LANDOWNERS' ACCEPTANCE OF CHRONIC WASTING DISEASE MANAGEMENT: IMPLICATIONS FOR ACCESS TO PRIVATE LAND

By

Rachel Susan Correia

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Fisheries and Wildlife – Master of Science

2025

ABSTRACT

Management of chronic wasting disease (CWD) in cervids is dependent upon landowner access to private property. When access is allowed, CWD management strategies such as targeted removals and recreational hunter harvest can decrease local prevalence, and surveillance strategies can improve knowledge. However, the decision to allow property access rests on the landowner's acceptance of wildlife management actions. I distributed a survey to landowners in six U.S. states, which varied by region, state CWD prevalence, and county CWD prevalence, to assess landowners' willingness to allow CWD management on their land. In Chapter 1, I assessed landowners' acceptance of various CWD management and research strategies on their private property and explored a range of attributes that may influence their decisions. Results indicated that landowners were more supportive of targeted removals than recreational hunter harvest for managing CWD but were most likely to allow surveillance strategies overall. Additionally, management efforts led by government wildlife agents were more widely accepted than those involving recreational hunters. Acceptance of CWD management was influenced by a range of attributes, including demographics, geographic location, disease prevalence, risk perceptions, hunting status, trust in wildlife agencies, and property characteristics. In Chapter 2, I evaluated landowners' preferences for targeted removal attributes and quantified their willingness to accept (WTA) financial incentives for deer removals. To do so, I employed a discrete choice experiment (CE) with three attributes: (i) removal restriction, (ii) implementing agency, and (iii) payment mechanism. Results indicated that many respondents were against targeted deer removals on their property and were unlikely to accept a feasible financial incentive to change their minds. However, among those willing to permit removals, targeting antlerless deer conducted by a state wildlife agent was preferred, suggesting it may be the most viable strategy to implement on private land. Various factors, including landowner demographics, geographic region, state and county-level CWD prevalence, and hunting status, influenced acceptance of targeted removals. This research will help improve property access by identifying landowners most likely to allow CWD management efforts and accept financial incentives, enabling managers to better prioritize resources and therefore reduce local CWD prevalence more effectively.

ACKNOWLEDGEMENTS

This research is the result of years of dedication, hard work, and encouragement from the incredible network of people who love and support me. First, I would like to thank my parents and my sister June for inspiring my love of nature and wildlife and always being my biggest supporters. I especially would like to thank my mom, who is my best friend and an inspiration to me every day. I am grateful for our daily phone calls where we talk for hours about wildlife, research, and hear her words of encouragement. I'd like to thank my partner, Thomas, for supporting me throughout the countless late nights working, celebrating all my achievements, and encouraging me to follow my career in wildlife. Thank you for always reminding me of my capabilities, celebrating my successes, and standing by my side through every challenge. This would not have been possible without you.

I would like to express my deepest gratitude to my advisor and mentor, Dr. Sonja Christensen, for her unwavering support—not only throughout my master's but for several years and projects beforehand. Her mentorship, encouragement, and dedication have been instrumental in shaping my academic and professional journey. Thank you for inspiring me throughout my career in wildlife and for always leading by example. I am truly thankful to have had you as my advisor. I am also incredibly grateful to my committee members, Dr. David Ortega and Dr. Adam Zwickle, for their guidance and continuous support throughout this process. Your insights, expertise, and enthusiasm have been essential to my growth as a researcher.

This research would not have been possible without the support and partnership of the United States Department of Agriculture (USDA) and Dr. Nathan Snow. Thank you for funding this project and for providing valuable feedback that strengthened my work. Your collaboration has been instrumental in the success of this research.

I would like to thank Dr. Emily Pomeranz for her guidance in navigating the human dimensions of wildlife research. Your expertise, support, and encouragement have helped me as I explored this new direction in my career. To the past and present members of The Christensen Lab, thank you for making this journey so enjoyable. I will miss being part of such a fun and supportive group. Finally, I would like to extend my deepest appreciation to Steven Gurney, whom I consider one of my greatest mentors in my professional wildlife career. Your countless

hours of teaching, guidance, and advice have profoundly shaped me as a scientist, researcher, and person. Your mentorship has been instrumental, and I am forever grateful for your support. To all of these people and countless others who have helped and supported me throughout this time, thank you.

TABLE OF CONTENTS

INTRODUCTION

Chronic wasting disease (CWD) is a fatal disease in deer, elk, and moose (family Cervidae) caused by a prion protein mutation (Williams, 2005). The disease spreads through direct (animal-to-animal) and indirect (environmental) contact, making it difficult to control. Individuals can begin shedding prions as early as three months post-infection and will continue throughout their lifetime (Henderson et al. 2015). Given the average course of infection and daily production of body fluids, a deer can shed thousands of infectious doses over the time they are infected (Henderson et al. 2015). In the late stages of the disease, animals exhibit weight loss (emaciation), abnormal behavior, loss of function, and ultimately, death (Williams et al. 2002). In areas where CWD has become established, reductions to the health and stability of deer populations are a significant concern (DeVivo et al. 2017; Edmunds et al. 2016; Gross and Miller, 2001; Manjerovic et al. 2014) and can discourage hunters from harvesting deer (Needham et al. 2004; Vaske and Lyon, 2010). As sales from hunting licenses and other hunting-related expenditures account for the largest portion of funding for wildlife management agencies (Jacobson et al. 2010), the decline in hunter participation is a significant concern.

Although hunters remain a primary group of interest surrounding CWD, many other stakeholders are also affected by the disease and should be included in management decisions (Ufer et al. 2023). In particular, landowners are vital to the success of CWD management in free-ranging deer as infected deer may inhabit their land, making their cooperation essential for surveillance, research, and control efforts. Without landowner participation, wildlife agencies face significant barriers to effectively managing the disease, limiting their ability to monitor its spread and implement mitigation strategies. Understanding landowner preferences for CWD management and attributes that shape their decision to allow access is crucial, as their perspectives may differ from those of hunters. Stafford et al. (2007) found that hunting and non-hunting landowners differed in their responses on five of six belief indices related to CWD management, highlighting the importance of considering all landowners in human dimensions research.

Landowners' willingness to allow access to their property may depend on their perceptions of the management or surveillance method and who will be responsible for

implementing it on their property. Lethal management, such as targeted removals and recreational deer harvest, is currently the only effective approach for reducing CWD prevalence and limiting disease spread (Manjerovic et al. 2014; Mateus-Pinilla et al. 2013; Moss et al. 2025; Uehlinger et al. 2016). Past studies have found that landowners exhibit moderate support for population reduction through hunting, but express little support for targeted removals on private land (Durocher et al. 2022; Landon et al. 2022). Research approaches such as live deer capture and trail-camera monitoring can assist managers with disease surveillance and may be more acceptable to landowners. However, these approaches do not contribute to the control or reduction of CWD prevalence. Therefore, the challenge in managing CWD lies in the fact that the only effective strategies are also the most invasive and receive the least public support, limiting access to private land. One potential method to increase support for lethal management, particularly targeted removals, is to offer the landowner a financial incentive to remove deer from their land. Furthermore, understanding the attributes that shape landowners' preferences for CWD management is crucial for wildlife managers to allocate their time and resources more effectively, enabling them to focus their outreach on landowners who are more likely to allow a given strategy.

Since CWD was first identified in Colorado, USA, in 1967, the disease has spread to thirty-six states and five Canadian provinces (Williams and Young, 1980). Research has shown that both geographic location and CWD prevalence can significantly influence risk perceptions and acceptance of CWD management (Vaske, 2010; Needham et al. 2004). To capture these variations, I distributed a survey to landowners across six U.S. states, representing differences in (i) region, (ii) state-CWD prevalence, and (iii) county-CWD prevalence. To do so, I selected three states in both the western and eastern regions of the U.S. with varying levels of state CWD prevalence, measured by the total number of CWD-positive deer recorded since testing began. Each region included one state with high prevalence (more than 1,000 detections), one with medium prevalence (100–999 detections), and one with low prevalence (less than 100 detections) in January 2023, when the survey was constructed. In the western region, Wyoming represents high CWD prevalence, Nebraska medium CWD prevalence, and North Dakota low CWD prevalence. In the eastern region, Illinois represents high CWD prevalence, Michigan

medium CWD prevalence, and Virginia low CWD prevalence. Within each state, surveys were distributed to landowners in CWD-positive counties, which had at least one confirmed case, or adjacent counties that border a positive one.

The overarching goals of this thesis were to assess the attributes that influence landowners' willingness to allow CWD management strategies on their property and to estimate the financial incentives required by landowners to allow targeted removal efforts. The first goal was developed to identify the management strategies landowners are most willing to allow and the attributes that significantly influenced their decisions to improve access to private lands. The second goal was developed to assess whether incentives can improve the acceptability of targeted removals on private land, which is the most effective yet least accepted strategy to manage CWD.

In Chapter 1, I assessed the willingness of landowners to allow four different CWD management and two research strategies on their private property. My objectives were to 1) compare landowners' acceptance of management strategies and research approaches on their private property, and 2) assess the attributes influencing their willingness to allow each strategy. The variables collected for Chapter 1 were then used for the choice experiment assessment in Chapter 2.

In Chapter 2, I evaluated the willingness of landowners to allow targeted removals on their private property and estimated the financial incentives accepted for removal attributes. My objectives were 1) identify the willingness of landowners to accept targeted removal alternatives and financial incentives, 2) compare acceptance of financial incentives by region, state CWD prevalence, county CWD prevalence, and hunting status, and 3) determine the driving factors that influence landowners' willingness to accept incentives for targeted removal attributes. Each Chapter serves as a standalone document for submission as a manuscript.

LITERATURE CITED

DeVivo, M. T., D. R. Edmunds, M. J. Kauffman, B. A. Schumaker, J. Binfet, T. J. Kreeger, B. J. Richards, H. M. Schätzl, and T. E. Cornish. 2017. Endemic chronic wasting disease causes mule deer population decline in Wyoming. PLoS ONE 12:e0186512.

Durocher, G., M. K. (Marty) Luckert, E. W. Goddard, and W. L. (Vic) Adamowicz. 2022. Public preferences for options to manage chronic wasting disease in Canada: A paired comparisons study. Environmental Science and Policy 132:206–213.

Edmunds, D. R., M. J. Kauffman, B. A. Schumaker, F. G. Lindzey, W. E. Cook, T. J. Kreeger, R. G. Grogan, and T. E. Cornish. 2016. Chronic Wasting Disease Drives Population Decline of White-Tailed Deer. PLoS ONE 11:1–19.

Gross, J. E., and M. W. Miller. 2001. Chronic Wasting Disease in Mule Deer: Disease Dynamics and Control. The Journal of Wildlife Management 65:205–215.

Henderson, D. M., N. D. Denkers, C. E. Hoover, N. Garbino, C. K. Mathiason, and E. A. Hoover. 2015. Longitudinal Detection of Prion Shedding in Saliva and Urine by Chronic Wasting Disease-Infected Deer by Real-Time Quaking-Induced Conversion. Journal of Virology 89:9338–9347.

Jacobson, C. A., J. F. Organ, D. J. Decker, G. R. Batcheller, and L. Carpenter. 2010. A Conservation Institution for the 21st Century: Implications for State Wildlife Agencies. The Journal of Wildlife Management 74:203–209.

Landon, A. C., K. Smith, L. Cornicelli, D. C. Fulton, L. E. McInenly, and S. A. Schroeder. 2022. Examining landowners' preferences for a chronic wasting disease management program. Wildlife Society Bulletin 47:e1401.

Manjerovic, M. B., M. L. Green, N. Mateus-Pinilla, and J. Novakofski. 2014. The importance of localized culling in stabilizing chronic wasting disease prevalence in white-tailed deer populations. Preventive Veterinary Medicine 113:139–145.

Mateus-Pinilla, N., H.-Y. Weng, M. O. Ruiz, P. Shelton, and J. Novakofski. 2013. Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003–2008. Preventive Veterinary Medicine 110:541–548.

Needham, M. D., J. J. Vaske, and M. J. Manfredo. 2004. Hunters' Behavior and Acceptance of Management Actions Related to Chronic Wasting Disease in Eight States. Human Dimensions of Wildlife 9:211–231.

Stafford, N. T., M. D. Needham, J. J. Vaske, and J. Petchenik. 2007. Hunter and Nonhunter Beliefs about Chronic Wasting Disease in Wisconsin. The Journal of Wildlife Management 71:1739–1744.

Uehlinger, F. D., A. C. Johnston, T. K. Bollinger, and C. L. Waldner. 2016. Systematic review of management strategies to control chronic wasting disease in wild deer populations in North America. BMC Veterinary Research 12:173.

Ufer, D. J., S. A. Christensen, E. Pomeranz, and D. L. Ortega. 2023. A behavioral economic assessment of the role of stakeholder preferences in managing an infectious wildlife disease. Wildlife Society Bulletin 47:e1411.

Vaske, J. J. 2010. Lessons Learned from Human Dimensions of Chronic Wasting Disease Research. Human Dimensions of Wildlife 15:165–179.

Vaske, J., and K. Lyon. 2010. CWD Prevalence, Perceived Human Health Risks, and State Influences on Deer Hunting Participation. Risk analysis : an official publication of the Society for Risk Analysis 31:488–96.

Williams, E. S., and M. W. Miller. 2002. Chronic wasting disease in deer and elk in North America: -EN- -FR- -ES-. Revue Scientifique et Technique de l'OIE 21:305–316.

Williams, E. S. 2005. Chronic Wasting Disease. Veterinary Pathology 42:530–549.

Williams, E. S., and S. Young. 1980. Chronic wasting disease of captive mule deer: a spongiform encephalopathy. Journal of Wildlife Diseases 16:89–98.

CHAPTER 1: ASSESSING THE WILLINGNESS OF LANDOWNERS TO ALLOW CHRONIC WASTING DISEASE MANAGEMENT ON PRIVATE LAND

INTRODUCTION

Background

Chronic wasting disease, or CWD, is a fatal transmissible spongiform encephalopathy (TSE) that infects the family Cervidae, which includes white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*) species (Williams, 2005). It was first discovered in Colorado in 1967 and has since spread to captive and free-ranging cervids across thirty-six states and five Canadian provinces (Williams and Young, 1980; Figure 1.1). Prions are the etiological agent of TSEs and are transmitted through direct contact with infectious saliva, urine, or tissue or through indirect contact with a prion-contaminated environment (Miller et al. 2004). Prions can remain infectious in the environment for several years, increasing the likelihood of transmission (Colby and Prusiner, 2011; Miller et al. 2004). As the disease continues to spread, threats to the health and population dynamics of deer are a major concern. Research has shown the potential for population declines in areas where the disease has become endemic, posing a significant threat to both the conservation and recreational opportunities associated with deer (DeVivo et al. 2017; Edmunds et al. 2016; Miller et al. 2008). Although there is no evidence that CWD can be transmitted to humans or pose a risk to human health, it cannot be completely dismissed (Belay et al. 2004). CWD, therefore, has the potential to cause social and economic disruptions that could extensively impact deer, humans, and other wildlife species.

The public highly values deer for recreational viewing, and they are the most popular game species among North American hunters. In the United States, hunters support over 500,000 jobs (Duda et al. 2010), though only 4.3% of the population participates (Cambronne, 2013). Conover (2011) calculated the net economic value of white-tailed deer and mule deer in the US during 2008 as $12.2 billion, which includes positive economic activity from hunting ($12.0 billion) and deer viewing ($4.6 billion) minus the negative economic effects, such as deer-vehicle collisions and agricultural losses. Several studies have suggested that the ongoing spread of CWD may lead to significant shifts in hunter behavior (Holland et al. 2020; Miller, 2003;

Needham et al. 2017; Schroeder et al. 2021; Vaske et al. 2004). For example, Needham et al. (2004) found that across eight states, 49% of hunters would stop if the majority of deer were infected. As revenue from deer hunting is the largest contributor to the management, conservation, and research of deer and other wildlife (Jacobson et al. 2010), the threat of CWD causing declines in cervid populations, and therefore, a decline in hunter participation, is of great concern.

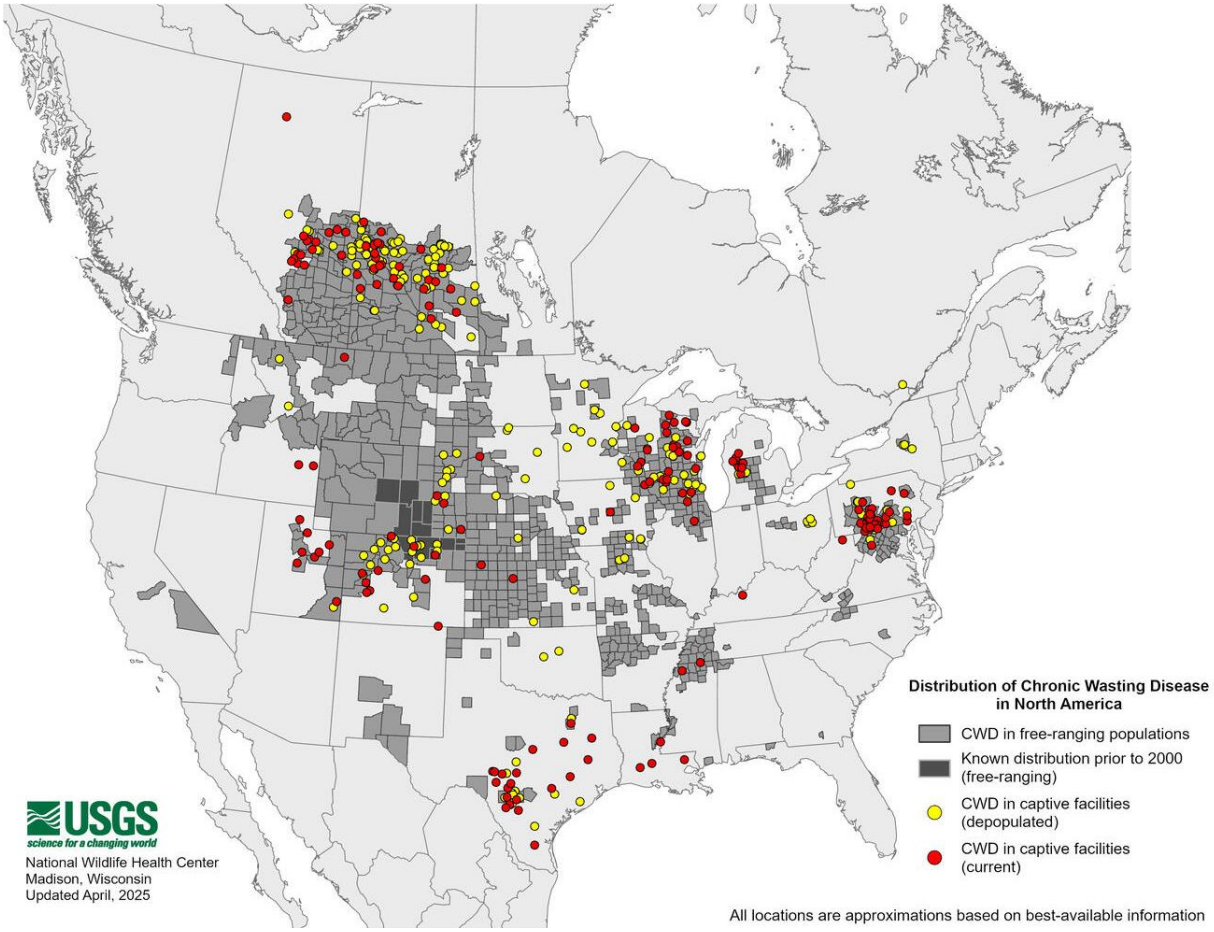

Figure 1.1. Current distribution of chronic wasting disease in North America as of April 2025.

Past human dimensions literature on CWD has often focused solely on hunters (Cooney and Holsman, 2010; Harper et al. 2015; Haus et al. 2017; Holsman and Petchenik, 2006; Lyon and Vaske, 2010; Meeks et al. 2022; Needham and Vaske, 2008; Needham et al. 2004; Rubino and Serenari, 2022; Schroeder et al. 2021; Vaske et al. 2021; Vaske et al. 2004). However, studies have shown that other stakeholders may hold differing views regarding CWD management (Brown et al. 2006; Landon et al. 2022; Stafford et al. 2007; Ufer et al. 2023; Vaske, 2010). These differences can stem from individuals' social and political values, attitudes, and beliefs regarding wildlife, shaping their perspective on the proper use and management of species. Manfredo et al. (2017) discussed how traditional hunters' values often align with a domination orientation or utilitarian value, believing that wildlife exists for human use. In contrast, the mutualist orientation believes wildlife should be protected from human activities and often opposes lethal management. Mutualist orientations have increased over the past two decades and now represent the nationally dominant perspective, accounting for 35% of the population (Manfredo et al. 2018). Wildlife agencies have traditionally aligned management with the domination perspective to protect hunter opportunities, but are now adapting management practices to be inclusive of both perspectives. This shift in wildlife values and subsequent institutional change may lead to backlash from stakeholders, reducing trust in agencies tasked with managing natural resources closely tied to their identity (Inglehart and Norris, 2016).

As CWD has been characterized as the most important disease threatening North American deer, access to private property is crucial for managing CWD during the early stages of a detected outbreak (Gillin and Mawdsley, 2018). Private properties account for over 60% of U.S. land (Lubowski et al. 2006) and contain habitats that support deer populations, making them critical areas for management. Wildlife agencies often prioritize control and surveillance measures in areas with high CWD prevalence, high deer densities, specific risk factors, or newly emergent cases. However, a fundamental challenge for wildlife agencies is gaining permission from landowners to access their property when such situations arise, hindering their ability to manage these critical areas effectively (Hargiss and Dekeyser, 2014). The lack of research on

landowners' willingness to allow access to their property for management adds to the difficulty of reducing prevalence in free-ranging populations.

Identifying the underlying factors that drive behavior is necessary to understand landowners' decisions regarding property access. The theory of planned behavior (TPB) frames how attitudes, norms, and perceived behavioral control influence an individual's intentions (Ajzen, 1991). Norm-activation theory (NAT) can be integrated with the Theory of Planned Behavior (TPB), which proposes that personal norms, or our internalized moral obligations, shape morally ethical behaviors (Schwartz, 1997; Schwartz and Howard, 1981). O'Brien et al. (2021) found landowners' personal norms were a driving motivation for allowing conservation research on their property. NAT can also be applied to CWD management acceptance, as landowners may feel a moral obligation to maintain healthy deer herds and recognize that their decisions can prevent or facilitate the spread of CWD (Kreinheder et al. 2024). Although the public may share a moral understanding that management is necessary to reduce CWD (Durocher et al. 2022), there is often disagreement over which specific management strategies should be implemented to achieve this goal.

CWD Management

There are various management and research strategies employed by wildlife agencies to monitor, identify, and mitigate the spread of CWD, all of which rely on access to private land to be effective. Most often, agencies use lethal management to reduce population density and minimize the spread of CWD, and surveillance to improve knowledge. Utilizing a combination of these strategies, wildlife managers can expand their understanding of the disease and its transmission, identify where it is located, and reduce its prevalence in endemic and emerging areas (Manjerovic et al. 2014; Mateus-Pinilla et al. 2013; Varga et al. 2022). However, not all management actions are equally effective or accepted by stakeholders (Vaske, 2010).

Targeted Removals

Targeted removals are a population control method involving professional sharpshooters removing specific individuals from known infected landscapes. This will reduce overall density and, therefore, limit the possibility of transmission among free-ranging deer (Durocher et al. 2022). This approach typically targets localized areas where deer are at a greater risk of

infection, such as those with a high population density or prevalence (Manjerovic et al. 2014). Due to the extended incubation period during which deer can transmit CWD, removing positive individuals from the landscape can dramatically lower the dispersal of prions among deer and in the environment (Williams and Miller, 2002). Past studies have employed empirical data and modeling approaches to demonstrate successful reductions in CWD prevalence through targeted removals (Gross and Miller, 2001; Jennelle et al. 2014). However, public support for this strategy is limited, presenting a significant barrier to its effectiveness as a management tool (Cooney and Holsman, 2010; Durocher et al. 2022; Harper et al. 2015; Heberlein, 2004). Without landowner support and access to private property for conducting deer removals, new outbreaks will continue to occur and spread at an increasingly rapid rate (Gross and Miller, 2001). For a more in-depth discussion of this strategy, please refer to Chapter 2.

Recreational Deer Harvest

Hunters play primary role in managing CWD, as the annual harvest helps remove deer from the landscape and reduce local densities, thereby limiting the opportunity for contact between infectious deer or environments. Hunting is the primary source of funding for researching and managing CWD through hunter license sales and programs (Jacobson et al. 2010; Price Tack et al. 2018; Uehlinger et al. 2016). Therefore, recreational deer harvest can support CWD management and serve as a population control method to reduce transmission in free-ranging deer. Hunters often focus on adult male harvest for trophy hunting (Holsman et al. 2010), which can significantly reduce CWD (Moss et al. 2025) as the prevalence in adult males is twice as high as in females (Beier and McCollough, 1990; Grear et al. 2006; Miller and Conner, 2005; Osnas et al. 2009; Wolfe et al. 2004). Alternatively, if high contact rates and CWD transmission risk are a concern due to high deer density, the female portion of the population, typically regulated as “antlerless deer”, can be a focus for reducing overall deer densities by reducing fawn birth rates and reproductive potential (Brown et al. 2000; McNulty et al. 1997; Porter et al. 1991; Van Buskirk et al. 2021). Wildlife managers have also attempted to expand hunters’ harvest threshold or the maximum number of deer they are willing to harvest in a single season (Holsman and Petchenik, 2006). However, only a small percentage of hunters fill multiple tags (National Deer Association, 2024). Additionally, hunters may avoid harvesting deer

in areas with high CWD prevalence, limiting the impact of hunter harvest on managing CWD (Needham et al. 2004; Vaske et al. 2004; Vaske and Lyon, 2010). Therefore, with the decline in hunter participation coupled with a rise in deer populations, managing CWD will become considerably more challenging (Haley and Hoover, 2015; Harper et al. 2015).

Live Deer Capture

Early detection of infected individuals in emergent areas is key to successfully managing CWD (Gross and Miller, 2001). Postmortem identification techniques, such as hunter harvest and culling, may have limited accessibility due to the nature of the strategy (i.e., shooting is not feasible or permitted in all areas) and may face challenges in gaining public support. While not considered management, one way wildlife agencies can detect CWD and estimate prevalence in virtually any location is through live capture and testing of deer. Tonsillar immunohistochemistry, or IHC (O'Rourke et al. 2003; Spraker et al. 2002), is an antemortem test used to detect prion proteins (PrP^{CWD}) that accumulate in the lymphoid tissue of deer that can positively identify CWD (Spraker et al. 1997). For example, a study conducted by Wild et al. (2002) demonstrated that antemortem tonsillar biopsies were able to detect CWD in 26 out of 32 (81%) live mule deer and 4 out of 4 (100%) white-tailed deer, and in many cases, well before the onset of clinical signs. Live deer capture allows wildlife managers to detect the presence of CWD and may gain greater acceptance from landowners as it avoids the need for lethal measures. However, while live deer capture can aid wildlife agencies in detecting CWD, it does not reduce CWD prevalence within a population.

Trail Cameras

Trail cameras are a non-invasive observational tool used to estimate abundance, monitor habitat use, and detect interactive behaviors between deer and the environment. Abundance estimates can be used to locate densely populated areas with a greater risk of contamination and transmission (DeYoung, 2011). They also inform wildlife managers about habitat use, such as commonly used trails, feeding and drinking areas, and bed sites, which are more likely to accumulate prions in the environment. Using trail cameras, deer behaviors can be observed in a natural, undisturbed setting, which can improve understanding of disease spread and monitor localized changes from CWD management efforts. Since this tool is strictly observational and

requires minimal to no property access by wildlife agents, it may be highly acceptable to landowners. However, while effective for monitoring, camera traps do not facilitate direct intervention for controlling CWD.

Acceptance of Management Strategies

Acceptance of management will depend on landowners' attitudes towards disease control methods and who accesses their property to implement the strategy. Targeted removals and recreational deer harvest use lethal management to remove deer from the landscape (Manjerovic et al. 2014; Mateus-Pinilla et al. 2013). Past studies have explored whether landowners would allow property access for these methods and found moderate support for density reduction by hunters and little support for targeted removals (Durocher et al. 2022; Landon et al. 2022). However, lethal control is currently the only effective method for reducing CWD prevalence and preventing further disease spread (Manjerovic et al. 2014; Mateus-Pinilla et al. 2013; Uehlinger et al. 2016). While surveillance approaches such as live deer captures and trail-camera monitoring can help gain insight into CWD's spread, distribution, and impact on local cervid populations, lethal control is still required to manage the disease. As the mutualist value orientation becomes more widespread (Manfredo et al. 2018), landowners may be more inclined to accept surveillance strategies over lethal control, presenting one of the greatest challenges currently faced by wildlife agencies in managing CWD.

Concurrently, acceptance of these strategies can be influenced by who is accessing the property. While recreational deer harvest involves a hunter accessing the landowner's property, targeted removals and surveillance efforts would require access by government wildlife agents (state or federal). Previous studies have found that the public generally accepts hunting for managing CWD (Landon et al. 2022; Lischka et al. 2010). However, landowners may have concerns about property infringement caused by unfamiliar hunters (Demartini et al. 2018; Jagnow et al. 2006; O'Brien et al. 2021). On the other hand, the public generally trusts their government wildlife agencies to manage CWD (Needham and Vaske, 2008; Stafford et al. 2007) and may be more accepting of professional management actions.

Attributes Influencing Landowners' Decisions to Allow Access

Several attributes may influence a landowner's decision to allow access to their property for CWD management. First, differences among landowners' demographics, such as age, gender, and income, could influence their management preferences. For example, males often have lower risk perceptions (Slovic, 2000) and tend to believe in the economic importance of hunting (Byrd et al. 2017) more than females. Past research has also found an association between lower education and higher risk perceptions of wildlife diseases (Hanisch-Kirkbride et al. 2013). Older age has been associated with higher participation in hunting (Gude et al. 2012; Winkler and Warnke, 2013) and an increase in utilitarian values (Kellert, 1993; Manfredo et al. 2003; Vaske et al. 2011). However, past research exploring the connection between preferences for CWD management and demographics has seen minimal or no relationship (Landon et al. 2022; Lyon and Vaske, 2010; Meeks et al. 2022; Needham et al. 2006; Vaske et al. 2021). Landowners' property-use decisions may also predict management acceptance on private land. Landowners using their property for farming or production have been more likely to allow lethal control methods (Urbanek et al. 2015; West and Parkhurst, 2002) as deer are often associated with crop damage (Curtis and Lynch, 2001). O'Brien et al. (2021) also found that landowners with larger land parcels were more likely to allow access for research.

Geographic location and CWD prevalence levels can influence risk perceptions and, therefore, acceptance of CWD management (Needham et al. 2004; Vaske, 2010). The eastern and western regions of the U.S. can differ in terms of species range (Heffelfinger, 2006), land ownership (Price, 1995), and values (Manfredo et al. 2018), underscoring the need for comparison between individuals who own land in these areas. White-tailed deer are found throughout the mainland of the United States, while mule deer are typically located west of the Missouri River (Heffelfinger, 2006), which impacts hunting culture and opportunities. Further, privately owned land parcels are significantly larger in western states than in eastern states (Price, 1995; see Appendix 1C for the average parcel size of surveyed states). As wildlife managers seek permission from landowners to access their properties, western states would likely require fewer participants, as one property owner could account for the same amount of land as several owners in the east. Manfredo et al. (2018) found that mutualist values are more

prevalent among individuals in the eastern U.S. and that opposition to lethal control increases as the proportion of mutualists in a state grows. Additionally, as mutualist values become more prevalent in the eastern region, the proportion of hunters tends to decline (Manfredo et al. 2018).

Understanding risk perceptions is crucial for determining the effectiveness of management techniques (Vaske et al. 2009) and can significantly influence support for CWD management (Cooney and Holsman, 2010). Past research has found that familiarity and knowledge of a hazard can influence risk perceptions (Fischhoff et al. 1978; Gupta et al. 2012; Siegrist and Cvetkovich, 2000). Specifically, risk perceptions are heightened when the disease is new or unknown (Heberlein and Stedman, 2009; Vaske et al. 2004), which may increase support for management efforts aimed at mitigating the risk. Risk perceptions may be lower in states where CWD has been present for decades, yet its negative impact on deer populations may be more evident (DeVivo et al. 2017). Several studies have found that hunters are concerned about the potential impact of CWD on hunting and human health (Brown et al. 2006; Garruto et al. 2008; Gigliotti, 2004; Miller, 2003; Schuler et al. 2016) but perceive very minimal risk in areas with low CWD prevalence (Needham et al. 2006; Needham et al. 2017).

Previous research has identified trust in wildlife agencies as a key predictor of public support for CWD management and willingness to allow property access (Gigliotti et al. 2020; Harper et al. 2015; Holsman et al. 2010; Landon et al. 2022; Meeks et al. 2022; Schroeder et al. 2021). Hunters generally trust their state wildlife agencies to manage CWD but also believe future risks from the disease will likely be beyond their control (Needham and Vaske, 2008). Further, when hunters trust their wildlife agency to manage CWD, they perceive less risk from the disease (Needham and Vaske, 2008). In Wisconsin, non-hunting landowners also trusted their state wildlife agency to manage CWD (Stafford et al. 2007).

Goal of Study, Predictions, and Objectives

The goal of this chapter was to identify the attributes that influence landowners' willingness to allow CWD management and research strategies for white-tailed deer (*Odocoileus virginianus)* and mule deer (*Odocoileus hemionus*) on their private property. My objectives were to (i) compare landowners' acceptance of management strategies and research approaches on

their private property, and (ii) assess the attributes influencing their willingness to allow each strategy. I hypothesized that a) landowners have heterogeneity in preferences among CWD management strategies and b) this heterogeneity may be explained by observable demographics, geographic location, CWD knowledge and opinions, hunting characteristics, agency trust, property characteristics, and broader management applications (*H1*). Specifically, I first predicted that a) landowners who live in the eastern region are less likely to allow access for CWD management than landowners who live in the western region, based on a higher prevalence of mutualist values in the east, which have been associated with opposition to lethal management (Manfredo et al. 2018); and b) landowners in areas with higher CWD prevalence are more likely to allow access for CWD management than landowners in areas with lower prevalence, as greater exposure to the disease may lead to increased knowledge (Vaske et al. 2018), awareness of population declines as a result of CWD (DeVivo et al. 2017; Edmunds et al. 2016; Miller et al. 2008), and an increase in urgency to manage it (*P1*). My second prediction is that hunting landowners will be less likely to allow CWD management than non-hunting landowners, as hunters often prefer higher deer populations to improve harvest opportunities (D'Angelo and Grund, 2015; Diefenbach et al. 1997; Lischka et al. 2008) and have been less likely to support targeted removal management than non-hunters (Lischka et al. 2010; *P2*). This research aimed to fill a knowledge gap by identifying the key attributes influencing landowners' willingness to allow CWD management strategies on their private property.

STUDY AREA

Much like the eight-state study by Needham and Vaske (2006), the study area was designed to capture how geographic location and disease exposure influence a landowner's decision regarding property access for CWD management. The survey was distributed to six states across the U.S. to assess three key differences: (i) regional variation (eastern versus western states), (ii) state-level CWD prevalence, and (iii) county-level CWD prevalence. Western states included Wyoming, Nebraska, and North Dakota, and eastern states included Illinois, Michigan, and Virginia (Figure 1.2). Within each region, states were chosen to reflect varying levels of CWD prevalence based on the total number of CWD-positive deer since testing began. Each region included a state with high prevalence (more than 1,000 detections), a state with

medium prevalence (100-999 detections), and a state with low prevalence (less than 100 detections) at the time of survey design (January 2023). The high-prevalence states were Wyoming and Illinois, the medium-prevalence states were Nebraska and Michigan, and the low-prevalence states were North Dakota and Virginia. Within these states, surveys were distributed to landowners in CWD-positive counties (with at least one positive detection) or CWD-adjacent counties (bordering a positive county; Figure 1.3). This approach maximized responses from individuals who were aware of CWD and targeted landowners who currently or will soon experience CWD presence in their county.

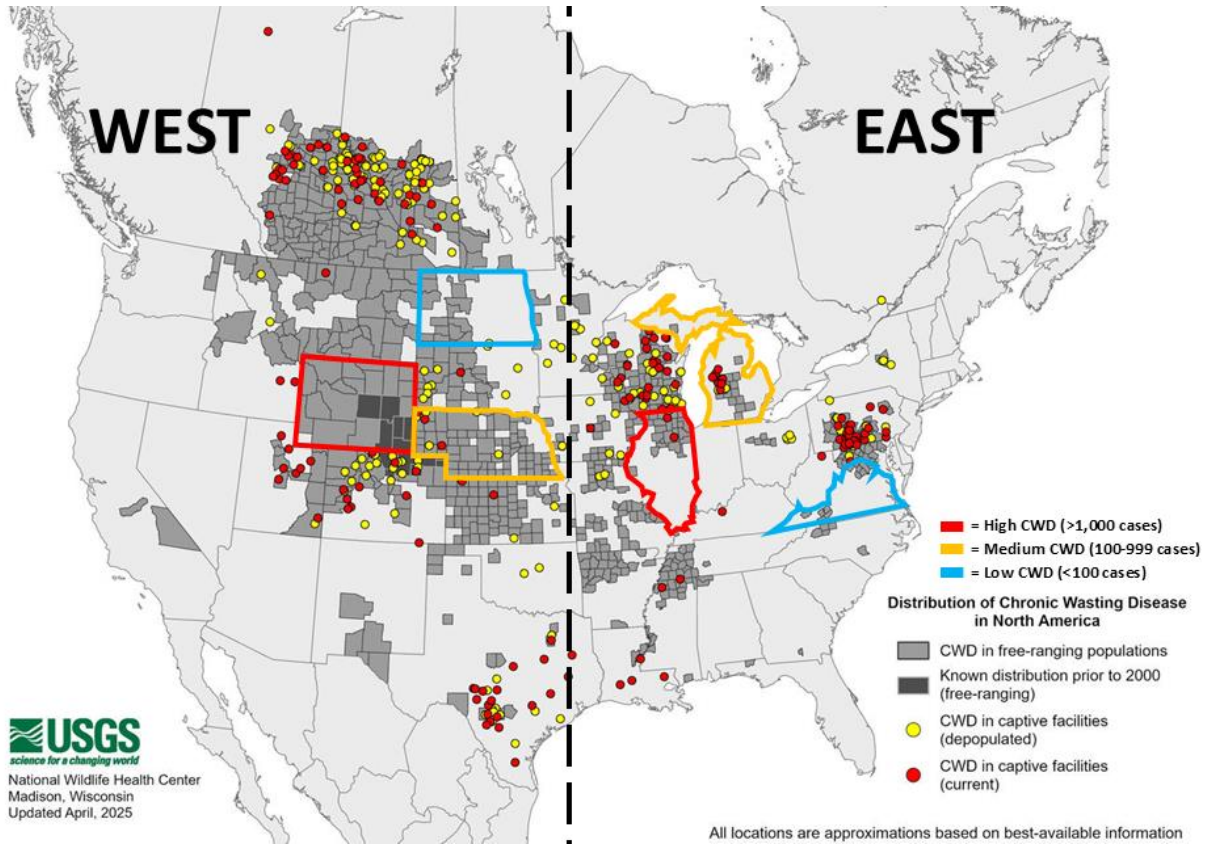

Figure 1.2. Map of sampled states with the current distribution of CWD. States include Wyoming, Nebraska, and North Dakota in the western region, and Illinois, Michigan, and Virginia in the eastern region. Red-outlined states indicate high state CWD prevalence (more than 1,000 cases), orange-outlined states indicate medium state CWD prevalence (100-999 cases), and blue-outlined states indicate low state CWD prevalence (less than 100 cases).

