The Effects of Food Quality on Preference and Incurred Risk in White-tailed Deer (*Odocoileus virginianus*)

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Abstract: An observational study was conducted in Nacogdoches County, Texas, to determine if free-range white-tailed deer (*Odocoileus virginianus*) could assess forage value. Multiple parameters were recorded to determine if individuals were willing to incur higher levels of risk as they sought to maximize their fitness, through dietary selection. Our results indicated that individuals were willing to incur higher levels of risk, in order to attain higher quality food items.

Introduction: There have been various studies which have attempted to explain the relationship between diet selection and its correlation to predation risk in ungulates. Consistent evidence supports the idea that forage selection is largely based upon maximizing fitness through selecting higher quality food items, while attempting to avoid predation (Pierce, Becky M. *et. al*. 2004, Murden, Steven and Risenhoover 1993). The relative implementation of supplemental feeding regimes have increased exponentially within the last couple decades (Bartoskewitz *et. al.* 2003). Management objectives, regarding supplemental feeding vary between increasing herd size, increasing individual's health, antler size, body mass, fawn development, as well as, altering previous movement patterns (Lewis and Rongstad 1998).

Hypothesis: We hypothesized (1) that individuals could assess the nutritional quality of food items, (2) individuals will seek to maximize fitness by acquiring higher quality food items, (3) and therefore are willing to incur higher levels of risk to do so.

Methods: Four, 0.25-acre food plots were planted in one of four possible covertypes,which included: common chicory (*Cichorium intybus*), oats (*Avena* spp.), Austrian winter pea (*Lathyrus hirsutus*), or clover (*Trifolium* spp.). Each plot was planted within at least 100 ft. of suitable cover. Each of the four plots were sampled for 10, 2-hour sessions, prior to dusk. Parameters, which included: time, group size, survey time (before entering plot), sex, age, number of reentries, duration of time in plot, and number of spooks (cease in current feeding behavior), were recorded for each sample. Mean values were compared to the crude protein content of each covertype.

Table 1. Average Values sampled from White-tailed deer (*Odocoileus virginianus*) for Four Different Covertypes in Nacogdoches County, Texas; 10.5.2009-11.20.2009

Covertype	# Ind. Sampled (n)	Avg. Entry Time (P.M.)	Avg. Group Size	Avg. Spooks	Avg. Re-entries	Avg. Survey Time (sec.)	Avg. Sex Ratio		Avg. Age* Ratio		Avg. Duration (min.)
							M	F	J	A	
winter pea	26	5:28	4.78	3.90	0.77	22.00	0.15	0.85	0.52	0.48	5.00
chickory	30	5:47	4.77	4.30	0.84	19.00	0.23	0.77	0.47	0.53	5.37
clover	31	5:46	3.03	2.10	0.90	18.00	0.29	0.71	0.42	0.58	6.13
oats	17	5:36	2.82	1.90	0.33	31.00	0.24	0.76	0.65	0.35	2.12

* Age distinguises Juvenile from Adult

Table 2. Crude Protein Content of 4 Supplemental Forages Planted in 0.25-acre Plots in Nacogdoches County, TX; 9.6.2009

Covertype	Crude Protein (%)
clover	24-35
winter peas	18-20
chicory	25-30
oats	14-16

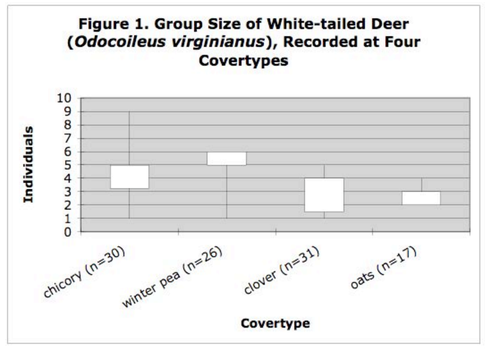

Figure 1. Group Size of White-tailed Deer (*Odocoileus virginianus*), Recorded at Four Covertypes

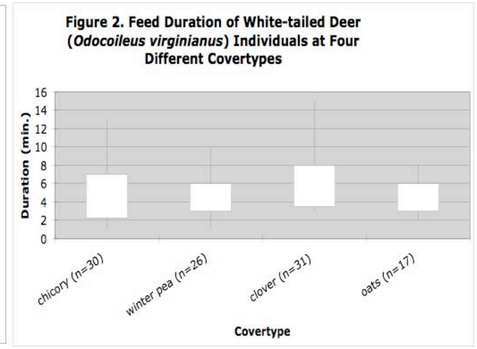

Figure 2. Feed Duration of White-tailed Deer (*Odocoileus virginianus*) Individuals at Four Different Covertypes

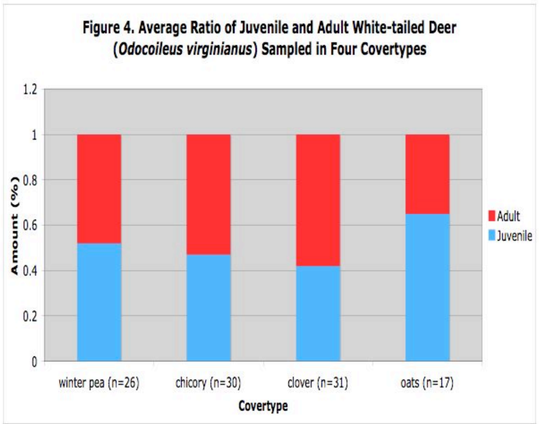

Figure 4. Average Ratio of Juvenile and Adult White-tailed Deer (*Odocoileus virginianus*) Sampled in Four Covertypes

