



Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Wild Cervid Chronic Wasting Disease Management and Response Activities 2024 Cooperative Agreements

2024 Project Executive Summaries

October 2024

Project Summaries for the Wild Cervid Chronic Wasting Disease Management and Response Activities 2024 Cooperative Agreements

USDA Animal Plant Health and Inspection Service (APHIS) Wildlife Service (WS) awarded \$5.5 million through 29 Cooperative Agreements to 17 State Departments of Wildlife in 15 states, 1 State Department of Agriculture, 10 universities, and 1 Federally recognized Native American Tribal government. These projects will allow recipients to further develop and implement Chronic Wasting Disease (CWD) management, response, and research activities in wild cervids, including surveillance and testing. The Executive Summaries provided by the recipients are below.

State Wildlife Agency Funded Projects
Arkansas Game and Fish Commission's 2024-2025 CWD White-tailed Statewide Surveillance and Monitoring , Arkansas Game and Fish Department (Gray, C.)
<p>Chronic Wasting Disease (CWD) in Arkansas was first detected in spring 2016 and has since been identified in 20 counties in the state in both white-tailed deer and elk populations with over 1,700 positive detections to date. The Arkansas Game and Fish Commission (AGFC) created a CWD Management and Response Plan in 2020 which defines the strategies the agency uses to monitor and manage this disease. Of utmost priority within the plan is the collection of surveillance data. The AGFC's surveillance strategy is directed by three major objectives: 1) monitoring apparent prevalence in known CWD-affected areas, 2) sampling for CWD other areas of the state for early detection purposes, and 3) providing free CWD testing to hunters to maintain public confidence and participation.</p> <p>The AGFC utilized historic surveillance data to develop a quantitative, weighted sampling system that was created in partnership with the USGS National Wildlife Health Center. This weighted sampling system was paired with a multifactorial risk analysis to establish county- specific quotas for CWD surveillance. This surveillance strategy allocates staff time and resources as efficiently as possible while increasing the likelihood of early detection of CWD in new areas. To collect samples to meet county goals, agency staff utilize a variety of sample sources, including operating a network of 100 CWD testing drop-off locations statewide with at least one in every county. In addition, AGFC partners with over 50 taxidermists who collect CWD samples at no charge to the hunter.</p> <p>The AGFC is committed to continuing to offer CWD testing at no charge to the public as the vast majority of CWD samples collected by the agency come from hunter harvested samples. Without adequate surveillance data, the AGFC would not be able to take a proactive approach to CWD management. In addition, providing access to free testing likely helps to maintain hunting participation in CWD positive areas, potentially slowing the rise of CWD prevalence through harvest-based management. However, surveillance costs are high and leave relatively little room in the agency's budget for other management actions to control CWD, such as post-season targeted removal efforts. If funded, this project would cover most of the laboratory fees the agency anticipates incurring in the coming sampling season, allowing the agency to direct resources toward other research and management</p>

actions.

The target audience of this project is the CWD Management Team at the AGFC. Staff will utilize these funds to pay for laboratory testing of samples. The main benefactors of this project will be the hunting public in the state of Arkansas who will continue to receive free CWD testing of any harvested animal. These funds will allow the AGFC to remain proactive in their CWD management efforts and continue to improve the surveillance and management program.

Response to First CWD Detection in California, Enhanced Surveillance and Research, California Department of Fish and Wildlife (Munk, B.)

This project seeks to significantly enhance CWD testing in California's CWD-positive and adjacent hunt zones to determine prevalence and geographic extent of CWD following recent detections in California. We will accomplish this by hiring additional personnel to support and enhance current CWD surveillance efforts, collect environmental samples for rPrP testing, support paired sampling (e.g. RAMALT and ear biopsies) of live captured deer for rPrP testing, and identify areas of high deer densities that overlap with recent or current wildfires. We will couple these efforts with ongoing deer management actions to assess potential environmental prion hot spots as a pilot for assessing potential effects of wildfires on the persistence and infectivity of prions in the environment. The project will deliver enhanced surveillance to determine prevalence and geographic extent of CWD affected zone, a field test of live animal sampling techniques for CWD to provide additive CWD detection data, and pilot data for assessing the effects of wildfire on environmental prions. The target audiences are wildlife managers, environmental prion researchers, hunters, and tribal partners. Data and results may be applicable to tribal co-management partners and other wildlife managers in the southwest. Hunters will benefit from increased information on CWD prevalence and geographic distribution. CWD and prion researchers, both disease ecologists, disease modelers, and environmental chemists will benefit from this work.

Tribal Outreach, Education, and Surveillance Support Following Recently Detected Chronic Wasting Disease in California, California Department of Fish and Wildlife (Munk, B.)

This project addresses the need for more engagement with tribal partners on CWD prevention and management specifically and provides a mechanism for increased cooperation and co-management of our shared natural resources with tribal partners. Specifically, this project will provide comprehensive educational outreach on Chronic Wasting Disease prevention and control among wild cervid stakeholders and Tribal entities in California. We aim to develop and deliver culturally relevant educational materials and programs tailored to the unique needs and preferences of tribal communities, hunters, meat processors, and taxidermists. The project aims to mitigate the impact of CWD on wild cervid populations through a series of targeted activities, including consultation sessions, hands-on training workshops, development of culturally relevant materials, human dimensions research, and evaluation of outreach efforts.

The specific problem this project solves is the lack of culturally appropriate and accessible educational resources for tribal communities and other key stakeholders to effectively prevent and control CWD. The project aims to increase awareness, understanding, and adoption of CWD prevention measures among the target audience, ultimately contributing to the conservation and sustainability of wild cervid populations in California.

Key deliverables include culturally tailored educational materials such as brochures, fact sheets, and posters, multimedia content for distribution via social media and community websites, hands-on training sessions to demonstrate proper CWD sampling techniques, and human dimensions research to better understand tribal perspectives, attitudes, and behaviors related to CWD prevention and control.

The target audience includes tribal leaders, community members, hunters, meat processors, taxidermists, and other stakeholders involved in wild cervid management and conservation efforts. These stakeholders will directly benefit from the project's outcomes by gaining access to culturally relevant educational resources, training opportunities, and research findings that will enhance their capacity to prevent and control CWD in their respective communities.

Improving Surveillance Techniques After the First Positive CWD Detection in IN, Indiana Department of Natural Resources (Benavidez Westrich, M.)

During the '23 – '24 deer hunting season, an adult buck was harvested which tested positive for chronic wasting disease. This marked the first CWD positive deer detected in Indiana. This detection occurred in April 2024, well after the hunting season concluded due to inefficiencies within our CWD Taxidermist Incentive Program process. Due to this delay, the hunter was not notified prior to the deer being consumed; therefore, we failed to offer the hunter the best information for making an informed decision regarding consumption. As the next deer season approaches, we propose to use this first year of being a CWD+ state to streamline our surveillance methods, increase laboratory diagnostic funds, and determine the most effective avenues for securing CWD samples quickly and efficiently thereby offering test results to hunters more quickly.

The proposed work will contribute to our existing CWD surveillance program and allow us to build more efficiency/expand our current taxidermist incentive program. We propose to achieve this by identifying and contracting with a vendor to supply taxidermists and processors with prepaid shipping labels and materials so they can ship collected samples more frequently, purchase and organize a backstock of supplies for partners and DNR staff that is easily accessible statewide and identify a vendor to create engaging training videos for partners and Department of Natural Resource (DNR) staff. In the 2023-2024 surveillance season, DNR staff were driving to each taxidermist across the state semi-regularly to pick up samples. This effort involved a large amount of time spent calling and scheduling and driving to pick up.

Therefore, shipping samples back to DNR allows for more flexibility for the taxidermist/DNR staff and allows samples to get to DNR staff quicker and more regularly. Additionally, when

taxidermist needed more supplies, DNR staff had to travel to them to drop off supplies. Sometimes these supplies were located hours away, therefore, having backstock across the state will help to facilitate quicker restock of supplies for partners. Finally, training videos will help to decrease the need for in-person training, provide the ability to increase the number of partners we can have in the program, and decrease tissue sampling/datasheet errors. These objectives will guide in informing cost-effective sampling strategies for any state that wants to increase CWD surveillance efforts without diminishing sample quality or quantity.

