

Grad researcher studies impacts of Marcellus Shale development on wildlife

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Pennsylvania, a.k.a. Penn's Woods, is roughly 60 percent forest, with the largest unbroken block of trees spanning the state's north central region.

"This region is one of Pennsylvania's greatest resources," says Penn State graduate student Lillie Langlois. "Since the logging era it has re-established itself to contiguous mature [forest](#). A lot of wildlife depend on that habitat for breeding."

Within the past six years, however, the rapid expansion of Marcellus Shale drilling has been breaking up the block.

According to the state Department of Environmental Protection, as of 2012, there were more than 8,000 well permits issued and 6,000 wells drilled across the state, with the north-central region being one of the hot spots. Drilling for natural gas requires plenty of infrastructure, and that infrastructure leaves a sizeable footprint.

"The well pads themselves are stone pads which are often over 5 acres in size set in the middle of the forest," Langlois explains. Potentially more disruptive are the pipelines laid to carry the gas to market, each of which requires a linear corridor some 30 meters wide. The combined effect is a significant loss of what Langlois calls core forest, that is, unbroken woods that are at least 100 meters from any road, development, or farmer's field.

This fragmentation of the forest has varying impacts on wildlife, she

says. Pipelines in particular can serve as travel corridors being used by deer, bear and [nest predators](#) such [foxes](#) and [raccoons](#). For birds, which are Langlois' specialty, the results are less clear.

"Some species—robins and chipping sparrows—are attracted to forest edges. Others—scarlet tanagers, for example—require a more dense forest to breed," she says. "Pennsylvania is very important for a lot of migratory neo-[tropical birds](#) coming from Central and South America that depend on large tracts of forest for breeding."

Working with Margaret Brittingham, professor of wildlife resources, Langlois is attempting to get a better handle on this changing habitat. Her dissertation project has two parts. For the first, she is using Geographic Information Systems, or GIS, to quantify the fragmentation occurring across Lycoming County. By layering land-use maps and satellite images to locate pipelines and well pads, she says, "We're looking at the spatial imprint from an aerial perspective."

This computer analysis then guides her fieldwork, which is aimed at gauging changes in wild bird communities in response to the changing habitat. During breeding season, from late May through early July—"That's when the males are calling and singing their songs to establish and keep their territory," she says—Langlois is in the woods, walking miles of pipeline. "Then I walk off transects into the forest, so it's a lot of bushwhacking through some very dense habitat. I record any birds seen or heard at count stations set up along the pipeline edge and in the adjacent forest."

Her focus is on public lands, which are less intensely developed than private holdings and are therefore increasingly important as wildlife refuges. Last year, Langlois looked at the southern region of the Tiadaghton State Forest, which has been leased for gas extraction since 2008. A moratorium prevents drilling in the Tiadaghton's northern

region, she notes, and that difference provided a useful comparison.

Unlike many private landowners, Langlois says, the state Department of Conservation and Natural Resources "has done a lot of mitigation effort in the Tiadaghton, working directly with gas companies on consolidating infrastructure. They try to put roads and pipelines along pre-existing features, instead of cutting new swaths through the forest. They also site more wells per pad—about four, compared to the state average of 2.2."

Even so, Langlois says, her GIS data shows an average loss greater than 4 percent of core forest in the southern Tiadaghton in less than four years with some management units losing up to 10 percent. "That doesn't mean 10 percent of the forest is being lost," she stresses. "It's maybe three to four percent in this case. But what's happening is it is no longer core forest because it is now near a road or pipeline."

This summer she is examining the impacts of these changes on birds. In addition to gathering new data, "I'm still analyzing my data from last field season," Langlois says. "Right now, general trends are that the forest interior species are avoiding the pipelines. It may be many years before we see how responses by individual species add up to changes in the bird community. My study is establishing some baseline data."

Other members of Brittingham's lab are studying bird communities around well pads, "which leave a different kind of footprint," Langlois says. Brittingham also has a project exploring the effects of fragmentation on amphibians. And Penn State colleague Patrick Drohan, associate professor of soil science, has taken a lead role in analyzing issues related to landscape change, soil compaction and restoration.

As these researchers point out, these and other changes are just beginning to be felt. Though drilling slowed in 2012 with a fall in gas prices, The Nature Conservancy predicts that up to 60,000 wells may be

drilled in Pennsylvania by 2030. If that level of development does come to pass, the necessary build-up of infrastructure will likely affect not just wildlife habitats, but also agricultural production and water quality throughout the Susquehanna River basin, according to Drohan and Brittingham. In a paper published last year in the journal *Environmental Management*, they called for a regional strategy that would help to manage these challenges.

"Already, in a short period of time, we've fragmented the forest to a considerable extent," Langlois says.

Provided by Pennsylvania State University

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