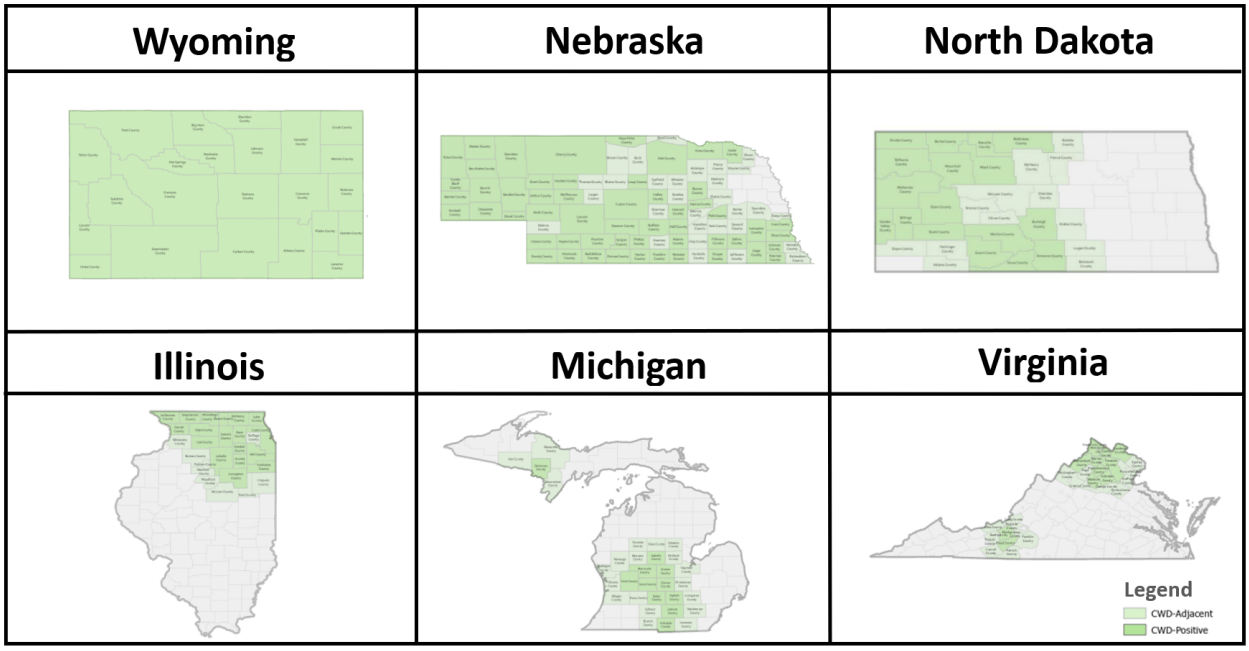

Figure 1.3. Map of sampled states (Wyoming, Nebraska, North Dakota, Illinois, Michigan, and Virginia) and the counties surveys were distributed to (CWD-positive and CWD-adjacent counties) during January 2023. CWD-positive counties are colored dark green, and CWD-adjacent counties are colored light green.

METHODS

Survey Distribution

A total of 13,400 landowners were randomly selected across the study area to participate in the survey. The survey sample, distribution, and collection were contracted through the Office of Survey Research at Michigan State University. Data were collected using an Address-Based Sample and a mixed-mode approach, which involved contacting respondents via a web-based questionnaire programmed in Qualtrics and a mailed paper self-administered questionnaire. Only landowners possessing a parcel of at least three acres were included in the sample, as smaller properties are not suitable for CWD management. The sample was stratified within each state by CWD-positive (60.0%) and CWD-adjacent counties (40.0%), except in Wyoming, where all counties were positive. Two survey versions were distributed randomly across the sample as a result of the choice experiment design. The only difference between versions was the content included in the choice experiment, assessed in Chapter 2. All other survey content discussed in

this chapter remained consistent across both versions. All landowners who completed the survey were offered a $10 Amazon e-card as a token of appreciation for their participation.

Data collection consisted of two separate samples. Following the tailored design method (Dillman et al. 2014), the first sample of 8,400 landowners was initially contacted via a mailed letter with access to the online Qualtrics version, from which 567 completed questionnaires were received. Non-respondents received a second contact, consisting of either a self-administered paper questionnaire (n = 5,500) or a postcard reminder, to ensure that all landowners were contacted twice. Landowners who received a self-administered questionnaire packet were given a letter, a copy of the questionnaire, and a postage-paid envelope. After the initial push to 8,400 landowners and receiving 974 completed questionnaires (Table 1.1), a supplemental sample of 5,000 landowners was purchased from Coreograph, Inc. It was stratified using the same protocols as the initial sample. From this push, 391 web-based responses were received (Table 1.2). Throughout the study, the data collection period spanned from August 28, 2023, to March 13, 2024. The final case dispositions and response rates are in Table 1.3.

Survey drafts were shared with wildlife agency representatives from each state for awareness and feedback, with all practical suggestions incorporated into the final instrument. The participants willing to take the survey first verified they were at least 18 years of age and owned or leased more than three acres of land. Landowners were informed that their state wildlife agency may not currently employ the CWD management strategies being assessed, but their responses are crucial to understanding their future potential for managing the disease. This research project was approved by Michigan State University as IRB-exempt, as there are no foreseeable risks to subjects participating in this study (STUDY00009414). The information letter included a consent form that disclosed a description of the research project and procedures, voluntary participation, withdrawal without penalty, and the name and contact information of the MSU Office of Survey Research.

Table 1.1. Sample 1 of 8,400 landowners' case disposition and response rates.

State	Paper	Web	Total	Ineligible	Undeliverable	Refused	Unknown	Total	Response Rate AAPOR[1] RR1[2]	Response Rate AAPOR RR3[3]
Illinois	46	76	122	50	64	2	1,162	1,400	9.0%	12.2%
Michigan	34	176	210	2	47	5	1,136	1,400	15.0%	15.1%
Nebraska	36	71	107	9	37	0	1,247	1,400	7.7%	8.3%
North Dakota	64	120	184	2	30	4	1,180	1,400	13.2%	13.3%
Virginia	36	119	155	4	47	1	1,193	1,400	11.1%	11.4%
Wyoming	87	109	196	9	47	2	1,146	1,400	14.1%	14.6%
Total	303	671	974	76	272	14	7,064	8,400	11.7%	12.5%

[1] The American Association for Public Opinion Research (AAPOR) is the leading association of public opinion and survey research professionals.

[2] The AAPOR Response Rate 1 (RR1) represents the minimum response rate.

$$RR1 = \frac{I}{(I+P)+(R+NC+O)+(UH+UO)}$$

[3] The AAPOR Response Rate 3 (RR3) is a method for estimating the proportion of cases with unknown eligibility that are actually eligible. It assumes that in households where eligibility was not determined, the proportion of households containing an eligible adult is the same as that proportion among households where eligibility was determined. e is the estimated proportion of cases of unknown eligibility that are eligible.

$$RR3 = \frac{I}{(I+P)+(R+NC+O)+e(UH+UO)}$$

Table 1.2. Supplemental sample 2 of 5,000 landowners' case dispositions and response rates.

State	Completed	Ineligible	Undeliverable	Refused	Unknown	Total	Response Rate AAPOR RR1	Response Rate AAPOR RR3
Illinois	41	5	8	1	920	975	4.2%	4.7%
Michigan	89		12	4	395	500	17.8%	17.8%
Nebraska	51	1	8		865	1925	5.0%	5.1%
North Dakota	52	1	2	1	74	800	6.5%	6.6%
Virginia	74	1	13	2	685	775	9.6%	9.7%
Wyoming	84		21	2	918	1,025	8.2%	8.2%
Total	391	8	64	10	4,527	5,000	7.8%	8.0%

Table 1.3. Complete study of 13,400 landowners' case dispositions and response rates.

State	Completed Strata 1	Completed Strata 2	Total Completed	Ineligible	Refusal	Undeliverable	Unknown	Total Lines of Sample	Response Rate AAPOR RR1	Response Rate AAPOR RR3
Illinois	80	83	163	55	3	72	2,082	2,375	7.0%	9.0%
Michigan	198	101	299	2	9	59	1,531	1,900	15.8%	16.0%
Nebraska	119	73	192	10	0	45	2,112	2,325	6.8%	7.0%
North Dakota	128	74	202	3	5	32	1,924	2,200	10.7%	11.0%
Virginia	140	89	229	5	3	60	1,878	2,175	10.6%	11.0%
Wyoming	280		280	9	4	68	2,064	2,425	11.6%	12.0%
Total	945	420	1365	84	24	336	11,591	13,400	10.3%	11.0%

Non-Response Bias

A continuum of resistance non-response analysis was conducted to address non-response bias. The continuum of resistance operates on the assumption that late respondents are more similar to non-respondents, providing insights into potential non-response bias (Lin and Schaeffer, 1995; Voogt et al. 1998). The two survey samples were analyzed separately (sample 1: n = 974; sample 2: n = 391), as each was obtained independently. The first and last fifty respondents from each sample were compared using Pearson's chi-squared test to determine if there were significant differences in responses. Six key questions were examined, and a significant difference in awareness of CWD was found only in sample two (Table 1.4). I found minimal evidence of non-response bias and therefore chose not to apply weighting adjustments to the data. However, due to this difference in response to CWD awareness in the second sample, individuals who were aware of CWD may have been more likely to respond to the survey.

Table 1.4. Comparison of chi-squared p-values for non-response bias for two survey samples.

Variable	Sample 1	Sample 2
Observations (*n*)	974	391
Aware of CWD	0.621	**0.023****
Importance of managing CWD	0.123	0.853
Trust in federal wildlife agency	0.116	0.579
Allow targeted removals	0.160	0.761
Allow any deer recreational harvest	0.392	0.773
Income	0.586	0.799

Note: Double asterisks (**) denote the significance level at 5%.

Survey Variables

The survey questionnaire consisted of thirty-five questions in four sections. The first section of the survey focused on obtaining information from landowners about their property characteristics, property usage, and hunting activities. If a landowner owned more than one property, they were asked to respond to the survey questions considering the property they believed had the most deer present. Property attributes, such as landscape cover types, agriculture and animal farming, and deer presence, were used to assess the effect of property features on landowners' willingness to allow CWD management. Information regarding hunting

activity on the property was used to address and compare responses between hunting and non-hunting landowners, as seen in Stafford et al. (2007). After exposing respondents to information regarding CWD and each of the six CWD management and research strategies, they were asked to indicate their previous knowledge and experiences with each. Following, landowners were asked to indicate how important they and their close social relationships (family, friends, etc.) feel that managing CWD is using a 5-point Likert scale from [1] not important at all to [5] extremely important. Questions regarding the risk perceptions of human health and deer health were also assessed using a 5-point Likert scale from [1] not concerned at all to [5] extremely concerned.

Respondents were asked a series of questions to determine their willingness to allow four management strategies—targeted removals and recreational harvest of any deer, does only, and 2+ deer—and two research strategies—live deer captures and trail camera monitoring. Each of these strategies was defined and clarified whether they involve lethal management, are used for research, and whether a government agent or hunter would be accessing the property. The recreational harvest strategy of "does only" was specified as the removal of adult female (antlerless) deer. Landowners were then asked to choose between yes and no to allow each strategy on their private property. Following these questions, a choice experiment was included to elicit landowners' willingness to accept financial incentives for targeted removals on their property. For a more comprehensive understanding of the choice experiment, please refer to Chapter 2.

Trust in state and federal wildlife agencies was measured using a 5-point Likert scale ranging from [1] no trust to [5] full trust. Questions were also included to assess if this research can be applied more broadly to landowner access for other diseases and species, or if access was strictly limited to deer and CWD. Lastly, demographic information (age, gender identity, education, and income) was obtained to evaluate the characteristics of landowners relative to their willingness to allow property access.

Statistical Analysis

A hierarchical logistic regression (Wong and Mason, 1985) was used to assess the impact of various predictor groups on landowners' willingness to allow six different CWD management

and research strategies on their property. Using a blockwise method, predictors were added into the model in a series of pre-defined blocks, each representing a category of variables. The stepwise addition allowed for the assessment of the incremental explanatory power of each block. Six independent regressions were employed with the dependent variable of allowing access for each CWD management strategy on the respondent's property, assigned a value of "1" if they selected "yes" and a value of "0" if they selected "no." The number of observations for each model varied according to the number of landowners who responded to the question regarding allowing the strategy. Therefore, the optimal models were determined by comparing the Akaike Information Criteria (AIC) based on the combination of predictors with the lowest AIC for each independent model. After the final block was added, three variables (live near a big city, own multiple properties, and neighbors' friends/family) that were not significant across any of the six strategies and did not have significant foundational research were excluded from the model and significantly improved the AIC values for all six regressions. As income had a significant portion of missing data (over 5%), it was included as an indicator variable to preserve the sample size and reduce potential bias. Logistic regression models were estimated using the *logit* command in STATA (StataCorp, 2023). The coefficients were transformed into odds ratios, illustrating the change in the likelihood of a binary outcome resulting from a one-unit change in continuous predictor variables. For categorical predictor variables, odds ratios compare the likelihood of the binary outcome between two different levels (Hosmer et al. 2000).

RESULTS

Summary Statistics

A total of 1,365 complete questionnaires were obtained, and after accounting for non-deliverables, the final response rate was 11%. After removing respondents who did not answer questions used in the analysis, there were 1,168 usable responses, yielding a response rate of 9.8%. Summary statistics are presented in Table 1.5. Across respondents, the mean age was 56 years, with 65.33% being male and 34.67% being female. Most landowners had a college education (80.82%), and approximately half (53.68%) had an annual household income over $100,000. Geographically, the percentage of respondents who lived in each region (eastern and western) and across the three prevalence categories (high, medium, and low) was fairly even.

The number of landowners in CWD-positive counties versus CWD-adjacent counties coincided with the sample stratification, with a higher percentage of landowners residing in CWD-positive counties (68.41%) compared to CWD-adjacent counties (31.59%).

The majority of respondents (85.70%) indicated that they were previously aware of CWD, and approximately half of those were familiar with two or more of the six strategies. On a 1–5 scale, the mean for landowners' belief in the importance of managing CWD was slightly higher (3.82) than for their close relationships (3.49). The mean for concern regarding CWD affecting deer health (3.16) was higher than the mean concern for human health (2.52). Information on hunter-related variables was collected, with 29% of respondents indicating they hunted on their property (which will be considered 'hunters' for further analysis), and ~49% have allowed some form of hunting on their property within the past 5 years. Additionally, 38% of landowners have had a deer harvested on their property within the past 5 years. The mean trust in government wildlife agencies was lower for federal wildlife agencies (2.86) compared to state wildlife agencies (3.17).

Landowners' property characteristics were also examined, and most landowners' property sizes fell between 3-49 acres. Only a small proportion of the sample leased their property for farming (16.18%), but a larger majority (47.35%) used their property for some form of production (animals, crops, etc.). Nearly the entire sample indicated they had seen deer on their property within the past 5 years (95.38%). Lastly, landowners were asked if they would allow other forms of management on their property, to which 60.19% indicated yes for other diseases and 50.60% for other species.

Table 1.5. Summary statistics of survey variables (mean value for continuous variables with standard deviations, percent for categorical variables).

Variables	**Statistics**
Observations *(n)*	1,168
Demographics	
Age (*mean ± st.dev.*)	56.11 ± 14.40
Gender (percent)	
Male	65.33
Female	34.67
Education (percent)	
College educated	80.82
Less than college education	19.18
Income (percent)	
Income $100K+	53.68
Income <$100K	39.04
Income missing	7.28
Geographic variables	
Region (percent)	
Eastern	51.71
Western	48.29
State CWD prevalence (percent)	
High	32.45
Medium	30.22
Low	37.33
County prevalence (percent)	
CWD-Positive county	68.41
CWD-Adjacent county	31.59
CWD variables	
Aware CWD *(percent)*	85.70
Importance managing CWD (*mean ± st.dev.*)	3.82 ± 1.16
Importance managing CWD others *(mean ± st.dev.*)	3.49 ± 1.19
Concern CWD human health (*mean ± st.dev.*)	2.52 ± 1.23
Concern CWD deer health (*mean ± st.dev.*)	3.16 ± 1.32
Familiar 2+ strategies *(percent)*	41.61
Familiar targeted removals	33.0
Familiar live deer capture	15.7
Familiar trail cameras	23.9
Familiar recreational harvest any sex deer	39.5
Familiar recreational harvest does only	29.5
Familiar recreational harvest 2+ deer	25.6
Not familiar with any	44.0
Hunter variables	
Hunter *(percent)*	29.02

Table 1.5 (cont'd)

Allowed hunters on property *(percent)*	48.89
Deer harvested on property *(percent)*	38.01
Trust	
Trust federal wildlife agency *(mean ± st.dev.)*	2.86 ± 1.19
Trust state wildlife agency *(mean ± st.dev.)*	3.17 ± 1.16
Property characteristics	
Property acres *(percent)*	
3-49 acres	81.25
50-499 acres	14.55
500-5000+ acres	4.19
Leased for farming *(percent)*	16.18
Production use *(percent)*	47.35
Deer seen *(percent)*	95.38
Broader application	
Allow management for other diseases *(percent)*	60.19
Allow management for other species *(percent)*	50.60

Landowners' willingness to allow four CWD management strategies (targeted removals and recreational hunter harvest of any sex deer, does only, and 2+ deer) and two research strategies (live deer capture and trail-camera monitoring) on their property are summarized as percentages of respondents who indicated they would or would not allow each (Table 1.6). Landowners were more likely to allow targeted removals (40.05%) to manage CWD over recreational hunter harvest on their property. The most accepted of the recreational hunting strategies was the harvest of any sex deer (39.01%), followed by the harvest of does only (35.71%), and the least accepted strategy overall was the harvest of 2+ deer (31.25%). Landowners were most accepting of research strategies, with 60.22% indicating they would allow trail-camera monitoring and 49.96% indicating they would allow live deer captures.

Table 1.6. The percentage of landowners who would allow or not allow each of the four CWD management and two research strategies on their property.

Variables	% Allow	% Not Allow	Obs. (*n*)
CWD Management Strategies			
Targeted removals	40.05	59.95	1,141
Recreational harvest any sex deer	39.01	60.99	1,156
Recreational harvest does only	35.71	64.29	1,134
Recreational harvest 2+ deer	31.25	68.75	1,136
CWD Research Strategies			
Live deer capture	49.96	50.04	1,141
Trail cameras	60.22	39.78	1,159

Logistic Regression

The results from the hierarchical logistic regression show how the odds of allowing four different CWD management and two research strategies on the landowner's property change based on the associated covariates (Table 1.7). In the demographics block, statistically significant associations were observed between management strategies for age and missing income data. Each additional year in age corresponded with a 1-2% decrease in allowing all recreational harvest management strategies (any sex deer, does only, and 2+ deer) but a 5% increase in allowing trail-camera surveillance. Landowners who did not report income information were 53% less likely to allow trail cameras on their property. Other demographics, including gender, education, and reported income, were not significant across any of the six strategies.

In the geographic variables block, the only significant variable was region. Landowners residing in the eastern region of the U.S. were 47% less likely to permit targeted removals on their property, but 77% more likely to allow the recreational harvest of two or more deer, compared to those living in the western region. Other geographic variables, including state-level and county-level CWD prevalence, did not show significant associations related to allowing CWD management or research strategies on their property.

In the third block, focused on CWD variables, with each one-unit increase in landowners' belief in the importance of managing CWD, they were 23% more likely to permit hunting of does only for CWD management. In addition, these landowners were more likely to allow research through live deer capture (35%) and trail-camera monitoring (74%). In contrast, a one-

unit increase concerning close relationships' belief in managing CWD led to a 30% decrease in the likelihood of allowing trail cameras. Landowners who were familiar with two or more strategies were significantly more likely to permit all three recreational harvest strategies and live deer captures. Additionally, those who were previously aware of CWD were 2.19 times more likely to permit trail cameras. Lastly, there was no statistically significant association for concern regarding CWD's impact on human or deer health.

All hunter-related variables demonstrated a statistically significant impact on allowing recreational harvest management. Hunting landowners were 70% less likely to allow the recreational harvest of any sex deer, 57% less likely for the harvest of does only, and 64% less likely for the harvest of 2+ deer. In contrast, landowners who previously allowed others to hunt on their property were 5.73 times more likely to allow recreational harvest of any sex deer, 3.81 times more likely for harvest of does only, and 3.03 times more likely for the harvest of 2+ deer. Lastly, landowners with deer harvested on their property within the past five years were approximately twice as likely to allow recreational harvest of 2+ deer.

Each one-unit increase in trust in the federal wildlife agency was significantly associated with a higher likelihood of allowing targeted removal management and both research strategies. However, it also corresponded to a decreased likelihood of permitting the recreational harvest of does only. In contrast, trust in the state wildlife agency was only statistically significant for the recreational harvest of does only; with every one-unit increase in trust, landowners were 28% more likely to allow this strategy on their property.

For property characteristics, landowners who leased their property for farming were significantly more likely to allow all three recreational hunter-led management strategies. Landowners who had some form of production on their property were 63% more likely to permit targeted removal management. Landowners who had observed deer on their property within the past five years were 2.37 times more likely to allow trail cameras. No significant associations were found between property size (in acres) and allowing any of the six strategies.

In the final block, landowners who were willing to allow access for the management of other diseases were 6.14 times more likely to allow targeted removals, 5.59 times more likely to allow live deer capture, and 6.23 times more likely to allow trail cameras. Similarly, landowners

who were willing to grant access for managing other species were 2.75 times more likely to permit targeted removals, 1.74 times more likely to allow the recreational harvest of two or more deer, 2.26 times more likely to allow live deer capture, and 2.08 times more likely to allow the use of trail cameras.

Table 1.7. Binary logistic regression results (β coefficients presented as odds ratios, standard errors in parentheses).

	CWD Management Strategies				**CWD Research Strategies**	
Covariates	**Targeted removals**	**Hunting any sex deer**	**Hunting does only**	**Hunting 2+ deer**	**Live deer capture**	**Trail cameras**
Observations (*n*)	**1,141**	**1,156**	**1,134**	**1,136**	**1,141**	**1,159**
Block 1: Demographics						
Age	1.00	**.99*** **	**.98*** **	**.98*** **	1.01	**1.05*** **
	(.01)	**(.01)**	**(.01)**	**(.01)**	(.01)	**(.01)**
Female	.87	.89	.78	.72*	.87	1.36*
	(.15)	(.14)	(.13)	(.12)	(.15)	(.25)
College educated	1.43*	1.32	1.31	1.28	1.11	.88
	(.31)	(.24)	(.24)	(.25)	(.22)	(.18)
Income $100K+	1.04	1.21	1.24	1.29	1.10	1.29
	(.18)	(1.8)	(.19)	(.20)	(.18)	(.23)
Income missing	1.65	.91	1.17	1.01	.94	**.47** **
	(.54)	(.26)	(.34)	(.31)	(.29)	**(.15)**
Block 2: Geographic variables						
Region	**.53*** **	1.07	1.17	**1.77*** **	.77	1.07
	(.09)	(.16)	(.18)	**(.29)**	(.13)	(.20)
Medium prevalence	0.95	1.13	1.18	1.36	.76	.87
	(.18)	(.19)	(.21)	(.25)	(.14)	(.17)
Low prevalence	1.30	1.19	1.09	1.18	1.21	1.28
	(.26)	(.21)	(.20)	(.23)	(.24)	(.27)
County prevalence	.98	.78*	.85	.85	.74*	.99
	(.17)	(.12)	(.13)	(.13)	(.12)	(.17)
Block 3: CWD variables						
Aware CWD	1.34	1.33	.96	1.03	1.10	**2.19*** **
	(.32)	(.30)	(.22)	(.24)	(.26)	**(.55)**
Importance managing CWD	1.08	1.00	**1.23** **	1.06	**1.35*** **	**1.74*** **
	(.11)	(.09)	**(.12)**	(.11)	**(.14)**	**(.20)**

Table 1.7 (cont'd)

Importance managing CWD others	1.00 (.09)	1.04 (.09)	.95 (.08)	.99 (.09)	.86 (.08)	**.70*** (.08)**
Concern CWD human health	1.09 (.08)	.94 (.06)	.95 (.06)	1.03 (.07)	1.11 (.08)	.92 (.07)
Concern CWD deer health	1.01 (.07)	.98 (.06)	.96 (.06)	.94 (.07)	.97 (.07)	1.06 (.08)
Familiar 2+ strategies	1.19 **(.19)**	**1.60*** (.23)**	**1.92*** (.28)**	**1.77*** (.26)**	**1.64*** (.27)**	1.07 (.18)
Block 4: Hunter variables						
Hunter	.69 (.16)	**.30*** (.06)**	**.43*** (.08)**	**.36*** (.07)**	1.33 (.30)	1.08 (.25)
Allowed hunters on property	1.04 (.30)	**5.73*** (1.40)**	**3.81*** (.94)**	**3.03*** (.78)**	.59* (.17)	.89 (.27)
Deer harvested on property	1.04 (.28)	1.29 (.29)	1.50* (.34)	**1.89*** (.45)**	1.12 (.30)	.63 (.18)
Block 5: Trust						
Trust federal wildlife agency	**1.27** (.13)**	.86 (.07)	**.75*** (.07)**	.87 (.08)	**1.26** (.12)**	**1.28** (.13)**
Trust state wildlife agency	1.18 (.12)	1.06 (.10)	**1.28*** (.12)**	1.15 (.11)	1.07 (.11)	1.03 (.11)
Block 6: Property characteristics						
Leased for farming	.68 (.18)	**1.77*** (.38)**	**1.66** (.36)**	**1.57** (.35)**	.97 (.24)	.98 (.25)
Production use	**1.63*** (.31)**	1.00 (.16)	.97 (.16)	1.06 (.18)	.91 (.17)	1.01 (.20)
Deer seen	.67 (.26)	1.31 (.48)	.99 (.36)	1.02 (.40)	.93 (.35)	**2.37** (.93)**
Property acres	.96 (.07)	1.06 (.07)	1.06 (.07)	1.11 (.07)	1.07 (.08)	1.06 (.08)

Table 1.7 (cont'd)

Block 7: Broader application						
Allow management for other diseases	**6.14*** (1.69)**	1.51 (.38)	1.60* (.40)	1.26 (.35)	**5.59*** (1.37)**	**6.23*** 1.68**
Allow management for other species	**2.75*** (.62)**	1.48 (.35)	1.10 (.26)	**1.74** (.45)**	**2.26*** (.51)**	**2.08*** (.56)**
Constant	.01*** (.01)	.19*** (.11)	.22*** (.13)	.15*** (.09)	.03*** (.02)	.00*** (.00)
Pseudo R2	0.3141	0.1427	0.1326	0.1400	0.3032	0.3540

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

DISCUSSION

In this study, I examined attributes influencing landowners' acceptance of CWD management strategies on their private land. Overall, results reveal landowners can be receptive to allowing management on their property, but their acceptance can vary by the strategy, who will implement it, and landowner attributes. Specifically, targeted removals conducted by government wildlife agents were more accepted than recreational hunting, and acceptance of recreational strategies declined as they became more specific. However, a wide range of landowner attributes, such as age, hunting experience, property use, geographic region, and agency trust can predict which management strategy landowners are more likely to accept. To my knowledge, this is the first study to simultaneously examine a) landowners' acceptance of a gradient of CWD management and research strategies on their property, b) across multiple states and CWD prevalence levels, and c) in relation to a broad range of attributes that may influence their decision.

The most supported CWD management strategy was targeted removals, with 40% of respondents indicating they would allow this approach on their property. Targeted culling is one of the few successful options wildlife managers have for reducing the prevalence of CWD (Gross and Miller, 2001; Jennelle et al. 2014; Manjerovic et al. 2014), and its success depends on access to private land where CWD has been detected. While previous research has shown limited support for targeted removals as a CWD management strategy (Cooney and Holsman, 2010; Durocher et al. 2022; Harper et al. 2015; Heberlein, 2004; Meeks et al. 2022), my findings revealed that a moderate portion of landowners were willing to accept this approach and represent an underutilized resource for providing property access to manage CWD. These results align with findings from Lischka et al. (2010) and Mateus-Pinilla et al. (2013) that the public may support the use of sharpshooters when necessary to control the disease. Further, culling is increasingly necessary to target areas where hunter-harvest cannot successfully slow disease spread (Holsman and Petchenik, 2006; Shelton and McDonald, 2017).

Results indicated landowners have moderate acceptability for recreational hunting on private land, but this can change based on the hunting approach. Specifically, 39% of landowners would allow property access for recreational hunting when any sex or aged deer is

removed. However, approximately 36% of respondents indicated they would allow the harvest of does only, and the least accepted hunting strategy was the harvest of more than 2 deer (31%). Hunting is a primary tool for managing deer populations and containing CWD spread (Brown et al. 2000). However, limited public hunting land makes access to private properties necessary to continue the success of this strategy. Hunting as a form of CWD management has been found generally acceptable by stakeholders (Landon et al. 2022; Lischka et al. 2010), and I found similar results. Population control can be achieved through the harvest of antlerless deer by reducing the reproductive rates, however, few hunters are willing to harvest female deer (Bhandari et al. 2006; Holsman et al. 2010). Therefore, the willingness of landowners to allow the harvest of antlerless deer could significantly improve population density reductions. A hunter's harvest threshold in a single season is typically two deer (Holsman and Petchenik, 2006), and harvesting more may conflict with personal ethics (Holsman et al. 2010). Therefore, convincing hunters to harvest and landowners to allow the removal of several deer from private properties may be challenging. However, with 31% of respondents indicating they would allow hunters to remove over two deer on their property, this approach could still be a viable strategy for reducing deer populations and managing CWD.

Overall, landowners were most willing to allow access for research strategies, which included trail-camera monitoring (60%) and live deer captures (50%). These findings were consistent with previous studies that found support for strategies aimed at monitoring the spread of CWD (Durocher et al. 2022; Vaske et al. 2006) and the growing prominence of mutualist value orientations in North America supporting non-lethal approaches (Manfredo et al. 2018). However, while these surveillance approaches improve knowledge surrounding CWD, they do not manage or reduce disease spread.

These results suggest landowners were more open to allowing management conducted by government wildlife agents over recreational hunters. Landowners may have higher trust in professional wildlife agencies' ability to manage the disease and respect their property when doing so. Further, landowners may be concerned about hunters causing destruction or infringement of their property (Demartini et al. 2018; Jagnow et al. 2006; O'Brien et al. 2021).

To improve landowner participation in allowing hunter-harvest, policies that limit landowner liability could be put in place (D'Angelo and Grund, 2015; Knoche and Lupi, 2012).

Results from the regression indicate that several landowner attributes can significantly influence acceptance of CWD management strategies. First, an increase in the landowners' age decreased the likelihood of allowing recreational hunting on their property. As older individuals are more likely to be hunters (Gude et al. 2012; Winkler and Warnke, 2013) and hold utilitarian wildlife value orientations (Kellert, 1993; Manfredo et al. 2003; Vaske et al. 2011) allowing recreational hunting may conflict with their control over resources, land use, and property access. Other demographics, including gender, education, and income, were not significant predictors of allowing CWD management strategies on private land. This finding supports previous research that has consistently shown acceptance of CWD management does not vary by demographic variables (Landon et al. 2022; Lyon and Vaske, 2010; Meeks et al. 2022; Needham et al. 2006; Vaske et al. 2021).

Region was found to be a significant predictor of management acceptance on private land. Landowners in the eastern U.S. were significantly less likely to allow targeted removals but were more likely to allow the recreational harvest of two or more deer. Therefore, part A of my first prediction was only partially supported. The lower acceptance of targeted removals among eastern landowners may reflect the higher prevalence of mutualist values in the region, which are associated with opposition to lethal management strategies (Manfredo et al. 2018). In contrast, western landowners may have been less accepting of targeted removals but more accepting of recreational hunter harvest due to declining trust in federal and state wildlife agencies (Manfredo et al. 2017; Manfredo et al. 2018). These patterns suggest that eastern landowners may be more open to CWD management conducted by government agents, while western landowners may favor management carried out through recreational hunting. As other geographic variables, including state- and county-level CWD prevalence, were not significantly associated with management acceptance, part B of my first prediction was not supported. This suggests that when controlling for other factors, CWD prevalence may not strongly influence landowners' willingness to allow management on their property.

Hunting landowners were significantly less likely to allow all recreational hunting management strategies on their property, supporting my second prediction. Since these individuals hunt on their land, the reluctance to allow other hunters may reflect concerns about potential impacts on their hunting opportunities. In contrast, landowners who previously allowed others to hunt on their property were significantly more likely to allow recreational harvest of any sex deer, does only, and the harvest of 2+ deer. In addition, landowners who have had deer harvested on their property were also twice as likely to allow recreational harvest of 2+ deer. These results suggest that individuals who allowed hunting on their property and have previously had deer harvested could be ideal candidates for outreach regarding recreational hunter management. However, landowners who hunted on their own property may be less receptive and may not be prioritized.

Consistent with previous research, higher levels of trust were associated with greater support for CWD management actions (Holsman et al. 2010; Schroeder et al. 2021). Specifically, landowners who trusted federal agencies were more likely to permit all government-led strategies, including targeted removals and surveillance methods. While prior research has demonstrated that trust in state agencies predicts acceptance of sharpshooting (Harper et al. 2015), these results suggest that trust in federal agencies can also be a significant predictor of support for CWD management. On the other hand, landowners who trusted their state wildlife agency were more likely to support the recreational harvest of does only. This finding aligns with state agency messaging that removing antlerless deer contributes to maintaining a healthy, stable population.

Landowners who use their property for economic profit have supported the use of lethal management strategies (Urbanek et al. 2015; West and Parkhurst, 2002), and my results support this. Landowners who leased their property for farming were more likely to allow recreational hunter management, while production on the property led to a higher likelihood of allowing targeted removals. Bryd et al. (2017) found that nearly half of their respondents agreed that hunting reduced crop damage and wildlife disease. Therefore, removing deer from the landowner's property could reduce economic losses while contributing to CWD management, leading to acceptance of lethal control. My findings align with those of Landon et

al. (2022), who found that property size (in acres) did not significantly influence acceptance of CWD management.

The approach wildlife agencies take to manage CWD can be applied to a variety of wildlife diseases and species, helping prepare for the next wildlife disease or population crisis (Vaske et al. 2009). My findings indicate that over half of the respondents would permit property access for managing other diseases (60%) and wildlife species (51%). Further, landowners who would permit property access for other management were significantly more likely to allow management for CWD on their property, particularly for government agent-led strategies. This suggests that landowners may allow property access for various management efforts, and the findings from this research could inform broader wildlife management objectives and goals.

Limitations of my study include a low response rate of 11%, which may lead to non-response bias and underrepresentation in this sample (Stedman et al. 2019). Self-selection bias may be present, as factors such as hunting status, prior knowledge of CWD, and experiences with deer impacts could influence participation in the survey. As a result, this sample may not fully represent the broader population of landowners considered for CWD management on their property. For my study, 'hunters' were defined as landowners who hunted on their private property, which may restrict the applicability of my findings to the broader population of deer hunters. Lastly, landowners' acceptability of CWD management may change over time. Therefore, the results for preferences are only reflective of the time at which the study was conducted.

Managing CWD will remain a significant challenge for wildlife agencies across North America due to limited available strategies and restricted access to private lands. My findings will help identify landowners most likely to allow CWD management, enabling wildlife managers to develop targeted outreach strategies and improve access. For targeted removals, I recommend that agencies focus on landowners in the western region, who trust wildlife agencies, use their property for production, and have either previously allowed or would allow management on their land. For gaining access to private property for recreational hunting, I recommend that agencies focus efforts on younger, non-hunting landowners in the eastern

region, who have allowed hunting and deer harvests, value CWD management, trust wildlife agencies, lease their land for farming, and support other wildlife management practices. These results inform the importance of gaining access to a targeted proportion of private lands surrounding a newly discovered outbreak. Specifically, this research can help wildlife agencies tasked with managing CWD gain access to private property as new detections of the disease are observed across the country.

LITERATURE CITED

Ajzen, I. 1991. The Theory of Planned Behavior. Organizational Behavior and Human Decision Processes, 50, 179-211.

Beier, P., and D. R. McCullough. 1990. Factors Influencing White-Tailed Deer Activity Patterns and Habitat Use. Wildlife Monographs 3–51.

Bhandari, P., R. C. Stedman, A. E. Luloff, J. C. Finley, and D. R. Diefenbach. 2006. Effort versus Motivation: Factors Affecting Antlered and Antlerless Deer Harvest Success in Pennsylvania. Human Dimensions of Wildlife 11:423–436.

Brown, T. L., D. J. Decker, J. T. Major, P. D. Curtis, J. E. Shanahan, and W. F. Siemer. 2006. Hunters' and Other Citizens' Reactions to Discovery of CWD in Central New York. Human Dimensions of Wildlife 11:203–214.

Brown, T., S. Riley, J. Enck, T. Lauber, P. Curtis, and G. Mattfeld. 2000. The Future of Hunting as a Mechanism to Control White-Tailed Deer Populations. Wildlife Society Bulletin 28:797–807.

Byrd, E., J. G. Lee, and N. J. O. Widmar. 2017. Perceptions of Hunting and Hunters by U.S. Respondents. Animals : an Open Access Journal from MDPI 7:83.

Cambronne, A., 2013, Deerland: America's Hunt for Ecological Balance and the Essence of Wilderness. Guilford, CT: Lyons Press. 3–263.

Conover, M.R. 2011. Impacts of deer on society. In: D.G. Hewitt (Ed.) Biology and Management of WhiteTailed Deer. Boca Raton, FL: CRC Press. 399–408.

Cooney, E. E., and R. H. Holsman. 2010. Influences on Hunter Support for Deer Herd Reduction as a Chronic Wasting Disease (CWD) Management Strategy. Human Dimensions of Wildlife 15:194–207.

