**Appendix 1: Prior specification**

Table S1. Prior specification for parameters in migration model. Parameter symbols correspond to those in Table 1 in main text of manuscript.

|  |  |
| --- | --- |
| **Prior** | **Description** |
|  | Uniform prior on standard deviation process variance in annual regional population growth (measured on log scale) |
| 4) | Normal prior on median migration rate from stratum j to migration station s |
|  | Uniform prior on standard deviation of year-to-year variation in migration to monitoring stations (measured on log scale) |
|  | Uniform prior on date of peak migration at each monitoring station (measured in days) |
|  | Uniform prior on width of migration period (measured in days) |
|  | Uniform prior on standard deviation of “overdispersion” in daily migration counts at migration monitoring stations (measured on log scale) |

**Appendix 2: Analysis of North American Breeding Bird Survey data**

Strata and locations of routes contributing data to analysis of the North American Breeding Bird Survey (BBS) are illustrated in Figure S2. In total, Blackpoll Warblers were detected at 226 routes between 2000 and 2018, in 19 analytical strata.

A map of the united states

Description automatically generated

Figure S1. Locations of routes contributing to continental trend analysis of Blackpoll Warbler between 2000 and 2018. USGS analytical strata are overlaid.

The estimated Blackpoll Warbler continental trajectory for the period of 2000-2018 is illustrated in figure S2.

A graph of a graph showing the growth of a country

Description automatically generated with medium confidence

Figure S2. Estimated continental trajectory of Blackpoll Warbler from 2000 to 2018 based on analysis of Breeding Bird Survey.

The estimated trajectories of Blackpoll Warbler in eastern and western BBS strata are illustrated in Figures S3 and S4. Regional estimates were generated by aggregating area-weighted annual indices within USGS analytical strata, which were grouped in “east” and “west” categories based on geographic overlap with the corresponding strata used in migration analysis (see Figure S1). Methods for estimating trajectories within custom strata are described by Edwards and Smith (2020) and example code is available on https://github.com/bbsBayes/bbsBayes.

A graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of a graph of

Description automatically generated

Figure S3. Estimated population trajectories of Blackpoll Warbler from 2000 to 2018 based on analysis of Breeding Bird Survey, by aggregating estimated annual indices in “eastern” and “western” strata.

**Appendix 3: Simulations to confirm that the migration model can accurately recover trends within strata**