Yearly estimates of abundance and realized demographic rates of black-throated blue warblers

(*Setophaga caerulescens*) breeding at the trailing edge of the range in North Carolina (Trailing)

and core of the range in New Hampshire (Core). Models were run separately for each of the six

study plots. Median and 95% credible intervals are shown for estimates of yearly abundance (N),

population growth rate (λ), per-capita recruitment rate (γ), and apparent survival rate (φ).

Estimates of apparent survival are averaged estimates of second-year and after-second-year

apparent survival. Estimates were generated from the models allowing for a temporal trend on

recruitment and apparent survival. Note that estimates of population growth, per-capita

recruitment, and apparent survival are from the noted year to the next. Estimates are from

Bayesian analyses in Lewis, W. B., R. J. Cooper, R. B. Chandler, R. W. Chitwood, M. H. Cline,

M. T. Hallworth, J. L. Hatt, J. Hepinstall-Cymerman, S. A. Kaiser, N. L. Rodenhouse, T. S.

Sillett, K. W. Stodola, M. S. Webster, and R. T. Holmes. Climate-mediated population dynamics

of a migratory songbird differ between the trailing edge and range core. Submitted to *Ecological*

Monographs.

Range Position	Elevation	Parameter	Year	Lower CI	Median	Upper CI
Trailing	Low	N	2002	8	12	19
Trailing	Low	N	2003	8	10	15
Trailing	Low	N	2004	6	8	12
Trailing	Low	N	2005	6	7	9
Trailing	Low	N	2006	3	4	7
Trailing	Low	N	2007	6	6	9
Trailing	Low	N	2008	5	6	8

Trailing	Low	N	2009	0	3	7
Trailing	Low	N	2010	0	2	7
Trailing	Low	N	2011	0	1	6
Trailing	Low	N	2012	0	1	5
Trailing	Low	N	2013	0	0	4
Trailing	Low	N	2014	0	0	3
Trailing	Low	N	2015	0	0	2
Trailing	Low	N	2016	0	0	1
Trailing	Low	N	2017	0	0	0
Trailing	Low	N	2018	0	0	0
Trailing	Mid	N	2002	10	12	15
Trailing	Mid	N	2003	10	11	14
Trailing	Mid	N	2004	6	9	13
Trailing	Mid	N	2005	12	13	15
Trailing	Mid	N	2006	11	13	16
Trailing	Mid	N	2007	13	14	17
Trailing	Mid	N	2008	6	7	10
Trailing	Mid	N	2009	7	8	10
Trailing	Mid	N	2010	9	10	12
Trailing	Mid	N	2011	9	10	12
Trailing	Mid	N	2012	10	11	13
Trailing	Mid	N	2013	8	9	11
Trailing	Mid	N	2014	7	8	10

Trailing	Mid	N	2015	6	6	8
Trailing	Mid	N	2016	6	6	8
Trailing	Mid	N	2017	3	4	6
Trailing	Mid	N	2018	5	5	6
Trailing	Mid	N	2019	4	4	5
Trailing	High	N	2003	17	20	25
Trailing	High	N	2004	15	17	21
Trailing	High	N	2005	16	18	22
Trailing	High	N	2006	16	18	22
Trailing	High	N	2007	17	19	23
Trailing	High	N	2008	16	18	22
Trailing	High	N	2009	12	14	17
Trailing	High	N	2010	19	20	23
Trailing	High	N	2011	17	19	22
Trailing	High	N	2012	14	16	19
Trailing	High	N	2013	16	17	20
Trailing	High	N	2014	17	18	21
Trailing	High	N	2015	15	18	22
Trailing	High	N	2016	22	23	26
Trailing	High	N	2017	17	20	23
Trailing	High	N	2018	16	18	22
Trailing	High	N	2019	13	15	18
Core	Low	N	2002	8	9	11

Core	Low	N	2003	10	11	13
Core	Low	N	2004	8	9	12
Core	Low	N	2005	23	24	27
Core	Low	N	2006	23	25	29
Core	Low	N	2007	29	31	35
Core	Low	N	2008	22	24	28
Core	Low	N	2009	20	23	26
Core	Low	N	2010	20	22	25
Core	Low	N	2011	12	14	17
Core	Low	N	2012	19	21	25
Core	Low	N	2013	22	24	28
Core	Low	N	2014	34	36	40
Core	Low	N	2015	26	27	31
Core	Mid	N	2002	40	43	46
Core	Mid	N	2003	40	43	48
Core	Mid	N	2004	43	46	50
Core	Mid	N	2005	52	55	59
Core	Mid	N	2006	65	68	72
Core	Mid	N	2007	59	63	68
Core	Mid	N	2008	54	58	63
Core	Mid	N	2009	61	64	69
Core	Mid	N	2010	52	56	61
Core	Mid	N	2011	38	41	46