Curtis, J. and Lynch, L. 2001. Explaining Deer Population Preferences: An Analysis of Farmers, Hunters and the General Public. Agriculture and Resource Economics, 44-55.

D'Angelo, G., and M. Grund. 2015. Evaluating Competing Preferences of Hunters and Landowners for Management of Deer Populations. Human–Wildlife Interactions 9.

Demartini, E., D. Vecchiato, T. Tempesta, A. Gaviglio, and R. Viganò. 2018. Consumer preferences for red deer meat: a discrete choice analysis considering attitudes towards wild game meat and hunting. Meat Science 146:168–179.

DeVivo, M. T., D. R. Edmunds, M. J. Kauffman, B. A. Schumaker, J. Binfet, T. J. Kreeger, B. J. Richards, H. M. Schätzl, and T. E. Cornish. 2017. Endemic chronic wasting disease causes mule deer population decline in Wyoming. PLOS ONE 12:e0186512.

DeYoung, C.A., 2011. Population dynamics. Pages 160–193 in D. G. Hewitt, editor. Biology and Management of White-tailed Deer. CRC Press, Boca Raton, Florida, USA.

Dillman, D. A., Smyth, J. D., and Christian, L. M. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th ed.). John Wiley and Sons.

Duda, M.D., Jones, M., Criscione, A. and Ritchie, A., 2010, The importance of hunting and the shooting sports on state, national and global economies. In: T. Rowe (Ed.) Symposium Proceedings on the Ecologic and Economic Benefits of Hunting. Roma: World Forum on the Future of Sport Shooting Activities. 276–293.

Durocher, G., M. K. (Marty) Luckert, E. W. Goddard, and W. L. (Vic) Adamowicz. 2022. Public preferences for options to manage chronic wasting disease in Canada: A paired comparisons study. Environmental Science and Policy 132:206–213

Edmunds, D. R., M. J. Kauffman, B. A. Schumaker, F. G. Lindzey, W. E. Cook, T. J. Kreeger, R. G. Grogan, and T. E. Cornish. 2016. Chronic Wasting Disease Drives Population Decline of White-Tailed Deer. PLoS ONE 11:1–19.

Fischhoff, B., P. Slovic, S. Lichtenstein, S. Read, and B. Combs. 1978. How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. Policy Sciences 9:127–152.

Garruto, R. M., Reiber, R., Durruty, M. A., and Gastrich, H. 2008. Risk behaviors in a rural community with a known point-source exposure to chronic wasting disease. Environmental Health 7(1): 31.

Gigliotti, L. M. 2004. Hunters' Concerns About Chronic Wasting Disease in South Dakota. Human Dimensions of Wildlife 9:233–235.

Gigliotti, L. M., L. A. Sweikert, L. Cornicelli, and D. C. Fulton. 2020. Minnesota landowners' trust in their department of natural resources, salient values similarity and wildlife value orientations. Environment Systems and Decisions 40:577–587.

Grear, D. A., M. D. Samuel, J. A. Langenberg, and D. Keane. 2006. Demographic patterns and harvest vulnerability of chronic wasting disease infected white-tailed deer in Wisconsin. Journal of Wildlife Management 70:546–553.

Gross, J. E., and M. W. Miller. 2001. Chronic Wasting Disease in Mule Deer: Disease Dynamics and Control. The Journal of Wildlife Management 65:205–215.

Gude, J. A., J. A. Cunningham, J. T. Herbert, and T. Baumeister. 2012. Deer and elk hunter recruitment, retention, and participation trends in Montana. The Journal of Wildlife Management 76:471–479.

Gupta, N., A. R. H. Fischer, and L. J. Frewer. 2012. Socio-psychological determinants of public acceptance of technologies: A review. Public Understanding of Science (Bristol, England) 21:782–795.

Haley, N. J., and E. A. Hoover. 2015. Chronic Wasting Disease of Cervids: Current Knowledge and Future Perspectives. Annual Review of Animal Biosciences 3:305–325.

Hanisch-Kirkbride, S. L., Riley, S. J., and Gore, M.L. 2013. Wildlife Disease and Risk Perception. Journal of Wildlife Diseases, 49:841-849.

Hargiss, C., and E. DeKeyser. 2014. The challenges of conducting environmental research on privately owned land. Environmental Monitoring and Assessment 186:979–985.

Harper, E. E., C. A. Miller, and J. J. Vaske. 2015. Hunter Perceptions of Risk, Social Trust, and Management of Chronic Wasting Disease in Illinois. Human Dimensions of Wildlife 20:394–407.

Haus, J. M., T. B. Eyler, M. D. Duda, and J. L. Bowman. 2017. Hunter perceptions toward chronic wasting disease: Implications for harvest and management. Wildlife Society Bulletin 41:294–300.

Heberlein, T. A. 2004. “Fire in the Sistine Chapel”: How Wisconsin Responded to Chronic Wasting Disease. Human Dimensions of Wildlife 9:165–179.

Heberlein, T. A., and R. C. Stedman. 2009. Socially Amplified Risk: Attitude and Behavior Change in Response to CWD in Wisconsin Deer. Human Dimensions of Wildlife 14:326–340.

Heffelfinger, J. 2006. Deer of the Southwest: A Complete Guide to the Natural History, Biology, and Management of Southwestern Mule Deer and White-tailed Deer. Texas AandM University Press.

Holsman, R. H., and J. Petchenik. 2006. Predicting Deer Hunter Harvest Behavior in Wisconsin’s Chronic Wasting Disease Eradication Zone. Human Dimensions of Wildlife 11:177–189.

Holsman, R. H., J. Petchenik, and E. E. Cooney. 2010. CWD After “the Fire”: Six Reasons Why Hunters Resisted Wisconsin’s Eradication Effort. Human Dimensions of Wildlife 15:180–193.

Hosmer, D. W., Lemeshow, S., and Sturdivant, R. X. 2000. Applied Logistic Regression. John Wiley and Sons, Inc.

Jacobson, C. A., J. F. Organ, D. J. Decker, G. R. Batcheller, and L. Carpenter. 2010. A Conservation Institution for the 21st Century: Implications for State Wildlife Agencies. The Journal of Wildlife Management 74:203–209.

Jagnow, C. P., R. C. Stedman, A. E. Luloff, G. J. San Julian, J. C. Finley, and J. Steele. 2006. Why Landowners in Pennsylvania Post Their Property against Hunting. Human Dimensions of Wildlife 11:15–26.

Jennelle, C. S., V. Henaux, G. Wasserberg, B. Thiagarajan, R. E. Rolley, and M. D. Samuel. 2014. Transmission of Chronic Wasting Disease in Wisconsin White-Tailed Deer: Implications for Disease Spread and Management. PLOS ONE 9:e91043.

Kellert, S. R. 1993. Attitudes, knowledge, and behavior toward wildlife among the industrial superpowers: United States, Japan, and Germany. Journal of Social Issues, 49,53–69.

Knoche, S., and F. Lupi. 2012. The economic value of publicly accessible deer hunting land. The Journal of Wildlife Management 76:462–470.

Kreinheder, D. D., R. C. Stedman, and T. B. Lauber. 2024. Using Personal Norms to Understand Deer Hunters' Chronic Wasting Disease (CWD) Prevention Behaviors: The "Right" Thing to Do. Society and Natural Resources 37:1417–1434.

Landon, A. C., K. Smith, L. Cornicelli, D. C. Fulton, L. E. McInenly, and S. A. Schroeder. 2022. Examining landowners' preferences for a chronic wasting disease management program. Wildlife Society Bulletin 47:e1401.

Lin, I.-F., and N. C. Schaeffer. 1995. Using Survey Participants to Estimate the Impact of Nonparticipation. The Public Opinion Quarterly 59:236–258.

Lischka, S. A., P. Shelton, and J. Buhnerkempe. 2010. Support for Chronic Wasting Disease Management Among Residents of the Infected Area in Illinois. Human Dimensions of Wildlife 15:229–232.

Lubowski, R. N. 2006. Major Uses of Land in the United States, 2002.

Lyon, K. M., and J. J. Vaske. 2010. Predicting Hunting Participation in Response to Chronic Wasting Disease in Four States. Human Dimensions of Wildlife 15:208–220.

Manjerovic, M. B., M. L. Green, N. Mateus-Pinilla, and J. Novakofski. 2014. The importance of localized culling in stabilizing chronic wasting disease prevalence in white-tailed deer populations. Preventive Veterinary Medicine 113:139–145.

Manfredo, M. J., Teel, T., and Bright, A. 2003. Why are public values toward wildlife changing? Human Dimensions of Wildlife, 8, 287–306.

Manfredo, M. J., T. L. Teel, and K. L. Henry. 2009. Linking Society and Environment: A Multilevel Model of Shifting Wildlife Value Orientations in the Western United States. Social Science Quarterly 90:407–427.

Manfredo, M. J., Sullivan, L., Don Carlos, A. W., Dietsch, A. M., Teel, T. L., Bright, A. D., and Bruskotter, J. 2018. America's Wildlife Values: The Social Context of Wildlife Management in the U.S. National report from the research project entitled "America's Wildlife Values". Fort Collins, CO: Colorado State University, Department of Human Dimensions of Natural Resources.

Mateus-Pinilla, N., H.-Y. Weng, M. O. Ruiz, P. Shelton, and J. Novakofski. 2013. Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003–2008. Preventive Veterinary Medicine 110:541–548.

McNulty, S. A., W. F. Porter, N. E. Mathews, and J. A. Hill. 1997. Localized Management for Reducing White-Tailed Deer Populations. Wildlife Society Bulletin (1973-2006) 25:265–271.

Meeks, A., N. C. Poudyal, L. I. Muller, and C. Yoest. 2022. Hunter acceptability of chronic wasting disease (CWD) management actions in Western Tennessee. Human Dimensions of Wildlife 27:457–471.

Miller, M. W., and M. M. Conner. 2005. EPIDEMIOLOGY OF CHRONIC WASTING DISEASE IN FREE-RANGING MULE DEER: SPATIAL, TEMPORAL, AND DEMOGRAPHIC INFLUENCES ON OBSERVED PREVALENCE PATTERNS. Journal of Wildlife Diseases 41:275–290.

Miller, C. 2003. Hunter Perceptions and Behaviors Related to Chronic Wasting Disease in Northern Illinois. Human Dimensions of Wildlife 8:229–230.

Miller, M. W., H. M. Swanson, L. L. Wolfe, F. G. Quartarone, S. L. Huwer, C. H. Southwick, and P. M. Lukacs. 2008. Lions and Prions and Deer Demise. PLoS ONE 3:1–7.

Moss, W. E., J. Binfet, L. E. Hall, S. E. Allen, W. H. Edwards, J. E. Jennings-Gaines, and P. C. Cross. 2025. The effectiveness of harvest for limiting wildlife disease: Insights from 20 years of chronic wasting disease in Wyoming. Ecological Applications 35:e3089.

National Deer Association. 2024. 41% of Deer Hunters Take at Least One Deer, But States Range from 18 to 71%.

Needham, M. D., J. J. Vaske, and M. J. Manfredo. 2004. Hunters' Behavior and Acceptance of Management Actions Related to Chronic Wasting Disease in Eight States. Human Dimensions of Wildlife 9:211–231.

Needham, M. D., and J. J. Vaske. 2008. Hunter Perceptions of Similarity and Trust in Wildlife Agencies and Personal Risk Associated with Chronic Wasting Disease. Society and Natural Resources 21:197–214.

Needham, M. D., and J. J. Vaske. 2006. Beliefs about Chronic Wasting Disease Risks across Multiple States, Years, and Interest Groups. Human Dimensions of Wildlife 11:215–220.

Needham, M. D., J. J. Vaske, and J. D. Petit. 2017. Risk Sensitivity and Hunter Perceptions of Chronic Wasting Disease Risk and Other Hunting, Wildlife, and Health Risks. Human Dimensions of Wildlife 22:197–216.

O'Brien, R. S. M., A. A. Dayer, and W. A. Hopkins. 2021. Understanding landowner decisions regarding access to private land for conservation research. Conservation Science and Practice 3:e522.

O'Rourke, K. I., D. Zhuang, A. Lyda, G. Gomez, E. S. Williams, W. Tuo, and M. W. Miller. 2003. Abundant PrP(CWD) in tonsil from mule deer with preclinical chronic wasting disease. Journal of Veterinary Diagnostic Investigation: Official Publication of the American Association of Veterinary Laboratory Diagnosticians, Inc 15:320–323.

Osnas, E. E., D. M. Heisey, R. E. Rolley, and M. D. Samuel. 2009. Spatial and Temporal Patterns of Chronic Wasting Disease: Fine-Scale Mapping of a Wildlife Epidemic in Wisconsin. Ecological Applications 19:1311–1322.

Porter, W. F., N. E. Mathews, H. B. Underwood, R. W. Sage, and D. F. Behrend. 1991. Social organization in deer: Implications for localized management. Environmental Management 15:809–814.

Price, E. T. 1995. Dividing the Land: Early American Beginnings of Our Private Property Mosaic. University of Chicago Press.

Price Tack, J., C. McGowan, S. Ditchkoff, W. Morse, and O. Robinson. 2018. Managing the vanishing North American hunter: a novel framework to address declines in hunters and hunter-generated conservation funds. Human Dimensions of Wildlife 23:1–18.

Rubino, E. C., and C. Serenari. 2022. Using Latent Profile Analysis to Evaluate Preferences for Chronic Wasting Disease Management Options among Different Hunter Types. Animals 12:2751.

Schroeder, S. A., A. C. Landon, L. Cornicelli, D. C. Fulton, and L. McInenly. 2021. Institutional trust, beliefs, and evaluation of regulations, and management of chronic wasting disease (CWD). Human Dimensions of Wildlife 26:228–244.

Schwartz, S. H. 1977. Normative Influences on Altruism1. Pages 221–279 *in* L. Berkowitz, editor. Advances in Experimental Social Psychology. Volume 10. Academic Press.

Schwartz S. H. and Howard, J. A. 1981. "A Normative Decision-Making Model of Altruism," In: P. J. Rushton and R. M. Sorrentino, Eds., Altruism and Helping Behavior: Social, Personality, and Developmental Perspectives, Lawrence Erlbaum, Hillsdale, pp. 189-211.

Schuler, K. L., A. M. Wetterau, E. M. Bunting, and H. O. Mohammed. 2016. Exploring perceptions about chronic wasting disease risks among wildlife and agriculture professionals and stakeholders. Wildlife Society Bulletin 40:32.

Shelton, P., and McDonald, P. (2017). Illinois chronic wasting disease: 2016-2017 surveillance and management report. Springfield, IL: Illinois Department of Natural Resources.

Siegrist, M., G. Cvetkovich, and C. Roth. 2000. Salient value similarity, social trust, and risk/benefit perception. Risk Analysis: An Official Publication of the Society for Risk Analysis 20:353–362.

Slovic, P. 2000. The perception of risk. Earthscan Publications.

Spraker, T. R., K. I. O'Rourke, A. Balachandran, R. R. Zink, B. A. Cummings, M. W. Miller, and B. E. Powers. 2002. Validation of Monoclonal Antibody F99/97.6.1 for Immunohistochemical Staining of Brain and Tonsil in Mule Deer (Odocoileus Hemionus) with Chronic Wasting Disease. Journal of Veterinary Diagnostic Investigation 14:3–7.

Spraker, T. R., M. W. Miller, E. S. Williams, D. M. Getzy, W. J. Adrian, G. G. Schoonveld, R. A. Spowart, K. I. O'Rourke, J. M. Miller, and P. A. Merz. 1997. SPONGIFORM ENCEPHALOPATHY IN FREE-RANGING MULE DEER (ODOCOILEUS HEMIONUS), WHITE-TAILED DEER (ODOCOILEUS VIRGINIANUS) AND ROCKY MOUNTAIN ELK (CERVUS ELAPHUS NELSONI) IN NORTHCENTRAL COLORADO. Journal of Wildlife Diseases 33:1–6.

Stafford, N. T., M. D. Needham, J. J. Vaske, and J. Petchenik. 2007. Hunter and Nonhunter Beliefs about Chronic Wasting Disease in Wisconsin. The Journal of Wildlife Management 71:1739–1744.

StataCorp. 2023. Stata Statistical Software: Release 18. College Station, TX: StataCorp LLC.

Uehlinger, F. D., A. C. Johnston, T. K. Bollinger, and C. L. Waldner. 2016. Systematic review of management strategies to control chronic wasting disease in wild deer populations in North America. BMC Veterinary Research 12:173.

Ufer, D. J., S. A. Christensen, E. Pomeranz, and D. L. Ortega. 2023. A behavioral economic assessment of the role of stakeholder preferences in managing an infectious wildlife disease. Wildlife Society Bulletin 47:e1411.

Urbanek, R. E., C. K. Nielsen, M. A. Davenport, and B. D. Woodson. 2015. Perceived and desired outcomes of suburban deer management methods. The Journal of Wildlife Management 79:647–661.

Van Buskirk, A. N., C. S. Rosenberry, B. D. Wallingford, E. J. Domoto, M. E. McDill, P. J. Drohan, and D. R. Diefenbach. 2021. Modeling how to achieve localized areas of reduced white-tailed deer density. Ecological Modelling 442:109393.

Varga, C., P. McDonald, W. M. Brown, P. Shelton, A. L. Roca, J. E. Novakofski, and N. E. Mateus-Pinilla. 2022. Evaluating the ability of a locally focused culling program in removing chronic wasting disease infected free-ranging white-tailed deer in Illinois, USA, 2003–2020. Transboundary and Emerging Diseases 69:2867–2878.

Vaske, J. J., M. D. Needham, and C. A. Miller. 2021. Wildlife Agency Trust and Perceived Risks From Chronic Wasting Disease. Wildlife Society Bulletin 45:597–607.

Vaske, J. J., N. R. Timmons, J. Beaman, and J. Petchenik. 2004. Chronic Wasting Disease in Wisconsin: Hunter Behavior, Perceived Risk, and Agency Trust. Human Dimensions of Wildlife 9:193–209.

Vaske, J. J. 2010. Lessons Learned from Human Dimensions of Chronic Wasting Disease Research. Human Dimensions of Wildlife 15:165–179.

Vaske, J. J., Jacobs, M. H., and Sijtsma, M. T. J. 2011. Wildlife value orientations and demographics in the Netherlands. European Journal of Wildlife Research, 57, 1179–1187. doi:10.1007/s10344011-0531-0.

Vaske, J., and K. Lyon. 2010. CWD Prevalence, Perceived Human Health Risks, and State Influences on Deer Hunting Participation. Risk analysis : an official publication of the Society for Risk Analysis 31:488–96.

Vaske, J. J., M. D. Needham, P. Newman, M. J. Manfredo, and J. Petchenik. 2006. Potential for Conflict Index: Hunters' Responses to Chronic Wasting Disease. Wildlife Society Bulletin 34:44–50.

Vaske, J. J., Shelby, L. B., and Needham, M. D. 2009. Preparing for the next disease: The human-wildlife connection. In M. J. Manfredo, J. J. Vaske, P. J. Brown, D. J. Decker, and E. A. Duke (Eds.), Wildlife and society: The science of human dimensions (pp. 244–261). Washington, DC: Island Press.

Voogt, R. J. J., and H. Van Kempen. 2002. Nonresponse Bias and Stimulus Effects in the Dutch National Election Study. Quality and Quantity 36:325–345.

West, B. C., and J. A. Parkhurst. 2002. Interactions between deer damage, deer density, and stakeholder attitudes in Virginia. Wildlife Society Bulletin 30:139–147.

Wild, M. A., T. R. Spraker, C. J. Sigurdson, K. I. O'Rourke, and M. W. Miller. 2002. Preclinical diagnosis of chronic wasting disease in captive mule deer (Odocoileus hemionus) and white-tailed deer (Odocoileus virginianus) using tonsillar biopsy. Journal of General Virology 83:2629–2634.

Williams, E. S., and M. W. Miller. 2002. Chronic wasting disease in deer and elk in North America: -EN- -FR- -ES-. Revue Scientifique et Technique de l'OIE 21:305–316.

Williams, E. S. 2005. Chronic Wasting Disease. Veterinary Pathology 42:530–549.

Winkler, R., and K. Warnke. 2013. The future of hunting: an age-period-cohort analysis of deer hunter decline. Population and Environment 34:460–480.

Wolfe, L. L., M. W. Miller, and E. S. Williams. 2004. Feasibility of "test-and-cull" for managing chronic wasting disease in urban mule deer. Wildlife Society Bulletin 32:500–505.

Wong, G. Y., and W. M. Mason. 1985. The Hierarchical Logistic Regression Model for Multilevel Analysis. Journal of the American Statistical Association 80:513–524.

CHAPTER 2: EVALUATING THE WILLINGNESS OF LANDOWNERS TO ACCEPT TARGETED REMOVAL ALTERNATIVES AND FINANCIAL INCENTIVES

INTRODUCTION

Background

Chronic wasting disease (CWD) is a fatal neurological disease affecting the family Cervidae, which includes white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*) species (Williams, 2005). CWD was first identified in 1967 and has since spread to thirty-six states and five Canadian provinces (Figure 2.1). As CWD is always fatal (Williams et al. 2002), threats to the health and stability of deer populations are a significant concern. In areas where the disease has become endemic, long-term population declines pose a serious threat to the conservation and recreational opportunities associated with deer (DeVivo et al. 2017; Edmunds et al. 2016; Gross and Miller, 2001; Miller et al. 2008). Hunting serves as the primary source of revenue for the research and management of many wildlife species (Jacobson et al. 2010). However, the presence of CWD can discourage hunters from harvesting deer (Needham et al. 2004; Vaske and Lyon, 2010). The threat that CWD poses to deer populations, hunter participation, and agency funding has prompted wildlife agencies to implement management measures to reduce its prevalence and spread. However, the success of management efforts is often reliant on gaining the support, acceptance, and engagement of various stakeholder groups.

Effective CWD management depends on the participation of private landowners. Wildlife are considered a public resource; however, landowners have the right to allow or deny access to their property. Private property constitutes over 60% (1,378 million acres) of the land in the United States (Lubowski et al. 2006) and comprises diverse habitats that support populations of deer, and therefore CWD. Wildlife agencies typically implement management strategies on landscapes with high CWD prevalence, high deer densities, specific risk factors, or newly emergent cases. However, a fundamental challenge for wildlife agencies is gaining permission from landowners to access their property when these situations arise (Hargiss and Dekeyser, 2014).

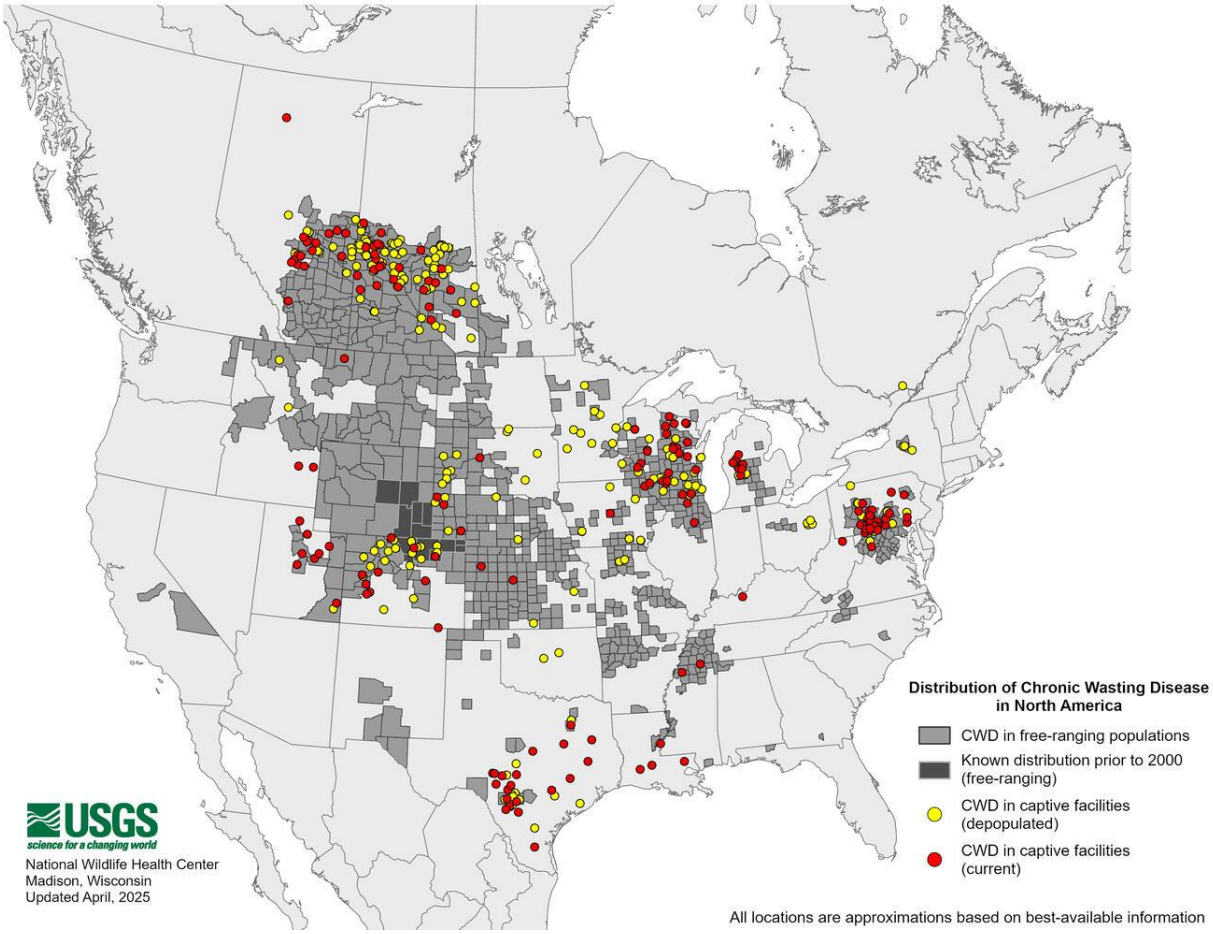

Figure 2.1. Current distribution of chronic wasting disease in North America as of April 2025.

Targeted Removals

As there is currently no cure or vaccine for CWD, wildlife managers are tasked with finding alternative methods to prevent transmission. One method is limiting the dispersal of prions (Smith et al. 2011) by reducing the overall density of an infected population. Densely clustered groups face a significantly higher risk due to increased exposure to other deer and prion-contaminated environments (Varga et al. 2022). To achieve density reductions and prevent the spread of CWD, wildlife managers have implemented culling techniques. Selective culling, also known as targeted removals, involves the removal of deer by a professional sharpshooter to remove specific individuals from known infected landscapes. This strategy aims to alter the size, composition, and lower the density of infected populations to reduce the possibility of transmission (Durocher et al. 2022). Research has shown the effectiveness of culling in reducing

CWD prevalence through observational field studies (Manjerovic et al. 2014; Mateus-Pinilla et al. 2013) and modeling approaches (Gross and Miller, 2001; Jennelle et al. 2014). Culling typically occurs after the hunting season to allow hunters to harvest deer first (National Deer Association, 2021). Targeted removals are conducted near locations of known positive detections, resulting in a high success rate for removing infected deer (National Deer Association, 2024; Wisconsin Department of Natural Resources, 2008).

Behavioral and social variations between the sexes or age groups of deer may drive differences in CWD prevalence and transmission, altering the targeted removal approach and its success in reducing CWD. However, managers may need to adjust their removal strategy according to landowner preferences. Past studies have demonstrated the prevalence of CWD in adult male deer is twice as high as in females, presumably driven by seasonal increases in movements and expanded home ranges (Beier and McCollough, 1990; Grear et al. 2006; Miller and Conner, 2005; Osnas et al. 2009; Wolfe et al. 2004). Moss et al. (2025) and Jennelle et al. (2014) found that the removal of male deer effectively reduced CWD prevalence within a given population, suggesting this strategy may substantially reduce CWD. However, the majority of hunters target adult males for recreational hunting (Holsman et al. 2010) and may already be unsatisfied with the number of quality bucks available (D'Angelo and Grund, 2015). Yearling males exhibit the highest frequency of dispersal within deer populations, resulting in increased contact rates and a potential for CWD spread (Gross and Miller, 2001; Nelson, 1993; Skuldt et al. 2008). Belsare and Stewart (2020) simulated that higher removal rates of yearling males displayed a lower probability of a CWD outbreak. However, hunters may also favor younger males (less than 2.5 years old) for harvest, as seen in North Carolina (Serenari et al. 2019). Adult female deer removal also allows managers to lower population densities by decreasing fawn birth rates and reducing reproductive potential (Brown et al. 2000; McNulty et al. 1997; Porter et al. 1991; Van Buskirk et al. 2021). Smolko et al. (2021) demonstrated that the overall growth rate in CWD prevalence was highest in adult female deer, and over time, may have equal prevalence rates to those of males. However, as current prevalence rates are much lower in adult female deer, their removal may not be the most effective strategy for reducing CWD. Landowners may be more accepting of this strategy as many believe the deer population is too

high, and few hunters (e.g., 5%) prefer harvesting antlerless deer (D'Angelo and Grund, 2015). Lastly, targeting infected individuals (Gross and Miller, 2001) believed to have CWD, based on observable signs (such as emaciation, drooling, and lack of fear), or identified through a test-and-cull strategy (Wolfe et al. 2004), can successfully reduce CWD. For example, Gross and Miller (2001) simulated the selective culling of less than 20% infected mule deer in a newly emerging population (prevalence <0.01), which effectively eliminated CWD.

Public Concern

Although targeted removals may successfully reduce CWD prevalence, obtaining landowner permission can be challenging, as this method is often met with public opposition. Durocher et al. (2022) found that the general public disliked targeted removals on public and private land. The perception that targeted removals will reduce the overall deer population (Jenkins, 2012; Miller et al. 2013) may lead hunters—particularly those who harvest deer on their property—to resist granting access fearing their hunting opportunities will be affected (Cooney and Holsman, 2010; Harper et al. 2015). Studies by Heberlein (2004) and Mateus-Pinilla et al. (2013) demonstrate how public involvement and support can significantly influence the success or failure of targeted removal efforts. Heberlein (2004) discussed how the Wisconsin DNR employed targeted removals without consulting major stakeholders beforehand. This led to dramatic declines in hunter participation, substantial economic and recreational losses, and petitions from individuals agreeing not to participate with the Wisconsin DNR (Heberlein, 2004). On the other hand, the Illinois DNR has shown it is possible to retain support from hunters and landowners while using culling to manage CWD. To achieve public support, they extended their hunting season, increased permit quotas, and treated their CWD management program as a long-term effort rather than an aggressive eradication program (Mateus-Pinilla et al. 2013). They maintained collaborative partnerships, public support, and hunting opportunities since they began culling in 2003. Therefore, if state agencies communicate and involve stakeholders in their decision to use targeted removals, it can be a viable and supported CWD management strategy.

Agency Trust

Individuals' perspectives on managing wildlife species are driven by their social and political values, attitudes, and beliefs, referred to as their value orientation (Fulton et al. 1996). Manfredo et al. (2017) discussed how traditional hunters' values often align with a domination orientation and utilitarian values, believing that wildlife exists for human use. However, mutualist orientations and protectionist values, which believe wildlife should be protected from human activity, are becoming increasingly popular (Manfredo et al. 2018). Historically, wildlife agencies have managed deer populations primarily to protect hunting opportunities, reinforcing a domination-oriented approach. However, with the shift towards mutualist values, agencies must adapt their management practices to balance both perspectives. This shift in wildlife values and institutional change may lead to a backlash against targeted removals as a CWD management tool, thereby diminishing trust in the agencies responsible for managing the disease (Inglehart and Norris, 2016).

As trust in wildlife agencies declines, the rapid spread of CWD may further weaken agency trust. Previous research has identified trust in wildlife agencies as a key predictor of public support for CWD management and willingness to allow property access (Gigliotti et al. 2020; Harper et al. 2015; Holsman et al. 2010; Landon et al. 2022; Meeks et al. 2022; Schroeder et al. 2021). A study by Stafford et al. (2007) found a higher proportion of hunters (48%) expressed little trust in the Wisconsin DNR and their ability to manage CWD compared to non-hunters (25%). Gigliotti et al. (2020) found that approximately 43% of landowners were neutral in trust in their agency, providing an opportunity to build a trusting relationship. However, in an eight-state regional study, the majority of hunters trusted their wildlife agencies to manage CWD (Needham and Vaske, 2008).

While research has extensively explored trust in state wildlife agencies (Decker et al. 2014; Gigliotti et al. 2020; Riley et al. 2018; Schroeder et al. 2021), there are few direct comparisons between trust in state versus federal agencies. State wildlife agencies often have a closer connection to communities and can tailor their management strategies to address local challenges. This can create feelings of perceived similarity, where an individual believes their agency shares similar values and goals, which elevates trust (Cvetkovich and Winter, 2003;

Needham and Vaske, 2008; Siegrist et al. 2000; Vaske et al. 2004; Winter et al. 2004). A study by Sullivan et al. (2022) found that 37.7% of respondents trusted their state government and only 25% trusted the federal government. Understanding the disparity in trust levels between state and federal agencies is crucial, as it may influence a landowner's decision regarding who is allowed access to their property. The lack of research comparing trust in state versus federal wildlife agencies suggests the need for ongoing investigations to understand the implications of this difference on disease management.

Financial Incentives

One potential strategy for increasing access to private property for targeted removals is offering landowners financial incentives for deer removals. Financial incentives present an opportunity to modify landowners' behavior, particularly for those who are undecided about allowing property access. Incentives may change landowners' perception of targeted removals to be more beneficial, through financial gain and contribution to wildlife conservation and public health. Monetary incentives can also be presented as a form of recognition and reward for landowners, acknowledging their vital role in CWD management and reinforcing their stewardship. However, offering money may not be a strong enough incentive to change someone's mind about allowing access (Holsman et al. 2010; Landon et al. 2022; Petchenik, 2006), particularly for an invasive management strategy such as targeted removals.

Preference Elicitation

Since field experiments are unrealistic for identifying how financial incentives impact landowners' acceptance of targeted removals, hypothetical choice methods can reveal individual preferences. Stated choice methods (SCM) place the decision-maker in a realistic frame of mind, allowing them to make trade-offs between attributes and enabling researchers to identify how individuals value one attribute over another. There are many benefits to using SCMs, including (i) researchers can control the stimuli, (ii) controlling the design matrix enhances statistical efficiency and mitigates issues of collinearity, (iii) it facilitates the development of more robust models by allowing broader attribute ranges, and (iv) the introduction and/or removal of attributes are easily executed, often impossible in actual situations (Adamowicz et al. 1998).

Choice experiments are a stated-choice method used to calculate the trade-offs individuals make between several different attributes of a good or service (Hanley et al. 1998). Each attribute has corresponding levels used to create choice tasks that reflect preferences between different situations (Boxall et al. 1996). For each choice task, respondents select between alternative situations or 'opt out' and choose neither. Choice experiments can be used to assess an individual's willingness to accept (WTA), or the minimum monetary amount required to accept something undesirable, or willingness to pay (WTP), which reflects the maximum amount an individual is willing to pay to avoid that outcome. In deer management research, choice experiments are an emerging method that can provide decision-makers with detailed estimates of preferences for management techniques (Cornicelli et al. 2011; Landon et al. 2022; Rubino and Serenari, 2022; Serenari et al. 2019; Ufer et al. 2023; Ward et al. 2008). Using choice experiments enables wildlife researchers to quantify preferences for various attributes of wildlife management interventions systematically. Therefore, a choice experiment estimating WTA can be used to calculate the incentives landowners would accept for various attributes of targeted removal management.

Goal of Study, Predictions, and Objectives

The goal of this study was to elicit landowners' willingness to accept targeted removals of white-tailed deer and mule deer on their private property. My analysis is based on five predictions derived from past research on CWD, deer management, landowner characteristics and preferences, and hunting culture. I first predicted that landowners would choose the opt-out option (i.e., no management) more than the targeted removal alternatives (*P1*), based on prior research showing limited support for targeted removal management (Cooney and Holsman, 2010; Durocher et al. 2022; Harper et al. 2015; Heberlein, 2004). Furthermore, this lack of support can be attributed to low trust in government wildlife agencies and their ability to manage CWD (Gigliotti et al. 2020; Stafford et al. 2007). Sullivan et al. (2022) found federal agents were less trusted than state agents, driving my prediction that landowners will require higher payments for federal agent property access over state agents (*P2*). My third prediction is that hunters will require a higher payment for the removal of adult male deer and a lower payment for the removal of adult female deer (*P3*). Most hunters have preferences for the sex

and age class of deer they harvest, with adult males being most preferred and adult females being least preferred (D'Angelo and Grund, 2015). Therefore, hunters would require a higher incentive for removing adult males, as they may feel it will limit their hunting opportunities, and a lower incentive for removing adult females, as they are less preferred for harvest. My fourth prediction is that landowners' acceptance of targeted removal attributes will vary by region, state CWD prevalence, and county CWD prevalence (*P4*). I anticipated differences in acceptance of targeted removals between the western and eastern regions of the U.S. based on socio-demographics (Manfredo et al. 2018), land ownership (Price, 1995), and hunting culture. The prevalence of CWD has been identified as a significant predictor of hunting participation (Lyon and Vaske, 2010; Vaske and Lyon, 2011) and is associated with greater acceptance of lethal control methods as prevalence increases (Needham et al. 2004, 2006). In addition, Needham et al. (2004, 2006) and Vaske et al. (2018) found that hunters in CWD-positive counties perceived less risk than those in CWD-adjacent counties. My last prediction is that landowners have heterogeneity in preferences for targeted removal attributes, and some of this heterogeneity can be explained by observable socio-demographics, land ownership, past experiences, trust, and geographic location (*P5*), driven by extensive past research of these factors influence on management acceptance. Exploring these research predictions can improve our understanding of landowners' preferences for targeted removal attributes and acceptance of financial incentives to reduce the prevalence and spread of CWD.

My first objective was to identify the willingness of landowners to accept targeted removal alternatives and financial incentives. Specifically, I used a choice experiment to estimate preference heterogeneity for various targeted removal attributes. The second objective was to compare acceptance of financial incentives by region, state CWD prevalence, county CWD prevalence, and hunting status using sub-samples of the data. My final objective was to identify the driving factors that influence landowners' willingness to accept compensation for targeted removal attributes. To achieve this, I employed a multiple linear regression model using landowner-specific willingness to accept values (WTA) for each attribute.

