*A Birds captured during migration*

In the vast majority of states, we captured birds during either the breeding or the wintering season, so we could be relatively certain that birds captured would enter the HMM in a pre-migration state. However, birds captured in Virginia and Maryland were sometimes captured either late in the fall migratory season (August 1 – Feb 25) or early in the spring migratory season (date tk – date tk). In these cases, where we could not be certain whether a particular bird entered the HMM in a pre-migration or a migration state, we allowed the HMM to estimate the initial state of the model instead of having it be set to premigratory. We only allowed this to happen for birds captured in Virginia and Maryland.

*B Bug fix in the correlated random walk*

Correlated random walks produce a set of interpolated locations that maintain consistency of direction and momentum between two known locations. However, this can occasionally lead correlated random walks to produce loops of interpolated points to explain rapid changes in direction. These loops are often lengthy, and can artificially push a bird beyond the 30.2km threshold to begin migration. To compensate for this, we removed all loops of interpolated points for which the total length of the loop was more than 10 times the distance between observed points. We replaced these loops with sets of predicted locations spaced evenly along a line between the observed points.

*C Mortality handling*

The Pinpoint GPS transmitters that we used during this study usually stop transmitting when the bird is deceased, due to attenuation of the signal when the antenna hits the ground. However, if the transmitter remains upright after the bird’s death, there can be some circumstances in which the transmitter continues to transmit after the bird is deceased. To recognize and filter out these circumstances, we designed a two-stage process for recognizing and removing the locations of deceased birds from our dataset. The first step was an automated process, which used an HMM to recognize locations from birds which had not moved for an extended period of time. We trained this HMM using a subset of #tk training locations gathered during transmitter testing, when #tk transmitters were left on the ground to gather 1 location per minute for #tk minutes. During this test, we placed #tk transmitters under no cover (short grass), #tk transmitters under light cover (tall grass), #tk transmitters under medium cover (early successional aspen stand, tk ft canopy), and #tk transmitters under heavy cover (mature deciduous forest, tk feet canopy). We collected this data to provide a balanced sample size from each cover type and reflect how the locations from stationary transmitters on deceased birds might look under a variety of different circumstances.

*D Overlap between fall and spring migration*

During our study, we observed an overlap in a small proportion of birds between the dates on which the final fall migrants settled into their wintering ranges and when the first spring migrants began their spring migrations. We addressed this by using an individual-specific date range for each bird when designating their fall migrations. We delineated the spring migrations before the fall migrations. If a given bird had a fall migration in the season immediately preceding a delineated spring migration, we shortened the end of the default fall migration timeframe (August 1 – Feb 25) to a day before spring migration was set to start for that bird. By doing this, we were able to delineate fall migration using custom timeframes for each bird to overcome the fact that there is no universal cutoff date between spring and fall migration.

*E Individual exceptions*

Throughout the study we encountered numerous individual birds which broke the parameters of our models due to erratic behavior. We frequently made individual edits to the tracks of these individuals to ensure that that they were classified correctly by our HMMs. A full list of the edits that we made is available below.

|  |  |  |  |
| --- | --- | --- | --- |
| Bird | Season | Issue | Edit |
|  |  |  |  |