# Bayesian modeling to identify and map multi-species change points in the North American population trends of avian aerial insectivores.

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**Abstract:** Many North American populations of swallows, swifts, nightjars, and flycatchers (avian aerial insectivores, hereafter "AI"), are declining. There is some indication that the population trends of species in this group changed, for the worse, in the 1980s. That is, that the population trends of these species share a common change point, presumably as a result of some common response to a change in the environment. To test for a common change point across 18 species of AIs, I fit a Bayesian, penalized regression splines model, using estimated annual indices of abundance from the North American Breeding Bird Survey (BBS). To first generate annual indices from BBS data that would be suitable for this type of model—indices published annually are not suitable—I fit a spatial, Bayesian conditional autoregressive (CAR) model to BBS data from all routes in North America. The CAR model estimates population trajectories separately for each species, while sharing information among neighbouring spatial strata (intersections of Bird Conservation Regions and states/provinces/territories), within each year of the BBS time-series (1968-2011). The results of these models indicate that: 1) there is in fact, strong evidence for two common change points in the population trends of these North American aerial insectivores—one positive, one negative; and 2) the timings of the change points are geographically structured—earlier in the East, later in the West. Future studies to identify covariates that explain the temporal and spatial structure of these change points, may shed light on the causes of AI declines.