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Final Project

Game farms are defined as an agricultural property where game animals are raised as livestock for the purpose of hunting. Farming entails the intense management of cervids, to the extent that the animals are individually identified (Smits 1990). White-tailed deer (*Odocoileus virginianus*) game farms are controversial among modern hunters, and some believe they go against the North American Model of Wildlife Conservation (Miller and Miller 2016). The topic of white-tailed deer farms is highly debated due to the blatant overpopulation of *O. virginianus* in the US. Although they are stigmatized, deer farms do contribute positively to the economy through the sale of antlers, velvet, urine, controlled hunts, and breeding stock (Lupi and Schulz 2001). However, they pose a variety of negative ecological impacts that should be considered when planning for the future management of *O. virginianus* game farms.

The main concern raised by game farms is their ideal habitat for disease cultivation. Chronic Wasting Disease (CWD) is a disease commonly spread from captive cervids, such as deer, elk, and moose, to wild ungulates of the same species. For this reason, it is of concern to wildlife managers. It is typically horizontally transmitted through contact with infectious bodily fluids, such as saliva and fecal matter (Osterholm *et al.* 2019). Of the transmissible spongiform encephalopathies (TSEs), CWD is the only one found in free-ranging species (Williams *et al.* 2002). Once in the environment, CWD prions can persist for years. They can withstand extremely high disinfectants, such as heat, radiation, and formaldehyde, and are capable of binding to certain plants while still being infectious (Osterholm *et al.* 2019). Due to its longevity and ease of transmission, CWD is of special interest to wildlife managers looking to mitigate the spread of the disease before prevention becomes infeasible.

Transmission is more common when animals are congregated, thus large game farms are cause for concern. Movement of infected live cervids has been implicated in the spread of CWD among North American deer farms, with ten states and three provinces noting their first CWD cases in captive ungulates (Osterholm *et al.* 2019). Three species are known to be naturally susceptible to the disease-mule deer, white-tailed deer, and Rocky Mountain elk; livestock such as cattle are not naturally susceptible (Williams *et al.* 2002). Concentrating deer in captivity increases the likelihood of direct or indirect transmission between individuals. Furthermore, no treatment is available for cervids infected with CWD. The disease has an eighteen-month incubation period between initial infection and initial symptoms, and there is no way to test for infection while the animal is still alive (Hunter 2020). CWD is lethal and highly contagious, making it a major challenge for breeders and farmers interested in keeping their cervid herds healthy.

To manage the disease, farming facilities are currently limited to culling infected herds, quarantining infected individuals, and preventing introduction of CWD. Attempts to eradicate the disease have failed in environments contaminated with residual CWD prions (Williams *et al.* 2002). Additionally, managing CWD in free-ranging cervids presents another series of challenges. Long-term surveillance programs have been established to monitor disease distribution and prevalence in the Wyoming-Colorado-Nebraska endemic area to determine the disease’s range (Williams *et al.* 2002). Management goals vary among affected states and provinces, but the most popular and effective method adopted thus far is selective culling of infected populations (Williams *et al.* 2002).

Besides the threat of disease transmission, captive cervids pose other negative ecological consequences. Both native and exotic cervid species have been documented to cause impacts at the ecosystem level, such as succession and habitat quality (Lupi and Schulz 2001). Deer and elk have the potential to change forest composition due to their preference for herbaceous understory growth. Thus, in places subjected to deer browsing, a more open forest overstory may be maintained that encourages the development of shade-intolerant understory species. Furthermore, deer browsing can have a negative impact on forest regeneration. Over browsing may alter overstory species composition and nutritional qualities, resulting in loss of important winter cover for deer in the long term (Lupi and Schulz 2001). Finally, by affecting forest structure, deer browsing might alter the composition of breeding bird communities. Bird species associated with undergrowth or lower canopy layers are less likely to breed in forested areas heavily affected by deer browsing (Lupi and Schulz 2001).

Over browsing is an avoidable problem provided captive herds stay captive. However, escape of captive cervids is another issue associated with game farms. If farmed animals escape to surrounding property, they could potentially mix with wild deer or elk and may pose ecological risks to the wild herd. If an escape of substantial numbers were to occur, the escaped animals may become established as a self-sustaining population, which would be quite difficult to remove (Lupi and Schulz 2001). Wildlife agencies consider exotics as competitors with native species; thus, the existence of free-ranging exotics is not ideal for wildlife management programs since they outcompete native species for habitat and forage (Lupi and Schulz 2001). Additionally, hybridization may occur if captive cervids mate with wild deer or if wild deer enter farming facilities and mate with captive cervids. The long-term effects of hybridization are not fully known, but the deleterious effects include reduced resistance to disease, altered growth and maturation patterns, and reduced reproductive potential (Lupi and Schulz 2001).