STUDY AREA

The choice experiment was part of a larger survey effort aimed at understanding landowners' willingness to allow CWD management on their property and the factors influencing their decisions. The study area was designed to capture how differences in geographic location and disease exposure influence acceptance of management. The survey was distributed to six states across the U.S. to assess three key differences: (i) regional variation, (ii) state-level CWD prevalence, and (iii) county-level CWD prevalence. The states chosen were Wyoming, Nebraska, and North Dakota in the western region, and Illinois, Michigan, and Virginia in the eastern region (Figure 2.2). These two regions differ in terms of deer species range (Heffelfinger, 2006), land ownership (Price, 1995), and socio-demographics (Manfredo et al. 2018), underscoring the need for comparison. White-tailed deer are found throughout the mainland of the United States, while mule deer are typically found west of the Missouri River in arid, rocky environments (Heffelfinger, 2006). Privately owned land parcels are significantly larger in the western states than in the eastern states (Price, 1995; see Appendix 1C for the average parcel size of surveyed states). As wildlife managers seek permission from landowners to access their properties, western states would likely require fewer participants, as one property owner could account for the same amount of land as several owners in the east. Within each region, states were selected to reflect varying levels of statewide CWD prevalence, determined by the number of CWD-positive deer since testing began (collected in January 2023). Each region included a state with high prevalence (more than 1,000 detections), a state with medium prevalence (100-999 detections), and a state with low prevalence (less than 100 detections). The high-prevalence states were Wyoming and Illinois, the medium-prevalence states were Nebraska and Michigan, and the low-prevalence states were North Dakota and Virginia. Within each state, surveys were distributed to landowners in CWD-positive counties (at least one positive detection) or CWD-adjacent counties (bordering a positive county) owning more than 3 acres of land (Figure 2.3). This approach maximizes responses from individuals aware of CWD and targets landowners currently experiencing, or will soon experience, CWD presence in their county.

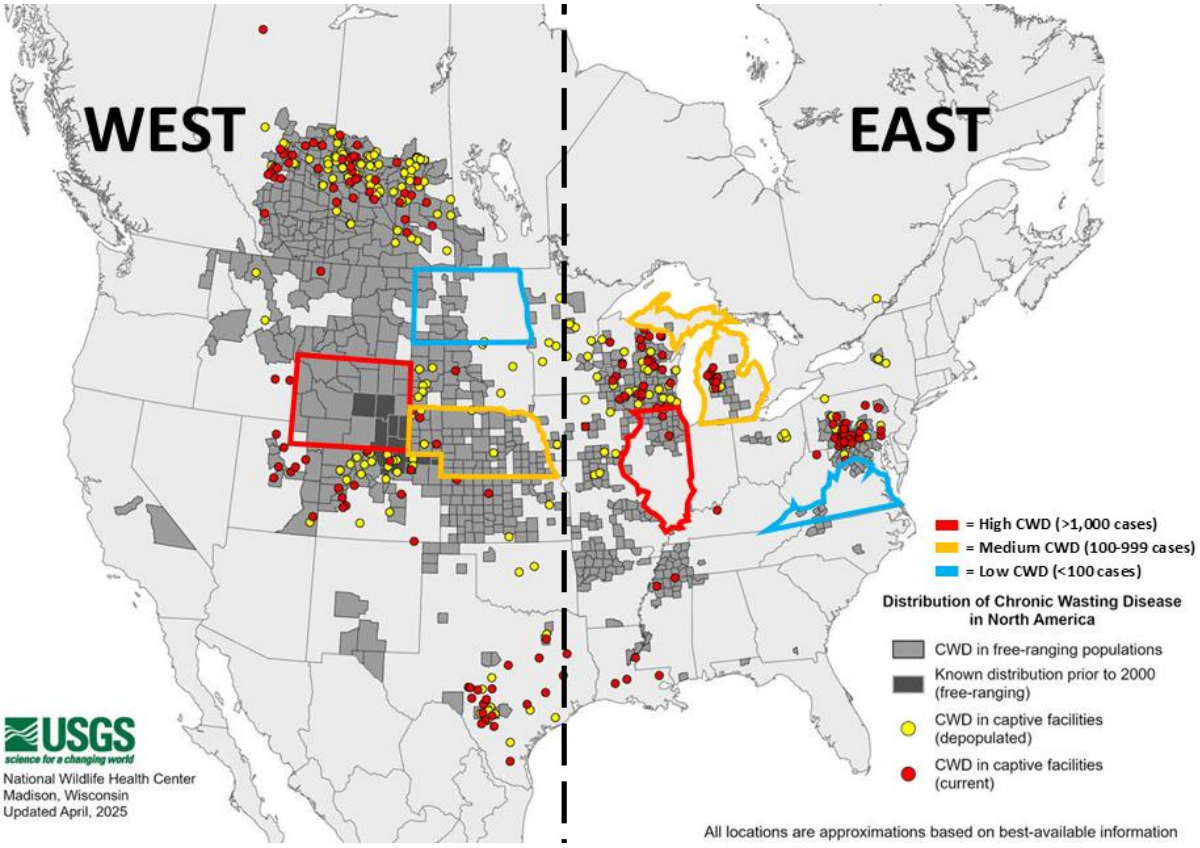

Figure 2.2. Map of sampled states with the current distribution of CWD. States include Wyoming, Nebraska, and North Dakota in the western region, and Illinois, Michigan, and Virginia in the eastern region. Red-outlined states indicate high state CWD prevalence (more than 1,000 cases), orange-outlined states indicate medium state CWD prevalence (100-999 cases), and blue-outlined states indicate low state CWD prevalence (less than 100 cases).

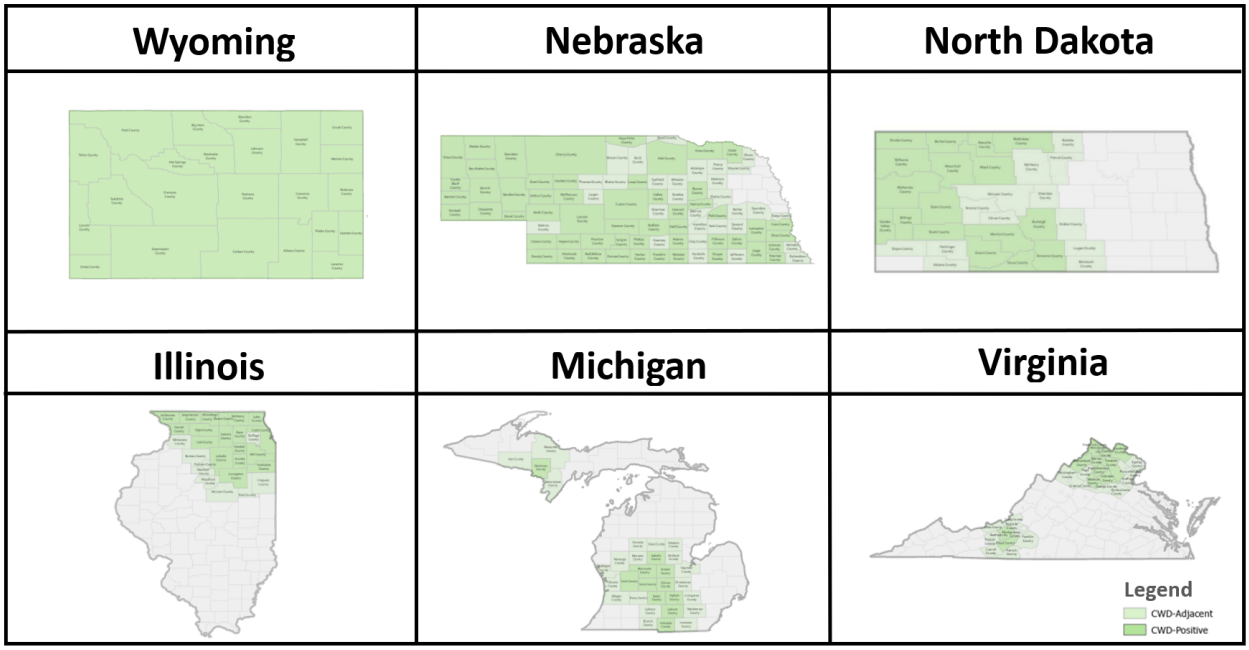

Figure 2.3. Map of sampled states (Wyoming, Nebraska, North Dakota, Illinois, Michigan, and Virginia) and the counties surveys were distributed to (CWD-positive and CWD-adjacent counties) in January 2023. CWD-positive counties are colored dark green, and CWD-adjacent counties are colored light green.

METHODS

The choice experiment was designed to assess landowners' preferences for targeted removal attributes using a willingness to accept (WTA) framework, as this was the most appropriate method for valuing losses of property rights, such as granting access for deer removal (Freeman et al. 2014). Given that CEs offer numerical assessments of trade-offs among attributes, the monetary value respondents would accept in exchange for differences in deer removal attributes were estimated. In my application, the targeted removal strategy was described as a combination of removal restriction, implementing agency, and payment per deer removed, each with varying levels. I selected three attributes guided by two main factors: (i) the goal of simplifying choices and minimizing the cognitive burden for respondents, as highlighted by Swait and Adamowicz (1996), and (ii) relevant literature in the field.

Attributes and Levels

As shown in Table 2.1, the chosen attributes and their levels are as follows:

1. Removal restriction refers to the specific sex and age class of deer removed from the respondent's private property. The four associated levels include removing any sex deer (RASD), adult males only (RAMO), young males only (RYMO), and adult females only (RAFO). These levels were selected for two primary reasons: (i) the prevalence and spread of CWD disproportionately affect different sex and age classes, changing targeted management strategies, and (ii) landowner preferences regarding which sex and age classes of deer are removed from their property may influence their WTA.
2. The second attribute is implementing agency, which refers to the government wildlife agency conducting the deer removal on the respondent's private property. The levels include state wildlife agency (STATE) and federal wildlife agency (FED). Both agencies are responsible for conducting targeted removal management. However, differences in landowners' perception and trust in these agencies may influence their acceptance of management on their property.
3. The final attribute is payment mechanism, which represents the compensation a landowner would receive per deer removed from their property. The levels include 0, 50, 100, and 150 USD (PAY), chosen to (i) reflect a range of payments wildlife agencies could feasibly offer to landowners, (ii) enhance WTA estimation and efficiency, and (iii) ensure a balanced design.

Table 2.1. Attributes and levels used in the choice experiment.

Attributes	Levels	Description	Abbrev.
Removal restriction	Remove any sex deer, Remove adult males only, Remove young males only, Remove adult females only,	The sex and age of the deer that will be removed from the property.	RASD, RAMO, RYMO, RAFO
Implementing agency	State agency, Federal agency	The government wildlife agency conducting the removal on the property.	STATE, FED
Payment mechanism	$0, $50, $100, $150	The payment the landowner would receive per deer removed from the property.	PAY

Experimental Design

Given the number of attributes and levels in the experiment, presenting a full factorial design of all possible combinations (4^2 x 2^1) would result in 32 choice questions. Therefore, an orthogonal optimal in the difference (OOD) fractional factorial design, or D-optimal design (Street, Burgess, and Louviere, 2005; Street and Burgess, 2007) was employed. This design eliminates identical alternatives, which significantly reduces the number of choice tasks administered. The design began with constructing the first alternative using the OOD design, which maximizes the differences in attribute levels across various alternatives (Tang et al. 2014). Next, design generators were used to make systematic changes to generate balanced and uncorrelated attribute levels, which produced a D-efficiency of 95.26%. The resulting DCE consists of sixteen choice tasks divided into two blocks of eight to reduce cognitive burden (Hanley et al. 2002). An example of a choice task is provided in Figure 2.4. For each choice task, landowners selected from three options: two targeted removal alternatives (option A or B) and one no-management option or 'opt-out' (option C). Instructions on responding to the choice questions and information about each attribute were given immediately before the first question. Participants were informed that the federal wildlife agency was non-regulatory, meaning the agents' activities were not related to enforcing laws, and access to their property was strictly for deer management.

Which of the following options for targeted deer removal do you prefer? **(select one)**

	Option A	**Option B**	**Option C**
	Remove any sex deer	Remove adult females only	I would not choose either option (skip)
	State agency	Federal agency	
	$100 payment per deer	$50 payment per deer	
Select one option →	☐	☐	☐

Figure 2.4. Example of a choice experiment question from the survey.

Survey Procedure and Data Collection

The survey, including the choice experiment, was conducted using a mixed-mode approach, contacting respondents through a web-based questionnaire programmed in Qualtrics and a mailed paper self-administered questionnaire. The sample consisted of 13,400 landowners aged 18 years or older who owned at least 3 acres of land. The sample was stratified by county, with 60.0% sent to CWD-positive counties and 40.0% sent to CWD-adjacent counties. The survey was administered between August 2023 and March 2024, in which landowners first received a letter to access the online survey via Qualtrics. Non-respondents were mailed either a self-administered paper survey (n = 5,500) or a postcard reminder. All landowners who completed the survey were offered a $10 Amazon e-card as appreciation for their participation. Participants were randomly assigned to one of two survey versions, each reflecting a different choice experiment block (8 choice tasks each), while all other survey components remained identical. Although some respondents did not complete all eight choice questions, individuals who responded to at least one were retained in the analysis. The order of the choice sets was randomized using the Qualtrics platform, and before printing for mailed questionnaires.

Hypothetical Bias

Hypothetical bias (HB) can occur in choice experiments when an individual overstates or understates their valuation due to differences between hypothetical valuations and real elicitations. This can be a limitation of CE studies, as respondents may provide unrealistically high answers (Arrow et al. 1993). However, Penn and Hu (2021) found little evidence of HB in most WTA studies and no significant difference between hypothetical and real experiments. Regardless, using mitigation techniques to reduce the possibility of bias is a common strategy

across all SCMs. Recognizing that respondents may lack familiarity with targeted removals, three methods appropriate for WTA applications were used to minimize HB: (i) positioning choice experiment questions midway through the survey to foster a sense of ownership (Penn and Hu, 2021), (ii) integrating consequentiality statements to emphasize the importance of their responses (Vossler et al. 2012), and (iii) encouraging respondents to approach each choice as a real-world decision.

Theoretical Foundations

Choice experiments are grounded in Lancaster's consumer theory (Lancaster, 1966), which posits that the utility derived from a good (or, in this case, a management strategy) is based on its attributes, rather than the good itself. Therefore, respondents will choose the set of attributes maximizing their utility while simultaneously making trade-offs between them. This is operationalized in econometric modeling through random utility maximization (RUM), developed by McFadden (1974). RUM assumes individuals maximize their utility based on known preferences.

As choice experiments are rooted in RUM, they operate under the assumption that individual n (i.e., a respondent) obtains utility [U_{nit}] from selecting an alternative i from a determined set of J alternatives, all of which are contained in a choice set C in a given situation t. Within this model, utility is comprised of a deterministic component [V_{nit}] which is dependent upon the attributes of an alternative and a random component [ε_{nit}], which are unknown and treated as random and distributed independently, identically extreme values. The utility of alternative i can be specified as

$$U_{nit} = V_{nit} + \varepsilon_{nit}$$

Therefore, individual n will choose alternative i if $U_{nit} > U_{njt}$ $\forall$ j $\neq i$. Consequently, the probability of individual n choosing alternative i is given by

$$P_{nit} = Prob(V_{nit} + \varepsilon_{njt} > V_{njt} + \varepsilon_{njt};\ \forall \text{ j} \in \text{C})$$

To operationalize a choice model, specific assumptions about the joint distribution of the random error component and the form of the deterministic utility function must be established. If homogeneous preferences are assumed across landowners, a general model specification, such as the multinomial logit (MNL) model, can be applied, where errors are independently and

identically distributed, following a Type 1 extreme value (Gumbel) distribution. However, if preferences are expected to vary among respondents as in this study, employing discrete choice models such as the random parameters logit (RPL) model is more appropriate to account for heterogeneity.

Econometric Modeling

The random parameters logit model is a widely used econometric model for estimating discrete choice experiments and is regarded as highly flexible (McFadden and Train, 2000). Advances in simulation methods, such as simulated maximum likelihood estimation, enable the RPL to be estimated easily, hence its popularity (Hensher and Greene, 2003). Unlike standard logit models, RPL allows for random taste variation (McFadden and Train, 2000; Train, 2002). It assumes diverse and unobserved individual characteristics influence preferences, rather than applying a single parameter set across the entire population. In the RPL framework, the utility that an individual n derives from choosing alternative i is composed of a systematic component, represented as a linear function of attributes, and a random error term. The systematic component of utility is denoted by:

$$V_{nit} = \beta' x_{nit}$$

Where β', a vector of random parameters representing individual preferences, and x_{nit}, the vector of observed attributes for the i-th alternative. According to Train (2003), the probability that individual n chooses alternative i from the choice set C in situation t is given by:

$$P_{nit} = \int \frac{\exp(V_{nit})}{\sum_j \exp(V_{njt})} f(\beta) d\beta$$

Here, $f(\beta)$ specifies the distribution of the random parameters. When these parameters are fixed at specific values, the RPL model simplifies to the standard logit model. Landowners' preferences and WTA for targeted removals were analyzed within this modeling framework.

Choice models can be redefined in terms of 'preference space' where utility parameters are expressed through coefficients that typically follow assumed distributions, such as normal or log-normal (Train and Weeks, 2005). For this study, a normal distribution was used for the non-payment attributes, allowing for both positive and negative variations in preferences among individuals. In this context, the RPL model accounts for individual-level heterogeneity by applying this distribution to the coefficients across respondents, thereby capturing variations in

preferences. Payment was constrained to follow a one-sided triangular distribution to ensure the distribution of the payment parameter satisfies the positive sign and marginal utility increases with compensation (Hensher et al. 2015). Studies by Hole and Kolstad (2011), Sonnier et al. (2007), and Train and Weeks (2005) demonstrate that models in preference space tend to fit data better, accurately reflecting systematic taste heterogeneity. The RPL model in preference space, therefore, offers a robust framework for capturing the diverse individual preferences of landowners.

Final Utility Specification

The final utility specification for this study includes an alternative-specific constant ($ASC_{no-mgmt}$) representing the no-management option and a payment variable (PAY_{jt}) which reflects the per-deer payment levels from the experimental design. The attributes are defined as follows: RAMO (removal of adult males only), RYMO (removal of young males only), RAFO (removal of adult females only), and FED (federal agent implementing agency). The utility that individual n obtains from alternative j is represented as:

$$U_{njt} = ASC_{no-mgmt} - \beta_p PAY_{jt} + \beta_1^R RAMO_{jt} + \beta_2^R RYMO_{jt} + \beta_3^R RAFO_{jt} + \beta_4^R FED_{jt} + \varepsilon_{njt}$$

Where $\beta_1^R RAMO_{jt} + \beta_2^R RYMO_{jt} + \beta_3^R RAFO_{jt} + \beta_4^R FED_{jt}$ are indicator variables representing different removal restrictions and implementing agency attributes. These terms capture the observed representative portion of utility for each chosen alternative. The term ε_{njt} represents the error component, capturing unobserved factors and assumed to be random and independently distributed, following a Gumbel or extreme value type I distribution. This distributional assumption allows for a closed-form expression for choice probabilities, making it computationally efficient to estimate RPL models.

Marginal Willingness to Accept

Random parameter models were estimated in NLOGIT version 6.0 (Greene, 2018). Simulated maximum likelihood estimation techniques, utilizing 1000 Halton draws, were employed to estimate the models and derive individual or landowner-specific preference coefficients (Bhat, 2003; Train, 2009). Since the estimated model coefficients are not easily interpretable in monetary terms, landowners' marginal willingness to accept (MWTA) was calculated as:

$$MWTA = -\frac{\beta^R}{\beta_p}$$

Where $MTWA$ is the marginal willingness to accept compensation for a change in any of the attributes for targeted removals, β^R is the coefficient of the removal restriction or implementing agency attributes, and β_p is the coefficient of the monetary compensation attribute (PAY). The standard errors of the MWTAs were estimated using the parametric bootstrapping procedure developed by Krinsky and Robb (1986). Specifically, 1,000 observations were simulated from a multivariate normal distribution, using the coefficients and variance-covariance estimates obtained from the RPL model as parameters.

Sub-Sample Analyses

RPL models were estimated for the full sample and sub-sample datasets to compare WTA across key groups of interest. Specifically, MWTA was compared by (i) region (eastern versus western), (ii) state-level CWD prevalence (high versus medium versus low), (iii) county-level CWD prevalence (CWD-positive versus CWD-adjacent), and (iv) hunting status (hunters versus non-hunters). This enabled an in-depth examination of the differences in MWTA for targeted removal attributes across these key factors. Statistical comparisons were conducted using t-tests or Welch's ANOVA to account for differences in group variances, providing further insight into landowner preferences and compensation requirements by these factors.

Linear Regression

A linear regression model can be a powerful tool for analyzing individual WTA values derived from choice experiments. This model was used to understand which factors significantly influenced the monetary compensation that landowners were willing to accept for targeted removal management alternatives on their property. The dependent variable was the landowner-specific (i.e., individual-specific) willingness to accept (WTA) calculated from the RPL model. The independent variables were categorized into socio-demographics, survey variables, and geographic variables and were used to assess the relative contribution of each predictor variable to changes in WTA values. These models were estimated using the *regress* command in STATA (StataCorp, 2023). As is common in survey-based data collection, missing values may occur for certain variables. In this analysis, income had a significant proportion of missing data

(more than 5%) and was included as a missing data indicator to retain as many observations as possible and minimize potential bias.

RESULTS

Summary Statistics

A total of 1,365 completed surveys were received, yielding a response rate of 11%. After accounting for non-deliverable and unusable cases, excluding respondents who did not answer any of the eight CE questions, and removing respondents who did not answer the questions used in the linear regression, the effective sample size was 1,204, with a 10.1% usable response rate. Summary statistics on socio-demographics, property characteristics, knowledge, trust, management preferences, and geographic location are presented in Table 2.2. The mean age was 56.3 years, and approximately one-third of the respondents were female. The majority of respondents (80.48%) had some college education, indicating sufficient capability to evaluate attributes in the choice experiment (Czajkowski et al. 2014). The average annual household income fell between $50,000 and $149,999. Additionally, 28.90% of landowners indicated they have hunted on their property within the past five years and are classified as hunters.

For property characteristics, 80.98% of respondents' properties were between 3 and 49 acres, 54.32% owned multiple properties, and 49.42% had allowed hunting on their property in the past. Landowners were asked if they would allow access for targeted removals on their property, of which 40.20% said yes. The majority of landowners (85.47%) indicated they were aware of CWD before taking the survey. On a scale of [1] no trust to [5] full trust, respondents indicated that, on average, they trusted the federal wildlife agency at 2.88 and their state wildlife agency slightly more at 3.18. The regional distribution of landowners was nearly identical in the western (47.84%) and eastern (52.16%) regions. Similarly, distribution across state CWD prevalence levels was fairly even, with 32.48% in high-prevalence states, 36.96% in medium-prevalence states, and 30.56% in low-prevalence states. The distribution of landowners by county showed a similar pattern to the stratification, with 68.27% residing in CWD-positive counties and 31.73% in CWD-adjacent counties. Lastly, only 11.96% of respondents indicated that they lived within 10 miles of a big city (more than 100,000 people).

Table 2.2. Summary statistics of covariates used in the linear regression model. Mean values are presented for continuous variables with ± standard deviations, and percentages for categorical variables.

Variable	Summary Statistics
Sample size (persons)	1204
Socio-demographics	
Age (*mean ± st.dev.)*	56.3 ± 14.4
Gender (percent)	
Male	65.78
Female	34.22
Household yearly income (percent)	
<$49,999	10.55
$50,000 - $99,999	28.24
$100,000 - $149,999	25.25
>$150,000	28.82
Missing	7.14
Education (percent)	
College education	80.48
Less than college education	19.52
Hunting status (percent)	
Hunter	28.90
Non-hunter	71.10
Survey variables	
Property size (percent)	
3-9 acres	43.94
10-49 acres	37.04
50-99 acres	5.07
100-249 acres	7.31
250-499 acres	2.57
500-999 acres	1.91
1,000-4,999 acres	1.91
5,000+ acres	0.25
Multiple properties (*percent)*	54.32
Allowed hunters on property *(percent)*	49.42
Would allow targeted removals *(percent)*	40.20
Aware of CWD *(percent)*	85.47
Trust in federal agency (*mean ± st.dev.)*	2.88 ± 1.19
Trust in state agency (*mean ± st.dev.)*	3.18 ± 1.16
Geographic variables	
Region (percent)	
Western	47.84
Eastern	52.16

Table 2.2 (cont'd)

State CWD prevalence (percent)	
High	32.48
Medium	36.96
Low	30.56
County CWD prevalence (percent)	
CWD-positive	68.27
CWD-adjacent	31.73
Near big city *(percent)*	11.96

Model Results

Estimates from the RPL model, based on 9,475 observations from 1,204 individuals who each completed between one and eight choice tasks, are presented in Table 2.3. The results show that all coefficients were statistically significant at the 0.01 level. The high positive coefficient for the NO-MGMT variable indicates a strong preference among respondents to avoid property access for targeted removals. Similarly, the positive and statistically significant coefficient for PAY suggests that higher compensation payments increase the likelihood of respondents accepting targeted removals. The negative and statistically significant coefficients for all other attributes (RAMO, RYMO, RAFO, and FED) indicate a reduction in utility for changes in targeted removal management attributes. For removal restriction, RYMO is the least preferred, as evidenced by its most negative coefficient, with RAMO ranking as the next least preferred, and RAFO most preferred. FED was the most favored, reflected by the coefficient being closest to zero. Finally, the statistically significant standard deviations indicate significant heterogeneity in preferences within the sample.

Table 2.3. Estimates of willingness to accept targeted removals for the entire sample using the random parameters logit model in preference space.

Coefficients	Estimates	Std. error	| T-Statistic|
PAY			
Mean	0.016***	0.001	31.17
Std. deviation	0.016***	0.001	31.17
NO-MGMT			
Mean	3.741***	0.103	36.20
Std. deviation	8.030***	0.201	39.97
RAMO			
Mean	-1.391***	0.075	-18.42
Std. deviation	1.070***	0.065	16.49
RYMO			
Mean	-1.454***	0.083	-17.49
Std. deviation	1.024***	0.065	15.74
RAFO			
Mean	-0.640***	0.069	-9.30
Std. deviation	1.304***	0.062	20.87
FED			
Mean	-0.585***	0.046	-12.82
Std. deviation	0.834***	0.044	19.01
N	9475		
Log Likelihood	-4885.824		

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

Using the coefficients from the RPL model (Table 2.3), landowners' marginal willingness to accept (MWTA) compensation estimates were calculated across the entire sample. The average payment landowners would accept per deer removed from their property for each targeted removal attribute is reported in Table 2.4. The results indicate that all MWTA estimates were statistically significant from zero at the 0.01 level, reflecting meaningful differences in landowner preferences across targeted removal attributes. The negative attribute NO-MGMT shows respondents' willingness to pay (WTP) to avoid targeted deer removals on their property ($229 per deer), showing a strong preference for no management. Conversely, positive MWTA values for RYMO ($88.97), RAMO ($85.10), and RAFO ($39.14) reflect the compensation landowners would accept to become indifferent to the specified removal practice compared to a generic, non-targeted removal approach. Similarly, landowners' MWTA for FED ($35.82)

reflects the compensation landowners would accept to become indifferent to removals conducted by a federal wildlife agent compared to a state wildlife agent. Among these, the highest MWTA value is observed for RYMO, indicating that respondents have the greatest aversion to the removal of young males, followed closely by RAMO, RAFO, and FED, also displaying positive MWTA values.

Table 2.4. Marginal willingness to accept estimates for targeted removal attributes across the full sample (*n* = 1,204).

Coefficients	Estimates ($)	Std. error	T-values	95% Confidence Interval ($)	
RAMO	85.10***	4.77	-17.83	75.74	94.45
RYMO	88.97***	5.22	-17.04	78.74	99.20
RAFO	39.14***	4.25	-9.20	30.80	47.47
FED	35.82***	2.82	-12.72	30.30	41.34
NO-MGMT	-228.90***	6.54	35.02	-241.71	-216.09

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

Marginal willingness to accept estimates between landowners in the western (*n* = 576) and eastern (*n* = 628) regions of the study were compared using t-tests to identify significant differences across attributes (Table 2.5). A visual representation of regional differences in MWTA is shown in Figure 2.5. For the NO-MGMT attribute, eastern landowners exhibited a significantly higher willingness to pay ($277.41), indicating a greater resistance to targeted removals on their property than western landowners ($204.10). The estimates for RAMO and FED indicate that western landowners have a significantly higher WTA for these attributes compared to eastern landowners. Lastly, while differences in MWTA estimates for RYMO and RAFO were observed, the t-test results indicate that these differences were not statistically significant.

Table 2.5. Marginal WTA estimates comparing landowners in western (Wyoming, Nebraska, North Dakota) and eastern (Illinois, Michigan, Virginia) regions. T-test p-values show significant differences between regions for each attribute.

	Western (*n* = 576)		Eastern (*n* = 628)		
Coefficients	**Estimates ($)**	**Std. error**	**Estimates ($)**	**Std. error**	**T-test p-value**
RAMO	97.63	8.52	75.08	5.52	0.0242**
RYMO	94.39	8.98	87.12	6.07	0.4963
RAFO	45.61	7.47	38.55	5.13	0.4297
FED	53.33	5.21	24.51	3.37	0.0001***
NO-MGMT	-204.10	10.05	-277.41	10.24	0.0001***

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

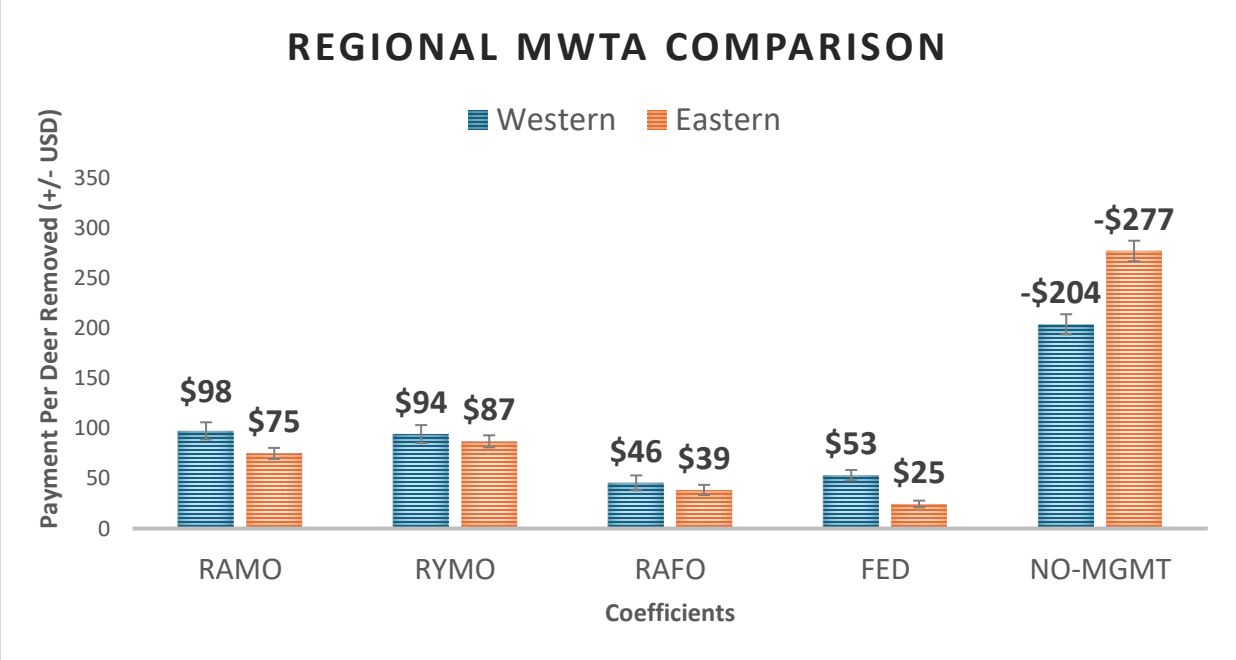

Figure 2.5. Comparison of marginal willingness to accept values for targeted removal attributes for landowners in the western (Wyoming, Nebraska, and North Dakota) and eastern (Illinois, Michigan, and Virginia) regions.

Estimates for MWTA across different state CWD prevalence levels—high (*n* = 391), medium (*n* = 445), and low (*n* = 368)—are presented in Table 2.6. Significant differences at the 99% level using t-tests for high versus medium states are denoted by "A", high versus low states are "B", and medium versus low states are "C". A visual representation of the differences between the three groups is provided in Figure 2.6. All comparisons between state prevalence

levels for NO-MGMT were statistically significant (A, B, and C). Estimates revealed that landowners across all prevalence levels were willing to pay to avoid targeted removal management on their property. However, landowners in low-prevalence states were least resistant to removals, as they are willing to pay the least to avoid them ($192.96), followed by those in high-prevalence states ($214.33), while landowners in medium-prevalence states were the most resistant, with the highest willingness to pay ($278.02). For all other attributes (RAMO, RYMO, RAFO, and FED), landowners in high-prevalence states required significantly higher payments compared to those in medium and low-prevalence states. However, there were no differences observed in WTA between medium and low-prevalence states for these attributes

Table 2.6. Marginal WTA estimates comparing state CWD prevalence levels between high-prevalence states (Wyoming and Illinois), medium-prevalence states (Michigan and Nebraska), and low-prevalence states (Virginia and North Dakota). Welch's ANOVA and t-test show significant differences between state CWD prevalence levels for each attribute.

	High prevalence (*n* = 391)		**Medium prevalence (*n* = 445)**		**Low prevalence (*n* = 368)**			
Coefficients	**Estimates ($)**	**Std. error**	**Estimates ($)**	**Std. error**	**Estimates ($)**	**Std. error**	**ANOVA p-value**	**T-test group comparisons**
RAMO	142.46	13.40	74.70	6.51	57.79	7.49	0.001***	AB
RYMO	145.98	14.57	79.42	7.50	65.68	7.90	0.001***	AB
RAFO	64.35	10.55	40.42	6.17	25.13	6.79	0.001***	AB
FED	55.94	7.18	27.65	4.04	32.04	4.47	0.001***	AB
NO-MGMT	-214.33	15.60	-278.02	10.85	-192.96	9.65	0.001***	ABC

Note: Triple asterisks (***) denote the significance level at 1% for Welch's ANOVA between three groups. Significant differences at the 5% level for t-tests are indicated by A = high prevalence and medium prevalence states, B = high prevalence and low prevalence states, and C = medium prevalence and low prevalence states.

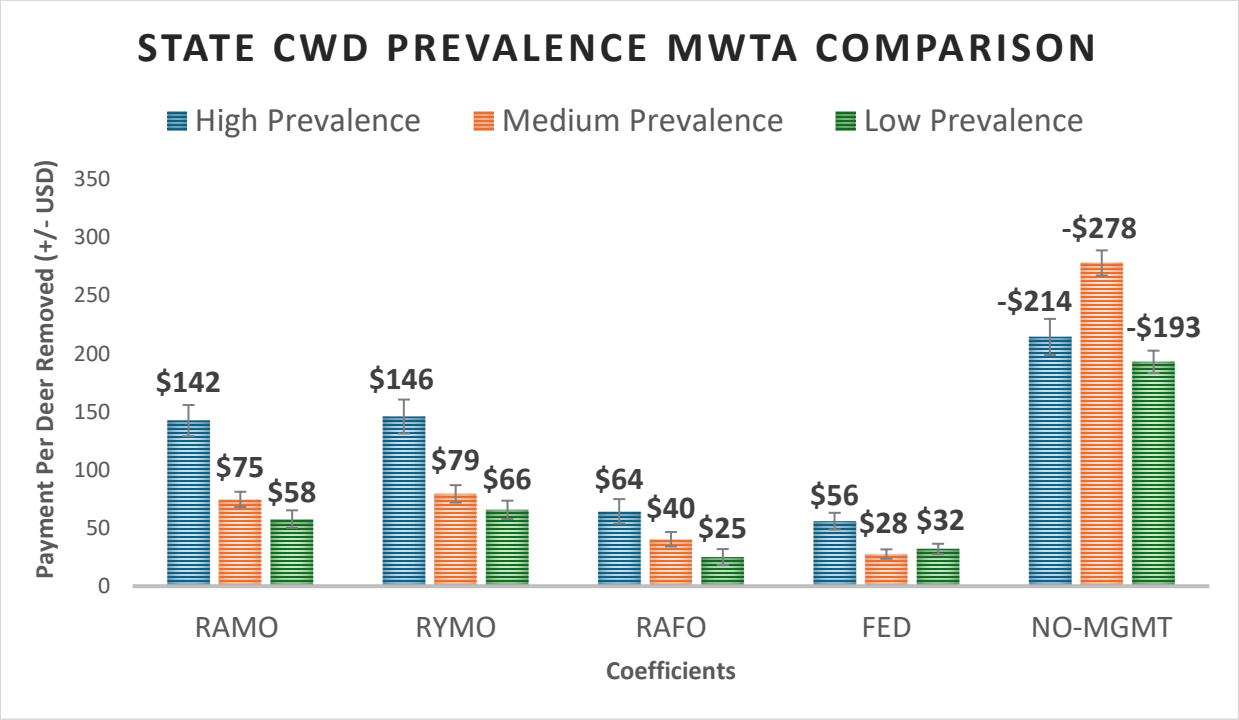

Figure 2.6. Comparison of marginal willingness to accept values for targeted removal attributes between landowners in high-prevalence states (Wyoming and Illinois), medium-prevalence states (Nebraska and Michigan), and low-prevalence states (North Dakota and Virginia).

MWTA estimates were compared between landowners who live in CWD-positive (*n* = 822) and CWD-adjacent (*n* = 382) counties, with results presented numerically and visually in Table 2.7 and Figure 2.7, respectively. For NO-MGMT, landowners in CWD-adjacent counties have a higher WTP to avoid targeted removals at $254.09 per deer compared to those in CWD-positive counties at $202.08 per deer. Both male deer attributes (RAMO and RYMO) indicate statistically significant differences between counties, with landowners who live in CWD-positive counties requiring higher payments for their removal. The RAFO and FED attributes did not show statistically significant differences between counties, indicating no difference in payments required to remove adult female deer or federal implementing agents.

Table 2.7. Marginal WTA estimates comparing CWD-positive counties (1+ positive CWD cases) and CWD-adjacent counties (bordering positive counties). T-test p-values show significant differences between county types for each attribute.

