



# 2004 EPA STAR Graduate Fellowship Conference Next Generation Scientists—Next Opportunities

## Effects of Habitat Fragmentation and Nest Predation on Maternal Stress in a Neotropical Migratory Bird

### Overview

Habitat fragmentation is an important factor limiting breeding populations of Neotropical migratory birds. Habitat edges and openings, especially in fragmented landscapes, attract a variety of predators that eat or destroy nest contents and force birds to renest or forgo further breeding attempts within a season. Nest predation decreases reproductive success, and predation-induced renesting likely imposes physiological constraints on females, due to the increased energetic effort required to renest.

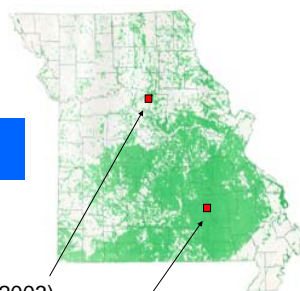


To understand the impact of nest predation and the consequences to reproduction and survival I measured maternal body condition, stress hormone levels (corticosterone), and reproductive output of female Indigo Buntings (*Passerina cyanea*) breeding in an unfragmented and a fragmented landscape in central Missouri.

### Research Highlights

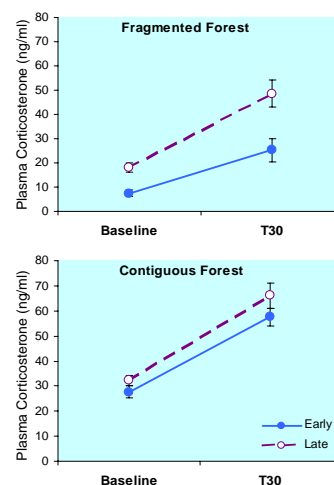
### Methods

- 39 females sampled in fragmented forest (2003).
- 102 females sampled in unfragmented forest (2000-2002).
- Body measurements of parents and 6-day old offspring.
- Blood collected within 1-5 minutes of capture (baseline corticosterone) and at 30 minutes post-capture (acute stress response).
- Productivity measures: clutch size, nestling quality of 6-day old nestlings, # inviable eggs, mean number of fledglings produced per female.



### Results

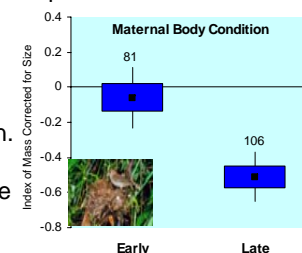
Both populations are largely single-brooded (97%), however the effort to produce a single brood varied considerably. Most females finished reproduction by mid-late July in the unfragmented landscape while females continued attempts to produce one successful brood into September in the fragmented landscape. The proportion of successful nests was higher in the unfragmented landscape (46.8%, 175/374) compared to the fragmented landscape (31.6%, 32/101). However, the percent of territories that eventually



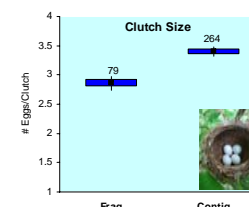
**Figure 1.** Baseline and acute plasma corticosterone levels of females nesting in fragmented forests differ significantly with nest attempt ( $F = 19.32$ ,  $p = 0.0001$ ).

produced fledglings differed only slightly between landscapes (45.1% in unfragmented, 38.8% in fragmented) reflecting the importance of renesting on season-long productivity.

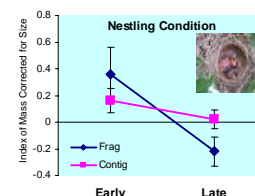
However, females that renested one or more times after nest predation had higher corticosterone levels (Figure 1) and lower body condition indices than females that nested once successfully (Figure 2). Maternal body condition was also lower overall in the fragmented landscape than in the unfragmented landscape. Among renesting females in both populations, baseline and acute corticosterone levels were negatively related to body condition. Additionally, clutch sizes and nestling condition were lower at late nests and in the fragmented landscape (Figures 3 and 4).



**Figure 2.** Maternal body condition is significantly lower for renesting females ( $F = 5.63$ ,  $p = 0.01$ ).



**Figure 3.** Clutch size is significantly lower in fragmented forests ( $F = 14.16$ ,  $p = 0.0004$ ).



**Figure 4.** Nestling condition tends to decrease more sharply at re-nests in fragmented forests ( $F = 3.49$ ,  $p = 0.06$ ).

### Impact

This research suggests that increased nesting attempts, particularly in fragmented forests, elicit stress in female buntings and this results in decreased productivity and offspring quality. Additionally, this study investigates methods of measuring condition and stress hormones that may be useful in assessing stressor-response scenarios related to habitat loss, fragmentation, environmental contaminants, and species reintroductions.

### Acknowledgments

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