

NELSON ISSUE BRIEF

NOVEMBER 2019, VOLUME 1, NUMBER 2

DEER: HUNTING, ECOLOGY, AND CHRONIC WASTING DISEASE

Introduction

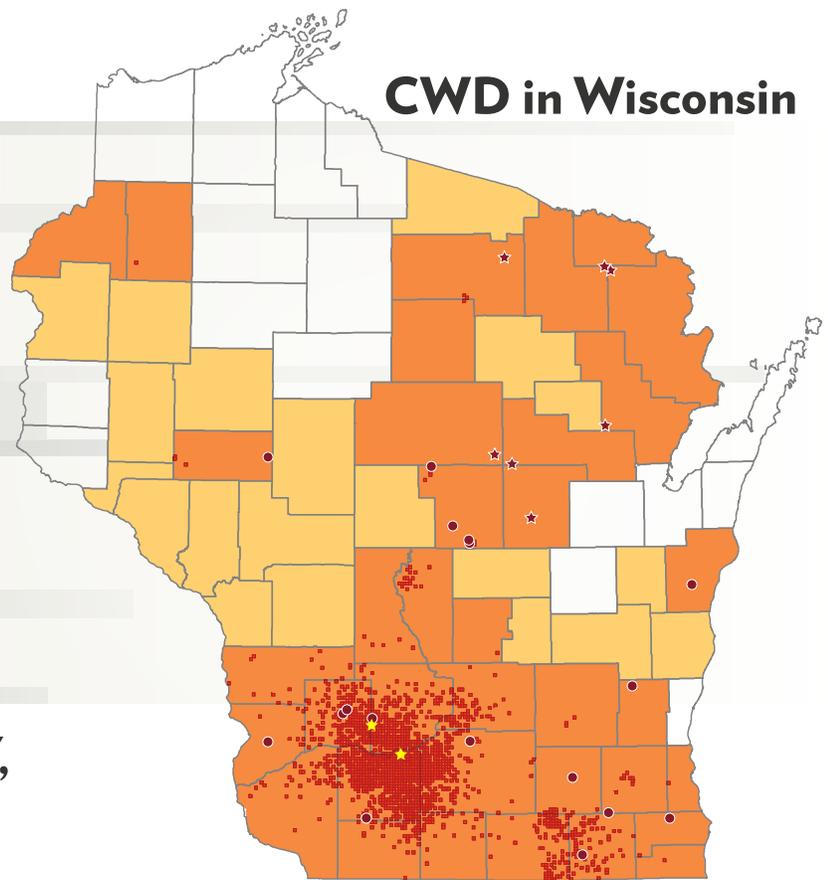
As a new administration attempts to balance the ecological impact of deer, the social and economic impact of deer hunting, and the potential dangers of Chronic Wasting Disease (CWD), the second edition of the Nelson Issue Brief provides summaries of important deer-related research taking place at the University of Wisconsin-Madison.

Deer hunting in Wisconsin is a long-standing cultural touchstone, with more than 470,000 gun-deer hunting licenses sold in 2018. Hunting also creates significant economic activity, as hunters spend more than \$1 billion on hunting each year, often in rural parts of the state. Whitetail deer are the most ecologically significant wild grazing animal in the state, with a population of approximately 1.5 million animals, impacting ecosystems, farm crops, and highways. Deer populations can completely change a local plant community, making their management key to any attempt at ecological restoration.

The emergence of CWD, a neurological disorder fatal to deer, in the state's herd has complicated questions surrounding the management of deer hunting. A recent Marquette University poll showed that a majority of Wisconsin voters mistakenly think that CWD is not increasing in the state. While there are no known cases of transmission of CWD from deer to humans, there are still concerns about human consumption of meat from infected deer. The disease also limits deer populations and spreads rapidly in areas with high deer densities. The state's response to CWD's emergence ignited a continuing controversy among the conservation community. Efforts to manage the population and the disease require engagement with multiple groups.

We hope these summaries connect researchers at the University engaged in world-class research with Wisconsinites that care about deer and deer hunting. Please reach out to the researchers highlighted in this report if you have further questions about their work.

CWD in Wisconsin



- CWD wild positive location
- ★ Hunting ranches infected with CWD currently in operation
- ★ Deer farms infected with CWD currently in operation
- Past positive CWD farms, depopulated
- CWD affected county per positive(s) detected in the county
- CWD affected county "watch county" per being within 10 miles of a CWD positive detection (e.g. CWD has not been detected in these counties)

Map printed 9/1/19 using WDNR and WDATCP data

KEY POINTS

- » Deer operate as a keystone herbivore in forests, dramatically impacting the makeup and size of forest trees.
- » Blaze pink provides an additional, potentially safer option for high-visibility hunting clothing.
- » CWD prevalence and geographic distribution has increased dramatically since initial discovery in 2002.
- » Increased testing of hunter-harvested deer will be key in limiting continued transmission of CWD.
- » Hunters and state officials may identify the threats of CWD differently. Successful policy will incorporate these differences in understanding.