	CWD-positive (*n* = 822)		CWD-adjacent (*n* = 382)		
Coefficients	**Estimates ($)**	**Std. error**	**Estimates ($)**	**Std. error**	**T-test p-value**
RAMO	92.01	5.87	68.15	7.73	0.0183**
RYMO	98.88	6.41	69.06	8.29	0.0067***
RAFO	42.26	5.20	35.70	7.02	0.4665
FED	38.96	3.37	30.57	4.51	0.1498
NO-MGMT	-202.08	7.45	-254.09	12.96	0.0002***

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

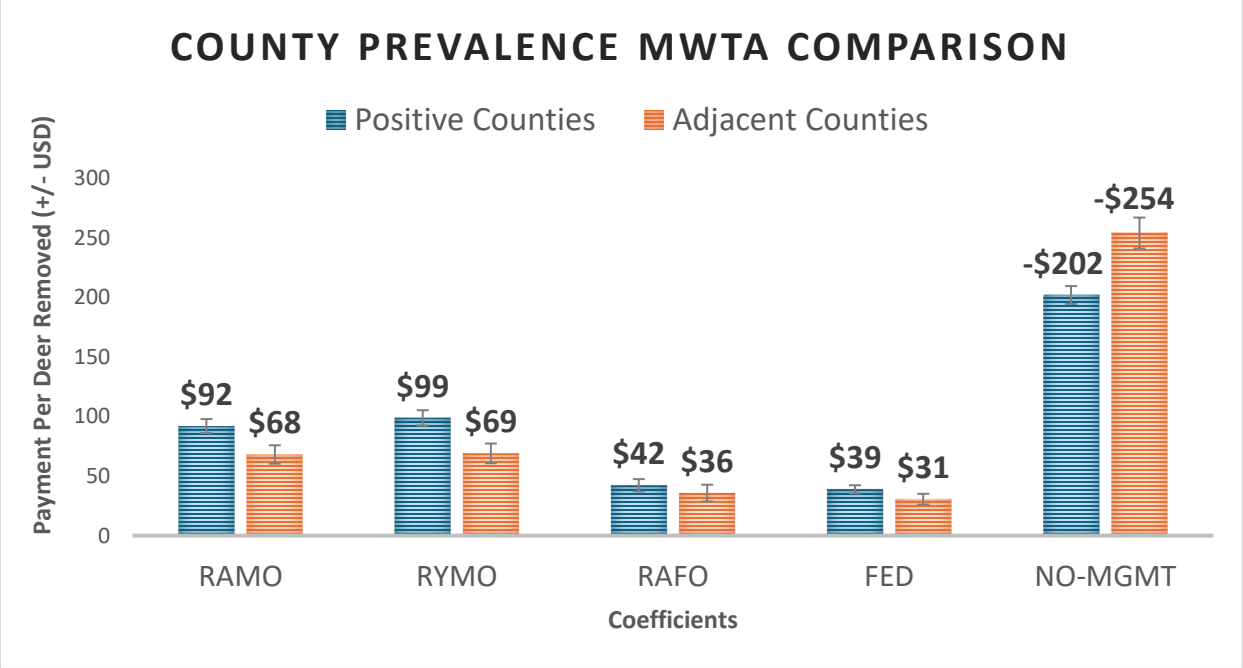

Figure 2.7. Comparison of marginal willingness to accept values for targeted removal attributes for landowners in CWD-positive counties (1+ positive CWD cases) and CWD-adjacent counties (bordering positive counties).

Marginal WTA estimates comparing hunting landowners (*n* = 348) and non-hunting landowners (*n* = 856) are presented in Table 2.8 and visually represented in Figure 2.8. For NO-MGMT, hunters displayed a significantly higher WTP to avoid deer removals ($349.72) relative to non-hunters ($207.14). Further, hunting landowners had the highest WTP for no management across all sub-sample comparisons. Similarly, hunters require higher payments for

removing adult male deer ($136.84) compared to non-hunters ($72.12). However, for removing adult female deer, hunters required significantly lower payments ($15.80) compared to non-hunters ($48.03). For RYMO and FED attributes, there was no significant difference between the two groups.

Table 2.8. Marginal WTA estimates comparing hunters and non-hunters. T-test p-values show significant differences between hunting status for each attribute.

	Hunter (*n* = 348)		**Non-hunter (*n* = 856)**		
Coefficients	**Estimates ($)**	**Std. error**	**Estimates ($)**	**Std. error**	**T-test p-value**
RAMO	136.84	15.93	72.12	5.03	0.0001***
RYMO	88.01	14.03	90.78	5.43	0.8225
RAFO	15.80	11.49	48.03	4.48	0.0015***
FED	44.84	8.34	34.53	2.94	0.1431
NO-MGMT	-349.72	23.21	-207.14	7.07	0.0001***

Note: Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

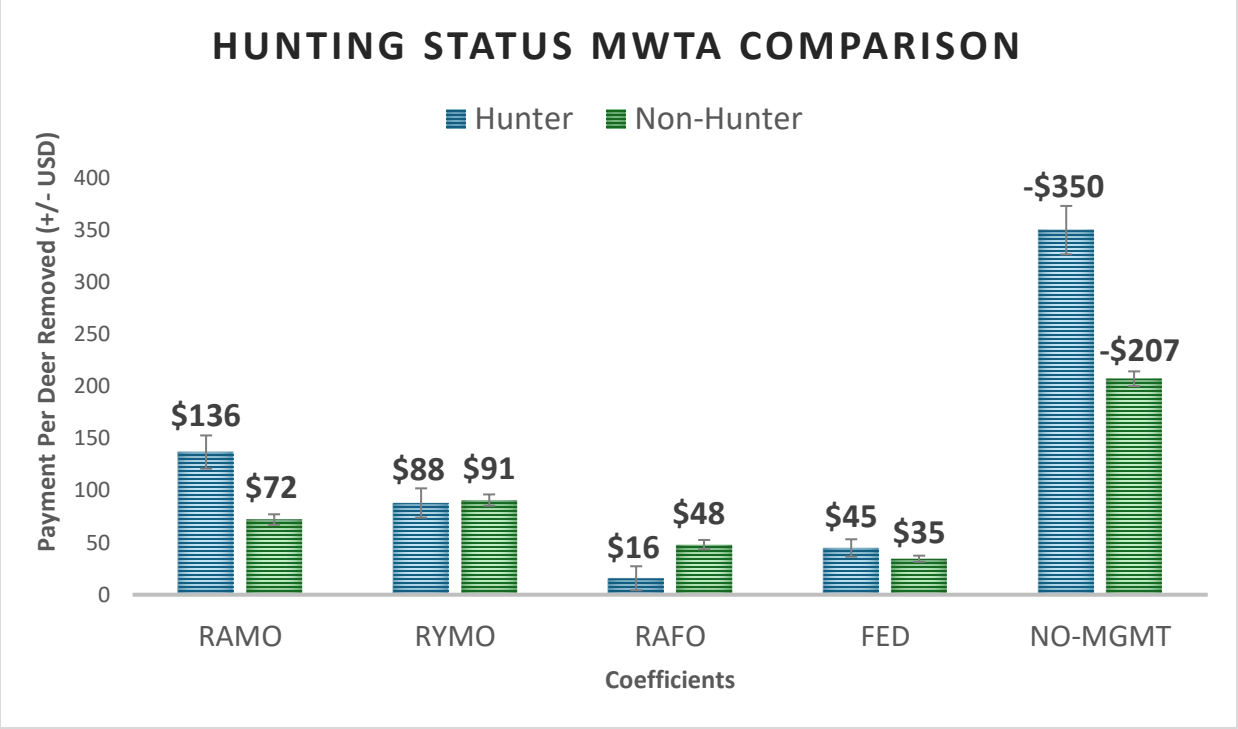

Figure 2.8. Comparison of marginal willingness to accept values for targeted removal attributes for hunting landowners and non-hunting landowners.

Linear Regression

The marginal effects of explanatory variables on landowners' willingness to accept payments for targeted removal attributes are presented in Table 2.9. Positive values for attribute levels (RAMO, RYMO, RAFO, and FED) reflect a higher WTA, whereas negative values reflect a lower WTA and greater acceptance of that management attribute, relative to the base attribute level. For the NO-MGMT opt-out option, negative values indicate a more substantial reluctance to allow targeted removals and a higher WTP to avoid it. Results for socio-demographics indicated that older landowners (50+ years) demonstrated significantly higher WTA values for RAMO, RYMO, and RAFO, paired with a high negative WTA for NO-MGMT, compared to younger landowners (<50 years). Education, gender, and income showed no statistically significant effects across all targeted removal attributes. Hunters had a significantly higher WTA for RAMO, indicating that they would require $7.69 more per adult male deer removed than non-hunters, which aligns with the sub-sample analysis.

Results for survey variables revealed that owning multiple properties had a positive and statistically significant association with adult male deer removal, where landowners who owned more than one property required approximately $6 more per deer. As expected, landowners who indicated they would not allow targeted removals on their property were willing to pay $515.9 more per deer to avoid removals on their land. However, the negative and significant coefficients for deer removal restrictions (RAMO, RYMO, and RAFO) suggested that they were more inclined to accept these strategies relative to any sex deer removal. Property size (in acres) and previously allowing hunting on the property did not have a significant effect on any attributes.

Landowners who indicated they were aware of CWD before the survey had a strong positive association with WTA for RAMO and therefore require a higher compensation. Each one-unit increase in trust in the federal wildlife agency was associated with lower compensation requirements for allowing deer removals to be conducted by federal agents on the landowner's property. Conversely, as trust in state wildlife agencies increased, landowners required an additional $9.76 for each deer removed when conducted by a federal agent. Notably, the positive and significant value for NO-MGMT suggests that landowners who trusted their state

wildlife agency were less opposed to deer removals on their land overall. Geographically, state-level CWD prevalence showed a negative and statistically significant association with male deer removal. In medium-prevalent states, landowners required less compensation for both young and adult male deer removal (RAMO and RYMO) than in high-prevalent states. In addition, landowners in low-prevalence states required less compensation specifically for adult male removal (RAMO) compared to high-prevalence states. These results support the previous sub-sample analyses. Lastly, there was no statistically significant association between region, county-level CWD prevalence, or proximity to a major city.

Table 2.9. Determinants of WTA for targeted removal attributes.

	WTA				
	RAMO	**RYMO**	**RAFO**	**FED**	**NO-MGMT**
Socio-demographics					
Age (50+)	**10.422*** **	**5.872** **	**13.859*** **	-1.045	**-106.130*** **
	(2.372)	**(2.622)**	**(3.122)**	(1.882)	**(25.130)**
College educated	0.186	1.448	3.977	2.400	26.484
	(2.948)	(2.325)	(3.732)	(1.751)	(24.964)
Female	-3.935	-0.673	-0.753	0.643	-11.498
	(2.619)	(2.896)	(3.349)	(1.822)	(25.197)
Income					
$50,000 - $99,999	-6.350	1.322	-2.878	2.170	41.204
	(5.485)	(3.965)	(4.329)	(2.062)	(33.687)
$100,000 - $149,999	1.190	4.632	0.485	2.426	28.754
	(5.704)	(4.598)	(4.862)	(2.341)	(35.410)
$150,000+	-3.396	2.786	-0.220	3.356	40.455
	(5.506)	(4.286)	(4.634)	(2.434)	(36.178)
Missing	.662	2.462	4.179	-1.890	-65.502
	(6.786)	(4.639)	(5.625)	(2.488)	(42.563)
Hunter	**7.689** **	-0.994	-5.324	-1.240	3.939
	(3.262)	(3.277)	(4.487)	(2.250)	(28.876)
Survey variables					
Property size	-0.208	-1.028	-2.482*	-0.083	-4.685
	(1.080)	(0.905)	(1.459)	(0.833)	(9.967)
Multiple properties	**5.989** **	4.588*	2.323	2.491	-0.429
	(2.607)	(2.525)	(3.139)	(1.650)	(23.175)

Table 2.9 (cont'd)

Allowed hunters on property	-2.003 (3.337)	2.255 (3.224)	-3.711 (3.811)	2.160 (2.244)	2.146 (28.218)
Would not allow targeted removals	**-8.322*** (2.841)**	**-11.429*** (2.851)**	**-10.643*** (3.580)**	-0.973 (1.836)	**-515.898*** (24.594)**
Aware of CWD	**9.535*** (3.578)**	2.140 (4.429)	2.722 (3.957)	1.029 (2.258)	-62.650* (32.678)
Trust in federal agency	-0.863 (1.761)	0.441 (1.448)	1.224 (1.623)	**-11.273*** (1.362)**	-18.924 (15.187)
Trust in state agency	0.970 (1.757)	-0.940 (1.437)	-2.062 (1.777)	**9.775*** (1.389)**	**54.849*** (15.203)**
Geographic variables					
Region	-1.200 (2.652)	0.526 (2.405)	-4.335 (3.389)	-0.615 (1.580)	34.326 (22.417)
State CWD prevalence					
Medium	**-6.006** (3.006)**	**-7.346*** (2.695)**	1.744 (3.723)	-1.416 (1.813)	-20.917 (26.682)
Low	**-8.363*** (3.229)**	-4.264 (3.053)	-2.293 (3.806)	-0.124 (2.081)	18.956 (27.103)
CWD-positive counties	1.437 (2.477)	2.489 (2.310)	-3.350 (3.116)	-1.854 (1.602)	27.523 (22.533)
Near big city	-2.567 (3.678)	-2.771 (4.017)	-3.380 (4.484)	-2.220 (2.311)	31.039 (36.011)
Constant	67.499*** (9.860)	77.107*** (7.669)	37.861*** (9.482)	31.624*** (5.088)	-519.502*** (76.084)
Observations (*n*)	1,204	1,204	1,204	1,204	1,204
R-squared	0.0590	0.0416	0.0461	0.1162	0.3789

Note: Numbers in parentheses are standard errors. Single asterisk (*), double asterisk (**), and triple asterisk (***) denote the significance level at 10%, 5%, and 1%, respectively.

DISCUSSION

In this study, I explored landowners' preferences and willingness to accept payments for targeted deer removals to manage chronic wasting disease. Overall, my findings suggest financial incentives may be effective in persuading landowners who are undecided or have specific preferences regarding the sex and age of deer removed or the implementing agency, but were unlikely to influence landowners who oppose targeted removals. Specifically, landowners required the lowest payment incentives for adult female deer removals when conducted by a state wildlife agent, indicating this strategy was most preferred. To my knowledge, this is the first study to provide detailed insights into landowners' willingness to accept various attributes of targeted removals and present monetary valuations associated with these preferences.

Landowners expressed preferences for the sex and age class of deer removed, with the greatest acceptance for removing adult females, followed by adult males, and the strongest opposition towards removing young males. Specifically, agencies would have to pay landowners a significantly higher amount to remove male deer ($89 per deer for young males, $85 per deer for adult males) compared to female deer ($39). Landowners' preference to retain male deer on their land may be driven by the aesthetic appeal of antlers and male-specific behaviors, such as increased movement, territorial marking, and sparring which make male deer more noticeable than females (Alexy et al. 2001; Gross and Miller, 2001; Hewitt, 2011; Nelson, 1993; Skuldt et al. 2008). This finding is also consistent with hunter preferences for male deer harvest (Bhandari et al. 2006; Holsman et al. 2010). Landowners also required higher payments for federal wildlife agents to conduct removals on their property over state agents by an additional $36 per deer. Sullivan et al. (2022) and Manfredo et al. (2018) found that throughout the U.S., there were higher levels of trust in state agencies compared to federal agencies, which aligns with my findings of landowners' reluctance to allow federal agents to access their property. Therefore, to improve access to private lands, state wildlife agents may approach landowners when requesting to conduct targeted removals. Overall, results show that landowners preferred the option of no management over the targeted removal alternatives, supporting my first prediction and consistent with findings from past research (Cooney and Holsman, 2010; Durocher et al.

2022; Harper et al. 2015; Heberlein, 2004; Meeks et al. 2022). This indicated that many respondents opposed targeted deer removals on their property and would not accept a feasible financial incentive to change their minds.

When comparing landowners' acceptance of removals by region, results show landowners in the western U.S. were more likely to allow targeted removals on their property, provided that adult males were not targeted, and federal wildlife agents were not involved. The western U.S. has seen a decline in mule deer populations as a result of CWD (DeVivo et al. 2017), which may lead landowners to be protective of the deer inhabiting their property. This region has also experienced a decline in recreational hunting, accompanied by a rise in the mutualist orientation (Manfredo et al. 2009). As this region has traditionally leaned towards domination-oriented values, the rise in mutualist values has led to distrust in wildlife agencies (Manfredo et al. 2017). Manfredo et al. (2018) found that trust in federal and state governments has declined significantly in the western U.S., while trust in state fish and wildlife agencies has remained constant, and my results follow these findings.

Landowners who live in states with low CWD prevalence were most likely to allow targeted removals on their property. This may be due to a lack of exposure to the perceived negative impacts of lethal control or fatigue from prolonged engagement with CWD management efforts. Their willingness may also reflect an understanding that targeted removals are most effective when conducted during the early stages of a detected outbreak (Gross and Miller, 2001). Landowners in states with high CWD prevalence required significantly higher financial incentives to remove all sex and age classes of deer, and when conducted by a federal wildlife agent. However, landowners in states with medium prevalence were least likely to allow targeted removals overall. CWD has existed in these states for decades, resulting in declining deer populations (DeVivo et al. 2017; Edmunds et al. 2016; Miller et al. 2008). As a result, landowners in states with higher prevalence levels may be protective of the deer on their property and skeptical about the effectiveness of deer removal as a strategy for managing CWD (Kreeger, 2009).

Landowners in CWD-positive counties required higher payments for removing male deer, but were more likely to allow targeted removals on their property overall. This supports findings

from Needham et al (2004), who found that the acceptability of targeted removals increased dramatically as prevalence increased. Vaske et al. (2018) also found that hunters in CWD-positive counties perceived less risk from the disease than those in non-CWD counties, likely due to greater familiarity and knowledge of CWD, and success of targeted removals in reducing CWD prevalence. Therefore, landowners in counties with a known presence of CWD may be more likely to allow deer removals as long as adult male deer are not targeted.

Results show that hunters were significantly less likely to allow targeted removals on their property compared to non-hunters. Specifically, hunting landowners would require $143 more per deer to consider removals than non-hunting landowners. This supports previous research that hunters are less accepting of targeted removals to manage CWD compared to non-hunters (Lischka et al. 2010), coupled with hunters' preference for deer populations to increase, maximizing their recreational opportunities (D'Angelo and Grund, 2015; Diefenbach et al. 1997; Lischka et al. 2008). Results also supported my prediction that hunters would require a higher payment for adult male deer removal and a lower payment for adult female deer removal compared to non-hunters. As most deer hunters identify themselves as buck hunters or trophy buck hunters (Holsman et al. 2010) and may be unsatisfied with the number of quality bucks available to hunt (D'Angelo and Grund, 2015), landowners who hunt on their property may want to retain adult male deer for personal hunting opportunities. However, this presents a challenge for wildlife managers, as adult male deer are found to have twice as high prevalence of CWD compared to females (Beier and McCollough, 1990; Grear et al. 2006; Jennelle et al. 2014; Miller and Conner, 2005; Osnas et al. 2009; Wolfe et al. 2004), making their removal essential for controlling the spread of CWD. On the other hand, targeting adult female deer can be a primary strategy for reducing population density by limiting reproductive potential (Brown et al. 2000; McNulty et al. 1997; Porter et al. 1991; Van Buskirk et al. 2021). Since few hunters harvest female deer, they may be more receptive to removing them from their land. Therefore, wildlife managers could approach hunters to remove female deer on their private property, while prioritizing non-hunting landowners to remove male deer.

Results from the linear regression revealed heterogeneity in preferences for targeted removal attributes based on several factors, supporting my fifth prediction. Results show that

landowners over 50 were more reluctant to allow targeted removal management on their property and demanded higher compensation for all specific sex and age deer removal strategies. Older individuals are more likely to hold utilitarian wildlife value orientations (Kellert, 1993; Manfredo et al. 2003; Vaske et al. 2011) and may become more utilitarian as they age (Inglehart, 1990). Therefore, older landowners who hold this view may perceive targeted removals as a conflict with the practical use and control over the deer inhabiting their property. Younger landowners, who are more likely to hold protectionist perspectives (Clark et al. 2017) may view targeted removals as an essential strategy for controlling disease spread and be more open to their implementation. Hunters required an additional compensation of $8 per adult male deer removed compared to non-hunters, aligning with the sub-sample analysis and hunter preferences for adult male harvest (Holsman et al. 2010). This difference, though modest, could influence the cost-efficiency or design of incentive-based management programs. Other demographic variables, including gender, income, and education, did not significantly influence WTA of targeted removal attributes. This finding supports previous research indicating that the acceptability of CWD management did not vary by demographic variables (Landon et al. 2022; Meeks et al. 2022).

Results from the broader survey variables revealed that landowners who owned multiple properties required a significantly higher compensation to remove adult male deer, which may be consistent with a higher proportion of hunters in the sample owning multiple properties (59%). As expected, landowners who indicated they would not allow targeted removals on their property required impractically high financial incentives to consider removals. Specifically, these landowners were willing to pay $508 per deer to avoid removals on their property. Therefore, offering financial incentives to landowners who oppose targeted removals on their property may not be a practical way to change their minds. Trust in wildlife agencies strongly predicted acceptance of targeted removal attributes. Notably, landowners who trusted their state wildlife agency were less opposed to targeted removals, demonstrating higher support for management when trust in the state agency is high (Harper et al. 2015; Needham and Vaske, 2008). Lastly, compared to landowners in high-prevalence states, those in medium-prevalence states required lower incentives for removing adult and young male deer, while

landowners in low-prevalence states required lower incentives for removing adult male deer. This may be driven by the decline in deer populations observed in states where CWD has been established for decades (DeVivo et al. 2017; Edmunds et al. 2016; Miller et al. 2008), a trend that has not yet been experienced in states with lower prevalence.

This study does involve limitations worth discussing. First, the survey had a low response rate of 11%, which may lead to uncertainty about the validity of the sample (Stedman et al. 2019). Second, hunters were defined as landowners who hunt on their property, which limits the generalizability of these findings to the broader population of deer hunters. Third, while orthogonal optimal in the difference (OOD) designs offer practical advantages for experimental efficiency, they can be affected by missing data due to non-response or duplicated alternatives. These issues, though infrequent, can reduce statistical efficiency or slightly alter the balance of the design (Street, Burgess, and Louviere, 2005; Holmes et al. 2017).

Managing CWD will remain a significant challenge for wildlife agencies across North America due to restricted access to private properties and limited public support for lethal control measures. Results from this research will help USDA Wildlife Services and state wildlife agencies tasked with managing CWD as new detections of the disease are observed across the country. Specifically, a better understanding of landowners' preferences for lethal management to combat CWD on their private property will help wildlife managers adapt strategies to improve access. Results from this study will help improve our understanding of who is more likely to allow targeted removal management, enabling managers to better prioritize resources and therefore reduce local CWD prevalence more effectively. For example, my results suggest that state wildlife agents could approach landowners and offer a financial payment to remove adult female deer to improve access. Lastly, wildlife agencies can utilize the willingness to accept values as a baseline offer for landowners who may require an incentive to remove deer from their property.

LITERATURE CITED

Adamowicz, W., P. Boxall, M. Williams, and J. Louviere. 1998. Stated Preference Approaches for Measuring Passive Use Values: Choice Experiments and Contingent Valuation. American Journal of Agricultural Economics 80:64–75.

Alexy, K. J., J. W. Gassett, D. A. Osborn, and K. V. Miller. 2001. Remote Monitoring of Scraping Behaviors of a Wild Population of White-Tailed Deer. Wildlife Society Bulletin (1973-2006) 29:873–878.

Arrow, K., R. Solow, P. R. Portney, E. E. Leamer, R. Radner, and H. Schuman. n.d. Report of the NOAA Panel on Contingent Valuation.

Beier, P., and D. R. McCullough. 1990. Factors Influencing White-Tailed Deer Activity Patterns and Habitat Use. Wildlife Monographs 3–51.

Belsare, A. V., and C. M. Stewart. 2020. OvCWD: An agent-based modeling framework for informing chronic wasting disease management in white-tailed deer populations. Ecological Solutions and Evidence 1:e12017.

Bhandari, P., R. C. Stedman, A. E. Luloff, J. C. Finley, and D. R. Diefenbach. 2006. Effort versus Motivation: Factors Affecting Antlered and Antlerless Deer Harvest Success in Pennsylvania. Human Dimensions of Wildlife 11:423–436.

Bhat, C. R. 2003. Simulation estimation of mixed discrete choice models using randomized and scrambled Halton sequences. Transportation Research Part B: Methodological 37:837–855.

Boxall, P. C., W. L. Adamowicz, J. Swait, M. Williams, and J. Louviere. 1996. A comparison of stated preference methods for environmental valuation. Ecological Economics 18:243–253.

Brown, T. L., D. J. Decker, J. T. Major, P. D. Curtis, J. E. Shanahan, and W. F. Siemer. 2006. Hunters' and Other Citizens' Reactions to Discovery of CWD in Central New York. Human Dimensions of Wildlife 11:203–214.

Brown, T., S. Riley, J. Enck, T. Lauber, P. Curtis, and G. Mattfeld. 2000. The Future of Hunting as a Mechanism to Control White-Tailed Deer Populations. Wildlife Society Bulletin 28:797–807.

Clark, K. E., K. Cupp, C. L. Phelps, M. N. Peterson, K. T. Stevenson, and C. Serenari. 2017. Household Dynamics of Wildlife Value Orientations. Human Dimensions of Wildlife 22:483–491.

Cooney, E. E., and R. H. Holsman. 2010. Influences on Hunter Support for Deer Herd Reduction as a Chronic Wasting Disease (CWD) Management Strategy. Human Dimensions of Wildlife 15:194–207.

Cornicelli, L., D. C. Fulton, M. D. Grund, and J. Fieberg. 2011. Hunter perceptions and acceptance of alternative deer management regulations. Wildlife Society Bulletin 35:323–329.

Cvetkovich, G., and P. L. Winter. 2003. Trust And Social Representations Of The Management Of Threatened And Endangered Species. Environment and Behavior 35:286–307.

Czajkowski, M., T. Kądziela, and N. Hanley. 2014. We want to sort! Assessing households' preferences for sorting waste. Resource and Energy Economics 36:290–306.

D'Angelo, G. J., and M. D. Grund. 2015. Evaluating competing preferences of hunters and landowners for management of deer populations. Human-Wildlife Interactions 9:236–247.

Decker, D. J., A. B. Forstchen, J. F. Organ, C. A. Smith, S. J. Riley, C. A. Jacobson, G. R. Batcheller, and W. F. Siemer. 2014. Impacts management: An approach to fulfilling public trust responsibilities of wildlife agencies. Wildlife Society Bulletin 38:2–8.

DeVivo, M. T., D. R. Edmunds, M. J. Kauffman, B. A. Schumaker, J. Binfet, T. J. Kreeger, B. J. Richards, H. M. Schätzl, and T. E. Cornish. 2017. Endemic chronic wasting disease causes mule deer population decline in Wyoming. PLoS ONE 12:1–17.

Diefenbach, D. R., W. L. Palmer, and W. K. Shope. 1997. Attitudes of Pennsylvania sportsmen towards managing white-tailed deer to protect the ecological integrity of forests. Wildlife Society Bulletin 25:244–251.

Durocher, G., M. K. (Marty) Luckert, E. W. Goddard, and W. L. (Vic) Adamowicz. 2022. Public preferences for options to manage chronic wasting disease in Canada: A paired comparisons study. Environmental Science and Policy 132:206–213.

Edmunds, D. R., M. J. Kauffman, B. A. Schumaker, F. G. Lindzey, W. E. Cook, T. J. Kreeger, R. G. Grogan, and T. E. Cornish. 2016. Chronic Wasting Disease Drives Population Decline of White-Tailed Deer. PLOS ONE 11:e0161127.

Freeman AM, Herriges J, Kling CL. 2014. *The Measurement of Environmental and Resource Values: Theory and Methods* Baltimore, MD: Resour. Future

Fulton, D. C., Manfredo, M. J., and Lipscomb, J. (1996). Wildlife value orientations: A conceptual and measurement approach. Human Dimensions of Wildlife, 1(2), 24–47.

Gigliotti, L. M., L. A. Sweikert, L. Cornicelli, and D. C. Fulton. 2020. Minnesota landowners' trust in their department of natural resources, salient values similarity and wildlife value orientations. Environment Systems and Decisions 40:577–587.

Grear, D. A., M. D. Samuel, J. A. Langenberg, and D. Keane. 2006. Demographic patterns and harvest vulnerability of chronic wasting disease infected white-tailed deer in Wisconsin. Journal of Wildlife Management 70:546–553.

Greene, W. H. 2018. *NLOGIT 6:* Reference Guide. Econometric Software, Inc.

Gross, J. E., and M. W. Miller. 2001. Chronic Wasting Disease in Mule Deer: Disease Dynamics and Control. The Journal of Wildlife Management 65:205–215.

Hanley, N., R. E. Wright, and V. Adamowicz. 1998. Using Choice Experiments to Value the Environment. Environmental and Resource Economics 11:413–428.

Hanley, N., G. Koop, and R. Wright. 2002. Modelling Recreation Demand Using Choice Experiments: Climbing in Scotland. Environmental and Resource Economics 22:449–466.

Harper, E. E., C. A. Miller, and J. J. Vaske. 2015. Hunter Perceptions of Risk, Social Trust, and Management of Chronic Wasting Disease in Illinois. Human Dimensions of Wildlife 20:394–407.

Haus, J. M., T. B. Eyler, M. D. Duda, and J. L. Bowman. 2017. Hunter perceptions toward chronic wasting disease: Implications for harvest and management. Wildlife Society Bulletin 41:294–300.

Heberlein, T. A. 2004. "Fire in the Sistine Chapel": How Wisconsin Responded to Chronic Wasting Disease. Human Dimensions of Wildlife 9:165–179.

Heffelfinger, J. 2006. Deer of the Southwest: A Complete Guide to the Natural History, Biology, and Management of Southwestern Mule Deer and White-tailed Deer. Texas AandM University Press.

Hensher, D. A., and W. H. Greene. 2003. The Mixed Logit model: The state of practice. Transportation 30:133–176.

Hensher, D. A., Rose, J. M. and Greene, W. H. 2015. Applied Choice Analysis, 2nd ed. Cambridge: Cambridge University Press.

Hewitt, D.G. (Ed.). 2011. Biology and Management of White-tailed Deer (1st ed.). CRC Press.

Hole, A. R., and J. R. Kolstad. 2011. Mixed logit estimation of willingness to pay distributions: a comparison of models in preference and WTP space using data from a health-related choice experiment. Empirical Economics 42:445–469.

Holmes, T. P., W. L. Adamowicz, and F. Carlsson. 2017. Choice Experiments. Pages 133–186 *in* P. A. Champ, K. J. Boyle, and T. C. Brown, editors. A Primer on Nonmarket Valuation. Springer Netherlands, Dordrecht.

Holsman, R. H., and J. Petchenik. 2006. Predicting Deer Hunter Harvest Behavior in Wisconsin's Chronic Wasting Disease Eradication Zone. Human Dimensions of Wildlife 11:177–189.

Holsman, R. H., J. Petchenik, and E. E. Cooney. 2010. CWD After "the Fire": Six Reasons Why Hunters Resisted Wisconsin's Eradication Effort. Human Dimensions of Wildlife 15:180–193.

Inglehart, R. 1990. Culture shift in advanced industrial society. Princeton, NJ: Princeton University Press.

Inglehart, R. F., and P. Norris. 2016. Trump, Brexit, and the Rise of Populism: Economic Have-Nots and Cultural Backlash. SSRN Scholarly Paper, Rochester, NY.

Jenkins, M. 2012. Sharpshooting program causes friction in northern Illinois. Illinois Outdoor News, p. 1.

Jennelle, C. S., V. Henaux, G. Wasserberg, B. Thiagarajan, R. E. Rolley, and M. D. Samuel. 2014. Transmission of Chronic Wasting Disease in Wisconsin White-Tailed Deer: Implications for Disease Spread and Management. PLOS ONE 9:e91043.

Kellert, S. R. 1993. Attitudes, knowledge, and behavior toward wildlife among the industrial superpowers: United States, Japan, and Germany. Journal of Social Issues, 49,53–69.

Kreeger, T. J. (2009). Chronic wasting disease: Where we were and where we are now. Wyoming Outdoors. Wyoming Outfitters and Guides Association, 52–53.

Krinsky, I., and A. L. Robb. 1986. On Approximating the Statistical Properties of Elasticities. The Review of Economics and Statistics 68:715–719.

Lancaster, K. J. 1966. A New Approach to Consumer Theory. The Journal of Political Economy 74:132–157.

Landon, A. C., K. Smith, L. Cornicelli, D. C. Fulton, L. E. McInenly, and S. A. Schroeder. 2023. Examining landowners' preferences for a chronic wasting disease management program. Wildlife Society Bulletin 47:e1401.

Lischka, S. A., S. J. Riley, and B. A. Rudolph. 2008. Effects of impact perception on acceptance capacity for white-tailed deer. Journal of Wildlife Management 72:502–509.

Lischka, S. A., P. Shelton, and J. Buhnerkempe. 2010. Support for Chronic Wasting Disease Management Among Residents of the Infected Area in Illinois. Human Dimensions of Wildlife 15:229–232.

Lyon, K. M., and J. J. Vaske. 2010. Predicting Hunting Participation in Response to Chronic Wasting Disease in Four States. Human Dimensions of Wildlife 15:208–220.

Manfredo, M. J., Teel, T., and Bright, A. 2003. Why are public values toward wildlife changing? Human Dimensions of Wildlife, 8, 287–306.

Manfredo, M. J., T. L. Teel, and K. L. Henry. 2009. Linking Society and Environment: A Multilevel Model of Shifting Wildlife Value Orientations in the Western United States. Social Science Quarterly 90:407–427.

Manfredo, M. J., T. L. Teel, L. Sullivan, and A. M. Dietsch. 2017. Values, trust, and cultural backlash in conservation governance: The case of wildlife management in the United States. Biological Conservation 214:303–311.

Manfredo, M. J., Sullivan, L., Don Carlos, A. W., Dietsch, A. M., Teel, T. L., Bright, A. D., and Bruskotter, J. 2018. America's Wildlife Values: The Social Context of Wildlife Management in the U.S. National report from the research project entitled "America's Wildlife Values". Fort Collins, CO: Colorado State University, Department of Human Dimensions of Natural Resources.

Manjerovic, M. B., M. L. Green, N. Mateus-Pinilla, and J. Novakofski. 2014. The importance of localized culling in stabilizing chronic wasting disease prevalence in white-tailed deer populations. Preventive Veterinary Medicine 113:139–145.

Mateus-Pinilla, N., H.-Y. Weng, M. O. Ruiz, P. Shelton, and J. Novakofski. 2013. Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003–2008. Preventive Veterinary Medicine 110:541–548.

Meeks, A., N. C. Poudyal, L. I. Muller, and C. Yoest. 2022. Hunter acceptability of chronic wasting disease (CWD) management actions in Western Tennessee. Human Dimensions of Wildlife 27:457–471.

McFadden, D. 1974. Conditional logit analysis of qualitative choice behavior.

McFadden, D., and K. Train. 2000. Mixed MNL models for discrete response. Journal of Applied Econometrics 15:447–470.

McNulty, S. A., W. F. Porter, N. E. Mathews, and J. A. Hill. 1997. Localized Management for Reducing White-Tailed Deer Populations. Wildlife Society Bulletin (1973-2006) 25:265–271.

Miller, C. A., McCleary, M. E., Harper, E. E., and Campbell, L. K. 2013. Stakeholder attitudes toward deer management and chronic wasting disease in Illinois. (Job Completion Report, Federal Aid in Wildlife Restoration W-112-R-21 and 22. Human Dimensions Research Program Report HR-11-05/INHS Technical Report 32). Champaign, IL: Natural History Survey

Miller, M. W., and M. M. Conner. 2005. EPIDEMIOLOGY OF CHRONIC WASTING DISEASE IN FREE-RANGING MULE DEER: SPATIAL, TEMPORAL, AND DEMOGRAPHIC INFLUENCES ON OBSERVED PREVALENCE PATTERNS. Journal of Wildlife Diseases 41:275–290.

Moss, W. E., J. Binfet, L. E. Hall, S. E. Allen, W. H. Edwards, J. E. Jennings-Gaines, and P. C. Cross. 2025. The effectiveness of harvest for limiting wildlife disease: Insights from 20 years of chronic wasting disease in Wyoming. Ecological Applications 35:e3089.

National Deer Association. 2021. 9 Facts about targeted removal for fighting CWD.

National Deer Association. 2024. Missouri shows us how to manage CWD in deer for the long haul.

Nelson, M. E. 1993. Natal Dispersal and Gene Flow in White-Tailed Deer in Northeastern Minnesota. Journal of Mammalogy 74:316–322.

Needham, M. D., J. J. Vaske, and M. J. Manfredo. 2004. Hunters' Behavior and Acceptance of Management Actions Related to Chronic Wasting Disease in Eight States. Human Dimensions of Wildlife 9:211–231.

Needham, M. D., J. J. Vaske, and M. J. Manfredo. 2006. State and Residency Differences in Hunters' Responses to Chronic Wasting Disease. Human Dimensions of Wildlife 11:59-176.

Needham, M. D., and J. J. Vaske. 2008. Hunter Perceptions of Similarity and Trust in Wildlife Agencies and Personal Risk Associated with Chronic Wasting Disease. Society and Natural Resources 21:197–214.

O'Brien, R. S. M., A. A. Dayer, and W. A. Hopkins. 2021. Understanding landowner decisions regarding access to private land for conservation research. Conservation Science and Practice 3:e522.

Osnas, E. E., D. M. Heisey, R. E. Rolley, and M. D. Samuel. 2009. Spatial and Temporal Patterns of Chronic Wasting Disease: Fine-Scale Mapping of a Wildlife Epidemic in Wisconsin. Ecological Applications 19:1311–1322.

Penn, J. M., and W. Hu. 2021. The Extent of Hypothetical Bias in Willingness to Accept. American Journal of Agricultural Economics 103:126–141.

Petchenik, J. 2003. Chronic wasting disease in Wisconsin and the 2002 hunting season: Gun hunters' first response. Madison, WI: Bureau of Integrated Science Services, Wisconsin Department of Natural Resources.

Petchenik, J. 2006. Landowner Responses to Harvest Incentives in Wisconsin's Southwest Chronic Wasting Disease Eradication Zone. Human Dimensions of Wildlife 11:225–226.

Porter, W. F., N. E. Mathews, H. B. Underwood, R. W. Sage, and D. F. Behrend. 1991. Social organization in deer: Implications for localized management. Environmental Management 15:809–814.

Price, E. T. 1995. Dividing the Land: Early American Beginnings of Our Private Property Mosaic. University of Chicago Press.

Riley, S. J., J. K. Ford, H. A. Triezenberg, and P. E. Lederle. 2018. Stakeholder trust in a state wildlife agency. The Journal of Wildlife Management 82:1528–1535.

Rubino, E. C., and C. Serenari. 2022. Using Latent Profile Analysis to Evaluate Preferences for Chronic Wasting Disease Management Options among Different Hunter Types. Animals 12:2751.

Schroeder, S. A., A. C. Landon, L. Cornicelli, D. C. Fulton, and L. McInenly. 2021. Institutional trust, beliefs, and evaluation of regulations, and management of chronic wasting disease (CWD). Human Dimensions of Wildlife 26:228–244.

Serenari, C., J. Shaw, R. Myers, and D. T. Cobb. 2019. Explaining deer hunter preferences for regulatory changes using choice experiments. The Journal of Wildlife Management 83:446–456.

