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Patuxent Wildlife Research Center

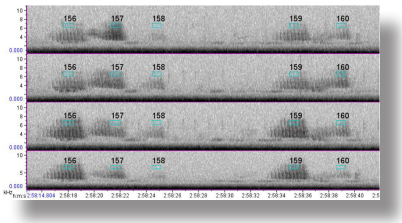
Breeding Bird Density on the Patuxent Research Refuge

The Challenge: During 1959-1972, PWRC scientist Chandler Robbins and others studied breeding birds on a forested plot on the Patuxent Research Refuge; the study was among the first designed to estimate population size from capture data on banded birds. We re-sampled the plot during 2005-2010 to assess how the bird community has changed, and developed and evaluated alternative methods for sampling bird populations.

The Science: We captured birds in mist nets, banding new individuals, and noting the date and location of all captures. We also sampled the bird population acoustically, recording their vocalizations on a small array of microphones moved to points across the plot. Spatially explicit capture-recapture methods were applied to the capture data to estimate species' densities for both the early and recent time periods, and were adapted to estimate density from data extracted from the sound recordings. We refined and extended the acoustic methods to sample large areas, and in 2011 surveyed forest bird populations across the refuge, recording sounds at 272 points and re-sampling 66 points with a 4-microphone array. Data on song rates and intensity are being extracted to estimate distance-related sound attenuation and spatial detection probabilities for hierarchical models to estimate species' densities.

The Future: The density of Ovenbirds on the study plot appears to have increased in recent years, and other common birds (Acadian Flycatcher, Red-eyed Vireo, Tufted Titmouse, Wood Thrush) generally varied within their earlier density range. A few species, however, are now rare or absent, including Kentucky Warbler and Hooded Warbler, which have also declined regionally. Acoustic estimates of density were consistent with estimates from capture-recapture data, but more precise. The acoustic methods also are desirable because they do not require that birds be captured and handled, and sounds are archived so they can be reviewed or re-sampled. The song rate and intensity data, on which they rely, may be key for estimating the availability component of detection, which has long vexed biometricians. These data can't easily be collected by field observers, who are already stretched to record distances to birds or other information required by other methods to estimate density from aural cues.

Collaborator: Murray Efford, Otago University.



Ovenbird songs recorded by a four-microphone array, Patuxent Research Refuge, June 2011

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