Oil and gas development homogenizing core-forest bird communities

May 21 2014

Conventional oil and gas development in northern Pennsylvania altered bird communities, and the current massive build-out of shale-gas infrastructure may accelerate these changes, according to researchers in Penn State's College of Agricultural Sciences. The commonwealth's Northern Tier—one of the largest blocks of Eastern deciduous forest in the entire Appalachian region—is an important breeding area for neotropical migrant songbirds. These diminutive, insect-eating creatures, which breed in Pennsylvania and winter in Central and South America, contribute greatly to the health of forests.

But they are being negatively affected in areas where there are high densities of shallow oil and gas wells, says Margaret Brittingham, professor of wildlife resources, who conducted a study of bird communities in the Allegheny National Forest. The national forest, on the extensively forested Allegheny Plateau in northwestern Pennsylvania, has more than 14,000 active oil and gas wells. Although the footprint of a shallow well is much smaller than the immense Marcellus Shale well pads now being built across the region, clusters of shallow wells, service roads, pads and pipelines create networks of disturbance that fragment forests, changing songbird communities, Brittingham explained.

"The cumulative effect of many small-scale disturbances within the forest is resulting in the homogenization of bird communities, with species that inhabit the interior forest, such as black-throated blue warblers, ovenbirds and Blackburnian warblers being pushed out, and species that prefer living in edge habitat and near people and

development, such as robins, blue jays and mourning doves, moving in," she said.

"Biotic homogenization is a subtle process by which generalists replace specialists, with common and widespread species tending to become more abundant and habitat specialists declining. Our results revealed changes in avian guilds resulting from oil and gas development and suggest that a loss of community uniqueness is a consequence."

The study, done in collaboration with the U.S. Department of Agriculture's Northern Forest Research Station, took place over three years. Lead researcher Emily Thomas, at the time a graduate student advised by Brittingham, surveyed birds in 50-acre blocks selected for their varied amount of oil and gas development.

Thomas completed her master's degree in wildlife and fisheries science and is currently an instructor in the wildlife technology program at Penn State DuBois.

In a recently published issue of the *Journal of Wildlife Management*, the researchers documented the presence or absence of different songbird species in a range of landscapes, including undisturbed forest, low-density oil and gas development, and high-density development. They catalogued the abundance and diversity of songbirds in the study areas, which spanned two types of forest—northern hardwood and oak.

"We wanted to find out what the well pads, roads, pipelines and other openings created by oil and gas development are doing to bird populations," said Brittingham. "We compared and contrasted the abundance and diversity of birds near well sites to bird communities in reference sites far away from disturbances in the big woods, and what we found was compelling." Forest interior species declined in proximity to the wells and at a rate that was roughly proportional to the intensity of

gas development. Songbird species that prefer early successional habitat increased in abundance on the edge of gas development.

In addition, Brittingham noted, the generalist bird species that do better around people and tend to be common wherever there are people or development were more abundant near oil and gas development than within undisturbed forest—potentially displacing the forest specialists.

The expansive development of Marcellus Shale gas, which began within the core forests of northcentral Pennsylvania around 2007, is increasing exponentially. Deep, horizontal shale gas wells differ substantially from shallow, conventional oil and gas wells in many ways.

Shale-gas well pads are immense but occur at a much lower density. Drillers install pad substrate of stone to support heavy equipment, and the drillers use a much greater quantity of water for hydrofracturing. That technology demands greatly increased levels of truck traffic on wider, more highly engineered roads. Brittingham and her students are currently studying the effects of shale-gas development on birds to determine how it affects avian communities.

"Birds are easy to study and survey to gauge the impacts of gas development because they are abundant, respond quickly to habitat change and are early indicators of problems," she said. "The bottom line is we are going to have resource extraction in this state, but the forests on top of it are providing clean water, clean air, climate regulation and a host of other ecological values.

"We need to maintain them as healthy, functioning ecosystems while extracting the gas. We hope our research will help to determine where thresholds of change occur and to identify areas where gas development should be avoided or minimal at best to protect these valuable ecological services that are provided free-of-charge to all of us."

Provided by Pennsylvania State University