Siegrist, M., G. Cvetkovich, and C. Roth. 2000. Salient value similarity, social trust, and risk/benefit perception. Risk Analysis: An Official Publication of the Society for Risk Analysis 20:353–362.

Skuldt, L. H., N. E. Mathews, and A. M. Oyer. 2008. White-Tailed Deer Movements in a Chronic Wasting Disease Area in South-Central Wisconsin. The Journal of Wildlife Management 72:1156–1160.

Smith, C. B., C. J. Booth, and J. A. Pedersen. 2011. Fate of Prions in Soil: A Review. Journal of environmental quality 40:449–461.

Smolko, P., D. Seidel, M. Pybus, A. Hubbs, M. Ball, and E. Merrill. 2021. Spatio-temporal changes in chronic wasting disease risk in wild deer during 14 years of surveillance in Alberta, Canada. Preventive Veterinary Medicine 197:105512.

Sonnier, G., A. Ainslie, and T. Otter. 2007. Heterogeneity distributions of willingness-to-pay in choice models. Quantitative Marketing and Economics 5:313–331.

Stafford, N. T., M. D. Needham, J. J. Vaske, and J. Petchenik. 2007. Hunter and Nonhunter Beliefs about Chronic Wasting Disease in Wisconsin. The Journal of Wildlife Management 71:1739–1744.

StataCorp. 2023. *Stata Statistical Software: Release 18*. College Station, TX: StataCorp LLC.

Stedman, R., N. A. Connelly, T. A. Heberlein, D. J. Decker, and S. B. Allred. 2019. The end of the (research) world as we know it? Understanding and coping with declining response rates to mail surveys. Society and Natural Resources 32: 1139–1154.

Street, D. J., L. Burgess, and J. J. Louviere. 2005. Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. International Journal of Research in Marketing 22:459–470.

Street, D. J., and L. Burgess. 2007. The Construction of Optimal Stated Choice Experiments: Theory and Methods. John Wiley and Sons.

Sullivan, L. M., M. J. Manfredo, and T. L. Teel. 2022. Technocracy in a time of changing values: Wildlife conservation and the “relevancy” of governance reform. Conservation Science and Practice 4:e545.

Swait, J., and W. L. Adamowicz, editors. 1996. The Effect of Choice Environment and Task Demands on Consumer Behavior: Discriminating Between Contribution and Confusion. Staff Paper 96-09.

Tang, L., X. Luo, Y. Cheng, F. Yang, and B. Ran. 2014. Comparing the State-of-the-Art Efficient Stated Choice Designs Based on Empirical Analysis. Mathematical Problems in Engineering 2014:e740612.

Train, K. 2002. Discrete Choice Methods with Simulation.

Train, K., and M. Weeks. 2005. Discrete Choice Models in Preference Space and Willingness-to-Pay Space. Pages 1–16 *in* R. Scarpa and A. Alberini, editors. Applications of Simulation Methods in Environmental and Resource Economics. Springer Netherlands, Dordrecht.

Ufer, D. J., S. A. Christensen, E. Pomeranz, and D. L. Ortega. 2023. A behavioral economic assessment of the role of stakeholder preferences in managing an infectious wildlife disease. Wildlife Society Bulletin 47:e1411.

Varga, C., P. McDonald, W. M. Brown, P. Shelton, A. L. Roca, J. E. Novakofski, and N. E. Mateus-Pinilla. 2022. Evaluating the ability of a locally focused culling program in removing chronic wasting disease infected free-ranging white-tailed deer in Illinois, USA, 2003–2020. Transboundary and Emerging Diseases 69:2867–2878.

Vaske, J. J., N. R. Timmons, J. Beaman, and J. Petchenik. 2004. Chronic Wasting Disease in Wisconsin: Hunter Behavior, Perceived Risk, and Agency Trust. Human Dimensions of Wildlife 9:193–209.

Vaske, J. J. 2010. Lessons Learned from Human Dimensions of Chronic Wasting Disease Research. Human Dimensions of Wildlife 15:165–179.

Vaske, J., and K. Lyon. 2010. CWD Prevalence, Perceived Human Health Risks, and State Influences on Deer Hunting Participation. Risk analysis : an official publication of the Society for Risk Analysis 31:488–96.

Vaske, J. J., Jacobs, M. H., and Sijtsma, M. T. J. 2011. Wildlife value orientations and demographics in the Netherlands. European Journal of Wildlife Research, 57, 1179–1187. doi:10.1007/s10344011-0531-0

Vaske, J. J., C. A. Miller, A. L. Ashbrook, and M. D. Needham. 2018. Proximity to chronic wasting disease, perceived risk, and social trust in the managing agency. Human Dimensions of Wildlife 23:115–128.

Vaske, J. J., M. D. Needham, and C. A. Miller. 2021. Wildlife Agency Trust and Perceived Risks From Chronic Wasting Disease. Wildlife Society Bulletin 45:597–607.

Van Buskirk, A. N., C. S. Rosenberry, B. D. Wallingford, E. J. Domoto, M. E. McDill, P. J. Drohan, and D. R. Diefenbach. 2021. Modeling how to achieve localized areas of reduced white-tailed deer density. Ecological Modelling 442:109393.

Vossler, C. A., M. Doyon, and D. Rondeau. 2012. Truth in Consequentiality: Theory and Field Evidence on Discrete Choice Experiments. American Economic Journal: Microeconomics 4:145–171.

Ward, K. J., R. C. Stedman, A. E. Luloff, J. S. Shortle, and J. C. Finley. 2008. Categorizing Deer Hunters by Typologies Useful to Game Managers: A Latent-Class Model. Society and Natural Resources 21:215–229.

White Buffalo Inc. Conserving Native Species and Ecosystems. 2023. Deer Management.

Winter, G., C. Vogt, and S. Mccaffrey. 2004. Examining Social Trust in Fuels Management Strategies. Journal of Forestry 102:8–15.

Wisconsin Department of Natural Resources. 2008. A Plan for Managing Chronic Wasting Disease in Wisconsin: The Next 10 Years.

Wolfe, L. L., M. W. Miller, and E. S. Williams. 2004. Feasibility of “test-and-cull” for managing chronic wasting disease in urban mule deer. Wildlife Society Bulletin 32:500-5.

APPENDIX 1A.1: CWD LANDOWNER SURVEY BLOCK 1

This is a survey designed and administered by faculty within the department of fisheries and wildlife at Michigan State University to obtain information from US landowners or leasers regarding their opinions and willingness to allow access to their property for the management of chronic wasting disease (CWD) in deer.

To be eligible for this study, we need to confirm that you **own or lease property** that is at **least 3 acres in size**?

☐ Yes ⟶ Please continue with the survey
☐ No ⟶ Please stop and return your survey in the postage-paid envelope

We would like to know more about the property that you own or lease.

Q1. Do you own and/or lease **more than one** property that is at least 3 acres?

☐ Yes
☐ No

If you own or lease more than one property that is at least 3 acres in size, when answering the questions in the survey, please think about the single property you own or lease that you believe to have the most deer present.

Q2. Are you the landowner or land leaser of this property? **(Select one)**

☐ Land owner
☐ Land leaser

Q3. How many acres is this property? **(Select one)**

☐ 3-9 acres ☐ 50-99 acres ☐ 250-499 acres ☐ 1,000-4,999 acres
☐ 10-49 acres ☐ 100-249 acres ☐ 500-999 acres ☐ 5,000 or more acres

Q4. How much, if any, of this property is leased out for **farming**? **(Select one)**

☐ All of it ☐ Most of it ☐ Some of it ☐ None of it

Q5. Generally, how would you characterize the landscape of this property? Please fill in the estimated **percent** landscape composition that makes up this property. **Please make sure your answers total 100%.**

Lawn:	%	Forested:	%	Grassland/ Open herbaceous:	%
Wetland:	%	Pine forested:	%	Mountainous Terrain:	%
Agricultural:	%	Rangeland/Shrub:	%	Other:	%

Q6. Is this property used for any of the following types of production? **(Select all that apply)**

☐ Crops ☐ Cattle ☐ Poultry ☐ Hogs
☐ Cervids ☐ None ☐ Other, please specify: _____

Q7. Have you seen any of the following deer species on this property in the past five years? **(Select all that apply)**

☐ White-tail deer ☐ Mule Deer ☐ Other deer, please specify if known: _____
☐ Unsure of species ☐ No, have not seen any deer in the past five years

Q8a. Which of the following people, if any, have hunted on this property in the past five years? **(Select all that apply)**

☐ Myself
☐ My friends and/or family
☐ People who lease my land
☐ Other people, please specify:
_____
☐ No one in the past five years has hunted on this property

→ Answer Q8b.

Q8b. Did you or anyone else harvest any of the following deer species on this property in the past five years? **(Select all that apply)**

☐ White-tailed deer
☐ Mule deer
☐ Other deer species, please specify if known:
_____
☐ Unsure of species
☐ No deer have been harvested

Q9. Are you part of a DMAP (Deer Management Assistance Program), or similar deer management program? **(Select one)**

☐ Yes ☐ No ☐ Unsure

The next set of questions focus on **chronic wasting disease**. Chronic wasting disease (CWD) is a contagious, neurological disease that affects deer, elk, and moose. It causes a degeneration of the brain resulting in emaciation (abnormally thin), abnormal behavior, loss of bodily functions and death. CWD is always fatal; there is no recovery or cure.

Q10. Before this survey, were you aware of chronic wasting disease (**CWD**)? **(Select one)**

☐ Yes ☐ No ☐ Unsure

Q11. How concerned are you about. . .

	Not concerned at all	(circle one for each row)			Extremely concerned
A. The human health impacts of CWD, despite chronic wasting disease not being confirmed in humans?	1	2	3	4	5
B. CWD affecting the health of deer on this property?	1	2	3	4	5

Q12. Have any of the following people encountered or harvested a **verified** (confirmed positive by state wildlife official) CWD positive deer on this property? **(Select all that apply)**

- ☐ Myself
- ☐ Friends and/or family
- ☐ People who lease my land
- ☐ Others, please specify: _____
- ☐ No verified CWD deer has been encountered or harvested

Q13. In your opinion, how important is managing:

	Not important at all	(circle one for each row)			Extremely important
A. CWD to you?	1	2	3	4	5
B. CWD to people who are close to you (such as family, friends, hunting groups, etc.)	1	2	3	4	5

Wildlife agencies, such as a state Department of Natural Resources or a federal wildlife organization, have undertaken a variety of actions to manage CWD, which attempt to reduce deer-to-deer transmission, limit the opportunity for disease spread, and protect public health. Although your state's wildlife agency may not currently use these CWD management strategies in your area, your responses are essential to understanding their future management potential

The next section of this survey will ask questions on whether you would allow six (6) different CWD management strategies to be carried out on this property. Below are descriptions of each CWD management strategy for your reference.

- **Targeted removals:** Selective deer removals by professional government (wildlife agency) sharpshooters.
- **Recreational deer harvest (any deer):** A hunter of your choice harvesting any sex deer
- **Recreational deer harvest (does only):** A hunter of your choice harvesting only does (female deer).
- **Recreational deer harvest (2+ deer)**: A hunter of your choice harvesting more than 2 deer of any sex.
- **Live deer capture:** The live capture and release of deer for CWD research.
- **Trail-camera monitoring:** Monitoring deer using a trail-camera for CWD research.

Q14. Which of the following strategies for managing CWD, if any, were you familiar with prior to receiving this survey? **(Select all that apply)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)
- ☐ None, not familiar with any of the management strategies

Q15. Which of the following CWD management strategies, if any, have been carried out on this property? **(Select all that apply)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)
- ☐ No CWD management strategies have been carried out
- ☐ Unsure

Q16. In general, would you allow a **government wildlife agency** on this property to: **(Select one for each row)**

	Yes	No
A. Conduct targeted removals	☐	☐
B. Conduct live deer capture (for research purposes)	☐	☐
C. Place trail-cameras (for research purposes)	☐	☐

Q17. If one of your neighbors said **YES** to allowing targeted removals on <u>their</u> property, would that have any influence on your decision to allow targeted removals on <u>your</u> property? **(Select one)**

- ☐ Yes
- ☐ No
- ☐ Unsure

Q18. In general, would you allow hunters on this property to: **(Select one for each row)**

	Yes	No
A. Harvest any deer recreationally	☐	☐
B. Harvest does only (female deer) recreationally	☐	☐
C. Harvest 2+ deer recreationally	☐	☐

Q19. Which **<u>two</u>** of the following management strategies would you most likely allow on this property? **(Select no more than 2)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)

In this set of questions, you will be given 8 scenarios, each with two different options for targeted removal of deer on this property, and a third option to opt out. We would like you to choose which option you would be most likely to allow on this property. It is important that your selection reflects choices you would make in the real world. The characteristics of each option are:

1. Removal restriction: this refers to the specific sex/age of the deer that will be removed off your land. The options are any sex deer can be removed, the removal of adult female deer only, the removal of young males only, or the removal of adult males only.

2. Implementing agency: this refers to the government wildlife agency that will carry out the deer removal on this property. The options are state or federal wildlife agency (non-regulatory).

3. Payment per deer removed: this refers to the payment you would receive per deer that is removed from this property. For example, if the payment per deer is $100 and your government wildlife agency removes 3 deer from this property, you would receive $300.

You will then be asked how many deer you would allow the government wildlife agency to remove off this property based on the option you selected in the previous scenario.

Q20. Which of the following options for targeted deer removal do you prefer?

Option A	**Option B**	**Option C**
Remove any sex deer	Remove adult females only	I would not choose either option
State agency	Federal agency	
$100 payment per deer	$50 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q21. Which of the following options for targeted deer removal do you prefer?

Option A	**Option B**	**Option C**
Remove young males only	Remove adult males only	I would not choose either option
Federal agency	State agency	
$100 payment per deer	$50 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q22. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult females only	Remove young males only	I would not choose either option
State agency	Federal agency	
$0 payment per deer	$150 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q23. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult males only	Remove any sex deer	I would not choose either option
Federal agency	State agency	
$0 payment per deer	$150 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q24. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove any sex deer	Remove adult females only	I would not choose either option
Federal agency	State agency	
$150 payment per deer	$100 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q25. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove young males only	Remove adult males only	I would not choose either option
State agency	Federal agency	
$50 payment per deer	$0 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q26. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult males only	Remove any sex deer	I would not choose either option
State agency	Federal agency	
$150 payment per deer	$100 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off <u>this property</u> in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q27. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult females only	Remove young males only	I would not choose either option
Federal agency	State agency	
$50 payment per deer	$0 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off <u>this property</u> in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q28. In general, to what extent do you trust your:

	No Trust	(circle one for each row)			Full Trust
A. Federal wildlife agency	1	2	3	4	5
B. State wildlife agency	1	2	3	4	5

Q29. In general, would you allow your government wildlife agency **on this property** to carry out management strategies for other types of wildlife: **(select one for each row)**

	Yes	No
A. Diseases	☐	☐
B. Species	☐	☐

Q30. Are your neighbors on either side of this property: **(select all that apply)**

☐ Family
☐ Friends
☐ Neither

Please complete this section so that we may better understand the perspectives of respondents.

Q31. What is your age? ☐ years

Q32. What is your gender identity? **(Select one)**

- ☐ Man
- ☐ Woman
- ☐ Another identity, specify if you wish _____

Q33. Do you live within 10 miles of a big city (has more than 100,000 people)? **(Select one)**

- ☐ Yes
- ☐ No
- ☐ Unsure

Q34. What is the highest level of education you have completed? **(Select one)**

- ☐ Less than high school
- ☐ High school graduate or GED
- ☐ Technical training
- ☐ Some college
- ☐ Bachelor's degree (BS, BA)
- ☐ Post-graduate (MS, PhD, JD)

Q35. What was your total annual household income from all sources in 2022? **(Select one)**

- ☐ 0-$19,999
- ☐ 20,000-$49,999
- ☐ 50,000-$99,999
- ☐ 100,000-$149,999
- ☐ 150,000-$199,999
- ☐ $200,000+

That was our last question. We greatly appreciate your time and participation. Please return your completed questionnaire in the postage-paid envelope.

Should you have any additional comments about land management, chronic wasting disease, or any other topics covered in this survey, please add them below.

_____
_____
_____
_____
_____
_____

As promised we would like to send you a **$10 Amazon e-card** as a thank you for completing this survey. Please provide the following information so we can email your gift card. This information will only be used to send the gift cards.

Name:
Email Address: (please write legibly)
Phone: (should we have issues distributing the gift card)

APPENDIX 1A.2: CWD LANDOWNER SURVEY BLOCK 2

This is a survey designed and administered by faculty within the department of fisheries and wildlife at Michigan State University to obtain information from US landowners or leasers regarding their opinions and willingness to allow access to their property for the management of chronic wasting disease (CWD) in deer.

To be eligible for this study, we need to confirm that you **own or lease property** that is at **least 3 acres in size**?

- ☐ Yes ⟶ Please continue with the survey
- ☐ No ⟶ Please stop and return your survey in the postage-paid envelope

We would like to know more about the property that you own or lease.

Q1. Do you own and/or lease **more than one** property that is at least 3 acres?

- ☐ Yes
- ☐ No

If you own or lease more than one property that is at least 3 acres in size, when answering the questions in the survey, please think about the single property you own or lease that you believe to have the most deer present.

Q2. Are you the landowner or land leaser of this property? **(Select one)**

- ☐ Land owner
- ☐ Land leaser

Q3. How many acres is this property? **(Select one)**

☐ 3-9 acres	☐ 50-99 acres	☐ 250-499 acres	☐ 1,000-4,999 acres
☐ 10-49 acres	☐ 100-249 acres	☐ 500-999 acres	☐ 5,000 or more acres

Q4. How much, if any, of this property is leased out for **farming**? **(Select one)**

☐ All of it	☐ Most of it	☐ Some of it	☐ None of it

Q5. Generally, how would you characterize the landscape of this property? Please fill in the estimated **percent** landscape composition that makes up this property. **Please make sure your answers total 100%.**

Lawn:	%	Forested:	%	Grassland/ Open herbaceous:	%
Wetland:	%	Pine forested:	%	Mountainous Terrain:	%
Agricultural:	%	Rangeland/Shrub:	%	Other:	%

Q6. Is this property used for any of the following types of production? **(Select all that apply)**

☐ Crops ☐ Cattle ☐ Poultry ☐ Hogs
☐ Cervids ☐ None ☐ Other, please specify: _____

Q7. Have you seen any of the following deer species on this property in the past five years? **(Select all that apply)**

☐ White-tail deer ☐ Mule Deer ☐ Other deer, please specify if known: _____
☐ Unsure of species ☐ No, have not seen any deer in the past five years

Q8a. Which of the following people, if any, have hunted on this property in the past five years? **(Select all that apply)**

☐ Myself
☐ My friends and/or family
☐ People who lease my land
☐ Other people, please specify:
_____
☐ No one in the past five years has hunted on this property

→ Answer Q8b.

Q8b. Did you or anyone else harvest any of the following deer species on this property in the past five years? **(Select all that apply)**

☐ White-tailed deer
☐ Mule deer
☐ Other deer species, please specify if known:
_____
☐ Unsure of species
☐ No deer have been harvested

Q9. Are you part of a DMAP (Deer Management Assistance Program), or similar deer management program? **(Select one)**

☐ Yes ☐ No ☐ Unsure

The next set of questions focus on **chronic wasting disease**. Chronic wasting disease (CWD) is a contagious, neurological disease that affects deer, elk, and moose. It causes a degeneration of the brain resulting in emaciation (abnormally thin), abnormal behavior, loss of bodily functions and death. CWD is always fatal; there is no recovery or cure.

Q10. Before this survey, were you aware of chronic wasting disease (**CWD**)? **(Select one)**

☐ Yes ☐ No ☐ Unsure

Q11. How concerned are you about. . .

	Not concerned at all	(circle one for each row)			Extremely concerned
A. The human health impacts of CWD, despite chronic wasting disease not being confirmed in humans?	1	2	3	4	5
B. CWD affecting the health of deer on this property?	1	2	3	4	5

Q12. Have any of the following people encountered or harvested a **verified** (confirmed positive by state wildlife official) CWD positive deer on this property? **(Select all that apply)**

- ☐ Myself
- ☐ Friends and/or family
- ☐ People who lease my land
- ☐ Others, please specify: _____
- ☐ No verified CWD deer has been encountered or harvested

Q13. In your opinion, how important is managing:

	Not important at all	(circle one for each row)			Extremely important
A. CWD to you?	1	2	3	4	5
B. CWD to people who are close to you (such as family, friends, hunting groups, etc.)	1	2	3	4	5

Wildlife agencies, such as a state Department of Natural Resources or a federal wildlife organization, have undertaken a variety of actions to manage CWD, which attempt to reduce deer-to-deer transmission, limit the opportunity for disease spread, and protect public health. Although your state's wildlife agency may not currently use these CWD management strategies in your area, your responses are essential to understanding their future management potential

The next section of this survey will ask questions on whether you would allow six (6) different CWD management strategies to be carried out on this property. Below are descriptions of each CWD management strategy for your reference.

- **Targeted removals:** Selective deer removals by professional government (wildlife agency) sharpshooters.
- **Recreational deer harvest (any deer):** A hunter of your choice harvesting any sex deer
- **Recreational deer harvest (does only):** A hunter of your choice harvesting only does (female deer).
- **Recreational deer harvest (2+ deer)**: A hunter of your choice harvesting more than 2 deer of any sex.
- **Live deer capture:** The live capture and release of deer for CWD research.
- **Trail-camera monitoring:** Monitoring deer using a trail-camera for CWD research.

Q14. Which of the following strategies for managing CWD, if any, were you familiar with prior to receiving this survey? **(Select all that apply)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)
- ☐ None, not familiar with any of the management strategies

Q15. Which of the following CWD management strategies, if any, have been carried out on this property? **(Select all that apply)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)
- ☐ No CWD management strategies have been carried out
- ☐ Unsure

Q16. In general, would you allow a **government wildlife agency** on this property to: **(Select one for each row)**

	Yes	No
A. Conduct targeted removals	☐	☐
B. Conduct live deer capture (for research purposes)	☐	☐
C. Place trail-cameras (for research purposes)	☐	☐

Q17. If one of your neighbors said **YES** to allowing targeted removals on <u>their</u> property, would that have any influence on your decision to allow targeted removals on <u>your</u> property? **(Select one)**

- ☐ Yes
- ☐ No
- ☐ Unsure

Q18. In general, would you allow hunters on this property to: **(Select one for each row)**

	Yes	No
A. Harvest any deer recreationally	☐	☐
B. Harvest does only (female deer) recreationally	☐	☐
C. Harvest 2+ deer recreationally	☐	☐

Q19. Which **<u>two</u>** of the following management strategies would you most likely allow on this property? **(Select no more than 2)**

- ☐ Targeted removals
- ☐ Recreational deer harvest (any deer)
- ☐ Recreational deer harvest (does only)
- ☐ Recreational deer harvest (2+ deer)
- ☐ Live deer capture (for research purposes)
- ☐ Trail-camera monitoring (for research purposes)

In this set of questions, you will be given 8 scenarios, each with two different options for targeted removal of deer on this property, and a third option to opt out. We would like you to choose which option you would be most likely to allow on this property. It is important that your selection reflects choices you would make in the real world. The characteristics of each option are:

1. Removal restriction: this refers to the specific sex/age of the deer that will be removed off your land. The options are any sex deer can be removed, the removal of adult female deer only, the removal of young males only, or the removal of adult males only.

2. Implementing agency: this refers to the government wildlife agency that will carry out the deer removal on this property. The options are state or federal wildlife agency (non-regulatory).

3. Payment per deer removed: this refers to the payment you would receive per deer that is removed from this property. For example, if the payment per deer is $100 and your government wildlife agency removes 3 deer from this property, you would receive $300.

You will then be asked how many deer you would allow the government wildlife agency to remove off this property based on the option you selected in the previous scenario.

Q20. Which of the following options for targeted deer removal do you prefer?

Option A	**Option B**	**Option C**
Remove any sex deer	Remove adult females only	I would not choose either option
State agency	Federal agency	
$0 payment per deer	$150 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**
If chose option A or B: ➡	How many deer would you allow to be removed off this property in one year using this method? ☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____	

Q21. Which of the following options for targeted deer removal do you prefer?

Option A	**Option B**	**Option C**
Remove young males only	Remove adult males only	I would not choose either option
Federal agency	State agency	
$0 payment per deer	$150 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**
If chose option A or B: ➡	How many deer would you allow to be removed off this property in one year using this method? ☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____	

Q22. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult females only	Remove young males only	I would not choose either option
State agency	Federal agency	
$100 payment per deer	$50 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q23. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult males only	Remove any sex deer	I would not choose either option
Federal agency	State agency	
$100 payment per deer	$50 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q24. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove young males only	Remove adult males only	I would not choose either option
State agency	Federal agency	
$150 payment per deer	$100 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q25. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove any sex deer	Remove adult females only	I would not choose either option
Federal agency	State agency	
$50 payment per deer	$0 payment per deer	
☐ Option A	☐ Option B	☐ Option C

If chose option A or B: ➡ How many deer would you allow to be removed off this property in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q26. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult females only	Remove young males only	I would not choose either option
Federal agency	State agency	
$150 payment per deer	$100 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off <u>this property</u> in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q27. Which of the following options for targeted deer removal do you prefer?

Option A	Option B	Option C
Remove adult males only	Remove any sex deer	I would not choose either option
State agency	Federal agency	
$50 payment per deer	$0 payment per deer	
☐ **Option A**	☐ **Option B**	☐ **Option C**

If chose option A or B: ➡ How many deer would you allow to be removed off <u>this property</u> in one year using this method?

☐ 1-9 ☐ 10-19 ☐ 20-49 ☐ 50-99 ☐ 100-199 ☐ 200+, _____

Q28. In general, to what extent do you trust your:

	No Trust	(circle one for each row)			Full Trust
A. Federal wildlife agency	1	2	3	4	5
B. State wildlife agency	1	2	3	4	5

Q29. In general, would you allow your government wildlife agency **on this property** to carry out management strategies for other types of wildlife: **(select one for each row)**

	Yes	No
A. Diseases	☐	☐
B. Species	☐	☐

Q30. Are your neighbors on either side of this property: **(select all that apply)**

☐ Family
☐ Friends
☐ Neither

Please complete this section so that we may better understand the perspectives of respondents.

Q31. What is your age? ☐ years

Q32. What is your gender identity? **(Select one)**

- ☐ Man
- ☐ Woman
- ☐ Another identity, specify if you wish _____

Q33. Do you live within 10 miles of a big city (has more than 100,000 people)? **(Select one)**

- ☐ Yes
- ☐ No
- ☐ Unsure

Q34. What is the highest level of education you have completed? **(Select one)**

- ☐ Less than high school
- ☐ High school graduate or GED
- ☐ Technical training
- ☐ Some college
- ☐ Bachelor's degree (BS, BA)
- ☐ Post-graduate (MS, PhD, JD)

Q35. What was your total annual household income from all sources in 2022? **(Select one)**

- ☐ 0-$19,999
- ☐ 20,000-$49,999
- ☐ 50,000-$99,999
- ☐ 100,000-$149,999
- ☐ 150,000-$199,999
- ☐ $200,000+

That was our last question. We greatly appreciate your time and participation. Please return your completed questionnaire in the postage-paid envelope.

Should you have any additional comments about land management, chronic wasting disease, or any other topics covered in this survey, please add them below.

_____
_____
_____
_____
_____
_____

As promised we would like to send you a **$10 Amazon e-card** as a thank you for completing this survey. Please provide the following information so we can email your gift card. This information will only be used to send the gift cards.

Name:
Email Address: (please write legibly)
Phone: (should we have issues distributing the gift card)

APPENDIX 1B: SURVEY CODEBOOK

Table 1B.1. Codebook describing all variables included in the survey, with corresponding carriable names, survey response codes, and measurement types.

Variable	Variable Name	Coded Values	Measurement
Date	DATE	Date answered survey	Continuous
Identification number	ID	Number assigned to each questionnaire	Categorical Nominal
Survey mode type	MODE	1 = Paper 2 = Web	Categorical Nominal
Eligible for study	ELIGABILITY	1 = Yes 2 = No	Categorical Nominal
Consent for study	CONSENT	1 = Yes, consent 2 = No, do not consent	Categorical Nominal
Own multiple properties	Q3	1 = Yes 2 = No	Categorical Nominal
Who owns property	Q5	1 = Landowner 2 = Land leaser	Categorical Nominal
Property size- acres	Q6	1 = 3-9 acres 2 = 10-49 acres 3 = 50-99 acres 4 = 100-249 acres 5 = 250-499 acres 6 = 500-999 acres 7 = 1,000-4,999 acres 8 = 5,000 or more acres	Continuous
Property leased for farming	Q7	1 = All of it is leased out 2 = Most of it is leased out 3 = Some of it is leased out 4 = None of it is leased out	Categorical Ordinal
Property landscape-Lawn	Q8_1	Percent	Continuous
Property landscape-Wetland	Q8_2	Percent	Continuous
Property landscape-Agriculture	Q8_3	Percent	Continuous
Property landscape-forested	Q8_4	Percent	Continuous
Property landscape-Pine forested	Q8_5	Percent	Continuous
Property landscape-Rangeland/shrub	Q8_6	Percent	Continuous

Table 1B.1 (cont'd)

Property landscape- Grassland/open herbaceous	Q8_7	Percent	Continuous
Property landscape- Mountainous terrain	Q8_8	Percent	Continuous
Property landscape- Other	Q8_9	Percent	Continuous
Property landscape- Text	Q8_9_TEXT	Text, other landscape type	Text Nominal
Production use- Crops	Q9_1	1 = Crops	Categorical Nominal
Production use- Cattle	Q9_2	1 = Cattle	Categorical Nominal
Production use- Poultry	Q9_3	1 = Poultry	Categorical Nominal
Production use- Hogs	Q9_4	1 = Hogs	Categorical Nominal
Production use- Cervids	Q9_5	1 = Cervids	Categorical Nominal
Production use- Other	Q9_6	1 = Other	Categorical Nominal
Production use- None used for production	Q9_7	1 = None used for production	Categorical Nominal
Production use- Text	Q9_6_TEXT	Text, other production type on property	Text Nominal
Deer on property- White-tailed deer	Q10_1	1 = White-tailed deer	Categorical Nominal
Deer on property- Mule deer	Q10_2	1 = Mule deer	Categorical Nominal
Deer on property- Other deer species	Q10_3	1 = Other deer species	Categorical Nominal
Deer on property- Text	Q10_3_TEXT	Text, Other deer species	Text Nominal
Deer on property- Unsure of species	Q10_4	1 = Unsure of species	Categorical Nominal
Deer on property- No, have not seen any	Q10_5	1 = No, have not seen any deer	Categorical Nominal
Who hunted on property- Myself	Q11_1	1 = Myself	Categorical Nominal

Table 1B.1 (cont'd)

Who hunted on property- friends/family	Q11_2	1 = My friends and/or family	Categorical Nominal
Who hunted on property- People who lease my land	Q11_3	1 = People who lease my land	Categorical Nominal
Who hunted on property- Other	Q11_4	1 = Other	Categorical Nominal
Who hunted on property- Text	Q11_4_TEXT	Text, Other people who have hunted on property	Text Nominal
Who hunted on property- No one	Q11_5	1 = No one in past five years	Categorical Nominal
Species harvested deer on property- White-tailed deer	Q12_1	1 = White-tailed deer	Categorical Nominal
Species harvested deer on property- Mule deer	Q12_2	1 = Mule deer	Categorical Nominal
Species harvested deer on property- Text	Q12_3_TEXT	Text, Other deer species harvested on property	Text Nominal
Species harvested deer on property- Another species	Q12_3	1 = Another species	Categorical Nominal
Species harvested deer on property- Unsure of species	Q12_4	1 = Unsure of species	Categorical Nominal
Species harvested deer on property- No deer	Q12_5	1 = No deer harvested in past five years	Categorical Nominal
Part of DMAP	Q13	1 = Yes 2 = No 3 = Unsure	Categorical Nominal
Aware of CWD	Q15	1 = Yes 2 = No 3 = Unsure	Categorical Nominal
Concern of CWD affecting human health	Q16_1	1 = Not at all concerned 2 = 2 3 = 3 4 = 4 5 = Extremely concerned	Categorical Ordinal

Table 1B.1 (cont'd)

Concern of CWD affecting deer health	Q17_1	1 = Not at all concerned 2 = 2 3 = 3 4 = 4 5 = Extremely concerned	Categorical Ordinal
Encountered/harvested CWD positive deer- Myself	Q18_1	1 = Myself	Categorical Nominal
Encountered/harvested CWD positive deer- Friends and/or family	Q18_2	1 = Friends and/or family	Categorical Nominal
Encountered/harvested CWD positive deer- People who lease my land	Q18_3	1 = People who lease my land	Categorical Nominal
Encountered/harvested CWD positive deer- Others	Q18_4	1 = Others	Categorical Nominal
Encountered/harvested CWD positive deer- Text	Q18_4_TEXT	Text, Others CWD positive deer	Text Nominal
Encountered/harvested CWD positive deer- No verified deer on property	Q18_5	1 = No verified deer on property	Categorical Nominal
Importance of managing CWD- Self	Q19_1	1 = Not at all important 2 = 2 3 = 3 4 = 4 5 = Extremely important	Categorical Ordinal
Importance of managing CWD- Others	Q20_1	1 = Not at all important 2 = 2 3 = 3 4 = 4 5 = Extremely important	Categorical Ordinal
CWD strategies familiar with- Targeted removals	Q22_1	1 = Targeted removals	Categorical Nominal
CWD strategies familiar with- Recreational deer harvest (any deer)	Q22_2	1 = Recreational deer harvest (any deer)	Categorical Nominal

Table 1B.1 (cont'd)

CWD strategies familiar with- Recreational deer harvest (does only)	Q22_3	1 = Recreational deer harvest (does only)	Categorical Nominal
CWD strategies familiar with- Recreational deer harvest (2+ deer)	Q22_4	1 = Recreational deer harvest (2+ deer)	Categorical Nominal
CWD strategies familiar with- Live capture	Q22_5	1 = Live capture	Categorical Nominal
CWD strategies familiar with- Trail-camera	Q22_6	1 = Trail-camera monitoring	Categorical Nominal
CWD strategies familiar with- None, not familiar	Q22_7	1 = Not familiar with any	Categorical Nominal
CWD strategies on property- Targeted removals	Q23_1	1 = Targeted removals	Categorical Nominal
CWD strategies on property- Recreational deer harvest (any deer)	Q23_2	1 = Recreational deer harvest (any deer)	Categorical Nominal
CWD strategies on property- Recreational deer harvest (does only)	Q23_3	1 = Recreational deer harvest (does only)	Categorical Nominal
CWD strategies on property- Recreational deer harvest (2+ deer)	Q23_4	1 = Recreational deer harvest (2+ deer)	Categorical Nominal
CWD strategies on property- Live capture	Q23_5	1 = Live capture	Categorical Nominal
CWD strategies on property- Trail-cameras	Q23_6	1 = Trail-camera monitoring	Categorical Nominal
CWD strategies on property- None have been carried out	Q23_7	1 = None have been carried out on property	Categorical Nominal
CWD strategies on property- Unsure	Q23_8	1 = Unsure	Categorical Nominal
Allow govt agent to conduct- Targeted removals	Q24_1	1 = Yes 2 = No	Categorical Nominal
Allow govt agent to conduct- live deer capture	Q24_2	1 = Yes 2 = No	Categorical Nominal

Table 1B.1 (cont'd)

Allow govt agent to conduct- trail-camera	Q24_3	1 = Yes 2 = No	Categorical Nominal
Neighbor said yes, change decision targeted removals	Q25	1 = I would still say ANSWER 2 = I would change my mind	Categorical Nominal
Allow hunters to conduct- Any sex deer	Q26_1	1 = Yes 2 = No	Categorical Nominal
Allow hunters to conduct- Does only	Q26_2	1 = Yes 2 = No	Categorical Nominal
Allow hunters to conduct- 2+ deer	Q26_3	1 = Yes 2 = No	Categorical Nominal
Two strategies most likely allow- Targeted removals	Q27_1	1 = Targeted removals	Categorical Nominal
Two strategies most likely allow- Recreational deer harvest (any deer)	Q27_2	1 = Recreational deer harvest (any deer)	Categorical Nominal
Two strategies most likely allow- Recreational deer harvest (does only)	Q27_3	1 = Recreational deer harvest (does only)	Categorical Nominal
Two strategies most likely allow- Recreational deer harvest (2+ deer)	Q27_4	1 = Recreational deer harvest (2+ deer)	Categorical Nominal
Two strategies most likely allow- Live capture	Q27_5	1 = Live capture	Categorical Nominal
Two strategies most likely allow- Trail-cameras	Q27_6	1 = Trail-cameras	Categorical Nominal
Choice experiment block	SEN_VERSION	1 = Block 1 2 = Block 2	Categorical Nominal
CE Question	S-M	1 = Option A 2 = Option B 3 = Option C	Categorical

Table 1B.1 (cont'd)

How many deer removed using CE strategy choice	S-D	1 = 1-19 2 = 10-19 3 = 20-49 4 = 50-99 5= 100-199 6=200+	Continuous
Text, more than 200+ deer removed	S_D_TEXT	Text, 200+ specify how many deer	Text Nominal
Trust in federal wildlife agency	Q61_1	1 = No trust 2 = 2 3 = 3 4 = 4 5 = Full trust	Categorical Ordinal
Trust in state wildlife agency	Q61_2	1 = No trust 2 = 2 3 = 3 4 = 4 5 = Full trust	Categorical Ordinal
Management for other-Diseases	Q62_1	1 = Yes 2 = No	Categorical Nominal
Management for other-Species	Q62_2	1 = Yes 2 = No	Categorical Nominal
Neighbors on either side- Family	Q63_1	1 = Family	Categorical Nominal
Neighbors on either side- Friends	Q63_2	1 = Friends	Categorical Nominal
Neighbors on either side- Neither	Q63_3	1 = Neither	Categorical Nominal
Age	Q64	Age in years, fill in blank	Continuous
Gender	Q65	1 = Man 2 = Woman 3 = Other	Categorical Nominal
Gender, Text other	Q65_TEXT	Text, Other gender identity	Text Nominal
Within 10 miles city	Q66	1 = Yes 2 = No 3 = Unsure	Categorical Nominal

Table 1B.1 (cont'd)

Highest education	Q67	1 = Less than high school 2 = High school graduate/GED 3 = Technical training 4 = Some college 5 = Bachelor's degree (BS/BA) 6 = Post-graduate (MS, PhD, JD)	Categorical Ordinal
Annual household income	Q68	1 = $0-$19,999 2 = $20,000-$49,999 3 = $50,000-$99,999 4 = $100,000-$149,999 5 = $149,999-$199,999 6 = $200,000+	Continuous
Additional comments	Q69	Text, additional comments open ended	Text Nominal
City	CITY	Text, city live in	Categorical Nominal
County	COUNTYNAME	Text, county live in	Categorical Nominal
Fips code	FIPSCODE	Fips code	Categorical Nominal
State	STATE	Text, WY, NE, ND, IL, MI, VA	Categorical Nominal
Strata, positive/adjacent	STRATA	1 = Positive county 2 = Adjacent county	Categorical Nominal
Zip code	ZIPCODE	Zip code number	Categorical Nominal

APPENDIX 1C: STATE INFORMATION

In 1985, Wyoming became the second state to find a positive case of chronic wasting disease in the US. Since 2016, the Wyoming Game and Fish Department (2023) has reported 1,167 CWD-positive white-tailed deer and 2,282 positive mule deer. Based on these reports, we selected Wyoming to represent the western state with high CWD prevalence. As of today, all counties have at least one positive case. Wyoming has confirmed population declines across the state in both mule deer and white-tailed deer from CWD (DeVivo et al. 2017; Edmunds et al. 2016). Wyoming's land-cover types are categorized into *Artemisia tridentata spp. wyomingensis* sagebrush (33.4%), mixed-grass prairie (17.5%), and *Pinus contorta* forest (6.5%) (Driese et al. 1997). The climate is semiarid with mild to warm summers and cold winters, largely due to the state's mid-latitude location far from oceanic moisture (Kunkel, 2022). As of 2022, the average size of a farm/ranch is 2,721 acres, over five times the national average size (Census of Agriculture, 2017). According to the United States Department of Agriculture (USDA), the federal government owns 46.7% (29.1 million of 62.3 million acres) of land, divided among the Bureau of Land Management (60%), Forest Service (31.6%), National Parks Service (8.1%), and the Fish and Wildlife Service (0.2%), leaving 43.3% of the state under private ownership (USDA, 2019).