Trail cam photo (left) from Dr. Waller's research near an exclusion fence that keeps deer from browsing on forest plants, which shows the effect deer have on the rest of the forest.

Monitoring Deer Density Impacts on Forests

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Deer populations rebounded from near extinction in many parts of Wisconsin in the late 1800s as habitat conditions improved, hunting was limited, and natural predators became scarce. Deer now thrive in landscapes that mix young and old forests with crop fields, suburbs, and other edge habitats. As deer herds reached and surpassed record densities in the early 2000s, we saw outbreaks of diseases like CWD in deer and Lyme disease in humans, as well as mounting numbers of deer-vehicle collisions. Impacts on crop fields, forests, and ornamental plantings have also increased. Are current deer densities too high?

My research team looks at how deer affect forests. We count the numbers and sizes of tree seedlings at sites in the Northwoods of Wisconsin and the western Upper Peninsula of Michigan. We also use fences that exclude deer to see how plants respond in the absence of deer. We were alarmed to discover how few seedlings of slow-growing conifers like Canada yew, eastern hemlock, and northern white cedar now survive repeated browsing from deer. Deer also prevent most yellow birch, white pine, many maples, and most oaks from surviving through the critical one to five-foot high stage, termed the “molar zone” as these are the leaves that deer can reach to eat. Through these strong and cumulative effects, deer are shifting the composition and structure of forests across Wisconsin.

Most of a forest's diversity, however, is found in the understory – the shrubs and plants of the forest floor – rather than in its trees. We compare different Apostle Islands which have known deer population histories, and for which we have good historical data on forest understory conditions collected by UW–Madison students and faculty in the 1950s. These studies show that deer grazing promotes grasses, sedges, and some ferns while eliminating many of our prettier lilies, orchids, and other wildflowers. Overall, diversity has declined in a process termed biotic homogenization. There are exceptions, for example, on the Menominee and Ojibway Indian reservations, deer populations hardly affect tree regeneration or understory and wildflower diversity. Tribal management strategies result in more mature forest conditions and lower deer densities.

Our research finds that deer act as a “keystone herbivore” greatly affecting the composition and dynamics of forests in Wisconsin and throughout the Midwest. The first step to addressing deer density is to devise rapid, cheap, and effective ways to monitor and assess deer. Our new “Twig Age” method can be used in both professional and ‘citizen

science’ monitoring programs. It provides accurate, real-time information on where and when deer have impacts, allowing policymakers to adjust forest and deer management in informed and effective ways.

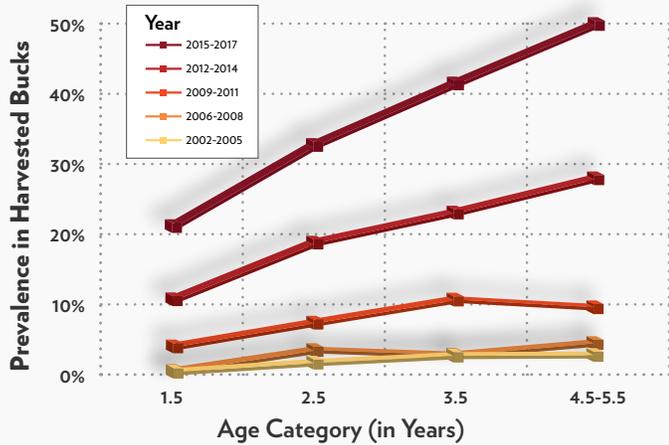
CWD Prevalence and Transmission

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CWD is well-established in southern Wisconsin and is spreading. Where established, CWD's prevalence is accelerating each year, and is higher in male deer and in older deer. Recent data suggested that prevalence among males who are more than four years old is nearly 50 percent in portions of south-central Wisconsin endemic areas. Research suggests that transmission occurs through both direct contact (deer-to-deer) and through the environment (where the disease agent persists in the soil and is taken up in plants), but that direct contact appears to be the most important transmission mechanism. Our research in collaboration with the Wisconsin Department of Natural Resources (WDNR) and U.S. Geological Survey finds that CWD causes the growth rates of infected deer populations to decline as prevalence increases. Year-to-year survival is greatly reduced among radio-collared Wisconsin deer that test positive for CWD when compared to deer that test negative. Moreover, we find that CWD-positive deer may not die from the disease directly. Rather, CWD enhances mortality risks from the many other sources of mortality that deer routinely experience, such as predators and car-deer collisions. The effect on growth rates is particularly concerning, because sustainable hunting requires a deer population that is adding individuals somewhat faster than it is losing them. Unfortunately, there are few options for managing endemic CWD outbreaks, and those that we have are expensive and controversial. Therefore, prevention, containment, and early detection are vitally important.