As Indiana navigates being a CWD+ state, DNR is evaluating a budget for the potential of increased surveillance needs. This increase could come from more hunters wanting their deer tested and/or to help inform DNR of spread/prevalence of disease. The increase in diagnostic funding will help offset costs associated with this potential increase in demand for testing and allow Indiana DNR leadership to predict future budget requirements as CWD continues to spread.

Hunters, meat processors, and taxidermists will benefit most from this project. Hunters will benefit the most because they will have the ability to obtain quicker results from their CWD tests. Processors and taxidermists benefit from assisting with surveillance as they receive monetary compensation for sample collections assistance.

A Streamlined Approach to Improve Outreach, Education, and Stakeholder Engagement in Chronic Wasting Disease Surveillance in Kentucky, Kentucky Department of Fish and Wildlife (Casey, C.)

Since Tennessee's detection of CWD <15 km from Kentucky's border in 2021, Kentucky Department of Fish and Wildlife Resources (KDFWR) has intensified its CWD surveillance efforts in western Kentucky. Following the initial detection of CWD within the state in 2023, KDFWR will again be increasing its surveillance efforts in western Kentucky. Furthermore, due to the looming threat of new detections in other high-risk areas of the state, KDFWR has recognized the need to expand its CWD surveillance, education, and outreach efforts in Kentucky's border counties. However, this heightened focus strains the agency's already limited resources, risking long-term sustainability and staff burnout. Compounding the issue, frequent changes in annual surveillance goals, mandatory check requirements, voluntary freezer locations, and communication materials have led to confusion among hunters, subsequently reducing compliance and the number of samples collected.

This project aims to rectify these challenges by expanding Kentucky's voluntary self-service surveillance programs through two key initiatives 1) Expanding a "DIY" mail-in CWD sampling kits program for hunters to increase CWD surveillance across Kentucky and 2) Developing a complementary CWD mobile app offering statewide and region-specific information concerning CWD in Kentucky to promote stakeholder engagement in CWD surveillance and management.

Implementing these initiatives not only aims to alleviate staff burden and mitigate burnout,

but also actively engages stakeholders, thereby enhancing surveillance efforts. Furthermore, these initiatives will address the logistical, infrastructural, and communications challenges prevalent in rural regions of the state, particularly those at risk for a CWD detection. By tackling these issues head-on, the project lays the groundwork for more effective future management activities.

The primary beneficiaries of these initiatives will be Kentucky hunters as they will gain access to an expanded voluntary self-service CWD surveillance program, improving access to CWD testing and fostering a better understanding of the sample collection processes. Additionally, the complementary CWD mobile app will provide hunters with efficient on- or offline access to the latest information on CWD in Kentucky, including regulations, sampling programs and locations, test results, and more. Empowered with this knowledge, hunters will be better equipped to make informed decisions, contributing to the prevention of the spread of CWD within the state.

KDFWR stands to benefit from these initiatives as well, through increased hunter engagement and sampling capacity. Furthermore, the adoption of more efficient and cost-effective communication methods, alongside reduced staff burnout, will further bolster the agency's capacity to address the challenges posed by CWD effectively.

Increasing CWD Surveillance in Louisiana, Louisiana Department of Wildlife and Fisheries (Duguay, J.)

Louisiana conducts CWD surveillance based on a weighted risk assessment model. Due to continued detections within Louisiana's existing CWD Control Area, there is increased focus on surveillance in close proximity to existing detections. However, this is not unique to positives detected in Louisiana. Positive detections 7 miles north of the Louisiana / Arkansas boundary in Union County, Arkansas, warrants increased surveillance within Union and Morehouse Parishes, adjacent to the Arkansas detections. Similarly, a detection in Harrison County, Mississippi in 2023 adds a heightened risk assessment for Washington and St. Tammany Parishes in Southeast Louisiana. In response to the nearby detections, surveillance numbers will be increased in advance of the 2024 Louisiana deer season. This will require additional surveillance costs in the form of staff hours and increased diagnostic costs. Louisiana would like to pursue two seasonal biologists employed by the agency during the 5-month CWD sampling season. The assigned staff will focus on surveillance efforts in Southeast and Northeast Louisiana due to the emerging threat of CWD within current areas of detection across state lines. The seasonal staff assigned to the project will work solely on surveillance in the form of CWD sampling, sample data entry, and preparation of samples for laboratory submission. They will increase the capacity for statewide surveillance and response by focusing on the priority areas mentioned. This in turn will allow current staff to focus on all areas of the state without increased time in the priority areas mentioned. Without the additional staff, existing staff effort will be diluted in some portions of the state due to increased focus in disease emergence areas. The seasonal staff added will improve the agencies CWD management efforts both inside and outside of existing areas of detection due to the extensive field work involved in collecting

samples from hunters, processors, taxidermists, CWD drop-off coolers, and LDWF WMA hunter check stations. Louisiana also would like to pursue funding to help cover the laboratory costs of CWD testing for hunter-harvested deer as well as any target deer (those exhibiting symptoms consistent with CWD) harvested.

Improving CWD Surveillance and Stakeholder Outreach in Nevada, Nevada Department of Wildlife (LaHue, N.)

CWD has not been detected in Nevada. However, it is at significant risk due to increased detections in neighboring states, most notably the recent detection near Bishop, California, only 25 miles from the border with Nevada. Historically there has been little surveillance in this area due to a perceived lower risk (than eastern Nevada), low numbers of tags, and low hunter participation. The two main ways that CWD may be introduced to Nevada (or if present, moved around Nevada) are through the movement of migrating deer and elk and the importation of infected material by hunters harvesting animals in CWD affected areas. To prevent introduction via infected materials, in 2019 the Nevada legislature passed Senate Bill 85, which limits the importation of the most likely sources of contamination from the carcasses of cervids. Despite the passing of Senate Bill 85 and a large effort to disseminate CWD information to the public, anecdotal reports suggest people are still moving illegal parts and surveillance numbers are low. While a hunter participation rate of around 4-6% of harvested deer sampled is good compared to other states, it is inadequate to detect CWD across the state at a low prevalence, due to the low number of tags issued in Nevada. To improve participation, we need more outreach and education. This is especially true in the border area, to understand if CWD has reached Nevada and if so, prevent its movement within the state. To accomplish this the Nevada Department of Agriculture has issued a quarantine affecting a large portion of the central west portion of the state (figure 1). Within this transport restriction zone (TRZ) hunters must abide by the rules set forward in Senate Bill 85 and will be required to submit a CWD sample for testing if they harvest a deer in this area.

The objectives outlined in this grant serve to help ensure that both within TRZ mandatory sampling and voluntary sampling in the rest of the state is successful, meaning that we reach our goal to better detect CWD if it is present in Nevada. They also serve to make sure that hunters, and those passing through Nevada abide by the transport restrictions set forward in the Quarantine order and Senate Bill 85. This is vital to keeping Nevada CWD free, and if present in the Quarantine area, prevent its movement to other parts of the state. To accomplish this requires a significant investment in both costs and manpower.

Nevada Department of Wildlife (NDOW) does not currently have sufficient capacity to enact these objectives alone and we are asking USDA APHIS for funding to be able to meet our objectives and work towards the shared goal of limiting CWD spread and prevalence across the US. We expect the objectives of this project will significantly improve CWD prevention efforts across the state and along borders, if detected vastly improve future CWD management for the benefit of hunters and the public and improve stakeholder understanding of CWD regulations and increase cooperation with

these regulations.

Implementing Risk-based Surveillance for Chronic Wasting Disease in New Jersey, New Jersey Department of Environmental Protection, Fish & Wildlife (Connelly, P.)

Chronic Wasting Disease (CWD) poses a serious threat to wild white-tailed deer in New Jersey. CWD is not known to be present in New Jersey and has never been detected during over fifteen years of surveillance. Introduction and establishment of CWD in New Jersey would have serious economic, ecological, and social implications. This project fills gaps in our surveillance program so that can be better equipped for early detection of CWD and provides increased opportunities for New Jersey hunters to be engaged in local CWD management and feel confident that they are consuming prion-free meat in accordance with CDC guidelines.

