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Supplementary material

Appendix 1

Nest predator index and experimental procedures.

We measured nest predator abundance directly from 1986-1995 (Holmes 2011, Table A1). However, to extend this predator abundance estimate to the first three years of our study (1983-85), when nest predator abundance was not measured directly, we estimated sciurid abundance using a linear regression model based on black-throated blue warbler nest success data from Hubbard Brook as a measure of nest predation rates in those years. Specifically, we regressed this predator abundance index for the 16 years it was available (1986-2001; Holmes 2011) against black-throated blue warbler (BTBW) annual nesting success as estimated using the Mayfield Method (all BTBW nests, and total length of nestling period = 21.5 days, i.e., 13 incubation and 8.5 nestling days; Table A1), giving the equation nest predator abundance = 8.711 - 10.173*BTBW nesting success ($P < 0.05$). For the years 1983-1985, we obtained estimates of black-throated blue warbler nesting success from Rodenhouse (1986, Table 18), but he used a 24-day nesting period, which we corrected to a 21.5-day period for use in this equation: 21.5-day nest survival = $DNS^{21.5}$, where DNS = $e^{\{\ln[(24\text{-day nest survival}]/24\}}$, e = base of natural logarithms and ln = logarithm base e. These 21.5-day nesting success estimates for 1982-1985 were then entered into the regression equation above to estimate what nest predator (sciurids) abundances would have been in those three summer nesting seasons based on BTBW nesting success in these three years.

Population density of American redstarts at Hubbard Brook was measured as the total number of redstart males (After-Second-Year = ASY plus Second-Year = SY) in the 180-ha study area, as described in Study Area section of the main paper. The results are given in Table A2).

The sample design for experimentally protecting nests against scansorial predators was to baffle about half the nests (every other nest, roughly in the temporal order discovered) off the 34-ha plot in the years 1985-1995 (except 1990). Two kinds of baffles were used, depending on tree DBH: a downward facing conical baffle (such as often affixed below bird feeders) on small trees (DBH < ~10 cm) or an aluminum sleeve ~50 cm wide wrapped tightly against the tree trunk and fastened (as were the conical baffles) with sheet metal screws (Fig. 1). Upon installation, all baffles were spray-painted with non-glossy gray and brown splotches for camouflage, so as to reduce the likelihood that visually oriented, widely ranging predators (like blue jays) could find enough baffled tree nests to learn to associate baffles with nests. Normally baffles were placed just on the one tree in which a nest was built by an American redstart. However, in a few cases more than one tree was baffled (as in Fig. 1) because of closely interdigitating vegetation from multiple nearby trees that could have otherwise provided easy access to the nest tree by a scansorial predator.

Literature Cited

Holmes R. T. 2011. Avian population and community processes in forest ecosystems: long-term research in the Hubbard Brook Experimental Forest. *Forest Ecol. Manage.* **262**: 20-32.

Powell L. A. 2007. Approximating variance of demographic parameters using the delta method: a reference for avian biologists. *Condor* **109**: 949-954.

Rodenhouse N. L. 1986. Food limitation for forest passerines: effects of natural and experimental food reductions. - Ph.D. dissertation, Dartmouth College, Hanover, NH, USA.

Table A1. Nest-predator estimate (mean number of red squirrels plus eastern chipmunks observed per hour) in Hubbard Brook Experimental Forest, NH, 1983-2001, both observed directly (1986-2001; from Holmes 2011) and extrapolated using data on predation losses of Black-throated Blue Warbler (BTBW) nests for the years 1983-1985; see supplemental text). The 21.5-day Black-throated Blue Warbler nest survival data for years 1986-2001 (column 4) from RTH, unpubl. data (pooled incubation plus nestling stages).

Year	24-d BTBW Nest survival[a]	Nest-predator index	21.5-d BTBW Nest Survival (No. nests)
1983	0.59	2.4[b]	0.623[c] (46)
1984	0.79	0.5[b]	0.810[c] (34)
1985	0.48	3.4[b]	0.518[c] (51)
1986		6	0.711 (21)
1987		1.7	0.623 (47)
1988		0.3	0.632 (38)
1989		2.2	0.496 (39)
1990		1.3	0.514 (44)
1991		0	0.871 (44)
1992		7.6	0.332 (67)
1993		3.5	0.402 (44)
1994		2	0.673 (32)
1995		4.6	0.422 (39)
1996		1.2	0.604 (33)
1997		6.1	0.493 (58)

1998	0.7	0.577 (63)
1999	6.1	0.472 (82)
2000	1.2	0.514 (69)
2001	4.7	0.528 (43)

[a] Data from Rodenhouse (1986): Black-throated Blue Warbler nest survival from his Table 18, and no. nests from his Table 20.

[b] Calculated from regression equation--see Supplemental Materials text.

[c] Calculated from column 2 (24-day nest survival) for years 1983-1985 using the equation 21-day nest survival = daily nest survival$^{21.5}$ = $\{e^{[\ln(\text{24-day nest survival})/24)]}\}^{21.5}$, where e = base of natural logarithms; see Supplemental Material text.

Table A2. Annual American redstart density per ha based on surveys of 180-ha portion of study area in mid-June, annual nest success estimates from Program MARK and the number of nests each year in the baffle and control treatment groups. Annual nest success was estimated by raising the daily nest survival estimates to 20, the combined length of the incubation and nestling periods on average. Standard errors of the nest success estimate were obtained using the Delta Method (Powell 1997).

Year	Density	Nest success (mean $\pm$ SE)	No. Baffled Nests	No. Control Nests
1983	0.867	0.24 $\pm$ 0.07	0	38
1984	0.467	0.52 $\pm$ 0.08	0	32

1985	0.589	0.46 ± 0.10	8	26
1986	0.439	0.66 ± 0.08	9	39
1987	0.372	0.61 ± 0.10	4	34
1988	0.361	0.78 ± 0.09	10	32
1989	0.350	0.47 ± 0.11	12	29
1990	0.472	0.61 ± 0.07	0	53
1991	0.428	0.64 ± 0.08	4	40
1992	0.528	0.35 ± 0.06	6	58
1993	0.356	0.19 ± 0.06	10	43
1994	0.233	0.49 ± 0.12	6	22
1995	0.222	0.36 ± 0.12	2	20