Our research was conducted in June of 2007, at the Poudre Learning Center, an 80-acre wildlife educational facility located along the Cache la Poudre River in Greeley, Colorado. It is on 83rd avenue approximately ½ mile North of the Business Route of Highway 34. The Center includes wetland habitat, cottonwood marshes, tallgrass prairie and shortgrass prairie. We chose our site along a transect of shortgrass prairie located somewhat near a farming house to replicate an environment of grass lands located near crop fields.



Figure 1: The plot in the field at the PLC learning center



Figure 4: The rock tossing method



Figure 2a: Tender treat corn seeds



Figure 2b: Sunflower seeds

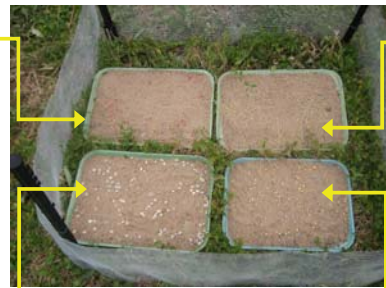


Figure 3: The individual trays containing seeds and sand inside the plot



Figure 2c: Dryland grass seeds



Figure 2d: Jubilee corn seeds

## Methods

We set up our plot for study in the shortgrass prairie ecosystem located ¼ mile directly west of the PLC headquarters building. The plot location was chosen randomly by the rock tossing method (Figure 4). Where it landed became the center of our plot. We then placed four 1 ft by 2 ft serving trays into a 2 row and 2 column pattern (with tray 2 located to the right of tray 1, and tray 3 located beneath tray 1 and tray 4 beneath tray 2). Each serving tray was filled with 2.5 kg of sand comparable to the native soil nearby. We then evenly spread approximately 20 grams of one type of seed within each tray as shown in the table below:

<b>Tray 1</b> Tender Treat Red Corn 20.03 grams or 124 seeds	<b>Tray 2</b> Dryland Grass 20.0 grams or 8000 seeds
<b>Tray 3</b> Sunflower 20.0 grams or 149 seeds	<b>Tray 4</b> Jubilee Yellow Corn 19.9 grams or 207 seeds

In order to prevent (or limit) foraging from small mammals, we surrounded our 4 seed trays with wire mesh fencing 3.5 ft wide by 3.5 ft long and 1.5 ft high. This plot was then left undisturbed for 48 hours. After the 48 hour time period, we separated the seeds from the sand in order to be counted and weighed. We recorded this information in our data table to be used for comparisons to their initial amounts.

## Results

After collecting the seeds from the site and quantifying them, we found the following:

- 64 % jubilee corn seeds remained
- 99.95 % dryland grass seeds remained
- 99.32 % sunflower seeds remained
- 100 % tender treat corn seeds remained; not a single one was missing

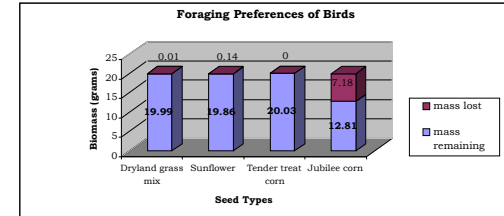


Figure 5: Biomass in grams of each seed remaining

## Discussion

We did not find any evidence of disturbances from other organisms like small mammals (raccoons or mice) or insects. No tracks, feces, or any excessive movement of the sand was evident after 48 hours. Weather was fairly consistent, warm days and cool nights. No extreme weather-- like thunderstorms or high winds -- occurred during the experiment.

Dryland grass seeds are the smallest of all the seeds in the experiment. Essentially all of these seeds remained after the 48 hour period. Though our mix of seeds included two of the most common agricultural seeds commercially grown in Weld County, the foraging cost for birds may be too high due to the grain's small size and minimal amount of nutrients.

Sunflower seeds are smaller than corn seeds and have a harder shell. The shells could present a barrier to birds or the birds may be unfamiliar with them as a food source since it is not a commonly crop in the Greeley area.

Birds removed 36% of the jubilee corn seeds, one of the most common commercial agricultural crops in Weld County. But not a single tender treat seed was removed, though they are very similar to jubilee with exception to color and mass. Jubilee corn seeds average 0.0965 g per seed, whereas tender treat seeds average 0.1615 g per seed, 1.67 times heavier. Our hypothesis predicted that since birds have well-developed eyesight, the red color of the tender treat seeds would attract them more than yellow seeds. However, since the seed is not as common, it is possible that the birds avoided it. Or since the color red can indicate presence of poison like the red berry from the lily-of-the-valley plant, perhaps the birds avoided it.

Our study coincides with the theory of optimal foraging which states that a bird should quit a food patch when the total cost of foraging (harvest) equals the benefits (Brown 1988). In other words, as the energetic cost increases, the foraging efficiency decreases, and it becomes more likely that the bird(s) will choose alternative options for foraging. The birds nearby the Poudre Learning Center, when given options, seem to follow this theory by choosing seeds that have a lower energetic cost.

## References

- Brown, J.S. 1988. Patch use as an indicator of habitat preference, predation risk, and competition. Behavioral Ecology and Sociobiology. 22: 37 – 47
- Shochat, E., S. Lerman, M. Katti and D. Lewis. 2004. Linking Optimal foraging Behavior in Bird Community Structure in an Urban-Desert Landscape: Fields Experiments and Artificial Food Patches. The American Naturalist. 164(2): 232-243.
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