

days of hatching. When nestlings were present, we described their physical appearance to age them (Podlesak and Blem 2002). On day 6, 7, or 8 post-hatching, we measured each nestling's tarsus (mm) and body mass (to the nearest 0.01 g) and banded him/her with a numbered aluminum leg band

(U.S. Geological Survey). After fledging, breeding pairs were monitored to determine their re-nesting status and attempts at second broods. For females that attempted a second brood after successfully fledging a first brood, we calculated the total number of fledglings produced in a season.

Adult Baseline Stress Hormones

Each season, at least four focal adult pairs from each subplot (≥ 16 pairs per site; 50% males and 50% females) were captured and bled for baseline plasma stress hormones (i.e., corticosterone). Focal adults were always captured and bled prior to nestling banding. If a bird had also been randomly chosen as a focal male for behavioral observations, he was not observed and bled on the same day. We placed mist-nets in front of nest boxes to capture adults as they arrived to feed their nestlings. Small blood samples ($\leq 40 \mu\text{l}$) were taken from the brachial vein within 3 min of capture (Wingfield et al. 1982) via heparinized microcapillary tubes, sealed with clay on one end of the tube, and stored on ice for ≤ 8 hrs. We then centrifuged samples for 11 mins, extracted the plasma, and stored samples individual-

Table 1. Classification of foraging movements and prey attack maneuvers made by male Prothonotary Warblers during focal behavioral observations in 2010. Classifications based on Holmes & Robinson (1988).

Foraging Movements	
Walking	Used at least one leg at a time for support
Hopping	Both feet off the ground but wings were not used; includes jumps
Flight	Used their wings and took flight while searching for food
Prey Attack Maneuvers	
Sally strike	Caught prey in flight and consumed it while continuing to fly
Sally hover	Caught prey during hover-like flight
Glean	Removed prey item from surface of plant, fallen log, or the ground
Probe	Inserted bill into tree cavity or the ground

Table 2. Behavioral responses (song, foraging movement, and prey attack rates) of male Prothonotary Warblers in relation to neighbor density, nest stage, male age, and the density x stage interaction during first nesting attempts in 2010 in southern Illinois. Results are from generalized linear mixed models. Each behavioral response count was modeled as a Poisson distribution with the log of observation time specified as an offset variable for the linear predictor.

	Song Rate			Hop/Walk Rate			Flight Rate			Prey Attack Rate		
	<i>F</i>	<i>P</i>	<i>df</i>	<i>F</i>	<i>P</i>	<i>df</i>	<i>F</i>	<i>P</i>	<i>df</i>	<i>F</i>	<i>P</i>	<i>df</i>
Neighbor density	1.25	0.29	1, 9	2.87	0.12	1, 9	0.75	0.41	1, 9	0.23	0.64	1, 9
Nest stage	1.27	0.33	2, 9	11.14	0.003	2, 9	1.47	0.28	2, 9	2.30	0.15	2, 9
Male age	3.58	0.09	1, 9	1.32	0.28	1, 9	0.30	0.60	1, 9	1.81	0.21	1, 9
Density x stage	2.28	0.15	2, 9	6.09	0.021	2, 9	0.77	0.49	2, 9	2.64	0.12	2, 9

Table 3. Results of generalized linear mixed models comparing correlates of Prothonotary Warbler annual reproductive output to conspecific neighbor density, year, ordinal date, density x year, and density x ordinal date.

	Clutch Size (n = 377)		Hatching Success (n = 371)		Fledging Success (n = 365)		Attempts at 2nd Brood (n = 286)		Total Annual Fledgling Production ^a (n = 85)	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
Neighbor density	0.04	0.84	0.12	0.73	1.97	0.16	0.48	0.49	0.34	0.57
Year	0.01	0.99	3.66	0.014	0.41	0.74	1.02	0.39	1.75	0.23
Ordinal date	0.89	0.35	0.04	0.84	2.59	0.11	11.92	0.001	4.65	0.06
Density x year	0.01	0.99	2.24	0.09	0.66	0.58	0.18	0.91	0.69	0.58
Density x ordinal date	0.08	0.77	0.08	0.78	1.97	0.16	0.54	0.46	0.36	0.56
Cowbird parasitism status ^b	-	-	18.73	<0.0001	-	-	-	-	-	-

^aOnly females that successfully raised a first brood and attempted a second brood are included in this analysis.

^bCowbird parasitism status was included as a fixed effect for the hatching success model only.