Researchers identify terrain likely to attract wasting disease-infected deer

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The study yielded important insight into how chronic wasting disease has progressed in the East. Subsequent modeling based on the research has revealed likely paths of future dispersal of the disease, Credit: Joe Kosack/PGC

(Phys.org) —A study of the spread of chronic wasting disease among white-tailed deer in Virginia, West Virginia, Maryland and Pennsylvania

found that infected deer tend to cluster in low-lying open and developed areas. These results suggest that state wildlife management agencies should concentrate surveillance efforts in such topography and landscapes, according to researchers in Penn State's College of Agricultural Sciences.

The study yielded important insight into how the ailment, commonly called CWD, has progressed in the East, said David Walter, adjunct assistant professor of wildlife ecology. Subsequent modeling based on the research has revealed likely paths of future dispersal of the disease, which always is fatal to cervids, such as deer, elk and moose.

"We are looking at what environmental variables might be associated with the presence or absence of chronic wasting disease in the Northeast," explained Walter, who is an assistant leader of the Pennsylvania Cooperative Fish and Wildlife Research Unit at Penn State.

"We obtained the geographic coordinates of hunter-killed deer that tested positive for CWD and overlaid them on a map showing a variety of habitat and landscape features," he said. "The analysis showed a high prevalence of CWD in deer sampled from low-lying open and developed landscapes."

This knowledge—generated by thesis work done by graduate student Tyler Evans, who is advised by Walter—became more important this spring when the Maryland Department of Natural Resources, and the state Game Commission and Department of Agriculture in Pennsylvania announced that tests had revealed three more CWD-positive deer.

Pennsylvania has found seven CWD-positive deer in the last two years. Maryland and Virginia have had a few each, but West Virginia has had more than 100 during the last decade.

Evans, a native of Salem, Ohio, who is scheduled to receive a master's degree in wildlife and fisheries science this fall, investigated the geographic coordinates where deer testing positive for CWD were found.

Chronic wasting disease, which infects the brain and nervous system of cervids, belongs to a group of diseases known as transmissible spongiform encephalopathies, or prion diseases. It eventually produces enough damage to the brains of affected animals to result in death. While CWD is similar to so-called mad cow disease in cattle and scrapie in sheep, there is no known relationship between them.

There is no evidence that humans can contract CWD, although the disease is similar to Creutzfeldt-Jakob disease, a rare, fatal syndrome that afflicts people.

While it's not known exactly how CWD is transmitted, scientists believe that the prion responsible for the disease may be spread both directly through animal-to-animal contact and indirectly via soil or other surfaces—most likely through the saliva and feces of infected animals or decomposing carcasses.

Perhaps surprisingly, CWD in the East first was documented in free-ranging deer in West Virginia concurrently with captive deer in New York in 2005. In the West, it first was recognized in 1967 in captive mule deer in a northern Colorado facility. Walter conducted research several years ago on the spread of the disease in Colorado in free-ranging mule deer.

"We weren't sure the disease would act the same way here as it did in the West, because that's a much more open landscape," he said. "We found out west that the lowlands, where mule deer yard up in the winter after coming down from the high elevations, had the highest prevalence of

chronic wasting disease. We are seeing some of that in this region with whitetails—in low-lying areas where they come out of the forests in winter and congregate."

Considering the disease's prevalence in low-lying areas, Evans has modeled how it is likely to spread in free-ranging deer, in valleys parallel to mountains and along river bottoms, most likely through developed and agricultural terrain. This information should help agencies, such as the Pennsylvania Game Commission, know where to sample for CWD-infected deer.

Walter currently is assembling funding to add a DNA-testing component to the research, starting in August, in which deer testing both positive and negative for chronic wasting disease will be analyzed. One of the things he hopes to learn is whether white-tailed deer in Virginia and West Virginia have the same "lineage" as those in the mountains of northcentral Pennsylvania.

"If they share genetics between populations, then we might be able to infer whether the CWD positives came from captive animals transported between deer farms or whether the disease has spread from within wild populations across the region," he explained.

"This has not been done in the Northeast before, but it has been done in Wisconsin and Illinois," he said. "However, it could be a different situation here because deer are known not to travel as far in the forests and mountains of Pennsylvania as they do in the open agricultural landscape of the Midwest."

With the short distances deer move in the East, it would take centuries for a deer lineage to advance from Virginia to northern Pennsylvania. Walter and his research team will collect nearly 500 samples a year from hunter-killed deer in the four states to analyze DNA.

Wildlife scientists suspect the transport of captive deer play a major role in the spread of CWD. But the spread of the disease in the East is mysterious because West Virginia and Virginia don't have a lot of game farms. Pennsylvania, on the other hand, has the second highest number in the country behind only Texas, Walter said.

"There is no known direct link to say that CWD actually spread from West Virginia to Virginia to Maryland to Pennsylvania. It is not accurate to say that, because so much time passed between finding positives in each state—we can't really connect the dots and determine a path. But we hope the pending DNA testing and genetic component of the research can help us solve that mystery."

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