CWD surveillance in NJ contains both active and syndromic components. However, active surveillance via hunter-harvested samples has tended to focus on utilizing processor and butcher facilities with longstanding relationships with New Jersey Fish and Wildlife (NJFW). As a result, NJFW CWD surveillance data has historically been clustered, with oversampled units around high volume partner processors – leaving some management units under-sampled. Furthermore, NJFW lacks a clear protocol defining where CWD surveillance should be prioritized in the state, and accompanying quotas for all management units. Other agencies have demonstrated the clear benefits of utilizing a risk-weighted approach, particularly in utilizing experts from the Surveillance Optimization Project for Chronic Wasting Disease (SOP4CWD) to help us make the transition to an annual data-guided sampling effort. This funding will go towards a consulting agreement with SOP4CWD to inform our future surveillance efforts towards greater likelihood for early detection in our state. NJFW does not have the modelling and machine learning staff to complete such an effort, and we look forward to working with expert partners.

We recognize CWD as a threat to public trust, but currently lack programs to allow residents to make an informed decision when consuming New Jersey produced wild venison. While we are a CWD-free state, many New Jerseyans still would like to test their harvests for CWD – a sentiment we agree with and would like to encourage. This money will fund a pilot program where we provide three wild deer head drop-off stations (electric freezers) across the state (one within each state region). The success of this 1-year effort will guide our decision- making on whether to expand this program to more locations around the state.

Finally, based on our population estimates, our surveillance quota should be increased to a minimum of 1,250 animals. We anticipate our proposed hunter drop-off program will increase our totals. Through new programs for direct hunter submissions and enhanced outreach with processors and butchers in regions infrequently pursued for CWD testing, we seek to increase our sample size to meet this quota. Requested funds for this objective will be utilized to cover the costs associated with testing ~500 additional deer than is typical this upcoming sampling season.

Together, we intend these efforts to culminate in better prevention for CWD incursion into New Jersey.

CWD Outreach: Cultivating Long-term Engagement with a Long-term Issue, North Dakota Game and Fis Department (Bahnson, C.)

The success of CWD management depends on the degree to which new behaviors are adopted. Regulations are used to motivate such changes, but compliance can vary considerably. The purpose of this project is to sustain efforts initiated from a previous cooperative agreement (APP-20010), deliver a marketing package to a new region of North Dakota, and test different approaches to foster engagement.

To date, CWD has only been documented in the western half of North Dakota. Outside of this area, the public has had little exposure to the issue of CWD, much less the management tools aimed at combating CWD, such as baiting restrictions, transportation requirements, and CWD-focused harvest management. One measure of engagement is participation in voluntary hunter surveillance programs. Hunters can drop off heads at collection sites across the region, bring them to a district office, or request a mail-in self-sampling kit. Participation has historically been low, especially in areas where CWD has not been detected.

Last year marked the first of a four-year rotational plan in which surveillance is focused on one quarter of the state. A previous cooperative agreement (APP-20010) funded a comprehensive, two-tiered outreach campaign that delivered general content statewide, as well as focused messaging to hunters in the southeast portion of the state. The rate of participation in the voluntary surveillance program rose from approximately 6% in 2019 to 12% in 2023. This suggests the outreach campaign improved engagement among hunters. Ultimately, compliance and support for risk-mitigating management tools has likely increased because of these efforts. However, there is a need to sustain messaging efforts to engrain lasting change. Furthermore, there are still many opportunities for improvement. For example, participation rates among archery and landowner license holders remain extremely low.

Interest in CWD tends to wane as the issue becomes normalized (Vaske and Miller 2018; Erickson et al. 2019). Therefore, a sustained, multi-year outreach campaign is required to inculcate a concern for CWD into the larger hunting culture in an enduring way. This project will deliver messaging statewide while also providing specialized outreach to the northeast portion of the state where surveillance will be focused in 2024. Although CWD has not yet been found in this area, recent detections nearby in Manitoba and Minnesota indicate the disease is imminent and there is an urgent need for hunters to engage with the issue. Importantly, major cities in these areas serve as a regional hub, meaning outreach efforts will extend to northwest Minnesota and southern Manitoba.

In 2019, approximately 3.6% of successful hunters from the Northeast participated in voluntary CWD surveillance. In addition to incorporating lessons learned from APP-

20010, we will test the effectiveness of preemptively sending self-sampling kits to a subset of hunters.

**Oregon Chronic Wasting Disease Prevention, Surveillance, and Management Program
FY2024, Oregon Department of Fish and Wildlife (Gilllin, C.)**

The proposed project aim is to increase the state of Oregon's capacity of preventative agency actions to avoid incursion of CWD into Oregon through three key objectives funded under this grant opportunity. The focus of this effort involves foremost, increasing and providing a robust educational and outreach program and significantly ramping up capacity for CWD detection and response through increased sample collection and increased sample size related to surveillance and implementing an active carcass management and parts disposal program as part of this effort.

Oregon's need to increase capacity for the prevention and control of CWD is supported in the planned start-up of a new CWD National Animal Health Laboratory Network (NAHLN) testing facility at Oregon state University Veterinary Diagnostic Laboratory for rapid response and better containment and control. This effort was developed in previous USDA CWD funding opportunities. Improved carcass collection and disposal will facilitate disease management actions and education and outreach will align the knowledge of the public and stakeholders with agency management actions. The objectives of this grant proposal include:

- 1) Develop and implement educational outreach materials and programs for wild cervid stakeholders including hunters, news media, and general public.
- 2) Surveillance for early detection and prevention of CWD in Oregon wild cervids, prior to incursion of the disease into Oregon cervid populations, by increasing sample collection and intensity statewide and in priority zones adjacent to infected areas/states (i.e. Idaho, California).
- 3) Prevent and control the spread of CWD by implementing Association of Fish and Wildlife Agencies (AFWA) Best Management Practices utilize efficient and biosecure wild cervid carcass and waste management.

Developing an Optimal Mitigation Strategy for Chronic Wasting Disease in Columbia White-tailed Deer, Oregon Department of Fish and Wildlife (Gilllin, C.)

The Columbian White-tailed Deer (WTD), the westernmost subspecies of WTD, is of conservation concern because it survives in only two small, isolated populations, one in the Columbia River Valley (OR and WA), which is listed as Threatened under the ESA, and another in Douglas County (OR), delisted due to recovery. With the recent detection of CWD in Idaho counties bordering Oregon, those responsible for management of these small herds must immediately consider actions to mitigate the establishment and spread of CWD within these populations. Given that a commonly employed management action to combat CWD is reducing the host density, an action inherently opposed to the goal of increasing threatened species numbers, methods to evaluate the efficacy of available management actions must

be developed. Furthermore, we have determined that the Columbian WTD is likely to be the WTD taxon most genetically vulnerable to CWD. Among WTD, two protein-altering mutations in the prion gene *PRNP* are less common in CWD-positive than in negative deer. In most WTD population, a large proportion of deer (30%-45%) carry at least one copy of an advantageous mutation. By contrast, among Columbian white-tailed deer (N = 50) advantageous mutations have not been detected.

We seek APHIS support to develop a system dynamics model capable of simulating potential management actions forward in time to determine the optimal strategies that lead to the lowest risk of introduction and the largest reduction in spread of CWD, while maintaining or increasing the abundance of Columbian WTD. We seek to expand genetics research on Columbian WTD, proposing to sequence *PRNP* from the under-sampled Columbian River Valley population, from additional Douglas County deer, and from the more common and nearby northwestern WTD subspecies found in eastern Oregon. We will examine genetic vulnerability to CWD among black-tailed deer and elk sympatric with the two Columbian WTD populations. Modeling studies will incorporate genetics data, including the three species of sympatric deer to develop optimal CWD mitigation strategies for the Columbian-white tailed deer that limit the potential spread and impact of CWD among them. The systems model will account for the interactions between host, disease, and social dynamics. Specifically, the model will incorporate the genetics study data to account for the genetic vulnerability of this taxon as well as consequences of genetics in all modelled species, the potential for interspecies transmission in a multi-host system, the specific management options available to ODFW, and other factors that could impact the spread of CWD in this extremely vulnerable subspecies (e.g., potential increase in elk should CWD be detected and hunter participation drop). The resulting system model will provide a valuable tool for other situations in which multiple overlapping species are exposed to CWD, including cases where one species may be in decline or of conservation concern.