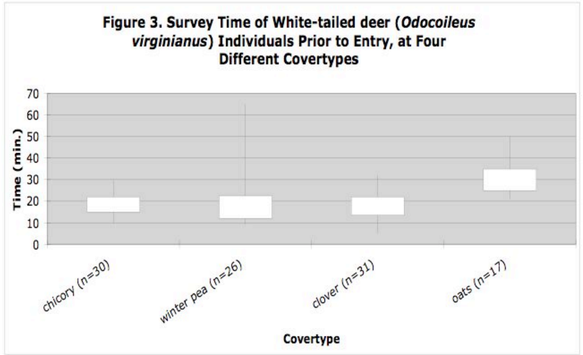

Figure 3. Survey Time of White-tailed deer (*Odocoileus virginianus*) Individuals Prior to Entry, at Four Different Covertypes

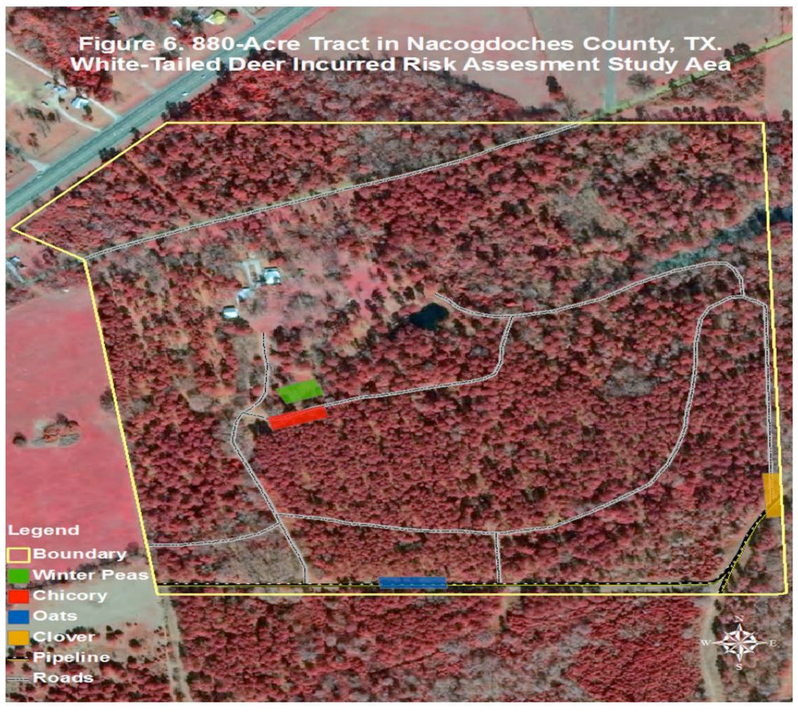

Figure 6. 880-Acre Tract in Nacogdoches County, TX. White-Tailed Deer Incurred Risk Assesment Study Aea

Conclusion: Our results indicate a consistent trend that white-tailed deer may be willing to incur higher levels of risk to attain forage, which had a higher crude protein content. Crude protein content was significantly higher in both clover and chicory covertypes (Table 2). Our observations concluded that individuals were willing to spend less time surveying the area while spending more time feeding, thereby increasing there chances of predation (Figure 3). Considering the average survey time and average duration feeding was marginally different than winter pea and significantly different than oats, we concluded that individuals are more willing to incur higher levels of risk to feed on the higher quality forages (Table 1). Average group size was least, in both the oats and clover covertypes (Figure 1). Considering that significantly fewer individuals frequented the oats, as compared to the other covertypes, we assumed that the average group size at the oats may be more a function of the fewer visitations, rather than being a true predictor of incurred risk. This assumption is further supported by evidence that the majority of individuals who visited the oats were juveniles, lending to the idea that with an increase in youth, there is a general increase in naivety (Figure 4). These individuals may not fully comprehend the risk-benefit exchange, modeled by their mature conspecifics or perhaps the dietary demands for yearling white-tailed deer differ from adults. The relationship between incurred risk and food quality is undoubtedly one of high variability. We assessed a relationship between crude protein content and risk; however, individuals require a variety of nutrients, including general carbohydrates, phosphorous, calcium, and sodium. Different developmental stages throughout the life of white-tailed deer require differing amounts of nutrients (Berteaux *et. al* 1998). The nutrient requirements of ungulates are highly dynamic and vary temporally (Pierce *et. al* 2004). While white-tailed deer in the southern United States prefer foods high in protein during the summer, this is not necessarily true throughout the year. Osborn and Jenks (1998) reported that white-tailed deer benefit minimally from supplemental feeding regimes when the population is below carrying capacity. If white-tailed deer do not attain significant benefits from supplemental feeding regimes it may contradict the principle tested in this study. In general, our observations indicated a positive correlation between crude protein content and incurred risk. Further experimentation should be conducted to account for seasonal and developmental changes in diet.

Literature Cited

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