The testing of hunter-killed deer provides essential information for tracking changes in prevalence, changes in age- and sex-related patterns of infection; in short it allows us to map the extent of Wisconsin's CWD outbreak. Testing is also important for being informed consumers of venison. The World Health Organization and the Centers for Disease Control both recommend that people not consume venison from deer that test positive for CWD. Hunters and landowners can

CWD in Tested Bucks in Iowa, Sauk, and Richland Counties



CWD prevalence increases dramatically as deer age, and has been increasing rapidly over the last 15 years. Sample size was restricted to in-season hunter-killed deer. Credit: Data from Wisconsin DNR

assist in the management of CWD by 1) reporting sickly looking deer to WDNR; 2) participating in the WDNR's CWD testing program; 3) participating in deer hunting to remove deer that are at highest risk for infection (older males) and to reduce the population generally; 4) adhering to guidelines for butchering wild deer (bone out the meat, do not cut into spine or lymph nodes); 5) disposing of potentially infectious bones, meat scraps, and offal in sanitary landfills; 6) avoid moving deer and deer tissues; 7) refraining from baiting and feeding or otherwise concentrating wild deer; and 8) making livestock mineral licks inaccessible to deer.

How do Wisconsinites “see” Chronic Wasting Disease?

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CWD presents a policy challenge as it spreads across Wisconsin because the disease is difficult to detect without laboratory testing. In addition, CWD persists for a long time in the landscape, and thus its consequences will likely outlast current hunters and policymakers. This difficulty of seeing CWD as part of everyday experiences makes it difficult for Wisconsinites to reach consensus on how to address the disease's risks or even understand what it is.

CWD, therefore, needs to be made visible in ways that lead to proactive attitudes and planning rather than fear and anxiety. Sensationalist articles about “zombie deer” and a potential hunting apocalypse work counter to this aim. But current practices of engagement with hunters, land owners, deer farmers, and the public have not given us the political tools and vision we need either.

Wisconsin has been remarkably successful at increasing its deer population, through both habitat restoration and hunting policy. However, in areas of deer overpopulation, the state has struggled to maintain or even selectively reduce herd size. Even increased hunting is not effective

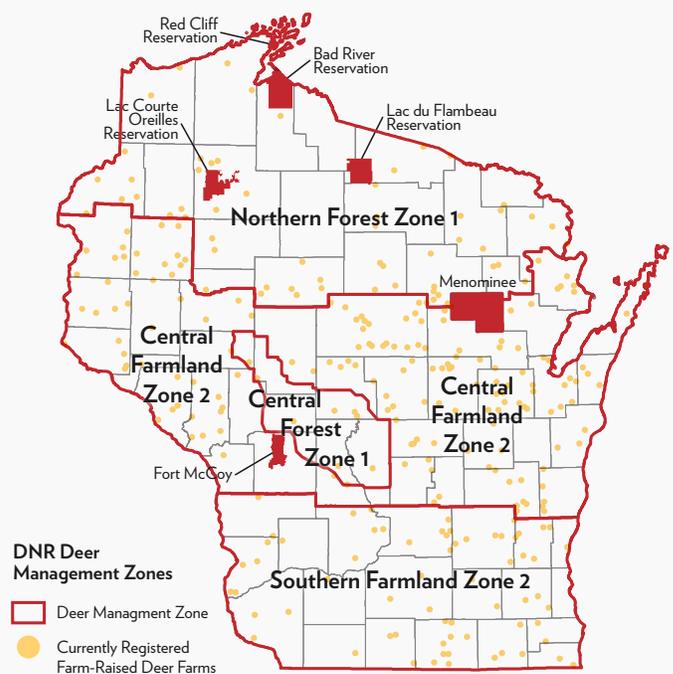
as hunters tend not to want lower deer populations, many still favor older bucks with larger antlers, some eat as much venison as they care to already, and overall the number of active hunters is declining.

The WDNR now organizes deer management at county-level units, rather than geographic areas of similar habitat. This move has increased the political importance of local activism around CWD, but it has also made it harder to coordinate regulation. We have been conducting interviews across Wisconsin to develop a picture of how CWD becomes visible to hunters, state officials, farmers, and other stakeholders in this context.

Harvesting an animal that appeared healthy but tested positive for CWD is a common experience for the hunters we interviewed. Even when their awareness was high, visibility was an ongoing problem. Hunters currently “see” CWD through four channels: 1) reading on their own; 2) receiving scientific reporting from the County Deer Advisory Council in the county in which they hunt; 3) submitting samples from harvested animals for CWD testing; and/or 4) being notified of baiting and other restrictions when their area comes under CWD regulation. In other words, interactions which “show” hunters CWD are almost entirely voluntarily – and those that aren't keep CWD itself “invisible.” These interactions may limit hunters' activities, or add undesired tasks to a day's hunt, but do not address attitudes or provide proactive strategies to manage CWD. Deer farms represent a notable exception, as they are subject to a stricter regulatory regime. Deer depopulation is a very real possibility for them, and is especially visible to the public via news coverage.