CWD in Florida – Apparent Early Detection Affords Unique Surveillance and Management Opportunities, The Florida Fish and Wildlife Conservation Commission (Kelly, J.)

The Florida Fish and Wildlife Conservation Commission (FWC) has conducted annual surveillance of wild white-tailed deer since 2002. However, sampling prior to 2022-23 was largely passive surveillance and convenience sampling. In fiscal year (FY) 2022-23, FWC, in collaboration with the Cornell Wildlife Health Lab, implemented a weighted, risk-based surveillance strategy which called for an overall increase in the number of samples collected statewide annually and to shift sampling efforts towards counties with a greater risk of having CWD based on known hazards.

By June of 2023, FWC detected CWD in Holmes County in the Panhandle of Florida with only a slightly above-average number of samples collected in Holmes County that year.

As part of our emergency response (among a litany of other items) in FY 2023-24, FWC established an enhanced surveillance zone (ESZ) consisting of Holmes, Jackson, and

Washington Counties (all FL counties intersected by a 15-mile buffer of the index positive). FWC set surveillance quotas of 600 points for each county within the ESZ which, with 95% confidence, would yield at least one detection if the prevalence of CWD was $\geq 0.5\%$ in any of these counties. Outside of the ESZ, FWC once again used the risk-based strategy to set county quotas.

By the end of FY 2023-24, FWC did not have another detection despite exceeding quotas in Holmes and Jackson Counties (735 and 1085.5 points, respectively), achieving 76% of its quota in Washington County (457.5 points), and meeting or exceeding 49 of 67 county quotas statewide.

This apparent early detection of CWD is a best-case scenario for a successful response. However, it is paramount for FWC to press on and intensify targeted surveillance efforts in the ESZ for FY 2024-25. Furthermore, given the uncertainty around the origin of the CWD focus in Holmes County, it is critical for FWC to meet all county quotas outside of the ESZ in 2024-25 to maximize the likelihood of detecting CWD should it already exist in Florida outside of the ESZ.

Given the apparent low prevalence and limited distribution, the timely implementation of management actions may slow the spread and keep the prevalence at a low level. However, without accurate knowledge regarding the distribution and prevalence of the disease in FL, these management actions may be ineffective. Further, given the proximity of Florida's CWD positive to the state border (just over 6 miles), our neighboring states, Alabama and Georgia, are depending on Florida to accurately characterize the outbreak.

Increasing Chronic Wasting Disease Sample Size and Quality among Utah's Sportsmen and Wildlife Professionals – Part 2, Utah Division of Wildlife Resources (Stout, V.)

Submission of CWD samples for testing through Utah's hunter harvest program is low, and this severely impedes Utah Division of Wildlife Resources' ability to track CWD spread even in the presence of robust spatial predictions. We propose investigating strategies to increase CWD sample submissions in an effort to strengthen the monitoring program in ways that can be sustained through time. We plan to approach this investigation in two ways: (1) a human dimensions approach aimed at gathering perspectives from hunters through surveys; and (2) a boots-on-the-ground experiment to determine how many additional samples could be gained with how much additional effort in priority areas for CWD sampling.

Under the human dimensions approach, we will use the results of a preliminary survey conducted in FY2023 to inform a more targeted follow-up investigation to identify strategies for increasing sampling that would have support in the hunter community.

Under the connectivity modeling approach, we will generate a map of how hunter residences and hunt occurrences are connected across the state. This will give us a sense of where particularly risky hunter communities reside (to improve targeted outreach) and will help us identify potential roads that connect hunts in CWD-positive areas with hunter

residences in CWD-negative areas. Those roads will give us clear guidance about where to place potential CWD check stations.

This project will also deliver additional samples of CWD for two Utah regions in FY2024. More importantly, it will deliver a clear assessment of how many samples we might expect to obtain through the effort of two hired technicians during the sampling season. The human dimensions component of this project will provide information about hunter awareness and attitudes toward CWD, along with ideas about how to improve sampling rates while minimizing challenges and obstacles to sample submission for hunters. Ultimately the results of this project will help inform UDWR strategy regarding costs and effort allocations associated with CWD sampling in the future. As such, the project will directly benefit UDWR's wildlife veterinarian and state wildlife biologists in their response planning to CWD; it will benefit the sportsmen communities and broader public by helping protect Utah's statewide cervid population. The project will benefit game farm owners and operators by providing stronger information about CWD prevalence near their facilities.

The objectives will be achieved in collaboration with Utah State University, and prioritization of locations for more intensive sampling will draw from a past spatially modeling effort that predicts CWD prevalence through time around the Utah CWD foci. Thus, this project leverages over \$230,000 of previous support to further improve statewide CWD surveillance in Utah.

Expansion of CWD Surveillance and Carcass Disposal Strategies in Virginia, Virginia Department of Wildlife Resources (Petruskie, L.)

CWD management and control is listed as one of the top five priorities of the Virginia Department of Wildlife Resources (DWR). In addition to enacting various administrative and regulatory measures to control the spread of the disease over the last decade, including establishing a carcass importation ban, prohibiting the use of natural deer lures and scents, and liberalizing hunting opportunities in Disease Management Areas (DMAs), DWR continues to strive to improve its CWD surveillance and carcass disposal strategies.

Virginia detected CWD in Tazewell County this past year, 62 miles from the next nearest CWD detection, leading to the establishment of a new DMA in southwest Virginia. The hiring of five technicians dedicated to CWD surveillance and data management will allow DWR to more efficiently carry out the increased surveillance that we hope to achieve over the next year, especially in southwest Virginia. Additionally, it will facilitate more timely access to real-time CWD data, thereby enabling DWR to more rapidly implement activities to manage and/or control the spread of CWD in affected deer populations.

Increased surveillance and establishment of new regulations in southwest Virginia will require communication between the Virginia DWR, the public, meat processors, and taxidermists to ensure success. First and foremost, DWR plans to increase outreach efforts to these counties through the use of email, social media, and in-person public meetings. DWR will also work to expand its taxidermist and meat processor cooperator program to maximize surveillance

efficiency. DWR works with cooperating taxidermists to prioritize sampling of older male deer, which is the sex and age class most likely to be infected with CWD. This surveillance strategy has resulted in detecting the first CWD case in six counties, including the recent Tazewell case. Detection of the disease in an area with low prevalence allows DWR the best opportunity to utilize the 2021 – 2025 DWR CWD Management Plan to develop and implement effective management actions. The use of USDA funds to expand and continue this targeted, taxidermist assisted CWD surveillance program will allow DWR to maximize the efficiency and precision of its statewide CWD surveillance strategy.

Procurement and set up of additional dumpsters that will be accessible to the public is proposed because proper carcass disposal is a continuing challenge for hunters in areas with strict carcass transport regulations. Access to landfills for disposal of deer carcasses is limited in certain parts of Virginia. Providing more opportunities for hunters to dispose of deer in DMAs allows them to follow best management practices for carcass disposal as described in the Association of Fish and Wildlife Agencies (AFWA) Best Management Practices (BMPs) for Prevention, Surveillance, and Management of CWD.

This proposal demonstrates a commitment by DWR to improve CWD surveillance and management, to detect CWD at a low prevalence by optimizing the efficiency and sensitivity of Virginia's CWD surveillance strategy, and to adhere to the AFWA CWD BMPs for carcass disposal.

Tools for Coordination: Developing an Approach to the Human Dimensions of CWD Across State and National Boundaries, Washington Department of Fish and Wildlife (DeVivo, M.)

CWD threatens diverse native cervid populations across North America, negatively impacts vibrant hunting and outdoor recreation culture, and weakens wildlife agency capacity to support hunting and conservation. CWD management is challenging not just because of the characteristics of the disease, but also due to varying levels of public knowledge, agency trust, and compliance with managers. These human dimensions have been major impediments to effective CWD management, but they remain poorly understood and are rarely coordinated across jurisdictions despite the frequent movement of hunters across borders. In the North American West, states and provinces respond to and manage diverse constituencies while dealing with ever-changing CWD futures. While in some jurisdictions CWD has been established for a number of years, others have only recently had positive detections, whereas others have not yet detected the disease but are bordered by CWD-positive locations.