Core	Mid	N	2012	66	70	75
Core	Mid	N	2013	58	62	68
Core	Mid	N	2014	72	76	81
Core	Mid	N	2015	62	66	72
Core	High	N	2002	26	27	30
Core	High	N	2003	30	33	36
Core	High	N	2004	28	30	34
Core	High	N	2005	27	29	32
Core	High	N	2006	31	33	37
Core	High	N	2007	37	39	43
Core	High	N	2008	36	39	43
Core	High	N	2009	30	33	36
Core	High	N	2010	25	28	31
Core	High	N	2011	18	21	25
Core	High	N	2012	34	36	40
Core	High	N	2013	30	34	39
Core	High	N	2014	37	40	44
Core	High	N	2015	34	36	39
Trailing	Low	λ	2002	0.73	0.97	1.31
Trailing	Low	λ	2003	0.71	0.91	1.16
Trailing	Low	λ	2004	0.69	0.85	1.04
Trailing	Low	λ	2005	0.65	0.80	0.96
Trailing	Low	λ	2006	0.59	0.76	0.91

Trailing	Low	λ	2007	0.51	0.72	0.88
Trailing	Low	λ	2008	0.44	0.69	0.86
Trailing	Low	λ	2009	0.36	0.66	0.85
Trailing	Low	λ	2010	0.30	0.62	0.85
Trailing	Low	λ	2011	0.24	0.59	0.85
Trailing	Low	λ	2012	0.20	0.57	0.86
Trailing	Low	λ	2013	0.16	0.54	0.88
Trailing	Low	λ	2014	0.13	0.52	0.90
Trailing	Low	λ	2015	0.10	0.50	0.94
Trailing	Low	λ	2016	0.08	0.49	0.99
Trailing	Low	λ	2017	0.07	0.47	1.06
Trailing	Mid	λ	2002	0.89	1.00	1.13
Trailing	Mid	λ	2003	0.89	0.99	1.11
Trailing	Mid	λ	2004	0.89	0.98	1.09
Trailing	Mid	λ	2005	0.90	0.97	1.06
Trailing	Mid	λ	2006	0.90	0.97	1.04
Trailing	Mid	λ	2007	0.90	0.96	1.02
Trailing	Mid	λ	2008	0.90	0.95	1.01
Trailing	Mid	λ	2009	0.90	0.95	0.99
Trailing	Mid	λ	2010	0.89	0.94	0.98
Trailing	Mid	λ	2011	0.89	0.94	0.98
Trailing	Mid	λ	2012	0.87	0.93	0.99
Trailing	Mid	λ	2013	0.86	0.93	0.99

Trailing	Mid	λ	2014	0.84	0.93	1.00
Trailing	Mid	λ	2015	0.83	0.92	1.02
Trailing	Mid	λ	2016	0.81	0.92	1.04
Trailing	Mid	λ	2017	0.80	0.92	1.06
Trailing	Mid	λ	2018	0.78	0.92	1.09
Trailing	High	λ	2003	0.89	0.99	1.10
Trailing	High	λ	2004	0.90	0.99	1.09
Trailing	High	λ	2005	0.91	0.99	1.07
Trailing	High	λ	2006	0.92	0.99	1.06
Trailing	High	λ	2007	0.94	0.99	1.05
Trailing	High	λ	2008	0.95	0.99	1.04
Trailing	High	λ	2009	0.95	0.99	1.03
Trailing	High	λ	2010	0.96	0.99	1.03
Trailing	High	λ	2011	0.96	1.00	1.03
Trailing	High	λ	2012	0.96	1.00	1.04
Trailing	High	λ	2013	0.95	1.00	1.05
Trailing	High	λ	2014	0.94	1.00	1.06
Trailing	High	λ	2015	0.93	1.00	1.08
Trailing	High	λ	2016	0.92	1.00	1.09
Trailing	High	λ	2017	0.91	1.01	1.11
Trailing	High	λ	2018	0.90	1.01	1.13
Core	Low	λ	2002	1.03	1.17	1.34
Core	Low	λ	2003	1.03	1.15	1.29