Deer farms not only come with ecological costs, but also managerial and economic challenges. Since captive cervids pose so many potential risks to wildlife, it is important that movement of captive cervids within and between states be recorded and monitored. Currently, captive cervid owners must report the sale and transport of any white-tailed deer, as well as test the animal for brucellosis and bovine tuberculosis (Lupi and Schulz 2001). This rigorous monitoring helps to mitigate the spread of disease and provides important information if a disease outbreak were to occur. Proper fencing is another invaluable tool in reducing the transmission of CWD. The potential escape of captive cervids, ingress by wild cervids into captive herds, or any interaction between captive and wild cervids poses risks to all animals involved. Other than height restrictions and a woven wire fencing requirement, there are very few regulations currently in place for confining cervids on game farms (Lupi and Schulz 2001). In short, fencing must be at least ten feet high and constructed of woven wire. The addition of electric wires has been shown to be effective in minimizing contact between captive and wild cervids, however more research should be done on proper fencing for containment of white-tailed deer (Lupi and Schulz 2001).

Some states require game farms to be licensed and monitored, however it is unclear if funds must be diverged from conservation efforts in order to enforce these regulations (Miller and Miller 2016). Elements such as fence construction and maintenance, production costs, and both short- and long-term risks to the market for the animals and their associated products are poorly understood by legislators and current breeders (Miller and Miller 2016). The cost of starting and maintaining game farms can be quite steep. Fence construction costs can be affected by the size of the order, labor costs, topography, whether electrified fencing is used, the mesh and height of the woven wire, and the number of gates (Lupi and Schulz 2001). In an interview with Mike Sheppard, a former game farm owner from Ohio, he stated that fencing was the costliest aspect of running a game farm. He owned roughly 250 acres of land and stated that he paid $89 per 10-12 ft of fencing, as well as $29 for barbed wire around the entirety of his property (Sheppard 2022).

There are, however, some economic pros to game farms. In 1997, white-tailed deer numbers rose from 287 to 3,544 (Lupi and Schulz 2001), with livestock costing approximately $60 million in total. Other minor products sold are hard antlers for decoration and velvet antlers for dietary supplementation: reduce inflammation and support immune function. Other products sold are deer urine, hides, tails, leg sinews and antler buttons. Furthermore, the breeding stock market includes sales of semen straws of elk and, to a lesser extent, deer (Lupi and Schulz 2001). Public contributions to the farming facilities, as well as to conservation in general, include buying permits and funding hunting programs. New York State hunters aged 16 to 69 must pay $22 for a hunting license, and a hunter education course is required for those who have no prior hunting license (NYSDEC 2022). Hunting on game farms is likely the most well-known deer farming method. Prices of hunts vary between farms and overall demand for trophy deer is unclear since most farms manage their own herds. Trophy hunts are the most expensive way to hunt and can cost as much as $20,000, while just hunting on the property is less expensive at about $500 per person per day (Lupi and Schulz 2001).

Although hunting itself is well-regulated and accepted by the general population, hunting on game farms is much more taboo. This is because game farm hunts seem to fly in the face of the North American Model of Wildlife Conservation, the globally recognized model for wildlife management and conservation. The captive cervid industry undermines the model’s tenants, including maintaining wildlife as a public trust resource, eliminating markets for game, killing wildlife only for legitimate purpose, and democratizing hunting (Miller and Miller 2016). While many Americans support hunting, that support counts on the idea that hunted species are only harvested for legitimate reasons. Hunting captive cervids erodes this view of hunting for the public and threatens continued public support of fair-chase hunting as an important tool for conservation (Miller and Miller 2016).

Traditional hunters deem game farms as a relatively cheap and easy way to score a buck. Multiple surveys have shown a majority of American adults in support of ethical hunting; however, support is much lower when hunting occurs within established preserve boundaries (Adams *et al.* 2016). The proliferation of the captive cervid industry may negatively affect public perception of hunting, and the widespread availability of abnormally large-antlered hunt bucks could alter hunter expectations and change the fundamental hunting experience (Adams *et al.* 2016). According to Mike Sheppard, game farms were not always so highly stigmatized. When he would host hunts on his property, he stated that “each hunter went home with more than one kill” and he had enough acreage to make the experience feel real. It is worth noting that transporting animals across state lines was much easier decades ago, so Mr. Sheppard was able to obtain several exotic species of ungulates and hogs. On some of the hunts he hosted, not all the boars he would release were captured. These boars “were never seen again” by Mr. Sheppard, suggesting that they escaped and scattered into the surrounding Ohio landscape. Although hunts held by Mr. Sheppard were popular, at least in his opinion, this was most likely due to the state’s lax hunting regulations at the time. Today, most hunters would rather hunt wild cervids than farmed cervids, due to game farms being considered unsportsmanlike and simply not as fun as traditional hunting.

White-tailed deer farms host a barrage of problems. They are ideal habitats for disease, encouraging the transmission of lethal prions from captive cervids to wild herds. Fencing plays an important role in containing farmed livestock and mitigating contact between captive and wild cervids, which is nearly impossible unless costly measures are taken. If livestock breach containment, they could impose disastrous ecological consequences on both the species and ecosystem level. Furthermore, game farms oppose four of the seven main tenants of the North American Model of Wildlife Conservation and do not appeal to traditional hunters. The few economic benefits of captive cervid farming do not override the many detriments associated with white-tailed deer farms.

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