To effectively conduct CWD management and outreach, it is necessary to coordinate human dimensions research, education, and outreach across states and provinces. Here we build on a previous USDA APHIS-supported project surveying hunters in Washington State. In this proposal, we will create a standardized, easy to deploy, and readily interpretable survey that will initiate a longitudinal study of the human dimensions of CWD across multiple jurisdictions. Furthermore, the results can inform and help coordinate

management and outreach across the states and provinces of the North American West.

Our research consists of four phases. First, we will establish a collaborative process across agencies through an initial workshop and a subsequent regular working group to identify needs and coordinate research goals. The knowledge gained from this process will be used to inform the second phase, a quantitative master survey. The survey will provide the foundation for a multi-year longitudinal study and will evaluate issues such as resident hunter knowledge and perceptions of CWD, support for management strategies, agency trust, and avenues for education and outreach. Thirdly, we will develop a decision tree to guide survey deployment across jurisdictions so that agencies may address different requirements and easily select optional survey elements relevant to their specific needs. In our fourth objective, we will conduct a literature review of COVID-19 communication research to inform the survey questions regarding education and outreach and build on the crucial lessons of the pandemic.

By coordinating human dimensions research across jurisdictions in the West, we will not only improve our understanding of effective CWD management, but also allow for a cost-effective process, ensuring each state and province does not need to develop and implement its own research program from the ground up. The tools we will create will be adaptable over space and time, allowing for targeted adaptation of education and outreach interventions. All tools will be made available to partnering states and provinces, as well as to any other states and provinces who may request them. Ultimately this project offers an effective, cross-jurisdictional method to help meet Funding Priority 5 and is poised to be impactful in the near-term and in the future.

Deepening Partnerships and Maintaining Resources: Reducing CWD Transmission Risks by Supporting Proper Carcass Disposal, Wisconsin Department of Natural Resources (Larson, E.)

Chronic wasting disease (CWD) was first detected in Wisconsin in 2002 from three white-tailed deer harvested during the 2001 deer hunting season. The 2018 deer hunting season was the first year that more than 1,000 CWD-positive wild deer were detected statewide, and the positive detections continue to increase. In 2018, the Department of Natural Resources (DNR) initiated the Adopt-a-Dumpster (AAD) program. The main goal of the AAD program is to provide hunters an option for appropriate deer carcass waste disposal, especially in areas where carcass disposal options are very limited or not already available. In addition to the AAD program the DNR started hosting dumpsters in 2019. See Table 1 for the totals of these types of dumpsters.

Table 1.

Hunting Season	AAD Participants	AAD w/ Cost-Share Option	DNR- Hosted	Total Dumpsters
2018	16	NA	NA	16
2019	61	38	32	93
2020	52	48	37	89
2021	64	57	43	107
2022	69	62	48	117
2023	77	69	45	131

The first year of the cost-share option was 2019, where the DNR reimbursed 50% of the total cost of a dumpster, up to \$500, for up to two dumpsters in select counties. In 2020, cost-share expanded to all 72 counties in the state. Hunters appreciated having more deer carcass waste disposal options statewide, but the financial burden associated with hosting a dumpster was limiting where and how long dumpsters could be available. For the 2021 deer hunting season, DNR increased the reimbursement amount for each AAD cost-share dumpster and the number of AAD cost-share dumpsters allowed per county to three. The AAD partner and DNR shared the cost of the dumpster, 50:50 for the first \$1,000, and then the DNR reimbursed the entire remaining cost above \$1,000. The maximum amount of \$500 was reasonable and much appreciated by the partners. To continue to improve efficiencies in 2022 the cost-share program was modified to eliminate the need for reimbursement. With this change, AAD cost-share partners contribute \$500 before placement, and they coordinate with the haulers and landfills/transfers stations for all invoices to be sent directly to local Wildlife Management (WM) staff for payment by DNR. In 2024 the DNR will continue to investigate ways to improve efficiencies with the process overall. It is still a priority to have a DNR-hosted dumpster in counties that do not have an AAD or other proper deer carcass waste disposal option. As a result, this request is for \$200,000 to provide funding for deer carcass waste disposal dumpsters.

Providing proper carcass disposal options statewide is part of Wisconsin's current CWD Response Plan. Carcass disposal is in the Prevention and Management sections of the Association of Fish and Wildlife Agencies (AFWA) Best Management Practices for Prevention, Surveillance, and Management of Chronic Wasting Disease, is a direct action in priority 1 (Improve the management of CWD-affected wild cervid populations), and in priority 2 (Improve the management of wild cervid CWD-affected areas) of this Funding Opportunity Announcement.

Next-generation CWD Management: Realizing the Possibilities of RT-QuIC Integration in Wildlife Agencies for Gaining Ground Over the Growing CWD Epizootic, Wyoming Game and Fish Commission (Allen, S.)

The State of Wyoming has detected a high prevalence of CWD in some elk and deer. With the Project herd mule deer currently having a 5-year average CWD prevalence of 65% in adult males, and the Iron Mountain elk herd with a 5-year average prevalence of 10.2% in adult animals. In general, the state of Wyoming is one of the top-five states for CWD prevalence and therefore, has some potential obligations to developing understanding of CWD disease proliferation, management, and dynamics.

This project aims to use RT-QuIC to test various biological samples from cervid species in the state of Wyoming. Overarching goals of this project include 1) Building RT-QuIC capacity in the Wyoming Game and Fish Department (WGFD), 2) using RT-QuIC to test ante-mortem tissues, with a current focus on ear notches, but also blood, feces, urine and nasal swabs in elk and deer, and 3) the creation of educational material for how other interested parties may adapt RT-QuIC to fit into their agency. Direct integration of these results could lead to the improved monitoring, understanding, and lab capacity for the research of prion kinetics in Wyoming and other similar agencies.

To achieve these goals, the aforementioned tissues have been collected through various efforts throughout the state and have been obtained and stored for research purposes. There is sufficient literature on the detection of CWD in these different tissues, each requiring different processing for optimized sensitivity and each with their own challenges for prion detection with RT-QuIC. From these collected samples, we aim to optimize procedures for selected tissues by using modified, and foundationally sound protocols that include iron-oxide magnetic bead extractions (IOME), sodium-iodide substitutions, and refinement of sodium dodecyl sulfate (SDS) concentrations. Data from RT-QuIC results will be analyzed using the MARS software, which comes with the BMG FLUOstar plate reader, to obtain fluorescent curves, thresholds, and amyloid formation rates commonly seen in prion literature to represent RT-QuIC results. Results will be graphically analyzed with MARS and optimized protocols will be used to test ante-mortem and post-mortem tissues for the development of CWD research and to further understanding of how RT-QuIC could inform management decisions. After this, outreach and educational materials will be created that outline set-up, potential uses, justifications, and methods to measure the effect of RT-QuIC detection on CWD management compared to current measures.

Funding of this project will result in enhancement of Wyoming's research and laboratory capacity for bettering CWD detection, research ability, and surveillance efforts, while also increasing awareness of the potential benefits RT-QuIC can bring to management agencies and building strong collaborations between researchers and wildlife managers.

State Agricultural Agency Funded Project

Ohio: Increasing Testing Capacity for CWD Testing in Wild Cervids, Ohio Department of Agriculture (Peña, D.)

The prevalence of CWD in Ohio's free-ranging deer population is increasing. This trend poses a significant threat to our cervid industry, which is a cornerstone of Ohio's agriculture and economy. To address this problem, Ohio Animal Disease Diagnostic Laboratory (OADDL), in collaboration with Ohio Department of Natural Resources (ODNR), aims to enhance disease surveillance capabilities.

To do this, the project will focus on expanding testing capacity by 1) acquiring advanced equipment, 2) evaluating efficiency of protocol and new equipment, and 3) supporting laboratory staff by adding a new laboratory technician to the team as well as providing epidemiological support for our disease surveillance efforts.