Core	Low	λ	2004	1.03	1.13	1.25
Core	Low	λ	2005	1.03	1.11	1.21
Core	Low	λ	2006	1.03	1.10	1.18
Core	Low	λ	2007	1.02	1.08	1.14
Core	Low	λ	2008	1.02	1.06	1.11
Core	Low	λ	2009	1.00	1.05	1.09
Core	Low	λ	2010	0.98	1.03	1.08
Core	Low	λ	2011	0.95	1.02	1.08
Core	Low	λ	2012	0.92	1.00	1.08
Core	Low	λ	2013	0.89	0.99	1.09
Core	Low	λ	2014	0.86	0.98	1.10
Core	Mid	λ	2002	0.98	1.06	1.15
Core	Mid	λ	2003	0.99	1.06	1.13
Core	Mid	λ	2004	0.99	1.05	1.11
Core	Mid	λ	2005	1.00	1.04	1.09
Core	Mid	λ	2006	1.00	1.04	1.08
Core	Mid	λ	2007	1.00	1.03	1.06
Core	Mid	λ	2008	1.00	1.03	1.05
Core	Mid	λ	2009	1.00	1.02	1.05
Core	Mid	λ	2010	0.99	1.02	1.05
Core	Mid	λ	2011	0.97	1.01	1.05
Core	Mid	λ	2012	0.96	1.01	1.06
Core	Mid	λ	2013	0.94	1.01	1.07

Core	Mid	λ	2014	0.93	1.00	1.07
Core	High	λ	2002	0.93	1.01	1.12
Core	High	λ	2003	0.93	1.01	1.10
Core	High	λ	2004	0.94	1.01	1.09
Core	High	λ	2005	0.95	1.01	1.07
Core	High	λ	2006	0.96	1.01	1.06
Core	High	λ	2007	0.97	1.01	1.05
Core	High	λ	2008	0.98	1.01	1.05
Core	High	λ	2009	0.98	1.01	1.05
Core	High	λ	2010	0.97	1.01	1.06
Core	High	λ	2011	0.96	1.01	1.07
Core	High	λ	2012	0.95	1.02	1.09
Core	High	λ	2013	0.94	1.02	1.11
Core	High	λ	2014	0.92	1.02	1.13
Trailing	Low	γ	2002	0	0.14	0.45
Trailing	Low	γ	2003	0.21	0.34	0.56
Trailing	Low	γ	2004	0.17	0.27	0.44
Trailing	Low	γ	2005	0.11	0.17	0.33
Trailing	Low	γ	2006	0.83	1.30	2.00
Trailing	Low	γ	2007	0	0.17	0.43
Trailing	Low	γ	2008	0	0.24	0.83
Trailing	Low	γ	2009	0	0.41	2.00
Trailing	Low	γ	2010	0	0.32	2.00

Trailing	Low	γ	2011	0	0.24	2.00
Trailing	Low	γ	2012	0	0.17	1.33
Trailing	Low	γ	2013	0	0.12	1.00
Trailing	Low	γ	2014	0	0.07	1.00
Trailing	Low	γ	2015	0	0.03	0.50
Trailing	Low	γ	2016	0	0	0
Trailing	Low	γ	2017	0	0	0
Trailing	Mid	γ	2002	0.15	0.42	0.77
Trailing	Mid	γ	2003	0.33	0.50	0.75
Trailing	Mid	γ	2004	0.43	0.80	1.33
Trailing	Mid	γ	2005	0.33	0.46	0.67
Trailing	Mid	γ	2006	0.35	0.58	0.82
Trailing	Mid	γ	2007	0.00	0.07	0.20
Trailing	Mid	γ	2008	0.44	0.71	1.14
Trailing	Mid	γ	2009	0.60	0.86	1.13
Trailing	Mid	γ	2010	0.36	0.56	0.78
Trailing	Mid	γ	2011	0.58	0.78	1.00
Trailing	Mid	γ	2012	0.23	0.30	0.45
Trailing	Mid	γ	2013	0.40	0.50	0.75
Trailing	Mid	γ	2014	0.33	0.56	0.71
Trailing	Mid	γ	2015	0.50	0.71	1.00
Trailing	Mid	γ	2016	0.38	0.50	0.71
Trailing	Mid	γ	2017	0.40	1.00	1.33