All of these dynamics are critical to understanding how hunters, state representatives, and the general public will receive and respond to information about and policies on CWD.

Deer Farms and CWD Management Areas



Blaze Pink as a Safe Hunting Clothing Option

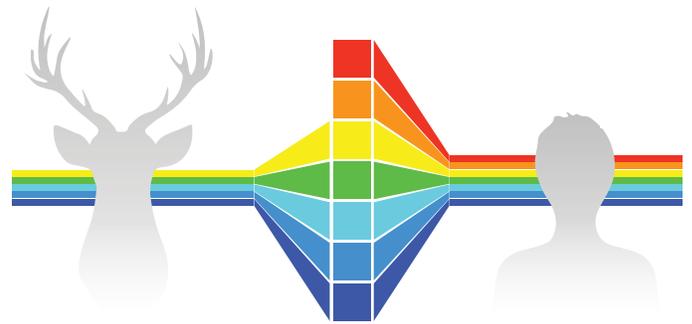
Majid Sarmadi, Rothermel Bascom Professor, Department of Design Studies, UW–Madison, majidsar@wisc.edu, <https://sohe.wisc.edu/staff/majid-sarmadi>

No color or outfit can eliminate hunting accidents entirely, but the aim of our research is to reduce them as much as possible. Blaze orange is required to be worn for hunting in many states, but it is not popular with some hunters. Even so, 14 states have issued regulations permitting fluorescent pink as an alternative to blaze orange. Therefore, we studied alternatives to blaze orange in an effort to provide more choices to hunters. While it is possible that men may resist wearing pink because pink is not perceived as a “macho” color, we hope that a hunter would consider wearing any color that significantly reduces their chances of getting shot accidentally.

Making a hunter easily-seen poses a basic challenge to successful hunting as deer hunting requires hunters to conceal themselves. Deer’s eyes can detect slight movements far better than human eyes can. Additionally, deer noses can be anywhere from 500 to 1,000 times more acute than a human’s nose, so hunters often avoid scented detergents when washing their hunting clothing. And, while deer hearing isn’t much better than that of humans, their ears articulate like satellite dishes that tip back and forth and roll around to pick up and lock onto various sounds. Therefore, hunters should ideally be invisible, odorless, and quiet.

How can we make hunters visible to other hunters without making them more visible to deer? Deer eyes, like our own, have photo-sensitive cells called rods and cones. Cone cells detect fine details and colors, and work best in bright light conditions. Rod cells detect movement and broad details, and work best in low-light conditions. The human eye has three different types of cones (perceiving red, green, and blue colors) but deer have only two types (blue and green). Deer are adapted to twilight and night activity and have fewer cones and a much higher density of rods than do humans and other animals that are active during the day. Research indicates that because of this, deer can detect

Human vs Deer Eyesight



Human eyes have abundant cone cells allowing us to see red and orange. Deer eyes have more rod cells, providing good night vision, but fewer cone cells and none of the type that allow them to see red and orange.

only greens, blues, yellows, and ultraviolet. A deer’s special ability to see ultraviolet colors allows them to see the brighteners that most detergents leave in clothing after laundering.

Therefore, the visibility of hunting clothing depends on the amount of light reflected from it, and on the color contrast with the surroundings. Our study used a spectrophotometer to compare the amount of light reflected from several blaze orange hunting and blaze pink hats. We also investigated the color contrast with green and orange (the colors most found in the woods in hunting season) under different light sources.

It is well known that blaze orange provides a very good contrast in wooded areas in the spring and summer. However, when compared to the orange colors found in the fall leaves, we discovered that blaze orange was harder to detect than the pink colors that were tested. The pink colors provided a better color contrast and our spectrometric analysis indicated that the blaze pink color had a visibility similar to, or better than, the blaze orange. Whether deer perceive the difference is a matter for further study. However, we know that because of the nature of deer eyesight, the effect of color is far less significant than the effect of a hunter’s scent, movement, detergents, and noise.

RESOURCES

Wisconsin CWD Overview:
<https://dnr.wi.gov/topic/wildlifehabitat/cwd.html>

Center for Disease Control and Prevention overview of Prion Diseases:
<https://www.cdc.gov/prions/cwd/index.html>

Meat Processing Recommendations to Prevent the Spread of CWD:
https://www.canr.msu.edu/resources/meat_processor_deer_venison_processing_protocol_to_prevent_the_spread_of_ch

Wisconsin Deer Trustee Report:
<https://dnr.wi.gov/topic/wildlifeHabitat/trustee.html>

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