CWD was first discovered in Nebraska in 2000 in Kimball County, however, the Nebraska Game and Parks Commission (2023) began testing in 1997. Nebraska was selected as the western state with medium prevalence of CWD, based on their report of 630 CWD-positive deer since the start of testing. At this time, Nebraska has not seen population declines attributed to CWD in the state, however, in one Deer Management Unit they have seen prevalence in mule deer bucks reach 30 percent. The survey was distributed across 54 CWD-positive and 33 adjacent counties. The average size farm is 1,000 acres, and the federal government owns 1.1% of the land (USDA, 2019). Privately owned land therefore makes up 97.2% of the state, the highest among the study area and 4th highest in the US (Vivid Maps, 2021). The climate is characterized as continental, with large variances in temperature, severe weather, and distinct seasons (Kunkel 2022). The dominant land-cover types are agriculture fields and grass prairies.

North Dakota has reported 70 CWD-positive cases in deer since the disease was first discovered in 2009, serving as the low prevalent state in the western region (North Dakota Game and Fish, 2023). The survey was distributed to 17 counties that are CWD-positive and 13 that are adjacent, comprised of 8 deer management units. The deer management unit 3F2 has the highest recorded infection rates, with 4.9% in mule deer and 3% in white-tailed deer (North Dakota Game and Fish, 2023). The average farm size in North Dakota is 1,512 acres, and the federal government owns 3.9% of the land, leaving 96.1% of the state privately owned (USDA, 2019). The dominant land cover types include cultivated crops, which comprise nearly 90% of the state, and grassland/prairie. The climate is continental and characterized by low to moderate precipitation, large variance in temperature (average 40 degrees), and windy conditions (Kunkel, 2022).

We selected Illinois as the high CWD prevalent state in the eastern region, with 1,383 total reported positive cases since the start of testing (Illinois Department of Natural Resources, 2023). Since the first case of CWD was discovered in 2002, the Illinois Department of Natural Resources started a targeted surveillance program utilizing non-selective culling that reduced transmission and lowered prevalence across the state (Mateus-Pinilla et al. 2013). The survey was distributed to landowners among 19 CWD-positive counties and 8 adjacent counties. The state is 95.9% privately owned land with an average of 375 acres per farm, making it the 5th highest privately owned land in the U.S. (USDA, 2019). The predominant land cover types are agricultural fields, forests, forest/savanna, and urban land (USDA, 2019). Illinois's climate is characterized as continental with cold winters, warm summers, and fluctuations in temperature, humidity, cloudiness, and wind (Kunkel, 2022).

Since CWD was first discovered in Michigan in 2015, there have been 241 reported positive cases of CWD, serving as the medium prevalent state in the eastern region (Michigan Department of Natural Resources, 2023). The survey was sent to landowners across 11 CWD-positive counties and 19 adjacent counties. The average-sized farm is 211 acres, in which privately owned land makes up 90% of the state, and the federal government owns the remaining 10% (USDA, 2019). The dominant land-cover types in Michigan are agricultural fields, forests, urban land, and wetlands (NOAA, 2013). The Great Lakes play an important role in the

state's climate, causing it to be more temperate and moister than other Midwest states (Kunkel, 2022). Overall, Michigan's climate is characterized by large seasonal changes in temperature, with warm summers and cold winters.

CWD was first discovered in Virginia in 2009 when a hunter-harvested 2.5-year-old female white-tailed deer tested positive. Since then, the Virginia Department of Wildlife Resources (2023) has reported 179 total positive cases, serving as the low prevalent state in the eastern region. Due to the continued geographic spread, the DWR initiated a statewide targeted surveillance program focusing on older males in the year 2018. Following data collection, Disease Management Areas (DMA1, DMA2, DMA3) were established across 11 CWD-positive counties and 15 adjacent counties. The state of Virginia is made up of 90.7% privately owned land and has the smallest average-sized farm of the 6 selected states at 181 acres (USDA, 2019). The most common land cover types are agricultural fields, forests, and pastures (USDA, 2023). The state's climate is characterized by very warm summers and moderately cold winters but with significant regional variation due to diverse geographic elements such as the Appalachian and Blue Ridge mountains in the west and the Atlantic coastal region in the east (Kunkel, 2022).

LITERATURE CITED

DeVivo, M. T., D. R. Edmunds, M. J. Kauffman, B. A. Schumaker, J. Binfet, T. J. Kreeger, B. J. Richards, H. M. Schätzl, and T. E. Cornish. 2017. Endemic chronic wasting disease causes mule deer population decline in Wyoming. PLoS ONE 12:1–17.

Driese, K. L., W. A. Reiners, E. H. Merrill, and K. G. Gerow. 1997. A digital land cover map of Wyoming, USA: a tool for vegetation analysis. Journal of Vegetation Science 8:133–146.

Edmunds, D. R., M. J. Kauffman, B. A. Schumaker, F. G. Lindzey, W. E. Cook, T. J. Kreeger, R. G. Grogan, and T. E. Cornish. 2016. Chronic Wasting Disease Drives Population Decline of White-Tailed Deer. PLoS ONE 11:1–19.

Illinois Department of Natural Resources. 2023. Chronic Wasting Disease Management.

Kunkel, K. E. State Climate Summaries for the United States. 2022. NOAA Technical Report NESDIS 150. NOAA NESDIS.

Mateus-Pinilla, N., H.-Y. Weng, M. O. Ruiz, P. Shelton, and J. Novakofski. 2013. Evaluation of a wild white-tailed deer population management program for controlling chronic wasting disease in Illinois, 2003–2008. Preventive Veterinary Medicine 110:541–548.

Michigan Department of Natural Resources. 2023. Chronic Wasting Disease (CWD).

Nebraska Game and Parks Commission. 2023. Chronic Wasting Disease (CWD).

NOAA Coastal Services Center. 2013. Lake Michigan Basin Land Cover Change Report 1985-2010.

North Dakota Game and Fish. 2023. Chronic Wasting Disease.

United States Department of Agriculture. 2019. 2017 Census of Agriculture: United States Summary and State Data (AC-17-A-51). Washington, DC: U.S. Department of Agriculture, National Agricultural Statistics Service.

United States Department of Agriculture. 2023. Virginia Land Use and Protection | Natural Resources Conservation Service. n.d.

Virgina Department of Wildlife Resources. 2023. Chronic Wasting Disease.

Vivid Maps. Value of Private Land in the U.S. Mapped. 2021.

Wyoming Game and Fish Department. 2023. Chronic Wasting Disease in Wyoming Wildlife.

APPENDIX 1D: CODE FOR SUMMARY STATISTICS IN STATA

```
// Demographics
// Age
summarize q64

// Female
// Gender //Drops missing data and "other" gender
gen gender = .  // Initialize with missing values
// Assign categories based on gender
replace gender = 1 if q65 == 1  // Male
replace gender = 2 if q65 == 2  // Female
// Drop observations where q65 is missing or selected "other gender"
drop if missing(q65) | q65 == 3
label define gender_lbl 1 "Male" 2 "Female"
label values gender gender_lbl
tabulate gender

// Education
gen college_educated = .  // Initialize with missing values
// Assign categories based on the education variable q67
replace college_educated = 1 if q67 >= 4 and q67 <= 6  // College educated
replace college_educated = 0 if q67 >= 1 and q67 <= 3  // Less than
college
// Drop observations where q67 is missing
drop if missing(q67)
label define edu_lbl 1 "College Educated" 0 "Less than College"
label values college_educated edu_lbl
tabulate college_educated

// Income $100K+, Income Missing
// Create a new variable for the simplified income categories
gen income_cat_simple = .
// Assign categories based on existing income variable (q68)
replace income_cat_simple = 1 if q68 == 1 | q68 == 2 | q68 == 3   // Less
than $100,000
replace income_cat_simple = 2 if q68 == 4 | q68 == 5 | q68 == 6   //
$100,000 or more
replace income_cat_simple = 3 if q68 == .                         //
Missing data category
// Label the new income_cat_simple variable
label define income_cat_simple_lbl 1 "Less than $100,000" 2 "$100,000 or
more" 3 "Missing"
label values income_cat_simple income_cat_simple_lbl
tabulate income_cat_simple


// Geographic Variables
// Region
gen western_landowners = (state_3 == 1) | (state_4 == 1) | (state_6 == 1)
gen eastern_landowners = (state_1 == 1) | (state_2 == 1) | (state_5 ==1)
gen region = .
replace region = 0 if western_landowners == 1
replace region = 1 if eastern_landowners == 1
```

```
label define region_lbl 0 "Western" 1 "Eastern"
label values region region_lbl
tabulate region

// Prevalence (High, Medium, Low)
gen cwd_prevalence = .
replace cwd_prevalence = 1 if state == "WY" | state == "IL" // High
prevalence
replace cwd_prevalence = 2 if state == "NE" | state == "MI" // Medium
prevalence
replace cwd_prevalence = 3 if state == "ND" | state == "VA" // Low
prevalence
label define cwd_prevalence 1 "High" 2 "Medium" 3 "Low"
label values cwd_prevalence cwd_prevalence
tabulate cwd_prevalence

// CWD-Positive County
tabulate strata


//CWD Variables
//Aware CWD
gen aware_cwd = .  // Initialize with missing values
replace aware_cwd = 1 if q15 == 1  // Set to 1 if q15 == Yes
replace aware_cwd = 0 if q15 == 2 | q15 == 3  // Set to 0 if q15 is No or
Unsure
// Drop observations where q15 is missing
drop if missing(q15)
label define aware_cwd_lbl 1 "Yes" 0 "No/Unsure"
label values aware_cwd aware_cwd_lbl
tabulate aware_cwd

//Importance Manage CWD (Self)
summarize q19_1
// Importance Manage CWD (Others)
summarize q20_1

// Concern CWD (Human Health)
summarize q16_1
// Concern CWD (Deer Health)
summarize q17_1

// Familiar 2+ Management Strategies
tabulate q22_familiar_2plus
// Familiar Targeted removals
tabulate q22_1
// Familiar Live deer capture
tabulate q22_5
// Familiar trail-camera monitoring
tabulate q22_6
// Familiar Recreational harvest any sex deer
tabulate q22_2
// Familiar Recreational harvest does only
tabulate q22_3
```

```
// Familiar Recreational harvest 2+ deer
tabulate q22_4
// Familiar None
tabulate q22_7


//Hunter Variables
//Hunter (Self)
gen hunting_self = .  // Initialize with missing values
replace hunting_self = 1 if q11_1 == 1  // Set to 1 if q11_1 is selected
replace hunting_self = 0 if q11_1 == . and (q11_2 != . | q11_3 != . |
q11_4 != . | q11_5 != .)  // Set to 0 if q11_1 is missing but other q11
responses exist
// Drop observations where all q11 variables are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
label define hunting_self_lbl 1 "Hunter" 0 "Not Hunter"
label values hunting_self hunting_self_lbl
tabulate hunting_self

// Allowed Any Hunters on Property
gen hunting_property = .
// Assign 1 to hunting_property if any of the first four options are "1"
replace hunting_property = 1 if q11_1 == 1 | q11_2 == 1 | q11_3 == 1 |
q11_4 == 1
// Assign 0 to hunting_property if the fifth option is "1" (i.e., no
hunting allowed)
replace hunting_property = 0 if q11_5 == 1
// Drop observations where all five options are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
label define hunting_lbl 0 "No" 1 "Yes"
label values hunting_property hunting_lbl
tabulate hunting_property

// Deer Harvested on Property
// Generate a filter variable to identify respondents who answered q11
gen q11_responded = 0  // Initialize with 0 (did not respond)
// Set q11_responded to 1 if there is a "1" for any of q11_1 to q11_5
replace q11_responded = 1 if q11_1 == 1 | q11_2 == 1 | q11_3 == 1 | q11_4
== 1 | q11_5 == 1
// Drop observations where all q11_1 to q11_5 are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
// Generate variable for deer harvested on property
gen deer_harvested = 0  // Initialize with 0 (no deer harvested)
// Set deer_harvested to 1 if there is a "1" for any of q12_1, q12_2,
q12_3, or q12_4
replace deer_harvested = 1 if q12_1 == 1 | q12_2 == 1 | q12_3 == 1 | q12_4
== 1
// Set deer_harvested to 0 if q12_5 is 1 (indicating no deer harvested)
replace deer_harvested = 0 if q12_5 == 1
// Keep respondents who answered q11 but did not answer q12 (due to
restrictions) in the "0" category
```

```
replace deer_harvested = 0 if q11_responded == 1 and missing(q12_1) and
missing(q12_2) and missing(q12_3) and missing(q12_4) and missing(q12_5)
// Add labels to deer_harvested
label define deer_lbl 0 "No" 1 "Yes"
label values deer_harvested deer_lbl
tabulate deer_harvested


//Trust
//Trust Federal Wildlife Agency
summarize q61_1
//Trust State Wildlife Agency
summarize q61_2


//Property Characteristics
//Property Acres
summarize q6
tabulate q6

// Leased for farming
gen leased_farming = .  // Initialize with missing values (".")
replace leased_farming = 1 if q7 >= 1 and q7 <= 3  // Set to 1 for values
1-3
replace leased_farming = 0 if q7 == 4  // Set to 0 if value is 4
drop if missing(q7)
label define leased_lbl 0 "No" 1 "Yes"
label values leased_farming leased_lbl
tabulate leased_farming

// Production Use
gen any_production_use = 0
replace any_production_use = 1 if q9_1 == 1 | q9_2 == 1 | q9_3 == 1 | q9_4
== 1 | q9_5 == 1 | q9_6 == 1  // Set to 1 if any of the production uses
are "1"
replace any_production_use = 0 if q9_7 == 1  // Set to 0 if q9_7 is "1"
(indicating no production use)
// Drop observations if all q9_1 to q9_7 are missing
drop if missing(q9_1) and missing(q9_2) and missing(q9_3) and
missing(q9_4) and missing(q9_5) and missing(q9_6) and missing(q9_7)
label define production_lbl 0 "No" 1 "Yes"
label values any_production_use production_lbl
tabulate any_production_use

// Deer seen
// Generate the deer_seen variable and initialize it with 0
gen deer_seen = 0
// Set deer_seen to 1 if any of q10_1, q10_2, q10_3, or q10_4 is 1
replace deer_seen = 1 if q10_1 == 1 | q10_2 == 1 | q10_3 == 1 | q10_4 == 1
// Set deer_seen to 0 if q10_5 is 1 (indicating no deer seen)
replace deer_seen = 0 if q10_5 == 1
// Drop observations if all q10_1 to q10_5 are missing
drop if missing(q10_1) and missing(q10_2) and missing(q10_3) and
missing(q10_4) and missing(q10_5)
```

```
label define deer_seen_lbl 0 "No" 1 "Yes"
label values deer_seen deer_seen_lbl
tabulate deer_seen


//Broader Application
//Allow Management for Other Diseases
gen mgmt_diseases = .
// Set mgmt_diseases to 1 if q62_1 is 1 (Yes)
replace mgmt_diseases = 1 if q62_1 == 1
// Set mgmt_diseases to 0 if q62_1 is 2 (No)
replace mgmt_diseases = 0 if q62_1 == 2
drop if missing(q62_1)
label define mgmt_lbl 0 "No" 1 "Yes"
label values mgmt_diseases mgmt_lbl
tabulate mgmt_diseases

//Allow Management for Other Species
gen mgmt_species = .
// Set mgmt_species to 1 if q62_2 is 1 (Yes)
replace mgmt_species = 1 if q62_2 == 1
// Set mgmt_species to 0 if q62_2 is 2 (No)
replace mgmt_species = 0 if q62_2 == 2
drop if missing(q62_2)
label define mgmt_lbl2 0 "No" 1 "Yes"
label values mgmt_species mgmt_lbl2
tabulate mgmt_species


// 6 Management Strategies
// Targeted Removals (TR)
gen allow_tr_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_tr_mgmt = 1 if q24_1 == 1
// Assign 0 if response is "2" (no)
replace allow_tr_mgmt = 0 if q24_1 == 2
// Missing observations in q24_1 will remain missing in allow_tr_mgmt
tabulate allow_tr_mgmt

// Live Deer Capture (LDC)
gen allow_ldc_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_ldc_mgmt = 1 if q24_2 == 1
// Assign 0 if response is "2" (no)
replace allow_ldc_mgmt = 0 if q24_2 == 2
// Missing observations in q24_2 will remain missing in allow_ldc_mgmt
tabulate allow_ldc_mgmt

// Trail Camera Monitoring (TCM)
gen allow_tcm_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_tcm_mgmt = 1 if q24_3 == 1
// Assign 0 if response is "2" (no)
replace allow_tcm_mgmt = 0 if q24_3 == 2
```

```
// Missing observations in q24_3 will remain missing in allow_tcm_mgmt
tabulate allow_tcm_mgmt

// Recreational Harvest Any Sex Deer (RHASD)
gen allow_rhasd_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhasd_mgmt = 1 if q26_1 == 1
// Assign 0 if response is "2" (no)
replace allow_rhasd_mgmt = 0 if q26_1 == 2
// Missing observations in q26_1 will remain missing in allow_rhasd_mgmt
tabulate allow_rhasd_mgmt

// Recreational Harvest Does Only (RHDO)
gen allow_rhdo_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhdo_mgmt = 1 if q26_2 == 1
// Assign 0 if response is "2" (no)
replace allow_rhdo_mgmt = 0 if q26_2 == 2
// Missing observations in q26_2 will remain missing in allow_rhdo_mgmt
tabulate allow_rhdo_mgmt

// Recreational Harvest 2+ Deer (RHTP)
gen allow_rhtp_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhtp_mgmt = 1 if q26_3 == 1
// Assign 0 if response is "2" (no)
replace allow_rhtp_mgmt = 0 if q26_3 == 2
// Missing observations in q26_3 will remain missing in allow_rhtp_mgmt
tabulate allow_rhtp_mgmt
```

APPENDIX 1E: CODE FOR LOGISTIC REGRESSION IN STATA

```
// Generate binary variables for select all that apply questions
// Q9 production types on property
gen q9_1_selected = (q9_1 != .) and (q9_1 != 0)
gen q9_2_selected = (q9_2 != .) and (q9_2 != 0)
gen q9_3_selected = (q9_3 != .) and (q9_3 != 0)
gen q9_4_selected = (q9_4 != .) and (q9_4 != 0)
gen q9_5_selected = (q9_5 != .) and (q9_5 != 0)
gen q9_6_selected = (q9_6 != .) and (q9_6 != 0)
gen q9_7_selected = (q9_7 != .) and (q9_7 != 0)

// Q10 Deer species seen on property
gen q10_1_selected = (q10_1 != .) and (q10_1 != 0)
gen q10_2_selected = (q10_2 != .) and (q10_2 != 0)
gen q10_3_selected = (q10_3 != .) and (q10_3 != 0)
gen q10_4_selected = (q10_4 != .) and (q10_4 != 0)
gen q10_5_selected = (q10_5 != .) and (q10_5 != 0)

// Q11 Who hunted on property
gen q11_1_selected = (q11_1 != .) and (q11_1 != 0)
gen q11_2_selected = (q11_2 != .) and (q11_2 != 0)
gen q11_3_selected = (q11_3 != .) and (q11_3 != 0)
gen q11_4_selected = (q11_4 != .) and (q11_4 != 0)
gen q11_5_selected = (q11_5 != .) and (q11_5 != 0)

// Q12 Deer species harvested on property
gen q12_1_selected = (q12_1 != .) and (q12_1 != 0)
gen q12_2_selected = (q12_2 != .) and (q12_2 != 0)
gen q12_3_selected = (q12_3 != .) and (q12_3 != 0)
gen q12_4_selected = (q12_4 != .) and (q12_4 != 0)
gen q12_5_selected = (q12_5 != .) and (q12_5 != 0)

// Q18 Encountered/harvested CWD+ deer on property
gen q18_1_selected = (q18_1 != .) and (q18_1 != 0)
gen q18_2_selected = (q18_2 != .) and (q18_2 != 0)
gen q18_3_selected = (q18_3 != .) and (q18_3 != 0)
gen q18_4_selected = (q18_4 != .) and (q18_4 != 0)

// Q22 CWD strategies familiar with
gen q22_1_selected = (q22_1 != .) and (q22_1 != 0)
gen q22_2_selected = (q22_2 != .) and (q22_2 != 0)
gen q22_3_selected = (q22_3 != .) and (q22_3 != 0)
gen q22_4_selected = (q22_4 != .) and (q22_4 != 0)
gen q22_5_selected = (q22_5 != .) and (q22_5 != 0)
gen q22_6_selected = (q22_6 != .) and (q22_6 != 0)
gen q22_7_selected = (q22_7 != .) and (q22_7 != 0)

// Q23 CWD strategies carried out on property
gen q23_1_selected = (q23_1 != .) and (q23_1 != 0)
gen q23_2_selected = (q23_2 != .) and (q23_2 != 0)
gen q23_3_selected = (q23_3 != .) and (q23_3 != 0)
gen q23_4_selected = (q23_4 != .) and (q23_4 != 0)
gen q23_5_selected = (q23_5 != .) and (q23_5 != 0)
```

```
gen q23_6_selected = (q23_6 != .) and (q23_6 != 0)
gen q23_7_selected = (q23_7 != .) and (q23_7 != 0)
gen q23_8_selected = (q23_8 != .) and (q23_8 != 0)

// Q27 Two strategies most likely to allow on property
gen q27_1_selected = (q27_1 != .) and (q27_1 != 0)
gen q27_2_selected = (q27_2 != .) and (q27_2 != 0)
gen q27_3_selected = (q27_3 != .) and (q27_3 != 0)
gen q27_4_selected = (q27_4 != .) and (q27_4 != 0)
gen q27_5_selected = (q27_5 != .) and (q27_5 != 0)
gen q27_6_selected = (q27_6 != .) and (q27_6 != 0)

// Q63 Neighbors on either side
gen q63_1_selected = (q63_1 != .) and (q63_1 != 0)
gen q63_2_selected = (q63_2 != .) and (q63_2 != 0)
gen q63_3_selected = (q63_3 != .) and (q63_3 != 0)


// Generate dummy variables for Nominal (Categorial) variables
tabulate q3, generate(q3_)
tabulate q5, generate(q5_)
tabulate q13, generate(q13_)
tabulate q15, generate(q15_)
tabulate q24_1, generate(q24_1_)
tabulate q24_2, generate(q24_2_)
tabulate q24_3, generate(q24_3_)
tabulate q25, generate(q25_)
tabulate q26_1, generate(q26_1_)
tabulate q26_2, generate(q26_2_)
tabulate q26_3, generate(q26_3_)
tabulate q62_1, generate(q62_1_)
tabulate q62_2, generate(q62_2_)
tabulate q65, generate(q65_)
tabulate q66, generate(q66_)
tabulate q67, generate(q67_)
tabulate q68, generate(q68_)
tabulate state, generate(state_)
tabulate strata, generate(strata_)


// Create new binary variables for each 6 management strategies
// Allow Targeted Removals (q24_1)
gen allow_tr_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_tr_mgmt = 1 if q24_1 == 1
// Assign 0 if response is "2" (no)
replace allow_tr_mgmt = 0 if q24_1 == 2
// Missing observations in q24_1 will remain missing in allow_tr_mgmt
tabulate allow_tr_mgmt


// Allow Live Deer Capture (q24_2)
gen allow_ldc_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
```

```
replace allow_ldc_mgmt = 1 if q24_2 == 1
// Assign 0 if response is "2" (no)
replace allow_ldc_mgmt = 0 if q24_2 == 2
// Missing observations in q24_2 will remain missing in allow_ldc_mgmt
tabulate allow_ldc_mgmt


// Allow Trail Camera Monitoring (q24_3)
gen allow_tcm_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_tcm_mgmt = 1 if q24_3 == 1
// Assign 0 if response is "2" (no)
replace allow_tcm_mgmt = 0 if q24_3 == 2
// Missing observations in q24_3 will remain missing in allow_tcm_mgmt
tabulate allow_tcm_mgmt


// Allow Recreational Harvest Any Sex Deer (q26_1)
gen allow_rhasd_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhasd_mgmt = 1 if q26_1 == 1
// Assign 0 if response is "2" (no)
replace allow_rhasd_mgmt = 0 if q26_1 == 2
// Missing observations in q26_1 will remain missing in allow_rhasd_mgmt
tabulate allow_rhasd_mgmt


// Allow Recreational Harvest Does Only (q26_2)
gen allow_rhdo_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhdo_mgmt = 1 if q26_2 == 1
// Assign 0 if response is "2" (no)
replace allow_rhdo_mgmt = 0 if q26_2 == 2
// Missing observations in q26_2 will remain missing in allow_rhdo_mgmt
tabulate allow_rhdo_mgmt



// Allow Recreational Harvest Two Plus Deer (q26_3)
gen allow_rhtp_mgmt = .  // Initialize as missing
// Assign 1 if response is "1" (yes)
replace allow_rhtp_mgmt = 1 if q26_3 == 1
// Assign 0 if response is "2" (no)
replace allow_rhtp_mgmt = 0 if q26_3 == 2
// Missing observations in q26_3 will remain missing in allow_rhtp_mgmt
tabulate allow_rhtp_mgmt


// Covariates for Logistic Regression from Survey
// Only Add Missing Category for Income (more than 5% missing)

// Hunter // Drops missing data
gen hunting_self = .  // Initialize with missing values
replace hunting_self = 1 if q11_1 == 1  // Set to 1 if q11_1 is selected
```

```
replace hunting_self = 0 if q11_1 == . and (q11_2 != . | q11_3 != . |
q11_4 != . | q11_5 != .)  // Set to 0 if q11_1 is missing but other q11
responses exist
// Drop observations where all q11 variables are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
label define hunting_self_lbl 1 "Hunter" 0 "Not Hunter"
label values hunting_self hunting_self_lbl
tabulate hunting_self


// Aware CWD (q15) //Drop missing data
gen aware_cwd = .  // Initialize with missing values
replace aware_cwd = 1 if q15 == 1  // Set to 1 if q15 == Yes
replace aware_cwd = 0 if q15 == 2 | q15 == 3  // Set to 0 if q15 is No or
Unsure
// Drop observations where q15 is missing
drop if missing(q15)
label define aware_cwd_lbl 1 "Yes" 0 "No/Unsure"
label values aware_cwd aware_cwd_lbl
tabulate aware_cwd


// Trust in wildlife agency (average of federal and state trust) //Drop
missing data
gen trust_wildlife_agencies = .  // Initialize the variable with missing
values
// Calculate the average of q61_1 and q61_2 if neither is missing
replace trust_wildlife_agencies = (q61_1 + q61_2) / 2 if !missing(q61_1,
q61_2)
// Drop observations where either q61_1 or q61_2 is missing
drop if missing(q61_1) | missing(q61_2)
label define trust_lbl 1 "Low Trust" 2 "Moderate Trust" 3 "Neutral Trust"
4 "High Trust" 5 "Full Trust"
label values trust_wildlife_agencies trust_lbl
tabulate trust_wildlife_agencies


// Age //In 2 categories, below 50 and 50+ //Drop missing data
gen age_cat = .  // Initialize with missing values
// Assign categories based on age
replace age_cat = 1 if q64 < 50   // Below 50
replace age_cat = 2 if q64 >= 50  // 50 and above
// Drop observations where q64 is missing
drop if missing(q64)
label define age_lbl 1 "Below 50" 2 "50 and above"
label values age_cat age_lbl
tabulate age_cat


// Gender //Drops missing data and "other" gender
gen gender = .  // Initialize with missing values
// Assign categories based on gender
replace gender = 1 if q65 == 1  // Male
```

```
replace gender = 2 if q65 == 2  // Female
// Drop observations where q65 is missing or selected "other gender"
drop if missing(q65) | q65 == 3
label define gender_lbl 1 "Male" 2 "Female"
label values gender gender_lbl
tabulate gender


// Education //This includes a third category for missing data
gen college_educated = .  // Initialize with missing values
// Assign categories based on the education variable q67
replace college_educated = 1 if q67 >= 4 and q67 <= 6  // College educated
replace college_educated = 0 if q67 >= 1 and q67 <= 3  // Less than
college
// Drop observations where q67 is missing
drop if missing(q67)
label define edu_lbl 1 "College Educated" 0 "Less than College"
label values college_educated edu_lbl
tabulate college_educated


// Income //Includes a 5th category for missing data
gen income_cat = .
replace income_cat = 1 if q68 == 1 | q68 == 2   // Below $49,999
replace income_cat = 2 if q68 == 3              // $50,000 - $99,999
replace income_cat = 3 if q68 == 4              // $100,000 - $149,999
replace income_cat = 4 if q68 == 5 | q68 == 6   // $150,000+
replace income_cat = 5 if q68 == .              // Missing data category
// Label the income_cat variable
label define income_lbl 1 "Below $49,999" 2 "$50,000 - $99,999" 3
"$100,000 - $149,999" 4 "$150,000+" 5 "Missing"
label values income_cat income_lbl
count if q68 == .
// Tabulate income categories including missing data
tabulate income_cat


// Create a new variable for the simplified income categories
gen income_cat_simple = .
// Assign categories based on existing income variable (q68)
replace income_cat_simple = 1 if q68 == 1 | q68 == 2 | q68 == 3   // Less
than $100,000
replace income_cat_simple = 2 if q68 == 4 | q68 == 5 | q68 == 6   //
$100,000 or more
replace income_cat_simple = 3 if q68 == .                        //
Missing data category
// Label the new income_cat_simple variable
label define income_cat_simple_lbl 1 "Less than $100,000" 2 "$100,000 or
more" 3 "Missing"
label values income_cat_simple income_cat_simple_lbl
tabulate income_cat_simple
// Region (don't need to drop since everyone has a region)
gen western_landowners = (state_3 == 1) | (state_4 == 1) | (state_6 == 1)
gen eastern_landowners = (state_1 == 1) | (state_2 == 1) | (state_5 ==1)
```

```
gen region = .
replace region = 0 if western_landowners == 1
replace region = 1 if eastern_landowners == 1
label define region_lbl 0 "Western" 1 "Eastern"
label values region region_lbl
tabulate region


// Prevalence (don't need to drop since everyone has a prevalence level)
gen cwd_prevalence = .
replace cwd_prevalence = 1 if state == "WY" | state == "IL" // High
prevalence
replace cwd_prevalence = 2 if state == "NE" | state == "MI" // Medium
prevalence
replace cwd_prevalence = 3 if state == "ND" | state == "VA" // Low
prevalence
label define cwd_prevalence 1 "High" 2 "Medium" 3 "Low"
label values cwd_prevalence cwd_prevalence


// Strata (Positive vs. Adjacent Counties) (don't need to drop since
everyone has a county)
label define strata_lbl 0 "Adjacent" 1 "Positive"
label values strata_1 strata_lbl
// Tabulate strata_1 with labels
tabulate strata_1


// Drop missing observations for q3 (own multiple properties)
count if q3 == .
drop if missing(q3)
tabulate q3


// Generate variables for lives within 10 miles big city (Yes vs.
No/Unsure)
gen within_10_miles = .
replace within_10_miles = 1 if q66 == 1  // Yes
replace within_10_miles = 0 if q66 == 2 | q66 == 3  // No
count if q66 == .
drop if missing(q66)
label define within_miles_lbl 1 "Yes" 0 "No"
label values within_10_miles within_miles_lbl
tabulate within_10_miles


// Generate dummy variable for people hunting on property (any)
gen hunting_property = .
// Assign 1 to hunting_property if any of the first four options are "1"
replace hunting_property = 1 if q11_1 == 1 | q11_2 == 1 | q11_3 == 1 |
q11_4 == 1
// Assign 0 to hunting_property if the fifth option is "1" (i.e., no
hunting allowed)
replace hunting_property = 0 if q11_5 == 1
```

```
// Drop observations where all five options are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
label define hunting_lbl 0 "No" 1 "Yes"
label values hunting_property hunting_lbl
tabulate hunting_property


// Generate variable for property leased out for farming
gen leased_farming = .  // Initialize with missing values (".")
replace leased_farming = 1 if q7 >= 1 and q7 <= 3  // Set to 1 for values
1-3
replace leased_farming = 0 if q7 == 4  // Set to 0 if value is 4
drop if missing(q7)
label define leased_lbl 0 "No" 1 "Yes"
label values leased_farming leased_lbl
tabulate leased_farming


// Generate variable for property used for production
gen any_production_use = 0
replace any_production_use = 1 if q9_1 == 1 | q9_2 == 1 | q9_3 == 1 | q9_4
== 1 | q9_5 == 1 | q9_6 == 1  // Set to 1 if any of the production uses
are "1"
replace any_production_use = 0 if q9_7 == 1  // Set to 0 if q9_7 is "1"
(indicating no production use)
// Drop observations if all q9_1 to q9_7 are missing
drop if missing(q9_1) and missing(q9_2) and missing(q9_3) and
missing(q9_4) and missing(q9_5) and missing(q9_6) and missing(q9_7)
label define production_lbl 0 "No" 1 "Yes"
label values any_production_use production_lbl
tabulate any_production_use


// Generate variable for deer seen on property
// Generate the deer_seen variable and initialize it with 0
gen deer_seen = 0
// Set deer_seen to 1 if any of q10_1, q10_2, q10_3, or q10_4 is 1
replace deer_seen = 1 if q10_1 == 1 | q10_2 == 1 | q10_3 == 1 | q10_4 == 1
// Set deer_seen to 0 if q10_5 is 1 (indicating no deer seen)
replace deer_seen = 0 if q10_5 == 1
// Drop observations if all q10_1 to q10_5 are missing
drop if missing(q10_1) and missing(q10_2) and missing(q10_3) and
missing(q10_4) and missing(q10_5)
label define deer_seen_lbl 0 "No" 1 "Yes"
label values deer_seen deer_seen_lbl
tabulate deer_seen


// Generate variable for deer harvested on property
// Generate a filter variable to identify respondents who answered q11
gen q11_responded = 0  // Initialize with 0 (did not respond)
// Set q11_responded to 1 if there is a "1" for any of q11_1 to q11_5
```

```
replace q11_responded = 1 if q11_1 == 1 | q11_2 == 1 | q11_3 == 1 | q11_4
== 1 | q11_5 == 1
// Drop observations where all q11_1 to q11_5 are missing
drop if missing(q11_1) and missing(q11_2) and missing(q11_3) and
missing(q11_4) and missing(q11_5)
// Generate variable for deer harvested on property
gen deer_harvested = 0  // Initialize with 0 (no deer harvested)
// Set deer_harvested to 1 if there is a "1" for any of q12_1, q12_2,
q12_3, or q12_4
replace deer_harvested = 1 if q12_1 == 1 | q12_2 == 1 | q12_3 == 1 | q12_4
== 1
// Set deer_harvested to 0 if q12_5 is 1 (indicating no deer harvested)
replace deer_harvested = 0 if q12_5 == 1
// Keep respondents who answered q11 but did not answer q12 (due to
restrictions) in the "0" category
replace deer_harvested = 0 if q11_responded == 1 and missing(q12_1) and
missing(q12_2) and missing(q12_3) and missing(q12_4) and missing(q12_5)
// Add labels to deer_harvested
label define deer_lbl 0 "No" 1 "Yes"
label values deer_harvested deer_lbl
// Tabulate deer_harvested to check the results
tabulate deer_harvested


// Generate variable for CWD strategies familiar with (at least 2)
// Count the number of "1"s for q22_1 to q22_6
egen q22_count = rowtotal(q22_1 q22_2 q22_3 q22_4 q22_5 q22_6)
// Generate the variable q22_familiar_2plus and set it to 1 if they have 2
or more "1"s in q22_1 to q22_6
gen q22_familiar_2plus = 1 if q22_count >= 2
// Set q22_familiar_2plus to 0 if they answered q22_7 (indicating
unfamiliar) or if they have 1 or fewer "1"s in q22_1 to q22_6
replace q22_familiar_2plus = 0 if q22_7 == 1 | q22_count <= 1
// Drop observations if all q22_1 to q22_7 are missing
drop if missing(q22_1) and missing(q22_2) and missing(q22_3) and
missing(q22_4) and missing(q22_5) and missing(q22_6) and missing(q22_7)
// Add labels to q22_familiar_2plus
label define familiar_lbl 0 "No" 1 "Yes"
label values q22_familiar_2plus familiar_lbl
// Tabulate q22_familiar_2plus to check the results
tabulate q22_familiar_2plus


// Generate variable for recreational harvest on property before
gen allowed_rec_hunt_before = 0
// Set allowed_rec_hunt_before to 1 if there is a 1 for any of q23_2,
q23_3, or q23_4
replace allowed_rec_hunt_before = 1 if q23_2 == 1 | q23_3 == 1 | q23_4 ==
1
// Drop observations where all q23_1 to q23_8 are missing
drop if missing(q23_1) and missing(q23_2) and missing(q23_3) and
missing(q23_4) and missing(q23_5) and missing(q23_6) and missing(q23_7)
and missing(q23_8)
// Add labels to allowed_rec_hunt_before
```

```
label define rec_hunt_lbl 0 "No" 1 "Yes"
label values allowed_rec_hunt_before rec_hunt_lbl
// Tabulate allowed_rec_hunt_before to check the results
tabulate allowed_rec_hunt_before


// Generate variable for mgmt other diseases
gen mgmt_diseases = .
// Set mgmt_diseases to 1 if q62_1 is 1 (Yes)
replace mgmt_diseases = 1 if q62_1 == 1
// Set mgmt_diseases to 0 if q62_1 is 2 (No)
replace mgmt_diseases = 0 if q62_1 == 2
drop if missing(q62_1)
label define mgmt_lbl 0 "No" 1 "Yes"
label values mgmt_diseases mgmt_lbl
tabulate mgmt_diseases


// Generate variable for mgmt other species
gen mgmt_species = .
// Set mgmt_species to 1 if q62_2 is 1 (Yes)
replace mgmt_species = 1 if q62_2 == 1
// Set mgmt_species to 0 if q62_2 is 2 (No)
replace mgmt_species = 0 if q62_2 == 2
drop if missing(q62_2)
label define mgmt_lbl2 0 "No" 1 "Yes"
label values mgmt_species mgmt_lbl2
tabulate mgmt_species


// Generate variable for neighbor family/friends
gen neighbor_type = .
// Set neighbor_type to 1 if q63_1 or q63_2 is 1 (indicating a "Yes")
replace neighbor_type = 1 if q63_1 == 1 | q63_2 == 1
// Set neighbor_type to 0 if q63_3 is 1 (indicating a "No")
replace neighbor_type = 0 if q63_3 == 1
// Drop observations if all q63_1, q63_2, and q63_3 are missing
drop if missing(q63_1) and missing(q63_2) and missing(q63_3)
// Add labels to neighbor_type
label define neighbor_lbl 0 "No" 1 "Yes"
label values neighbor_type neighbor_lbl
// Tabulate neighbor_type to check the results
tabulate neighbor_type


// q19_1
drop if missing(q19_1)
tabulate q19_1

// q20_1
drop if missing(q20_1)
tabulate q20_1

// q16_1
```

```
drop if missing(q16_1)
tabulate q16_1

// q17_1
drop if missing(q17_1)
tabulate q17_1

// q64
drop if missing(q64)
tabulate q64

// q6
drop if missing(q6)
tabulate q6


// Run Logistic Regressions and compare AIC values
// Stepwise Logistic Regression in Blocks
// Block 1- Demographics
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple,
or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple,
or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple,
or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated
i.income_cat_simple, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple,
or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple,
or
estat ic



// Block 2- Geographic variables
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic
```

```
logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles, or
estat ic



// Block 3- CWD variables
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus, or
estat ic



// Block 4- Hunter variables
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
```

```
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested, or
estat ic



// Block 5- Trust
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic


logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic


logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
```

```
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic


logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic


logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic


logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2, or
estat ic



// Block 6- Property characteristics
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
```

```
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen, or
estat ic



// Block 7- Broader application
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic
```

```
logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.within_10_miles i.aware_cwd q19_1
q20_1 q16_1 q17_1 i.q22_familiar_2plus hunting_self hunting_property
deer_harvested q61_1 q61_2 i.q3 q6 i.leased_farming i.any_production_use
deer_seen i.mgmt_diseases i.mgmt_species i.neighbor_type, or
estat ic



// Removing q66 (within_10_miles), q3 (own more than one property), and
neighbor_type
logit allow_tr_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic

logit allow_ldc_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic

logit allow_tcm_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic

logit allow_rhasd_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic

logit allow_rhdo_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic

logit allow_rhtp_mgmt q64 i.gender i.college_educated i.income_cat_simple
i.region i.cwd_prevalence i.strata i.aware_cwd q19_1 q20_1 q16_1 q17_1
i.q22_familiar_2plus i.hunting_self i.hunting_property i.deer_harvested
q61_1 q61_2 q6 i.leased_farming i.any_production_use i.deer_seen
i.mgmt_diseases i.mgmt_species, or
estat ic
```