Trailing	Mid	γ	2018	0.50	0.80	0.80
Trailing	High	γ	2003	0.15	0.32	0.56
Trailing	High	γ	2004	0.47	0.61	0.81
Trailing	High	γ	2005	0.38	0.47	0.61
Trailing	High	γ	2006	0.29	0.39	0.53
Trailing	High	γ	2007	0.18	0.25	0.38
Trailing	High	γ	2008	0.15	0.23	0.35
Trailing	High	γ	2009	0.67	0.85	1.00
Trailing	High	γ	2010	0.14	0.16	0.26
Trailing	High	γ	2011	0.27	0.33	0.43
Trailing	High	γ	2012	0.37	0.47	0.57
Trailing	High	γ	2013	0.45	0.53	0.63
Trailing	High	γ	2014	0.50	0.59	0.72
Trailing	High	γ	2015	0.47	0.65	0.81
Trailing	High	γ	2016	0.32	0.38	0.46
Trailing	High	γ	2017	0.26	0.37	0.50
Trailing	High	γ	2018	0.19	0.32	0.44
Core	Low	γ	2002	0.45	0.63	0.88
Core	Low	γ	2003	0.33	0.40	0.60
Core	Low	γ	2004	1.73	2.11	2.63
Core	Low	γ	2005	0.50	0.57	0.67
Core	Low	γ	2006	0.57	0.68	0.81
Core	Low	γ	2007	0.30	0.39	0.48

Core	Low	γ	2008	0.59	0.71	0.83
Core	Low	γ	2009	0.44	0.56	0.68
Core	Low	γ	2010	0.35	0.43	0.55
Core	Low	γ	2011	1.12	1.40	1.69
Core	Low	γ	2012	0.63	0.76	0.95
Core	Low	γ	2013	0.89	1.08	1.25
Core	Low	γ	2014	0.40	0.47	0.54
Core	Mid	γ	2002	0.51	0.58	0.66
Core	Mid	γ	2003	0.60	0.67	0.75
Core	Mid	γ	2004	0.63	0.70	0.78
Core	Mid	γ	2005	0.66	0.71	0.77
Core	Mid	γ	2006	0.40	0.44	0.49
Core	Mid	γ	2007	0.47	0.52	0.57
Core	Mid	γ	2008	0.54	0.61	0.68
Core	Mid	γ	2009	0.34	0.39	0.44
Core	Mid	γ	2010	0.31	0.34	0.40
Core	Mid	γ	2011	1.09	1.23	1.37
Core	Mid	γ	2012	0.37	0.42	0.47
Core	Mid	γ	2013	0.71	0.79	0.86
Core	Mid	γ	2014	0.30	0.33	0.36
Core	High	γ	2002	0.57	0.64	0.73
Core	High	γ	2003	0.28	0.31	0.39
Core	High	γ	2004	0.42	0.47	0.54

Core	High	γ	2005	0.56	0.64	0.71
Core	High	γ	2006	0.47	0.53	0.61
Core	High	γ	2007	0.32	0.36	0.43
Core	High	γ	2008	0.29	0.35	0.42
Core	High	γ	2009	0.34	0.42	0.52
Core	High	γ	2010	0.32	0.40	0.52
Core	High	γ	2011	1.12	1.35	1.61
Core	High	γ	2012	0.53	0.61	0.71
Core	High	γ	2013	0.49	0.61	0.73
Core	High	γ	2014	0.37	0.45	0.53
Trailing	Low	φ	2002	0.46	0.75	1.00
Trailing	Low	φ	2003	0.25	0.46	0.73
Trailing	Low	φ	2004	0.4	0.57	0.83
Trailing	Low	φ	2005	0.25	0.46	0.71
Trailing	Low	φ	2006	0.17	0.32	0.67
Trailing	Low	φ	2007	0.56	0.74	1.00
Trailing	Low	φ	2008	0	0.26	0.67
Trailing	Low	φ	2009	0	0.35	1.00
Trailing	Low	φ	2010	0	0.29	1.00
Trailing	Low	φ	2011	0	0.22	1.00
Trailing	Low	φ	2012	0	0.17	1.00
Trailing	Low	φ	2013	0	0.12	1.00
Trailing	Low	φ	2014	0	0.08	1.00