A key enhancement will be done to the implementation of liquid handlers- machines that automate manual processes, streamlining routine pipetting tasks. Liquid handlers reduce physical strain on analysts and improve reproducibility due to their consistent tip immersion depths, controlled pipetting speeds, and precise tip positioning in wells. Currently, OADDL uses the non-structural protein (NSP) for the purification step in the CWD ELISA protocol, but the multiple limitations experienced with this equipment decrease the efficiency and cost effectiveness of the protocol. This project aims to verify a new equipment that addresses those limitations.

The primary beneficiaries of this project are: 1) government agencies responsible for wildlife management such as ODNR, 2) deer hunters as they support regulations and requirements designed to maintain a healthy deer population ensuring sustainable hunting practices, and 3) general public, contributing to ecological balance and economic stability.

For OADDL, this project is expected to yield quantifiable savings in testing costs through automation and efficiency improvements. The veterinary laboratory community will gain valuable insights from OADDL's implementation of liquid handling automation, with findings shared through conferences and publications. Enhanced testing capacity will significantly improve the ability to detect and manage CWD in wild deer, protecting Ohio's cervid industry. This project will enable OADDL to maintain and enhance its critical role in CWD surveillance, supporting ODNR's efforts in monitoring and managing wild deer population. Overall, this project is essential for mitigating the risks posed by CWD, safeguarding Ohio's cervid populations, ensuring the sustainability of this vital industry.

University Funded Projects

CWD Risk in Wild Cervids: Expanding Surveillance Strategies to All Susceptible North American Species, Cornell University (Schuler, K.)

Large-scale infectious disease outbreaks require collaborations across management agencies but are challenging if not impossible when data are not standardized or shared (Brandell et al. 2022). Despite the obvious need to work across boundaries to surveil for CWD, practical limitations to the collection of specimens in the study of wildlife health are numerous (Ryser- Degiorgis 2013; Booth et al. 2023). This agreement will augment the technological infrastructure of surveillance CWD in free-ranging wildlife and promote regional collaboration so wildlife agencies can detect disease sooner,

respond more quickly to manage an outbreak, and perhaps stop the spread of CWD while the infection is still tractable (Thompson et al. 2024).

We will leverage previously existing partnerships and data use agreements through the Surveillance Optimization Project for Chronic Wasting Disease (SOP4CWD) project (CWHL 2024) with 26 US state, 2 Canadian provincial, and 1 Tribal Nation wildlife agencies to expand technological surveillance infrastructure to accommodate state, provincial, and tribal wildlife agencies in western North America. We will help western agencies organize their CWD testing data for inclusion in the Warehouse (*Obj. 1*), elicit expert opinion to identify risk factors for CWD emergence and spread that are unique to western North America (*Obj. 2*), and expand previously existing models on CWD sampling and epidemiology to incorporate sympatric species inhabiting western North America (*Obj. 3*).

Partnerships and collaborations needed to complete *Objs. 1-2* require the involvement of the Western Association of Fish and Wildlife Agencies (WAFWA) wildlife health coordinator (Thompson), who is in the position to contact and coordinate the involvement of additional WAFWA agencies. Deliverables of *Obj. 3* are achievable with the Principal Investigators (PIs) listed on this proposal, as they include the original SOP4CWD team.

This project is the direct request of the target audience (wildlife agencies in the western U.S.) who have asked for these tools as a practical solution to the problems of expense and management that CWD surveillance poses in their home states. Project outcomes will promote the health of cervid herds, improve targeted surveillance of CWD, conserve limited wildlife agency resources, and aid in regional efforts to manage the shared threat of CWD.

Chasing the Deer Denominator: Establishing a Standardized White-tailed Deer Abundance Estimator for Chronic Wasting Disease Treatment Areas, Michigan State University
(Christensen, S.)

The ability to effectively remove deer is foundational to chronic wasting disease (CWD) management. Reducing white-tailed deer density is recommended in CWD infected areas to reduce potential transmission and spread of disease (Association of Fish and Wildlife Agencies 2018). In localized areas where CWD has been newly detected (hotspots) and apparent prevalence is assumed low, targeted hunter harvest and culling is often employed to remove additional infected animals and reduce deer densities. However, assuming additive mortality alone will reduce future deer abundance fails to recognize the impending inverse density-dependent response in reproduction and recruitment as deer populations are reduced. However, our ability to assess the effectiveness of removal operations is limited by challenges in estimating deer abundance, both pre- and post-treatment. Thus, a reliable and easily repeated population estimator is required to evaluate desired CWD mitigation and management goals, including understanding whether targeted removals are having desired effects to reduce deer density. Furthermore, it is essential that density estimators are rigorous yet easily implemented by practitioners.

Although there are numerous techniques available for estimating abundance of deer, obtaining density estimates with levels of precision effective for management (~20%) can be difficult to achieve (Caughley 1977, Skalski et al. 2005) and often require resources not available to management agencies. The first objective of this project is to conduct a thorough review of published literature of

density estimation techniques for deer, focusing on techniques that rely on passive methods and are readily available to management agencies such as trail cameras and unmanned aerial vehicles (UAVs). We will summarize strengths and weaknesses of each approach including assessing whether techniques provide additional measures informative for CWD management (e.g., ratio of mature males). The goal of this objective is to determine two estimation techniques that show promise for providing precise estimates of deer density at the scale of management for hotspots (~9 sq. miles). The second objective of this project is to evaluate the selected estimation techniques in field conditions typical of agricultural dominated regions of the Midwest. Techniques will be prioritized based on feasibility, precision and accuracy measures appropriate for management, and cost. We will produce a best management practices document with standardized field protocols and analytical methods for generating density estimates of hotspots. There is an additional need to standardize these approaches to compare CWD management efforts over time and among jurisdictions. We believe our final product will have broad applicability to state, federal (including USDA) and tribal governments for estimating deer density in localized areas and will be applied in regional research assessing CWD mitigation and management efforts.

Wild CWD Surveillance and Detection Through Signature Volatile Organic Compound Identification, Penn Vet Working Dog Center (Otto, C.)

This project investigates Chronic Wasting Disease (CWD) affected areas within Pennsylvania via the methods of bio-sampling (cervid fecal samples) and aims to develop and improve upon antemortem detection methods of CWD, including trained detection canines as well as identification of signature volatile organic compounds (VOCs) that can differentiate fecal samples from CWD-positive and CWD-negative deer. The first aim is to increase cervid fecal sample collections from the landscape and verify CWD status of fecal samples by RT-QuIC and/or RPLN. This will provide the basis for a biobank store and will maintain a sample pool for both chemical analysis and for training detection canines. The second aim focuses on characterizing the VOCs present in the headspace of fecal matter from CWD-positive and CWD-negative deer. This methodology could lead to the development of novel antemortem testing methods for CWD. The third aim uses the characteristic VOCs identified from Aim 2 to develop a fecal-matter-based non-hazardous training aid for CWD detection dogs. Together, the development of antemortem detection techniques like signature VOC identification in conjunction with CWD surveillance tools like bio-detection dogs can save substantial time and money in CWD management efforts. This research will provide a foundation for the development of further VOC testing methods and improve training of bio-detection dogs, which collectively can impact CWD detection and surveillance efforts.

Assessing and Reducing Environmental Chronic Wasting Disease Prion Load, Colorado State University Prion Research Center (Zabel, M.)

CWD prions have been detected and can persist in soil, plants, and water in CWD endemic areas, presenting a relevant reservoir of infectious prions that can infect incoming animals for many years. This has significant consequences for management strategies currently practiced for farmed cervids, where infected herds are culled and cervid farming prohibited for years. Even with these measures, however, introduction of animals into previously infected facilities often results in infection of the newly introduced cervids. Similar concerns have been expressed regarding the re-introduction of reindeer into CWD-affected Nordfjella region in Norway.

Shedding of prions present in excreta and decaying carcasses into the environment represent an important source of indirect transmission. But prion titers on the landscape from environmental contamination from these sources are likely many orders of magnitude lower than titers from other biological samples. Lowering this already low but significant environmental prion titer represents an attractive target for mitigating indirect transmission and overall CWD prevalence over time.

Controlled burning of landscapes has been employed to mitigate fire danger by reducing the amount of tinder and fuel available to ignite and feed forest fires, for example. The United States and Canadian National Park Service routinely uses prescribed burns in its managed lands to mitigate fire threats. Lowering prion titers as well as eliminating vectors like plants consumed by cervids represents an analogous strategy to reduce environmental prion titers and halt indirect CWD transmission.