APPENDIX 2A: CODE FOR DATA RESHAPING IN STATA

```
// 3 alternatives*8 questions
expand 24

sort id

// create 8 sets
bys id: gen row=_n
gen choice_Q=1
replace choice_Q=2 if row>3 and row<7
replace choice_Q=3 if row>6 and row<10
replace choice_Q=4 if row>9 and row<13
replace choice_Q=5 if row>12 and row<16
replace choice_Q=6 if row>15 and row<19
replace choice_Q=7 if row>18 and row<22
replace choice_Q=8 if row>21 and row<25

// create 3 alternatives within each set
bys id choice_Q: gen alternative=_n


// create dummy choice
gen choice=0
destring (s1_1m), replace
replace choice=1 if s1_1m==1 and choice_Q==1 and alternative==1
replace choice=1 if s1_1m==2 and choice_Q==1 and alternative==2
replace choice=1 if s1_1m==3 and choice_Q==1 and alternative==3

destring (s1_2m), replace
replace choice=1 if s1_2m==1 and choice_Q==2 and alternative==1
replace choice=1 if s1_2m==2 and choice_Q==2 and alternative==2
replace choice=1 if s1_2m==3 and choice_Q==2 and alternative==3

destring (s1_3m), replace
replace choice=1 if s1_3m==1 and choice_Q==3 and alternative==1
replace choice=1 if s1_3m==2 and choice_Q==3 and alternative==2
replace choice=1 if s1_3m==3 and choice_Q==3 and alternative==3

destring (s1_4m), replace
replace choice=1 if s1_4m==1 and choice_Q==4 and alternative==1
replace choice=1 if s1_4m==2 and choice_Q==4 and alternative==2
replace choice=1 if s1_4m==3 and choice_Q==4 and alternative==3

destring (s1_5m), replace
replace choice=1 if s1_5m==1 and choice_Q==5 and alternative==1
replace choice=1 if s1_5m==2 and choice_Q==5 and alternative==2
replace choice=1 if s1_5m==3 and choice_Q==5 and alternative==3

destring (s1_6m), replace
replace choice=1 if s1_6m==1 and choice_Q==6 and alternative==1
replace choice=1 if s1_6m==2 and choice_Q==6 and alternative==2
replace choice=1 if s1_6m==3 and choice_Q==6 and alternative==3
```

```
destring (s1_7m), replace
replace choice=1 if s1_7m==1 and choice_Q==7 and alternative==1
replace choice=1 if s1_7m==2 and choice_Q==7 and alternative==2
replace choice=1 if s1_7m==3 and choice_Q==7 and alternative==3

destring (s1_8m), replace
replace choice=1 if s1_8m==1 and choice_Q==8 and alternative==1
replace choice=1 if s1_8m==2 and choice_Q==8 and alternative==2
replace choice=1 if s1_8m==3 and choice_Q==8 and alternative==3

destring (s2_1m), replace
replace choice=1 if s2_1m==1 and choice_Q==1 and alternative==1
replace choice=1 if s2_1m==2 and choice_Q==1 and alternative==2
replace choice=1 if s2_1m==3 and choice_Q==1 and alternative==3

destring (s2_2m), replace
replace choice=1 if s2_2m==1 and choice_Q==2 and alternative==1
replace choice=1 if s2_2m==2 and choice_Q==2 and alternative==2
replace choice=1 if s2_2m==3 and choice_Q==2 and alternative==3

destring (s2_3m), replace
replace choice=1 if s2_3m==1 and choice_Q==3 and alternative==1
replace choice=1 if s2_3m==2 and choice_Q==3 and alternative==2
replace choice=1 if s2_3m==3 and choice_Q==3 and alternative==3

destring (s2_4m), replace
replace choice=1 if s2_4m==1 and choice_Q==4 and alternative==1
replace choice=1 if s2_4m==2 and choice_Q==4 and alternative==2
replace choice=1 if s2_4m==3 and choice_Q==4 and alternative==3

destring (s2_5m), replace
replace choice=1 if s2_5m==1 and choice_Q==5 and alternative==1
replace choice=1 if s2_5m==2 and choice_Q==5 and alternative==2
replace choice=1 if s2_5m==3 and choice_Q==5 and alternative==3

destring (s2_6m), replace
replace choice=1 if s2_6m==1 and choice_Q==6 and alternative==1
replace choice=1 if s2_6m==2 and choice_Q==6 and alternative==2
replace choice=1 if s2_6m==3 and choice_Q==6 and alternative==3

destring (s2_7m), replace
replace choice=1 if s2_7m==1 and choice_Q==7 and alternative==1
replace choice=1 if s2_7m==2 and choice_Q==7 and alternative==2
replace choice=1 if s2_7m==3 and choice_Q==7 and alternative==3

destring (s2_8m), replace
replace choice=1 if s2_8m==1 and choice_Q==8 and alternative==1
replace choice=1 if s2_8m==2 and choice_Q==8 and alternative==2
replace choice=1 if s2_8m==3 and choice_Q==8 and alternative==3


// remove any sex deer level for block 1
gen rasd=0
```

```
replace rasd=1 if choice_Q==1 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==1 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==2 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==2 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==3 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==3 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==4 and alternative==1 and sen_version==1
replace rasd=1 if choice_Q==4 and alternative==2 and sen_version==1

replace rasd=1 if choice_Q==5 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==5 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==6 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==6 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==7 and alternative==1 and sen_version==1
replace rasd=1 if choice_Q==7 and alternative==2 and sen_version==1

replace rasd=0 if choice_Q==8 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==8 and alternative==2 and sen_version==1

**remove any sex deer level for block 2
replace rasd=1 if choice_Q==1 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==1 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==2 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==2 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==3 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==3 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==4 and alternative==1 and sen_version==2
replace rasd=1 if choice_Q==4 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==5 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==5 and alternative==2 and sen_version==2

replace rasd=1 if choice_Q==6 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==6 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==7 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==7 and alternative==2 and sen_version==2

replace rasd=0 if choice_Q==8 and alternative==1 and sen_version==2
replace rasd=1 if choice_Q==8 and alternative==2 and sen_version==2

// remove adult males only level for block 1
gen ramo=0
replace ramo=0 if choice_Q==1 and alternative==1 and sen_version==1
replace ramo=0 if choice_Q==1 and alternative==2 and sen_version==1
```

```
replace ramo=0 if choice_Q==2 and alternative==1 and sen_version==1
replace ramo=1 if choice_Q==2 and alternative==2 and sen_version==1

replace ramo=0 if choice_Q==3 and alternative==1 and sen_version==1
replace ramo=0 if choice_Q==3 and alternative==2 and sen_version==1

replace ramo=1 if choice_Q==4 and alternative==1 and sen_version==1
replace ramo=0 if choice_Q==4 and alternative==2 and sen_version==1

replace ramo=0 if choice_Q==5 and alternative==1 and sen_version==1
replace ramo=0 if choice_Q==5 and alternative==2 and sen_version==1

replace ramo=0 if choice_Q==6 and alternative==1 and sen_version==1
replace ramo=1 if choice_Q==6 and alternative==2 and sen_version==1

replace ramo=1 if choice_Q==7 and alternative==1 and sen_version==1
replace rasd=0 if choice_Q==7 and alternative==2 and sen_version==1

replace ramo=0 if choice_Q==8 and alternative==1 and sen_version==1
replace ramo=0 if choice_Q==8 and alternative==2 and sen_version==1

**remove adult males only level for block 2
replace ramo=0 if choice_Q==1 and alternative==1 and sen_version==2
replace ramo=0 if choice_Q==1 and alternative==2 and sen_version==2

replace ramo=0 if choice_Q==2 and alternative==1 and sen_version==2
replace ramo=1 if choice_Q==2 and alternative==2 and sen_version==2

replace ramo=0 if choice_Q==3 and alternative==1 and sen_version==2
replace ramo=0 if choice_Q==3 and alternative==2 and sen_version==2

replace ramo=1 if choice_Q==4 and alternative==1 and sen_version==2
replace ramo=0 if choice_Q==4 and alternative==2 and sen_version==2

replace ramo=0 if choice_Q==5 and alternative==1 and sen_version==2
replace ramo=1 if choice_Q==5 and alternative==2 and sen_version==2

replace ramo=0 if choice_Q==6 and alternative==1 and sen_version==2
replace ramo=0 if choice_Q==6 and alternative==2 and sen_version==2

replace ramo=0 if choice_Q==7 and alternative==1 and sen_version==2
replace rasd=0 if choice_Q==7 and alternative==2 and sen_version==2

replace ramo=1 if choice_Q==8 and alternative==1 and sen_version==2
replace ramo=0 if choice_Q==8 and alternative==2 and sen_version==2

// remove young males only level for block 1
gen rymo=0
replace rymo=0 if choice_Q==1 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==1 and alternative==2 and sen_version==1

replace rymo=1 if choice_Q==2 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==2 and alternative==2 and sen_version==1
```

```
replace rymo=0 if choice_Q==3 and alternative==1 and sen_version==1
replace rymo=1 if choice_Q==3 and alternative==2 and sen_version==1

replace rymo=0 if choice_Q==4 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==4 and alternative==2 and sen_version==1

replace rymo=0 if choice_Q==5 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==5 and alternative==2 and sen_version==1

replace rymo=1 if choice_Q==6 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==6 and alternative==2 and sen_version==1

replace rymo=0 if choice_Q==7 and alternative==1 and sen_version==1
replace rymo=0 if choice_Q==7 and alternative==2 and sen_version==1

replace rymo=0 if choice_Q==8 and alternative==1 and sen_version==1
replace rymo=1 if choice_Q==8 and alternative==2 and sen_version==1

// remove young males only level for block 2
replace rymo=0 if choice_Q==1 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==1 and alternative==2 and sen_version==2

replace rymo=1 if choice_Q==2 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==2 and alternative==2 and sen_version==2

replace rymo=0 if choice_Q==3 and alternative==1 and sen_version==2
replace rymo=1 if choice_Q==3 and alternative==2 and sen_version==2

replace rymo=0 if choice_Q==4 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==4 and alternative==2 and sen_version==2

replace rymo=1 if choice_Q==5 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==5 and alternative==2 and sen_version==2

replace rymo=0 if choice_Q==6 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==6 and alternative==2 and sen_version==2

replace rymo=0 if choice_Q==7 and alternative==1 and sen_version==2
replace rymo=1 if choice_Q==7 and alternative==2 and sen_version==2

replace rymo=0 if choice_Q==8 and alternative==1 and sen_version==2
replace rymo=0 if choice_Q==8 and alternative==2 and sen_version==2

// remove adult females only level for block 1
gen rafo=0
replace rafo=0 if choice_Q==1 and alternative==1 and sen_version==1
replace rafo=1 if choice_Q==1 and alternative==2 and sen_version==1

replace rafo=0 if choice_Q==2 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==2 and alternative==2 and sen_version==1

replace rafo=1 if choice_Q==3 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==3 and alternative==2 and sen_version==1
```

```
replace rafo=0 if choice_Q==4 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==4 and alternative==2 and sen_version==1

replace rafo=0 if choice_Q==5 and alternative==1 and sen_version==1
replace rafo=1 if choice_Q==5 and alternative==2 and sen_version==1

replace rafo=0 if choice_Q==6 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==6 and alternative==2 and sen_version==1

replace rafo=0 if choice_Q==7 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==7 and alternative==2 and sen_version==1

replace rafo=1 if choice_Q==8 and alternative==1 and sen_version==1
replace rafo=0 if choice_Q==8 and alternative==2 and sen_version==1

// remove adult females only level for block 2
replace rafo=0 if choice_Q==1 and alternative==1 and sen_version==2
replace rafo=1 if choice_Q==1 and alternative==2 and sen_version==2

replace rafo=0 if choice_Q==2 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==2 and alternative==2 and sen_version==2

replace rafo=1 if choice_Q==3 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==3 and alternative==2 and sen_version==2

replace rafo=0 if choice_Q==4 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==4 and alternative==2 and sen_version==2

replace rafo=0 if choice_Q==5 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==5 and alternative==2 and sen_version==2

replace rafo=0 if choice_Q==6 and alternative==1 and sen_version==2
replace rafo=1 if choice_Q==6 and alternative==2 and sen_version==2

replace rafo=1 if choice_Q==7 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==7 and alternative==2 and sen_version==2

replace rafo=0 if choice_Q==8 and alternative==1 and sen_version==2
replace rafo=0 if choice_Q==8 and alternative==2 and sen_version==2

// state agent level for block 1
gen state=0
replace state=1 if choice_Q==1 and alternative==1 and sen_version==1
replace state=0 if choice_Q==1 and alternative==2 and sen_version==1

replace state=0 if choice_Q==2 and alternative==1 and sen_version==1
replace state=1 if choice_Q==2 and alternative==2 and sen_version==1

replace state=1 if choice_Q==3 and alternative==1 and sen_version==1
replace state=0 if choice_Q==3 and alternative==2 and sen_version==1

replace state=0 if choice_Q==4 and alternative==1 and sen_version==1
replace state=1 if choice_Q==4 and alternative==2 and sen_version==1
```

```
replace state=0 if choice_Q==5 and alternative==1 and sen_version==1
replace state=1 if choice_Q==5 and alternative==2 and sen_version==1

replace state=1 if choice_Q==6 and alternative==1 and sen_version==1
replace state=0 if choice_Q==6 and alternative==2 and sen_version==1

replace state=1 if choice_Q==7 and alternative==1 and sen_version==1
replace state=0 if choice_Q==7 and alternative==2 and sen_version==1

replace state=0 if choice_Q==8 and alternative==1 and sen_version==1
replace state=1 if choice_Q==8 and alternative==2 and sen_version==1

// state agent level for block 2
replace state=1 if choice_Q==1 and alternative==1 and sen_version==2
replace state=0 if choice_Q==1 and alternative==2 and sen_version==2

replace state=0 if choice_Q==2 and alternative==1 and sen_version==2
replace state=1 if choice_Q==2 and alternative==2 and sen_version==2

replace state=1 if choice_Q==3 and alternative==1 and sen_version==2
replace state=0 if choice_Q==3 and alternative==2 and sen_version==2

replace state=0 if choice_Q==4 and alternative==1 and sen_version==2
replace state=1 if choice_Q==4 and alternative==2 and sen_version==2

replace state=1 if choice_Q==5 and alternative==1 and sen_version==2
replace state=0 if choice_Q==5 and alternative==2 and sen_version==2

replace state=0 if choice_Q==6 and alternative==1 and sen_version==2
replace state=1 if choice_Q==6 and alternative==2 and sen_version==2

replace state=0 if choice_Q==7 and alternative==1 and sen_version==2
replace state=1 if choice_Q==7 and alternative==2 and sen_version==2

replace state=1 if choice_Q==8 and alternative==1 and sen_version==2
replace state=0 if choice_Q==8 and alternative==2 and sen_version==2

// fed agent level for block 1
gen fed=0
replace fed=0 if choice_Q==1 and alternative==1 and sen_version==1
replace fed=1 if choice_Q==1 and alternative==2 and sen_version==1

replace fed=1 if choice_Q==2 and alternative==1 and sen_version==1
replace fed=0 if choice_Q==2 and alternative==2 and sen_version==1

replace fed=0 if choice_Q==3 and alternative==1 and sen_version==1
replace fed=1 if choice_Q==3 and alternative==2 and sen_version==1

replace fed=1 if choice_Q==4 and alternative==1 and sen_version==1
replace fed=0 if choice_Q==4 and alternative==2 and sen_version==1

replace fed=1 if choice_Q==5 and alternative==1 and sen_version==1
replace fed=0 if choice_Q==5 and alternative==2 and sen_version==1
```

```
replace fed=0 if choice_Q==6 and alternative==1 and sen_version==1
replace fed=1 if choice_Q==6 and alternative==2 and sen_version==1

replace fed=0 if choice_Q==7 and alternative==1 and sen_version==1
replace fed=1 if choice_Q==7 and alternative==2 and sen_version==1

replace fed=1 if choice_Q==8 and alternative==1 and sen_version==1
replace fed=0 if choice_Q==8 and alternative==2 and sen_version==1

// fed agent level for block 2
replace fed=0 if choice_Q==1 and alternative==1 and sen_version==2
replace fed=1 if choice_Q==1 and alternative==2 and sen_version==2

replace fed=1 if choice_Q==2 and alternative==1 and sen_version==2
replace fed=0 if choice_Q==2 and alternative==2 and sen_version==2

replace fed=0 if choice_Q==3 and alternative==1 and sen_version==2
replace fed=1 if choice_Q==3 and alternative==2 and sen_version==2

replace fed=1 if choice_Q==4 and alternative==1 and sen_version==2
replace fed=0 if choice_Q==4 and alternative==2 and sen_version==2

replace fed=0 if choice_Q==5 and alternative==1 and sen_version==2
replace fed=1 if choice_Q==5 and alternative==2 and sen_version==2

replace fed=1 if choice_Q==6 and alternative==1 and sen_version==2
replace fed=0 if choice_Q==6 and alternative==2 and sen_version==2

replace fed=1 if choice_Q==7 and alternative==1 and sen_version==2
replace fed=0 if choice_Q==7 and alternative==2 and sen_version==2

replace fed=0 if choice_Q==8 and alternative==1 and sen_version==2
replace fed=1 if choice_Q==8 and alternative==2 and sen_version==2

// price level for block 1
gen price=0
replace price=100 if choice_Q==1 and alternative==1 and sen_version==1
replace price=50 if choice_Q==1 and alternative==2 and sen_version==1

replace price=100 if choice_Q==2 and alternative==1 and sen_version==1
replace price=50 if choice_Q==2 and alternative==2 and sen_version==1

replace price=0 if choice_Q==3 and alternative==1 and sen_version==1
replace price=150 if choice_Q==3 and alternative==2 and sen_version==1

replace price=0 if choice_Q==4 and alternative==1 and sen_version==1
replace price=150 if choice_Q==4 and alternative==2 and sen_version==1

replace price=150 if choice_Q==5 and alternative==1 and sen_version==1
replace price=100 if choice_Q==5 and alternative==2 and sen_version==1

replace price=50 if choice_Q==6 and alternative==1 and sen_version==1
replace price=0 if choice_Q==6 and alternative==2 and sen_version==1
```

```
replace price=150 if choice_Q==7 and alternative==1 and sen_version==1
replace price=100 if choice_Q==7 and alternative==2 and sen_version==1

replace price=50 if choice_Q==8 and alternative==1 and sen_version==1
replace price=0 if choice_Q==8 and alternative==2 and sen_version==1

// price level for block 2
replace price=0 if choice_Q==1 and alternative==1 and sen_version==2
replace price=150 if choice_Q==1 and alternative==2 and sen_version==2

replace price=0 if choice_Q==2 and alternative==1 and sen_version==2
replace price=150 if choice_Q==2 and alternative==2 and sen_version==2

replace price=100 if choice_Q==3 and alternative==1 and sen_version==2
replace price=50 if choice_Q==3 and alternative==2 and sen_version==2

replace price=100 if choice_Q==4 and alternative==1 and sen_version==2
replace price=50 if choice_Q==4 and alternative==2 and sen_version==2

replace price=150 if choice_Q==5 and alternative==1 and sen_version==2
replace price=100 if choice_Q==5 and alternative==2 and sen_version==2

replace price=50 if choice_Q==6 and alternative==1 and sen_version==2
replace price=0 if choice_Q==6 and alternative==2 and sen_version==2

replace price=150 if choice_Q==7 and alternative==1 and sen_version==2
replace price=100 if choice_Q==7 and alternative==2 and sen_version==2

replace price=50 if choice_Q==8 and alternative==1 and sen_version==2
replace price=0 if choice_Q==8 and alternative==2 and sen_version==2

// nobuy level for block 1 and block 2 (same)
gen nobuy=0
replace nobuy=1 if choice_Q==1 and alternative==3

replace nobuy=1 if choice_Q==2 and alternative==3

replace nobuy=1 if choice_Q==3 and alternative==3

replace nobuy=1 if choice_Q==4 and alternative==3

replace nobuy=1 if choice_Q==5 and alternative==3

replace nobuy=1 if choice_Q==6 and alternative==3

replace nobuy=1 if choice_Q==7 and alternative==3

replace nobuy=1 if choice_Q==8 and alternative==3


// Part 1. Remove any observations that were not answered.

// Added new column "Answer" that has a 1 if choice_Q answered, and 0 if
no answer
```

```
bys id choice_Q: egen answer = sum(choice)
// Drop rows if "answer=0"
drop if answer==0


// Part 2. Create column cset that represents number of questions answered
(/8)
// Create column cset1 that has total options answered (/24)
bys id: egen cset1 = total(answer)
gen cset = cset1

// Go from #options answered (/24) to #questions answered (/8) by dividing
cset1 by 3
replace cset = cset1/3
```

APPENDIX 2B: CODE FOR RANDOM PARAMETERS LOGIT (RPL) MODEL IN NLOGIT

```
RPLOGIT

   ;Lhs=CHOICE; Choices: PRODA, PRODB, NONE;

        ;Fcn= bRAMO(n), bRYMO(n), bRAFO(n), bFED(n),bPRICE(o),nobuy(n)

        ;RPL;Halton;Pts=1000; Pds=CSET;

          ;Checkdata

        ;parameters

        ;Model:U(PRODA,PRODB)=bPRICE*PRICE + bRAMO*RAMO + bRYMO*RYMO +
bRAFO*RAFO + bFED*FED/

                U(NONE)=nobuy; tlf=0.0001; tlb=0.0001; tlg=0.0001$


Matrix

    ;v_hat = part(varb,1,6,1,6)

    ;b_hat= part(b,1,6,1,1)

    $

WALD ; Labels = a1,a2,a3,a4,a5,a6

    ; Start  = b_hat

    ; Var    = v_hat

    ; Fn1    = (a1/a5)

    ; Fn2    = (a2/a5)

    ; Fn3    = (a3/a5)

    ; Fn4    = (a4/a5)

    ; Fn5    = (a6/a5)

    ;KandR; Pts=1000$
```

APPENDIX 2C: CODE FOR LINEAR REGRESSION IN STATA

```
// Generate binary variables for select all that apply questions
// Q9 production types on property
gen q9_1_selected = (q9_1 != .) and (q9_1 != 0)
gen q9_2_selected = (q9_2 != .) and (q9_2 != 0)
gen q9_3_selected = (q9_3 != .) and (q9_3 != 0)
gen q9_4_selected = (q9_4 != .) and (q9_4 != 0)
gen q9_5_selected = (q9_5 != .) and (q9_5 != 0)
gen q9_6_selected = (q9_6 != .) and (q9_6 != 0)
gen q9_7_selected = (q9_7 != .) and (q9_7 != 0)

// Q10 Deer species seen on property
gen q10_1_selected = (q10_1 != .) and (q10_1 != 0)
gen q10_2_selected = (q10_2 != .) and (q10_2 != 0)
gen q10_3_selected = (q10_3 != .) and (q10_3 != 0)
gen q10_4_selected = (q10_4 != .) and (q10_4 != 0)
gen q10_5_selected = (q10_5 != .) and (q10_5 != 0)

// Q11 Who hunted on property
gen q11_1_selected = (q11_1 != .) and (q11_1 != 0)
gen q11_2_selected = (q11_2 != .) and (q11_2 != 0)
gen q11_3_selected = (q11_3 != .) and (q11_3 != 0)
gen q11_4_selected = (q11_4 != .) and (q11_4 != 0)
gen q11_5_selected = (q11_5 != .) and (q11_5 != 0)

// Q12 Deer species harvested on property
gen q12_1_selected = (q12_1 != .) and (q12_1 != 0)
gen q12_2_selected = (q12_2 != .) and (q12_2 != 0)
gen q12_3_selected = (q12_3 != .) and (q12_3 != 0)
gen q12_4_selected = (q12_4 != .) and (q12_4 != 0)
gen q12_5_selected = (q12_5 != .) and (q12_5 != 0)

// Q18 Encountered/harvested CWD+ deer on property
gen q18_1_selected = (q18_1 != .) and (q18_1 != 0)
gen q18_2_selected = (q18_2 != .) and (q18_2 != 0)
gen q18_3_selected = (q18_3 != .) and (q18_3 != 0)
gen q18_4_selected = (q18_4 != .) and (q18_4 != 0)

// Q22 CWD strategies familiar with
gen q22_1_selected = (q22_1 != .) and (q22_1 != 0)
gen q22_2_selected = (q22_2 != .) and (q22_2 != 0)
gen q22_3_selected = (q22_3 != .) and (q22_3 != 0)
gen q22_4_selected = (q22_4 != .) and (q22_4 != 0)
gen q22_5_selected = (q22_5 != .) and (q22_5 != 0)
gen q22_6_selected = (q22_6 != .) and (q22_6 != 0)
gen q22_7_selected = (q22_7 != .) and (q22_7 != 0)

// Q23 CWD strategies carried out on property
gen q23_1_selected = (q23_1 != .) and (q23_1 != 0)
gen q23_2_selected = (q23_2 != .) and (q23_2 != 0)
gen q23_3_selected = (q23_3 != .) and (q23_3 != 0)
gen q23_4_selected = (q23_4 != .) and (q23_4 != 0)
gen q23_5_selected = (q23_5 != .) and (q23_5 != 0)
```

```
gen q23_6_selected = (q23_6 != .) and (q23_6 != 0)
gen q23_7_selected = (q23_7 != .) and (q23_7 != 0)
gen q23_8_selected = (q23_8 != .) and (q23_8 != 0)

// Q27 Two strategies most likely to allow on property
gen q27_1_selected = (q27_1 != .) and (q27_1 != 0)
gen q27_2_selected = (q27_2 != .) and (q27_2 != 0)
gen q27_3_selected = (q27_3 != .) and (q27_3 != 0)
gen q27_4_selected = (q27_4 != .) and (q27_4 != 0)
gen q27_5_selected = (q27_5 != .) and (q27_5 != 0)
gen q27_6_selected = (q27_6 != .) and (q27_6 != 0)

// Q63 Neighbors on either side
gen q63_1_selected = (q63_1 != .) and (q63_1 != 0)
gen q63_2_selected = (q63_2 != .) and (q63_2 != 0)
gen q63_3_selected = (q63_3 != .) and (q63_3 != 0)

// Generate dummy variables for Nominal (Categorial) variables
tabulate q3, generate(q3_)
tabulate q5, generate(q5_)
tabulate q13, generate(q13_)
tabulate q15, generate(q15_)
tabulate q24_1, generate(q24_1_)
tabulate q24_2, generate(q24_2_)
tabulate q24_3, generate(q24_3_)
tabulate q25, generate(q25_)
tabulate q26_1, generate(q26_1_)
tabulate q26_2, generate(q26_2_)
tabulate q26_3, generate(q26_3_)
tabulate q62_1, generate(q62_1_)
tabulate q62_2, generate(q62_2_)
tabulate q65, generate(q65_)
tabulate q66, generate(q66_)
tabulate q67, generate(q67_)
tabulate q68, generate(q68_)
tabulate state, generate(state_)
tabulate strata, generate(strata_)

// Generate variables for western vs. eastern landowners
gen western_landowners = (state_3 == 1) | (state_4 == 1) | (state_6 == 1)
gen eastern_landowners = (state_1 == 1) | (state_2 == 1) | (state_5 ==1)
gen region = .
replace region = 0 if western_landowners == 1
replace region = 1 if eastern_landowners == 1
label define region_lbl 0 "Western" 1 "Eastern"
label values region region_lbl
tabulate region


// Generate variables for high vs. medium vs. low prevalence
gen cwd_prevalence = .
replace cwd_prevalence = 1 if state == "WY" | state == "IL" // High
prevalence
```

```
replace cwd_prevalence = 2 if state == "NE" | state == "MI" // Medium
prevalence
replace cwd_prevalence = 3 if state == "ND" | state == "VA" // Low
prevalence
label define cwd_prevalence 1 "High" 2 "Medium" 3 "Low"
label values cwd_prevalence cwd_prevalence
tabulate cwd_prevalence


// Generate dummy variable for college educated
gen college_educated = .  // Initialize with missing values (".")
replace college_educated = 1 if q67 >= 4 and q67 <= 6
replace college_educated = 0 if q67 >= 1 and q67 <= 3
// Count and drop observations where q67 is missing
count if q67 == .
drop if q67 == .
// Add labels to college_educated
label define college_lbl 0 "No" 1 "Yes"
label values college_educated college_lbl
// Tabulate college_educated with labels
tabulate college_educated
tabulate q67


// Generate dummy variables for people hunting on property(any)
gen hunting_property = .
// Assign 1 to hunting_property if any of the first four options are "1"
replace hunting_property = 1 if q11_1 == 1 | q11_2 == 1 | q11_3 == 1 |
q11_4 == 1
// Assign 0 to hunting_property if the fifth option is "1" (i.e., no
hunting allowed)
replace hunting_property = 0 if q11_5 == 1
// Exclude observations where all five options are missing (.)
replace hunting_property = . if q11_1 == . and q11_2 == . and q11_3 == .
and q11_4 == . and q11_5 == .
count if q11_1 == . and q11_2 == . and q11_3 == . and q11_4 == . and q11_5
== .
drop if q11_1 == . and q11_2 == . and q11_3 == . and q11_4 == . and q11_5
== .
label define hunting_lbl 0 "No" 1 "Yes"
label values hunting_property hunting_lbl
tabulate hunting_property


// Generate variables for Aware CWD (Yes vs. No/Unsure)
gen aware_cwd = .
replace aware_cwd = 1 if q15 == 1
replace aware_cwd = 0 if q15 == 2 | q15 == 3
count if q15 == .
drop if q15 == .
label define aware_cwd_lbl 0 "No/Unsure" 1 "Yes"
label values aware_cwd aware_cwd_lbl
tabulate aware_cwd
```

```
// Generate variables for Income (Less than 50K, 50-100K, 100K-150K,
150K+)
// Generate dummy variable for missing income observations
// Generate the income_cat variable for income categories, including a
category for missing data
gen income_cat = .
replace income_cat = 1 if q68 == 1 | q68 == 2   // Below $49,999
replace income_cat = 2 if q68 == 3              // $50,000 - $99,999
replace income_cat = 3 if q68 == 4              // $100,000 - $149,999
replace income_cat = 4 if q68 == 5 | q68 == 6   // $150,000+
replace income_cat = 5 if q68 == .              // Missing data category
// Label the income_cat variable
label define income_lbl 1 "Below $49,999" 2 "$50,000 - $99,999" 3
"$100,000 - $149,999" 4 "$150,000+" 5 "Missing"
label values income_cat income_lbl
count if q68 == .
// Tabulate income categories including missing data
tabulate income_cat


// Generate variables for Gender (only Male vs. Female)
gen gender = .
replace gender = 1 if q65 == 1  // Male
replace gender = 2 if q65 == 2  // Female
// Remove missing and other categories
drop if q65 == . | q65 == 3  // Exclude Missing or Other gender responses
// Define and label gender categories (Male and Female only)
label define gender_lbl 1 "Male" 2 "Female"
label values gender gender_lbl
// Check the distribution
tabulate gender


// Generate variables for lives within 10 miles big city (Yes vs.
No/Unsure)
gen within_10_miles = .
replace within_10_miles = 1 if q66 == 1  // Yes
replace within_10_miles = 0 if q66 == 2 | q66 == 3  // No
count if q66 == .
drop if q66 == .  // Remove missing data
label define within_miles_lbl 1 "Yes" 0 "No"
label values within_10_miles within_miles_lbl
tabulate within_10_miles


// Generate new variable for hunters (self). Dropping observations if they
didn't answer the whole select all that apply question. Replacing
q11_1_selected variable.
gen hunting_self = .
replace hunting_self = 1 if q11_1 == 1  // Set to 1 if q11_1 is selected
replace hunting_self = 0 if q11_1 == . and (q11_2 != . | q11_3 != . |
q11_4 != . | q11_5 != .)  // Set to 0 if q11_1 is missing but other q11
responses exist
```

```
count if q11_1 == . and q11_2 == . and q11_3 == . and q11_4 == . and q11_5
== .
// Drop observations where all of q11_1 to q11_5 are missing
drop if q11_1 == . and q11_2 == . and q11_3 == . and q11_4 == . and q11_5
== .
label define hunter_lbl 0 "Not Hunter" 1 "Hunter"
label values hunting_self hunter_lbl
tabulate hunting_self


// Generate variable for q64 (age)
gen age_cat = .
replace age_cat = 1 if q64 < 50   // Below 50
replace age_cat = 2 if q64 >= 50  // 50 and above
// Remove observations with missing data in q64
drop if q64 == .   // Exclude missing data
label define age_lbl 1 "Below 50" 2 "50 and above"
label values age_cat age_lbl
tabulate age_cat
summarize q64


// Drop missing observations for q3 (own multiple properties)
count if q3 == .
drop if q3 == .
// Add labels to q3 where 1 = Yes and 2 = No
label define q3_lbl 1 "Yes" 2 "No"
label values q3 q3_lbl
tabulate q3


// q6 (property size acres)
drop if q6 == .
tabulate q6


// Generate variable for q24_1 (allow targeted removals)
gen allow_tr_mgmt = .
replace allow_tr_mgmt = 1 if q24_1 == 1  // Replace with 1 for "Yes"
replace allow_tr_mgmt = 0 if q24_1 == 2  // Replace with 0 for "No"
drop if q24_1 == .  // Exclude missing data
// Tabulate allow_tr_mgmt with labels
tabulate allow_tr_mgmt


// Drop missing observations for q61_1
count if q61_1 == .
drop if q61_1 == .
tabulate q61_1
summarize q61_1


// Drop missing observations for q61_2
count if q61_2 == .
```

```
drop if q61_2 == .
tabulate q61_2
summarize q61_2

// Strata (Positive vs. Adjacent Counties)
label define strata_lbl 0 "Adjacent" 1 "Positive"
label values strata_1 strata_lbl
// Tabulate strata_1 with labels
tabulate strata_1



// Linear Regression
// Remove Adult Males Only (RAMO)
regress wtaramo i.age_cat i.college_educated i.gender i.income_cat q6 q3
i.allow_tr_mgmt aware_cwd q61_1 q61_2 hunting_self hunting_property
i.within_10_miles strata_1 i.cwd_prevalence region, robust
estat ic

// Remove Young Males Only (RYMO)
regress wtarymo i.age_cat i.college_educated i.gender i.income_cat q6 q3
i.allow_tr_mgmt aware_cwd q61_1 q61_2 hunting_self hunting_property
i.within_10_miles strata_1 i.cwd_prevalence region, robust
estat ic

// Remove Adult Females Only (RAFO)
regress wtarafo i.age_cat i.college_educated i.gender i.income_cat q6 q3
i.allow_tr_mgmt aware_cwd q61_1 q61_2 hunting_self hunting_property
i.within_10_miles strata_1 i.cwd_prevalence region, robust
estat ic

// Federal Agent (FED)
regress wtafed i.age_cat i.college_educated i.gender i.income_cat q6 q3
i.allow_tr_mgmt aware_cwd q61_1 q61_2 hunting_self hunting_property
i.within_10_miles strata_1 i.cwd_prevalence region, robust
estat ic

// No Management (NOBUY)
regress wtanobuy i.age_cat i.college_educated i.gender i.income_cat q6 q3
i.allow_tr_mgmt aware_cwd q61_1 q61_2 hunting_self hunting_property
i.within_10_miles strata_1 i.cwd_prevalence region, robust
estat ic
```