Trailing	Low	φ	2015	0	0.05	1.00
Trailing	Low	φ	2016	0	0	0
Trailing	Low	φ	2017	0	0	0
Trailing	Mid	φ	2002	0.25	0.54	0.82
Trailing	Mid	φ	2003	0.09	0.30	0.58
Trailing	Mid	φ	2004	0.44	0.64	0.88
Trailing	Mid	φ	2005	0.43	0.54	0.69
Trailing	Mid	φ	2006	0.38	0.50	0.69
Trailing	Mid	φ	2007	0.33	0.46	0.62
Trailing	Mid	φ	2008	0.22	0.33	0.57
Trailing	Mid	φ	2009	0.30	0.43	0.71
Trailing	Mid	φ	2010	0.36	0.44	0.64
Trailing	Mid	φ	2011	0.25	0.33	0.56
Trailing	Mid	φ	2012	0.38	0.50	0.64
Trailing	Mid	φ	2013	0.27	0.38	0.50
Trailing	Mid	φ	2014	0.22	0.29	0.50
Trailing	Mid	φ	2015	0.13	0.17	0.50
Trailing	Mid	φ	2016	0.00	0.00	0.33
Trailing	Mid	φ	2017	0.40	0.67	1.00
Trailing	Mid	φ	2018	0.00	0.00	0.40
Trailing	High	φ	2003	0.33	0.53	0.74
Trailing	High	φ	2004	0.29	0.44	0.63
Trailing	High	φ	2005	0.41	0.53	0.70

Trailing	High	φ	2006	0.55	0.65	0.78
Trailing	High	φ	2007	0.57	0.68	0.82
Trailing	High	φ	2008	0.42	0.53	0.67
Trailing	High	φ	2009	0.50	0.63	0.79
Trailing	High	φ	2010	0.67	0.76	0.89
Trailing	High	φ	2011	0.40	0.50	0.65
Trailing	High	φ	2012	0.50	0.63	0.79
Trailing	High	φ	2013	0.42	0.53	0.68
Trailing	High	φ	2014	0.26	0.39	0.56
Trailing	High	φ	2015	0.52	0.65	0.79
Trailing	High	φ	2016	0.35	0.46	0.62
Trailing	High	φ	2017	0.43	0.55	0.71
Trailing	High	φ	2018	0.37	0.52	0.71
Core	Low	φ	2002	0.45	0.63	0.78
Core	Low	φ	2003	0.33	0.40	0.60
Core	Low	φ	2004	0.36	0.50	0.67
Core	Low	φ	2005	0.40	0.48	0.61
Core	Low	φ	2006	0.48	0.56	0.65
Core	Low	φ	2007	0.31	0.39	0.48
Core	Low	φ	2008	0.15	0.22	0.33
Core	Low	φ	2009	0.33	0.41	0.52
Core	Low	φ	2010	0.13	0.19	0.32
Core	Low	φ	2011	0.06	0.13	0.31

Core	Low	φ	2012	0.30	0.38	0.50
Core	Low	φ	2013	0.35	0.42	0.52
Core	Low	φ	2014	0.22	0.29	0.39
Core	Mid	φ	2002	0.37	0.44	0.53
Core	Mid	φ	2003	0.32	0.38	0.47
Core	Mid	φ	2004	0.43	0.50	0.58
Core	Mid	φ	2005	0.47	0.52	0.59
Core	Mid	φ	2006	0.43	0.48	0.55
Core	Mid	φ	2007	0.35	0.41	0.48
Core	Mid	φ	2008	0.45	0.51	0.58
Core	Mid	φ	2009	0.42	0.48	0.55
Core	Mid	φ	2010	0.34	0.40	0.47
Core	Mid	φ	2011	0.40	0.47	0.55
Core	Mid	φ	2012	0.41	0.47	0.54
Core	Mid	φ	2013	0.38	0.43	0.51
Core	Mid	φ	2014	0.49	0.55	0.62
Core	High	φ	2002	0.46	0.54	0.66
Core	High	φ	2003	0.53	0.60	0.70
Core	High	φ	2004	0.41	0.48	0.59
Core	High	φ	2005	0.43	0.50	0.61
Core	High	φ	2006	0.57	0.65	0.74
Core	High	φ	2007	0.56	0.63	0.71
Core	High	φ	2008	0.43	0.49	0.57

Core	High	φ	2009	0.34	0.42	0.53
Core	High	φ	2010	0.28	0.36	0.48
Core	High	φ	2011	0.27	0.36	0.50
Core	High	φ	2012	0.25	0.32	0.44
Core	High	φ	2013	0.49	0.56	0.66
Core	High	φ	2014	0.37	0.45	0.55