Understanding and estimating environmental CWD prion contamination in Rocky Mountain National Park (ROMO) will lead to a greater understanding of CWD transmission there and in nature generally. This work also will assist in identifying the best policies and practices for management of this incurable disease that continues to spread across North America at an alarming rate and threatens ROMO elk herds, a very popular attraction that draws millions of visitors annually.

Stakeholders that directly benefit from this proposed work include federal and state agencies that monitor and manage CWD, including wildlife biologists at ROMO, National Park Service and Colorado Parks and Wildlife, USDA APHIS, the National Wildlife Research Center, U.S. Fish and Game and other wildlife management agencies in states where CWD is endemic or that border states with CWD. The public, including hunters, tourists, and residents of CWD- endemic areas will also benefit.

Genetic Assignment Tests Using Single Nucleotide Polymorphisms in White-tailed Deer as a Management Tool for Chronic Wasting Disease, The Pennsylvania State University (Walter, D.)

Lack of information regarding population genetic structure and origin of CWD-positive deer is likely to reduce the effectiveness of mitigation efforts. Delineating management units that reflect spatial genetic structure will allow for coordinated management actions that cover the extent of each deme (i.e. genetic cluster). Historical management boundaries for white- tailed deer by management agencies are based on geopolitical boundaries or topography that are often not based on disease epidemiology or deer biology. In addition, movements (natural or anthropogenic) of CWD-positive deer can undermine local management actions. Understanding these movements by inferring the most likely geographic origin of CWD- infected deer could allow more effective control actions by incorporating source-sink dynamics of transmission, detection of anthropogenic movement of deer, and evaluating whether a CWD detection could be attributed to dispersal from another area or a sign of local establishment of the disease. Genetic analyses can assist in this process by identifying subpopulations and assigning CWD-positive individuals of unknown provenance to their most likely subpopulation of origin. These subpopulations can show differences in vulnerability to CWD establishment and expansion based on the genetic composition of their individuals. For example, Seabury et al. 2020 conducted genome-wide association analyses using Single Nucleotide Polymorphisms (SNPs) in farmed deer, finding genetic basis of CWD susceptibility that extends beyond the prion protein gene.

We aim to conduct similar association methods to the aforementioned analyses previously

conducted on captive deer, using samples from wild deer collected in six states of the mid-Atlantic region. We will assess which loci influence CWD susceptibility in the wild and which subpopulations, if any, present higher vulnerability to CWD establishment due to their relatively high abundance of susceptible individuals. Understanding population structure of white-tailed deer and delineating management units accordingly will allow for coordinated management actions covering the extent of each deme (across state lines). Management agencies will also benefit from a genetic characterization of each deme that could be used to assign individuals of unknown origin to a source population.

Federal, state, and tribal agencies would benefit from population genetic information, which can be used to delineate management units based on gene flow/genetic clusters. Historical management boundaries for white-tailed deer by management agencies are based on geopolitical boundaries or topography that are often not based on disease epidemiology or deer biology. Developing management units based on genetics or determining likely origin of a new foci for CWD will likely be useful across vast regions in the future to identify areas of high risk to CWD spread in the presence of an outbreak or at lower risk due to their isolation. Assessing susceptibility to CWD in the wild beyond *Prnp* could prove to be useful in determining relative risk of deer demes to CWD establishment, based on frequencies of these alleles. Our research is the first region-wide assessment of population structure likely to facilitate collaboration and transferability of results.

A Survey of the Genetic Vulnerability to CWD of White-tailed Deer Across their Range in the United States, The University of Illinois (Roca, A.)

This project aims to conduct a nationwide survey to sequence the prion gene (*PRNP*) in white-tailed deer (WTD) across the United States. By analyzing over 600 samples from various regions and subspecies, we will assess the diversity and geographic frequencies of *PRNP* and PrP variants and estimate the relative genetic vulnerabilities to CWD of WTD populations across their range in the U.S. Our proposal will (1) provide a comprehensive genetic survey to identify *PRNP* diversity in WTD populations nationwide, (2) estimate the frequencies of advantageous and other alleles in different populations of WTD, contributing to a better understanding of their genetic resiliency or vulnerability to CWD, and (3) identify broad geographic patterns in the distribution of advantageous alleles of *PRNP*, enhancing our knowledge of genetic diversity of *PRNP* across the US. The study will also (4) deliver information that can inform disease management strategies for WTD. Previous studies have highlighted the importance of *PRNP* variations in disease vulnerability, but data across from various parts of the range of WTD in the U.S. are lacking. Our project will address this gap. The outcomes of this proposal will benefit wildlife managers by providing detailed genetic data that will inform the development of strategies for managing and mitigating CWD in WTD populations across the United States. The comprehensive genetic survey and improved understanding of *PRNP* diversity will be important for managing WTD populations that face the increasing impact of CWD.

Development of a CRISPR Based Amplification Assay for the Detection of CWD in Wild Cervids, University of Georgia (Velayudhan, B.)

CWD has been detected in more than 32 states in the U.S., four provinces in Canada, Finland, Norway, Sweden, and South Korea. The prevalence of CWD is increasing in North America, spreading to new areas every year. Though Georgia has not reported any incidence of CWD yet, it has been recently reported from neighboring states including Florida, Tennessee, North Carolina, and

Alabama. There have been several reports of CWD outbreaks in Minnesota in recent years spanning nine counties. The diagnostic tests currently used for CWD detection include Enzyme Linked Immunosorbent Assay (ELISA) and immunohistochemistry (IHC). These are federally recognized diagnostic tests for CWD in brain tissue (obex) and retropharyngeal lymph nodes (RLNs). The Athens Veterinary Diagnostic Laboratory (AVDL) is an approved laboratory for CWD ELISA and the University of Minnesota (UMN) VDL is an approved lab for CWD IHC. Both the assays have low sensitivity, are time-consuming, and are not validated to test other samples. Recently, real-time quaking-induced conversion (RT-QuIC) assay has been introduced for the detection of CWD. The RT-QuIC assay is highly sensitive and high-throughput. However, it requires sophisticated instruments and advanced training or skillset. So, there is a high market need for innovative, rapid, highly sensitive and high throughput assays to detect CWD from cervids.

The proposal addresses an important market need for a rapid and highly sensitive diagnostic as well as surveillance assay for the detection of CWD from clinical samples from wild cervids. The proposal is to develop and validate a novel amplification assay by leveraging the advantages of CRISPR and combining that with ELISA methodology to improve sensitivity of the assay. Recent advances in development and use of CRISPR technology and CRISPR-associated (Cas) containing programmable endonucleases have led to the development of CRISPR-Cas based diagnostic methods. Compared to current methods of detection, CRISPR- based diagnostic assays are more specific and sensitive. The main objectives of this proposal are to: 1. Develop a CRISPR-ELISA amplification assay (CLISA) for the detection of CWD, 2. Test different sample types including obex, retropharyngeal lymph node, respiratory swab, feces, other lymph nodes (recto-anal mucosal-associated lymphoid tissue), and blood with CLISA to evaluate the analytical performance of the assay across various sample matrices, and 3. Compare CLISA with ELISA using clinical samples received for surveillance or diagnostic testing at the AVDL and UMN VDL.

The main deliverable of this proposal would be the development of a novel, rapid and high throughput test for the detection of CWD that can be used in any approved laboratory even in resource limited conditions. The proposed CRISPR ELISA will be a highly sensitive and specific assay for detecting CWD in clinical samples from cervids. Other deliverables include determination of analytical sensitivity, specificity, and time to results of CLISA amplification assay, evaluation of analytical performance of CLISA using multiple sample types collected from wild cervids, and comparison of CLISA with gold standard ELISA method using contrived samples. The new assay will be more sensitive and faster than the existing methods.

Optimizing the Surveillance and Management of Chronic Wasting Disease on Tribal Lands for the Preservation of Culture and Food Sovereignty, University of Minnesota (Wolf, T.)

CWD is difficult to eradicate from deer populations once introduced, hence prevention, early detection, and swift action with participation by all stakeholders are critical to successful CWD control. CWD threatens the food sovereignty and cultural heritage of Tribal nations; yet Tribal nations are often left out of decisions related to CWD management and control. In recognizing that CWD control requires community participation, the wildlife agencies of White Earth Nation and Leech Lake Band of Ojibwe, located within 15 mi of recent CWD detections, seek to effectively engage their communities on CWD. These agencies have now drafted CWD management plans following scientific best practices, but it remains unclear how certain changes in harvest regulations and associated hunter responses will impact CWD incursion and long-term prevalence on Tribal lands. Through our ongoing partnership with Tribal agencies in community-based participatory

research (CBPR), we have also learned that a community engagement priority is short, educational video communications that connect CWD with food sovereignty and better engage community members on CWD. Thus, using community engaged participatory research, we will leverage existing tools for the optimization of surveillance, management, and outreach such that Tribal natural resource agencies and community members are empowered in the control of CWD on Tribal lands.

Our goal is to use CBPR to optimize CWD surveillance and management for White Earth and Leech Lake reservations and co-create CWD outreach videos for broad use in Tribal communities. To accomplish this goal, we will adapt user-friendly agent-based modeling tools, *OvPOPsurveillance* and *OvCWD*, that can integrate Tribal CWD and deer population data to quantify the effectiveness of ongoing Tribal CWD surveillance and compare specific management actions on their impact on prevalence and deer population dynamics. Detecting CWD in the early phase of an outbreak is a major challenge due to geographic clustering of infected individuals with an overall low population prevalence, a potential situation of the WE and LL reservations. By incorporating stochasticity of deer population dynamics and individual heterogeneities in pathogen transmission, agent-based models can facilitate a better understanding of the epidemiology of CWD, which is critical for designing and implementing effective CWD surveillance and control strategies. These modeling tools will serve as an experimental platform for Tribal hunter engagement in management scenario analysis, communicating analytical insights, and engaging the community in management planning. We will further engage Tribal hunters in the co-creation of outreach videos on CWD. Recognizing that style (realistic vs animated) and platform (e.g., social media vs looped, professionally produced videos at the local health clinic) are important for reaching different demographic groups within the community, we will compare the effectiveness of different pilot videos. In collaboration with White Earth and Leech Lake, we will use quantitative and qualitative data to evaluate the educational effectiveness of the pilot videos to assess utility and uptake among different Ojibwe communities and stylistic preferences for future productions. Thus, the proposed work integrates key research and community priorities regarding CWD management and outreach in Tribal communities.

Optimization, Comparison, and Validation of Real-Time Quaking Induced Conversion of PrP^{CWD} to detect Chronic Wasting Disease in White-tailed Deer from Frozen, Formalin Fixed, and Formalin Fixed Paraffin Embedded Retropharyngeal Lymph Nodes, University of Pennsylvania Wildlife Futures Program (Gibison, M.)

This project investigates the possibility of retrieving and amplifying PrP^{CWD} from formalin fixed (FF), or formalin fixed paraffin embedded (FFPE) samples. This addresses the need for CWD diagnostics from less-than-ideal samples, where refrigeration of samples may not be possible or practical, or there is a discrepancy between ELISA and IHC results. IHC can also prove challenging due to the variabilities in the distribution of prion proteins, a particular concern during early disease progression, or staining artifacts due to sample quality issues. Yet formalin fixation has the advantage of not requiring refrigeration, so may prove useful to certain agencies, or all that is available for testing. We will demonstrate how the use of RT-QuIC on FF and FFPE samples can assist in screening and improve sensitivities in early disease progression in wild deer. This study will build off previous smaller studies that used experimentally inoculated deer, with a larger, more robust sample set. This study will then also compare a matched set of samples across ELISA, IHC, RT-QuIC and include genomic analysis of the PrP gene. This will provide valuable insights into how these various detections methods can directly compare with each other and how genetic polymorphisms may influence detection abilities.

This information will provide valuable feedback to state agencies on alternative methods that may be most relevant to their needs to conduct CWD surveillance and implement management practices.

Stress Effects on White-tailed Deer in a High Prevalence Chronic Wasting Disease Area, University of Tennessee (Muller, L.)

We have limited understanding of the effects of stressors placed on deer in areas of high CWD prevalence. Association of Fish and Wildlife Agencies Best Management Practices for Prevention, Surveillance, and Management of CWD said management zones should be based on life history and characteristics of local populations. Each area with CWD may have unique deer dispersal and movements because of habitat, social structure, and human interactions. Therefore, capture and monitoring deer is required for CWD management recommendations and evaluating potential for disease spread. Considering the role of stress is important when interpreting life history characteristics obtained through deer capture and vital for management recommendations for minimizing the spread of CWD.

Some of the clinical signs of CWD are also classical signs of stress including hyperexcitability, tremors, teeth grinding, excessive urination and drinking. We have seen high mortality after capture which may be directly due to the capture stress but appears to be more common in CWD+ deer. These CWD+ deer do not exhibit outward clinical signs of CWD. We would like to evaluate if stress as measured by cortisol is higher in CWD+ deer or not. We need to understand potential capture effects on our ability to use dispersal and movements for management recommendations. To our knowledge no one has evaluated stress hormones (cortisol) on deer populations with CWD.

We have frozen serum from 75 deer captures that occurred at Ames Research and Education Center (Ames REC) in West Tennessee during 2023 and 2024. We will also collect up to 200 hair samples from hunter-harvested deer. Ames REC has high prevalence of CWD. We will set up a hormone assay lab in West Tennessee and will measure cortisol from serum and extracted cortisol from the hair samples using a commercially available enzyme-linked immunosorbent assay (ELISA). For the captured deer we have biological information and movement data. For the hunter-harvested deer we will collect biological information at the time of harvest. Any capture mortalities and all the harvested deer will be tested for CWD. We expect to use this information to understand the potential role of stress on deer populations with high prevalence of CWD. These data are useful in making management recommendations to minimize deer dispersal and spread of CWD while sustaining populations.

Tribal Funded Project

Chronic Wasting Disease Surveillance on the Flathead Indian Reservation, 2024, Confederated Salish and Kootenai Tribes (Kingery, K.)

The Confederated Salish and Kootenai Tribes (CSKT) manage wildlife within the boundary of the Flathead Indian Reservation (FIR), Montana. We employ professionally trained B.S. and M.S. Wildlife Biologists to conduct research and manage all wildlife species on the Reservation; we work cooperatively with state and federal agencies on cross boundary matters. Chronic Wasting Disease, (CWD) was first detected in free ranging deer in eastern Montana in 2017, and in 2019 it was detected in Libby, northwestern Montana. This area is approximately 40- miles northwest of the northern boundary of the FIR. Tribal members subsistence hunt on the FIR, and treaty- hunt off reservation in open and

unclaimed lands. CSKT treaty hunters can harvest in the area in and around the Libby CWD MZ, as well as all other CWD positive areas in the State. All non-tribal member residents of the FIR hunt off-reservation on State Lands and return to the FIR with carcasses harvested from potential CWD Positive areas. The CSKT Wildlife Management Program is also concerned about the potential migration of deer (which migrate up to 150-miles), elk (120-miles) or moose (20- 50miles) between the Libby CWD Management Zone (CWD MZ) and the Flathead Reservation. A study conducted by the CSKT Wildlife Management program in between 2012-2017 showed that some radio collared elk migrate from the Flathead Reservation to the Lost Trail National Wildlife Refuge, and back again. Lost Trail is 15-miles from the Libby CWD MZ. The potential for infected elk migrating to the Reservation from this area is present.

CSKT have worked with Montana Fish, Wildlife and Parks on surveillance and submitting opportunistic cervid samples from hunters. Though CWD is not locally detected, it is very close to our boundary, and we need the public to assist with surveillance. We would benefit from additional funding to provide community outreach events and seasonal hunter check stations to further reach public and hunters to increase our sample size and awareness about CWD to Tribal members.

We do not have dedicated funding for work related to CWD and would rely on outside funding for the implementation of our newly written *CWD Surveillance and Emergency Response Plan for the Flathead Indian Reservation, 2022* (CWD SERP FIR). A big game specialist and seasonal crew would be required to achieve sample size goals estimated for CWD surveillance and prevalence sampling per the CWD Plan.